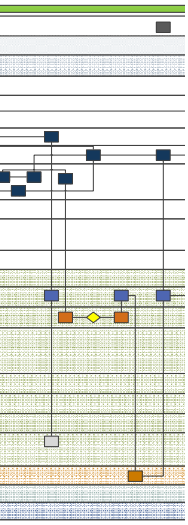
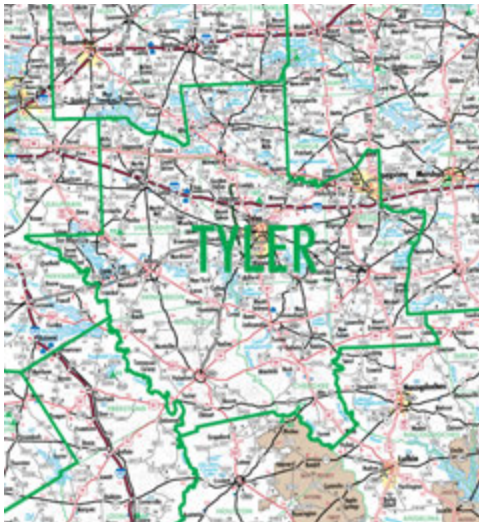
TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS (TSMO)





TYLER DISTRICT PROGRAM PLAN

September 2021

Texas Department of Transportation

Document Control

Date	Version	Description
August 30, 2021	1.0	Draft TxDOT Tyler District Transportation Systems Management and Operations Program Plan – TxDOT Tyler District Review
September 30, 2021	2.0	

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List of Acronyms

AAR	After-Action Review
AASHTO	American Association of State Highway and Transportation Officials
ATMS	Active Traffic Management Systems
BP	Business Processes (TSMO Capability Dimension)
CCTV	Closed-Circuit Television
CMF	Capability Maturity Framework
CMM	Capability Maturity Model
CO	Collaboration (TSMO Capability Dimension)
CRIS	Crash Records Information System
CU	Culture (TSMO Capability Dimension)
DMS	Dynamic Message Sign
DOT	Department of Transportation
DPS	Department of Public Safety
FHWA	Federal Highway Administration
ICT	Incident Clearance Time
ITS	Intelligent Transportation System
MPO	Metropolitan Planning Organization
OW	Organization and Workforce (TSMO Capability Dimension)
PM	Performance Measurement (TSMO Capability Dimension)
PSE	Planned Special Event (TSMO Focus Area)
RCT	Roadway Clearance Time
RWM	Road Weather Management (TSMO Focus Area)
ST	Systems and Technology (TSMO Capability Dimension)
SWZ	Smart Work Zone
TM	General Traffic Management (TSMO Focus Area)
TIM	Traffic Incident Management (TSMO Focus Area)
TMC	Traffic Management Center
TMS	Traffic Management Systems
TRF	TxDOT Traffic Safety Division
TSM	Traffic Signal Management (TSMO Focus Area)
TSMO	Transportation Systems Management and Operations
TTI	Texas Transportation Institute
TxDOT	Texas Department of Transportation
UTP	Unified Transportation Plan
WZM	Work Zone Management (TSMO Focus Area)

Executive Summary

What is a TSMO Program Plan?

Transportation Systems Management and Operations (TSMO) is an approach to improve mobility for all modes of transportation. TSMO uses integrated strategies that are designed to optimize the performance of existing infrastructure by preserving capacity and improving the security, safety, and reliability of the transportation system. The Texas Department of Transportation (TxDOT) Tyler District has developed this TSMO Program Plan to identify TSMO action items that District staff can implement over the next five years to improve traffic operations.

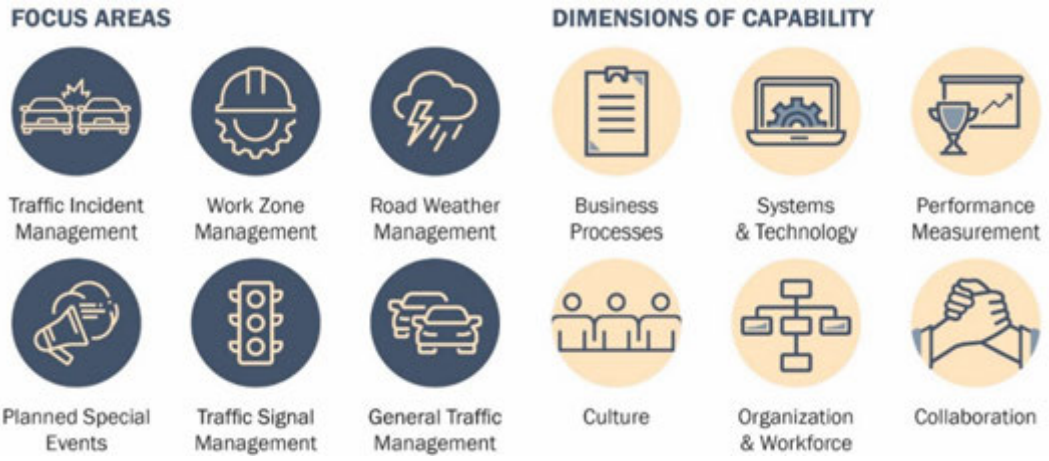
> TSMO is "an integrated set of strategies to optimize the performance of existing infrastructure through the implementation of multimodal and intermodal, cross jurisdictional systems, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system.
> (United States Department of Transportation (DOT))

Stakeholder engagement for this TSMO Program Plan effort began in September 2020 and included outreach to District staff, neighboring state departments of transportation (DOTs), local agency partners in traffic engineering and emergency response, and regional entities such as the Tyler Metropolitan Planning Organization (MPO) and Longview MPO. Each phase of stakeholder engagement is summarized in the timeline to the right.

STAKEHOLDER INVOLVEMENT TIMELINE

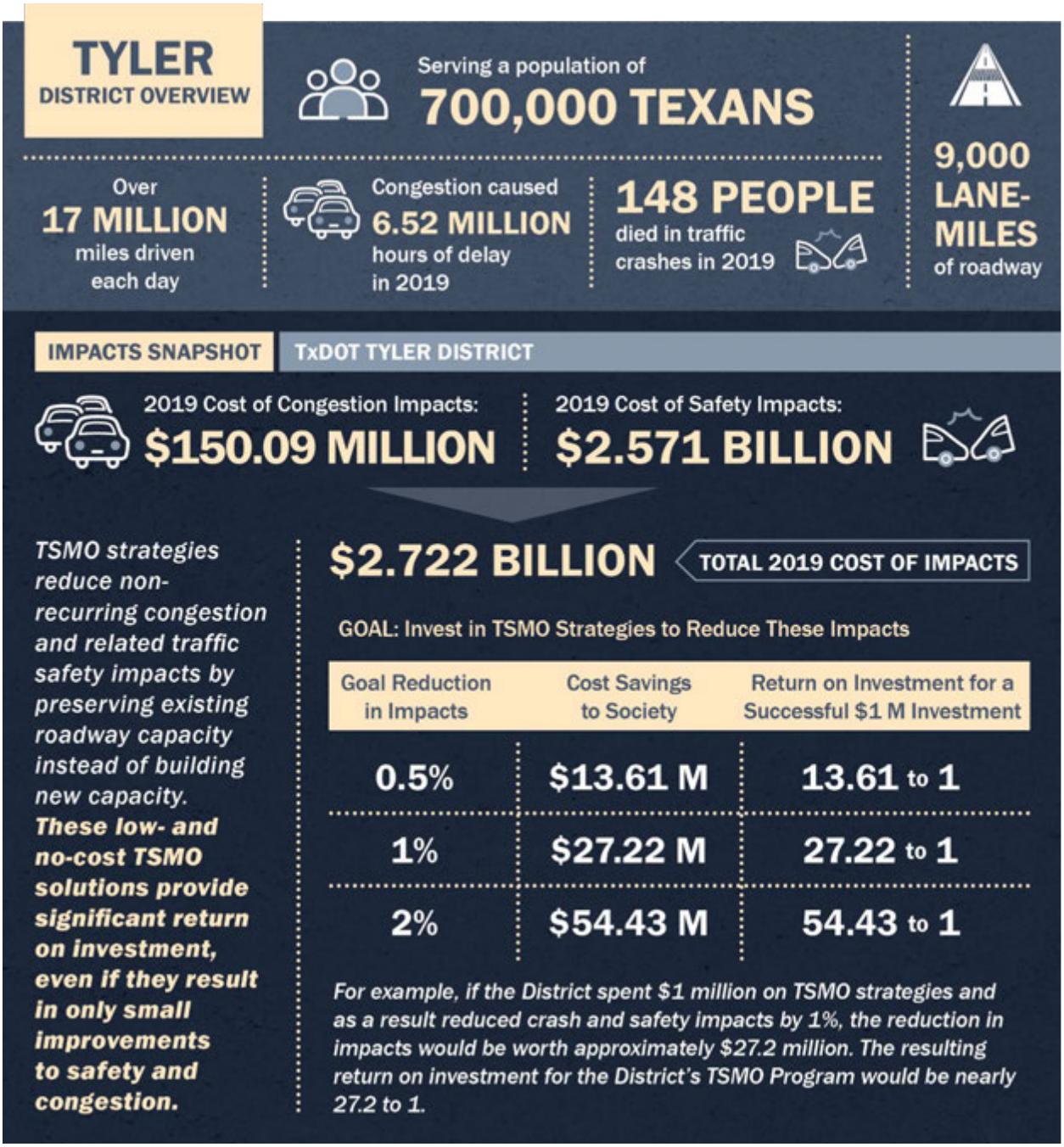
- **TxDOT Internal Outreach** — October 2020
- **External Partner Leadership Meetings** — November/December 2020
- **TSMO Outreach Workshops** — January 2021
- **Outreach and Capability Maturity Model (CMM) Workshops** — February/March 2021
- **Capability Maturity Framework (CMF) Workshops** — April 2021
- **State of the Practice Report** — July 2021
- **Draft TSMO Program Plan** — August 2021
- **Final TSMO Program Plan and Roll Out Event** — September 2021

To develop this plan, the TxDOT Tyler District reviewed existing data and engaged with both internal and external stakeholders through a series of meetings and workshops to identify strengths and needs related to six TSMO **Focus Areas**. The TxDOT Tyler District identified a list of potential action items that could be implemented to build on those existing strengths and address those ongoing needs. These action items were grouped into six TSMO **Dimensions of Capability**. These TSMO focus areas and dimensions of capability are shown below, with these icons used throughout the report to identify related discussion.



Why Invest in TSMO Actions?

A review of congestion and safety impacts in the TxDOT Tyler District revealed that traffic and crashes within the District's boundaries cost travelers more than $2.72 billion in 2019. TSMO actions have been proven to reduce congestion and crash rates at levels of investment far lower than would be required for capacity-building projects. The overview below shows how investing in TSMO actions to reduce these societal costs can provide a significant return on investment for the TxDOT Tyler District. More detail is provided in the **Business Case for TSMO** section of this TSMO Program Plan.



How Should the District Invest in TSMO?

Based upon the District's guiding TSMO principles and existing needs identified by TxDOT and its partners, 34 action items to advance TSMO were identified for the TxDOT Tyler District. A full list of recommended action items is in the **TSMO Implementation Plan** section of this TSMO Program Plan. Action items that were expected to provide some of the highest returns on investment and meet the greatest operations needs are summarized in the table below. These action items have been categorized as: Early Win Action Items, Low-Cost/High Impact Action Items, and High Cost/High Impact Action items.

Summary of Action Items with Expected Highest Benefit-Cost

Action No.	Action Description	Report Page #	TSMO Focus Area	TSMO Capability Dimension
Early Win Recommended Action Items				
BP 01	**Implement Traffic Incident Management (TIM) Response Measures for Major Construction:** Develop processes and procedures for incident management within construction work zones prior to letting of all major construction contracts.	38		
ST 03	**Provide Work Zone Closure Information Through Third-Party Apps:** Partner with third-party navigation apps to provide accurate work zone closure information for travelers through the District.	50		
OW 01	**Establish Regional Multidisciplinary TIM Training:** Partner with the TxDOT Statewide Traffic Incident Management Coordinator to provide TIM multidisciplinary trainings and Train the Trainer programs to TxDOT staff and interested partners.	67		
CO 03	**Conduct Annual Regional Traffic Operations Forums:** Conduct annual regional traffic operations forums with staff from traffic operations agencies throughout the District.	74		
Low Cost, High Impact Recommended Action Items				
BP 08	**Develop TxDOT Tyler District ITS Master Plan:** Develop an ITS Master Plan for the TxDOT Tyler District to identify and prioritize ITS device and related communication infrastructure deployments throughout the District.	45		
PM 01	**Improve TIM Data Collection:** Improve incident management-related data collection, with a focus on location data accuracy as well as regional collection of roadway clearance time, incident clearance time, and secondary crash data.	60		
CO 01	**Establish a Formal Regional TIM Team:** Establish a formalized TIM Team that meets regularly and includes all relevant jurisdictions and roles.	72		

Action No.	Action Description	Report Page #	TSMO Focus Area	TSMO Capability Dimension
High Cost, High Impact Recommended Action Items				
ST 04	**Expand Work Zone Technology Deployments:** Deploy work zone technology throughout the District to support improved work zone monitoring, localized real-time traveler information, and end of queue warning.	51		
ST 07	**Plan and Implement Surveillance Technology for Signals:** Identify implementation priority for cameras and necessary software enhancements to allow for remote surveillance of District traffic signals from a single software platform.			
ST 08	**Improve Communications Capabilities to TxDOT Signals:** Improve communications capabilities to TxDOT traffic signal locations to increase ability to monitor and respond to conflicts, outages, and changes in traffic patterns such as during incidents, construction, and special events.	55		
ST 09	**Establish a Regional TMC:** Establish a regional traffic management center (TMC) to support traffic incident management, traffic signal management, traveler information dissemination, and other traffic management priorities.	56		
ST 10	**Implement Additional ITS Field Devices:** Implement new ITS deployments in the District including additional CCTV cameras and DMS to support active traffic management. Development of an ITS Master Plan could help identify candidate deployments.	57		

Which TSMO Actions Would Benefit from Further Development?

Tactical plans provide a focused look at how to implement key action items. These plans can establish project details, identify and assign responsibilities, and include detailed cost and staffing estimates for specific TSMO initiatives. The TSMO Program Plan identifies several recommended Tactical Plans in the **TSMO Tactical Plan Assessment** section to support priority action items. Tactical plans that could benefit the TxDOT Tyler District are shown below.

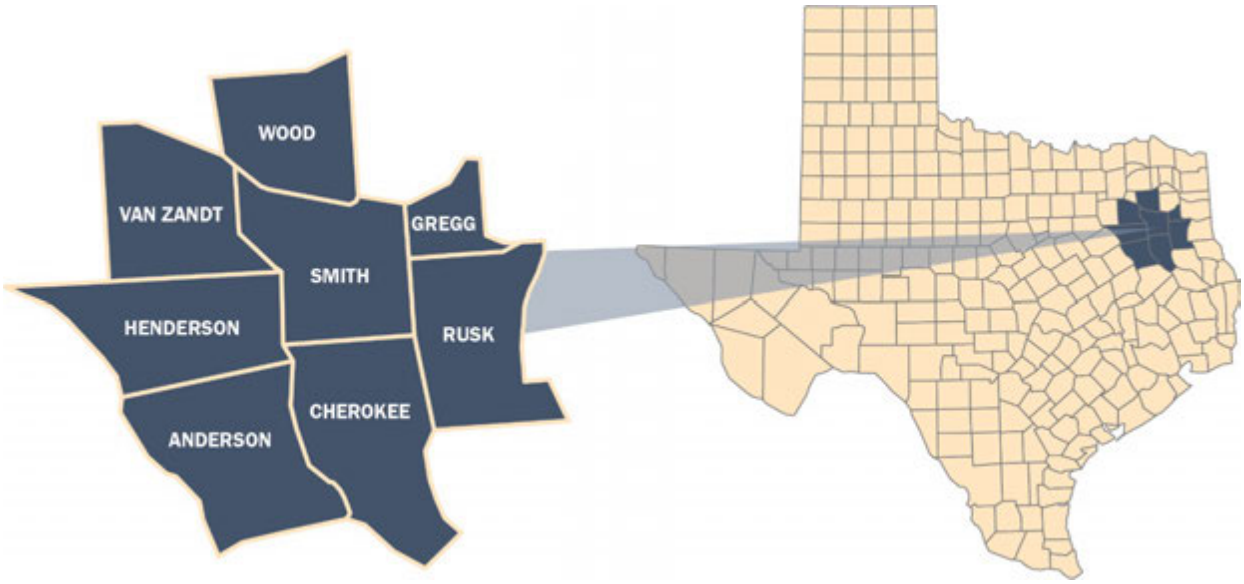
Potential Tactical Plan	Supports District TSMO Goals						Key Internal and External Partners	Expected Long Term Program Costs	Expected Ongoing Program Level of Effort	TSMO Action Items Addressed
	Safety					Integration				
TxDOT Tyler District ITS Master Plan (ITS Master Plan could include: ITS devices, traffic signal technologies, and TMC concept if not completed separately)	✓	✓	✓	✓	✓	✓	TYL Operations, TYL Area Engineers	$$$		BP-03, BP-08, ST-05, ST-07, ST-10
TMC Concept of Operations Development	✓	✓	✓	✓	✓	✓	TxDOT TRF, TYL Operations, TYL District Engineer, Local Transportation Agencies, Local Public Safety Agencies	$$		ST-07, ST-09, ST-11, OW-04, CO-01
Regional TIM Program Plan	✓	✓			✓	✓	TxDOT TRF, TYL Operations, TYL Maintenance, TYL Area Engineers, First Responders	$$		BP-01, ST-01, ST-02, PM-01, OW-01, CO-01, CO-02
Freeway Safety Service Patrol Feasibility Study	✓	✓	✓			✓	TYL Operations, TYL Area Engineers	$$$		ST-02, ST-09, CO-01
Work Zone Technology Deployment Expansion Plan		✓		✓		✓	TYL Operations, TYL Area Engineers, TYL Construction	$		BP-03, BP-08, ST-04

Introduction

The Texas Department of Transportation (TxDOT) Tyler District, shown in Figure 1, is developing and implementing a Transportation Systems Management and Operations (TSMO) program. TSMO is an approach to improve mobility for all modes of transportation using integrated strategies that are designed to optimize the performance of existing infrastructure by preserving capacity and improving the security, safety, and reliability of the transportation system.

> **TSMO is "an integrated set of strategies to optimize the performance of existing infrastructure through the implementation of multimodal and intermodal, cross jurisdictional systems, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system.**
> (United States Department of Transportation (DOT))

Figure 1: TxDOT Tyler District Map

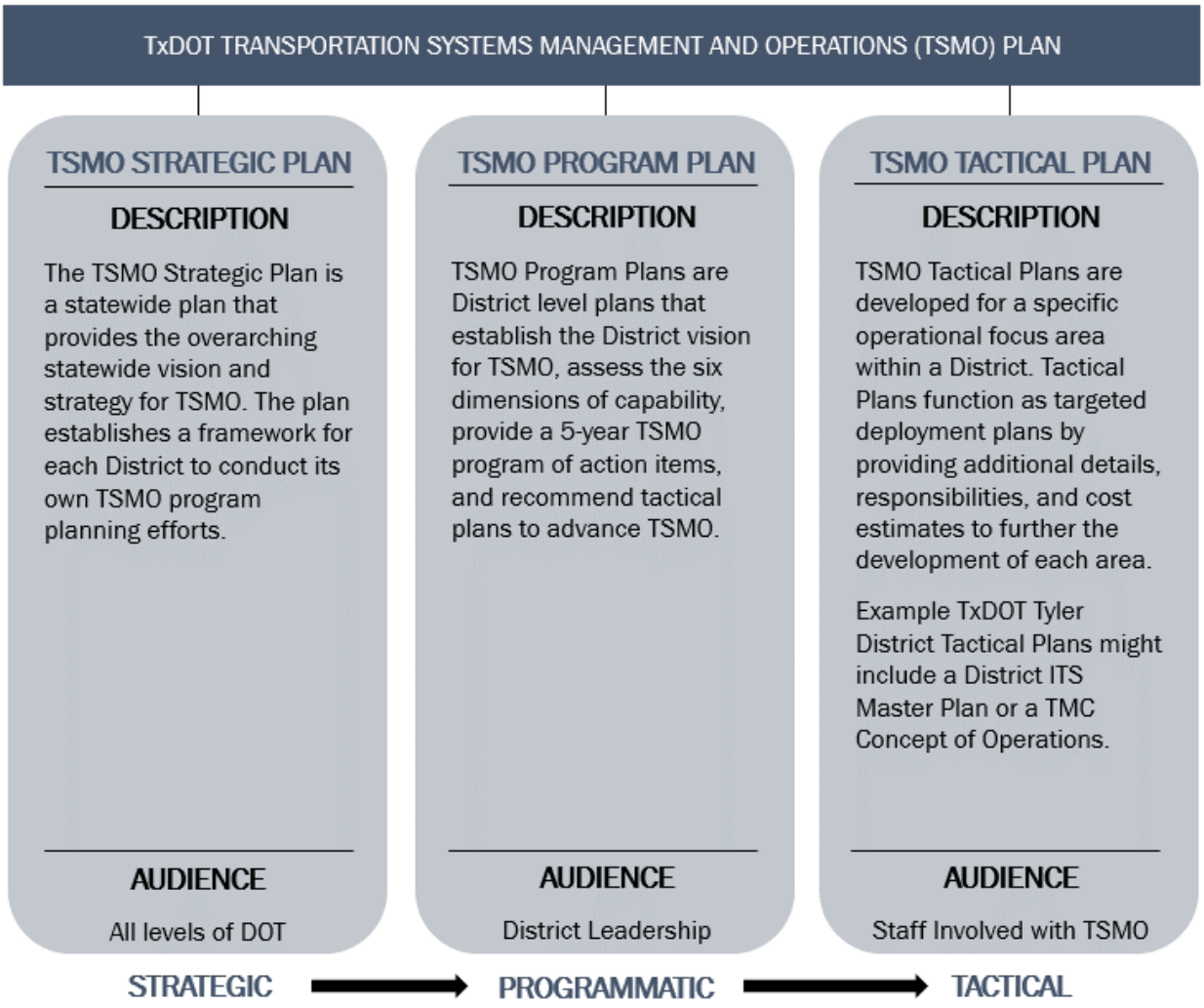


TSMO is defined specifically in federal legislation, including the Moving Ahead for Progress in the 21st Century Act (MAP-21), as well as the Fixing America's Surface Transportation (FAST) Act. The TxDOT Traffic Safety Division (TxDOT TRF) developed a Statewide TSMO Strategic Plan in 2018 that identifies statewide goals, objectives, and strategies for advancing TSMO in Texas.

In comparison to other state Departments of Transportation (DOTs), TxDOT is largely decentralized. Each of TxDOT's 25 districts has a unique set of operational challenges and constraints. As a result, each TxDOT District is developing its own TSMO Program Plan which will reference and conform to the Statewide TSMO Strategic Plan and related guidance that was finalized by TxDOT TRF in 2018. Even with consistency across each of the TxDOT districts' TSMO Program Plans, the business case, roles and partnering approaches, and implementation strategies will be uniquely tailored to each district's transportation challenges and needs.

The Federal Highway Administration (FHWA) generally recommends that state DOT TSMO planning elements include three levels of planning: strategic, program, and tactical. This report corresponds to the second level of TSMO planning in this hierarchy. The three levels of TSMO plans and a brief description of each is shown in Figure 2 below.

Figure 2: TxDOT Transportation Systems Management and Operations Plan Hierarchy



The TxDOT Statewide TSMO Strategic Plan was completed in 2018 as the first component of the TxDOT TSMO planning initiative. TSMO activities have been taking place throughout the state on an ad-hoc basis for decades. The TxDOT Statewide TSMO Strategic Plan defines processes to conduct TSMO consistently across the state. It also identifies the roles and responsibilities of each TxDOT division and of individual TxDOT districts for implementation of a statewide TSMO program.

Following the development of this framework, the second component of the TxDOT TSMO planning initiative is to develop district-level TSMO Program Plans. The TxDOT Austin District was the first of the 25 TxDOT districts to develop a TSMO Program Plan, completing theirs in June 2018. Other TxDOT districts began development of their TSMO Program Plans in 2019 and 2020.

Figure 3: TxDOT Tyler District TSMO Structure

Each district's TSMO Program Plan focuses on strategies that can be implemented within the next five years, after which the Program Plan should be updated to assess progress and to identify new focus areas and strategies. Potential TSMO Tactical Plans will be identified for the TxDOT Tyler District as a part of this TSMO Program Plan. The structure of the TxDOT Tyler District TSMO planning initiative is shown in Figure 3.

The development of the TxDOT Tyler District TSMO Program Plan involved individual agency outreach meetings and group workshops with both internal TxDOT stakeholders and external local and regional agency partners such as city transportation staff, regional planning organization staff, transit agency staff, and law enforcement and emergency response officials. These partners were asked to provide initial input on regional operational challenges, to give feedback on existing regional capabilities to address those challenges, and to discuss strategies that the region could enact to improve those regional capabilities. The stakeholder engagement timeline for this effort is shown in Figure 4, and a detailed list of participants is included in Appendix A. Due to travel restrictions related to the COVID-19 pandemic, all outreach was conducted virtually.

Figure 4: TxDOT Tyler District TSMO Stakeholder Engagement Timeline

Program Plan Format

In the **Business Case for TSMO** section, the TxDOT Tyler District TSMO Program Plan estimates the potential benefit-cost ratio for adopting TSMO priorities throughout the District. This business case includes available metrics on congestion and safety and an assessment of existing societal costs related to delay and crashes within the District. This information is analyzed alongside available funding sources and some of the regional operational challenges that TxDOT Tyler District staff and external partners identified. An explanation is provided as to how TSMO strategies might reduce these societal costs and address funding and operational challenges that the TxDOT Tyler District has identified as a priority.

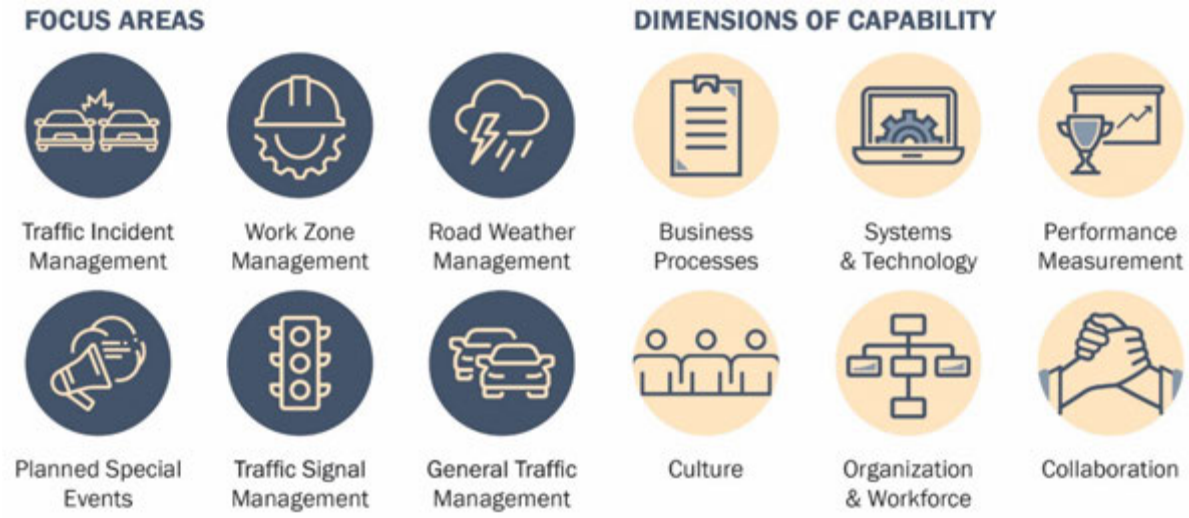
The **TSMO Vision, Mission, Goals, and Objectives** section introduces the Statewide TSMO Vision and Mission, both of which were developed as part of the 2018 TxDOT Statewide TSMO Strategic Plan. The section then lists the TSMO goals and objectives that the TxDOT Tyler District selected as part of this program planning process.

The **Capability Maturity Model** (CMM) section provides an overview of the self-assessment process and the assessment results that TxDOT Tyler District and partner agency stakeholders reported for six standard capability dimensions: Business Processes (BP), Systems and Technology (ST), Performance Measurement (PM), Culture (CU), Organization and Workforce (OW), and Collaboration (CO). The section describes how each of these results and related stakeholder feedback showed the TxDOT Tyler District's existing capabilities in responding to six of the most typical TSMO focus areas: Traffic Management (TM), Traffic Signal Management (TSM), Road Weather Management (RWM), Work Zone Management (WZM), Planned Special Events (PSE), and Traffic Incident Management (TIM).

The **TSMO Implementation Plan** section shows all recommended TSMO action items for the TxDOT Tyler District to undertake for the next five years in both a summary table and an implementation schedule. Detailed descriptions of each recommended TSMO action item, and relevant case studies of best practices from other TxDOT districts and state DOTs are included in this section. The icons shown in Figure 5 are used to relate the recommended action items to each TSMO capability dimension and focus area. Each recommended TSMO action item is detailed on its own page, and each page includes discussion on the underlying need for the action item, a guide for how that action item could potentially be implemented, and the anticipated benefits of implementing the action.

Finally, focus areas and related action items that would benefit from further planning or development prior to program implementation are summarized in the **TSMO Tactical Plan Needs Assessment** section. Each potential tactical plan listed in the section includes a plan lead from within the District, as well as other items such as anticipated level of cost and effort, potential partners in developing and implementing the tactical plan, and related action items that the tactical plan could help to address.

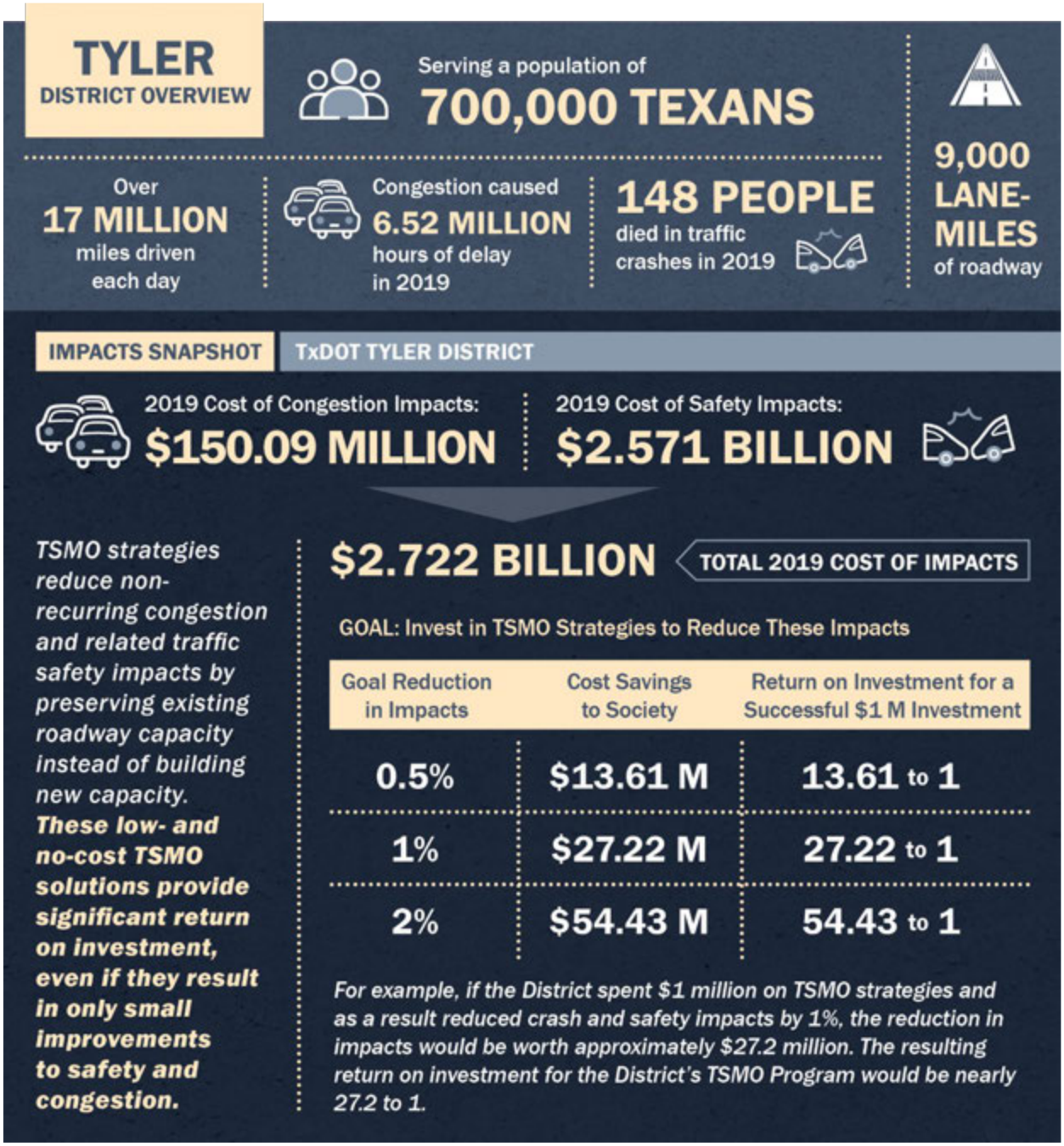
Figure 5: TSMO Focus Areas and Dimensions of Capability



Business Case for TSMO

Figure 6 below summarizes the business case for investing in TSMO strategies in the TxDOT Tyler District. A more detailed analysis of funding sources, congestion impacts, and safety impacts is provided on the pages that follow in this section.

Figure 6: TxDOT Tyler District Overview and TSMO Impacts Snapshot



Funding Impacts

The number of people living in Texas has increased by more than 15 percent in the last ten years. Adding transportation network capacity and optimizing the use of available funding have become increasingly challenging as the population of Texas continues to grow. As a result, TxDOT has emphasized transitioning transportation funding and resources from conventional capacity-adding methods to a focus on managing and operating the transportation network through investing in technology and Traffic Management Systems (TMS), as well as leveraging resources among regional partner agencies and the private sector.

The 2050 Texas Transportation Plan goal to **Deliver the Right Projects** corresponds closely with addressing funding challenges using TSMO strategies.

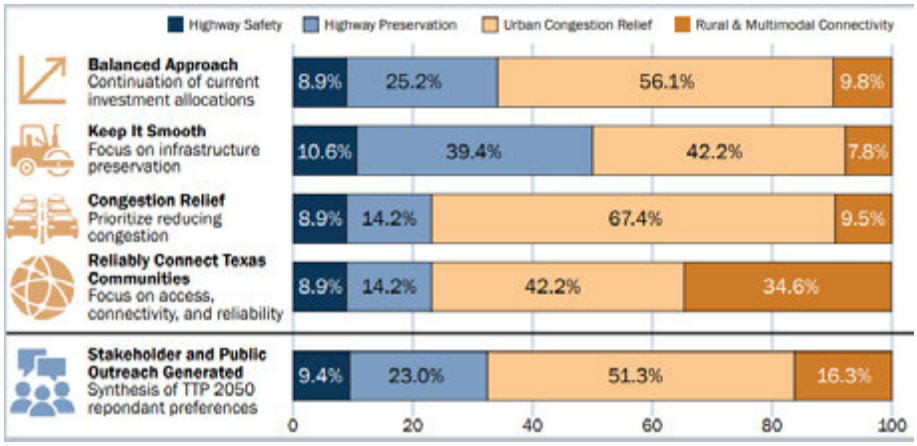
TxDOT Goal: Deliver the Right Projects

Detailed objectives include:

- Use scenario-based forecasting, budgeting, and resource-management practices to plan and program projects
- Align plans and programs with strategic goals
- Adhere to planned budgets and schedules
- Provide post-delivery project and program analysis
- Maintain and preserve system infrastructure to achieve a state of good repair and avoid asset deterioration

FHWA studies have shown that operational improvements to increase mobility without adding capacity typically have a higher benefit-cost ratio than infrastructure projects that build additional lane miles of capacity, especially when life-cycle costs are considered for both project types. With transportation demand growing, integrating TSMO into existing TxDOT Tyler District processes will help TxDOT staff identify and prioritize cost-efficient operations and systems management methods to improve system reliability and safety, thus optimizing the available capacity. TSMO will support projects that can bridge the gap between existing needs and available funding. Figure 7 below shows several potential investment scenarios for TxDOT over the next 30 years. [1]

Figure 7: 2050 Texas Transportation Plan Potential Funding Scenarios



The Texas 2020 Unified Transportation Program (UTP) established a planning target of $1,179,020,000 in project funding for the TxDOT Tyler District over the next 10 years.[2] The UTP also established a planning target of an additional $145,770,000 in project funding for the Tyler Metropolitan Planning Organization (MPO) and $72,010,000 in project funding for the Longview MPO over the next 10 years. Planning targets from the UTP for the TxDOT Tyler District are shown in Figure 8. Note that MPO target funding amounts are not included in this figure.

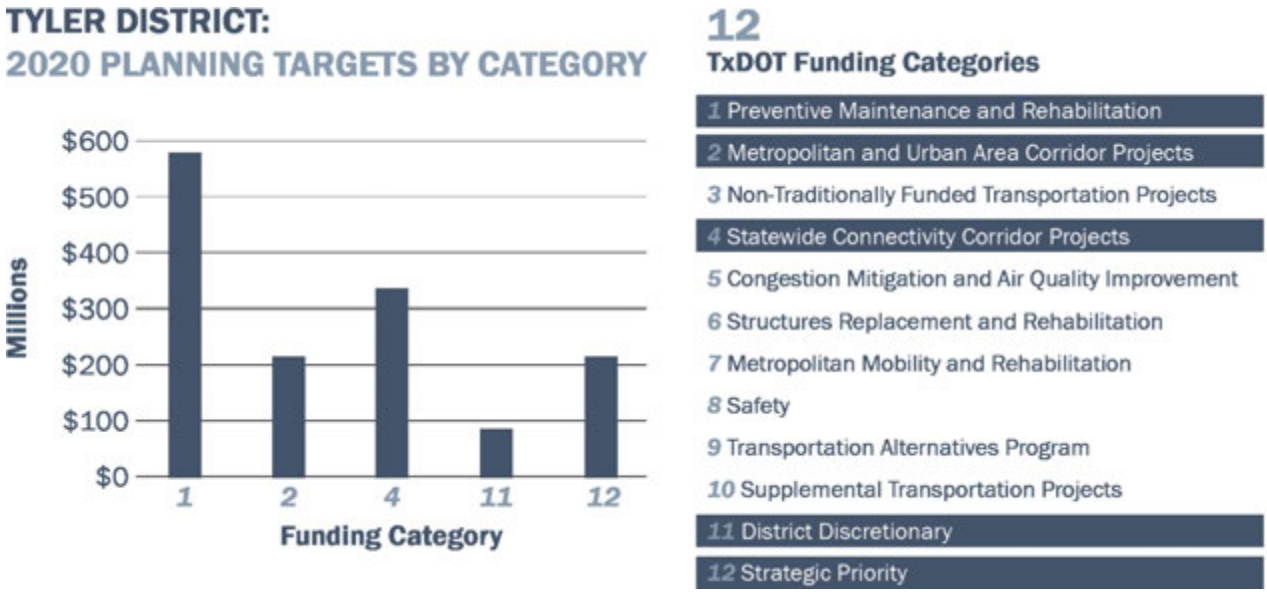


Figure 8: TxDOT Tyler District 10-Year Planning Targets by Category

Based on these planning targets, preventive maintenance and rehabilitation projects (Category 1), as well as Statewide Connectivity Corridor Projects (Category 4) are key investment areas that the TxDOT Tyler District will focus on over the next 10 years. TSMO strategies can be applied to both investment areas, and especially to improvements focused on preventive maintenance and rehabilitation projects. Several of the key projects related to these investment areas are:

- Widening US 175 to four lanes in Anderson and Cherokee Counties
- Widening US 271 to four lanes in Smith and Gregg Counties
- Reconfiguring the I-20/US 271/SH 31 Interchange in Gregg County
- Widening SL 465 to four lanes in Gregg County
- Widening SH 42 to four lanes in Gregg County

Agencies that place importance on TSMO in long-range planning, project development, system completion, and system maintenance have a strong basis for devoting funding to these strategies because operations and management activities can improve congestion while minimizing or delaying the need for physical capacity improvements. Through TSMO planning, funding is reserved to include TMS in conventional construction, asset management techniques, upgrades to existing infrastructure, workforce resources, and other operational strategies.

Congestion Impacts

The 2050 Texas Transportation Plan goal **Optimize System Performance: Movement of People and Goods** can be addressed using TSMO strategies.

TxDOT Goal: Optimize System Performance - Movement of People and Goods

Detailed objectives include:

- Mitigate congestion
- Enhance connectivity and mobility
- Improve the reliability of our transportation system
- Facilitate the movement of freight and international trade
- Foster economic competitiveness through infrastructure investments

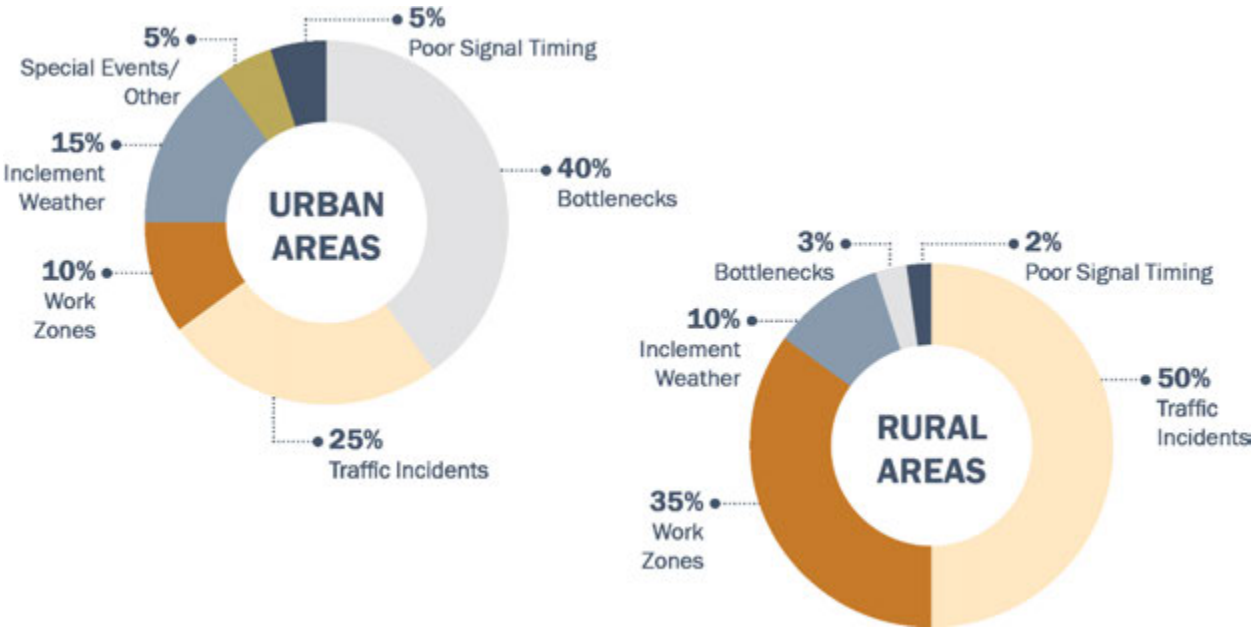
TSMO planning identifies strategies beyond typical capacity enhancements that reduce congestion. Since TSMO strategies are mostly focused on non-recurring congestion, they are typically more effective at improving travel time reliability when compared to capacity enhancements.

The Texas Demographic Center (TDC) reports the population of the TxDOT Tyler District has increased by 5.8 percent since 2010.[3] TDC projects that the population will continue to increase by approximately six percent over the next 20 years.[3] As annual vehicle miles traveled continue to increase, congestion will worsen unless innovative, proactive actions are taken.

One of the keys to maintaining economic vitality within the TxDOT Tyler District is the effective management of commute times. The United States Census Bureau tracks average commute time data through its Journey to Work questionnaire as part of the American Community Survey. Between 2010 and 2018, the average commute time for residents of Smith County within the TxDOT Tyler District increased by 12 percent, from 21.1 to 23.6 minutes.[4] The average commute time for residents of Henderson County within the TxDOT Tyler District increased by three percent, from 31.1 to 32 minutes.[4]

While the District has successfully managed commute times in the Tyler and Longview regions, many of the largest congestion impacts in other areas throughout the District occur due to events that limit roadway capacity, such as traffic incidents and planned construction. FHWA's breakdown of these congestion sources taken from nationwide data is shown in Figure 9 for both urban and rural areas, as well as for the nation overall.[5]

Figure 9: Causes of Congestion in Urban and Rural Areas (FHWA)



In 2020, the Texas Transportation Institute (TTI) estimated an annual total delay of approximately 6,524,131 passenger-hours along major thoroughfares within the District. This total is inclusive of an estimated annual freight vehicle delay of 615,587 driver-hours along those same major thoroughfares. Using Texas-specific user cost values, this congestion resulted in a societal cost of $150,093,300 within the TxDOT Tyler District in 2020.[6] The majority of these impacts likely resulted from capacity-limiting events, rather than bottlenecks.

TSMO allows for the inclusion of operations strategies that result in the improved management of incidents, work zones, weather events, and planned special events, thereby reducing the congestion impacts and related societal costs of these interferences on the TxDOT Tyler District transportation network.

Safety Impacts

The 2050 Texas Transportation Plan goal to **Promote Safety** corresponds with many TSMO strategies.

TxDOT Goal: Promote Safety

Detailed objectives include:

- Reduce crashes and fatalities by continuously improving guidelines, innovations, awareness, and education
- Reduce employee incidents

TSMO planning identifies technologies or systems that can be incorporated into existing or planned infrastructure to improve the safety of road users, whether they be drivers, cyclists, or pedestrians. In addition to the objectives outlined in the 2050 Texas Transportation Plan, the Texas Transportation Commission adopted a Road to Zero Goal in 2019. The goal is the elimination of all deaths on Texas roadways by 2050,

with a midway goal of halving the number of deaths on Texas roadways by 2035. The implementation of TSMO strategies will be essential in reducing and eventually eliminating deaths on Texas roadways.

In 2019, there were 14,429 reported crashes in the TxDOT Tyler District.[7] In those crashes, 148 people died and 550 people suffered an incapacitating injury. A summary of 2019 crashes in the TxDOT Tyler District, including the count of certain crash types that could be targeted by TSMO strategies, is shown in Table 1. Using Texas-specific user cost values, these crashes and associated damages resulted in a societal cost of $2,571,425,000 within the TxDOT Tyler District in 2019.[8]

Table 1: 2019 Summary of Crashes by Type Within the TxDOT Tyler District

	Fatal (K)	Serious Injury (A)	Minor Injury (B)	Possible Injury (C)	No Injury (O)	Unknown Severity
Total Crashes	129	431	1523	2767	9199	380
Total Persons Affected	148	550	2124	4581	28141	380
Inclement Weather Crashes Rain or Fog	13	50	154	304	1058	34
Inclement Weather Crashes Winter Weather	0	0	2	4	10	0
Work Zone Crashes	2	9	33	51	199	4
Intersection Crashes	20	107	456	828	2006	43
Commercial Vehicle Crashes	25	39	101	171	729	6

When TSMO activities are considered in project development, such as during planning for roadway reconstruction, solutions to improve safety for all modes of transportation can be identified and implemented. Furthermore, TSMO strategies aimed at reducing non-recurring sources of congestion and improving traveler information can improve driver expectancy and improve driver awareness of conditions that increase crash risks. Finally, TSMO strategies can help protect those who spend time working in the roadway, including TxDOT employees and contractors, public safety officers, and emergency responders.

The Value of Mainstreaming TSMO

The business case for TSMO is grounded in the fact that funding for the TxDOT Tyler District to solve existing congestion challenges through capacity enhancements alone is not readily available. FHWA congestion research shows that most of the congestion that road users experience in the United States is not a result of capacity bottlenecks. Instead, most congestion occurs due to non-recurring disruptions to the network such as traffic incidents, inclement weather, or work zones. In rural areas, nearly all congestion impacts come from these non-recurring sources.

TSMO strategies integrate TMS into the planning, design, and construction of District facilities. One group of strategies, the use of Intelligent Transportation Systems (ITS) deployments such as closed-circuit television (CCTV) cameras or dynamic message signs (DMS), has been used by TxDOT for decades and in the TxDOT Tyler

District for the past 15 years. The use of ITS as well as other TMS and TSMO strategies allows for more nimble operation and maintenance of facilities once they are constructed. Successful integration of TMS allows agencies who maintain the transportation network to respond more quickly and to better mitigate the adverse effects of many sources of non-recurring congestion, thereby reducing the amount of congestion and making roads safer.

Building necessary infrastructure and maintaining it have historically been the core goals of TxDOT's transportation project planning process, while operating and managing the performance of that infrastructure have traditionally not been as highly prioritized. TSMO justifies investment in technology and TMS infrastructure to facilitate the integration of management and operations into the transportation system. Promoting and formalizing TMS deployment and maintenance improves operational asset uptime, which in turn enables regional transportation agencies to provide better traveler information, improved traffic incident management, improved road weather management, safer work zones, and more.

TSMO planning fosters the cultural shift required to prioritize the dedicated funding of operational improvements and TMS. It also establishes a framework for performance measurement and continuous improvement to enhance safety and mobility throughout the District. Ultimately, this brings the District closer to achieving the TxDOT vision of serving as "a forward-thinking leader delivering mobility, enabling economic opportunity, and enhancing quality of life for all Texans."

TSMO Vision, Mission, Goals, and Objectives

The TxDOT Tyler District TSMO Program vision, mission, goals, and objectives match the items developed for the statewide TxDOT TSMO Strategic Plan. As part of a virtual meeting held in June 2021, District TSMO leadership at the TxDOT Tyler District determined that the District TSMO vision, mission, goals, and objectives should be the same as the statewide TSMO vision, mission, goals, and objectives. These items are listed below.

Statewide TSMO Vision

Improve safety and mobility for all modes of transportation by integrating planning, design, operations, construction, and maintenance activities and acknowledging all opportunities for innovation.

Statewide TSMO Mission

Through innovation, collaboration, and performance-based decision-making, transportation facilities are developed, constructed, maintained, and operated cost-effectively, with the end user in mind.

Tyler District TSMO Goals and Objectives

The goals and objectives for the TxDOT Tyler District TSMO Program Plan identified in Table 2 are based on the TxDOT statewide TSMO goals and objectives.

Table 2: TxDOT Tyler District TSMO Program Plan Goals and Objectives

TxDOT Tyler District TSMO Goals	TxDOT Tyler District TSMO Strategic Objectives
Safety	Reduce crashes and fatalities through continuous improvement of traffic management systems and procedures.
Reliability	Optimize travel times on transportation systems in critical corridors to ensure travelers are reaching their destinations in the amount of time they expected for the journey.
Efficiency	Implement projects that optimize existing transportation system capacity and vehicular throughput.
Customer Service	Provide timely and accurate travel information to customers so they can make informed mobility decisions.
Collaboration	Proactively manage and operate an integrated transportation system through multi-jurisdictional coordination, internal collaboration, and cooperation between various transportation disciplines and partner agencies.
Integration	Prioritize TSMO as a core objective in the agency's planning, design, construction, operations, and maintenance activities.

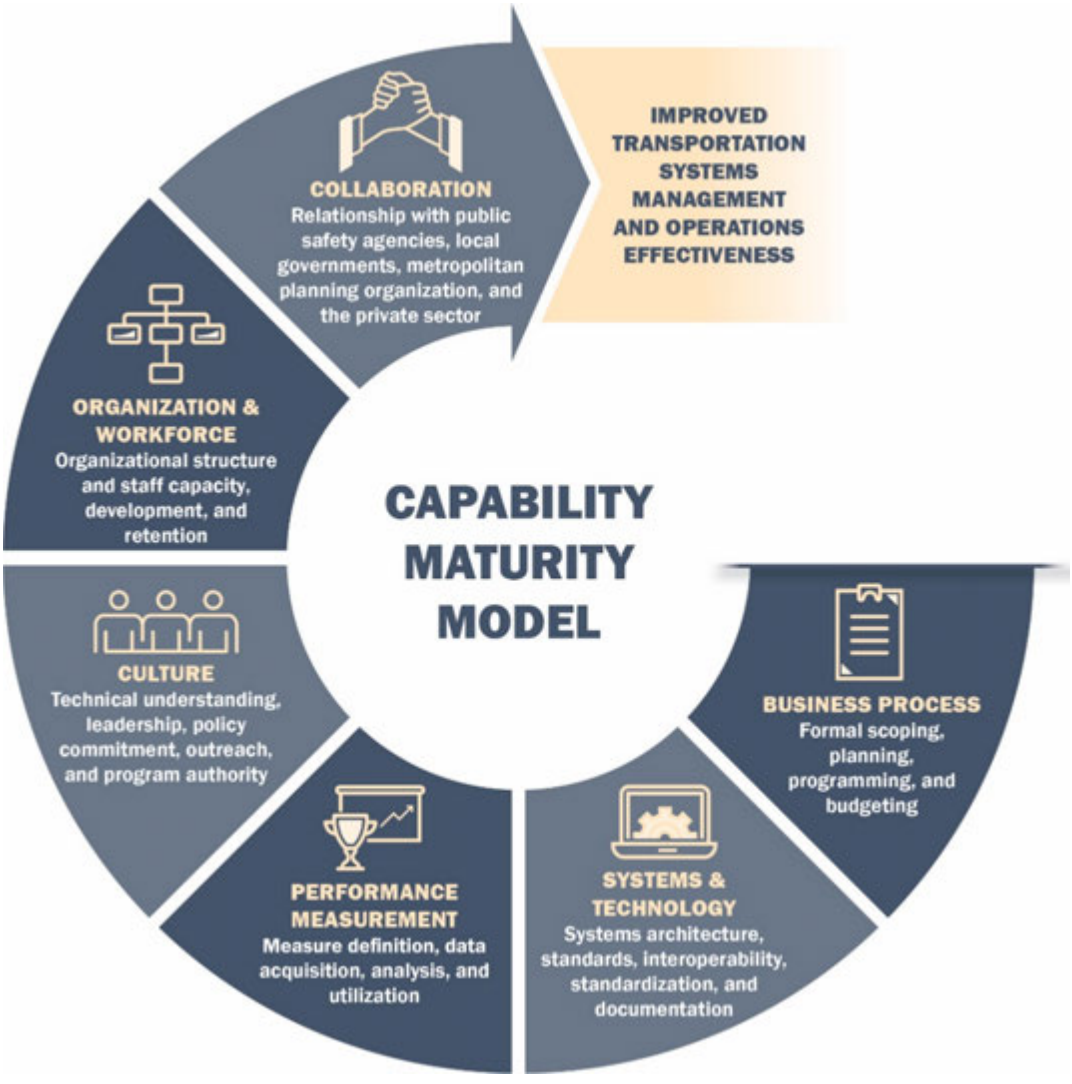
Capability Maturity Model

A Capability Maturity Model (CMM) is a systematic methodology in which a program or organization is evaluated to determine a level of achievement for specific attributes. The American Association of State Highway Transportation Officials (AASHTO) adapted the CMM approach, originally developed for the information technology industry, so that it could be used to gauge a transportation agency's capabilities in addressing various operational challenges related to TSMO. The CMM is a self-assessment and relies on direct input from internal and external stakeholders to assess the strengths and weaknesses across a range of different program perspectives.

Dimensions of TSMO Capability

The CMM is based on the concept that there are six core areas, referred to as 'dimensions' that are critical for improving program efficiency and effectiveness. These dimensions, as well as processes and activities within TxDOT that correspond to each one, are shown in Figure 10.

Figure 10: CMM Dimensions of TSMO Capability



TSMO Focus Areas

The AASHTO CMM assessed the TxDOT Tyler District's capabilities across the six dimensions of capability shown in Figure 10 for six different focus areas (often referred to as Capability Maturity Framework, or CMF). These focus areas are:

- **Traffic Incident Management (TIM):** The institutional capability to detect, respond to, and clear traffic incidents so that normal operations can be restored safely and quickly.
- **Work Zone Management (WZM):** The institutional capability to assess and mitigate work zone impacts.
- **Road Weather Management (RWM):** The institutional capability to respond to adverse weather conditions through both maintenance and operations activities.
- **Planned Special Events (PSE):** The institutional capability to manage traffic impacts generated by events at permanent event venues, temporary venues, or ones that occur on the road network itself.
- **Traffic Signal Management (TSM):** The institutional capability to effectively design, operate, and maintain traffic signals.
- **General Traffic Management (TM):** The institutional capability to manage the movement of traffic on roadways within a region, including through corridor management.

CMM Process and Assessment Results

Each of the TSMO capabilities evaluated in the CMM assessment are classified as one of four levels of organizational maturity by stakeholders through a facilitated self-assessment process. The base level, or Level 1, is the Performed level. The top level, or Level 4, is the Optimized level. It is important to note that the levels are not grades, they merely reflect how the organization currently operates within a particular TSMO capability.

As shown in Figure 11, Level 1, Performed, means the TSMO capability is completed on an ad-hoc basis, usually by one or two individual champions. Level 2, Managed, may involve more individuals on a team performing the activity and beginning to integrate the activity into other processes; however, there is little accountability for achieving performance measures.

At Level 3, Integrated, the program dimension is part of a more formalized process, there are established performance measures, and activities are structured to work toward performance objectives. At this stage, processes are more clearly defined and there is some recognized, organizational support for the activities, including dedicated budgets.

When an organization has achieved Level 4, Optimized, the capability is largely institutionalized and formalized, with strong collaboration and recognition of roles and responsibilities by agency staff and partners. At this level, there is also a more formal commitment for ongoing performance-based improvements.

Figure 11: CMM Levels of Maturity

Each of the capabilities were evaluated for the TxDOT Tyler District at three CMM workshops held virtually with both TxDOT and partner agency staff in February and March 2021 virtually via Microsoft Teams. The three CMM workshops were each focused on capabilities in different areas within the Tyler District. The first of these workshops on February 25th was focused on operations in the City of Tyler and the surrounding area. On March 4th, the second workshop focused on operations in the City of Longview and the surrounding area and the third workshop focused on operations of smaller cities outside of the City of Tyler and City of Longview regions. Capability responses gathered during each of these workshops were refined later through individual interviews with TxDOT staff.

Figure 12 shows where the TxDOT Tyler District ranked itself overall for each of the TSMO capability dimensions. Based on the overall CMM assessment results, the District currently sees itself operating at Level 2 in all CMM capability dimensions. Figure 13 through Figure 18 show CMM capability dimension rankings as they specifically apply to each of the six TSMO focus areas.

Figure 12: TxDOT Tyler District CMM Assessment

Overall Capabilities				
TSMO Capability Dimensions	Level 1 Performed	Level 2 Managed	Level 3 Integrated	Level 4 Optimized
Business Processes				
Systems & Technology				
Performance Measurement				
Culture				
Organization & Workforce				
Collaboration				

Following the completion of the CMM assessment, District leadership chose to hold two CMF workshops, one concentrating on Freeway Operations and another on Arterial Operations. These workshops provided an opportunity for interested stakeholders to identify action items that would allow the TxDOT Tyler District to advance one level in the CMM assessment for each capability dimension with respect to the workshop's subject matter.

The Freeway Operations CMF workshop was conducted on April 28, 2021 and included the following focus areas: TIM, WZM, and General TM (with an emphasis on Freight Management). The Arterial Operations CMF workshop was conducted on April 29, 2021 and included the following focus areas: TIM, TSM, and General TM (also with an emphasis on Freight Management).

Input from individual stakeholder meetings and from the CMM and CMF workshops is summarized on the pages that follow, organized by focus area. Additional information related to the District's existing practices in each of these focus areas is provided in the TxDOT Tyler District TSMO State of the Practice Report.

Traffic Incident Management District Assessment

Traffic Incident Management (TIM) involves the TxDOT Tyler District and partner agency response to traffic incidents. When TIM is conducted effectively, it can reduce congestion, improve travel time reliability, and increase safety. The TxDOT Tyler District generally performs TIM activities on an ad hoc basis and no formal TIM program exists as of July 2021. Funding is not currently allocated for TIM activities and there is minimal involvement by agency leadership in program-level TIM decisions. TIM is typically not considered during planning efforts for construction work zones and special events. Figure 13 shows where the District ranked itself for each of the TSMO capabilities regarding TIM.

Figure 13: TxDOT Tyler District CMM Assessment for Traffic Incident Management

Focus Area: Traffic Incident Management				
TSMO Capability Dimensions	Level 1 Performed	Level 2 Managed	Level 3 Integrated	Level 4 Optimized
Business Processes	●			
Systems & Technology		●		
Performance Measurement	●			
Culture	●			
Organization & Workforce		●		
Collaboration	●			

The TxDOT Tyler District currently does not collect any TIM-related performance measures, such as roadway clearance time (RCT), incident clearance time (ICT), and secondary crash data. Other TxDOT districts often use a traffic management center (TMC) to watch camera feeds to detect, verify, and monitor traffic incidents, but the TxDOT Tyler District does not currently have a TMC and its existing infrastructure has limited camera coverage. Therefore, the District self-identified the need to improve its capability to track these TIM performance measures.

The TxDOT Tyler District and its partners have established safety-oriented TIM guidelines including adherence to the statewide Authority Removal Law and Driver Removal Law. However, stakeholders noted that wrecked vehicles tend to be moved at the end of the incident clearance process. Rural areas in the District are generally slower to get cars off the roadway and restore traffic flow than the more heavily populated areas. There is a need for multidisciplinary training to encourage consistent compliance with statewide laws and quick-clearance goals, and to increase regional knowledge of TIM-related strategies and best practices.

The TxDOT Tyler District has self-identified a need for coordination district-wide in response to incidents and a need to increase accuracy of incident location data, potentially through increased CCTV coverage and sharing video feeds with first responders. A standard protocol for disseminating incident information has not been established and there is occasionally confusion on who to call when an incident is detected. Incident details often do not reach the appropriate response or operations personnel. Stakeholders identified the need to develop an updated list of points of contact at each agency to streamline sharing of incident information.

The TxDOT Tyler District does not currently conduct after-action reviews (AARs) on a regular basis for major incidents. Reviews are only conducted at the end of each month to discuss fatal traffic incidents, and these reviews often focus on crash causes rather than TIM-related items. Stakeholders and District staff identified that the creation of a formalized Traffic Incident Management Team to discuss TIM-related regional priorities and to coordinate AARs among the involved local agencies following each major incident would increase communication and coordination between agencies and improve incident response and operations.

Work Zone Management District Assessment

Work Zone Management (WZM) involves the TxDOT Tyler District and partner agency management before, during, and after planned construction events. Effective WZM can reduce congestion, improve travel time reliability, and increase safety. Figure 14 shows where the District ranked itself for each of the TSMO capabilities regarding WZM.

Figure 14: TxDOT Tyler District CMM Assessment for Work Zone Management

Focus Area: Work Zone Management				
TSMO Capability Dimensions	Level 1 Performed	Level 2 Managed	Level 3 Integrated	Level 4 Optimized
Business Processes		●		
Systems & Technology		●		
Performance Measurement				●
Culture				●
Organization & Workforce			●	
Collaboration			●	

Currently, the TxDOT Tyler District coordinates construction projects internally and conducts pre-construction meetings with external stakeholders for large projects. While these meetings are extended to local municipalities when large projects are planned, external stakeholders are not regularly included in discussions about more granular project details. The District also reaches out to contractors and affected businesses during its work zone and construction planning activities. The District communicates well with the public by disseminating information regarding closures, although there is an opportunity for better coordination and data sharing with third-party applications to distribute updated traveler information related to work zones directly to travelers in the area.

Work zone information is not consistently received by local agencies. Specifically, project updates and construction schedule changes are not always shared with partners in a timely manner. Discussions with first responder stakeholders yielded that although construction closure and work zone information is published weekly in the newspaper and the District distributes communications through the Highway Conditions Reporting System (HCRS), first responders are still often unaware of project schedule changes and work zone updates. First responders typically rely on the first unit dispatched to an incident within a work zone to inform other responders of existing lane or road closures they may encounter, further lengthening delays and increasing response times.

The District does not have many technologies that help with WZM and no work zone performance measures are currently being collected. Smart Work Zone (SWZ) units have been used in the past by TxDOT on I-20 to help determine queue length. Currently, the local agencies do not consistently utilize SWZ and instead use police officers to monitor queue length and divert traffic as necessary. The City of Longview places DMS in advance of work zones where queues are expected to form to warn motorists, but this traveler information approach does not update automatically in response to changes in traffic conditions. Agencies noted that this strategy is not very accurate and that projects could benefit from the use of SWZ systems. Stakeholders, such as the City of Tyler, expressed interest in implementing SWZ in future long-term projects, such as the upcoming I-20 widening.

Road Weather Management District Assessment

Road Weather Management (RWM) involves the TxDOT Tyler District and partner agency response to anticipated major weather events. Within the TxDOT Tyler District there is limited coordination between maintenance, traffic operations, and other stakeholders to support RWM. Externally, the TxDOT Tyler District has no established coordination with the local weather community. Communication of road closures and detours due to severe weather events occurs by TxDOT informing the media and the public via social media and other existing communication channels. Figure 15 shows where the District ranked itself for each of the TSMO capabilities regarding RWM.

The TxDOT Tyler District has developed an approach to strategic planning for winter storms, and AARs are conducted following a severe storm to identify areas for operational improvements. With the snowstorm that occurred in February 2021, staff within local agencies were highly dedicated and worked throughout the event to ensure the traffic system went back to normal operations quickly and efficiently. The City of Whitehouse

mentioned in the CMM workshop that it established a volunteer group in preparation of the winter storm to pool resources such as water and equipment. Stakeholders also noted that developing preset plans and strategically placing equipment in advance of adverse weather could be beneficial.

Figure 15: TxDOT Tyler District CMM Assessment for Road Weather Management

Focus Area: Road Weather Management				
TSMO Capability Dimensions	Level 1 Performed	Level 2 Managed	Level 3 Integrated	Level 4 Optimized
Business Processes		●		
Systems & Technology	●			
Performance Measurement		●		
Culture		●		
Organization & Workforce			●	
Collaboration			●	

RWM is handled by existing TxDOT staff who are assigned roles and responsibilities for when storms or other winter weather events occur. Roadway conditions and operations are monitored via camera to see if additional winter maintenance is needed. However, current camera coverage is minimal and there is a need to increase the District's capability to observe road weather conditions, as well as general traffic operations. Discussions with stakeholders of how to respond to areas that flood frequently also led to the District identifying the need to update and expand current technologies that notify District operations staff of when flooding is occurring.

The TxDOT Tyler District has self-identified the need to improve traveler information for weather-related roadway impacts and to better manage expectations of local municipalities with regards to winter weather road plowing. Travelers and local partner agencies are often unaware of closures or delays caused by roadway flooding and inclement weather prevention operations, such as pre-treating roads for preventing ice. Collaboration can also be a challenge when District and partner agency staff are unsure of who to contact when weather-related assistance or resources are needed.

Planned Special Event District Assessment

Planned Special Events (PSE) management involves the TxDOT Tyler District and partner agency response to preplanned special events, like local holiday events or major sporting events. The TxDOT Tyler District manages PSE activities primarily through external coordination with the local cities and on an ad hoc basis with MPOs. Figure 16 shows where the District ranked itself for each of the TSMO capabilities regarding PSE management.

Figure 16: TxDOT Tyler District CMM Assessment for Planned Special Events

Focus Area: Planned Special Events				
TSMO Capability Dimensions	Level 1 Performed	Level 2 Managed	Level 3 Integrated	Level 4 Optimized
Business Processes	●			
Systems & Technology		●		
Performance Measurement	●			
Culture			●	
Organization & Workforce	●			
Collaboration			●	

The TxDOT Tyler District does not have regularly occurring large special events. The traffic within the District is generally impacted by events happening in neighboring TxDOT districts, particularly in the Dallas-Fort Worth metroplex. Therefore, the TxDOT Tyler District does not have designated personnel with formal PSE job functions for events within the District, although one or more individuals within each department may have PSE transportation operations as part of their job function. There is minimal to no formal budgeting for PSE-related traffic planning and no PSE data is captured or shared.

The TxDOT Tyler District has self-identified the need for improved traveler information about PSE delays and related detour routing. Similar to WZM information dissemination efforts, this provides an opportunity for coordination with third-party web-based applications to distribute accurate event-related traveler information directly to travelers in the area. The TxDOT Tyler District has also identified the need for AARs following the completion of PSE activities. Improved data collection around PSE activities can increase the effectiveness of AARs and can allow for more targeted improvement in the management of these events.

Traffic Signal Management District Assessment

Traffic Signal Management (TSM) involves the TxDOT Tyler District's management of its traffic signal system, as well as the management of signals by local agency partners. Figure 17 shows where the District ranked itself for each of the TSMO capabilities regarding TSM.

The Tyler District is currently working on bringing each of its signals up to flashing yellow arrow standard at permissive left turn locations. The District currently cannot remotely manage signal operations and as a result no advanced troubleshooting is conducted before crews arrive on site. Therefore, the District has self-identified the need for the deployment of modern signal controller and communications technology to support signal operations, but funding is a constraint. District traffic signals in rural areas often malfunction or experience outages, typically caused by inclement weather. Improved communications capabilities and signal battery back-up systems would improve the District's ability to restore signal operations efficiently.

Figure 17: TxDOT Tyler District CMM Assessment for Traffic Signal Management

Focus Area: Traffic Signal Management				
TSMO Capability Dimensions	Level 1 Performed	Level 2 Managed	Level 3 Integrated	Level 4 Optimized
Business Processes			●	
Systems & Technology			●	
Performance Measurement	●			
Culture	●			
Organization & Workforce		●		
Collaboration	●			

As municipalities are looking into signal improvements, safety-related signal enhancements should conform to the TxDOT Tyler District's Safety Plan. The City of Tyler has recently explored traffic signal updates and new technologies and has developed a Traffic Signal and ITS Master Plan to plan for improving signal timing operations and traffic progression along high-volume corridors in the city. Some intersections within the City of Tyler are demo-ing signal performance measure technology to focus on improving signal retiming processes along corridors. The demo is tracking detection functions, split timings, and overall signal maintenance monitoring. Since communication technology on traffic signals is not universal throughout the region, there is not a consistent method for collecting traffic signal data or tracking this data remotely. No TSM data is captured, and no signal-related performance measures have been standardized in the District.

Stakeholders identified that maintenance conducted by signal technicians unfamiliar with coordinated signal systems has caused signals to go out of coordination with the rest of the corridor. There is a need for improved signal technician trainings for the region's municipal agency partners to standardize installation and maintenance techniques and to become familiar with emerging technologies that could support operations and safety goals. The District also noted that while signal technician training has improved significantly over the past year, the hiring and training of staff is still a challenge. Currently, the City of Tyler and the City of Longview occasionally share signal technician resources but do not have an agreement in place that formalizes this cooperative arrangement. Stakeholders from these cities are interested in conducting joint signal technician training to create a more cohesive signal system and develop regional expertise.

General Traffic Management District Assessment

General Traffic Management (TM) involves the TxDOT Tyler District management of traffic conditions throughout the region. The TxDOT Tyler District generally conducts internal General TM planning and programming to meet agency goals and objectives, but the District does so with limited coordination and communication with local jurisdictions. Figure 18 shows where the District ranked itself for each of the TSMO capabilities regarding General TM.

Figure 18: TxDOT Tyler District CMM Assessment for General Traffic Management

Focus Area: General Traffic Management				
TSMO Capability Dimensions	Level 1 Performed	Level 2 Managed	Level 3 Integrated	Level 4 Optimized
Business Processes	●			
Systems & Technology	●			
Performance Measurement	●			
Culture				●
Organization & Workforce	●			
Collaboration	●			

Although the TxDOT Tyler District currently has a video wall for staff to passively monitor traffic, the District has identified the need to expand deployment of CCTV cameras and communication connections to allow for improved visual coverage and active management capabilities. Stakeholders expressed interest in video

sharing among TxDOT and local agencies in the future. The District wants to implement additional DMS to improve dissemination of real-time traveler information, provide work zone updates, and encourage diversion of traffic to other routes as needed. A TMC was considered due to its potential for improved collaboration and operational benefits, but the funding for construction and operation is not readily available. The initial plans and concept of operations may be developed for a future District-level TMC.

The TxDOT Tyler District has self-identified the need for improved collaboration and training across the region for better General TM. Stakeholders established that there is a need for better performance data collection throughout the District, as the District currently does not collect or track General TM data such as travel time reliability. In addition, stakeholders identified a need for established procedures to share General TM performance data across the region once it has been collected.

The District mentioned it could benefit from creating a General TM group with regular meetings. Particularly in MPOs, institutional knowledge is often lost when there is staff turnover. Stakeholders identified a need for established procedures to share General TM performance data across the region once it has been collected, since staff currently find it difficult to know what data is available and where to find it. Forming a General TM working group or regularly conducting regional traffic operations forums could provide a new way to share data and help maintain institutional General TM knowledge in the District.

Lastly, TxDOT Tyler District staff and local partner agency staff discussed issues regarding collaboration and communication related to freight management. Throughout the District heavy trucks park in the right-of-way and along freeway ramps, creating safety concerns. Oversize and over-height vehicles are also an issue when they are routed around a work zone or incident and through towns that may not have adequate facilities to support these vehicles.

TSMO Implementation Plan

This section summarizes the 34 recommended action items for advancing TSMO in the TxDOT Tyler District over the next five years. Its contents are based on the existing strengths and needs that the Tyler District and regional stakeholders identified over the course of the TSMO Plan's development. The Implementation Plan is shown in Table 3 through Table 8, and in the schedule shown in Figure 19. Action Items in Table 3 through Table 8 are organized by TSMO capability dimension, and these same action items are shown in Appendix B organized by TSMO focus area. Table 3 through Table 8 and Appendix B include the following information for each recommended action item:

- **Action Number:** An identifier for each recommended action item, organized by CMM capability dimension: Business Processes (BP), Systems & Technology (ST), Performance Measurement (PM), Culture (CU), Organization & Workforce (OW), and Collaboration (CO).
- **Action Description:** Provides a brief description of the action, which may include multiple steps.
- **Program Plan Page Number:** A reference to TSMO Program Plan page number with more detailed discussion contained in the Action Item Sheets located in the CMM section of the report.
- **Action Lead:** Identifies the individual at the TxDOT Tyler District who will take ownership of the action and will oversee that implementation progresses as planned.
- **Supports District TSMO Goals:** Identifies which of the District's TSMO goals the action item supports: Safety, Reliability, Efficiency, Customer Service, Collaboration, or Integration.
- **Partners:** Identifies TxDOT staff and external stakeholders that will contribute to implementation of the recommended action item.
- **Cost:** Provides a semi-quantitative opinion of the level of fiscal resources that TxDOT would need to commit to implement the recommended action item.
- **Effort:** Provides a semi-quantitative opinion of the level of effort that TxDOT would need to dedicate to implement the recommended action item.
- **TSMO Focus Area:** Indicates which of the six TSMO focus areas the action item addresses: Traffic Incident Management (TIM), Work Zone Management (WZM), Road Weather Management (RWM), Planned Special Events (PSE), Traffic Signal Management (TSM), and General Traffic Management (TM).
- **Related Action Items:** Lists the Action Numbers of related action items that could be implemented either concurrently or subsequently if the District chose to focus on specific program areas or further developing relationships with specific stakeholders.

Separately, the implementation plan schedule shown in Figure 19 provides a year-by-year roadmap for implementing each recommended action item. All action items are shown with recommended timeframes at a half-year level of detail for the next five years, beginning with the first half of 2022.

The TxDOT Tyler District TSMO Program Plan is an unconstrained planning document focused on near-term implementation priorities. While all action items listed could potentially be implemented within the next five years, no funding is currently allocated for any of these action items unless otherwise specifically stated in this plan. Action items will be implemented as District resources permit.

Table 3: TxDOT Tyler District TSMO Implementation Plan for Business Processes

Action No.	Business Processes (BP) Action Item Descriptions	Program Plan Page #	Action Lead	Supports District TSMO Goals						Partners	Cost	Effort	TSMO Focus Area	Related Action Items
				Safety					Integration					
BP 01	**Implement TIM Response Measures for Major Construction:** Develop processes and procedures for incident management within construction work zones prior to letting of all major construction contracts.	38	District Director of Construction	✓		✓		✓	✓	TYL Construction, TYL Operations, TYL Area Engineers, First Responders	$$			ST-02, PM-01, OW-01, CO-02
BP 02	**Develop Alternate Plans for Diverting Traffic During Construction:** Develop guidelines for managing traffic during major construction on freeways and determining how to divert traffic onto other			✓		✓	✓		✓		$			
BP 03	**Use TxDOT's Smart Work Zone Decision Tool and Deployment Guidance:** Adapt TxDOT's existing SWZ guidance and deployment decision tool and reference it when determining which work zone ITS technologies to use for District construction projects.	40	District Director of Construction	✓	✓		✓		✓	TxDOT TRF, TYL Construction, TYL Operations	$			BP-02, BP-04, BP-05, BP-08, ST-04
BP 04	Standardize a District process for communicating construction impacts to local transportation, transit, and public safety partners			✓			✓	✓	✓		$			
BP 05	**Conduct Post-Construction Event Reviews:** Conduct post-construction event reviews as needed to debrief on traffic management performance during closures.	42	District Director of Construction		✓	✓		✓	✓	TYL Construction, TYL Operations, TYL Area Engineers, Local Transportation Agencies	$			BP-03, ST-04
BP 06	**Conduct Post-Special Event Reviews:** Conduct post-special event reviews to determine what worked and what can be improved upon.	43	District Director of Transportation Operations		✓	✓		✓	✓	TYL Operations, TYL Area Engineers, Local Transportation Agencies, Event Organizers	$			PM-02
BP 07	**Develop a Proactive Method for Retiming Corridors:** Develop a proactive approach that prioritizes corridors for retiming based on corridor performance data.	44	District Signal Shop Manager	✓	✓	✓			✓	TYL Operations, TYL Signal Shop, TYL Maintenance	$			ST-07, ST-08
BP 08	**Develop TxDOT Tyler District ITS Master Plan:** Develop an ITS Master Plan for the TxDOT Tyler District to identify and prioritize			✓	✓	✓	✓	✓	✓		$$			
BP 09	**Establish Notification Process to Cities for Over-Height/Oversize Vehicles Permits:** Establish a process within TxDOT to notify local agencies when over-height/oversize vehicles will be traveling through their jurisdictions so they can plan for and monitor these movements.	46	District Director of Transportation Operations	✓				✓		TxDOT TRF, TYL Operations, TYL Maintenance, Local Transportation Agencies	$			

Table 4: TxDOT Tyler District TSMO Implementation Plan for Systems & Technology

Action No.	Systems & Technology (ST) Action Item Descriptions	Program Plan Page #	Action Lead	Supports District TSMO Goals						Partners	Cost	Effort	TSMO Focus Area	Related Action Items
				Safety	Reliability	Efficiency	Customer Service	Collaboration	Integration					
ST 01	**Study Feasibility of Freeway Safety Service Patrol:** Study feasibility of a freeway safety service patrol along I-20 to respond to minor incidents and traffic disruptions, and to assist with response to larger incidents. Program implementation would not likely occur for at least 5-10 years, depending upon the projected frequency and impact of incidents.	48	District Director of Transportation Operations	✓	✓	✓			✓	TxDOT TRF, TYL Operations, TYL Area Engineers	$$			ST-02, CO-01
ST 02	**Establish Link to TIM Response Dispatch Information:** Establish connection with 911 public safety answering points to share computer-aided dispatch traffic incident information with TxDOT			✓				✓	✓		$$			
ST 03	**Provide Work Zone Closure Information Through Third-Party Apps:** Partner with third-party navigation apps to provide accurate work zone closure information for travelers through the District.	50	District Public Information Officer		✓		✓	✓	✓	Private Third-Party Providers, TYL Public Information Office, TYL Operations, TYL Construction	$			BP-02, BP-04
ST 04	**Expand Work Zone Technology Deployments:** Deploy work zone technology throughout the Tyler District to support improved work zone monitoring, localized real-time traveler information, and end			✓		✓	✓	✓	✓		$$			
ST 05	**Deploy Flood Detection, Warning, and Closure Devices:** Implement technology for flood detection, warning, and road closure in areas that frequently flood.	52	District Director of Transportation Operations	✓			✓		✓	TYL Operations, TYL Maintenance, TYL Area Engineer	$$			BP-08, ST-10, CU-01
ST 06	**Share Event-Related Road Impacts with Third-Party Apps:** Partner with third-party navigation apps to provide accurate special event-related closure and routing information for travelers through the	53	District Public Information Officer		✓		✓	✓	✓	Private Third-Party Providers, TYL Public Information Office, TYL Operations, Event Organizers	$			PM-02
ST 07	**Plan and Implement Surveillance Technology for Signals:** Identify implementation priority for cameras and necessary software enhancements to allow for remote surveillance of District traffic signals from a single software platform.	54	District Signal Shop Manager	✓	✓	✓		✓	✓	TYL Operations, TYL Maintenance	$$			BP-07, BP-08, ST-08, ST-11
ST 08	**Improve Communications Link to Signals in Rural Areas:** Upgrade communications capabilities at rural TxDOT traffic signal locations to improve ability to monitor and respond to conflicts, outages, and other signal issues.	55	District Signal Shop Manager	✓	✓	✓			✓	TYL Operations, TYL Maintenance, TYL Area Engineers, TYL Signal Shop	$$			ST-07

Table continued on next page.

Action No.	Systems & Technology (ST) Action Item Descriptions (*Continued*)	Program Plan Page #	Action Lead	Supports District TSMO Goals						Partners	Cost	Effort	TSMO Focus Area	Related Action Items
				Safety	Reliability	Efficiency	Customer Service	Collaboration	Integration					
ST 09	**Establish a Regional TMC:** Establish a regional traffic management center (TMC) to support traffic incident management, traffic signal management, traveler information dissemination, and other traffic management priorities.	56	District Director of Transportation Operations	✓	✓	✓	✓	✓	✓	TYL Operations, TYL Area Engineers, TYL Signal Shop, Local Transportation Agencies, Local Public Safety Agencies	$$$			BP-08, OW-04, CO-01, CO-03
ST 10	**Implement Additional ITS Field Devices:** Implement new ITS deployments in the District including additional CCTV cameras and DMS to support active traffic management. Development of an ITS Master Plan could help identify candidate deployments.	57	District Director of Transportation Operations	✓	✓	✓	✓	✓	✓	TYL Operations, TYL Area Engineers	$$$			BP-08, ST-04, ST-05, ST-07, ST-11
ST 11	**Improve Regional Video Sharing Capabilities:** Use cloud-based technology platforms for sharing access to view CCTV camera video feeds.	58	District Director of Transportation Operations			✓		✓	✓	TxDOT TRF, TYL Operations, Local Transportation Agencies, Local Public Safety Agencies	$			ST-07, ST-10, CO-01, CO-04
PM 01	**Improve TIM Data Collection:** Improve incident management-related data collection, with a focus on location data accuracy as well as regional collection of roadway clearance time, incident clearance time, and secondary crash data.	60	District Director of Transportation Operations	✓	✓	✓		✓	✓	TxDOT TRF, TYL Operations, Texas DPS, Local Public Safety Agencies	$			BP-01, CO-01, CO-04
PM 02	**Measure Event-Related Travel Time Delay:** Develop the capacity to measure travel time delay along key routes during special events. Implementation of measuring event-related travel time delay would be at least 5-10 years out, depending upon need.	61	District Director of Transportation Operations		✓	✓			✓	TYL Operations, Local Transportation Agencies, Event Organizers	$$			BP-06, ST-06, CO-04

Table 5: TxDOT Tyler District TSMO Implementation Plan for Performance Measurement

Table 6: TxDOT Tyler District TSMO Implementation Plan for Culture

Action No.	Culture (CU) Action Item Descriptions	Program Plan Page #	Action Lead	Supports District TSMO Goals: Safety					Integration	Partners	Cost	Effort	TSMO Focus Area	Related Action Items
CU 01	**Improve Communication of Road Weather Impacts to Local Partners:** Improve communication with local stakeholders regarding TxDOT weather-related road closures as well as snow and ice prevention operations.	63	District Public Information Officer	✓	✓	✓	✓	✓	✓	TYL Public Information Office, Local Transportation Agencies, Local Public Safety Agencies	$			ST-05, CU-02
CU 02	**Improve Communication of Activities that Impact Traffic Signals:** Improve communication between TxDOT and local cities to notify cities of any construction or maintenance work that may impact				✓			✓	✓		$			
CU 03	**Conduct Semi-Annual Signal Technician Forums:** Conduct signal technician forums twice a year with TxDOT partners throughout the District to improve collaboration, share best practices, and establish a regional competency regarding signal maintenance and operations.	65	District Signal Shop Manager				✓	✓	✓	TxDOT TRF, TYL Operations, TYL Area Engineers, TYL Signal Shop, Local Transportation Agencies	$			OW-02, OW-03, CO-03

Table 7: TxDOT Tyler District TSMO Implementation Plan for Organization & Workforce

Action No.	Organization & Workforce (OW) Action Item Descriptions	Program Plan Page #	Action Lead	Supports District TSMO Goals: Safety					Integration	Partners	Cost	Effort	TSMO Focus Area	Related Action Items
OW 01	**Establish Regional Multidisciplinary TIM Training:** Partner with TxDOT Statewide Traffic Incident Management Coordinator to provide TIM multidisciplinary trainings and Train the Trainer programs to TxDOT staff and interested partners.	67	District Director of Transportation Operations	✓	✓		✓	✓	✓	TxDOT Statewide TIM Coordinator, TYL Maintenance, TYL Operations, Local Transportation Agencies, Local Public Safety Agencies, Texas DPS	$			BP-01, CO-01, CO-02
OW 02	**Provide TxDOT Tyler District Training Opportunities to Local Staff:** Provide TxDOT Tyler District internal signal technician training opportunities to local agency traffic signal technicians. Consider combined training classes with TxDOT and local agency traffic signal technicians to support increased collaboration and			✓	✓		✓	✓	✓		$			
OW 03	**Improve Access to Available Specialized TxDOT Signal Training:** Improve local agency traffic signal technician access to signal-related trainings offered by the TxDOT Traffic Safety Division.	69	District Director of Transportation Operations		✓		✓	✓		TxDOT TRF, TYL Operations, Local Transportation Agencies	$			CU-03, OW-02
OW 04	**Identify and Fulfill Staffing Requirements for TMC Operation:** Develop a staffing approach for the effective operation and					✓		✓	✓		$$$			

Table 8: TxDOT Tyler District TSMO Implementation Plan for Collaboration

Action No.	Collaboration (CO) Action Item Descriptions	Program Plan Page #	Action Lead	Supports District TSMO Goals						Partners	Cost	Effort	TSMO Focus Area	Related Action Items
				Safety	Reliability	Efficiency	Customer Service	Collaboration	Integration					
CO 01	**Establish a Formal Regional TIM Team:** Establish a formalized TIM Team that meets regularly and includes all relevant jurisdictions and roles.	72	District Director of Transportation Operations	✓	✓	✓	✓	✓	✓	TxDOT Statewide TIM Coordinator, TYL Area Engineers, TYL Operations, Local Transportation Agencies, Local Public Safety Agencies	$			ST-01, ST-09, ST-11, PM-01, OW-01
CO 02	**Standardize TIM Communication Protocol:** Standardize communication protocol among law enforcement, maintenance sections, and the District office to improve TIM information sharing.	73	District Director of Maintenance					✓	✓	Texas DPS, Local Public Safety Agencies, TYL Operations, TYL Maintenance	$			BP-01, ST-02, OW-01
CO 03	**Conduct Annual Regional Traffic Operations Forums:** Conduct annual regional traffic operations forums with staff from traffic operations agencies throughout the District.	74	District Director of Transportation Operations				✓	✓	✓	TYL Area Engineers, TYL Operations, Local Transportation Agencies	$			ST-09, CU-03
CO 04	**Establish Regional Traffic Data Sharing Procedures:** Establish procedures for sharing collected traffic data among TxDOT, MPOs, and local agencies.	75	District Director of Transportation Operations		✓		✓	✓		TYL Operations, Local Transportation Agencies, Local MPOs	$			ST-11, PM-01, PM-02

Figure 19: TxDOT Tyler District TSMO Implementation Schedule

Task Name	2022		2023		2024		2025		2026	
	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2
BUSINESS PROCESSES										
BP-01: Implement TIM Response Measures for Major Construction										
BP-02: Develop Alternate Plans for Diverting Traffic During Construction										
BP-03: Use TxDOT's Smart Work Zone Decision Tool and Deployment Guidance										
BP-04: Streamline Advanced Notification of Planned Lane Closures										
BP-05: Conduct Post-Construction Event Reviews										*Ongoing*
BP-06: Conduct Post-Special Event Reviews										*Ongoing*
BP-07: Develop a Proactive Method for Retiming Corridors										
BP-08: Develop TxDOT Tyler District ITS Master Plan										
BP-09: Establish Notification Process to Cities for Over Height/Oversize Vehicles Permits										
SYSTEMS & TECHNOLOGY										
ST-01: Study Feasibility of Freeway Safety Service Patrol										*Ongoing*
ST-02: Establish Link to TIM Response Dispatch Information										
ST-03: Provide Work Zone Closure Information Through Third-Party Apps										*Ongoing*
ST-04: Expand Work Zone Technology Deployments										
ST-05: Deploy Flood Detection, Warning, and Closure Devices										
ST-06: Share Event-Related Road Impacts with Third-Party Apps										*Ongoing*
ST-07: Plan and Implement Surveillance Technology for Signals										
ST-08: Improve Communications Capabilities to TxDOT Signals										
ST-09: Establish a Regional TMC										
ST-10: Implement Additional ITS Field Devices										*Ongoing*
ST-11: Improve Regional Data and Video Sharing Capabilities										
PERFORMANCE MEASUREMENT										
PM-01: Improve TIM Data Collection										
PM-02: Measure Event-Related Travel Time Delay										*Ongoing*
CULTURE										
CU-01: Improve Communication of Road Weather Impacts to Local Partners										
CU-02: Improve Communication of Activities that Impact Traffic Signals										
CU-03: Conduct Semi-Annual Signal Technician Forums										*Ongoing*
ORGANIZATION & WORKFORCE										
OW-01: Establish Regional Multidisciplinary TIM Training										*Ongoing*
OW-02: Provide TxDOT Tyler District Training Opportunities to Local Staff										*Ongoing*
OW-03: Improve Access to Available Specialized TxDOT Signal Training										
OW-04: Identify and Fulfill Staffing Requirements for TMC Operation										
COLLABORATION										
CO-01: Establish a Formal Regional TIM Team										
CO-02: Standardize TIM Communication Protocol										
CO-03: Conduct Annual Regional Traffic Operations Forums										*Ongoing*
CO-04: Establish Regional Traffic Data Sharing Procedures										

Business Processes

Within the CMM, business processes refer to an agency's internal activities and tasks that allow it to meet its TSMO goals. Considerations include how an agency plans, programs, and budgets for TSMO projects. Business processes may also refer to how an agency follows its internal protocol to implement specific TSMO projects. Table 9 shows the recommended Business Processes action items for the TxDOT Tyler District.

Table 9: TxDOT Tyler District TSMO Recommended Action Items – Business Processes

CMM Capability Dimension	Action Item Number	Action Item Description
Business Processes	BP-01	**Implement TIM Response Measures for Major Construction**
	BP-02	**Develop Alternate Plans for Diverting Traffic During Construction**
	BP-03	
	BP-04	**Streamline Advanced Notification of Planned Lane Closures**
	BP-05	
	BP-06	**Conduct Post-Special Event Reviews**
	BP-07	
	BP-08	**Develop TxDOT Tyler District ITS Master Plan**
	BP-09	

BP-01: Implement TIM Response Measures for Major Construction

Focus Area:
Traffic Incident Management

Action Item Lead:
District Director of Construction

Partners:
TYL Construction, TYL Operations, TYL Area Engineers, First Responders

Goals Addressed:

Safety	✓
Reliability	
Efficiency	✓
Customer Service	
Collaboration	✓
Integration	✓

Objective: Develop processes and procedures for incident management within construction work zones prior to letting of all major construction contracts.

Need: The TxDOT Tyler District typically does not consider TIM during planning efforts for work zones. First responders are often unaware of project schedule changes and work zone updates, making it more difficult for them to access an incident and therefore increasing response times. First responders should be included in construction planning and in coordination meetings throughout the construction process to ensure they have accessibility to incidents within the construction area and receive updated work zone information.

Implementation Step #1: Develop criteria for determining when TIM response measures should be implemented within work zones. Factors to consider might include distance between entry points on a freeway, shoulder width, or ease of access from frontage roads.

Implementation Step #2: Develop a list of standard strategies to support TIM in work zones, such as use of movable barriers, emergency pull-off areas, or staged towing services. Identify when each of these strategies might be warranted based upon the work zone design factors listed above and anticipated traffic volumes.

Implementation Step #3: Incorporate the decision process into the District's existing project specification development and letting processes.

Expected Benefits: Maintaining first responder accessibility to roadways allows incident clearance to happen as fast as possible by reducing public safety agency response times. TIM protocols for work zones might also involve resource sharing discussions, such as providing first responders access to TxDOT camera feeds or identifying locally relevant resources or other assistance that TxDOT maintenance sections or contractors could provide to assist with traffic control in an incident influence area.

Strategy and Best Practice

The Colorado Department of Transportation (CDOT) published Guidelines for Developing Traffic Incident Management Plans (TIMP) for Work Zones. This document outlines existing CDOT TIMPs and best practice examples from TIMPs in other states. The considerations for developing TIMPs for work zones and key components include detailed lists of response agencies and their roles and responsibilities. Program implementation and management strategies are also provided in these guidelines.

BP-02: Develop Alternate Plans for Diverting Traffic During Construction

Focus Area:
Work Zone Management

Action Item Lead:
District Director of Construction

Partners:
TYL Construction, TYL Operations, TYL Area Engineers, Local Transportation Agencies

Goals Addressed:

Safety	✓
Reliability	
Efficiency	✓
Customer Service	✓
Collaboration	
Integration	✓

Objective: Develop guidelines for managing traffic during major construction on freeways and determining how to divert traffic onto other roads.

Need: The TxDOT Tyler District does not currently have standard protocol for managing traffic when a major freeway is under construction and its capacity is reduced. The District currently provides limited traveler information or advanced warning to alert drivers of possible delays or alternate routes. This often results in driver confusion and frustration, which can lead to aggressive and unsafe driver behavior. Local partner agencies have experienced issues when freeway traffic is redirected to local roads that cannot support the higher volumes.

Implementation Step #1: Identify priority freeway segments and key alternate routes based on planned construction and complicated roadway geometry that provide limited alternative route options.

Implementation Step #2: Incorporate alternate and detour routing into freeway construction project traffic control plans. Communicate with local stakeholders and partner agencies so they expect the increase in traffic volumes and can avoid scheduling conflicting closures (see Action Item BP-04).

Implementation Step #3: Deploy SWZ ITS (see Action Item ST-04) or stage equipment throughout the work zone and along alternate routes. Provide real-time traveler information to motorists to assist with routing decisions.

Expected Benefits: Guidelines for redirecting traffic around major construction on freeways would reduce the traffic impacts of the project work zone, including reduced congestion and the risk of secondary crashes. Congestion and queues can be reduced with the improvement of real-time traveler information dissemination via DMS or third-party apps to route vehicles around a work zone. Better information dissemination to drivers in advance of, and through, a work zone would improve safety for motorists and work zone personnel because drivers would be aware of potential obstacles ahead. Improved information dissemination to stakeholders about work zone updates and how a construction project will impact local roads also allows the District's local partner agencies to prepare for higher volumes and could improve working relationships between the District and its local partner agencies.

BP-03: Use TxDOT's Smart Work Zone Decision Tool and Deployment Guidelines

Focus Area:
Work Zone Management

Action Item Lead:
District Director of Construction

Partners:
TxDOT TRF, TYL Construction, TYL Operations

Goals Addressed:

Safety	✓
Reliability	✓
Efficiency	
Customer Service	✓
Collaboration	
Integration	✓

Objective: Adapt TxDOT's existing SWZ guidance and deployment decision tool and reference it when determining which work zone ITS technologies to use for District construction projects.

Need: Instead of implementing SWZ technologies, TxDOT stations maintenance staff and police officers within a work zone to monitor queue length and divert traffic as necessary. Portable DMS units with generic work zone warning messages are sometimes placed at points where queues are anticipated to form. The District noted that these strategies are not very efficient and projects could benefit from SWZ systems. Stakeholders expressed interest in implementing SWZ in future long-term projects, such as the upcoming I-20 widening. A decision tool is needed to aid in the selection of SWZ systems for deployment. TxDOT TRF developed SWZ Guidelines and a SWZ System Go/No-Go Decision Tool to aid work zone ITS device selection for construction projects statewide.

Implementation Guidance: Review available work zone ITS technologies specified in the TxDOT's SWZ Guidelines. Utilize the existing SWZ System Go/No-Go Decision Tool to select appropriate SWZ ITS devices for upcoming projects. Provide opportunities for training District area office staff and other agency staff involved in planning and construction on the use of the TxDOT SWZ decision tools. The District should explore what additional SOPs and staff roles might be necessary to monitor SWZs once they are deployed at construction sites to ensure the devices are deployed properly, that they maintain function throughout the construction project, and that they collect data that allows for evaluation of the work zone's performance measures.

Expected Benefits: A decision tool for when to deploy certain work zone ITS technologies can improve the safety of a work zone for motorists and construction workers while controlling construction costs. Providing drivers with more warning about an upcoming work zone allows them to make more informed decisions and prepare for potential hazards on the road ahead. Standardizing the use of work zone ITS devices can also better establish driver expectations for work zones, further increasing safety.

Resources: SWZ Guidelines and the System Go/No-Go Decision Tool are both available for download at:
https://www.txdot.gov/inside-txdot/division/traffic/smart-work-zones.html

BP-04: Streamline Advanced Notification of Planned Lane Closures

Focus Area:
Work Zone Management

Action Item Lead:
District Public Information Officer

Partners:
TYL Area Engineers, TYL Construction, TYL Public Information Office

Goals Addressed:

Safety	✓
Reliability	
Efficiency	
Customer Service	✓
Collaboration	✓
Integration	✓

Objective: Standardize a District process for communicating construction impacts to local transportation, transit, and public safety partners as well as the public.

Need: The TxDOT Tyler District publishes construction closure and work zone information in the newspaper weekly and distributes updates through the Highway Conditions Reporting System (HCRS). However, first responders are often unaware of project schedule changes and work zone updates. There is room for improvement in information dissemination, as work zone information is not consistently received by local agencies.

Implementation Step #1: Identify key contacts for TxDOT Tyler District staff, counterparts from local transportation agencies, transit, and other local partner agency staff that should receive construction information updates.

Implementation Step #2: Establish protocol for when and how to notify the appropriate contacts of updates related to construction activities, schedules, and anticipated impacts. Notification of these partners should occur via regular public information officer updates as well as direct outreach from local area engineers.

Implementation Step #3: Coordinate with local partners and third-party apps (see Action Item ST-03) to disseminate updated work zone information to the public.

Expected Benefits: Improving construction information dissemination can help the District maintain good working relations with its local partners and the public. A formal process for sharing work zone information between agencies would create a more cohesive and coordinated traveler information system throughout the region. Sharing information regarding upcoming projects could also help avoid concurrent closures and support work zone ITS use. During a project, providing updated closure information to the public as construction schedules and impacts change can help better manage expectations of drivers and local businesses or property owners that may be impacted by construction.

Strategy and Best Practice

The Greater Houston region uses TranStar, a multimodal transportation and emergency management center to plan, design, operate, and maintain the roads across the region. Engineers and planners from different agencies can share project information with *Roadworks*, TranStar's web-based construction management system. The public also has access to projects, maps, real-time traffic data, closures, and other information posted on the website.

BP-05: Conduct Post-Construction Event Reviews

Focus Area:
Work Zone Management

Action Item Lead:
District Director of Construction

Partners:
TYL Construction, TYL Operations, TYL Area Engineers, Local Transportation Agencies

Goals Addressed:

Safety	
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	✓
Integration	✓

Objective: Conduct post-construction event reviews to determine what worked and what can be improved upon.

Need: The TxDOT Tyler District does not track or collect work zone performance measurement data. Police officers are typically used to monitor queue lengths and direct traffic as needed, and local agencies in the City of Longview place portable DMS in advance of work zones where queues are expected to form in order to warn motorists. There is a need for assessing the performance of existing WZM strategies in achieving intended goals, reviewing work zone design and how it impacts TIM in work zones, and analyzing crash and delay data to get a sense of how a work zone impacted overall traffic operations and safety. A post-construction event review could provide the opportunity for this assessment to occur regularly.

Implementation Step #1: Continually gather and routinely summarize operations and safety data in work zones during construction events.

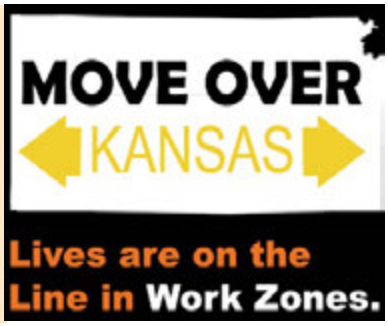
Implementation Step #2: Establish criteria to determine when post-construction reviews are warranted, possibly based upon road user costs or safety impacts.

Implementation Step #3: When data warrants them, conduct post-construction event reviews that include participation from District Operations, Construction, and Area Office staff.

Expected Benefits: Holding post-construction event reviews upon the completion of major construction efforts would allow TxDOT staff to revisit challenges or situations that arose during the project. While these issues are often addressed during construction, event reviews provide opportunities for TxDOT to transition from reacting to those issues toward preventing those issues from occurring altogether on future projects. Reviewing summarized data allows for staff to match spikes in delay or documented crashes with specific phases of the construction effort and related traffic control schemes.

Strategy and Best Practice

The Kansas Department of Transportation (KDOT) has implemented into their processes a Work Zone Review Team responsible for performing an onsite scan of project work zones throughout the state. As they scan the work zones, participants list positive and negative aspects of the operation. The review team also analyzes all work zone collision data in the state for each year and documents the contributing circumstances.



BP-06: Conduct Post-Special Event Reviews

Focus Area:
Planned Special Events

Action Item Lead:
District Director of Transportation Operations

Partners:
TYL Operations, TYL Area Engineers, Local Transportation Agencies, Event Organizers

Goals Addressed:

Safety	
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	✓
Integration	✓

Objective: Conduct post-special event reviews to determine what worked and what can be improved upon.

Need: Within the TxDOT Tyler District there are few large-scale PSEs that occur, but through traffic to nearby events beyond the District boundaries is common, particularly for events occurring in the Dallas-Fort Worth metroplex. Although the District does not consider PSE management a high priority at this time, upcoming large-scale and long-term road construction projects may create traffic impacts that conflict with PSE traffic to events in the Tyler District or in neighboring Districts, and post-event reviews could help District staff better understand those impacts.

Implementation Step #1: Establish criteria to determine when post-PSE reviews are warranted, possibly based upon anticipated road user costs or event attendance.

Implementation Step #2: Gather and summarize both operations data and anecdotal accounts of event impacts soon after special events conclude, and operations return to normal (see Action Item PM-02).

Implementation Step #3: When data warrants them, conduct post-PSE reviews that include participation from District operations and public information personnel, local city engineering staff if the event impacts local roads, public safety officials, and the event organizer. Topics discussed might include ingress and egress challenges, detour plans, emergency response access, and event messaging.

Expected Benefits: Establishing a process for organizing and leading multidisciplinary post-special event reviews would allow TxDOT staff to revisit challenges or situations that arose during an event. Reviewing operations data collected in the event impact area allows for staff to match spikes in delay or documented crashes with specific traffic control schemes or potential conflict points created by event-modified operations, which can result in improvements for future special events traffic operations within and around the TxDOT Tyler District.

Strategy and Best Practice

FHWA published the Managing Travel for Planned Special Events Handbook in 2003 which is regularly updated on their website. Chapter 10 of the handbook outlines Post-Event Activities and provides a great resource on the importance of a post-event report and the key components. A post event report should include an Operational Cost Analysis, Qualitative Evaluation, and Quantitative Evaluation.

BP-07: Develop a Proactive Method for Retiming Corridors

Focus Area:
Traffic Signal Management

Action Item Lead:
District Signal Shop Manager

Partners:
TYL Operations, TYL Signal Shop, TYL Maintenance

Goals Addressed:

Safety	✓
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	
Integration	✓

Objective: Develop a proactive approach that prioritizes corridors for retiming based on corridor performance data.

Need: The TxDOT Tyler District currently retimes signals on an as-needed or requested basis. There is no current signal program in place to evaluate and, if needed, update signal timings in an organized or scheduled manner. Uncoordinated signals can lead to driver frustration and unsafe driver behavior. Sudden braking when a platoon approaches an intersection as the light turns yellow is another crash risk. Traffic patterns may also change with time, which would require signal timings to be revisited to increase throughput. Some intersections within the City of Tyler are demo-ing signal performance measure technology to focus on improving signal retiming processes along corridors. The demo is tracking detection functions, split timings, and overall signal maintenance monitoring.

Implementation Step #1: Consistently inventory all signals and their signal timings and identify corridors with coordination issues. This should generally be done at least every five years.

Implementation Step #2: Prioritize signals to retime by analyzing traffic signal performance measure data, if available, or conduct a field review to observe signal performance. Look at intersection and corridor safety issues, such as crash data.

Implementation Step #3: As the implementation of signal performance measurement technology expands throughout the District, develop performance measures to track and set goals, and to inform when changes to signal operations may be needed.

Expected Benefits: Better corridor signal coordination can eliminate unnecessary starting and stopping and can decrease travel times. Minimizing these common issues can improve traffic flow and lead to reductions in congestion, rear-end collisions, waiting time, and fuel consumption. Signal coordination improves the safety of a corridor by reducing driver frustration and therefore unsafe driver behavior such as red light running, aggressive left turning, right turn on red issues, and hard braking.

BP-08: Develop TxDOT Tyler District ITS Master Plan

Focus Area:
General Traffic Management

Action Item Lead:
District Director of Transportation Planning & Development

Partners:
TYL Operations, TYL Area Engineers

Goals Addressed:

Safety	✓
Reliability	✓
Efficiency	✓
Customer Service	✓
Collaboration	✓
Integration	✓

Objective: Develop an ITS Master Plan for the TxDOT Tyler District to identify and prioritize ITS device and related communication infrastructure deployments throughout the District.

Need: In 2020, the City of Tyler finalized a 10 year ITS Master Plan, which included upgrading existing ITS deployments, improving traffic signal communications, and implementing new ITS technologies. However, the TxDOT Tyler District has not yet developed a formal ITS Master Plan that identifies and prioritizes ITS device needs throughout the region. Stakeholders noted that as I-20 construction continues, there may be an opportunity to install more DMS, CCTV cameras, and other ITS devices, for example road weather detection systems.

Implementation Guide: Develop an ITS Master Plan for the TxDOT Tyler District. The plan should include a review of the regional ITS architecture to demonstrate conformance, a data review to identify crash hotspots and critical infrastructure locations, a prioritized list of ITS device locations for the District's road network, cost estimates for device installation, asset management and design life considerations, and consideration for how recommended devices will be integrated into the existing system.

Expected Benefits: A District ITS Master Plan establishes a justification for additional ITS device deployments and provides cost and prioritization information to District decision makers so that the District can incorporate ITS device recommendations into its project development and budgeting processes. The document also includes information that can support project applications that require federal funding. ITS Master Plans represent an initial step in the systems engineering process and can guide subsequent stages of ITS project design, including device design and testing as well as Traffic Management Systems (TMS) verification.

Strategy and Best Practice

MetroPlan Orlando created an ITS Master Plan to evaluate the Central Florida Region's information, communication, and technology systems. MetroPlan Orlando and the Florida Department of Transportation (FDOT) reviewed the existing ITS architecture in three counties to determine its future needs. New ITS projects are now scored based on the goals and objectives of the ITS Master Plan as well as local needs to prioritize implementation.

BP-09: Establish Notification Process to Cities for Over-Height/Oversize Vehicles Permits

Focus Area:
General Traffic Management

Action Item Lead:
District Director of Transportation Operations

Partners:
TxDOT TRF, TYL Operations, TYL Maintenance, Local Transportation Agencies

Goals Addressed:

Safety	✓
Reliability	
Efficiency	
Customer Service	
Collaboration	✓
Integration	

Objective: Establish a process within TxDOT to notify local agencies when over-height/oversize vehicles will be traveling through their jurisdictions so they can plan for and monitor these movements.

Need: Cities within the TxDOT Tyler District have faced issues with over-height and oversized vehicles using local and city streets, or else moving along TxDOT routes at low speeds that result in residual traffic impacts to other motorists within the area. These issues are common throughout the District, as the oversize and over-height vehicles detour through towns on local streets instead of staying on the freeway when congestion or road work is occurring. Cities are often unaware of the over-height/oversize vehicles until they strike low structures, such as overpasses and signal mast arms, which can result in road closures, congestion, and signal communication loss.

Implementation Guidance: The District, in partnership with the TxDOT TRF, should establish a communication link with the Texas Department of Motor Vehicles, Motor Carrier Division to request that oversize vehicle permit and routing information be shared with the action item lead as permits are approved. TxDOT should regularly review approved routes and share permit details with local agencies whose jurisdictions would include some part of the oversize vehicle route in question.

Expected Benefits: If the cities are alerted when over-height and oversized vehicles are traveling through their jurisdiction, they can plan for traffic impacts and better mitigate infrastructure risks along the vehicle's planned route. The cities would also know in advance when and why the connection to a traffic signal may be lost if the permit involves temporary removal of overhead equipment such as signal mast arms. Cities may also be able to provide valuable information to TxDOT if a planned oversize vehicle route conflicts with construction activities or another planned event with potential traffic impacts.

Systems & Technology

The Systems & Technology dimension refers to an agency's systems engineering, regional architectures, and procurement processes that allow the agency to increase the value and functionality of a high-technology project, service, or system. Considerations include how an agency integrates ITS components regionally so that TSMO projects and services are deployed in an organized manner. Table 10 shows the recommended Systems & Technology action items for the TxDOT Tyler District.

Table 10: TxDOT Tyler District TSMO Recommended Action Items – Systems & Technology

CMM Capability Dimension	Action Item Number	Action Item Description
Systems & Technology	ST-01	**Study Feasibility of Freeway Safety Service Patrol**
	ST-02	**Establish Link to TIM Response Dispatch Information**
	ST-03	
	ST-04	**Expand Work Zone Technology Deployments**
	ST-05	
	ST-06	**Share Event-Related Road Impacts with Third-Party Apps**
	ST-07	
	ST-08	**Improve Communications Capabilities to TxDOT Signals**
	ST-09	
	ST-10	**Implement Additional ITS Field Devices**
	ST-11	

ST-01: Study Feasibility of Freeway Safety Service Patrol

Focus Area:
Traffic Incident Management

Action Item Lead:
District Director of Transportation Operations

Partners:
TxDOT TRF, TYL Operations, TYL Area Engineers

Goals Addressed:

Safety	✓
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	
Integration	✓

Objective: Study feasibility of a freeway safety service patrol along I-20 to respond to minor incidents and traffic disruptions, and to assist with response to larger incidents. Program implementation would not likely occur for at least 5-10 years, depending upon the projected frequency and impact of incidents.

Need: The TxDOT Tyler District has determined that a freeway safety service patrol (SSP) would not be feasible in the next 5 years based upon current funding limitations and existing operations demands. However, District staff understand the potential benefits a SSP would bring, particularly along I-20. The District has very limited surveillance along I-20. For stretches of those roads without deployed CCTV cameras, vehicles that become disabled or involved in a crash typically are not detected by District staff. Law enforcement and towing service response times are often slow in rural portions of the District, leaving motorists in the traveled way for longer periods and increasing the risk of secondary crashes.

Implementation Step #1: Based upon a study of the benefits and costs of existing SSP programs in Texas, determine what criteria would warrant the implementation of a freeway SSP in the TxDOT Tyler District.

Implementation Step #2: Identify a prioritized list of corridors within the District where operations would benefit most from the introduction of a freeway safety service patrol. Possibly coordinate with the TxDOT Dallas District to identify its existing SSP coverage and potential for extension into the TxDOT Tyler District.

Implementation Step #3: Develop a baseline of services that are desired for the operation of such a program, such as motorist assistance, traffic control, and vehicle relocation. Determine funding and staffing needs for an effective freeway SSP along the highest priority corridors.

Implementation Step #4: Procure and operate the SSP once funding is dedicated.

Expected Benefits: Several SSP benefits depend on the level of deployment and the services provided; however, an agency can generally expect a service patrol program to reduce traffic incident duration, remove debris more quickly, assist stranded motorists and crash victims, and improve traffic control and incident scene management along the routes of operation. Secondary benefits include improved traffic flow and fewer secondary crashes because of reduced traffic incident duration and improved incident visibility.

ST-02: Establish Link to TIM Response Dispatch Information

Focus Area:
Traffic Incident Management

Action Item Lead:
District Director of Transportation Operations

Partners:
TYL Operations, TxDOT TRF, TYL Public Information Office, Local Public Safety Agencies

Goals Addressed:

Safety	✓
Reliability	
Efficiency	
Customer Service	
Collaboration	✓
Integration	✓

Objective: Establish connection with 911 public safety answering points to share computer-aided dispatch traffic incident information with TxDOT in real time.

Need: Currently the TxDOT Tyler District detects incidents most commonly only after first responders request assistance, but this request may not arrive until responders are already on scene. A standard protocol for disseminating incident information has not been established and there is occasionally confusion on who to call when an incident is detected. Incident details often do not reach the appropriate response or operations personnel. The TxDOT Tyler District has self-identified a need for coordination district-wide in response to incidents and to streamline sharing incident information.

Implementation Step #1: Develop and maintain current local public safety and emergency response point-of-contact lists at the District Office and Area Office level. Develop protocol for determining when and how to share TIM-related updates among key contacts at TxDOT, Texas DPS, and local public safety agencies.

Implementation Step #2: Inventory existing ITS devices to identify gaps in coverage and establish time-based expectations indicating by when TxDOT should ideally be notified of incidents that cannot be verified through existing deployed ITS. Communicate these expectations to public safety agency partners.

Implementation Step #3: Consider an automated notification or dispatch system to initiate response from TxDOT once an incident is detected/verified by Texas DPS.

Expected Benefits: Establishing a direct line of communication and standardized communication protocol for the dissemination of incident information can ensure that each agency involved in TIM has the information it needs to effectively manage a traffic incident and can provide resources for drivers to make informed route choices. Not informing all partner agencies about an incident or not alerting the public in a timely manner can be detrimental to TIM activities by delaying response, increasing ICT, prolonging traffic delays, and decreasing the safety of motorists and responders. Updating travel information to include closures and delays can redirect drivers away from the incident and warn them of potential queues, reducing congestion and the likelihood for secondary crashes to occur.

ST-03: Provide Work Zone Closure Information Through Third-Party Apps

Focus Area:
Work Zone Management

Action Item Lead:
District Public Information Officer

Partners:
Private Third Party Providers, TYL Public Information Office, TYL Operations, TYL Construction

Goals Addressed:

Safety	
Reliability	✓
Efficiency	
Customer Service	✓
Collaboration	✓
Integration	✓

Objective: Partner with third-party navigation apps to provide accurate work zone closure information for travelers through the District.

Need: The TxDOT Tyler District communicates well with the public by disseminating information regarding closures, although there is an opportunity for coordination with third-party applications to distribute updated traveler information related to work zones directly to travelers in the area through the navigation apps they use. The District publishes construction closure and work zone information in the newspaper weekly, but last-minute updates to construction schedules and impacts are often not made widely available to the public.

Third-party navigation apps such as Waze maintain "trusted provider" programs available to public transportation agencies that permit those agencies to share updates regarding events that impact traffic. These updates are integrated into their platforms so that users are informed of events or are routed around them.

Implementation Step #1: Establish "trusted provider" status with third-party navigation applications (such as Waze, through their Connected Citizens Program).

Implementation Step #2: Update staff roles to designate responsibility for sharing details about construction events that impact travel lanes with partner third-party apps.

Expected Benefits: Establishing these partnerships with third-party navigation app vendors will increase the reach of traveler-focused work zone closure messaging beyond the existing methods available internally to TxDOT districts. With a larger number of travelers either aware of or actively routed around areas impacted by work zones, fewer vehicles pass through those work zones. As a result, congestion and traffic incident risks related to end-of-queue crashes are both reduced.

Strategy and Best Practice

The Port Authority of New York and New Jersey uses crowdsourced incident and congestion data via the Waze Connected Citizens Program to push out information such as road closures, detour routes, and preferred routes to influence traffic behavior. Crowdsourced data can help manage traffic through construction sites in real time by providing awareness of new incidents and congested spots. This allows for quicker dispatch of field units to incident scenes and for better congestion mitigation.

ST-04: Expand Work Zone Technology Deployments

Focus Area:
Work Zone Management

Action Item Lead:
District Director of Construction

Partners:
TYL Construction, TYL Operations, TYL Area Engineers, TxDOT Construction Division

Goals Addressed:

Safety	✓
Reliability	
Efficiency	✓
Customer Service	✓
Collaboration	✓
Integration	✓

Objective: Deploy work zone technology to support improved work zone monitoring, localized real-time traveler information, and end of queue warning.

Need: Currently, the TxDOT Tyler District does not consistently utilize SWZ systems to support operations data collection and traveler information within work zones or to improve work zone safety for travelers and workers in the road. The District noted that its current method of using police officers to monitor queue length and divert traffic as necessary is not very efficient and identified SWZ units as a potential investment area to improve these capabilities. SWZ systems may be implemented in upcoming long-term projects, such as the future I-20 widening.

Implementation Step #1: Identify planned construction projects scheduled in the next five years. Review work zone ITS technologies included in the TxDOT SWZ Guidelines and utilize the existing SWZ System Go/No-Go Decision Tool (see Action Item BP-03) to select the appropriate SWZ ITS devices for upcoming projects. Determine how much additional funding would need to be budgeted as part of projects to include these devices.

Implementation Step #2: Incorporate work zone ITS into construction contracts when the Statewide Decision Tree for SWZ Systems warrants them. Incorporate WZM specifications into the project specification development and letting process.

Implementation Step #3: Track instances of work zone ITS deployments on construction projects to monitor frequency of usage and related traffic operations impacts. Continuously identify existing SWZ strengths and weaknesses, investigate new technologies, and maintain guidelines that specify use of best practice technologies and strategies.

Expected Benefits: Consistent deployment of certain work zone ITS technologies can increase the traffic flow and safety within a work zone for motorists and construction workers by improving driver expectation and providing advance warning of the work zone area or potential vehicle queues. SWZ systems can be implemented to manage the traffic impacts work zones have on the roadway. Queue detection and Bluetooth detection technologies, for example can provide real-time work zone traveler information to help drivers make route decisions. This data can also be used to adjust lane closures or provide information for planning how similar work zones should be managed in the future.

ST-05: Deploy Flood Detection, Warning, and Closure Devices

Focus Area:
Road Weather Management

Action Item Lead:
District Director of Transportation Operations

Partners:
TYL Operations, TYL Maintenance, TYL Area Engineer

Goals Addressed:

Safety	✓
Reliability	
Efficiency	
Customer Service	✓
Collaboration	
Integration	✓

Objective: Implement technology for flood detection, warning, and road closure in areas that frequently flood.

Need: The TxDOT Tyler District monitors roadway conditions and operations via CCTV to see if weather-related maintenance is needed. However, current CCTV coverage is limited and there is a need to increase the District's capability to observe road weather conditions, as well as general traffic operations. Discussions with stakeholders of how to respond to areas that flood frequently also led to the District identifying the need to update and expand current technologies that notify District operations staff of when flooding is occurring on District roadways.

Implementation Step #1: Review crash data and anecdotal accounts to identify road flooding hotspots across the District.

Implementation Step #2: Prioritize locations for device implementation based on flooding event frequency, crash, and traffic volume data. An ITS Master Plan could include a prioritization of flood detection device locations (See Action Item BP-08).

Implementation Step #3: Business plan, budget for, and begin to deploy field devices based on the prioritized list of locations where devices are recommended.

Expected Benefits: Road weather detection and warning equipment is essential to provide drivers with accurate road condition information while also alerting operations and maintenance staff to weather events that require the dispatch of maintenance vehicles. Automated road closure technology that can detect hazardous road weather conditions could reduce response times, staff effort, and resources involved in protecting motorists from unsafe driving conditions. Drivers can also make more informed decisions on route choice based on public notification of road closures which can be set to broadcast automatically from deployed field devices.

Strategy and Best Practice

The TxDOT San Antonio District installed 26 High Water Detection Systems (HWDS). One unit was installed in the metro area and the remaining units were installed in rural areas which are subject to flash flooding due to the region's topography. The installation cost was approximately $75,000 per unit. The water level is transmitted to a cabinet near each stream crossing which activates flashers on warning signs. The device also transmits system status and water elevation to the District's traffic operations center (TOC).

ST-06: Share Event-Related Road Impacts with Third-Party Apps

Focus Area:
Planned Special Events

Action Item Lead:
District Public Information Officer

Partners:
Private Third Party Providers, TYL Public Information Office, TYL Operations, Event Organizers

Goals Addressed:

Safety	
Reliability	✓
Efficiency	
Customer Service	✓
Collaboration	✓
Integration	✓

Objective: Partner with third-party navigation apps to provide accurate special event-related closure and routing information for travelers through the District.

Need: Although municipalities in the TxDOT Tyler District do not currently host any major planned special events, staff noted that through traffic to events outside of the District, particularly in the Dallas-Fort Worth metroplex, can occasionally create congestion along routes in the Tyler District. The District's existing DMS coverage is minimal and drivers tend not to respond to the information the DMS provides. Therefore, the TxDOT Tyler District self-identified the need to improve traveler information about special event related traffic delays.

Each year more travelers rely on third-party navigation apps to route them while travelling. Third-party navigation apps such as Waze maintain "trusted provider" programs available to public transportation agencies that permit those agencies to share events with traffic impacts, which apps then integrate into their platforms so that users are informed of those events or are routed around them.

Implementation Guide: If event organizers plan events in the future that impact traffic operations, the TxDOT Tyler District operations staff should identify which event generators in the District are not sharing road closure impacts with third-party apps and should encourage those event generators to establish information-sharing relationships. Staff should prioritize which event organizers to engage with first, considering factors such as event frequency and measured congestion or safety impacts from past events. The District may also consider incorporating a third-party data reporting requirement for event organizers as part of its special events traffic control plan approval processes.

Expected Benefits: Establishing more partnerships between event organizers and third-party navigation app vendors will increase the frequency with which traveler-focused special event closure messaging appears on third-party navigation apps. With a larger number of travelers either aware of or actively routed around areas impacted by special events, more of the existing roadway capacity in the event impact area is available for event-related ingress and egress.

ST-07: Plan and Implement Surveillance Technology for Signals

Focus Area:
Traffic Signal Management

Action Item Lead:
District Signal Shop Manager

Partners:
TYL Operations, TYL Maintenance

Goals Addressed:

Safety	✓
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	✓
Integration	✓

Objective: Identify implementation priority for cameras and necessary software enhancements to allow for remote surveillance of District traffic signals from a single software platform.

Need: The TxDOT Tyler District does not have the ability to remotely manage signal operations and as a result no advanced troubleshooting is conducted before crews arrive on site. Therefore, the District has self-identified the need for the deployment of modern signal controller, communications, and surveillance technology to support signal operations. Currently, many signals throughout the District do not have any cameras installed. Cameras that are installed at signal locations are used solely for vehicle detection to support signal operations, rather than for signal surveillance.

Implementation Step #1: Upgrade signals along priority routes to quickly adjust timings in response to events and improve communications links to signals in rural areas (see Action Item ST-08).

Implementation Step #2: Identify signalized intersections with operational challenges and ones at crash hotspots to determine priority signal locations for initial camera deployments. Install cameras at these locations as funding allows.

Implementation Step #3: Adopt user-friendly software to allow for surveillance of deployed signal cameras from a single interface, as opposed to individual surveillance via separate IP addresses.

Expected Benefits: Improving camera coverage at signalized intersections throughout the region enhances the District's ability to monitor traffic actively and passively along key corridors and more easily detect issues, particularly those related to signal performance. The benefits of increasing video surveillance at signal locations can be enhanced further by improving operations staff accessibility to camera feeds. Adopting a single platform that provides access to all cameras within the District makes it easier to pull up real-time feeds and detect issues anywhere cameras are deployed. With a user-friendly interface and camera selection based on location, staff can quickly and easily track congestion and incidents along corridors.

ST-08: Improve Communications Capabilities to TxDOT Signals

Focus Area:
Traffic Signal Management

Action Item Lead:
District Signal Shop Manager

Partners:
TYL Operations, TYL Maintenance, TYL Area Engineers, TYL Signal Shop

Goals Addressed:

Safety	✓
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	
Integration	✓

Objective: Improve communications capabilities to TxDOT traffic signal locations to increase ability to monitor and respond to conflicts, outages, and changes in traffic patterns such as during incidents, construction, and special events.

Need: Traffic signals with remote communication capabilities allow traffic managers to operate those signals efficiently through both the active management of traffic progression and through the ability to quickly identify signal outages to minimize congestion and maintain safer intersections. Within the TxDOT Tyler District, the TxDOT traffic signals have limited communication capabilities, if at all, and sometimes malfunction or experience power outages (often caused by inclement weather). Increasing the number of signals that have communications capabilities would improve the District's ability to detect issues and restore signal operations efficiently. The City of Tyler has been demo-ing new traffic operations technologies, including adaptive traffic control systems (ATCS). The demo ATCS have been successful, and the City of Tyler is working on expanding the deployment.

Implementation Step #1: Inventory all signals in the TxDOT Tyler District to identify which ones need a signal cell modem. Plan and Implement surveillance technologies for signals and CCTV cameras (see Action Items ST-07 and ST-10).

Implementation Step #2: Prioritize signals based on existing conditions, such as intersection location, traffic volume, history of inclement weather impacts, and malfunction frequency.

Implementation Step #3: Verify that communications are operable to signals Districtwide once deployment is complete and address communications malfunctions as needed.

Implementation Step #4: Educate the public on how to navigate a signal whose power source has been interrupted, whether the signal is completely dark or flashing red. Consider establishing a regional TMC (see Action Item ST-09).

Expected Benefits: Completing systemwide traffic signal modem deployment is essential for managing the entire District's signal system. Once communication and monitoring capabilities are established at all signals, a signal status dashboard with automated notifications of malfunctions can be established to provide quick detection of and response to signals that lose power or malfunction.

ST-09: Establish a Regional TMC

Focus Area:
General Traffic Management

Action Item Lead:
District Director of Transportation Operations

Partners:
TYL Operations, TYL Area Engineers, TYL Signal Shop, Local Transportation Agencies, Local Public Safety Agencies

Goals Addressed:

Safety	✓
Reliability	✓
Efficiency	✓
Customer Service	✓
Collaboration	✓
Integration	✓

Objective: Establish a regional traffic management center (TMC) to support traffic incident management, traffic signal management, traveler information dissemination, and other traffic management priorities.

Need: The City of Tyler currently has a 'central command' center at the signal shop and the city's ITS Master Plan includes guidance for establishing a more formal TMC. The TxDOT Tyler District does not have a TMC and District staff noted that if a TMC were to be implemented, it would be initially set up for just District-level staff. The District signal shop currently has some monitors mounted on a video wall to passively monitor traffic operations. However, the District has limited camera coverage therefore staff does not consistently utilize the video wall. Although the District staff do not see establishing a TMC as a priority right now, it is important to start considering what it will take to develop a TMC to ensure the resources and infrastructure are in place once there is a greater need.

Implementation Step #1: Establish communication connections to all signals (see Action Items ST-07 and ST-08). Consider improving regional data and video sharing capabilities (see Action Item ST-11).

Implementation Step #2: Complete a systems engineering analysis and concept of operations to identify future TMC needs, objectives, and functional requirements for successful implementation.

Implementation Step #3: Identify which District staff, and potential partner agency staff, would sit at the TMC. Identify potential funding sources and identify potential locations for the TMC that meet space and communications connectivity requirements. Consider times of coverage, such as during peak travel times.

Implementation Step #4: Construct the TMC, install needed communications equipment, and verify that all elements are operating as designed.

Expected Benefits: A regional TMC would allow the TxDOT Tyler District to detect, verify, and respond to incidents more quickly; actively supervise operations for planned construction and special events; manage traffic signal corridors and adjust timings; and coordinate directly with collocated traffic engineering and public safety partner agency staff as well as neighboring district staff. A regional TMC would also enable the TxDOT Tyler District to maintain a centralized dispatch and operations center for a potential freeway safety service patrol (see Action Item ST-01).

ST-10: Implement Additional ITS Field Devices

Focus Area:
General Traffic Management

Action Item Lead:
District Director of Transportation Operations

Partners:
TYL Operations, TYL Area Engineers

Goals Addressed:

Safety	✓
Reliability	✓
Efficiency	✓
Customer Service	✓
Collaboration	✓
Integration	✓

Objective: Implement new ITS deployments in the District including additional CCTV cameras and DMS to support active traffic management. Development of an ITS Master Plan could help identify candidate deployments.

Need: The TxDOT Tyler District currently has some permanent ITS devices, including CCTV cameras and DMS units, deployed along I-20. Coverage along this route, however, is currently limited, with two to ten-mile gaps between cameras through the District. In these locations, the District currently relies upon probe-based data to detect traffic disruptions and cannot visually verify incidents or monitor key activities such as work zone operations. The District has identified a need to increase deployment of DMS, as well as CCTV cameras and other ITS devices that would increase surveillance and remote sensing capabilities, especially as District leadership considers one day investing in a regional TMC.

Implementation Guide: TxDOT Tyler District staff should seek to incorporate ITS device deployment recommendations from the future TxDOT Tyler District ITS Master Plan (see Action Item BP-08). Beyond that, staff should review upcoming major construction projects for which design is underway to identify opportunities for deploying additional ITS devices as part of project construction efforts. For projects in the planning phase, TxDOT Tyler District staff should review design summary reports prepared for those improvements to identify whether ITS device use has already been identified or could be added either during construction or as part of the built project design.

Expected Benefits: Expanding the District's ITS device deployments will allow for District staff to disseminate traveler information that will reach a greater number of travelers at a greater number of locations, in the case of DMS. Furthermore, by increasing CCTV camera coverage along key routes, District staff will have an improved ability to detect issues on the road that could impact traffic operations. ITS device deployments could also improve the District's ability to monitor signal operations and to collect general traffic operations performance data.

ST-11: Improve Regional Video Sharing Capabilities

Focus Area:
General Traffic Management

Action Item Lead:
District Director of Transportation Operations

Partners:
TxDOT TRF, TYL Operations, Local Transportation Agencies, Local Public Safety Agencies

Goals Addressed:

Safety	
Reliability	
Efficiency	✓
Customer Service	
Collaboration	✓
Integration	✓

Objective: Use cloud-based technology platforms for sharing access to view CCTV camera video feeds.

Need: Stakeholders in the TxDOT Tyler District expressed interest in sharing access to TxDOT and city camera feeds to increase coverage and to potentially use a program to view TxDOT camera feeds when needed to assist with incident response or traffic operations. As TxDOT and its local partners deploy more cameras throughout the TxDOT Tyler District, the need to improve accessibility and ease of sharing the video feeds with interested partners will increase.

Implementation Guidance: TxDOT Tyler District staff should coordinate with TxDOT TRF to improve CCTV camera video sharing capabilities and develop a user-friendly software or platform to permit access to camera feeds by external traffic operations partners. Consider investing in cloud-based communications interoperability software to make partner agency camera feeds and radio communications available in real time to staff at the potential TxDOT Tyler District TMC (see Action Item ST-09) and to staff at regional emergency operations centers while they are activated. The solution chosen to support this interoperability should offer security features such as end-to-end data encryption to meet privacy requirements of partners in public safety that may be sharing information through these efforts.

Expected Benefits: Allowing camera feeds to be shared regionally among partners allows for any partners responding to an event impacting traffic operations to view real-time conditions, which assists with decision making. For example, maintaining a platform to share real-time camera feeds throughout the region can allow emergency dispatchers to verify a traffic incident and to relay incident-specific information to responders when requesting specific equipment for response, such as a heavy wrecker tow truck for clearing a commercial vehicle traffic incident.

Performance Measurement

TSMO programs are tracked by agencies through performance measures to manage progress and assess benefits of implemented projects and processes. Well-defined performance measures help make informed decisions and prioritize projects. Performance measures drive the success of TSMO programs by allowing agencies to realize and quantify improvements in the short-term through the effective use of TSMO strategies. Table 11 shows the recommended Performance Measurement action items for the TxDOT Tyler District.

Table 11: TxDOT Tyler District TSMO Recommended Action Items – Performance Measurement

CMM Capability Dimension	Action Item Number	Action Item Description
Performance Measurement 	PM-01	**Improve TIM Data Collection**
	PM-02	**Measure Event-Related Travel Time Delay**

PM-01: Improve TIM Data Collection

Focus Area:
Traffic Incident Management

Action Item Lead:
District Director of Transportation Operations

Partners:
TxDOT TRF, TYL Operation, Texas DPS, Local Law Enforcement

Goals Addressed:

Safety	✓
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	✓
Integration	✓

Objective: Improve incident management-related data collection, with a focus on location data accuracy as well as regional collection of roadway clearance time, incident clearance time, and secondary crash data.

Need: The TxDOT Tyler District currently does not collect any TIM-related performance measures, such as RCT, ICT, and secondary crash data. Other TxDOT districts often use a TMC to watch camera feeds to detect, verify, and monitor traffic incidents, but the TxDOT Tyler District does not currently have a TMC and its existing infrastructure has limited camera coverage. Therefore, the District self-identified the need to improve its capability to track these TIM performance measures.

Implementation Step #1: Encourage traffic operators and law enforcement partners to prioritize TIM data collection. Identify additional data sources to use as proxies for when cameras cannot be used to track incident details firsthand. The Crash Records Information System (CRIS) could be considered for tracking RCT, ICT, and Secondary Crashes, while INRIX could be considered for measuring Time to Return to Normal Flow.

Implementation Step #2: Establish a process for regularly collecting TIM data from CRIS, which will soon include RCT, ICT, and Secondary Crashes for all responders.

Implementation Step #3: Add TIM data to the TxDOT Safety and Operations Dashboard and regularly assess TIM performance to set program performance targets.

Expected Benefits: TIM data is important for AARs to identify what worked well and what can be improved. This data can also be used to monitor responder performance and to convey TIM performance expectations. Aggregate data can also be used to identify problem spots where incident response and clearance times are generally longer.

PM-02: Measure Event-Related Travel Time Delay

Focus Area:
Planned Special Events

Action Item Lead:
District Director of Transportation Operations

Partners:
TYL Operations, Local Transportation Agencies, Event Organizers

Goals Addressed:

Safety	
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	
Integration	✓

Objective: Develop the capacity to measure travel time delay along key routes during special events. Implementation of measuring event-related travel time delay would be at least 5-10 years out, depending upon need.

Need: The TxDOT Tyler District does not have regularly occurring large special events and therefore does not capture or share PSE-related traffic data. The District has self-identified the need for improved traveler information about PSE delays and related detour routing, and this would require the District to track travel time and delay during a PSE. The TxDOT Tyler District has also identified the need for AARs following the completion of PSE activities, and these AARs would benefit from improved traffic data collection.

Implementation Guide: Develop approaches to measure travel time delay during PSEs of various sizes, either using field devices such as CCTV cameras and signal surveillance technology (see Action Items ST-10 and ST-07) or techniques to process probe-based travel time data sources. Reference this data during special events and during post-special event reviews (see Action Item BP-06). Incorporate data feeds into summary dashboards available to operations staff.

Expected Benefits: Measuring travel time delay would allow for TxDOT districts to better assess operations and safety performance during PSEs. Improved data collection around PSE activities can increase the effectiveness of AARs and can allow for more targeted improvement in the management of individual special events as well as tracking of regional PSE operations performance over time. Tracking regional performance will help TxDOT continue to set and revise attainable performance targets related to PSE management.

Culture

TSMO culture within an agency is dependent on engaged staff who adhere to and implement TSMO goals. Staff can positively improve TSMO culture by critically analyzing daily activities to meet program objectives. Considerations involved in creating a TSMO culture include a technical understanding, strong leadership, outreach, and buy-in of program authority. Table 12 shows the recommended Culture action items for the TxDOT Tyler District.

Table 12: TxDOT Tyler District TSMO Recommended Action Items – Culture

CMM Capability Dimension	Action Item Number	Action Item Description
Culture 	CU-01	**Improve Communication of Road Weather Impacts to Local Partners**
	CU-02	**Improve Communication of Activities that Impact Traffic Signals**
	CU-03	

CU-01: Improve Communication of Road Weather Impacts to Local Partners

Focus Area:
Road Weather Management

Action Item Lead:
District Public Information Officer

Partners:
TYL Public Information Office, Local Transportation Agencies, Local Public Safety Agencies

Goals Addressed:

Safety	✓
Reliability	✓
Efficiency	✓
Customer Service	✓
Collaboration	✓
Integration	✓

Objective: Improve communication with local stakeholders regarding TxDOT weather-related road closures and ice prevention operations.

Need: The TxDOT Tyler District has self-identified the need to improve information dissemination for weather-related roadway impacts. Within the TxDOT Tyler District there is limited coordination between maintenance and traffic operations to support communication of RWM activities to other local stakeholders. Local partner agencies are often unaware of closures or delays caused by roadway flooding and inclement weather prevention operations, such as pre-treating roads for ice prevention. Currently, communication of road closures and detours due to severe weather events primarily occurs by TxDOT informing the media and the public via its own social media accounts.

Implementation Guide: Formalize the communication of RWM treatment plans with local agencies. Maintenance sections should maintain a list of local agency contacts within their jurisdiction that would benefit from receiving RWM information and should take the lead in reaching out to these contacts in impacted communities as these activities are scheduled and again once they are completed. Messaging related to weather impacts that affect multiple counties within the District should continue to be disseminated by District public information officers.

Expected Benefits: Improved communication with local partners regarding RWM activities that occur within their jurisdiction can allow these partner agencies to better respond to citizen questions that may be directed to local elected officials instead of TxDOT. This exchange of information is another way that TxDOT can continue to be a good neighbor and effective partner to the cities and counties within the District.

CU-02: Improve Communication of Activities that Impact Traffic Signals

Focus Area:
Traffic Signal Management

Action Item Lead:
District Public Information Officer

Partners:
TYL Construction, TYL Operations, TYL Public Information Office, TYL Signal Shop, Local Transportation Agencies, Local MPOs

Goals Addressed:

Safety	✓
Reliability	✓
Efficiency	
Customer Service	
Collaboration	✓
Integration	✓

Objective: Improve communication between TxDOT and local cities to notify cities of any construction or maintenance work that may impact traffic signal operations along state routes.

Need: In the City of Tyler, the city operates and maintains some of the traffic signals located along roads that are maintained by the TxDOT Tyler District. There is limited communication and coordination between TxDOT and the city about planned roadway construction or maintenance work. This occasionally leads to inefficient traffic signal operations, as vehicles are redirected around work zones to alternate routes, where the signal timings have not been modified to accommodate the new traffic pattern.

Implementation Step #1: Identify key contacts for TxDOT Tyler District staff, counterparts from local transportation agencies, transit, and other local partner agency staff that should receive construction and maintenance impact information updates.

Implementation Step #2: Establish protocol for when and how to notify the appropriate contacts of updates related to construction and maintenance activities that are expected to impact local agency traffic signal operations. Notification of these partners should occur via regular public information officer updates as well as direct outreach from local area engineers.

Implementation Step #3: Coordinate with local partners and third-party apps (see Action Items ST-03 and ST-06) to disseminate updated closure information to the public.

Expected Benefits: Improving construction information dissemination can help the District maintain good working relationships with its local partners, particularly cities that operate signals along state routes. Advance notification of construction and maintenance activities on roads that impact city traffic signals allows the city to prepare timings and resources needed to adapt to the changes in traffic patterns caused by the TxDOT road work.

CU-03: Conduct Semi-Annual Signal Technician Forums

Focus Area:
Traffic Signal Management

Action Item Lead:
District Signal Shop Manager

Partners:
TxDOT TRF, TYL Operations, TYL Area Engineers, TYL Signal Shop, Local Transportation Agencies

Goals Addressed:

Safety	
Reliability	
Efficiency	
Customer Service	✓
Collaboration	✓
Integration	✓

Objective: Conduct signal technician forums twice a year with TxDOT partners throughout the District to improve collaboration, share best practices, and establish a regional competency regarding signal maintenance and operations.

Need: Signal technicians working for TxDOT and local agencies often manage signals that are similar in terms of deployed technology and configurations. The capabilities of signal technicians within each agency, however, is largely dependent upon each agency's institutional knowledge and capability to train and retain their technicians. Stakeholders expressed interest in organizing semi-annual signal technician forums to provide an opportunity for technicians from different agencies to discuss common challenges and solutions related to traffic signal operations and maintenance.

Implementation Guidance: Identify partners from across the region to invite to semi-annual signal technician forums. Use forums to provide opportunities such as:

- Reviewing and discussing updates to TxDOT or municipal specifications for signal design and signal controller technologies
- Hands-on signal cabinet field training to review common issues
- Scenario-based temporary traffic control training to improve technician safety when in the field
- Vendor-specific training on device configuration and maintenance
- Tours to allow technicians from different agencies to show partners how their agency operates and maintains signal shops and other facilities

Expected Benefits: Collaboration between agencies through semi-annual forums such as these can increase the capabilities of signal technicians regionwide and build relationships between agencies to support signal operations. City traffic engineers and TxDOT operations staff may also attend forums to discuss topics that may involve collaboration among both technicians and engineers.

Strategy and Best Practice

The San Francisco Bay Area's Metropolitan Transportation Commission developed the Arterial Operations Program to provide technical and financial aid for traffic signal projects. The Arterial Operations Committee (AOC) holds bi-monthly meetings for local traffic engineers and signal technicians to discuss regional issues, lessons learned, and training opportunities. Experts and local engineers can present new and improved technologies at these meetings.

Organization & Workforce

The Organization & Workforce component of TSMO planning addresses how the program will be delivered through institutional and organizational changes. There are many ways to structure TSMO programs and not all agencies will require major changes to existing organization and staffing. Agencies are encouraged to evaluate each possible solution and select the organizational structure that will work best with the desired outcomes for their TSMO program. Considerations involved in determining organizational structure include program status, workforce capability, staff development and recruitment, and staff retention. Table 13 shows the recommended Organization & Workforce action items for the TxDOT Tyler District.

Table 13: TxDOT Tyler District TSMO Recommended Action Items – Organization & Workforce

CMM Capability Dimension	Action Item Number	Action Item Description
Organization & Workforce	OW-01	**Establish Regional Multidisciplinary TIM Training**
	OW-02	**Provide TxDOT Tyler District Training Opportunities to Local Staff**
	OW-03	
	OW-04	**Identify and Fulfill Staffing Requirements for TMC Operation**

OW-01: Establish Regional Multidisciplinary TIM Training

Focus Area:
Traffic Incident Management

Action Item Lead:
District Director of Transportation Operations

Partners:
TxDOT Statewide TIM Coordinator, TYL Maintenance, TYL Operations, Local Transportation Agencies, Local Public Safety Agencies, Texas DPS

Goals Addressed:

Safety	✓
Reliability	✓
Efficiency	
Customer Service	✓
Collaboration	✓
Integration	

Objective: Partner with TxDOT Statewide Traffic Incident Management Coordinator to provide TIM multidisciplinary trainings and Train the Trainer programs to TxDOT staff and interested partners.

Need: Multidisciplinary TIM training is a core component of a successful TIM program and TIM activities. TxDOT TRF has been partnering with TxDOT districts and TIM working groups across Texas to conduct training. Training typically involves representatives from TxDOT, police, fire, EMS, local city transportation staff, and could one day include staff such as TMC or service patrol operators in the region.

Implementation Step #1: Develop a TIM training program by adapting statewide TIM training material and Strategic Highway Research Program 2 (SHRP2) trainings to focus on local TIM needs. Identify who will lead the trainings and outline which agencies should be involved. Meet individually with identified agencies to encourage participation and identify barriers to participation.

Implementation Step #2: Coordinate with TxDOT TRF to adapt the existing Train the Trainer program to fit the TxDOT Tyler District's TIM needs. Provide Train the Trainer sessions to interested personnel to initiate the TIM multidisciplinary trainings.

Implementation Step #3: Offer regional TIM training opportunities at least once per year. Continuously update trainings to incorporate new technologies, strategies, lessons learned, and best practices.

Expected Benefits: Benefits of multidisciplinary TIM training include a better understanding of each agency's roles and capabilities when responding to incidents, the ability to discuss response strategies using tabletop exercises that resemble real life situations, and the establishment of a baseline competency regarding incident management in the region. Train the Trainer courses would build the region's capacity for conducting its own TIM training as needed when new staff or stakeholders become involved in incident management.

Strategy and Best Practice

In the Dallas-Fort Worth Region, the North-Central Texas Council of Governments provides a free TIM training course. The multidisciplinary course supports a coordinated response to traffic incidents that builds partnerships, enhances safety for emergency personnel, reduces secondary crashes, and increases reliability by shortening response and clearance times. Specific courses have been designed for first responders, traffic managers, and executive level policy makers.

OW-02: Provide TxDOT Tyler District Training Opportunities to Local Staff

Focus Area:
Traffic Signal Management

Action Item Lead:
District Director of Transportation Operations

Partners:
TYL Operations, TYL Area Engineers, TYL Signal Shop, Local Transportation Agencies

Goals Addressed:

Safety	✓
Reliability	✓
Efficiency	
Customer Service	✓
Collaboration	✓
Integration	✓

Objective: Provide TxDOT Tyler District internal signal technician training opportunities to local agency traffic signal technicians. Consider combined training classes with TxDOT and local agency traffic signal technicians to support increased collaboration and resource sharing among TxDOT and cities.

Need: Local agencies within the TxDOT Tyler District do not have trainings for integrating new technicians, so knowledge transfer is dependent upon on-the-job training. Stakeholders identified that maintenance conducted by signal technicians unfamiliar with coordinated signal systems has caused signals to become uncoordinated with those along the rest of the corridor. Therefore, there is a need for improved signal technician trainings for the region's municipal agency partners to standardize installation and maintenance techniques and to become familiar with emerging technologies. The TxDOT Tyler District provides training to its internal signal technicians but does not currently make it available to local partners.

Implementation Step #1: Determine local signal technician training needs based on common issues operations and maintenance staff face.

Implementation Step #2: Develop a signal technician training program by adapting available internal TxDOT Tyler District trainings to focus on local needs. Identify who will lead the trainings and outline which agencies should be involved.

Implementation Step #3: Offer regional signal technician training opportunities at least once per year, possibly as part of a semi-annual signal technician forum (see Action Item CU-03). Continuously update trainings to incorporate new technologies, strategies, lessons learned, and best practices.

Expected Benefits: Allowing local partners to access or attend the District-led signal technician training could improve local agency capabilities and therefore overall corridor operations in locations where signals along a corridor are managed by different agencies. Training provides signal technicians with tools to improve their familiarity with the various signal controller technologies that are deployed at traffic signal locations throughout the District, to diagnose and troubleshoot signal problems more efficiently, and to safely stage a work area while addressing issues in the field. A more cohesive and up-to-date training program could improve the efficiency of operations and maintenance along key corridors in the District.

OW-03: Improve Access to Available Specialized TxDOT Signal Training

Focus Area:
Traffic Signal Management

Action Item Lead:
District Director of Transportation Operations

Partners:
TxDOT TRF, TYL Operations, Local Transportation Agencies

Goals Addressed:

Safety	
Reliability	✓
Efficiency	
Customer Service	✓
Collaboration	✓
Integration	

Objective: Improve local agency traffic signal technician access to signal-related trainings offered by the TxDOT Traffic Safety Division.

Need: In addition to training offered to signal technicians in the TxDOT Tyler District, TxDOT TRF offers more specialized or advanced training opportunities to TxDOT staff, including trainings on topics such as advanced signal controllers or active corridor operations. Staff from several cities have shown interest in participating in several of these training opportunities, but these staff shared that there was not clear guidance on how staff from agencies outside of TxDOT could get their names onto class lists. City staff also noted funding limitations for sending signal technicians to specialized conferences and trainings in other regions.

Implementation Step #1: Inventory what trainings TxDOT TRF currently offers as part of its specialized signal trainings throughout the state.

Implementation Step #2: Coordinate with local partners to identify specialized training needs for local signal technicians based on common issues operations and maintenance staff face.

Implementation Step #3: Reach out to TxDOT TRF to determine interest and logistics for making specialized TxDOT signal trainings available to select staff at local partner agencies. Selecting expert signal technicians to provide the trainings locally for the city staff within the TxDOT Tyler District would reduce the challenges posed by the existing limited availability of funding to support signal technician professional development.

Expected Benefits: Enabling local agencies to participate in specialized TxDOT signal trainings improves the region's overall institutional knowledge, increases the cohesion of signal systems, and sets a foundation for the implementation of newly available technologies and signal system management strategies. Specialized trainings could provide city signal technicians with information that may not be included in the standard District level training, such as guidance on use and maintenance of automated traffic signal performance measures (ATSPM), emergency and transit vehicle preemption, and current best practices in active corridor management.

OW-04: Identify and Fulfill Staffing Requirements for TMC Operation

Focus Area:
General Traffic Management

Action Item Lead:
District Director of Transportation Operations

Partners:
TYL Operations, Local Transportation Agencies, Local Public Safety Agencies

Goals Addressed:

Safety	
Reliability	
Efficiency	✓
Customer Service	
Collaboration	✓
Integration	✓

Objective: Develop a staffing approach for the effective operation and management of a District TMC.

Need: As the TxDOT Tyler District and its local partners expand CCTV camera coverage and begin to consider establishing a regional TMC, the District must identify the staffing needs for more active regional traffic management. The City of Tyler currently has a 'central command' center at their signal shop, and the City's ITS Master Plan includes guidance for establishing a more formal TMC. The TxDOT Tyler District does not have a TMC and District staff noted that if a TMC were to be implemented, it would be initially be operated solely by District staff. The District signal shop currently has some monitors mounted on a video wall; however, the District is still working on developing communication connections to all signals and therefore staff does not consistently utilize the video wall.

Implementation Guidance: The District should determine the desired extents of TMC operations and should identify corresponding staffing needs to budget and prepare for establishing a regional TMC (see Action Item ST-09). TMC operating considerations may include dedicated staffing for time periods such as the AM/PM weekday peak hours, having staff on call outside of normal business hours when the District is not actively monitoring traffic, and planned weather event or construction event staffing of the TMC.

Expected Benefits: Developing a plan for staffing the regional TMC would allow the TxDOT Tyler District and local partner agencies in the area to budget for the additional traffic operations staffing requirements. The planning and budgeting could also help District staff and stakeholders identify additional needs related to staffing, such as opportunities for TIM trainings (see Action Item OW-01) and regional traffic manager operations forums (see Action Item CO-03). Determining these needs and responsibilities in advance of establishing a regional TMC enables agencies to prepare the funding and resources for smooth coordination among traffic management stakeholders in the District.

Collaboration

The TSMO collaboration component is vital to emphasize the importance of partner agencies and stakeholders working together to meet regional transportation goals. Collaboration should take place in every aspect of TSMO programming; from early in developing TSMO strategic elements such as vision, mission, goals, and objectives to the final implementation and ongoing operation of projects, programs, and services. Collaboration includes internal partnerships as well as those among different levels of government like public safety agencies, and partnerships with the private sector. Table 14 shows the recommended Collaboration action items for the TxDOT Tyler District.

Table 14: TxDOT Tyler District TSMO Recommended Action Items – Collaboration

CMM Capability Dimension	Action Item Number	Action Item Description
Collaboration 	CO-01	**Establish a Formal Regional TIM Team**
	CO-02	**Standardize TIM Communication Protocol**
	CO-03	
	CO-04	**Establish Regional Traffic Data Sharing Procedures**

CO-01: Establish a Formal Regional TIM Team

Focus Area:
Traffic Incident Management

Action Item Lead:
District Director of Transportation Operations

Partners:
TxDOT Statewide TIM Coordinator, TYL Area Engineers, TYL Operations, Local Transportation Agencies, Local Public Safety Agencies

Goals Addressed:

Safety	✓
Reliability	✓
Efficiency	✓
Customer Service	✓
Collaboration	✓
Integration	✓

Objective: Establish a formalized TIM Team that meets regularly and includes all relevant jurisdictions and roles.

Need: The TxDOT Tyler District does not have a regional TIM working group, or "TIM Team", that meets regularly to discuss TIM-related training opportunities, best practices, and incident AARs. Stakeholders and District staff identified that the creation of a formalized TIM Team would increase communication and coordination between agencies and improve incident response and operations.

Implementation Step #1: Identify local partners at the county level, such as local sheriff, police, and fire departments, to involve in TIM working group outreach. Conduct outreach to share the District's goals for quick clearance of incidents, existing state laws supporting these goals, and upcoming training opportunities.

Implementation Step #2: Gauge interest for organizing and hosting regularly scheduled regional TIM working group meetings with TxDOT staff and responders. Items to consider when organizing these meetings include the frequency, location, agendas, and attendee list for working group meetings.

Implementation Step #3: Conduct regularly scheduled regional TIM working group meetings, with support from the TxDOT TRF Statewide TIM Coordinator.

Expected Benefits: TIM working groups consisting of stakeholders from throughout the region can meet on a regular basis to discuss current initiatives and challenges related to TIM. These working groups can conduct AARs of high-impact incidents and can feature guest presenters to showcase new technology or resources that incident managers could potentially incorporate into their TIM procedures. Conducting these activities with all stakeholders can improve TIM practices among agencies throughout the region, allowing for the entire region to improve in terms of TIM performance.

Strategy and Best Practice

The Austin-Area Incident Management for Highways (AIMHigh) Team in Austin, TX meet every other month to discuss TIM challenges and accomplishments. Meetings are facilitated by a contractor who encourages participation from first responders and other partners in the region. The team includes representatives from federal, state, and local transportation agencies; state and local law enforcement agencies; fire and rescue agencies; EMS; the local towing association; and the regional MPO.

CO-02: Standardize TIM Communication Protocol

Focus Area:
Traffic Incident Management

Action Item Lead:
District Director of Maintenance

Partners:
Texas DPS, Local Public Safety Agencies, TYL Operations, TYL Maintenance

Goals Addressed:

Safety	
Reliability	
Efficiency	
Customer Service	
Collaboration	✓
Integration	✓

Objective: Standardize communication protocol among law enforcement, maintenance sections, and the District office to improve TIM information sharing.

Need: The TxDOT Tyler District has self-identified a need for coordination district-wide in response to incidents and a need to increase accuracy of incident location data, potentially through increased CCTV coverage and sharing video feeds with first responders. A standard protocol for disseminating incident information has not been established and there is occasionally confusion on who to call when an incident is detected. Incident details often do not reach the appropriate response or operations personnel. Stakeholders identified the need to develop an updated list of points of contact at each agency to streamline sharing of incident information.

Implementation Step #1: Develop and maintain current local public safety and emergency response point-of-contact lists at the District Office and Area Offices. Develop protocol for determining when and how to share TIM-related updates among key contacts at TxDOT, Texas DPS, and local public safety agencies.

Implementation Step #2: Identify agency responsibilities and chain of communication for incident information based on existing best practices that District staff follow.

Implementation Step #3: Establish roles for disseminating incident information to the public. Consider an automated notification or dispatch system to initiate response from TxDOT once an incident is detected or verified by Texas DPS.

Expected Benefits: Standardized communication protocol for the dissemination of incident information can ensure that each agency involved in TIM has the information it needs to effectively manage a traffic incident, as well as provide resources for drivers to make informed route choices. Not informing all partner agencies about an incident or not alerting the public can be detrimental to TIM activities by delaying response, increasing ICT, prolonging traffic delays, and decreasing the safety of motorists and responders. Updating travel information to include closures and delays can redirect drivers away from the incident and warn them of potential queueing in the incident area, reducing congestion and the likelihood that secondary crashes would occur.

CO-03: Conduct Annual Regional Traffic Operations Forums

Focus Area:
General Traffic Management

Action Item Lead:
District Director of Transportation Operations

Partners:
TYL Area Engineers, TYL Operations, Local Transportation Agencies

Goals Addressed:

Safety	
Reliability	
Efficiency	
Customer Service	✓
Collaboration	✓
Integration	✓

Objective: Conduct annual regional traffic operations forums with staff from traffic operations agencies throughout the District.

Need: Stakeholders within the TxDOT Tyler District noted that the overall coordination between the District and local agencies regarding traffic operations could be improved. The District prioritizes statewide issues, while its partners prioritize local issues which are often different and occasionally require management approaches that conflict with District priorities. TxDOT receives little input from small cities in the TxDOT Tyler District due to limited outreach to those stakeholders.

Implementation Guidance: A regional traffic operations forum would provide an opportunity for engineering staff to provide updates on citywide and regionwide initiatives related to traffic and safety. As cities identify key corridors upon which to focus operations efforts, these forums would also provide an opportunity to share these plans with neighboring cities so that the corridors can be cooperatively managed by multiple jurisdictions throughout the region. While the regional TMC (see Action Item ST-09) advances from the conceptual stage to eventual construction and operation, this forum could also serve as an opportunity to share project progress and explore ideas such as developing interagency agreements to share camera access or collected traffic operations data (see Action Items ST-11 and CO-04). During the forums, staff from the District and its partner agencies can discuss TIM, TSM, upcoming planned special events, and future construction projects.

Expected Benefits: Better communication of the local and statewide issues and potential solutions during regularly scheduled traffic operations forums would allow partner agencies to give TxDOT a local perspective on traffic operations issues within the TxDOT Tyler District. These forums would reduce the likelihood that different stakeholders conduct traffic management activities that conflict with one another. They would also enable partner agencies and smaller cities to give input on TxDOT's planned improvements related to traffic management in the District.

CO-04: Establish Regional Traffic Data Sharing Procedures

Focus Area:
General Traffic Management

Action Item Lead:
District Director of Transportation Operations

Partners:
TYL Operations, Local Transportation Agencies, Local MPOs

Goals Addressed:

Safety	
Reliability	✓
Efficiency	
Customer Service	✓
Collaboration	✓
Integration	

Objective: Establish procedures for sharing collected traffic data among TxDOT, MPOs, and local agencies.

Need: Currently, the TxDOT Tyler District does not collect or analyze data for performance measurement purposes. However, TxDOT TRF has contracted with INRIX, a third-party provider, to make probe-based travel data available to all TxDOT districts and local partners. The TxDOT Tyler District and its local partner agencies should engage with TxDOT TRF staff to learn more about the data that is available and how it can be leveraged to support traffic operations.

Implementation Step #1: Identify which local partner agencies have traffic data. Engage with TxDOT TRF to improve District knowledge of capabilities available through existing agency partnerships with third-party probe-based traffic data providers, such as INRIX. Perform outreach to share this information with local partners, as local partners may also have access to some data through existing TxDOT agreements with third parties.

Implementation Step #2: Identify which agencies want data and determine what data they want and how to share it. Consider sharing agreements for camera feeds and other resources. Also continue to expand deployment of ITS devices to improve the District's ability to monitor traffic operations (see Action Item ST-10) and increase performance measure data collection.

Expected Benefits: Regional traffic data sharing allows agencies throughout the TxDOT Tyler District to establish reasonable performance goals and enables tracking of performance that helps to identify needed areas of improvement in traffic operations throughout the District. TxDOT sharing INRIX data with local MPOs and partner agencies can create consistency in data collection and performance measure tracking. Sharing data also minimizes the redundancy of different agencies collecting the same traffic data, resulting in more efficient use of available funds in agencies throughout the District.

Strategy and Best Practice

The Metropolitan Transportation Commission (MTC) in the San Francisco Bay area developed a data sharing portal as part of their 511 system. Key stakeholders include the MTC, Caltrans, California Highway Patrol, FHWA, and over 65 transit providers. The data portal has a published Application Programming Interface (API).

TSMO Tactical Plan Assessment

TSMO Tactical Plans allow the TxDOT Tyler District to establish greater detail in how to act upon some of the high priority recommended action items included in the TSMO Program Plan. Tactical Plans can establish project details, assign responsibilities, and include cost and staff estimates for specific initiatives. Often, Tactical Plans establish further direction regarding a specific TSMO capability dimension (for example, performance measurement), focus area (for example, TIM), or a service within the scope of a TSMO focus area (for example, winter road operations management, within the RWM focus area).

Tactical Plan Criteria

Based on the transportation challenges in the region, and priorities identified by regional stakeholders, several Tactical Plans are recommended for the TxDOT Tyler District. Plans are displayed according to the following criteria:

- Alignment with the TxDOT Tyler District TSMO Goals: Safety, Reliability, Efficiency, Customer Service, Collaboration, and Integration
- Stakeholder partnerships required for successful implementation
- Level of anticipated initial and ongoing costs anticipated for successful implementation
- Level of District staff support anticipated for successful implementation
- Expected return on investment, pending successful implementation
- Action items from this TSMO Program Plan that are within the Tactical Plan's scope

Tactical Plan Components

The following components are typically included in TSMO Tactical Plans:

- A detailed account of existing activities within the District and region, including who is responsible, a schedule of when and how the activities are executed, and other considerations
- Recommendations for new activities, or changes to existing activities that would support the aim of the Tactical Plan
- A description of how the recommended activities will be integrated with existing business processes
- A detailed schedule for up-front and ongoing recommended activities
- Up-front and ongoing cost estimates for implementation of recommended activities
- Performance measures that would allow for tracking the progress of recommended activities

Recommended Tactical Plans

Recommend TSMO Tactical Plans are included on the next page in Table 15.

Table 15: TxDOT Tyler District Potential TSMO Tactical Plans

Potential Tactical Plan	Supports District TSMO Goals						Key Internal and External Partners	Expected Long Term Program Costs	Expected Ongoing Program Level of Effort	TSMO Action Items Addressed
	Safety					Integration				
TxDOT Tyler District ITS Master Plan (ITS Master Plan could include: ITS devices, traffic signal technologies, and TMC concept if not completed as a separate plan)	✓	✓	✓	✓	✓	✓	TYL Operations, TYL Area Engineers	$$$		BP-03, BP-08, ST-05, ST-07, ST-10
TMC Concept of Operations Plan	✓	✓	✓	✓	✓	✓	TxDOT TRF, TYL Operations, TYL District Engineer, Local Transportation Agencies, Local Public Safety Agencies	$$		ST-07, ST-09, ST-11, OW-04, CO-01
Regional TIM Program Plan	✓	✓			✓	✓	TxDOT TRF, TYL Operations, TYL Maintenance, TYL Area Engineers, First Responders	$$		BP-01, ST-01, ST-02, PM-01, OW-01, CO-01, CO-02
Freeway Safety Service Patrol Feasibility Study	✓	✓	✓			✓	TYL Operations, TYL Area Engineers	$$$		ST-02, ST-09, CO-01
Work Zone Technology Deployment Expansion Plan		✓		✓		✓	TYL Operations, TYL Area Engineers, TYL Construction	$		BP-03, BP-08, ST-04

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Appendix A – Stakeholder Involvement Database

Appendix A – Stakeholder Involvement Database

TxDOT Tyler District TSMO Program Plan Stakeholder Database						
Organization	Name	Position/Role	Leadership Meeting Participant	Outreach Workshop Participant	CMM Workshop Participant	CMF Workshop Participant
City of Athens	Elizabeth Borstad	City Manager	X			
City of Athens	Monty Montgomery	Mayor	X			
City of Athens	Aaron Smith	City Councilman	X			
City of Gladewater	Ricky Tow	City Manager		X		
City of Henderson	Jay Abercrombie	City Manager		X		
City of Kilgore	Clay Evers	Director of Public Works		X		
City of Kilgore	Mark Robinson	Kilgore Area Chamber of Commerce				X
City of Lindale	Kyle McCoy	Utilities Director		X	X	
City of Longview	Dwayne Archer	Public Works Staff				X
City of Longview	Alton Bradley	City Engineer	X	X		
City of Longview	Steven Green	Assistant Fire Chief			X	
City of Longview	Stephen Ha	Traffic Engineer	X		X	
City of Longview	Brian Jones	Assistant Fire Chief			X	
City of Longview	Rolin McPhee	Director of Public Works			X	X
City of Longview	Zack Shaner	Project Manager			X	
City of Longview	Brandon Thorton	Longview Police Public Information Officer			X	
City of Tyler	Edward Broussard	City Manager	X	X	X	
City of Tyler	Lisa Crossman	City Engineer	X	X	X	X
City of Tyler	ReNissa M Wade	Managing Director		X		
City of Tyler	Donald Warren	Mayor	X			
City of Tyler	Cameron Williams	City Traffic Engineer	X		X	X
City of Whitehouse	Leslie Black	City Manager		X		
City of Whitehouse	James Wansley	Mayor		X	X	
FHWA	Tymli Frierson	Area Engineer			X	
FHWA	Millie Hayes	Safety & Traffic Operations Specialist		X	X	
Longview MPO	Bryan McBride	MPO Director			X	X
Longview MPO	Ingrid Self	Asst. Director of Development Services	X	X		
Longview Transit	Scott Lewis	General Manager				X
NETRMA	Colleen Colby	Communications Director		X		X
TxDOT TRF	Joseph Hunt	Traffic Management Section Division Director		X		
TxDOT TRF	David McDonald	Statewide TIM Coordinator			X	X
TxDOT TRF	Barbara Russell	TRF Engineering Branch Manager for Traffic Management	X	X	X	
TxDOT Tyler District	Will Buskell	Longview Area Engineer				X
TxDOT Tyler District	Shane Cunningham	TYL Director of Construction	X			
TxDOT Tyler District	Juanita Daniels-West	TYL Director of Transportation Operations	X	X	X	X
TxDOT Tyler District	Kyle Dykes	Mineola Assistant Area Engineer			X	
TxDOT Tyler District	Jeffrey Harmon	TYL Director of Transportation Planning & Development	X			
TxDOT Tyler District	Steven Swindell	TYL Traffic Engineer	X	X	X	X
TxDOT Tyler District	Vernon Webb	TYL District Engineer	X			
TxDOT Tyler District	Stuart Withington	TYL Director of Maintenance	X			
Tyler MPO	Michael Howell	MPO Manager	X	X	X	X
Tyler MPO	Heather Nick	Executive Director		X		
Tyler Transit	James Torres	General Manager		X	X	X

Appendix B – Implementation Plan Organized by TSMO Focus Area

Action No.	Traffic Incident Management (TIM) Action Item Descriptions	Program Plan Page #	Action Lead	Supports District TSMO Goals						Partners	Cost	Effort	TSMO Capability Dimension	Related Action Items
				Safety					Integration					
BP 01	**Implement TIM Response Measures for Major Construction:** Develop processes and procedures for incident management within construction work zones prior to letting of all major construction contracts.	38	District Director of Construction	✓		✓		✓	✓	TYL Construction, TYL Operations, TYL Area Engineers, First Responders	$$			ST-02, PM-01, OW-01, CO-02
ST 01	**Study Feasibility of Freeway Safety Service Patrol:** Study feasibility of a freeway safety service patrol along I-20 to respond to minor incidents and traffic disruptions, and to assist with response to larger incidents. Program implementation would not likely occur for at least 5-10 years, depending upon			✓	✓	✓			✓		$$			
ST 02	**Establish Link to TIM Response Dispatch Information:** Establish connection with 911 public safety answering points to share computer-aided dispatch traffic incident information with TxDOT in real time.	49	District Director of Transportation Operations	✓				✓	✓	TYL Operations, TxDOT TRF, TYL Public Information Office, Local Public Safety Agencies	$$			BP-01, ST-01, CO-02
PM 01	**Improve TIM Data Collection:** Improve incident management-related data collection, with a focus on location data accuracy as well as regional collection of roadway clearance time,			✓	✓	✓		✓	✓		$			
OW 01	**Establish Regional Multidisciplinary TIM Training:** Partner with TxDOT Statewide Traffic Incident Management Coordinator to provide TIM multidisciplinary trainings and Train the Trainer programs to TxDOT staff and interested partners.	67	District Director of Transportation Operations	✓	✓			✓	✓	TxDOT Statewide TIM Coordinator, TYL Maintenance, TYL Operations, Local Transportation Agencies, Local Public Safety Agencies, Texas DPS	$			BP-01, CO-01, CO-02
CO 01	**Establish a Formal Regional TIM Team:** Establish a formalized TIM Team that meets regularly and includes all relevant	72	District Director of Transportation Operations	✓	✓	✓	✓	✓	✓	TxDOT Statewide TIM Coordinator, TYL Area Engineers, TYL Operations, Local Transportation Agencies, Local Public Safety Agencies	$			ST-01, ST-09, ST-11, PM-01, OW-01
CO 02	**Standardize TIM Communication Protocol:** Standardize communication protocol among law enforcement, maintenance sections, and the District office to improve TIM information sharing.	73	District Director of Maintenance					✓	✓	Texas DPS, Local Public Safety Agencies, TYL Operations, TYL Maintenance	$			BP-01, ST-02, OW-01

Table continued on next page.

Action No.	Work Zone Management (WZM) Action Item Descriptions	Program Plan Page #	Action Lead	Supports District TSMO Goals						Partners	Cost	Effort	TSMO Capability Dimension	Related Action Items
				Safety					Integration					
BP 02	**Develop Alternate Plans for Diverting Traffic During Construction:** Develop guidelines for managing traffic during major construction on freeways and determining how to divert traffic onto other roads.	39	District Director of Construction	✓		✓	✓		✓	TYL Construction, TYL Operations, TYL Area Engineers, Local Transportation Agencies	$			BP-03, BP-04, ST-03, ST-08, CU-02
BP 03	**Use TxDOT's Smart Work Zone Decision Tool and Deployment Guidance:** Adapt TxDOT's existing SWZ guidance and deployment decision tool and reference it when determining which work zone ITS technologies to use for District			✓	✓		✓		✓		$			
BP 04	**Streamline Advanced Notification of Planned Lane Closures:** Standardize a District process for communicating construction impacts to local transportation, transit, and public safety partners as well as the public.	41	District Public Information Officer	✓			✓	✓	✓	TYL Area Engineers, TYL Construction, TYL Public Information Office	$			BP-02, BP-03, ST-03, CU-02
BP 05	**Conduct Post-Construction Event Reviews:** Conduct post-construction event reviews as needed to debrief on traffic management performance during closures.				✓	✓		✓	✓		$			
ST 03	**Provide Work Zone Closure Information Through Third-Party Apps:** Partner with third-party navigation apps to provide accurate work zone closure information for travelers through the District.	50	District Public Information Officer		✓		✓	✓	✓	Private Third-Party Providers, TYL Public Information Office, TYL Operations, TYL Construction	$			BP-02, BP-04
ST 04	**Expand Work Zone Technology Deployments:** Deploy work zone technology throughout the Tyler District to support improved work zone monitoring, localized real-time traveler information,	51	District Director of Construction	✓		✓	✓	✓	✓	TYL Construction, TYL Operations, TYL Area Engineers, TxDOT Construction Division	$$			BP-03, BP-05, BP-08

Table continued on next page.

Action No.	Road Weather Management (RWM) Action Item Descriptions	Program Plan Page #	Action Lead	Supports District TSMO Goals: Safety					Integration	Partners	Cost	Effort	TSMO Capability Dimension	Related Action Items
ST 05	**Deploy Flood Detection, Warning, and Closure Devices:** Implement technology for flood detection, warning, and road closure in areas that frequently flood.	52	District Director of Transportation Operations	✓			✓		✓	TYL Operations, TYL Maintenance, TYL Area Engineer	$$			BP-08, ST-10, CU-01
CU 01	**Improve Communication of Road Weather Impacts to Local Partners:** Improve communication with local stakeholders regarding TxDOT weather-related road closures as well as snow			✓	✓	✓	✓	✓	✓		$			

Action No.	Planned Special Events (PSE) Action Item Descriptions	Program Plan Page #	Action Lead	Supports District TSMO Goals: Safety					Integration	Partners	Cost	Effort	TSMO Capability Dimension	Related Action Items
BP 06	**Conduct Post-Special Event Reviews:** Conduct post-special event reviews to determine what worked and what can be improved upon.	43	District Director of Transportation Operations		✓	✓		✓	✓	TYL Operations, TYL Area Engineers, Local Transportation Agencies, Event Organizers	$			PM-02
ST 06	**Share Event-Related Road Impacts with Third-Party Apps:** Partner with third-party navigation apps to provide accurate special event-related closure and routing information for travelers through the District.	53	District Public Information Officer		✓		✓	✓	✓	Private Third-Party Providers, TYL Public Information Office, TYL Operations, Event Organizers	$			PM-02
PM 02	**Measure Event-Related Travel Time Delay:** Develop the capacity to measure travel time delay along key routes during special events. Implementation of measuring event-related travel time delay would be at least 5-10 years out, depending upon need.	61	District Director of Transportation Operations		✓	✓			✓	TYL Operations, Local Transportation Agencies, Event Organizers	$$			BP-06, ST-06, CO-04

Table continued on next page.

Action No.	Traffic Signal Management (TSM) Action Item Descriptions	Program Plan Page #	Action Lead	Supports District TSMO Goals: Safety					Integration	Partners	Cost	Effort	TSMO Capability Dimension	Related Action Items
BP 07	**Develop a Proactive Method for Retiming Corridors:** Develop a proactive approach that prioritizes corridors for retiming based on corridor performance data.	44	District Signal Shop Manager	✓	✓	✓			✓	TYL Operations, TYL Signal Shop, TYL Maintenance	$			ST-07, ST-08
ST 07	**Plan and Implement Surveillance Technology for Signals:** Identify implementation priority for cameras and necessary software enhancements to allow for remote surveillance of District traffic signals from a single software platform.	54	District Signal Shop Manager	✓	✓	✓		✓	✓	TYL Operations, TYL Maintenance	$$			BP-07, BP-08, ST-08, ST-11
ST 08	**Improve Communications Link to Signals in Rural Areas:** Upgrade communications capabilities at rural TxDOT traffic signal locations to improve ability to monitor and respond to conflicts, outages, and other signal issues.	55	District Signal Shop Manager	✓	✓	✓			✓	TYL Operations, TYL Maintenance, TYL Area Engineers, TYL Signal Shop	$$			ST-07
CU 02	**Improve Communication of Activities that Impact Traffic Signals:** Improve communication between TxDOT and local cities to notify cities of any construction or maintenance work that may impact traffic signal operations along state routes.	64	District Public Information Officer		✓			✓	✓	TYL Construction, TYL Operations, TYL Public Information Office, Local Transportation Agencies, Local MPOs	$			BP-02, BP-04, ST-08, CU-01
CU 03	**Conduct Semi-Annual Signal Technician Forums:** Conduct signal technician forums twice a year with TxDOT partners throughout the District to improve collaboration, share best practices, and establish a regional competency regarding signal maintenance and operations.	65	District Signal Shop Manager				✓	✓	✓	TxDOT TRF, TYL Operations, TYL Area Engineers, TYL Signal Shop, Local Transportation Agencies	$			OW-02, OW-03, CO-03
OW 02	**Provide TxDOT Tyler District Training Opportunities to Local Staff:** Provide TxDOT Tyler District internal signal technician training opportunities to local agency traffic signal technicians. Consider combined training classes with TxDOT and local agency traffic signal technicians to support increased collaboration and resource sharing among TxDOT and cities.	68	District Director of Transportation Operations	✓	✓		✓	✓	✓	TYL Area Engineers, TYL Operations, TYL Signal Shop, Local Transportation Agencies	$			CU-03, OW-03
OW 03	**Improve Access to Available Specialized TxDOT Signal Training:** Improve local agency traffic signal technician access to signal-related trainings offered by the TxDOT Traffic Safety Division.	69	District Director of Transportation Operations		✓		✓	✓		TxDOT TRF, TYL Operations, Local Transportation Agencies	$			CU-03, OW-02

Table continued on next page.

Action No.	General Traffic Management (TM) Action Item Descriptions	Program Plan Page #	Action Lead	Supports District TSMO Goals						Partners	Cost	Effort	TSMO Capability Dimension	Related Action Items
				Safety					Integration					
BP 08	**Develop TxDOT Tyler District ITS Master Plan:** Develop an ITS Master Plan for the TxDOT Tyler District to identify and prioritize ITS device and related communication infrastructure deployments throughout the District.	45	District Director of Transportation Planning & Development	✓	✓	✓	✓	✓	✓	TYL Operations, TYL Area Engineers	$$			BP-03, ST-04, ST-05, ST-07, ST-09, ST-10
BP 09	**Establish Notification Process to Cities for Over-Height/ Oversize Vehicles Permits:** Establish a process within TxDOT to notify local agencies when over-height/oversize vehicles will be traveling through their jurisdictions so they can plan for and			✓				✓			$			
ST 09	**Establish a Regional TMC:** Establish a regional TMC to support traffic incident management, traffic signal management, traveler information dissemination, and other traffic management priorities.	56	District Director of Transportation Operations	✓	✓	✓	✓	✓	✓	TYL Operations, TYL Area Engineers, TYL Signal Shop, Local Transportation Agencies, Local Public Safety Agencies	$$$			BP-08, OW-04, CO-01, CO-03
ST 10	**Implement Additional ITS Field Devices:** Implement new ITS deployments in the District including additional CCTV cameras and DMS to support active traffic management. Development of an ITS Master Plan could help identify candidate			✓	✓	✓	✓	✓	✓		$$$			
ST 11	**Improve Regional Video Sharing Capabilities:** Use cloud-based technology platforms for sharing access to view CCTV camera video feeds.	58	District Director of Transportation Operations			✓		✓	✓	TxDOT TRF, TYL Operations, Local Transportation Agencies, Local Public Safety Agencies	$			ST-07, ST-10, CO-01, CO-04
OW 04	**Identify and Fulfill Staffing Requirements for TMC Operation:** Develop a staffing approach for the effective operation and	70	District Director of Transportation Operations			✓		✓	✓	TYL Operations, Local Transportation Agencies, Local Public Safety Agencies	$$$			ST-09
CO 03	**Conduct Annual Regional Traffic Operations Forums:** Conduct annual regional traffic operations forums with staff from traffic operations agencies throughout the District.	74	District Director of Transportation Operations				✓	✓	✓	TYL Area Engineers, TYL Operations, Local Transportation Agencies	$			ST-09, CU-03
CO 04	**Establish Regional Traffic Data Sharing Procedures:** Establish procedures for sharing collected traffic data among TxDOT,				✓		✓	✓			$			

Appendix C – TxDOT Incident After Action Report Form

AFTER ACTION REPORT

TEXAS DEPT. OF TRANSPORTATION

Traffic Incident Management Teams

INCIDENT INFORMATION					
Distri Lonestar#		Level: Select Level		Conditions: Select Condition	
Select Day	Date:	Time:(HR:MN)		Incident Type:	☐ Traffic Crash
Location:				☐ HAZMAT	☐ Oil Spill
CMV: ☐ Yes ☐ No		Construction Zone: ☐ Yes ☐ No		PD/FD CAD#	
		Secondary Crash: ☐ Yes ☐ No			

INCIDENT TIMELINE

INCIDENT MILESTONE	TIME
T0 –Incident Occurrence	
T1 – Incident Reported	
T2 – Incident Verified	
T3a – Police Dispatched*	
T3a – Fire Rescue Dispatched*	
T3b – SSP Dispatched	
T3c – Response Plan Activated	
T4a – Police Arrived*	
T4a – Fire Rescue Arrived*	
T4b – SSP Arrived	
T5 – All Lanes Opened	
T6 – Responder Departs	
T7 – Normal Traffic Flow	

*Note: CAD data will be utilized for these times; if no times are available Lonestar data will be utilized.

NOTIFICATIONS			
TYPE	TIME	TYPE	TIME
TMC EMAIL ALERT		Medical Examiner	
SSP/HERO		News Media	
DOT		Other	
Wrecker			
Police			
Fire Rescue			

INCIDENT SUMMARY:

1

Reviewed by:
Position:
Date:

TxDOT After Action Report Template v6 2019-04-04

AFTER ACTION REPORT
TEXAS DEPT. OF TRANSPORTATION
Traffic Incident Management Teams

AAR MEETING LOCATION AND MODERATOR:
MEETING NOTES/QUESTIONS/COMMENTS:
RESOURCES NEEDED:

AFTER ACTION REPORT
TEXAS DEPT. OF TRANSPORTATION
Traffic Incident Management Teams

ISSUES:
WHAT WENT WELL?
TRAINING NEEDS?

3

AFTER ACTION REPORT
TEXAS DEPT. OF TRANSPORTATION
Traffic Incident Management Teams

ACTION ITEMS/LESSONS LEARNED/RECOMMENDATIONS:

AFTER ACTION REPORT
TEXAS DEPT. OF TRANSPORTATION
Traffic Incident Management Teams

AAR SIGN IN SHEET (please print clearly)				
Name	Title	Agency	Phone	Email Address

AFTER ACTION REPORT

TEXAS DEPT. OF TRANSPORTATION

Traffic Incident Management Teams

AAR SIGN IN SHEET (please print clearly)				
Name	**Title**	**Agency**	**Phone**	**Email Address**

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Texas Department of Transportation
Traffic Incident Management
After-Action Review Report (a.k.a., Post Incident Analysis)
Best Practices

After Action Reports – a document capturing an incident timeline, responding agencies, communications, issues, lessons learned and action items to improve future incident response and clearance. The AAR is created following a meeting of all involved first responders and agencies where a pro-active, non-confrontational approach is taken and usually includes scene documentation/photos, agency CAD reports and a tabletop review. AAR meetings are usually conducted by a lead agency representative that facilitates the time and location, agenda, audio-visuals, distributes meeting minutes and follows up on any action items. AAR reports can be captured on a shared filed system or database categorizing incident types, clearance methods and other related items to allow for historical access and benefit.

AAR Basics:

- **Assign an AAR Coordinator and alternate to manage meetings** - AAR facilitators should have a background in traffic incident management, understand the incident command system, each agencies responsibilities, incident timelines and be skilled in general meeting conduct and have professional writing skills.
- Develop AAR Meeting **Activation Requirements** - Develop an agreed upon AAR activation plan based on incident severity, location and impact. For less severe impacting incident, some agencies have "mini AARs" with selected agencies; sometimes at their station to resolve a particular matter but following basic AAR guideline principles.

It is important to understand what issues affected the decision making process from the actual first responders.

ACTIVATION RECOMMENDATION: Incidents involving first responder, hazmat or limited access highway blocked over 4 hours.

- Set **timeline to schedule AAR meetings** following the incident. Options: 1) immediately after the incident; 2) within 48-72 hours and no more than two weeks after the incident.
- **Get the actual participants** to take part in the AAR meeting, since other agency representative may not be able to relay the decision making process based on the information available in an agency report.
- Determine whether fire/police may have already scheduled an ARR meeting and ask to be included.
- Some agencies facilitate AAR meetings with the use of conference calls in concert or as alternative but **face-to-face meetings are most effective**.
- It is crucial to **capture the action items and lessons learned to report at the next TIM meeting** to show results and progress. At the same time, organizers can educate TIM team members about the overall AAR meeting benefits and set their expectations for the next incident.
- Have agencies **send Computer Aided Dispatch (CAD) or crash reports ahead of time** to the AAR coordination, so that he or she can compile and compare timelines and details; then use information as discussion points at the AAR meeting.

Some agency representatives have been reluctant to attend AARs because they felt they will be blamed. AAR coordinators have been able to change this perspective by showing that <u>AAR meetings are an opportunity to realize future benefits and understanding each agencies needs and objectives at crashes</u>.

- The person running the AAR meeting should take the approach to follow the agenda but **really try to engage participants – interviewing first responders about what they saw and what happened**.
- AAR coordinator should be careful not to allow finger pointing by turning a negative into improving operations in the future.

Prepare an AAR standard operating procedure document, update as needed and train AAR coordinators on the procedure.

Texas Department of Transportation
Traffic Incident Management
After-Action Review Report (a.k.a., Post Incident Analysis)
Best Practices

AAR MEETING PLAN CHECKLIST

- ☐ Prepare incident summary (location, times, agencies involved, incident description, incident impact). Contact any or all of the following agencies by phone and/or email:
  - ☐ Law enforcement (primary, backup)
  - ☐ Fire rescue (primary, backup)
  - ☐ Maintenance (DOT, county, municipal)
  - ☐ Wrecker companies
  - ☐ Environmental
  - ☐ HAZMAT Vendor
  - ☐ Medical Examiner
  - ☐ Other (NTSB, airport, emergency operations center, etc.)
- ☐ Obtain agency data reports before AAR meeting (incident reports, CAD, photographs
- ☐ Select meeting time/location
- ☐ Send email meeting invite to all first responders that were at scene. Include appropriate related transportation officials and supervisors.
- ☐ Prepare meeting materials:
  - ☐ Agenda template:
  - ☐ Incident brief description of date, time, location, weather/roadway conditions, etc.
  - ☐ Purpose of AAR
  - ☐ Synopsis of Event
  - ☐ List of involved agencies
  - ☐ Agency report reviews
  - ☐ Questions/Comments (issues, problems, successes and general comments)
  - ☐ Slides (include agenda, incident description, aerial photo/map, incident photographs)
  - ☐ Handouts
  - ☐ Sign in sheet (name, agency, email, phone)
- ☐ Reconfirm meeting room availability
- ☐ Send meeting reminder one day prior

CONDUCTING AN AFTER ACTION REPORT MEETING:

- ☐ Assign meeting note taker
- ☐ Distribute printed copies of agenda
- ☐ Confirm all have signed in
- ☐ Conduct self-introductions
- ☐ Describe purpose and goals of AAR
- ☐ Review slides with incident summary description
- ☐ Begin agency report/interview of participants. Ask each agency/company representative if they have anything to add about their response and involvement in the incident.
- ☐ Review each question/comment in depth, encouraging discussion from all of the participants.
- ☐ Take notes of key points, questions and action items for final report

Texas Department of Transportation
Traffic Incident Management
After-Action Review Report (a.k.a., Post Incident Analysis)
Best Practices

AAR TIMELINE

Upon determination of an AAR:

TASK	TIMELINE*
Contact first responders	Within 1-2 days of incident
Reserve AAR meeting room	Within 1-2 days of incident
Invite first responders	Within 1-2 days of incident
Request agency reports be sent prior to meeting	Within 1-2 days of incident
Prepare AAR agenda	Within 3-4 days of incident
Prepare meeting materials	Within 3-4 days of incident
Conduct AAR meeting	Within 3-14 days of incident
Complete Final AAR	Within 3 weeks of incident
Distribute Final AAR	Within 4 weeks of incident

*Timeline compressed if AAR immediately after incident

AAR FINAL REPORT - A final AAR will be compiled for the lead agency and distributed to all first responders. The report should include the following elements:

- Incident Summary
- Location of AAR Meeting
- Meeting Notes
- Resources Needed
- Issues
- Lessons Learned
- Training Needs Identified
- Action Items/Recommendation
- Sign In Sheet

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