



Transportation Systems Management and Operations Program Plan

TxDOT Dallas and Fort Worth Districts

July 16, 2021
Final Report

Document Control

Date	Version	Description
March 12, 2021	1.0	Draft Transportation Systems Management and Operations Program Plan
June 15, 2021	2.0	Draft Final Transportation Systems Management and Operations Program Plan
July 16, 2021	3.0	Final Transportation Systems Management and Operations Program Plan

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List of Acronyms

AASHTO	American Association of State Highway and Transportation Officials
ATMS	Advanced Traffic Management System
ATSPM	Automated Traffic Signal Performance Measures
BP	Business Processes
CCTV	Closed-Circuit Television
CMF	Capability Maturity Framework
CMM	Capability Maturity Model
CO	Collaboration
CRIS	Crash Records Information System
CU	Culture
DAL	TxDOT Dallas District
DSR	Design Summary Report
DMS	Dynamic Message Sign
DOT	Department of Transportation
DPS	Texas Department of Public Safety
FHWA	Federal Highway Administration
FTW	TxDOT Fort Worth District
ICT	Incident Clearance Time
IH	Interstate Highway
ITS	Intelligent Transportation Systems
MAP-21	Moving Ahead for Progress in the 21st Century Act
MPO	Metropolitan Planning Organization
NWS	National Weather Service
NCTCOG	North Central Texas Council of Governments
NTTA	North Texas Tollway Authority
OW	Organization and Workforce
PM	Performance Measures
PSE	Planned Special Events
RCT	Roadway Clearance Time
RWIS	Road Weather Information System
RWM	Road Weather Management
SEA	Systems Engineering Analysis
SH	State Highway
ST	Systems and Technology
SWZ	Smart Work Zone
TIM	Traffic Incident Management
TM	Traffic Management
TMC	Traffic Management Center
TMS	Traffic Management Systems
TMT	Traffic Management Teams
TP&D	Transportation Planning and Development
TSDC	Texas State Data Center

TSM	Traffic Signal Management
TSMO	Transportation Systems Management & Operations
TTI	Texas Transportation Institute
TxDOT	Texas Department of Transportation
TxDOT TRF	Texas Department of Transportation Traffic Safety Division
UTP	Unified Transportation Program
WZM	Work Zone Management

Executive Summary

The Dallas-Fort Worth region is the largest metropolitan area in Texas and the fourth largest in the United States. The region has been in a sustained period of population growth over the last decade, which has strained the surface transportation system as growing demands on the system far outpace increases in capacity. In order to continue to provide a safe and reliable system, the Texas Department of Transportation (TxDOT) and many of their partner agencies in the region are beginning to adopt an operations mindset built around the concept of Transportation Systems Management and Operations (TSMO).

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))



TSMO focuses on improving how the system is operated and continuously seeks improvements to make the system safer and more reliable. Adopting an operations mindset and implementing TSMO strategies is recognized by TxDOT, through the Statewide TSMO Strategic Plan, as an important component to achieve TxDOT’s goal of providing a safe and reliable transportation system.

TSMO relies strongly on agency coordination and cooperation in order to perform operations effectively. In the Dallas-Fort Worth Region there are two TxDOT Districts that serve a 16-county area: the TxDOT Dallas District and the TxDOT Fort Worth District. Recognizing the need to operate the system in an integrated and coordinated fashion, the TxDOT Dallas and Fort Worth Districts worked together to develop a single plan for TSMO in their combined two Districts.

What is a TSMO Program Plan?

In 2018 the TxDOT Traffic Safety Division (TRF) developed the Statewide TSMO Strategic Plan, which set a vision for TSMO deployment in Texas. The Statewide TSMO Strategic Plan recognized that each TxDOT district is unique in terms of their strengths and weaknesses related to operations. The plan recommended that each district develop its own TSMO Program Plan to assess their current level of maturity with operations and develop a five-year plan for increasing operational capabilities.

The Dallas-Fort Worth TSMO Program Plan began in the fall of 2019, following the schedule shown at the left. The Dallas-Fort Worth TSMO Program Plan is unique in that it is the only TxDOT TSMO Program Plan that focuses on two districts. The TxDOT Dallas and Fort Worth Districts made the decision to combine the plan given the close coordination required

between the two Districts in order to effectively operate the transportation system in the Dallas-Fort Worth metropolitan area.

The program plan identifies the level of maturity of operations within the two Districts, includes goals and objectives for TSMO, provides an assessment of the current state of the practice of operations within the two Districts, and lays out a five-year plan with action-items that will assist the region with meeting its goals and objectives that include operating a transportation system that is safe, reliable, efficient and integrated.

Key stakeholders in the development of the Dallas-Fort Worth TSMO Program Plan included staff from both TxDOT Districts as well as local and regional transportation and public safety representatives. A project website, located at TSMODFW.org, was developed to provide access to outreach materials and project deliverables to all stakeholders.

With much of the Dallas-Fort Worth TSMO Program Plan being developed during the COVID-19 pandemic, a majority of the stakeholder outreach was conducted through virtual meetings and workshops.



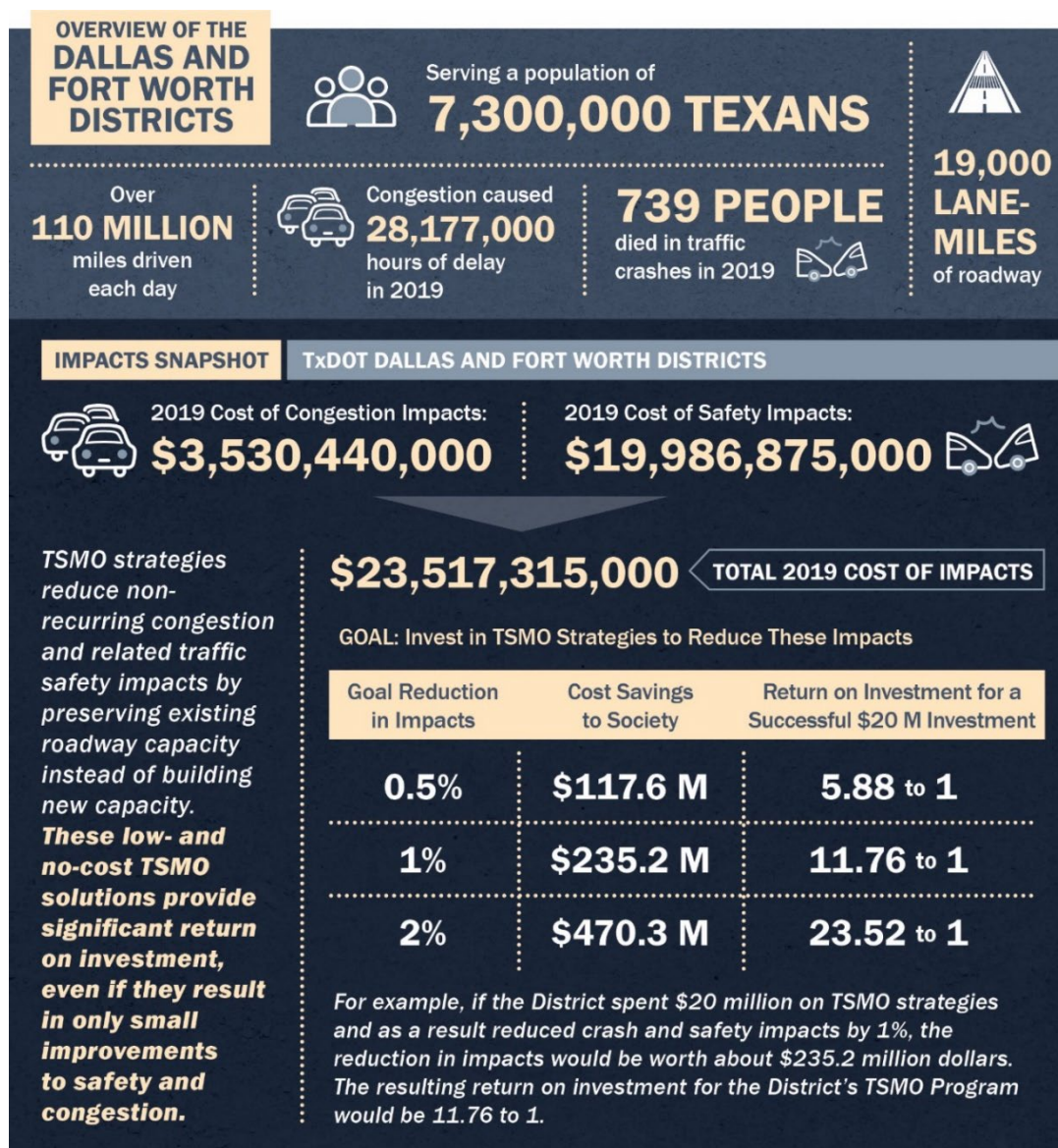
Project website located at TSMODFW.org

To develop the Dallas-Fort Worth TSMO Program Plan, the Districts reviewed existing data and engaged with stakeholders through a series of meetings and workshops to identify strengths and needs related to six TSMO **Focus Areas**. From these strengths and needs, the Districts developed a list of action items that could be implemented to build on existing strengths and address persistent needs. These action items were grouped into six TSMO **Dimensions of Capability**. These TSMO focus areas and dimensions of capability are shown in the figure below, and the icons for each appear throughout the document alongside related action items and discussion.



Why Invest in TSMO Actions?

A review of congestion and safety impacts in the TxDOT Dallas and Fort Worth Districts revealed that traffic and crashes within the Districts' boundaries cost society more than \$23.5 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 summary below shows how investing in TSMO actions to reduce these societal costs can provide a significant return on investment for the TxDOT Dallas and Fort Worth. More detail is provided in the **Business Case for TSMO** section of this TSMO Program Plan, which includes a breakout of these numbers by each TxDOT District.



How Should the Districts Invest in TSMO?

The Dallas-Fort Worth TSMO Program Plan identified a total of 48 action items that were recommended to advance operations in the TxDOT Dallas and Fort Worth Districts. 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 high benefit-cost returns and met 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.	District or Division	Action Description	Report Page #	TSMO Focus Area	TSMO Capability Dimension
Early Win Recommended Action Items					
BP-11	DAL	Develop TxDOT Dallas ITS Master Plan: Develop an ITS Master Plan for the TxDOT Dallas District to identify and prioritize ITS and communication infrastructure deployments throughout the District.	66		
CO-01	DAL & FTW	Conduct Quarterly TxDOT District TIM Meetings: Conduct quarterly meeting between TxDOT Dallas and TxDOT Fort Worth Districts.	101		
CO-03	DAL & FTW	Conduct After-Action Reviews for Major Incidents: Establish criteria for determining which incidents require after-action reviews and conduct reviews as needed.	103		
CO-04	DAL & FTW	Include Planned Special Events in Traffic Management Team Meetings: Add discussion on planned special events and invite planned special event managers to the regional Traffic Management Team (TMT) meetings.	104		
CO-07	DAL & FTW	Create Contact List for Special Signal Timing Notifications: Create a service/email exchange contact list for notification of implementation of incident-based traffic signal timing plans.	107		
Low Cost, High Impact Recommended Action Items					
PM-01	DAL, FTW, & TRF	Improve TIM Performance Collection and Reporting: Improve TIM related data collection and reporting, with a focus on recording incident response time, roadway clearance time, incident clearance time, secondary crash data and time to return to normal flow on all incidents tracked in Lonestar.	80		
OW-06	DAL, FTW, & TRF	Develop a Traffic Signal Training and Staff Development Program: Develop and implement a formal training program to improve capability and staff development of TxDOT traffic signal staff and local partners.	98		
CO-02	NCTCOG, TRF & DAL	Expand the Regional TIM Team in the Dallas District: Partner with NCTCOG to expand the attendance and participation in the Regional TIM Team in the Dallas District and formalize after-action reviews.	102		
CO-05	DAL, FTW, & TRF	Conduct Quarterly Signal Technician Forums: Conduct quarterly signal technician forums for TxDOT and partner agencies to improve collaboration, share best practices, and establish a regional competency regarding signal maintenance and operations.	105		

Table continued on next page.

Action No.	District or Division	Action Description	Report Page #	TSMO Focus Area	TSMO Capability Dimension
High Cost, High Impact Recommended Action Items					
ST-02	DAL & FTW	Develop and Implement Plan for Regional Courtesy/Service Patrol Program Expansion: Develop regional courtesy/service patrol plan for expansion; considering network coverage, hours of operation, and baseline of services provided.	70		
PM-07	DAL & FTW	Develop and Implement Automated Traffic Signal Performance Measures: Develop a formal program and implement necessary technology and software to support Automated Traffic Signal Performance Measures operations on key District corridors.	86		
OW-02	DAL	Establish Dedicated TIM Coordinator Position: Establish a dedicated TIM coordinator position in the Dallas District to support TIM activities throughout this District.	94		
OW-03	DAL & FTW	Establish Dedicated Work Zone Coordinator Position: Establish regional-level work zone coordinator position for coordination of construction closures to avoid conflicts and ensure communication to impacted stakeholders.	95		

In addition to action items that will be led by the Dallas and/or Fort Worth Districts, action items were also identified that will need to be led or implemented in close coordination with other TxDOT divisions or partner agencies. These included action items led by TxDOT TRF or the North Central Texas Council of Governments (NCTCOG). Action items requiring this coordination that were identified as high priority with the greatest expected benefit-cost return have been identified below.

Summary of Action Items Led by District Partners with Expected Highest Benefit-Cost

Action No.	District or Division	Action Description	Report Page #	TSMO Focus Area	TSMO Capability Dimension
High Impact Recommended Action Items Led by District Partners					
BP-08	TRF	Revise TxDOT Design Summary Report to Increase Emphasis on Operations: Revise the TxDOT Design Summary Report form to increase focus on TSMO related strategies including Smart Work Zones during construction, and traffic signals and ITS post-construction.	63		
PM-02	NCTCOG, TRF, DAL & FTW	Develop Regional TIM Database: Develop regional TIM database in partnership with NCTCOG and local agencies to track TIM quick clearance performance on routes throughout the DFW Region.	81		
PM-09	TRF	Develop Implementation Plan for Regional Data Usage: Develop implementation plan to maximize the region's utility of available probe-based INRIX and Streetlight data.	88		
OW-01	NCTCOG, TRF, DAL & FTW	Provide Recurring Regional TIM Training: Continue partnering with NCTCOG and other agencies to identify agencies that have not been involved with training and provide recurring regional TIM training in a multidisciplinary setting.	93		

In addition to the action items that were identified to implement TSMO, several recommended TSMO Tactical Plans were also identified. TSMO Tactical Plans allow the TxDOT Dallas and Fort Worth Districts 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 define project details, assign responsibilities, and include cost and staffing requirement estimates for specific initiatives. Often, Tactical Plans establish further direction regarding a specific TSMO capability dimension (for example, performance measurement), focus area (for example, traffic incident management), or a service within the scope of a TSMO focus area (for example, winter road management, within the road weather management focus area).

Several of the high priority TSMO Tactical Plans that have been recommended include:

- Development of a Safety Service Patrol Expansion Plan
- Development of a Traffic Management System (TMS) Device Maintenance Plan
- Development of a Work Zone Technology Deployment Expansion Plan
- Development of a Traffic Management and Signal Staff Development Plan

A full list of areas that could benefit from further study are included in the **TSMO Tactical Plan Assessment** section.

Introduction

The TxDOT Dallas and Fort Worth Districts are 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 strategic to optimize the performance of existing infrastructure through the implementation of multimodal and intermodal, cross-jurisdictional system, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system.” (United States DOT)

In comparison to other state 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 the TxDOT Traffic Safety Division (TxDOT TRF) in 2018. Even with consistency across each of the District 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.

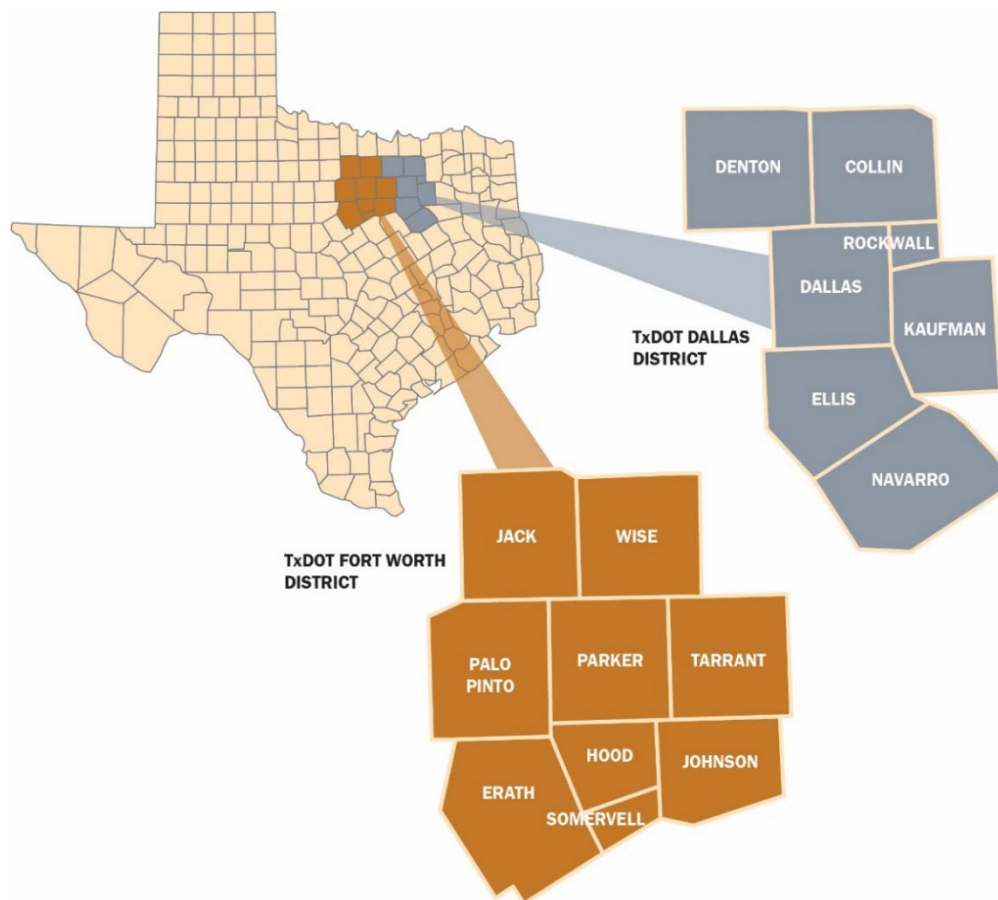


Figure 1: TxDOT Dallas and Fort Worth Districts Map

The Federal Highway Administration (FHWA) generally recommends that state DOT TSMO planning elements include the 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.

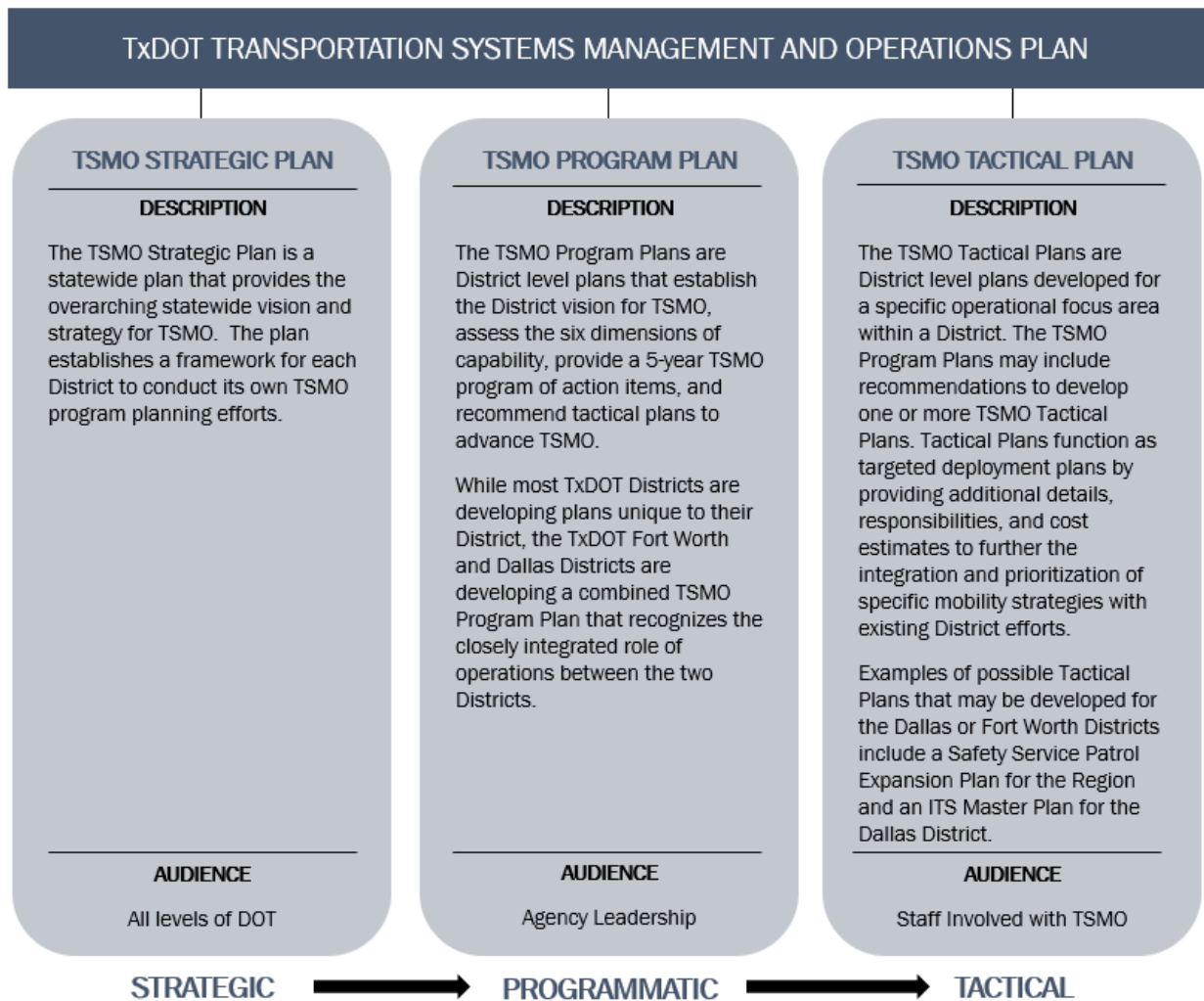


Figure 2: TxDOT Transportation Systems Management and Operations Plan Hierarchy

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.

TXDOT TSMO PLANNING INITIATIVE



Figure 3: TxDOT Dallas and Fort Worth 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 strategies. Potential TSMO Tactical Plans are identified for the TxDOT Dallas and Fort Worth Districts as a part of this TSMO Program Plan. The structure of the TxDOT Dallas and Fort Worth Districts TSMO planning initiative is shown in Figure 3.

The development of the TxDOT Dallas and Fort Worth TSMO Program Plan involved individual agency outreach meetings and group workshops with both internal TxDOT District stakeholders and external local and regional agency partners. These partners included city transportation staff, law enforcement and emergency response officials, staff from the NCTCOG, and staff from TxDOT TRF. Meeting and workshop participants were asked to provide 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 completed after March 2020 was conducted virtually.

STAKEHOLDER INVOLVEMENT TIMELINE



Figure 4: TxDOT Dallas and Fort Worth TSMO Stakeholder Engagement Timeline

Key stakeholders in the development of the Dallas-Fort Worth TSMO Program Plan included staff from both TxDOT Districts as well as local and regional transportation and public safety representatives. A project website, located at www.TSMODFW.org, was developed to provide access to outreach materials and project deliverables to all stakeholders.

Program Plan Format

In the following section, the TxDOT Dallas and Fort Worth TSMO Program Plan establishes a business case for adopting TSMO priorities throughout the two Districts. This business case reviews available metrics on congestion and safety to assess existing societal costs related to delay and crashes within the districts. This information is analyzed alongside available funding sources and some of the regional operational challenges that TxDOT Dallas and Fort Worth Districts staff and external partners identified. Finally, the business case describes how TSMO strategies might reduce societal costs and address funding and operational challenges that the TxDOT Dallas and Fort Worth Districts have identified as a priority. The following section introduces the Statewide TSMO Vision and Mission, both of which were developed as part of the 2017 statewide TxDOT TSMO Strategic Plan. The section then lists the TSMO goals and objectives that were specifically developed for the TxDOT Dallas and Fort Worth Districts 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 the TxDOT Dallas and Fort Worth Districts 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 Dallas and Fort Worth Districts' 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). These capability dimensions and focus areas are shown below in Figure 5.



Figure 5: TSMO Focus Areas and Dimensions of Capability

The results of the CMM process feed into the TSMO Implementation Plan, which provides an implementation schedule of recommended TSMO action items for the TxDOT Dallas and Fort Worth Districts to undertake for the next five years. The icons shown in Figure 5 are used to relate the recommended action items to each TSMO capability dimension and focus area. Each TSMO action item is described in greater detail on Action Item Sheets in this section, which include a description of the need for the action item, an implementation guide, a discussion of expected benefits, and in some cases an example program from elsewhere in Texas or around the country that could provide a model for implementation. Lastly, focus areas and action items that would benefit from further planning or development are described in the TSMO Tactical Plan Needs Assessment section.

Business Case for TSMO

A business case provides the foundation for justifying TxDOT exploring innovative and alternative solutions to the region’s transportation safety and mobility challenges. For the Dallas and Fort Worth Districts, the growing costs of congestion and safety impacts, which affects every resident and traveler who uses the region’s transportation network, is not sustainable. Agency resources cannot keep up with the growing demand. Adding capacity alone does not solve the safety and mobility challenges of this growing urban area. TSMO offers a range of solutions – many of them focused on improving processes, expanding collaboration among agencies, and implementing low-cost tools to improve real-time operating capabilities of the region’s existing transportation assets. Figure 6 below summarizes the business case for investing in TSMO in the Dallas District. Figure 7, on the next page, summarizes the business case for investing in TSMO in the Fort Worth District. More detailed analysis of funding sources, congestion impacts, and safety impacts is provided on the pages that follow in this section.

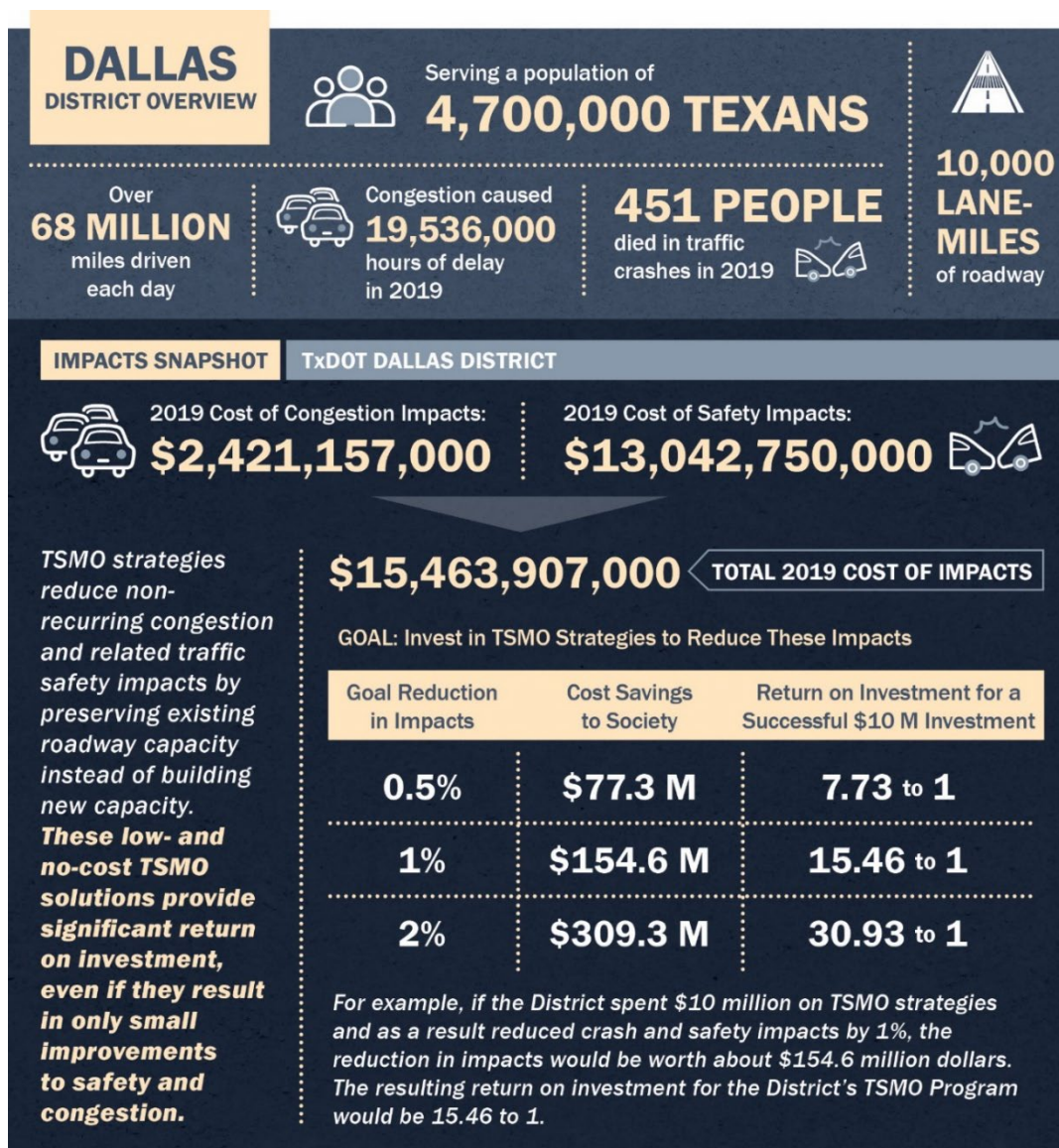


Figure 6: TxDOT Dallas District Overview and Impacts Snapshot

FORT WORTH
DISTRICT OVERVIEW



Serving a population of
2,600,000 TEXANS



9,000 LANE-MILES
of roadway

Over
42 MILLION
miles driven
each day



Congestion caused
8,641,000
hours of delay
in 2019

288 PEOPLE
died in traffic
crashes in 2019



IMPACTS SNAPSHOT

TxDOT FORT WORTH DISTRICT



2019 Cost of Congestion Impacts:

\$1,109,283,000

2019 Cost of Safety Impacts:

\$6,944,125,000



\$8,053,408,000

TOTAL 2019 COST OF IMPACTS

TSMO strategies reduce non-recurring congestion and related traffic safety impacts by preserving existing roadway capacity instead of building new capacity.

These low- and no-cost TSMO solutions provide significant return on investment, even if they result in only small improvements to safety and congestion.

GOAL: Invest in TSMO Strategies to Reduce These Impacts

Goal Reduction in Impacts	Cost Savings to Society	Return on Investment for a Successful \$10 M Investment
0.5%	\$40.3 M	4.03 to 1
1%	\$80.5 M	8.05 to 1
2%	\$161.1 M	16.11 to 1

For example, if the District spent \$10 million on TSMO strategies and as a result reduced crash and safety impacts by 1%, the reduction in impacts would be worth about \$80.5 million dollars. The resulting return on investment for the District's TSMO Program would be 8.05 to 1.

Figure 7: TxDOT Fort Worth District Overview and 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 TMS, as well as by leveraging resources available from regional partners and the private sector.

The 2050 Texas Transportation Plan goal to **Sustainably Fund and Effectively Deliver the Right Projects** corresponds closely with the Districts' goal of addressing funding challenges using TSMO strategies.

TxDOT Goal: Sustainably Fund and Effectively Deliver the Right Projects

Detailed objectives include:

- Reduce user costs
- Identify and maintain reliable funding
- Improve analytic capabilities to maximize the value of investments
- Fairly distribute transportation benefits and costs
- Strategically deploy innovative technology to increase effectiveness and efficiency of the system (keeping pace)

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 processes will help TxDOT staff identify and prioritize cost-efficient operations and management methods to improve system reliability and safety, thus optimizing available capacity. TSMO will support projects that can bridge the gap between existing needs and available funding. The existing TxDOT \$8 billion annual budget gap is shown in Figure 8, which is taken from the 2040 Texas Transportation Plan.¹

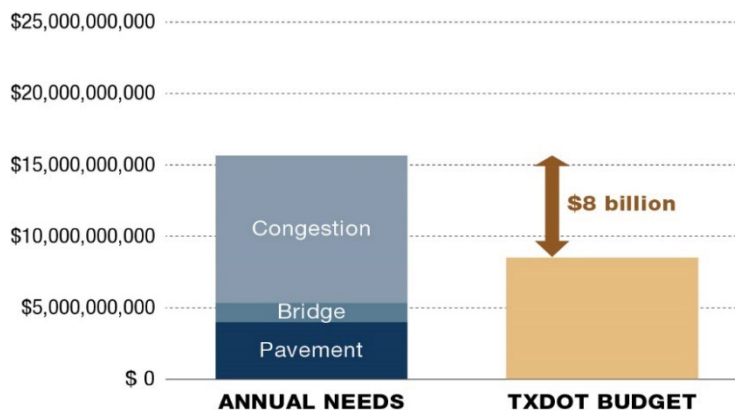
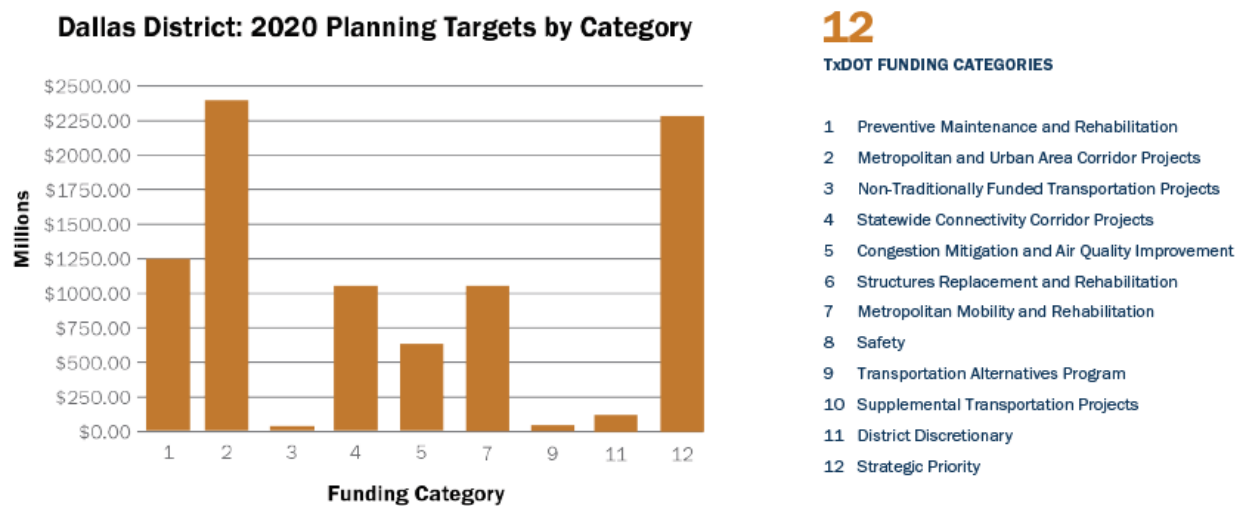


Figure 8: TxDOT Annual Transportation Needs and Budget

The Texas 2020 Unified Transportation Program (UTP) established a planning target of \$4,662,320,000 and \$2,246,720,000 in project funding for the TxDOT Dallas and Fort Worth Districts respectively over the next 10 years.² A breakdown of planning targets from the UTP over the next 10 years for the TxDOT Dallas and Fort Worth Districts (broken out by funding category) is shown in Figure 9 and Figure 10. Based on these planning targets, funding set aside for preventive maintenance and rehabilitation projects, metropolitan and urban area projects, and strategic priority projects are the largest TxDOT funding categories that the Dallas and Fort Worth Districts will rely on over the next 10 years. TSMO strategies can be applied to these investment areas, especially to many projects that will be funded through Category 2 - Metropolitan and Urban Area Projects and Category 12 - Strategic Priority Projects.

Several of the key projects programmed for the next ten years in each district are:

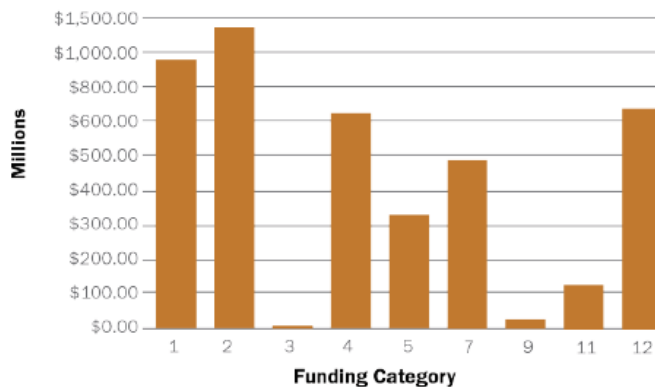
- Dallas
 - Widening and Reconstructing portions of I-30 in Dallas and Rockwall Counties
 - Reconstructing interchanges along I-35E in Denton County
 - Widening and Reconstructing I-635 East between US 75 and I-30 in Dallas County
- Fort Worth
 - Reconstructing State Highway (SH) 180 from I-35W to I-820 in Tarrant County
 - Widening and constructing frontage roads along I-20 and I-820 in Tarrant County
 - Converting US 281 to a Super 2 freeway configuration in Palo Pinto County



- 12**
TxDOT FUNDING CATEGORIES
- 1 Preventive Maintenance and Rehabilitation
 - 2 Metropolitan and Urban Area Corridor Projects
 - 3 Non-Traditionally Funded Transportation Projects
 - 4 Statewide Connectivity Corridor Projects
 - 5 Congestion Mitigation and Air Quality Improvement
 - 6 Structures Replacement and Rehabilitation
 - 7 Metropolitan Mobility and Rehabilitation
 - 8 Safety
 - 9 Transportation Alternatives Program
 - 10 Supplemental Transportation Projects
 - 11 District Discretionary
 - 12 Strategic Priority

Figure 9: TxDOT Dallas District 10-Year Planning Targets by Funding Category

Fort Worth District: 2020 Planning Targets by Category



12

TxDOT FUNDING CATEGORIES

- 1 Preventive Maintenance and Rehabilitation
- 2 Metropolitan and Urban Area Corridor Projects
- 3 Non-Traditionally Funded Transportation Projects
- 4 Statewide Connectivity Corridor Projects
- 5 Congestion Mitigation and Air Quality Improvement
- 6 Structures Replacement and Rehabilitation
- 7 Metropolitan Mobility and Rehabilitation
- 8 Safety
- 9 Transportation Alternatives Program
- 10 Supplemental Transportation Projects
- 11 District Discretionary
- 12 Strategic Priority

Figure 10: TxDOT Fort Worth District 10-Year Planning Targets by Funding Category

Agencies that place importance on TSMO in long-range planning, project development, system completion, and system maintenance have a strong case for devoting funding to these strategies because operations and management activities can improve congestion issues while minimizing or delaying the need for physical capacity improvements. Through TSMO planning, funding is set aside for 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 to **Optimize Movement of People and Goods** can be addressed using TSMO strategies.

TxDOT Goal: Optimize Movement of People and Goods

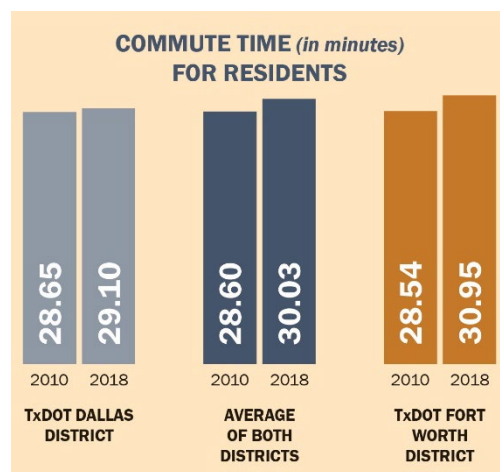
Detailed objectives include:

- Reduce congestion through both traditional and alternative strategies
- Improve travel time reliability
- Increase travel options and connections across modes
- Ensure freight can move efficiently
- Increase access to jobs, services, and activity centers
- Leverage transportation assets to support economic growth and vitality

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.

Quantifying Congestion-Related Impacts

The Texas State Data Center (TSDC) reports the population of the TxDOT Dallas and Fort Worth Districts has been growing rapidly since 2010, with an approximate population increase of 20 percent over the past 10 years. The region's population is projected to grow by about 41 percent over the next 20 years.³ The Dallas-Fort Worth region is also the number one tourist destination in Texas. In addition to local commuters, the City of Dallas is visited by an estimated 27.7 million tourists annually, while the City of Fort Worth receives about 8.8 million visitors each year.^{4,5}



One of the keys to maintaining economic vitality within the TxDOT Dallas and Fort Worth Districts is 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 within the TxDOT Dallas and Fort Worth Districts has increased by 5 percent, from 28.60 to 30.03 minutes, shown in Figure 11: Commute Time for Residents⁶ Specifically, Dallas District residents' average commute time increased by 1.6 percent, from 28.65 to 29.10 minutes.⁶ Commute time for residents within the Fort Worth District increased by 8.4 percent,

from 28.54 to 30.95 minutes.⁶

Figure 11: Commute Time for Residents

One potential cause of an increase in average commute times is an increase in traffic congestion within the TxDOT Dallas and Fort Worth Districts. In 2019, the Texas Transportation Institute (TTI) estimated an annual total delay of over 160 million passenger-hours along major thoroughfares within the region encompassing both Districts. This total is inclusive of an estimated annual freight vehicle delay of over nine-million driver-hours along those same major thoroughfares.

TTI estimated an annual total delay of 113,656,462 passenger-hours along major thoroughfares within the Dallas District in 2019. This total is inclusive of an estimated annual freight vehicle delay of 6,398,574 driver-hours along those same major thoroughfares.⁷ In 2019, the Fort Worth District had an estimated annual total delay of 47,775,328 passenger-hours along its major thoroughfares, 2,647,328 of which were the estimated driver-hours of freight vehicles.⁷ TTI estimated that this congestion resulted in a societal cost of approximately \$2,421,157,601 and \$1,019,283,139 within the TxDOT Dallas and Fort Worth Districts respectively, for a regional societal cost of approximately \$3,440,440,740.⁷

TSMO planning 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 impacts and related societal costs of these interferences on the transportation network. The strategies identified through TSMO planning help to ensure that congestion-related mobility challenges are mitigated by maximizing existing and future throughput and reducing the frequency and intensity of events that impact that throughput.

Safety Impacts

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

TxDOT Goal: Enhance Safety

Detailed objectives include:

- Design and build infrastructure to reduce crashes and lessen crash severity
- Improve incident response times
- Promote safe driving, bicycling, and pedestrian activities
- Enhance coordination with first responders

TSMO planning identifies technologies or systems that can be incorporated into existing or planned infrastructure to improve the safety of road users, whether they are 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 one day eliminating deaths on Texas roadways.

Quantifying Safety-Related Impacts

In 2019, there were 147,066 total reported crashes in the TxDOT Dallas and Fort Worth Districts.⁸ In those crashes, 739 people died and 4,028 people suffered an incapacitating injury. Using state-specific user cost values, these crashes and associated damages resulted in a societal cost of approximately \$19,986,875,000 in 2019.⁹ Within the Dallas District, 99,742 crashes were reported in 2019, which included 415 deaths and 2,618 incapacitating injuries, contributing to \$13,042,750,000 of the cost.^{8,9} In that same year there were 47,324 reported crashes in the Fort Worth District, resulting in 288 deaths and 1,410 incapacitating injuries, totaling a societal cost of about \$6,944,125,000.^{8,9} A summary of 2019 crashes in the TxDOT Dallas and Fort Worth Districts, including a breakout of crash types that could be targeted by TSMO strategies, is shown in

Table 1 and 2.

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

TxDOT DALLAS DISTRICT	Fatal (K)	Serious Injury (A)	Minor Injury (B)	Possible Injury (C)	No Injury (O)	Unknown Severity
Total crashes	415	2142	9694	18550	62333	6608
Total persons affected	451	2618	12808	29301	189595	6608
<i>Inclement Weather - Rain or Fog</i>	42	155	881	1870	6732	451
<i>Inclement Weather - Winter</i>	0	0	6	12	46	6
<i>Work Zone Crashes</i>	22	105	478	957	3581	105
<i>Intersection Crashes</i>	79	700	3614	6917	17482	460
<i>Commercial Vehicle Crashes</i>	48	137	547	1042	5153	136

Table 2: 2019 Summary of Crashes by Type Within the TxDOT Fort Worth District

TxDOT FORT WORTH DISTRICT	Fatal (K)	Serious Injury (A)	Minor Injury (B)	Possible Injury (C)	No Injury (O)	Unknown Severity
Total crashes	261	1160	4747	9128	28985	3043
Total persons affected	288	1410	6266	13964	90148	3043
<i>Inclement Weather - Rain or Fog</i>	21	101	458	891	3119	215
<i>Inclement Weather - Winter</i>	0	0	3	10	37	0
<i>Work Zone Crashes</i>	7	50	226	466	1306	40
<i>Intersection Crashes</i>	59	373	1696	3353	8922	288
<i>Commercial Vehicle Crashes</i>	32	70	236	439	2471	41

When TSMO activities are considered as part of 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

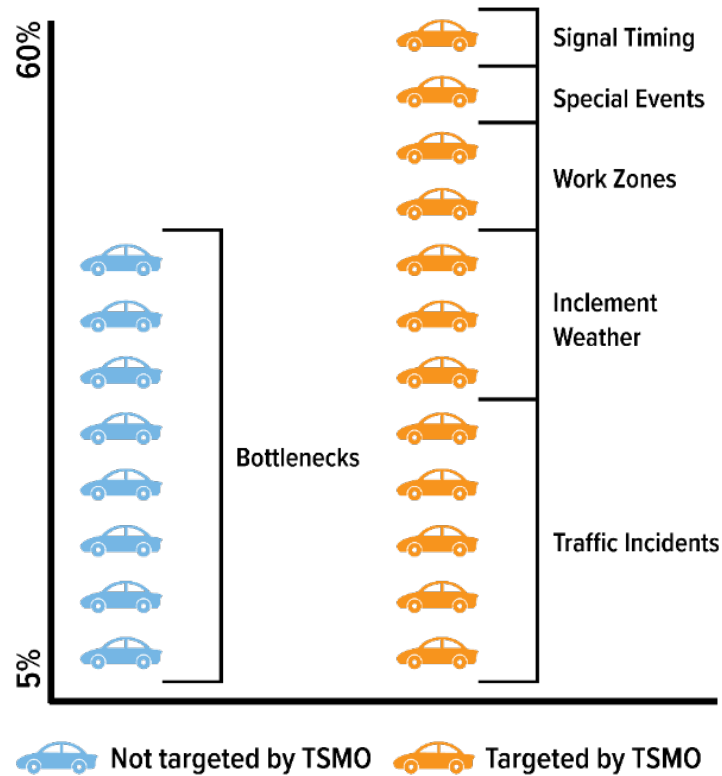
The business case for TSMO is grounded in the fact that funding for the TxDOT Dallas and Fort Worth Districts does not allow the Districts to build their way out of congestion. To solve existing congestion challenges through capacity enhancements alone is simply not feasible. FHWA congestion research 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 shocks to the network such as traffic incidents, inclement weather, or work zones. FHWA’s breakdown of these congestion sources at a nationwide level is shown in Figure 12.¹⁰

TSMO strategies integrate TMS into the planning, design, and construction of TxDOT roadways. 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. The use of ITS as well as other TMS and TSMO strategies allows for more nimble operation and maintenance of the 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 transportation infrastructure and then maintaining it have historically been the core goals of the 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 ensures operational asset uptime, which in turn enables regional transportation agencies to provide improvements in traveler information, TIM, RWM, WZM,

Causes of Congestion



and more.

Figure 12: Nationwide Causes of Congestion

TSMO planning fosters the cultural shift required to prioritize the dedicated funding and implementation of operational improvements and TMS. It also establishes a framework for performance measurement and continuous improvement to enhance safety and mobility throughout the Districts. Ultimately, this brings TxDOT closer to achieving the TxDOT mission statement: “Through collaboration and leadership, we deliver a safe, reliable, and integrated transportation system that enables the movement of people and goods.”

TSMO Vision, Mission, Goals, and Objectives

The TxDOT Dallas and Fort Worth TSMO Program vision, mission, goals, and objectives were based on similar items developed for the statewide TxDOT TSMO Strategic Plan. District project leadership chose to adopt the statewide vision, mission, and goals, and from them developed district-level TSMO program objectives.

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.

Dallas and Fort Worth TSMO Goals and Objectives

The goals and objectives for the TxDOT Dallas and Fort Worth TSMO Program Plan are identified in Table 3 on the next page and are based on the TxDOT statewide TSMO goals. The TxDOT Dallas and Fort Worth TSMO Program objectives were developed in consultation with staff from both Districts during a virtual meeting held in December 2020. The objectives provide additional context based on the TxDOT Dallas and Fort Worth Districts' needs.

Table 3: TxDOT Dallas and Fort Worth TSMO Program Plan Goals and Objectives

TxDOT Statewide TSMO Goals	TxDOT Statewide TSMO Strategic Objectives	TxDOT Dallas and Fort Worth TSMO Program Objectives
Safety	Reduce crashes and fatalities through continuous improvement of traffic management systems and procedures.	<ul style="list-style-type: none"> • Reduce crash fatalities by half by 2035 and achieve zero fatalities by 2050. • Reduce work zone crashes over the next five years. • Reduce secondary crashes over the next five years. • Include safety in the project prioritization and development process.
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.	<ul style="list-style-type: none"> • Increase percent of person-miles traveled on the Interstate system that are reliable over the next five years. • Increase percent of person-miles traveled on the non-Interstate national highway system (NHS) that are reliable over the next five years.
Efficiency	Implement projects that optimize existing transportation system capacity and throughput.	<ul style="list-style-type: none"> • Maintain a Regionwide TxDOT Transportation Management System (TMS) asset operational uptime of 90% or greater. • Use safety and traffic operations performance data to identify where additional investment is needed. • Implement performance measures to monitor traffic signal timing efficiency. • Consider all modes of transportation in the project development process.
Customer Service	Provide timely and accurate travel information to customers so they can make informed mobility decisions.	<ul style="list-style-type: none"> • Expand the availability of real-time traveler information, including construction and planned and unplanned event impacts, to the public and third-party consumers. • Increase the timeliness and accuracy of traveler information systems maintained by the Districts' TMCs.
Collaboration	Proactively manage and operate an integrated transportation system through multi-jurisdictional coordination, internal collaboration, and cooperation between various transportation disciplines and partner agencies.	<ul style="list-style-type: none"> • Conduct multiagency training in TIM and TSM. • Continue District leadership and participation in the Area TIM meetings. • Coordinate with impacted agency stakeholders throughout all phases of project delivery. • Promote data sharing across transportation and public safety agencies.
Integration	Prioritize TSMO as a core objective in the agency's planning, design, construction, operations, and maintenance activities.	<ul style="list-style-type: none"> • Institutionalize TSMO into the Districts' project development process. • Institutionalize TSMO activities into the Districts' day-to-day operations. • Implement roadway enhancements, such as lane markings, that benefit the public and technologically advanced vehicles. • Explore design options to incorporate connected and automated vehicle operations.

Capability Maturity Model (CMM)

A CMM is a systematic methodology in which a program or organization is evaluated to determine a level of achievement for specific attributes. The FHWA and 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 agency stakeholders to assess the strengths and weaknesses across a range of different program perspectives.

CMM Dimensions

The CMM is based on the concept that there are six core areas, referred to as 'dimensions' that are critical for improving TSMO program efficiency and effectiveness. These dimensions include Business Processes, Systems and Technology, Performance Measurement, Culture, Organization and Workforce, and Collaboration.

Additional information on each dimension is included in Figure 13. TxDOT Dallas and Fort Worth Districts have many activities that relate to the six CMM dimensions of TxDOT.

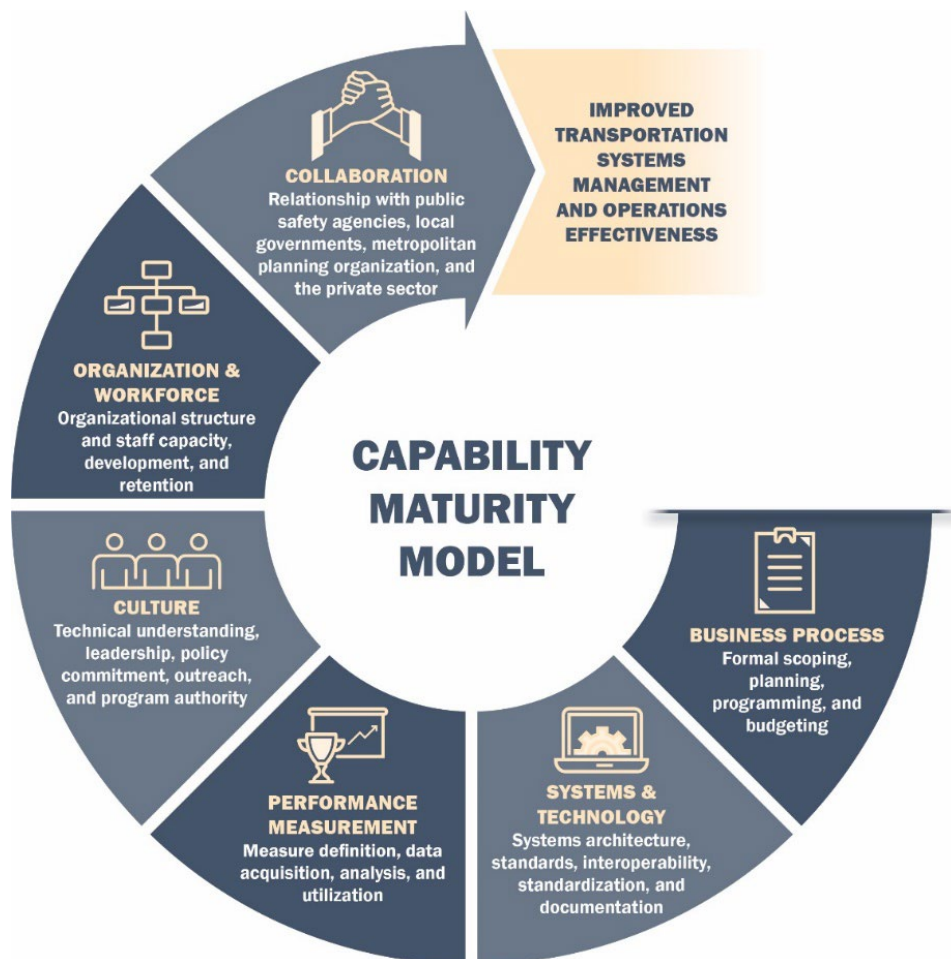


Figure 13: CMM Dimensions of TSMO Capability (Adapted from FHWA)

The following sections provide an overview of the TxDOT Dallas and Fort Worth Districts' existing practices with respect to the six TSMO capability dimensions from the CMM: Business Processes, Systems and Technology, Performance Measurement, Culture, Organization and Workforce, and Collaboration.



Business Processes

Business processes that support TSMO can vary from strategic items, like the development of agency-wide goals and objectives that focus on operations, to day-to-day items that focus on the formalization of ad hoc District activities and the development of documents such as ITS Master Plans and other project implementation documents. Business processes address agency planning processes such as project scoping, organizational budgeting, procurement and contracting processes, work flows and long-range planning.

Revised Project Delivery Process

Both Districts use TxDOT's Design Summary Reports (DSRs) to scope projects and guide the project delivery process. The DSR is meant to be a dynamic document updated throughout the project delivery timeline; it contains the record of project development and design. The DSR's purpose is to ensure that the project team does not overlook potentially critical issues, including traffic operations issues, during project planning and design. Traffic operations staff from both Districts noted that the "Proposed Traffic Operations Elements" section in the DSR form could be built out to compel the Districts to complete a more thorough analysis of how best to incorporate traffic operations elements into projects. The section is currently only a half-page long and asks five questions about traffic operations. This lack of detail has often led to potentially beneficial operations strategies being left off the DSR, making them more difficult to incorporate into projects later in the delivery process.

Beyond the DSR, the Fort Worth District conducts design concept meetings for specific projects during the planning phase, which include traffic operations staff. As a part of those meetings, TxDOT staff discuss whether ITS elements or traffic signals will be built or impacted as a part of the planned project. While the inclusion of traffic staff in these meetings regularly occurs, the Transportation Planning and Development (TP&D) group within the District is currently completing a design manual that will specifically state that traffic staff need to be included, thereby formalizing the Operations group's involvement in the early stages of project design.

The Dallas District has had challenges with including ITS elements in project design in the past, but these challenges have become less common over the past few years. According to District Operations staff, the current TP&D Director for the District has prioritized the consideration of ITS devices early in the project development process. The District will also conduct regular checks during the design phase to identify opportunities for signal or ITS device installation, but sometimes these opportunities are discovered too late in the project development process to be included in the final project design.

Planning for TSMO

Effective planning for TSMO involves early identification and assessment of costs associated with deployment of technologies and services, which often includes infrastructure investments, technology purchases, staff time, and other resources. The Fort Worth District has developed an ITS Master Plan, which was most recently

updated in 2018. The City of Dallas also has an ITS Master Plan. Both of these agencies use the plan to guide decision making related to the rollout of additional ITS field devices throughout the region. While the Dallas District does not have a current ITS Master Plan, agency staff maintain an internal list of ITS deployment projects to implement if funding is identified. The need to develop an ITS Master Plan in the Dallas District has been identified as one of the Action Items recommended for the Dallas District and is included in Table 11.

The NCTCOG will occasionally identify funding that supports the deployment of ITS throughout the region and will ask its member agencies, including both TxDOT Districts, to submit project proposals. NCTCOG completed an ITS Strategic Deployment Plan for the region in 2016 and is beginning to complete an update to that plan, which will provide a cross-jurisdictional snapshot of existing and recommended ITS deployments. Both Districts have submitted priority project lists to NCTCOG to support the completion of the current plan update.

Programming, Budgeting, and Funding

TxDOT's Chief Engineer directed each district in 2017 to include TSMO considerations and TMS in project planning, development, design, construction, maintenance, and operation. While statewide TSMO program planning does occur, a greater amount of planning and budgeting takes place at the district or corridor level. The responsibility in many aspects falls on each district to incorporate TSMO into their roadway and bridge project programming, budgeting, and funding.

Both the TxDOT Dallas and Fort Worth Districts noted that it is difficult to obtain funding for ITS device implementation and other TSMO strategies that support roadway projects in instances when these items are not scoped early in the project development process. As a result, operations staff in both Districts have sought greater involvement early in the project development process. If these elements are scoped early on, staff from both Districts said that it is uncommon for TSMO or ITS elements to be removed later on due to budget constraints. The Dallas District noted that at times, budget constraints may lead to a redesign of ITS elements on a project to reduce the number of devices that are deployed or to utilize less expensive communications technology, for example by utilizing wireless radio or cellular communication instead of installing a fiber optic cable backbone to connect deployed ITS devices back to the traffic management center (TMC).

Both Districts have an annual ITS device maintenance budget, and these budgets include line items for the replacement of ITS devices. Generally, though, these budgets are devised each year from historical averages and do not consider life-cycle projections of currently deployed ITS devices and component parts that tend to fail and require replacement after a set amount of time. As a result, repairs are often made in response to a component failing rather than preventatively, which results in a lower overall ITS asset uptime for the two Districts.



Continuous Improvement

Continuous Improvement can be reflected in incremental changes within the TxDOT Dallas and Fort Worth Districts to incorporate TSMO practices into its business processes and organizational culture. Continuous improvement can be fostered by sharing information related to data collection and development of performance metrics. Improving communication and increasing the frequency of coordination with internal and external stakeholders is one way to support continuous improvement with respect to TSMO priorities throughout the region.



Systems and Technology

The systems and technology component of TSMO includes systems engineering, regional architecture, ITS procurement processes, and deployment of technology to support operations.

Systems Engineering Analysis Process

In relation to ITS, systems engineering analysis (SEA) assesses value, functionality, and life cycle of technologies incorporated into roadway and bridge projects. FHWA realized the benefit of using a SEA on ITS projects and, since 2001, requires that a SEA be performed on all federally funded projects that involve ITS. States maintain flexibility in the extent of how they conduct SEA based on the project scope and scale of the project. USDOT policy specifies that the systems engineering process should include seven requirements:

- Identification of portions of the regional ITS architecture being implemented
- Identification of participating agencies' roles and responsibilities
- Requirements definitions
- Analysis of alternative system configurations and technology options to meet requirements
- Procurement options
- Identification of applicable ITS standards and testing procedures
- Procedures and resources

The primary benefit of doing systems engineering is that it will reduce the risk of schedule and cost overruns and will provide a system of higher integrity. Other benefits include:

- Better system documentation
- Higher level of stakeholder participation
- System functionality that meets stakeholders' expectation
- Potential for shorter project cycles
- Systems that can evolve with a minimum of redesign and cost
- Higher level of system reuse
- More predictable outcomes from projects

The systems engineering process represented by the "V" model shown in Figure 12 has been broadly adopted in the transportation industry. The left wing shows the regional ITS architecture, feasibility studies, and concept exploration that support initial identification and scoping of an ITS project based on regional needs. A gap follows the regional architecture(s) step because the regional architecture is a broader product of the planning

process that covers all ITS projects in the region. The following steps in the "V" are for a specific ITS project. The central core of the "V" shows the project definition, implementation, and verification processes. The right wing shows the operations and maintenance, changes and upgrades, and ultimate retirement of the system. The wings are a key addition to the model since it is important to consider the entire life cycle during project development.

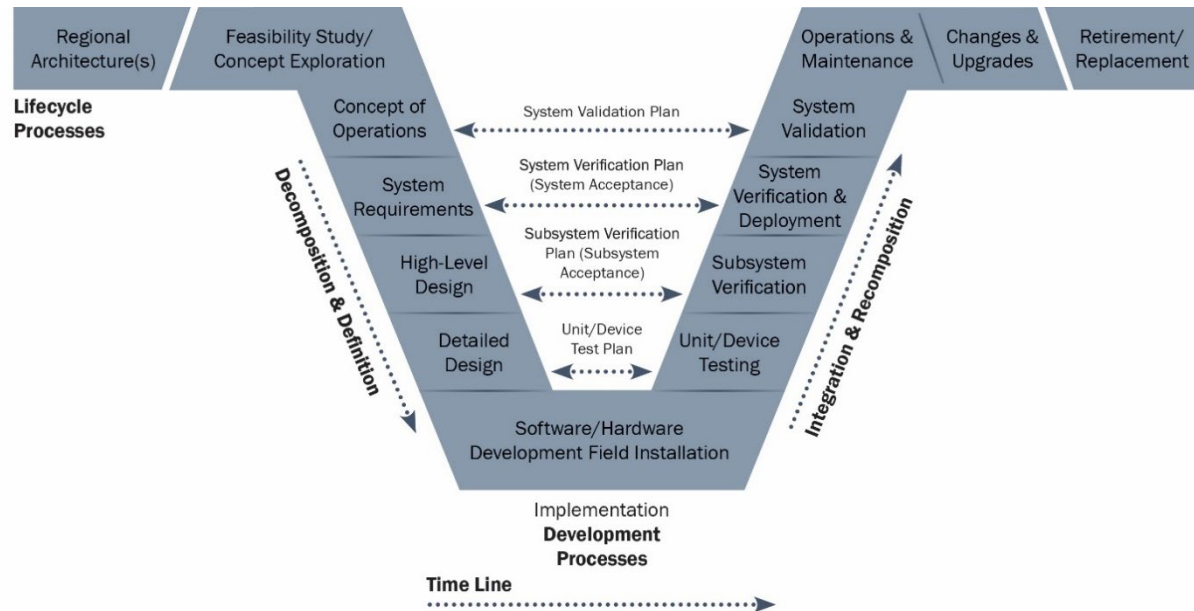


Figure 14: Systems Engineering "V" Diagram

Similarly, a System Verification Plan is developed with the System Requirements so that the engineers consider how to verify each requirement as the requirements are written. The connections between the left and right are indicated by the arrows that cross the "V", showing how plans developed on the left drive the process on the right. The system hardware and software are implemented at the bottom of the V, and the components of the system are then integrated and verified in iterative fashion on the right. Ultimately, the completed system is validated to measure how well it meets the agency's needs.

The TxDOT Dallas and Fort Worth Districts do not currently have processes in place to prepare a formal SEA for new projects involving ITS. Rather, both Districts typically rely on previous ITS project experience and lessons learned to guide the design and implementation of planned ITS improvements. The Fort Worth District, for example, prepares an after-action report once an ITS project is fully deployed and its elements are tested with the purpose of documenting successes and challenges with the project deployment.

Regional ITS Architecture

A regional ITS architecture is a framework that an agency maintains to improve the likelihood that ITS projects implemented throughout a region are integrated with one another in such a way that permits the region's stakeholders to obtain all desired functionality from the projects that are implemented. The framework allows for organized implementation of ITS projects, encourages resource sharing and interoperability among agencies, identifies relevant industry standards that apply to ITS elements and projects, and allows for cohesive long-range planning among regional stakeholders.

A regional ITS architecture is needed to satisfy the ITS conformity requirements first established in the Transportation Equity Act for the 21st Century (TEA-21) highway bill and continued in the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) bill passed in 2005 and the Moving Ahead for Progress in the 21st Century (MAP-21) bill passed in 2012. Since 2005, FHWA has required that any ITS projects show conformance with the regional ITS architecture to be eligible for federal funding. To show this conformance, it is important that any region deploying ITS have an updated regional ITS architecture in place.

Through the architecture's development, stakeholders can plan for what they want their system to look like in the long-term and then break out the system into smaller pieces that can be implemented as funding permits. Because those long-term visions change over time, the regional ITS architecture is a living document that should be periodically updated in order to accurately reflect current ITS needs and plans as ITS projects and processes are implemented and improved.

NCTCOG maintains a regional ITS architecture whose geographic scope encompasses both the Dallas and Fort Worth Districts.



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Both Districts, as well as NCTCOG's other municipal and county stakeholders, will communicate updates regarding newly planned or existing ITS elements or capabilities to NCTCOG staff so that the regional ITS architecture can be updated accordingly. As a result, neither District maintains its own ITS architecture. NCTCOG's regional ITS architecture was most recently updated in January 2020 and can be found online at this link: <https://www.nctcog.org/trans/manage/its/nct-regional-its-architecture>.

Existing and Planned Tools to Support ITS

Both the TxDOT Dallas and Fort Worth Districts use a bevy of tools to operate, monitor, and maintain their ITS assets deployed in the region. Several main tools used by the Districts are listed below:

- **Lonestar:** Lonestar is the advanced traffic management system (ATMS) used by TxDOT staff in both Districts to monitor and control TxDOT's deployed ITS devices, including CCTV cameras and DMS units. Lonestar also integrates probe-based data sources to provide travel time link estimates within the software and provides tools for operators to log incidents and manage service requests.
- **Skyline Network Monitoring Tool:** The Skyline Network Monitoring Tool regularly tracks and reports on the status of ITS assets owned and maintained by either TxDOT District. The Districts use this tool to track and monitor ITS asset uptime and to identify communication or power service issues to individual ITS devices deployed in the field.
- **TxDOTNOW Portal:** The TxDOTNOW Portal is the service portal that both Districts use to assign maintenance and service tickets for ITS devices (as well as other TxDOT property) to maintenance technicians so that these devices can be repaired efficiently and brought back online.
- **Tableau:** Tableau is a data visualization software platform available to staff in both Districts. Tableau links to TxDOT's data lake and allows users to quickly pull and visualize data through dashboards and other visual tools. Operations staff in the TxDOT Dallas and Fort Worth District have access to

dashboards that can show ITS and TSMO data, such as ITS asset uptime and incident clearance time (ICT), for customizable areas and timeframes.

Staff from the Dallas District noted that while the TxDOTNOW system includes some asset management capabilities, there is a need within the District for a more detailed asset inventory, specifically with information such as device age and time before end of design life for ITS devices and their component parts. TxDOT Fort Worth District staff also indicated a need for this type of tool, indicating that while both Districts informally maintain some asset management information for their ITS device deployments internally, this information often contains critical gaps due to the lack of a formal system to track the data. Specifically, the Fort Worth District identified the need for a better way to track when new ITS devices and components go into service and how this information might affect year-to-year fluctuations in the District's maintenance and construction budgets.



Performance Measurement

The success of any TSMO program is tracked through performance measures that are used to track progress towards goals and evaluate if implemented action items are beneficial.

Agency Performance-Based Initiatives

The Texas Transportation Commission adopted a formal road to zero goal to achieve zero deaths on Texas roadways by 2050, with a midway goal to reduce fatalities in half by 2035. TxDOT is developing interim goals to show fatality reductions before 2035 and has made significant investment in safety since the road to zero goal was adopted.



November 7, 2020 Texas marked 20 years with a death every day on Texas roadways. TxDOT will continue to look for ways to improve safety on Texas roads and end the streak of fatalities. The public messaging for this initiative is #EndTheStreakTX.

District-Wide (or Project Specific) Performance Measures

Both Districts access performance data via Tableau data dashboards. Examples of these dashboards include ones that provide performance summaries for:

- Safety service patrols operating in the region
- The DalTrans and TransVISION regional TMCs
- Regional incident management and response
- Travel time reliability on key routes
- ITS asset uptime
- District-wide safety data from Texas' Crash Records Information System (CRIS) database

District operations staff have access to these dashboards to check in on performance as needed or desired. The Fort Worth Director of Operations shares a summary report for these metrics with her staff each month for the purpose of generating discussion on areas of strength and areas for improvement. The Dallas District has used the information to support its tracking and reporting on TMS Status Report performance measures like

ITS asset uptime. The prompt resolution of issues through tracking asset uptime in this way has led to high performance on the status report, which in turn has helped the District secure additional funding and consideration for ITS deployments.

TMS Status Report Required Performance Measures

The TxDOT Dallas and Fort Worth Districts have tracked four TMS performance metrics since FY 2017, as required per the TxDOT Chief Engineer.

1. TMS Asset Operational Uptime – Measure how Districts maintain their TMS equipment, is the most critical metric to improve in the short-term.
2. Incident Clearance Times – Measure mobility on our system, driven by District TIM processes in collaboration with regional partners.
3. Level of Travel Time Reliability – An FHWA MAP-21 recommendation, to measure impact on the public from TMS strategies applied to on-system roads e.g. WZM, DMS, etc.
4. TMS System Coverage – Measure and understand what portion of on-system roadways are adequately covered with ITS equipment and communications, or where coverage needs to be expanded.

Both Districts report these metrics each month to identify the benefits of implemented projects and serve as an update to TSMO Program Plan goals. Performance metrics are also leveraged to identify TSMO projects and to incorporate ITS into programmed roadway and bridge projects.



Culture

The statewide TSMO program aims to improve mobility and safety through coordinated mobility strategies that are supported by well-defined institutional arrangements, operating procedures, and regional partnerships. At the District level, TSMO Coordinators and Champions aim to influence and nurture a culture which recognizes TMS as a core priority, supported by dedicated programs and funding. Decisions are often determined by an organization based on its culture, which is made up of the organization's values and beliefs.

Engagement Opportunities

Providing TSMO-related engagement opportunities at all organizational levels, from District leadership to summer interns, is a key component of creating a strong TSMO culture within an organization. Developing engaged employees and collaborative agency processes can strengthen institutional TSMO knowledge and procedures. Dallas and Fort Worth District Leadership, with the resources and support from TxDOT statewide divisions, are the key drivers for providing engagement opportunities.

Currently, the traffic operations leadership is focused on improving the ITS, illumination, and signal infrastructure within the Districts on all projects. Both Districts have designated TSMO Champions, who are members of the Districts' leadership team that advocate for the implementation of TSMO programs and the accompanying dedication of funding and resources. Similarly, both Districts have designated TSMO Coordinators who are involved in day-to-day operations programs within the Districts. The TSMO Coordinators are tasked with organizing activities and serving as a point-of-contact to improve understanding of TSMO and

its importance among staff in the District's Operations group, as well as the other teams operating within the District.

In addition to these formal roles in each District that supports a TSMO culture, TSMO Champions and Coordinators in the two Districts have been proactive in working with other partners and "bridging silos" to bring operations improvements to construction. For example, the Fort Worth TSMO team has worked with TP&D to become more included in the District's systemic safety projects identifying whether TSMO strategies can enhance other physical safety countermeasure deployments that have already been targeted for implementation. The Fort Worth District's TSMO team has also partnered with TxDOT's Traffic Safety Division and Information Technology Division to obtain cellular modems through a statewide initiative. As a result, the District is now deploying these modems to approximately 500 signals throughout the region. Once complete, the Fort Worth District will have remote surveillance and status monitoring capabilities for its entire signal system.



Organization & Workforce

Organization & Workforce refers to each District's programmatic elements like organizational structure, staffing and workforce needs, recruitment and retention, and training opportunities needed to support TSMO and to create key TSMO roles.

Revise Organization Structure to Accommodate TSMO

Revisions to organizational structure to accommodate TSMO are specific to the organization implementing TSMO processes and practices. Reorganization can be difficult depending on the institutional practices and is most effective when existing staff is engaged and supportive of TSMO goals. A specific organizational approach to accommodate TSMO could be implemented by a District TSMO Steering Committee chaired by the District TSMO Champion or TSMO Coordinator. The TSMO Steering Committee should include staff from TP&D, Construction, and Operations.

Beyond any formal reorganization, the Dallas and Fort Worth Districts have already taken some initial steps to accommodate the development of a TSMO focus within its staff. The Dallas District has found that one benefits of staff moving between positions within the District, which has occurred often over the last decade, has been that different groups within the organization have been working together more closely with each other and with area offices. District staff said that people throughout the District now have a better idea than they did 10 years ago of who to call to ask for guidance when they anticipate an effort might have large traffic operations impacts.

Key TSMO Roles

TxDOT has identified two key roles that should exist in each TxDOT District to support the a successful TSMO program: TSMO Champion and TSMO Coordinator.

TSMO Champion – A TSMO Champion supports TSMO outreach activities and has helped to enhance their TSMO culture. This champion continually advocates for TSMO in the agency and facilitates discussion for future improvement. The position is held by someone currently at the leadership or administrative level within TxDOT.

TSMO Coordinator – The TSMO Coordinator facilitates and is involved with day-to-day operations, traffic, and technology elements. The TSMO Coordinator is the point of contact for TSMO questions and activities.

However, success in TSMO cannot be dependent on just one champion and one coordinator. All roles within the agency have a responsibility to drive TSMO practices and create a mindset focused on operations. Other key contributors may be traffic engineers, traffic signal engineers, freeway and arterial operations engineers, ITS design engineers, maintenance and construction professionals, and transportation planners.

Staffing for TSMO Activities

In order to support operations, it is important for the TxDOT Dallas and Fort Worth Districts to recruit and retain staff, revise position responsibilities to accommodate TSMO activities, and provide growth opportunities. Both Districts have noted difficulties in hiring and retaining qualified staff to support design and maintenance of ITS devices, hiring qualified construction inspectors of ITS and signal systems, and hiring and retaining maintenance technicians for traffic signal systems. Staff from the Dallas District said that they aim to hire the most qualified candidate and typically resort to on-the-job training to build the needed skills for the job.

As of late 2020, the Fort Worth District had three full time equivalent job openings in their operations group. Candidates have generally not possessed the desired specialized experience in ITS and operations, and qualified applicants have at times spent a short amount of time with the District before moving on to work at another agency. Specifically, many applicants for engineering positions have not possessed sufficient experience with drafting software, which has led to missed errors in plan sets under review.

Strategies are needed to recruit and retain skilled TSMO professional. The lack of a well-defined career path could contribute to these retention challenges.

Training Plan

The Dallas and Fort Worth Districts have multiple opportunities for training both internally and through state-wide resources. For training on new technologies, the Districts often take advantage of free training and support offered from equipment vendors.

Both Districts noted room for growth among staff in working with ITS devices, both in terms of design at the engineering level and maintenance at the technician level. Each District is attempting to further build these skills among staff through a combination of internal and external training. In the Fort Worth District, for example, staff have been working to develop internal training opportunities geared toward ITS device design,

signal cabinet troubleshooting, and signal and ITS device maintenance and upkeep. The District also noted that there exists a need for more widely available statewide training opportunities for staff in the areas of ITS design and overhead sign board design.



Collaboration

The Collaboration dimension describes how the TxDOT Dallas and Fort Worth Districts proactively manage and operate an integrated transportation system through multijurisdictional coordination and cooperation between various transportation disciplines and partner agencies. Collaboration refers to informal but long-standing working relationships among staff, agencies and key groups, but also refers to more formal arrangements that might be governed by an agreement or policy.

Internal Partnerships

TSMO activities within the Dallas and Fort Worth Districts will often require internal collaboration among staff. The two Districts actively collaborate, with the Directors of Operations involving directors from other groups within the District in TSMO-related challenges when applicable. Operations staff often provide their expertise to area engineers and their teams as they carry out construction and maintenance efforts.

Within TxDOT, both Districts also regularly partner with subject matter experts in the TxDOT Traffic Safety Division or Information Technology Division to learn about new methods or technologies that could address TSMO goals and objectives. For example, both Districts are currently working with the TxDOT TRF to build expertise in the use of INRIX and Streetlight probe data tools that have been made available across the state. TMC staff in both Districts will also regularly partner with statewide experts to learn about new functionality available to tools already in use, such as the Lonestar ATMS.

External Partnerships

External partnerships with MPOs, local agencies, and incident responders improve many aspects of the Dallas-Fort Worth region's TSMO program. TIM is an example of a program that benefits from enhanced collaboration between organizations, and the region champions this spirit of collaboration through regularly held multidisciplinary incident management training sessions that are led by NCTCOG. The Dallas and Fort Worth Districts each lead multidisciplinary TIM working groups that meet regularly to share best practices and discuss ways to improve.

Transportation agencies throughout the region coordinate with one another through working groups and forums that support other specific initiatives, as well. Both Districts and cities partner with NCTCOG to support its regional traffic signal retiming program. District representatives also participate in activities of the NCTCOG regional ITS stakeholder committee and regional safety committee.

Both Districts also currently maintain numerous agreements that allow for the sharing of data and assets to support regional TM. These include fiber sharing agreements with partner cities in both Districts and with the North Texas Tollway Authority (NTTA); video feed sharing agreements with cities, counties, public safety officials, and local news media; and traffic signal data sharing agreements with partner cities and NCTCOG. As a part of the video sharing agreements, certain cities have access to a virtual Lonestar module that allows these cities to control TxDOT's CCTV cameras to support local traffic management needs. While some of these written agreements have lapsed or expired, involved agencies have typically continued supporting one another via an informal agreement until a new written agreement is executed.



TxDOT Fort Worth multidisciplinary TIM training (Photos courtesy of TxDOT TRF)



Public-Private Partnerships

Public-private partnerships involve collaboration between a government agency and the private-sector. These partnerships can help the agency finance, build, operate, and maintain projects that work towards completing TSMO objectives. One of the most common partnerships currently occurring within the region is the occurrence of data sharing agreements with third-party providers. For example, several agencies within the Dallas and Fort Worth Districts' boundaries have partnered with navigation applications to push out to the public planned event and construction closures that will impact the road network.

Similarly, agencies have sought agreements with probe-based data providers to access real-time traffic operations data that can aid in agency decision making. While many agencies currently have their own agreements and are already using this data, the TxDOT TRF recently executed an agreement with INRIX and Streetlight to provide probe-based traffic operation and origin-destination data to all TxDOT Districts. Both the Dallas and Fort Worth Districts have some experience with using this data and have been working with the TxDOT TRF to expand the institutional understanding of how probe-based traffic data can be used.

Adjacent Districts

Both the TxDOT Dallas District TMC (DalTrans) and Fort Worth TMC (TransVISION) support other TxDOT districts throughout the state, as displayed in Figure 15, with after-hours monitoring and operation of ITS field devices. DalTrans provides after-hours support to the Atlanta District, Bryan District, Paris District, and Tyler District. TransVISION provides after-hours support to the Abilene District, Amarillo District, Brownwood District, and Waco District. TransVISION has also supported the Wichita Falls District, but these responsibilities are currently transitioning over to DalTrans.

The two Districts are also able to collaborate with subject matter experts in other districts through both formal and informal means. Formal collaboration opportunities occur during events such as TxDOT's Short Course program, held each fall with attendees from across the state. Informal partnerships also arise when staff in multiple districts must confront similar challenges. For example, the Fort Worth District is currently collaborating with staff in the El Paso, Lubbock, and San Antonio Districts to develop potential solutions to address TSMO-related challenges.

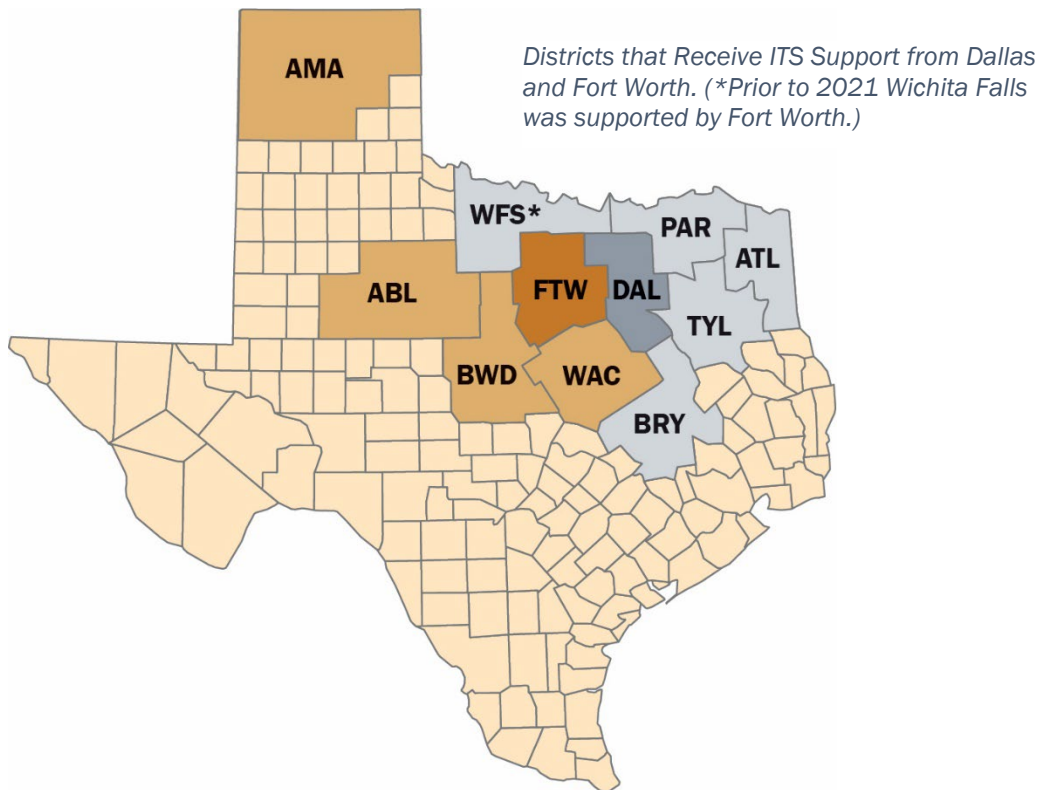


Figure 15: TxDOT Dallas and Fort Worth Districts Support to Other Districts

The CMM Process

Through a facilitated self-assessment process, the CMM classifies an agency as performing at one of four levels of organizational maturity for each of the six capability dimensions. 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 where the organization currently stands within a particular TSMO capability.

As shown in Figure 16, **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 into other processes; however, there is little accountability for achieving performance measures.

At **Level 3**, Integrated, ongoing efforts within the capability dimension are part of a formalized process with established performance measures, and activities are structured to work toward objectives tied to those performance measures. 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 formal commitment from agency leadership for performance-based improvements.

Each of the six capability dimensions were evaluated through a self-assessment survey that the Dallas and Fort Worth Districts completed independently to evaluate the current state of operations within their respective District. Table 4 shows where the TxDOT Dallas and Fort Worth Districts ranked themselves for each capability dimension. Based on the CMM assessment, both Districts on average currently see themselves operating between CMM Level 2 (Managed) and CMM Level 3 (Integrated) in all capability dimensions.

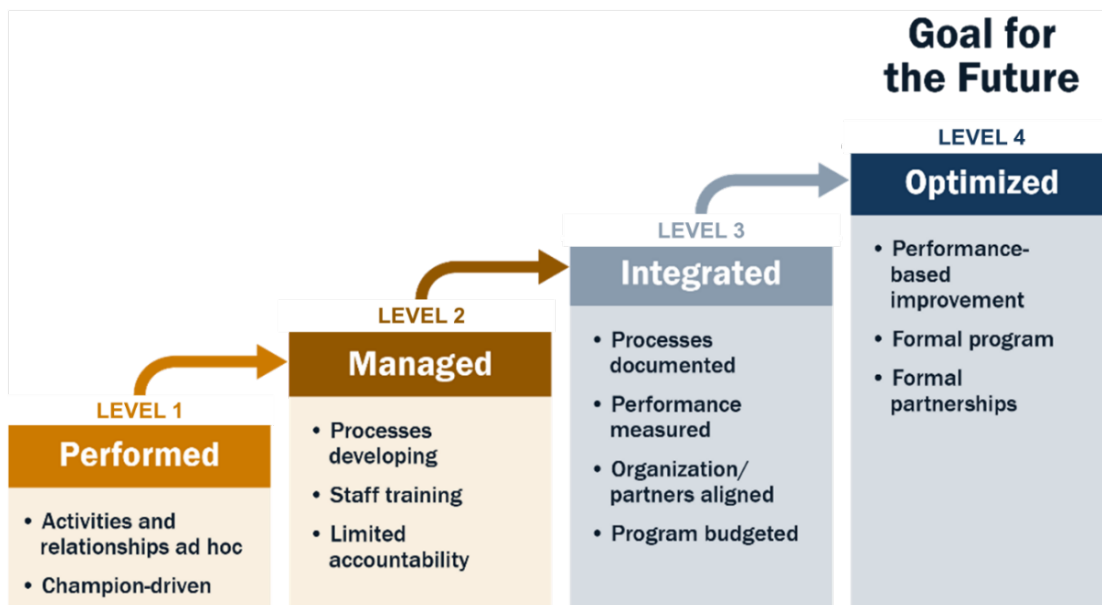














Figure 16: Capability Maturity Model Levels of Maturity

Table 4: TxDOT Dallas and Fort Worth CMM Assessment

TSMO Capability Dimensions	Overall Capabilities				Region Score
	Level 1 Performed	Level 2 Managed	Level 3 Integrated	Level 4 Optimized	
Business Processes		 			2.6
Systems & Technology		 			2.6
Performance Measurement		 			2.2
Culture		 			2.5
Organization & Workforce		 			2.5
Collaboration		 			2.6



Dallas District



Fort Worth District

TSMO Focus Areas

The AASHTO CMM was used to assess the TxDOT Dallas and Fort Worth Districts' capabilities across the six capability dimensions for six different focus areas (often referred to as Capability Maturity Framework (CMF)). These focus areas are:

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

Focus Area-Specific CMM Assessment Results

Through workshops and stakeholder interviews held virtually during the latter part of 2020, the TxDOT Dallas and Fort Worth Districts identified regional needs and assessed their capabilities for the six capability dimensions of TSMO as they related to each of the six TSMO focus areas. Three CMM workshops were held with both TxDOT and partner agency staff in August 2020 via virtual webinar to gauge stakeholders' initial thoughts on the existing capabilities of both Districts. The three CMM workshops focused on the following topics:

- CMM Workshop 1: Focus Area – TIM
- CMM Workshop 2: Focus Area – TSM & General Traffic Management (TM)
- CMM Workshop 3: Focus Area – WZM, PSE, RWM









Following completion of the CMM workshops and related self-assessment survey, the TxDOT Dallas and Fort Worth Districts' TSMO leadership selected three of the TSMO focus areas as the subject of CMF workshops. These workshops provided an opportunity for interested stakeholders to meet and identify action items that would allow the TxDOT Dallas and Fort Worth Districts to advance TSMO for each CMM capability dimension within a given TSMO focus area. The focus areas that the Districts chose for CMF workshops were TIM, TSM, and TM with a focus on TxDOT TMC operations. The CMF workshops were then conducted in October 2020 as noted below:




- CMF Workshop 1: Focus Area – Fort Worth District TSM
Workshop 1 was conducted with the TxDOT Fort Worth District and partner agencies located within the TxDOT Fort Worth District
- CMF Workshop 2: Focus Area – Dallas District TSM
Workshop 2 was conducted with the TxDOT Dallas District and partner agencies located within the TxDOT Dallas District.
- CMF Workshop 3: Focus Area – TM and TxDOT TMC Operations
Workshop 3 was conducted with TxDOT staff only from the TxDOT Dallas and Fort Worth Districts.
- CMF Workshop 4: Focus Area – TIM
Workshop 4 was conducted with stakeholders from throughout the Dallas-Fort Worth Region.

Traffic Incident Management CMM Assessment Summary

The TxDOT Dallas and Fort Worth Districts generally perform TIM response activities in coordination with other regional partners. A formal TIM program exists within the Districts, with funding allocated by NCTCOG for regional multidisciplinary TIM training. TIM performance data, including roadway clearance time (RCT), ICT, and secondary crashes is collected and logged in the TxDOT Lonestar system, and summaries of TIM data are available to TxDOT decision makers. The TxDOT Dallas and Fort Worth Districts generally incorporate TIM considerations in construction and work zone planning efforts. Table 5 summarizes CMM assessment responses related to TIM.

Table 5: CMM Assessment for Traffic Incident Management

Traffic Incident Management					
TSMO Capability Dimensions	Level 1 Performed	Level 2 Managed	Level 3 Integrated	Level 4 Optimized	Region Score
Business Processes			 		3.7
Systems & Technology					3.5
Performance Measurement		 			2.7
Culture					3.3
Organization & Workforce					3.8
Collaboration					3.3

 Dallas District
  Fort Worth District
  Both Districts

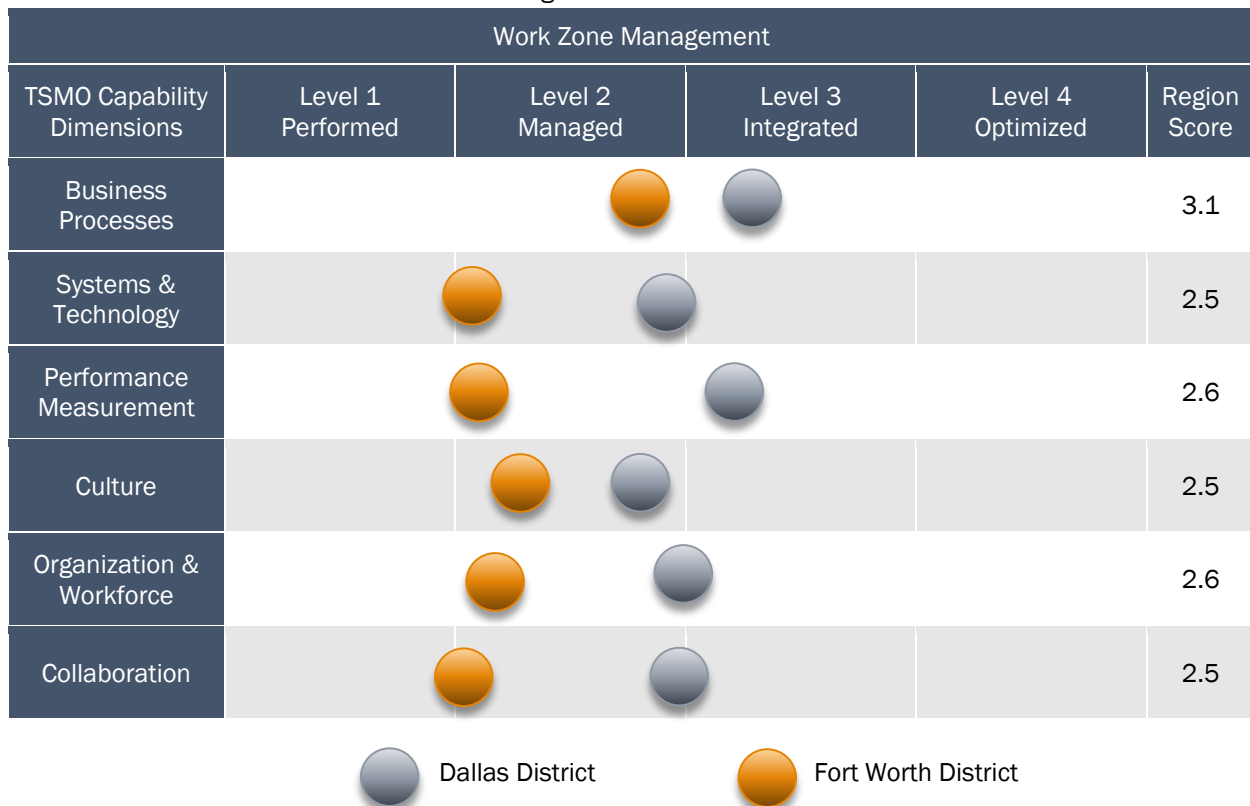
The TxDOT Fort Worth District has a formalized process for responding to incidents, including documented TIM guidelines. There are four separate TIM task forces that currently meet every other month within the Fort Worth District. The TxDOT Dallas District does not have TIM groups that meet on a regular basis but has expressed interest in forming such groups.

The region has safety service patrols that operate on freeways and toll roads, as well as policies in place to effectively respond to incidents that involve hazardous materials, commercial vehicles, and fatalities. Some law enforcement agencies have expedited crash investigation policies in place as well as procedures for early notification and timely response of specialized incident resources such as heavy wrecker towing and hazardous material cleanup. Although the Districts scored themselves lower in the performance measurement dimension of the CMM self-assessment, both are actively tracking and reporting key TIM metrics, as well as other general TM metrics such as travel time reliability and delay, in Lonestar.

Work Zone Management CMM Assessment Summary

Table 6 shows that the TxDOT Dallas District consistently scored themselves as performing WZM at or near capability maturity Level 3 - Integrated. The TxDOT Fort Worth District generally rated themselves slightly lower as performing WZM at capability maturity Level 2 - Managed. Both Districts regularly coordinate multiple projects along key corridors, inform partner agencies of road work plans, seek to apply established and existing technologies to support safety and mobility in work zones, and consider innovative technology to further improve work zone operations.

Table 6: CMM Assessment for Work Zone Management














The TxDOT Dallas and Fort Worth Districts acknowledge the benefits of effective WZM and train staff to improve understanding of the importance of WZM. The Districts will often use innovative contracting methods to incentivize WZM practices among contractors and will conduct regular check-ins to identify strengths and areas of needed improvement in work zone design and operations. While a process occurs to make sure that innovative technologies and strategies for improving WZM are considered in project planning, both Districts felt that innovative strategies should be considered earlier in the WZM planning process, potentially as part of DSR development.

In general, the Districts agree that work zone training and implementation are done well, especially on larger projects, and that most of those larger projects include ITS field device deployments to support WZM. Early engagement with partner agencies when considering WZM, especially related to planning for TIM within work zones, was identified as an area that needed improvement.

Road Weather Management CMM Assessment Summary

The TxDOT Dallas and Fort Worth Districts have developed a formal process to share resources throughout the region during weather events. Both Districts utilize data from the National Weather Service (NWS) to aid in forecasting and resource planning, and both Districts share road weather updates with the public via the Internet and via DMS or PCMS messages. Both Districts generally rated themselves as performing RWM at a managed or integrated level. Table 7 summarizes CMM assessment responses related to RWM.

Table 7: CMM Assessment for Road Weather Management

Road Weather Management					
TSMO Capability Dimensions	Level 1 Performed	Level 2 Managed	Level 3 Integrated	Level 4 Optimized	Region Score
Business Processes					1.8
Systems & Technology					2.5
Performance Measurement					1.5
Culture					2.6
Organization & Workforce					2.3
Collaboration					2.5



Dallas District



Fort Worth District

The TxDOT Dallas District has an established line of communication with the NWS to receive advance warnings of major weather events. The Fort Worth District currently does not directly coordinate with the NWS but does utilize the data on the NWS website to provide road weather information to the public. The Districts communicate effectively among their area offices and maintenance sections during road weather response. After each major weather event, the Districts may conduct an after-action review with a focus on strategic planning for an improved response in similar future events. In general, collaboration and business processes were seen as strengths, and performance measurement was seen as a weakness for both Districts.

For winter weather events and planning, the Dallas District spends considerable effort to pre-stage equipment and supplies to respond more effectively to adverse weather conditions. This tends to be effective and allows for a quick response by their maintenance sections when winter weather arrives. Both Districts share equipment as needed with local agencies during flooding and other weather events, but participants within the CMM and CMF workshops noted that TxDOT could improve preparedness by ensuring that the equipment is ready to use in advance. Communication with transit agencies regarding road weather conditions was identified as an area for improvement.

Planned Special Events CMM Assessment Summary

The TxDOT Dallas and Fort Worth Districts generally collaborate with external partners for PSE activities. For local events, TxDOT generally is not centrally involved in event operations and instead holds more of a general role of approver of event traffic control plans. Both Districts regularly task specific agency staff with formal PSE job functions for events occurring within the District and assess needs for planned events, but minimal funding is currently dedicated to PSE planning. Not all operational entities consider or account for PSEs within their budgets. Table 8 summarizes CMM assessment responses related to PSEs.

Table 8: CMM Assessment for Planned Special Events



The Districts have a formal process in place for larger events, with mobility coordinators deployed to document and assess TM needs ahead of PSE. Measurements of event-related traffic performance currently are strictly qualitative and are not often documented. PSE performance measures are considered when looking for ways to improve operations, but this activity is done inconsistently and not by all entities. The Districts support participation in PSE planning and operations, but current involvement is for approval purposes only.

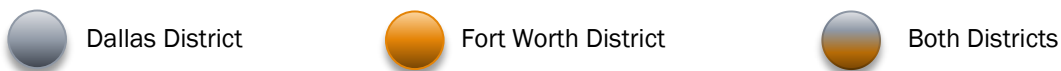
The Districts consider special event planning and implementation as a strength. The DFW area frequently has large special events, especially at professional sports facilities in Arlington. Local agencies coordinate well with District TMC staff, and preparedness for special events is built into roadway project design. The Districts do a good job of communicating with the public through the media and Waze for larger PSE.

Traffic Signal Management CMM Assessment Summary

The TxDOT Dallas and Fort Worth Districts generally incorporate TSM activities into everyday operations. Both Districts link signal system planning with other TxDOT project planning efforts, allow a good deal of flexibility in signal technology procurement, and use complex operational concepts when they are deemed beneficial to intersection operations. Currently, some TSM data is captured by the Districts and some partner agencies, but few performance measures have been identified. Table 9 summarizes TSM CMM assessment responses.

Table 9: CMM Assessment for Traffic Signal Management

Traffic Signal Management					
TSMO Capability Dimensions	Level 1 Performed	Level 2 Managed	Level 3 Integrated	Level 4 Optimized	Region Score
Business Processes					2.4
Systems & Technology					2.5
Performance Measurement					1.5
Culture					2.0
Organization & Workforce					2.4
Collaboration					2.3














The TxDOT Dallas and Fort Worth Districts link TSM goals to other TxDOT planning, design, operation, and maintenance goals and objectives. The Districts maintain signal systems along major corridors in a state of good repair and actively maintain an inventory of deployed signal equipment and traffic signal timing settings. Both Districts follow the Manual on Uniform Traffic Control Devices (MUTCD) guidelines and standards to ensure consistency in signal design, using standard design sheets, and hardware specifications. The Districts collect output-oriented performance measures specific to maintenance activities, such as response time and outage duration. However, these performance measures are not currently used to track performance or aid agency decision making.

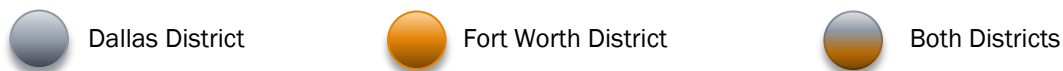
Some partners spoke of very strong coordination with TxDOT on TSM initiatives, but others noted that improvements were needed. There is a signal retiming program managed by NCTCOG that exists to coordinate signal operations between agencies along cross-jurisdictional corridors. The Districts noted that long-term planning for signal projects could be helpful: for example, considerations regarding whether to install traffic signals as part of a project should be made as early as possible in the project planning process.

General Traffic Management CMM Assessment Summary

The TxDOT Dallas and Fort Worth Districts perform TM activities through ongoing supervision of deployed ITS devices from the District Offices and TMCs. Both Districts consider TM strategies in construction and maintenance planning and include provisions for TM in department budgets. TM coordination occurs regionally between TxDOT, NCTCOG, and local transportation agencies, and regional efforts are tied to mutually agreed-upon operational objectives. Table 10 summarizes TM CMM assessment responses.

Table 10: CMM Assessment for General Traffic Management

TSMO Capability Dimensions	Traffic Management				Region Score
	Level 1 Performed	Level 2 Managed	Level 3 Integrated	Level 4 Optimized	
Business Processes		 			2.3
Systems & Technology					2.2
Performance Measurement		 			2.5
Culture					2.0
Organization & Workforce					1.8
Collaboration		 			2.1



The TxDOT Dallas and Fort Worth Districts are starting to move toward consistent support of TM projects. Both Districts agree that their current TM strategies address multimodal considerations on an ad hoc basis for specific events or projects, as opposed to through a formalized process to consider these impacts. The Districts' TM strategies are responsive during peak travel periods. Both Districts have also started to incorporate performance measures into the TMS and use Lonestar to track performance.

Both Districts have developed protocols, procedures, and guidelines for training and professional capacity building (PCB) for development of internal training and guides for TMC staff. The Dallas District has limited training options for new and experienced operators within the area, and completion of this training is not currently a requirement for staff. The Districts' most common arrangement for sharing TM data and information in the region is via manual efforts in response to specific agency needs or requests. Currently, TxDOT regularly shares TM data with NCTCOG and with NCTCOG. Both Districts mentioned a need to better coordinate operations along corridors that cross both Districts, such as I-30.

TSMO Implementation Plan

This section lays out a plan for advancing TSMO priorities in the TxDOT Dallas and Fort Worth Districts over the next five years. Its contents are based on the existing strengths and needs that the TxDOT Dallas and Fort Worth Districts and regional stakeholders identified over the course of the TSMO Plan's development. The Implementation Plan is shown in Table 11 and in the schedule on the following pages shown in Figure 17. Action items in Table 11 are organized by TSMO capability dimension, and these same action items are shown in Appendix B organized by TSMO focus area. Table 11 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).
- **District or Division:** Indicates which TxDOT District (Dallas or Fort Worth) or Division the action item is directed towards.
- **Action Description:** Provides a brief description of the action, which may include multiple steps.
- **Program Plan Page Number:** A reference to the TSMO Program Plan page number with additional discussion and implementation guidance for the action item.
- **Action Lead:** Identifies the roles within TxDOT who will take ownership of the action and will oversee that implementation progresses as planned.
- **Supports District TSMO Goals:** Identifies which of the Districts' TSMO goals the action item supports: Safety, Reliability, Efficiency, Customer Service, Collaboration, or Integration.
- **Partners:** Identifies TxDOT groups and external stakeholders that will contribute to the implementation of the action item.
- **Cost:** Provides a semi-quantitative opinion of the level of fiscal resources that TxDOT would need to commit to implement the action item.
- **Effort:** Provides a semi-quantitative opinion of the level of effort that TxDOT would need to dedicate to implement the action item.
- **TSMO Focus Area:** Indicates which of the six TSMO focus areas the action item addresses: TIM, WZM, RWM, PSE, TSM, TM.
- **Related Action Items:** Lists the Action Numbers of related action items that could be implemented either concurrently or subsequently if the Districts chose to focus on specific program areas or further developing relationships with specific stakeholders.

Separately, the implementation plan schedule shown in Figure 17. 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 in the second half of 2021.

The TxDOT Dallas and Fort Worth 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 11: TxDOT Dallas and Fort Worth Recommended TSMO Action Items

Action No.	District or Division	 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	Reliability	Efficiency	Customer Service	Collaboration	Integration					
BP-01	DAL & FTW	Implement TIM Response Measures for Major Construction: Develop process and procedures for incident management within construction work zones prior to letting of all major construction contracts.	56	District Director of Construction	✓	✓	✓	✓			DAL & FTW Construction, DAL & FTW Operations, DAL & FTW Area Engineers, First Responders	\$\$			ST-03
BP-02	DAL & FTW	Conduct Post-Construction Event Reviews: Conduct post-construction event reviews to determine level of delay, evaluate safety, and determine potential areas of improvement.	57	District Director of Construction		✓	✓		✓	✓	DAL & FTW Construction, DAL & FTW Operations, DAL & FTW Area Engineers, Local Transportation Agencies	\$			BP-03, PM-03, OW-03
BP-03	DAL & FTW	Establish Procedures for Collecting and Analyzing Work Zone Road User Cost Data: Establish procedures for collecting work zone road user cost data occurring at significant projects and compare to predictions made during project development.	58	District Director of Operations		✓		✓		✓	DAL & FTW Construction, DAL & FTW Operations	\$			BP-02
BP-04	DAL & FTW	Conduct After Action Reviews for Weather Events: Conduct after action reviews to improve emergency weather event response times and lines of communication.	59	District Director of Operations		✓	✓		✓	✓	DAL & FTW Operations, DAL & FTW Maintenance, Local Transportation Agencies	\$			PM-05, CU-02
BP-05	DAL & FTW	Conduct Post-Planned Special Event Reviews: Conduct post-planned special event reviews to determine level of delay, evaluate safety, and determine potential areas of improvement.	60	District Director of Operations		✓	✓		✓	✓	DAL & FTW Construction, DAL & FTW Operations, DAL & FTW Area Engineers, Local Transportation Agencies, Event Organizers	\$			ST-08, PM-06
BP-06	FTW	Improve Local Partner Knowledge of Existing Agreements: Improve local agency institutional knowledge of agreements involving municipal maintenance, signal maintenance, and illumination.	61	District Director of Operations					✓	✓	FTW Operations, FTW Area Engineer, Local Transportation Agencies	\$			
BP-07	DAL & FTW	Establish Regional Resource Sharing Agreements: Pursue resource sharing agreements per the region's ITS architecture, including agreements to share CCTV camera feeds as well as physical infrastructure such as conduit and fiber.	62	District Director of Operations			✓		✓		TxDOT Traffic Safety Division, DAL & FTW Operations, Local Transportation Agencies, NCTCOG	\$			ST-09
BP-08	TRF	Revise TxDOT Design Summary Report to Increase Emphasis on Operations: Revise the TxDOT Design Summary Report form to increase focus on TSMO related strategies including Smart Work Zones during construction, and traffic signals and ITS post-construction.	63	District Director of Transportation Planning & Development	✓	✓	✓			✓	TxDOT Traffic Safety Division, DAL & FTW Construction, DAL & FTW Operations, DAL & FTW Area Engineers, Local Transportation Agencies, NCTCOG	\$			

Table continued on next page.






Action No.	District or Division	 Business Processes (BP) Action Item Descriptions <i>(Continued)</i>	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						
BP-09	DAL & FTW	Support Regional Traffic Data Sharing Agreements: Support NCTCOG agreements for sharing collected traffic data among local agencies.	64	District Director of Operations		✓		✓		✓		DAL & FTW Operations, DAL & FTW Area Engineers, Local Transportation Agencies, Local MPOs, NCTCOG	\$	<div style="width: 25%;"><div style="background-color: #4a7ebb; height: 10px;"></div></div>		PM-01, PM-02, PM-04
BP-10	DAL & FTW	Develop a Multi-Year TMS Maintenance Plan: Develop a multi-year TMS maintenance plan that includes replacement cycles, preventative maintenance, warranties and procurement cycles.	65	District Director of Maintenance		✓	✓			✓		DAL & FTW Operations, DAL & FTW Maintenance	\$	<div style="width: 25%;"><div style="background-color: #4a7ebb; height: 10px;"></div></div>		
BP-11	DAL	Develop TxDOT Dallas ITS Master Plan: Develop an ITS Master Plan for the TxDOT Dallas District to identify and prioritize ITS and communication infrastructure deployments throughout the District.	66	District Director of Transportation Planning & Development	✓	✓	✓	✓	✓	✓		DAL Operations, DAL Area Engineers	\$\$	<div style="width: 25%;"><div style="background-color: #4a7ebb; height: 10px;"></div></div>		
BP-12	TRF	Establish Notification Process to Cities for Over Height/Oversize Vehicles Permits: Establish a process within TxDOT permitting to notify local agencies when over-height/oversize vehicles will be traveling through their jurisdictions so they can plan for and monitor these movements.	67	District Director of Operations	✓					✓		TxDOT Traffic Safety Division, DAL & FTW Operations, DAL & FTW Maintenance, Local Transportation Agencies	\$	<div style="width: 25%;"><div style="background-color: #4a7ebb; height: 10px;"></div></div>		

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Action No.	District or Division	 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	DAL & FTW	Establish Standardized Radio Communications for TIM Response Dispatch Information: Establish documented standard communication protocol for timely public safety information sharing with TxDOT.	69	District Director of Operations	✓					✓	✓	DAL & FTW Operations, TxDOT Traffic Safety Division, DAL & FTW Public Information Offices, Local Public Safety Agencies	\$	<div style="width: 25%;"><div style="background-color: #0070C0; height: 10px;"></div></div>		
ST-02	DAL & FTW	Develop and Implement Plan for Regional Courtesy/Service Patrol Program Expansion: Develop regional courtesy/service patrol plan for expansion; considering network coverage, hours of operation, and baseline of services provided.	70	District Director of Operations	✓	✓	✓				✓	DAL & FTW Operations, DAL & FTW Area Engineers, DAL & FTW TMC Staff, Dallas County Sheriff	\$\$\$	<div style="width: 50%;"><div style="background-color: #0070C0; height: 10px;"></div></div>		
ST-03	DAL & FTW	Utilize Decision Tool to Expand Work Zone Technology Deployments: Standardize an approach or decision tool for when to deploy certain work zone ITS technologies. Expand deployment of work zone technology throughout both Districts to support improved work zone monitoring, localized real-time traveler information, end of queue warning, and worker safety.	71	District Director of Construction	✓	✓	✓	✓			✓	DAL & FTW Operations, DAL & FTW Area Engineers, DAL & FTW Construction, TxDOT Construction Division	\$\$	<div style="width: 30%;"><div style="background-color: #0070C0; height: 10px;"></div></div>		BP-01, PM-03, OW-04
ST-04	DAL & FTW	Develop Automated Construction Notification Application: Develop a universal platform aimed at construction that will provide for notifications to self-subscribed users.	72	District Director of Operations				✓			✓	TxDOT Traffic Safety Division, DAL & FTW Construction, DAL & FTW Operations, DAL & FTW Maintenance, DAL & FTW Area Engineers, Local Transportation Agencies, Event Organizers	\$\$\$	<div style="width: 20%;"><div style="background-color: #0070C0; height: 10px;"></div></div>		CU-01, OW-03
ST-05	DAL & FTW	Provide Work Zone Closure Information Through Third-Party Apps: Partner with third-party navigation apps to expand and provide accurate information for travelers related to work zone closures.	73	District Public Information Officer		✓		✓		✓	✓	Private Third-Party Providers, DAL & FTW Operations, DAL & FTW Construction	\$	<div style="width: 25%;"><div style="background-color: #0070C0; height: 10px;"></div></div>		
ST-06	FTW	Deploy Flood Warning and Closure Devices: Implement technology for closing roads or warning drivers in areas that frequently flood.	74	District Director of Operations	✓						✓	FTW Operations, FTW Maintenance, FTW Area Engineer	\$\$	<div style="width: 30%;"><div style="background-color: #0070C0; height: 10px;"></div></div>		
ST-07	DAL & FTW	Expand Planned Special Event Closure Information Through Third-Party Apps: Partner with third-party navigation apps to expand and provide accurate information for travelers related to planned special events.	75	District Public Information Officer		✓		✓		✓	✓	Private Third-Party Providers, DAL & FTW Operations, DAL & FTW Public Information Offices, Event Organizers	\$	<div style="width: 25%;"><div style="background-color: #0070C0; height: 10px;"></div></div>		
ST-08	DAL & FTW	Establish Special Timing Plans: Establish special timing plans for alternate routes for planned special events and construction.	76	District Traffic Engineer				✓		✓	✓	DAL & FTW Operations, Local Transportation Agencies	\$	<div style="width: 20%;"><div style="background-color: #0070C0; height: 10px;"></div></div>		BP-05, CO-07
ST-09	DAL, FTW, & TRF	Improve Regional Data and Video Sharing Capabilities: Use cloud-based technology platforms to overcome individual agency difference for data sharing such as CCTV camera video feeds and automated traffic signal performance measures (ATSPMs).	77	District Director of Operations				✓		✓	✓	TxDOT Traffic Safety Division, DAL & FTW Operations, DAL & FTW TMC Staff, Local Transportation Agencies	\$\$\$	<div style="width: 30%;"><div style="background-color: #0070C0; height: 10px;"></div></div>		BP-07, CO-06
ST-10	DAL & FTW	Support Connected and Automated Vehicle Deployment and Smart Corridor Design: Provide TxDOT District support to statewide and regional initiatives aimed at testing and deployment of connected and automated vehicles (CAV) and Smart Corridor Design.	78	District Director of Operations	✓	✓	✓				✓	TxDOT Traffic Safety Division, DAL & FTW Operations, DAL & FTW Area Engineers, Local Transportation Agencies	\$	<div style="width: 25%;"><div style="background-color: #0070C0; height: 10px;"></div></div>		

Action No.	District or Division	 Performance Measurement (PM) 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					
PM-01	DAL, FTW, & TRF	Improve TIM Performance Collection and Reporting: Improve TIM related data collection and reporting, with a focus on recording incident response time, roadway clearance time, incident clearance time, secondary crash data and time to return to normal flow on all incidents tracked in Lonestar.	80	District Director of Operations	✓	✓	✓		✓	✓	TxDOT Traffic Safety Division, DPS and Local Law Enforcement, DAL & FTW Operations	\$	<div style="width: 25%;"></div>		BP-09, PM-02, CO-03
PM-02	NCTCOG TRF, DAL & FTW	Develop Regional TIM Database: Develop regional TIM database in partnership with NCTCOG and local agencies to track TIM quick clearance performance on routes throughout the DFW Region.	81	TxDOT TRF Statewide TIM Coordinator	✓				✓	✓	NCTCOG, DPS, Local Law Enforcement, Local Transportation Agencies	\$\$	<div style="width: 25%;"></div>		BP-09, PM-01
PM-03	DAL & FTW	Measure Work Zone Travel Time Delay: Measure and report travel time delay in work zones.	82	District Director of Construction		✓	✓		✓		DAL & FTW Operations, DAL & FTW Construction	\$	<div style="width: 25%;"></div>		BP-02, ST-03
PM-04	DAL & FTW	Establish a Work Zone Management Dashboard: Establish a dashboard of key work zone performance measures that can be continually updated and viewed by agency personnel, other agencies, and the public.	83	District Director of Construction		✓	✓		✓		DAL & FTW Construction, DAL & FTW Operations, DAL & FTW Maintenance, DAL & FTW Area Engineers	\$	<div style="width: 25%;"></div>		BP-09
PM-05	DAL & FTW	Develop Online Weather Event Dashboards: Develop online dashboards that provide summary statistics of response for weather events.	84	District Director of Operations	✓	✓		✓	✓		DAL & FTW Area Engineers, DAL & FTW Maintenance	\$	<div style="width: 25%;"></div>		BP-04, CU-02
PM-06	DAL & FTW	Measure Planned Special Event Impacts: Measure and report travel time delay and other impacts of planned special events.	85	District Director of Operations		✓	✓		✓		DAL & FTW Operations, Local Transportation Agencies, Event Organizers	\$	<div style="width: 25%;"></div>		BP-05, CO-04
PM-07	DAL & FTW	Develop and Implement Advanced Traffic Signal Performance Measures: Develop a formal program and implement necessary technology and software to support Advanced Traffic Signal Performance Measures operations on key District corridors.	86	District Director of Operations		✓	✓		✓		DAL & FTW Operations, DFW Area Engineers	\$\$\$	<div style="width: 25%;"></div>		
PM-08	TRF	Establish Standard Operating Procedures for District Traffic Management Systems Performance Measures: Establish standard operating procedures to ensure consistency in how District Traffic Management System (TMS) performance measures are collected.	87	TxDOT TRF Traffic Management Section Director	✓	✓	✓		✓	✓	DAL & FTW Operations, DAL & FTW TMC Staff, TxDOT Traffic Safety Division	\$	<div style="width: 25%;"></div>		
PM-09	TRF	Develop Implementation Plan for Regional Data Usage: Develop implementation plan to maximize the region's utility of available probe-based INRIX and Streetlight data.	88	District Director of Operations	✓	✓	✓	✓	✓	✓	TxDOT Traffic Safety Division, DAL & FTW Operations, DAL & FTW Area Engineers, Local Transportation Agencies	\$	<div style="width: 25%;"></div>		

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Action No.	District or Division	 Culture (CU) 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					
CU-01	DAL & FTW	Prioritize Communicating Work Zone Information to Local Partners: Prioritize communication with local agencies regarding both initial construction notices and subsequent construction plan or schedule changes.	90	District Public Information Officer	✓			✓	✓	✓	DAL & FTW Area Engineers, DAL & FTW Construction, DAL & FTW Public Information Offices	\$			ST-04
CU-02	DAL & FTW	Improve Communication of Road Weather Impacts and Response with Local Partners: Improve communication with local stakeholders regarding TxDOT weather-related road closures and ice prevention operations.	91	District Public Information Officer	✓	✓	✓	✓	✓	✓	DAL & FTW Operations, DAL & FTW Maintenance, DAL & FTW Public Information Officers, Local Transportation Agencies, Local Public Safety Agencies	\$			BP-04, PM-05

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Action No.	District or Division	 Organization & Workforce (OW) 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					
OW-01	NCTCOG, TRF, DAL & FTW	Provide Recurring Regional TIM Training: Continue partnering with NCTCOG and other agencies to identify agencies that have not been involved with training and provide recurring regional TIM training in a multidisciplinary setting.	93	TxDOT TRF Statewide TIM Coordinator	✓	✓		✓	✓	✓	TxDOT Statewide TIM Coordinator, TxDOT Traffic Safety Division, DAL & FTW Operations, DAL & FTW TMC Managers, NCTCOG, Local Transportation Agencies, Local Public Safety Agencies	\$\$			OW-02, CO-01, CO-02
OW-02	DAL	Establish Dedicated TIM Coordinator Position: Establish a dedicated TIM coordinator position in the Dallas District to support TIM activities throughout this District.	94	District Director of Operations	✓	✓	✓		✓	✓	TxDOT Statewide TIM Coordinator, TxDOT Traffic Safety Division, DAL Operations	\$\$			OW-01, CO-02, CO-03
OW-03	DAL & FTW	Establish Dedicated Work Zone Coordinator Position: Establish regional-level work zone coordinator position for coordination of construction closures to avoid conflicts and ensure communication to impacted stakeholders.	95	District Director of Construction		✓	✓		✓		TxDOT Traffic Safety Division, DAL & FTW Operations, DAL & FTW Construction, NCTCOG	\$\$			BP-02, ST-04
OW-04	DAL, FTW, & TRF	Establish Regular Training for Work Zone Technologies: Establish regular training sessions for TxDOT, education on work zone technologies, how and when each are most effective, installation procedures, and planning for budgets and contracts.	96	District Director of Construction		✓	✓			✓	TxDOT Traffic Safety Division, DAL & FTW Operations, DAL & FTW Construction, DAL & FTW Area Engineers, Local Transportation Agencies	\$			ST-03
OW-05	DAL & FTW	Manage Road Weather Equipment: Develop and provide training for operation, maintenance and asset management of road weather management equipment.	97	District Director of Maintenance						✓	DAL & FTW Operations, DAL & FTW Area Engineers, DAL & FTW Maintenance, Vendors	\$			
OW-06	DAL, FTW, & TRF	Develop a Traffic Signal Training and Staff Development Program: Develop and implement a formal training program to improve capability and staff development of TxDOT traffic signal staff and local partners.	98	District Transportation Engineering Supervisor	✓	✓		✓	✓	✓	TxDOT Traffic Safety Division, DAL & FTW Area Engineers, DAL & FTW Operations, DAL & FTW Signal Shops, Local Transportation Agencies	\$			CO-05
OW-07	DAL & FTW	Develop a Training Program and Career Advancement Process for Traffic Management Staff: Create a formal certification and training program as part of a clearly defined career advancement process for all traffic management operators.	99	District Director of Operations	✓	✓	✓			✓	TxDOT Traffic Safety Division, DAL & FTW Area Engineers, DAL & FTW Operations, DAL & FTW TMC Staff, Local Transportation Agencies	\$			

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Action No.	District or Division	 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	DAL & FTW	Conduct Quarterly TxDOT District TIM Meetings: Conduct quarterly meeting between TxDOT Dallas and TxDOT Fort Worth Districts.	101	District Director of Operations					✓	✓	DAL & FTW Operations, DAL & FTW Area Engineers, DAL & FTW Maintenance, DAL & FTW TMC Staff	\$	<div style="width: 25%;"></div>		OW-01	
CO-02	NCTCOG TRF & DAL	Expand the Regional TIM Team in the Dallas District: Partner with NCTCOG to expand the attendance and participation in the Regional TIM Team in the Dallas District and formalize after-action reviews.	102	District Director of Operations	✓	✓	✓	✓	✓	✓	TxDOT Statewide TIM Coordinator, DAL Operations, DAL Area Engineers, NCTCOG, Local Transportation Agencies, Local Public Safety Agencies	\$	<div style="width: 50%;"></div>		ST-02, OW-01, OW-02	
CO-03	DAL & FTW	Conduct After-Action Reviews for Major Incidents: Establish criteria for determining which incidents require after-action reviews and conduct reviews as needed.	103	District Director of Operations		✓	✓		✓	✓	TxDOT Statewide TIM Coordinator, DAL & FTW Area Engineers, DAL & FTW Operations, Local Transportation Agencies, Local Public Safety Agencies	\$	<div style="width: 25%;"></div>		PM-01, OW-01, OW-02	
CO-04	DAL & FTW	Include Planned Special Events in Traffic Management Team Meetings: Add discussion on planned special events and invite planned special event managers to the regional Traffic Management Team (TMT) meetings.	104	District Director of Operations		✓	✓		✓		DAL & FTW Area Engineers, DAL & FTW Operations, Local Transportation Agencies, Event Organizers	\$	<div style="width: 25%;"></div>		BP-05, PM-06	
CO-05	DAL, FTW, & TRF	Conduct Quarterly Signal Technician Forums: Conduct quarterly signal technician forums for TxDOT and partner agencies to improve collaboration, share best practices, and establish a regional competency regarding signal maintenance and operations.	105	District Traffic Engineer					✓	✓	✓	TxDOT Traffic Safety Division, DAL & FTW Area Engineers, DAL & FTW Operations, DAL & FTW Signal Shops, Local Transportation Agencies	\$	<div style="width: 25%;"></div>		OW-06
CO-06	DAL & FTW	Improve Signal Timing Coordination Across Jurisdictional Boundaries: Work with partner agencies to provide active assistance to NCTCOG in the development of incident and corridor timing plans.	106	District Traffic Engineer		✓	✓	✓	✓		DAL & FTW Area Engineers, DAL & FTW Operations, NCTCOG	\$	<div style="width: 25%;"></div>		ST-09	
CO-07	DAL & FTW	Create Contact List for Special Signal Timing Notifications: Create a service/email exchange contact list for notification of implementation of incident-based traffic signal timing plans.	107	District Director of Operations					✓	✓	DAL & FTW Area Engineers, DAL & FTW Operations, DAL & FTW Maintenance, Local Transportation Agencies	\$	<div style="width: 25%;"></div>		ST-08	
CO-08	DAL	Conduct Traffic Management Team Meetings with Cities: Conduct traffic management team meetings between the TxDOT Dallas District and cities on a regular basis similar to the TxDOT Fort Worth meetings.	108	District Director of Operations			✓		✓		DAL Area Engineers, DAL Operations, Local Transportation Agencies	\$	<div style="width: 25%;"></div>			

Figure 17: Implementation Schedule for Recommended TSMO Action Items

● TxDOT Dallas District ● TxDOT Fort Worth District ● TxDOT Traffic Safety Division

Action Item Name and Number	2021	2022		2023		2024		2025		2026
	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1
BUSINESS PROCESSES										
●● BP-01: Implement TIM Response Measures for Major Construction										
●● BP-02: Conduct Post-Construction Event Reviews										Ongoing
●● BP-03: Establish Procedures for Collecting and Analyzing Work Zone Road User Cost Data										
●● BP-04: Conduct After Action Reviews for Weather Events										Ongoing
●● BP-05: Conduct Post-Planned Special Event Reviews										Ongoing
● BP-06: Improve Local Partner Knowledge of Existing Agreements										Ongoing
●● BP-07: Establish Regional Resource Sharing Agreements										
● BP-08: Revise TxDOT Design Summary Report to Increase Emphasis on Operations										
●● BP-09: Support Regional Traffic Data Sharing Agreements										Ongoing
●● BP-10: Develop a Multi-Year TMS Maintenance Plan										
● BP-11: Develop TxDOT Dallas ITS Master Plan										
● BP-12: Establish Notification Process to Cities for Over Height/ Oversize Vehicles Permits										
SYSTEMS & TECHNOLOGY										
●● ST-01: Establish Standardized Radio Communications for TIM Response Dispatch Information										
●● ST-02: Develop and Implement Plan for Regional Courtesy/ Service Patrol Program Expansion										
●● ST-03: Utilize Decision Tool to Expand Work Zone Technology Deployments										
●● ST-04: Develop Automated Construction Notification Application										
●● ST-05: Provide Work Zone Closure Information through Third-Party Apps										Ongoing
● ST-06: Deploy Flood Warning and Closure Devices										
●● ST-07: Expand Planned Special Event Closure Information Through Third-Party Apps										Ongoing
●● ST-08: Establish Special Timing Plans										
●●● ST-09: Improve Regional Data and Video Sharing Capabilities										Ongoing
●● ST-10: Support Connected and Automated Vehicle Deployment and Smart Corridor Design										Ongoing

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● TxDOT Dallas District ● TxDOT Fort Worth District ● TxDOT Traffic Safety Division

Action Item Name and Number	2021	2022		2023		2024		2025		2026
	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1
PERFORMANCE MEASUREMENT										
●●● PM-01: Improve TIM Performance Collection and Reporting										
●●● PM-02: Develop Regional TIM Database										
●● PM-03: Measure Work Zone Travel Time Delay										Ongoing
●● PM-04: Establish a Work Zone Management Dashboard										
●● PM-05: Develop Online Weather Event Dashboards										
●● PM-06: Measure Planned Special Event Impacts										Ongoing
●● PM-07: Develop and Implement Advanced Traffic Signal Performance Measures										
● PM-08: Establish Standard Operating Procedures for District Traffic Management Systems Performance Measures										
● PM-09: Develop Implementation Plan for Regional Data Usage										
CULTURE										
●● CU-01: Prioritize Communicating Work Zone Information to Local Partners										
●● CU-02: Improve Communication of Road Weather Impacts and Response with Local Partners										
ORGANIZATION & WORKFORCE										
●●● OW-01: Provide Recurring Regional TIM Training										Ongoing
● OW-02: Establish Dedicated TIM Coordinator Position										
●● OW-03: Establish Dedicated Work Zone Coordinator Position										
●●● OW-04: Establish Regular Training for Work Zone Technologies										
●● OW-05: Manage Road Weather Equipment										
●●● OW-06: Develop a Traffic Signal Training and Staff Development Program										
●● OW-07: Develop a Training Program and Career Advancement Process for Traffic Management Staff										
COLLABORATION										
●● CO-01: Conduct Quarterly TxDOT District TIM Meetings										Ongoing
● CO-02: Establish a Formal Regional TIM Team in the Dallas District										
●● CO-03: Conduct After-Action Reviews for Major Incidents										Ongoing
●● CO-04: Include Planned Special Events in Traffic Management Team Meetings										Ongoing
●●● CO-05: Conduct Quarterly Signal Technician Forums										Ongoing
●● CO-06: Improve Signal Timing Coordination Across Jurisdictional Boundaries										
●● CO-07: Create Contact List for Special Signal Timing Notifications										
● CO-08: Conduct Traffic Management Team Meetings with Cities										



Detailed Recommendations – Business Processes

Within the CMM, business processes refer to an agency’s 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 12 shows the recommended Business Processes action items for the TxDOT Dallas and Fort Worth Districts.

Table 12: TxDOT Dallas and Fort Worth TSMO Action Items - Business Processes

CMM Capability Dimension	Action Item Number	Target District/ Division	Action Item Description
Business Processes 	BP-01	DAL & FTW	Implement TIM Response Measures for Major Construction
	BP-02	DAL & FTW	Conduct Post-Construction Event Reviews
	BP-03	DAL & FTW	Establish Procedures for Collecting and Analyzing Work Zone Road User Cost Data
	BP-04	DAL & FTW	Conduct After Action Reviews for Weather Events
	BP-05	DAL & FTW	Conduct Post-Planned Special Event Reviews
	BP-06	FTW	Improve Local Partner Knowledge of Existing Agreements
	BP-07	DAL & FTW	Establish Regional Resource Sharing Agreements
	BP-08	TRF	Revise TxDOT Design Summary Report to Increase Emphasis on Operations
	BP-09	DAL & FTW	Support Regional Traffic Data Sharing Agreements
	BP-10	DAL & FTW	Develop a Multi-Year TMS Maintenance Plan
	BP-11	DAL	Develop TxDOT Dallas ITS Master Plan
	BP-12	TRF	Establish Notification Process to Cities for Over Height/Oversize Vehicles Permits



BP-01: Implement TIM Response Measures for Major Construction

Focus Area:

Traffic Incident Management



Action Item Lead:

District Director of Construction

Partners:

DAL & FTW Construction, Operations, 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.

Emergency responders must have the ability to access incidents that occur within work zones. When first responders try to access an incident within a work zone, features like temporary concrete construction barriers and lack of available road shoulder width can significantly increase incident response times. TxDOT staff and public safety partners identified past instances where these barriers have existed within work zones.

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 construction 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.

Implementation Step #3: Incorporate the decision process into the Districts' 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: Conduct Post-Construction Event Reviews

Focus Area:

Work Zone Management



Action Item Lead:

District Director of Construction

Partners:

DAL & FTW Construction, DAL & FTW Operations, DAL & FTW Area Engineers, Local Transportation Agencies

Goals Addressed:

Safety	
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	✓
Integration	✓

Objective: Conduct post-construction event reviews to determine level of delay, evaluate safety, and determine potential areas of improvement.

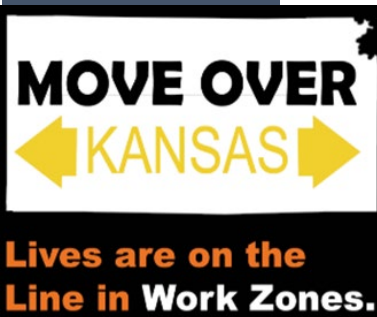
Stakeholders noted a need to conduct follow-up activities at the conclusion of major construction efforts in the Districts. While TxDOT staff monitor traffic operations and partner with contractors to effectively deploy ITS technologies that support operations during construction, no formal process exists for discussing and documenting successes and challenges related to these operations. Formalizing post-construction event reviews would provide a regular forum to revisit these topics.

Implementation Step #1: Establish criteria to determine when post-construction reviews are warranted, possibly based upon road user costs or safety impacts.

Implementation Step #2: Continually gather and routinely summarize operations and safety data in work zones during construction events.

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 unique 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. These reviews also provide an opportunity for TxDOT to compare the operations performance of a single work zone to the performance of other typical work zones throughout the Districts.



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-03: Establish Procedures for Collecting and Analyzing Work Zone Road User Cost Data

Focus Area:

Work Zone Management



Action Item Lead:

District Director of Operations

Partners:

DAL & FTW Construction, DAL & FTW Operations

Goals Addressed:

Safety	
Reliability	✓
Efficiency	
Customer Service	✓
Collaboration	
Integration	✓

Objective: Establish procedures for collecting work zone road user cost data occurring at significant projects and compare to predictions made during project development.

Large scale roadway construction projects can produce significant costs borne by motorists and the community at-large because of delays related to work zone activity closure. Previously, the TxDOT Dallas and Fort Worth Districts have been able to estimate these impacts, but have not been able to verify the estimates with collected data. Costs related to user travel delay can be calculated through smart work zone (SWZ) technology and probe-based data. Temporary travel time systems are one of the six SWZ systems within the TxDOT Smart Work Zone Guidelines that can be leveraged to calculate the reduced speed delay through the work zone while probe-data (i.e. Streetlight Data) can be leveraged for quantifying detour delay on detour routes.

Implementation Guidance: TxDOT Dallas and Fort Worth Districts should establish a methodology to gather and evaluate delay data on major construction projects. The data should be collected with the intent to review in real-time using data dashboards (see Action Item PM-04). The total road user cost also should be quantified and discussed in a post-construction event review (see Action Item BP-02) to support decision making for future work zone design and operation.

Expected Benefits: Quantifying and reviewing work zone road user costs allows for improved data-driven decision making on operations items such as work zone design, detour routing, and identifying times of the day or week to prioritize or avoid for lane or road closures. Incorporating this analysis into existing processes can reduce delay through work zones, provide the public with more accurate construction-related traveler information, and establish performance baselines for

Strategy and Best Practice

The Maryland State Highway Administration developed a real-time performance monitoring tool known as the Work Zone Performance Monitoring (WZPM) tool. The tool determines a user delay cost based on increased travel times calculated from average daily traffic (ADT), speed reduction factors, and delays. The program gathers information by aggregating third party probe data and real-time queue warning alerts. This tool helps measure work zone performance and validates incremental changes made to work zone practices, and it can also be used for higher-level review of WZM policy or practice.



BP-04: Conduct After Action Reviews for Weather Events

Focus Area:

Road Weather Management



Action Item Lead:

District Director of Operations

Partners:

DAL & FTW Operations, DAL & FTW Maintenance, Local Transportation Agencies

Goals Addressed:

Safety	
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	✓
Integration	✓

Objective: Conduct after action reviews to improve emergency weather event response times and lines of communication.

Stakeholders noted a need to conduct follow-up activities at the conclusion of major weather events that impact the Districts. Currently, no formal process exists for discussing and documenting successes and challenges related to road pretreatment, closure activities, and public information efforts related to RWM.

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

Implementation Step #2: Gather and summarize operations data, safety data, and anecdotal accounts of event impacts soon after weather events conclude and operations return to normal.

Implementation Step #3: When warranted, conduct post-weather event reviews that include TxDOT Operations and Maintenance staff, local partner agencies, and the NWS.

Expected Benefits: Holding after action reviews following weather events would allow TxDOT staff to revisit unique challenges or situations that arose in preparation for or during the event itself. Reviewing operations and safety data collected during the event allows for staff to assess the effectiveness of pretreatment approaches and of road closure activities and public information efforts related to the storm. Reviewing this data and comparing it to true conditions also permits each District to review the accuracy of deployed road weather information systems (RWIS) field devices and identify units that need replacement or recalibration. Maintenance section staff charged with activities such as ice prevention operations and execution of road closures can also use the forum provided by an after-action review to share issues they encounter in the field.



BP-05: Conduct Post-Planned Special Event Reviews

Focus Area:

Planned Special Events



Action Item Lead:

District Director of Operations

Partners:

DAL & FTW Construction, Operations, and Area Engineers, Local Transportation Agencies, Event Organizers

Goals Addressed:

Safety	
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	✓
Integration	✓

Objective: Conduct post-planned special event reviews to determine level of delay, evaluate safety, and determine potential areas of improvement.

Stakeholders noted a need to consistently meet with event organizers and other transportation agencies whose operations are impacted by special events, especially in the days following the conclusion of a special event that impacted traffic operations. While TxDOT staff noted that event operations are generally seen as a strength in both Districts, post-event reviews would allow for decision makers to revisit negative traffic impacts stemming from events and to determine whether these potentially could have been avoided through modified traffic operations.

Implementation Step #1: Establish criteria to determine when post-special event reviews are warranted, possibly based upon 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.

Implementation Step #3: When warranted, conduct post-special event reviews that include TxDOT Operations and Maintenance staff, local partner agencies, and event organizer representatives.

Expected Benefits: Holding post-special event reviews within several days of the conclusion of major events would allow TxDOT staff and event managers to discuss unique operational challenges or unexpected traffic impacts that arose during the project. 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.

Strategy and Best Practice

The FHWA published the Managing Travel for Planned Special Events Handbook in 2003 which regularly is 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. Daytona Beach, FL follows this format for the Daytona 500 race week events.



BP-06: Improve Local Partner Knowledge of Existing Agreements

Focus Area:

Traffic Signal Management



Action Item Lead:

District Director of Operations

Partners:

Operations, Area Engineers, Local Transportation Agencies

Goals Addressed:

Safety	
Reliability	
Efficiency	
Customer Service	✓
Collaboration	✓
Integration	

Objective: Improve local agency institutional knowledge of agreements involving municipal maintenance, signal maintenance, and illumination.

TxDOT and local agency partners encounter a lack of awareness or understanding at the local agency level of existing interlocal agreements that detail each agency's maintenance responsibilities with regards to traffic signals, street lighting, and other assets located on TxDOT right-of-way. Some agencies may no longer have copies of the original agreements resulting in confusion concerning who is responsible for operating and maintaining equipment and facilities.

Implementation Step #1: Districts should inventory existing interlocal agreements and target detailed reviews and updates to each agreement on a 20-year cycle, unless changes to deployed infrastructure necessitate more frequent updates.

Implementation Step #2: TxDOT should offer to meet with local agency partners to confirm that each agency is aware of and has copies of existing municipal maintenance agreements, to review the details of agreements that apply to each jurisdiction, and to identify whether any of the existing agreements might need to be updated or renegotiated.

Following the initial set of these meetings, the Districts should conduct follow-up meetings on an as-needed basis and when staff turnover occurs in leadership roles of local agency engineering or public works departments.

Implementation Step #3: The Districts should identify any agencies omitted from the inventory for which new municipal agreements are necessary. Due to rapid growth, municipal boundaries may include new incorporations adjacent to TxDOT facilities where the agency may have been previously excluded from any agreements.

Expected Benefits: Reiterating or redefining maintenance limits and responsibilities will reduce the time needed to address maintenance issues that arise from lack of clarity regarding who is responsible for addressing issues. This increased communication between TxDOT and local agencies will in turn increase the likelihood that local agencies include provisions within their budgets for maintenance of assets for which they are responsible, reducing liability concerns and allowing for operations and safety benefits typically associated with infrastructure that is kept in a state of good repair.



BP-07: Establish Regional Resource Sharing Agreements

Focus Area:

Traffic Signal Management



Action Item Lead:

District Director of Operations

Partners:

TxDOT TRF, DAL & FTW Operations, Local Transportation Agencies, NCTCOG

Goals Addressed:

Safety	
Reliability	
Efficiency	✓
Customer Service	
Collaboration	✓
Integration	

Objective: Pursue resource sharing agreements per the region’s ITS architecture, including agreements to share CCTV camera feeds as well as physical infrastructure such as conduit and fiber.

TxDOT maintains cooperative agreements with numerous jurisdictions for traditional traffic elements such as illumination and traffic signals; however, ITS devices, being relatively new, have not been included in many of these agreements. The regional infrastructure behind ITS has grown significantly in the last decade. TxDOT currently maintains a fiber-sharing agreement with the NTTA to better share costs of operating and maintaining ITS infrastructure. Many other agencies are starting to recognize the benefits of ITS and desire to have access to systems or to be involved in deployment activities when ITS is installed on roads within their jurisdiction. This necessitates new agreements that can be far more complex than the existing agreements.

Implementation Step #1: Catalog existing and proposed ITS installations, including communication capabilities as some facilities may only be capable of communicating to a centralized point or hub.

Implementation Step #2: Open dialogue with local agencies where the deployments are either installed or planned to be installed to determine interest in resource sharing as infrastructure is deployed or in sharing of camera feeds or other data.

Implementation Step #3: Follow up with agencies who have previously declined or have limited involvement. The region has experienced vast growth, and new projects and technology are constantly being developed to better manage the transportation network. Agencies who were previously uninterested or unable to participate may now be interested and able to participate.

Expected Benefits: Regional agreements can provide many benefits to the public. Some of the most-often cited ones include:

- Improved traffic incident verification and subsequent scene management,
- Improved inter-agency relationships and cross-jurisdictional coordination,
- Improved availability of timely and consistent traveler information, and
- Improved potential for project cost savings as multiple agencies deploy their own ITS devices on routes that are near one another.



BP-08: Revise TxDOT Design Summary Report to Increase Emphasis on Operations

Focus Area:

General Traffic Management



Action Item Lead:

District Director of TP&D

Partners:

TxDOT TRF, DAL & FTW Construction, DAL & FTW Operations, DAL & FTW Area Engineers, Local Transportation Agencies, NCTCOG

Goals Addressed:

Safety	✓
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	
Integration	✓

Objective: Revise the TxDOT Design Summary Report (DSR) form to increase focus on TSMO related strategies including smart work zones (SWZ) during construction, and traffic signals and ITS post-construction.

The current DSR is 15 pages in length and covers a wide range of topics from right-of-way to utilities to pavement to hydraulics. Unfortunately, there is only one question on the form related to ITS. Effective planning for TSMO involves many aspects that must be considered on every project, and as a result many key questions need to be identified as a part of project initiation.

Implementation Guide: Modify the DSR form to include consideration for the following, or similar questions related to TSMO:

- Which internal and external stakeholders were consulted with prior to the design, during design, and at the completion of design?
- If applicable, does the local governmental jurisdiction desire to maintain the responsibility for providing traffic signal timing during all phases of construction? If not, will the responsible area office staff perform these assignments?
- What actions were taken to consider safety and operations during and post construction?
- Can SWZ traffic control effectively increase traveler information, manage congestion, or reduce the likelihood of incidents?
- Will ITS devices be implemented in this project? If so, list device types that should be included.
- Will the proposed ITS devices previously mentioned be integrated into the statewide TMS software, Lonestar?
- Was TIM considered in the traffic control during construction?
- Do emergency response vehicles have access to the roadway during all stages of construction?
- What departments will be responsible for operations, maintenance, and safety during and after construction; are they aware of this project?

Expected Benefits: Considering TSMO benefits should begin with the initial planning and design of any project and carry all the way through post construction to maintenance and operations. Updating project development forms to better consider TSMO will increase the likelihood that those considerations will eventually be incorporated and constructed as part of the final project design.



BP-09: Support Regional Traffic Data Sharing Agreements

Focus Area:

General Traffic Management



Action Item Lead:

District Director of Operations

Partners:

DAL & FTW Operations, DAL & FTW Area Engineers, Local Transportation Agencies, Local MPOs, NCTCOG

Goals Addressed:

Safety	
Reliability	✓
Efficiency	
Customer Service	✓
Collaboration	✓
Integration	

Objective: Support NCTCOG agreements for sharing collected traffic data among local agencies.

NCTCOG serves to an extent as a regional transportation data repository for its member agencies, including the TxDOT Dallas and Fort Worth Districts. Through its operation of the region's 5-1-1 service, NCTCOG already publishes data from both private, third-party sources as well as partner agency sources. This regional service is important and TxDOT has been considering ways in which it can more performance and operations data to partners like NCTCOG and individual cities.

Implementation Guide: Continue to share data with regional partners through the execution and renewal of interagency agreements supporting data transfer to and from TxDOT. Formal efforts should engage the appropriate TxDOT contracts officer and legal department personnel for executing the agreements. Furthermore, data should be shared using published open data standards to the extent practical, meaning that data should be shared in a format that has a defined structure and utilizes open source, standard definitions (e.g., Traffic Management Data Dictionary (TMDD)).

Expected Benefits: Data sharing agreements memorialize verbal agreements between various interested parties and help establish a clear understanding of what each party is agreeing to, by when, and for how long; and if there is expected funds needed. Collecting data from all areas of the region provides the ability to make a comprehensive analysis of regional performance measures and/or statistics, and in certain environments like connected vehicles, provides the connectivity needed for regional travel. Sharing data also minimizes the redundancy of different agencies collecting the same traffic data, resulting in more efficient data collection by each agency.

Strategy and Best Practice

The Metropolitan Transportation Commission 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).



BP-10: Develop a Multi-Year TMS Maintenance Plan

Focus Area:

General Traffic Management



Action Item Lead:

District Maintenance Supervisor

Partners:

DAL & FTW Operations, DAL & FTW Maintenance

Goals Addressed:

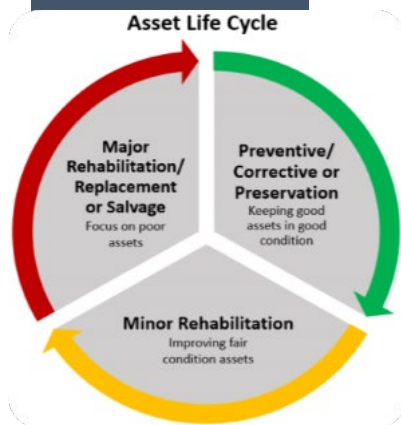
Safety	
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	
Integration	✓

Objective: Develop a multi-year TMS maintenance plan that includes replacement cycles, preventative maintenance, warranties, and procurement cycles.

Both TxDOT Districts identified the need to more actively record and track asset management data related to deployed TMS field devices such as CCTV cameras and DMS units. The development of a TMS maintenance plan would allow Districts to organize and collect available information regarding existing TMS devices and project when devices might require replacement.

Implementation Guide: Complete a formal inventory of all existing TMS assets in the Districts. Using that data, develop a TMS maintenance plan that projects when assets will require maintenance or replacement. Incorporate this information into the Districts' existing budgeting processes and other ITS plans. Update the formal TMS asset inventory as new devices are deployed or existing devices are repaired or replaced.

Expected Benefits: A TMS maintenance plan would allow for District staff to better manage TMS assets through proactive preventive maintenance and life-cycle device replacement activities. These activities will reduce the likelihood that TMS assets fail due to malfunctioning components that have remained in use beyond their intended design life. As a result, TMS asset uptime should increase. Planned maintenance and replacement activities are also often less expensive than emergency activities that might be required to quickly repair malfunctioning devices.



Strategy and Best Practice

The California Streets and Highway Code requires a 10-Year State Highway Operation and Protection Program (SHOPP) Plan and a 5-Year Maintenance Plan. The California DOT (Caltrans) developed the State Highway System Management Plan (SHSMP) to fulfill these requirements. The SHSMP assesses the current and future needs, funding, and performance measures of the State Highway System and provides a variety of rehabilitation and life-cycle planning strategies.



BP-11: Develop TxDOT Dallas ITS Master Plan

Focus Area:

General Traffic Management



Action Item Lead:

DAL Director of TP&D

Partners:

DAL Operations, DAL Area Engineers

Goals Addressed:

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

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

Internal stakeholders at the TxDOT Dallas District noted that they do not have a current Master Plan that identifies and prioritizes ITS device needs throughout the region. Currently, the District keeps an internal list of ITS needs and submits ITS device needs to NCTCOG regularly as a part of NCTCOG's calls for projects.

Implementation Guide: Develop an ITS Master Plan for the Dallas 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 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 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 projects are scored based on the goals and objectives of the ITS Master Plan as well as local needs in order to prioritize implementation.



BP-12: Establish Notification Process to Cities for Over-height and/or Oversize Vehicle Permits

Focus Area:

General Traffic Management



Action Item Lead:

District Director of Operations

Partners:

TxDOT TRF, DAL & FTW Operations, DAL & FTW Maintenance, Local Transportation Agencies

Goals Addressed:

Safety	✓
Reliability	
Efficiency	
Customer Service	
Collaboration	✓
Integration	

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

Cities within the TxDOT Dallas and Fort Worth Districts 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 oversized vehicles risk striking low structures, such as overpasses and signal mast arms. Occasionally a permitted over-height vehicle will have its own signal technician team to temporarily move signal mast arms that come into conflict with the vehicle, but cities will receive little to no warning of these activities and may lose communication with the signal or camera feeds.

Implementation Guidance: Both Districts, 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 route. The cities would also know in advance when and why the connection to a 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.



Detailed Recommendations – Systems & Technology

Systems and technology refer 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 13 shows the recommended Systems and Technologies action items for the TxDOT Dallas and Fort Worth Districts.

Table 13: TxDOT Dallas and Fort Worth TSMO Action Items – Systems & Technology

CMM Capability Dimension	Action Item Number	Target District/ Division	Action Item Description
Systems & Technology 	ST-01	DAL & FTW	Establish Standardized Radio Communications for TIM Response Dispatch Information
	ST-02	DAL & FTW	Develop and Implement Plan for Regional Courtesy/Service Patrol Program Expansion
	ST-03	DAL & FTW	Utilize Decision Tool to Expand Work Zone Technology Deployments
	ST-04	DAL & FTW	Develop Automated Construction Notification Application
	ST-05	DAL & FTW	Provide Work Zone Closure Information Through Third-Party Apps
	ST-06	FTW	Deploy Flood Warning and Closure Devices
	ST-07	DAL & FTW	Expand Planned Special Event Closure Information Through Third-Party Apps
	ST-08	DAL & FTW	Establish Special Timing Plans
	ST-09	DAL, FTW, & TRF	Improve Regional Data and Video Sharing Capabilities
	ST-10	DAL & FTW	Support Connected and Automated Vehicle Deployment and Smart Corridor Design



ST-01: Establish Standardized Radio Communications for TIM Response Dispatch Information

Focus Area:

Traffic Incident Management



Action Item Lead:

District Director of Operations

Partners:

DAL & FTW Operations, TxDOT TRF, DAL & FTW Public Information Offices, Local Public Safety Agencies

Goals Addressed:

Safety	✓
Reliability	
Efficiency	
Customer Service	
Collaboration	✓
Integration	✓

Objective: Establish documented standard communication protocol for timely public safety information sharing with TxDOT.

TxDOT operations staff have noted that they often do not receive timely incident information from first responders, a challenge that is even more impactful in instances where the incident occurs in locations without CCTV camera coverage. Not receiving this information prevents TxDOT from alerting travelers via DMS units in the field or the DriveTexas website. While certain public safety agencies communicate TIM information to TxDOT, there is no existing regional standard for what, when, and how this information should be shared or who should receive it.

Implementation Step #1: Review Districts' performance goals related to TIM and, from those, establish time-based expectations indicating by when TxDOT TMCs should ideally be notified of incidents that cannot be verified through existing deployed ITS. Also consider which types of incident-specific information are useful to the agency and incorporate these details into a draft communication protocol.

Implementation Step #2: In developing the protocol, collaborate with local first responder agencies to gauge implementation feasibility and determine how relevant information should be communicated in parallel with the management of an incident scene.

Implementation Step #3: Once the standard protocol has been agreed upon by all TIM parties, use of the protocol should be incorporated into existing agency academies and NCTCOG-led multidisciplinary TIM training programs.

Expected Benefits: If they were adhered to, standardized communication protocols for TIM response dispatch would allow for TxDOT and potentially other supporting agencies to be notified of developing traffic incidents sooner. In return, TxDOT would be able to inform the public of these incidents more quickly. Furthermore, sharing accurate incident details with TxDOT would allow its operations teams and maintenance sections to deploy proper traffic control and incident management responses, reducing the likelihood that multiple trips between the incident scene and maintenance yards would be required to properly work an incident. Reducing that likelihood would most likely translate to improved traffic control and reduced incident and roadway clearance times.



ST-02: Develop and Implement Plan for Regional Courtesy/Service Patrol Program Expansion

Focus Area:

Traffic Incident Management



Action Item Lead:

District Director of Operations

Partners:

DAL & FTW Operations, DAL & FTW Area Engineers, DAL & FTW TMC Staff, Dallas County Sheriff

Goals Addressed:

Safety	✓
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	
Integration	✓

Objective: Develop and implement a regional courtesy/service patrol plan for expansion considering network coverage, hours of operation, and baseline of services provided.

The TxDOT Dallas and Fort Worth Districts, NTTA, and Dallas County Sheriff each operate existing Service Patrol Programs (SPPs). Generally, these services are well-liked by regional transportation stakeholders and members of the public alike. Since these services are actively staffed, agencies make a significant fiscal commitment when establishing SPPs. As a result, TxDOT should study options for expanding SPP services to identify the opportunities that provide the greatest potential benefit.

Implementation Step #1: Develop an inventory of existing SPP services, outlining network coverage, hours of operation, baseline of services provided, and congestion levels and crash rates.

Implementation Step #2: Meet with regional freeway and toll road managers and service patrol operators to establish consistent performance goals, priorities for service expansion, and potential for pooling of resources and funding.

Implementation Step #3: Prioritize service expansion objectives internally at TxDOT and establish dedicated, ongoing budget items for highest-priority service patrol system growth. Considerations for expansion of service must also include procurement methods, integration and coordination among other existing SPP programs, and how dispatching and program administration would be handled through existing or planned TMC resources.

To evaluate existing and potential programs, the TxDOT Dallas and Fort Worth Districts should collect customer feedback and establish a method for quantifying program costs and benefits.

Expected Benefits: Several SPP benefits depend on the level of deployment and the services provided; however, an agency can generally expect an expanded SPP to reduce traffic incident duration, remove debris more quickly, provide assistance to stranded motorists and crash victims, and improve traffic control and incident scene management. Secondary benefits include improved traffic flow and safety because of reduced traffic incident duration.



ST-03: Utilize Decision Tool to Expand Work Zone Technology Deployments

Focus Area:

Work Zone Management



Action Item Lead:

District Director of Construction

Partners:

DAL & FTW Construction, DAL & FTW Operations, DAL & FTW Area Engineers, TxDOT TRF, TxDOT Construction Division

Goals Addressed:

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

Objective: Standardize an approach or decision tool for when to deploy certain work zone ITS technologies based on anticipated construction impacts. Expand deployment of work zone technology throughout both Districts to support improved work zone monitoring, localized real-time traveler information, end of queue warning, and worker safety.

The TxDOT Dallas and Fort Worth Districts expressed a need for considering innovative WZM strategies earlier in the construction planning process. While the Districts use contracting methods to require the use of WZM technology by contractors, no decision tool is currently used to determine in a standardized way when specific WZM technologies are warranted for a project.

Implementation Step #1: Review work zone ITS technologies included in the TxDOT Smart Work Zone (SWZ) Guidelines. Utilize the existing SWZ System Go/No-Go Decision Tool to select the appropriate SWZ ITS devices for a given project (Guidelines and Decision Tool located here: <https://www.txdot.gov/inside-txdot/division/traffic/smart-work-zones.html>)

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.

Implementation Step #4: Continuously identify existing SWZ strengths and weaknesses, investigate new technologies, and maintain guidelines with the most current technologies and strategies.

Expected Benefits: A decision tool for when to deploy certain work zone ITS technologies can increase the traffic flow within and safety of a work zone for motorists and construction workers by highlighting the technologies that would provide the greatest benefit given local road conditions.



ST-04: Develop Automated Construction Notification Application

Focus Area:

Work Zone
Management



Action Item Lead:

District Director of
Operations

Partners:

TxDOT TRF, DAL &
FTW Construction,
DAL & FTW
Operations, DAL &
FTW Maintenance,
DAL & FTW Area
Engineers, Local
Transportation
Agencies, Event
Organizers

Goals Addressed:

Safety	
Reliability	
Efficiency	✓
Customer Service	
Collaboration	✓
Integration	

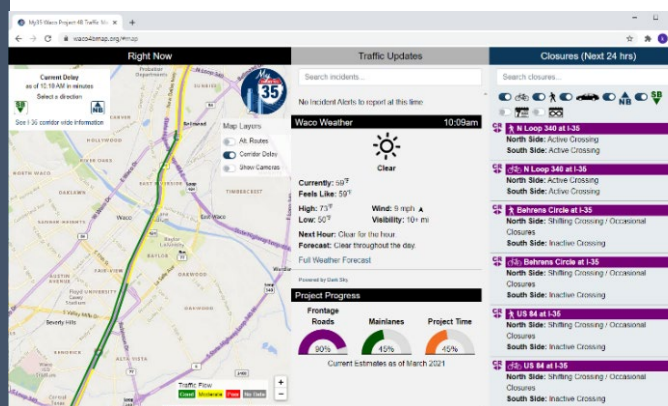
Objective: Develop a universal platform aimed at construction that will provide for notifications to self-subscribed users.

Any construction activity is a disruption to normal operating conditions – whether on a freeway or arterial, and whether the driving environment is urban or rural. Agencies rely upon different platforms for tracking construction events. TxDOT relies upon data entry into their Highway Conditions Reporting System (HCRS), which is the foundation for information used on the DriveTexas.org website. For off-system roadways (urban arterials) there is no consistent reporting system in use. In some cities there are active users of the existing regional 511DFW portal and the Waze Connected Citizen Program (Waze for Cities). Many area cities also have active public information officers (PIOs) that are active on social media platforms.

Implementation Step #1: Develop an enhanced data entry portal that can be used by TxDOT and local partners to input construction events. The portal would ideally be map-based so that updates for on-system and off-system roadways could be entered intuitively with minimal training required. Maintain integration with DriveTexas.org.

Implementation Step #2: Develop an event alert feature as part of the portal so that users can self-subscribe for any logged events within a geographic boundary and event date and time range.

Expected Benefits: The motoring public would receive advanced notice of construction activity on all roads throughout the region both on- and off-system, which is beneficial for daily commutes, identifying alternate routes, and overall travel. Neighboring cities will have access to better data related to construction events that may have an impact on their area roadways.



Strategy and Best Practice

The TxDOT Waco District has developed and refined a publicly accessible website that identifies graphically and tabular construction activity along the IH 35 corridor. Visit www.waco4bmap.org.



ST-05: 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, DAL & FTW Operations, DAL & FTW Construction

Goals Addressed:

Safety	
Reliability	✓
Efficiency	
Customer Service	✓
Collaboration	✓
Integration	✓

Objective: Partner with third-party navigation apps to expand and provide accurate information for travelers related to work zone closures.

Stakeholders noted a need to broadcast work zone closure information and related potential traffic impacts beyond the existing use of press releases, DMS, and the DriveTexas website. Each year more travelers rely on third-party navigation apps to route them while travelling, especially when navigating through urban areas where traffic patterns and best routes are especially susceptible to both typical congestion and atypical events that impact roadway capacity.

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 routed around them.

Implementation Guide: District operations staff should identify which navigation app vendors they wish to share work zone closure information with and then engage with representatives of those vendors to begin the program integration process. Districts should also update staff roles and responsibilities to assign duties of regularly providing this work zone closure information to vendors through “trusted provider” programs.

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 from the Waze Connected Citizens Program to push out information such as road closures, detour routes, and preferred routes through Waze 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 the implementation of targeted congestion mitigation strategies.



ST-06: Deploy Flood Warning and Closure Devices

Focus Area:

Road Weather Management



Action Item Lead:

FTW Director of Operations

Partners:

FTW Operations, FTW Maintenance, FTW Area Engineer

Goals Addressed:

Safety	✓
Reliability	
Efficiency	
Customer Service	✓
Collaboration	
Integration	✓

Objective: Implement technology for closing roads or warning drivers in areas that frequently flood.

The TxDOT Fort Worth District identified the need to install flood warning and closure devices at prioritized locations throughout the District. The District should select equipment that has been proven effective and reliable in other TxDOT districts. The TxDOT San Antonio District has deployed many flood warning devices in recent years and could be a good resource in identifying available deployment options. The reliability of road warning equipment is essential to provide drivers with accurate safety information while alerting operations and maintenance staff to weather events that require the dispatch of maintenance vehicles.

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.

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: An effective and reliable flood warning system increases alertness from motorists and operators of dangerous roadway conditions such as flooded roads. 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 cost is approximately \$75,000 per unit. The water level is transmitted to a cabinet near the stream crossing which activates flashers on warning signs. The device also transmits system status and water elevation to the central software application at the traffic operations center (TOC).



ST-07: Expand Planned Special Event Closure Information Through Third-Party Apps

Focus Area:

Planned Special Events



Action Item Lead:

District Public Information Officer

Partners:

Private Third-Party Providers, DAL & FTW Operations, DAL & FTW Public Information Offices, Event Organizers

Goals Addressed:

Safety	
Reliability	✓
Efficiency	
Customer Service	✓
Collaboration	✓
Integration	✓

Objective: Partner with third-party navigation apps to expand and provide accurate information for travelers related to planned special events.

TxDOT staff identified as a strength their partnerships with event promoters and management of traffic in the vicinity of many of the major event generators in the region. To build on this strength, staff identified an opportunity to expand the number of event organizers in the region that partner with third-party navigation apps to broadcast road closures and detours that are enacted due to ongoing special events.

Each year more travelers rely on third-party navigation apps to route them while travelling, especially when navigating through urban areas where traffic patterns and best routes are especially susceptible to both typical congestion and atypical events that impact roadway capacity. 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: District operations staff should identify which event generators are not currently sharing road closure impacts with third-party apps and should encourage those event generators to establish those 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 Districts 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-08: Establish Special Timing Plans

Focus Area:

Traffic Signal Management



Action Item Lead:

District Traffic Engineer

Partners:

DAL & FTW Operations, Local Agencies

Goals Addressed:

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

Objective: Establish special timing plans for alternate routes for planned special events and construction activities.

Large public events, such as concerts and sporting events, can place significant demand on roadway capacity. The times around the start and end of events can cause traffic volumes to exceed typical daytime peaks, which cause backups and delays across arterial road networks. Near construction zones, the reduced capacity, slower travel speeds, and increased demands on driver attention can lead to similar vehicular delays and queuing. Establishing special “flush” or “priority” timing plans to implement during these planned events can help to mitigate their traffic impacts.

Implementation Step #1: For special events, identify and catalog venues, significant events, dates, attendance, and jurisdictions in which they occur throughout the region, as well as signalized corridors whose operations are typically impacted.

Implementation Step #2: Coordinate with local jurisdictions to modify existing special event traffic action plans and road construction transportation management plans so that signal operations are considered as part of these documents.

Implementation Step #3: Refine or develop specialized timing plans for impacted corridors. The special event or construction event size will determine the effort needed to create these timing plans.

- For small events with no existing special signal timing, determine if there is an opportunity to implement special timing plans effectively.
- For events with existing special timing plans, determine if the existing timing plans can be expanded or improved. Identify signal locations which should be included and refine existing signal timing plans to accommodate the maximum estimated attendance to the event/venue.
- Large events or venues may require tiered timing plans based on the anticipated attendance.

Expected Benefits: Special timing plans can improve travel times and reliability, reduce queues and bottlenecking effects, and improve safety. When implemented successfully, special timing plans help to mitigate the overload in traffic congestion of the area surrounding a planned special event or construction event.



ST-09: Improve Regional Data and Video Sharing Capabilities

Focus Area:

General Traffic Management



Action Item Lead:

District Director of Operations

Partners:

TxDOT TRF, DAL & FTW Operations, DAL & FTW TMC Staff, Local Transportation Agencies

Goals Addressed:

Safety	
Reliability	
Efficiency	✓
Customer Service	
Collaboration	✓
Integration	✓

Objective: Use cloud-based technology platforms to overcome individual agency difference for data sharing such as CCTV camera video feeds and automated traffic signal performance measures (ATSPMs).

Several cities within the TxDOT Dallas District use a virtual Lonestar ATMS module to view and control TxDOT camera feeds when needed to assist with incident response or traffic operations. Other cities have expressed interest in sharing their camera feeds and other ITS asset information with TxDOT but establishing data connections between agencies by constructing a fiber link can be prohibitively expensive. TxDOT staff are interested in exploring more cost-effective options to gain access to partner agency ITS assets.

Implementation Guidance: Continue to extend TxDOT TMS asset access to local partners through the virtual Lonestar ATMS application currently shared with select cities in the TxDOT Dallas District. Consider investing in cloud-based communications interoperability software to make partner agency camera feeds and radio communications available to the Daltrans and TransVision TMCs (and emergency operations centers while they are activated) in real time. 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: Maintaining ITS assets so that camera feeds and DMS status, among other information, can be shared regionally among partners allows for any partners involved with 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.



ST-10: Support Connected and Automated Vehicle Deployment and Smart Corridor Design

Focus Area:

General Traffic Management



Action Item Lead:

District Director of Operations

Partners:

TxDOT TRF, DAL & FTW Operations, DAL & FTW Area Engineers, Local Transportation Agencies

Goals Addressed:

Safety	✓
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	
Integration	✓

Objective: Provide TxDOT District support to statewide and regional initiatives aimed at testing and deployment of connected and automated vehicles (CAV) and Smart Corridor Design.

The TxDOT Dallas and Fort Worth Districts have limited but continued active projects in their respective districts involving the connected vehicles environment. The Texas Connected Freight Corridor (TCFC), as noted in the example below, is deploying field infrastructure in Texas including Interstate Highway (IH) 35W and IH 45 in the DFW region. Within the DFW region there is also a plan to deploy ITS along the IH 30 corridor between IH 35W and IH 45 as part of a connected corridor approach. Also within the DFW region NCTCOG is actively providing grant funding to support the connected vehicle environment, including an effort to provide real-time traffic signal data to connected vehicles.

Implementation Guidance:

- The TxDOT Dallas and Fort Worth Districts should continue to support the TxDOT TRF TCFC projects in their Districts.
- The Districts should continue to support NCTCOG efforts in connected projects and look for opportunities to partner with local governmental agencies in deployment and piloting of technologies that foster CAVs.
- The Districts should consider assignment of District personal to one or more of the Cooperative Automated Transportation (CAT) coalition groups that promote policy, infrastructure, and planning for connected vehicles.
- The Districts should Participate in the Texas Technology Task Force meetings (Strategic Planning Division).
- The Districts should execute CV readiness plans as found in the FTW District ITS Master Plan and AASHTO documents.

Expected Benefits: The USDOT reports that connected vehicle safety applications will give drivers the tools they need to avoid potential crashes and significantly reduce the number of lives lost each year. Field testing also suggest that signal control applications can reduce travel time by up to 27 percent.



Strategy and Best Practice

The TCFC project will be Texas' largest deployment of connected vehicle technology aimed at making a significant reduction in the number and severity of crashes, congestion on major interstates that serve the nation, and fuel consumption of freight trucks. The vision is to create a sustainable connected vehicle environment that covers the 865-mile Texas Triangle of I-35 (including extension to Laredo), I-45, and I-10.



Detailed Recommendations – 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 14 shows the recommended Performance Measurement action items for the TxDOT Dallas and Fort Worth Districts.

Table 14: TxDOT Dallas and Fort Worth TSMO Action Items – Performance Measurement

CMM Capability Dimension	Action Item Number	Target District/ Division	Action Item Description
Performance Measurement 	PM-01	DAL, FTW, & TRF	Improve TIM Performance Collection and Reporting
	PM-02	NCTCOG, TRF, DAL & FTW	Develop Regional TIM Database
	PM-03	DAL & FTW	Measure Work Zone Travel Time Delay
	PM-04	DAL & FTW	Establish a Work Zone Management Dashboard
	PM-05	DAL & FTW	Develop Online Weather Event Dashboards
	PM-06	DAL & FTW	Measure Planned Special Event Impacts
	PM-07	DAL & FTW	Develop and Implement Advanced Traffic Signal Performance Measures
	PM-08	TRF	Establish Standard Operating Procedures for District Traffic Management Systems Performance Measures
	PM-09	TRF	Develop Implementation Plan for Regional Data Usage



PM-01: Improve TIM Performance Data Collection and Reporting

Focus Area:

Traffic Incident Management



Action Item Lead:

District Director of Operations

Partners:

TxDOT TRF, DPS and Local Law Enforcement, DAL & FTW Operations

Goals Addressed:

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

Objective: Improve TIM related data collection and reporting, with a focus on recording incident response time, roadway clearance time (RCT), incident clearance time (ICT), secondary crash data and time to return to normal flow on all incidents tracked in Lonestar.

The TxDOT Dallas and Fort Worth Districts actively track and report key TIM metrics in Lonestar as well as other general management metrics, such as travel time reliability and congestion/delay. However, data reporting is inconsistent due to gaps in camera coverage that prevent operators from tracking details such as the occurrence of secondary crashes and verifying the departure of responders on scene for recording ICT.

Implementation Step #1: Encourage TMC and service patrol operators to prioritize TIM data collection. Identify additional data sources to use as proxies for when cameras cannot be used to track incident details firsthand. 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 Operations Dashboard and regularly assess TIM performance to set program performance targets.

Expected Benefits: TIM data is important for after-action incident reviews 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 ICT is generally slower.

Strategy and Best Practice

The Maryland DOT has a program called Coordinated Highways Action Response Team (CHART). CHART staff maintain a database that tracks each traffic incident; cataloging the location, lane closures, and the number of vehicles involved. Through performance measurement and related resulting action items, CHART achieved a reduction of 13% to 41% in incident duration for each incident evaluation period, demonstrating the value of tracking performance and its emphasis resulting in significant percentage reductions in ICT.



PM-02: Develop Regional TIM Database

Focus Area:

Traffic Incident Management



Action Item Lead:

TxDOT Statewide TIM Coordinator

Partners:

NCTCOG, DPS, Local Law Enforcement, Local Transportation Agencies

Goals Addressed:

Safety	✓
Reliability	
Efficiency	
Customer Service	
Collaboration	✓
Integration	✓

Objective: Develop regional TIM database in partnership with NCTCOG and local agencies to track TIM quick clearance performance on routes throughout the DFW Region.

TIM data is currently logged into Lonestar for incidents that are tracked by DalTrans and TransVISION in the TxDOT Dallas and Fort Worth Districts. This data is reliable, but only available when CCTV camera coverage allows TMC operators to visually monitor an incident. NTTA also logs TIM data and DPS includes Incident Clearance Time (ICT), Roadway Clearance Time (RCT) and secondary crash data in the CRIS database. Crash data on other routes is ad hoc depending on the responding agency. Data from 911 dispatches may available to supplement current crash data.

Stakeholders identified a need to track and report on, at a minimum, the three national TIM performance measures (RCT, ICT, and secondary crashes) consistently across the region. The ultimate goal is to track all eight time points as recommended by FHWA in the TIM timeline. The NCTCOG 511 DFW maintained system may be an appropriate platform to collect all TIM data. NCTCOG is planning to migrate the 511 DFW system onto a non-proprietary platform in the near term and will have the opportunity to expand the system capabilities as part of this migration.

Implementation Plan: TxDOT, NTTA and NCTCOG should coordinate to determine the system requirements for a regional TIM database. The NCTCOG 511 DFW platform may be the appropriate system to manage the regional TIM database. If possible, NCTCOG should explore the possibility of incorporating TIM data from all sources in the region as part of their migration of the 511 DFW platform and begin pulling in data as part of a pilot program to build the regional TIM database. The system should be designed to be scaled up in the future to include additional sources of data including TIM data directly from local cities.

Expected Benefits: Tracking and reporting on TIM performance measures will provide the region with a means to focus efforts and funds. It is said: “what gets measured gets improved.” Collecting, reporting, and reviewing TIM performance measures will enable the region to target specific actions and improve overall response times.



PM-03: Measure Work Zone Travel Time Delay

Focus Area:

Work Zone Management



Action Item Lead:

Director of Construction

Partners:

DAL & FTW Operations, DAL & FTW Construction

Goals Addressed:

Safety	
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	
Integration	✓

Objective: Measure and report travel time delay in work zones.

TxDOT stakeholders identified a need for better tracking of work zone performance. While tools currently available provide some road user cost estimates during the planning of road work, these estimates are not verified against operations data later in the construction process. Technologies are currently available that would allow TxDOT Districts to collect this data, as described in Action Item ST-03.

Implementation Guide: Develop approaches to measure travel time delay in work zones of various sizes, either using field devices such as smart work zone units or techniques to process probe-based travel time data sources. Reference this data during construction events and during after-action reviews. Incorporate data feeds into summary dashboards available to operations staff.

Expected Benefits: Measuring travel time delay would allow for TxDOT Districts to better assess the operations and safety performance of their work zones. Regular reporting on this data would allow for the recommendation of focused improvements in individual work zones as well as tracking of regional work zone operations performance over time. Tracking regional performance will help TxDOT continue to set and revise attainable performance targets related to work zone operations.

Strategy and Best Practice

The Michigan Department of Transportation (MDOT) originally used stopwatches and later screenshots of Google Traffic to calculate travel delay by hand. MDOT began using the Regional Integrated Transportation Information System (RITIS) in 2013, which utilizes probe data. RITIS provides a faster, more accurate measure of delay and its attributor, such as a work zone, incident, or weather. This data is used to estimate user delay cost, which is analyzed to determine work zone modifications during construction and can be applied to future projects.



PM-04: Establish a Work Zone Management Dashboard

Focus Area:

Work Zone Management



Action Item Lead:

District Director of Construction

Partners:

DAL & FTW Construction, DAL & FTW Operations, DAL & FTW Maintenance, DAL & FTW Area Engineers

Goals Addressed:

Safety	
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	✓
Integration	

Objective: Establish a dashboard of key work zone performance measures that can be continually updated and viewed by agency personnel, other agencies, and the public.

The TxDOT Dallas and Fort Worth Districts expressed a need for innovative WZM strategies during construction projects. A valuable tool to monitor, support, and evaluate these strategies is through a WZM Dashboard. This action item is closely related to efforts in Action Item BP-03.

Implementation Step #1: Identify existing available data specific to work zones from deployed ITS devices, INRIX, and other sources.

Implementation Step #2: Develop a prototype dashboard using available data and reserving space for other identified data needs. For example, the dashboard could contain a work zone summary and name, a map of the work zone location, a work zone speed summary, work zone performance measures, and a speed heat map.

Implementation Step #3: Consider ease of integration into this data dashboard as other work zone performance data sources are identified and integrated.

Expected Benefits: Although assessment of traffic control performance in a work zone is important for future decision-making, the WZM dashboard would also allow for real-time identification of opportunities for improvement in mobility and safety that can be implemented while the work zone is still active. The creation of this dashboard could also allow for alerting systems to be implemented that might provide project staff with early notification of traffic issues in work zones as they are developing.

Strategy and Best Practice

University of Maryland developed techniques for computing work zone performance measures from multiple data sources and used this to create a prototype version of the work zone performance measures application. The application lists critical work zones, work zone locations, mobility performance through work zones, and allows the user to set customizable alerts.



PM-05: Develop Online Weather Event Dashboards

Focus Area:

Road Weather Management



Action Item Lead:

District Director of Operations

Partners:

DAL & FTW Area Engineers, DAL & FTW Maintenance

Goals Addressed:

Safety	✓
Reliability	✓
Efficiency	
Customer Service	✓
Collaboration	
Integration	✓

Objective: Develop online dashboards that provide summary statistics of response for weather events.

The TxDOT Dallas and Fort Worth Districts expressed the need for a way to monitor road conditions during winter weather and flooding events. One method for achieving this would be to set up a weather event data dashboard that could notify both TxDOT staff and the public of dangerous roadway conditions. This dashboard could be integrated with deployed road weather equipment, including the devices referenced in Action Item ST-06. Ideally, road weather devices would push notifications and conditions information directly to the dashboard.

Implementation Step #1: Identify data of interest to the public and to each District that can be easily tracked by maintenance sections or deployed field devices.

Implementation Step #2: Develop processes to collect and track that data online, transitioning existing paper recordkeeping wherever possible. Sources may include weather data from RWIS, NWS condition reports, and purchases of salt and material for winter maintenance.

Implementation Step #3: Prototype an internal dashboard to display total and maintenance section-specific data, and refine the dashboard prior to sharing with the public

Expected Benefits: An online weather event dashboard will help support achieving the Districts' RWM performance measurement goals. The dashboard supports weather event management by providing real-time information to TxDOT and to the public.



PM-06: Measure Planned Special Event Impacts

Focus Area:

Planned Special Events



Action Item Lead:

District Director of Operations

Partners:

DAL & FTW Operations, Local Transportation Agencies, Event Organizers

Goals Addressed:

Safety	
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	
Integration	✓

Objective: Measure and report travel time delay and other impacts of planned special events.

Stakeholders identified a need to better measure and quantify the traffic and safety impacts related to PSE, especially for regularly reoccurring events or at venue locations that regularly host events. While event organizers work with TxDOT to develop traffic control plans when on-system roadways are impacted, plans are currently most often modified or tweaked in response to anecdotal accounts of delay or safety concerns as opposed to real-time operations data.

Implementation Guide: Develop approaches to measure travel time delay along roads impacted by PSE operations and collect and review crash data in these locations once events are complete. Reference this data during PSE after-action reviews and in subsequent special event operations planning meetings if the event is a reoccurring one.

Expected Benefits: Measuring travel time delay and collecting and reviewing crash data would allow for both TxDOT Districts to better assess the operations and safety performance of traffic control plans used during PSE operations. Collecting and maintaining this data would allow for TxDOT Districts and event operators to review traffic control plans each year and to identify areas where operations might be modified to reduce delay or to mitigate the risk of crashes.



PM-07: Develop and Implement Automated Traffic Signal Performance Measures

Focus Area:

Traffic Signal Management



Action Item Lead:

District Director of Operations or District Traffic Engineer

Partners:

DAL & FTW Operations, DFW Area Engineers

Goals Addressed:

Safety	
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	
Integration	✓

Objective: Develop a formal program and implement necessary technology and software to support Automated Traffic Signal Performance Measures (ATSPM) operations on key District corridors.

Several cities across the Dallas-Fort Worth region, including the Cities of Irving and Frisco, have begun to collect and interpret ATSPM data from their signals. TxDOT staff from both Districts expressed interest in expanding the collection and use of ATSPM data along District signals on key corridors, including freeway frontage roads. TxDOT and TTI are currently reviewing ATSPM system capabilities and performance measures. The efforts include evaluating several ATSPM systems for future statewide system deployment, as well as guidelines to assist Districts in implementing systems that are recommended.

Implementation Step #1: Formalize the Districts' ATSPM program objectives by selecting performance measures to focus on, determining how ATSPM data will be managed and analyzed by District staff, and establishing criteria for prioritizing which signals and corridors would benefit most from the deployment of ATSPM technology.

Implementation Step #2: Inventory existing TxDOT traffic signal equipment. When the statewide ATSPM guidelines are available, it will be necessary to identify whether each TxDOT signal has equipment compatible with the proposed ATSPM system. Newer traffic signal locations are more likely to already be compatible but not all equipment may support ATSPM systems. These locations may be more budget friendly for ATSPM upgrades.

Implementation Step #3: Prioritize deployment locations for ATSPM technology and establish a budget item to support annual device procurement and installation. Single location upgrades can be the more cost-effective option for implementing ATSPM, but linear deployments along a major corridor stands to provide the greatest benefit.

Expected Benefits: ATSPM analysis allows for more effective signal timing plans, and the data can help Districts in reducing delay, reducing conflicting movements, supporting proactive maintenance activities, or pursuing other goals related to signal operations. Ultimately ATSPM deployments will provide relief to departments who experience staffing shortages, provide remote system diagnostics and analytics, as well as improve road user experience.



PM-08: Establish Standard Operating Procedures for District Traffic Management Systems Performance Measures

Focus Area:

General Traffic Management



Action Item Lead:

TxDOT TRF Traffic Management Section Director

Partners:

DAL & FTW Operations, DAL & FTW TMC Staff, TxDOT TRF

Goals Addressed:

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

Objective: Establish standard operating procedures to ensure consistency in how District Traffic Management Systems (TMS) performance measures are collected.

The TxDOT Fort Worth District identified a challenge with how TxDOT TMS performance measures are collected across the state. During major construction, when assets such as CCTV cameras may be out of service for planned extended periods of time, some districts do not count these assets in their TMS performance measures. Another challenge noted by the Fort Worth District is that the District includes CCTV cameras from NTTA within their Lonestar ATMS platform. These cameras are counted in the Fort Worth District TMS asset downtime if the cameras are out of service. Because the District does not own or maintain the NTTA assets, they have no control over the assets and believe they should not be part for their TMS performance measures. To ensure consistency in how the TMS performance measures are reported in all districts, standard operating procedures for collecting TMS asset uptime and other TMS performance measures should be developed and applied to all districts.

Implementation Guidance: The effort to establish standard operating procedures for the District TMS performance measures should be led by TxDOT TRF. Standard operating procedures should be developed so that they can be consistently applied to TMS performance measures equally across metro, urban and rural districts. Districts should participate in developing these standard operating procedures to ensure buy-in into the process for collecting performance measures.

Expected Benefits: Consistency in TMS performance measures will allow TxDOT to more accurately measure TMS performance and identify districts where additional support may be needed to improve TMS performance.



PM-09: Develop Implementation Plan for Regional Data Usage

Focus Area:

General Traffic Management



Action Item Lead:

TxDOT TRF Traffic Management Section Director

Partners:

TxDOT TRF, DAL & FTW Operations, DAL & FTW Area Engineers, Local Transportation Agencies

Goals Addressed:

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

Objective: Develop implementation plan to maximize the region’s utility of available probe-based INRIX and Streetlight data.

The TxDOT TRF recently executed a contract to obtain probe-based data to assist with agency operations and decision making. All TxDOT staff and local partner agencies have access to INRIX probe data, which provides real time speed and delay road link information aggregated from mobile phones and on-board navigation systems. TxDOT staff (but not partner agencies) also have access to Streetlight data, which provides origin-destination trip data to support traffic analyses. The TxDOT TRF is engaging with staff statewide to provide more information on how this data can be used to improve operations.

Implementation Guide: Develop an implementation plan that provides the TxDOT Dallas and Fort Worth Districts with direction on how to make use of available data to assist with activities such as:

- Traffic operations performance measurement
- Enhanced traveler information
- Traffic modeling, forecasting, and project-specific analysis
- Agency decision-making and budgeting processes

The implementation plan should also include an approach for sharing INRIX probe data capabilities with local agency partners through training and outreach activities.


Expected Benefits: A regional data implementation plan will allow the TxDOT TRF to achieve greater value from its contract with INRIX. It will also provide the TxDOT Dallas and Fort Worth Districts with a toolbox of strategies available to staff who want to use this data to improve regional traffic operations.



Detailed Recommendations – Culture

TSMO culture within an agency is dependent on engaged staff who adhere and implement TSMO goals. Staff can positively improve TSMO culture by critically analyzing daily activities to adhere to and meet program objectives. Considerations involved in creating a TSMO Culture include a technical understanding, strong leadership, outreach, and buy-in of program authority. Table 15 shows the recommended Culture action items for the TxDOT Dallas and Fort Worth Districts.

Table 15: TxDOT Dallas and Fort Worth TSMO Action Items - Culture

CMM Capability Dimension	Action Item Number	Target District/Division	Action Item Description
Culture 	CU-01	DAL & FTW	Prioritize Communicating Work Zone Information to Local Partners
	CU-02	DAL & FTW	Improve Communication of Road Weather Impacts and Response with Local Partners



CU-01: Prioritize Communicating Work Zone Information to Local Partners

Focus Area:

Work Zone Management



Action Item Lead:

District Public Information Officer

Partners:

DAL & FTW Area Engineers, DAL & FTW Construction, DAL & FTW Public Information Offices

Goals Addressed:

Safety	✓
Reliability	
Efficiency	
Customer Service	✓
Collaboration	✓
Integration	✓

Objective: Prioritize communication with local agencies regarding both initial construction notices and subsequent construction plan or schedule changes.

One common piece of feedback shared by local partners in the Dallas-Fort Worth region was that cities in either District were not always made aware of construction activities that were occurring on either freeways or state highways that passed through city boundaries. While city staff might be invited to preconstruction meetings and might be on lane closure alert lists or distribution lists for larger projects, some partners cited examples of not being aware of TxDOT road work activities underway in their cities. This lack of awareness often came as a result of changes to construction schedules that had not been communicated or had been buried among other construction notices and updates within the region.

Implementation Guide: Prioritize maintaining a line of communication regarding construction impacts as a key aspect of TxDOT’s ongoing partnership with local agencies within both Districts. While there are formal processes for outreach ahead of construction activities, the Districts can improve the way it communicates construction progress updates and any changes to schedule or lane impacts. While the District’s public information officer will generally capture and share these changes via an email list, many city staff may not be aware of this function or may need more direct and active communication from a TxDOT project manager to be able to pass along accurate information to colleagues and citizens.

Expected Benefits: Improved communication with local partners related to anticipated construction impacts contributes to the collaborative working relationship that TxDOT strives to maintain with its local partners. Local partners can amplify construction notices via their own public information channels.

Strategy and Best Practice

Houston, Texas uses TranStar, a multimodal transportation and emergency management center to plan, design, operate, and maintain the roads in the Greater Houston 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.



CU-02: Improve Communication of Road Weather Impacts and Response with Local Partners

Focus Area:

Road Weather Management



Action Item Lead:

District Public Information Officer

Partners:

DAL & FTW Operations, DAL & FTW Maintenance, DAL & FTW Public Information Officers, 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.

While the Districts have well-developed processes in place to prepare for and respond to severe weather events that may impact traffic operations, these activities and related traffic impacts are not always shared with local transportation agencies in cities whose constituents may have their travel plans impacted. In more rural parts of either District, where state highways tend to be the key thoroughfares passing through communities, information regarding when citizens can expect these roads to be pre-treated or cleared during winter weather is important to communicate

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 Districts 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 each District.



Detailed Recommendations – Organization & Workforce

The organization and staffing component of TSMO planning addresses how the program will be delivered through institutional and organizational changes. There are many ways to structure TSMO 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 retention. Table 16 shows the recommended Organization & Workforce action items for the TxDOT Dallas and Fort Worth Districts.

Table 16: TxDOT Dallas and Fort Worth TSMO Action Items – Organization & Workforce

CMM Capability Dimension	Action Item Number	Target District/ Division	Action Item Description
Organization & Workforce 	OW-01	NCTCOG, TRF, DAL, & FTW	Provide Recurring Regional TIM Training
	OW-02	DAL	Establish Dedicated TIM Coordinator Position
	OW-03	DAL & FTW	Establish Work Zone Coordinator Position
	OW-04	DAL, FTW, & TRF	Establish Regular Training for Work Zone Technologies
	OW-05	DAL & FTW	Manage Road Weather Equipment
	OW-06	DAL, FTW, & TRF	Develop a Traffic Signal Training and Staff Development Program
	OW-07	DAL & FTW	Develop a Training Program and Career Advancement Process for Traffic Management Staff



OW-01: Provide Recurring Regional TIM Training

Focus Area:

Traffic Incident Management



Action Item Lead:

TxDOT Statewide TIM Coordinator

Partners:

TxDOT Statewide TIM Coordinator, TxDOT TRF, DAL & FTW Operations, DAL & FTW TMC Managers, Local Transportation Agencies, Local Public Safety Agencies, NCTCOG

Goals Addressed:

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

Objective: Continue partnering with NCTCOG and other agencies to identify agencies that have not been involved with training and provide recurring regional TIM training in a multidisciplinary setting.

NCTCOG provides multiple TIM training classes and programs that are aimed at targeting a wide range of stakeholders, from first responders to executive level policy makers. The TxDOT Dallas and Fort Worth Districts actively attend and encourage engagement in the training classes; however, they recognize not all agencies are participating or attending. Effective TIM is performed through collaboration across multiple agencies involved with response. While championing involvement, TxDOT Dallas and Fort Worth Districts should follow these implementation steps to attempt to involve a larger group of stakeholder agencies in TIM training:

Implementation Step #1: Identify first responder and traffic management agencies in the region that have not recently participated in training.

Implementation Step #2: Identify existing training and/or develop new training as needed to meet regional TIM needs. (Note that this could be done in coordination with the TxDOT Statewide TIM Coordinator).

Implementation Step #3: Meet individually with identified agencies to encourage participation and identify barriers to participation.

Expected Benefits: Through a stronger collaborative effort with more trained stakeholders, the TxDOT Dallas and Fort Worth Districts can expect to reduce incident duration, to clear roadways faster, and to improve the management of traffic in the incident area. Secondary benefits may include improved traffic flow as a result of reduced incident duration, reduced travel times, fuel costs and vehicle emissions, improved travel time reliability, fewer secondary crashes, improved motorist and TIM responder safety due to the reduced likelihood of secondary crashes, and a reduction in the number of lanes closed during response to a given incident.



OW-02: Establish Dedicated TIM Coordinator Position

Focus Area:

Traffic Incident Management



Action Item Lead:

District Director of Operations

Partners:

TxDOT Statewide TIM Coordinator, TxDOT TRF, DAL Operations

Goals Addressed:

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

Objective: Establish a dedicated TIM coordinator position in the Dallas District to support TIM activities throughout this District.

The TxDOT Fort Worth District has designated one of its staff the responsibility to coordinate regional TIM activities such as subarea TIM Team meetings, to champion regional training efforts, and to serve as point person for the coordination of other TIM-related efforts such as regional service patrol programs and TIM data performance review activities. The TxDOT TRF has also created a role for a Statewide TIM Coordinator. The TxDOT Dallas District has not yet formally designated regional TIM coordination duties to a champion within its staff.

Implementation Guide: Either create a new full-time District TIM Coordinator position within the TxDOT Dallas District Operations or modify existing staff roles and responsibilities to allow an existing operations staff member to focus on TIM coordination duties at least half-time. This role should be organized within the District Operations and should report to the District Director of Operations. Work with the TxDOT Fort Worth District and TxDOT TRF to develop formal job responsibilities for the position.

Expected Benefits: Designating a TIM Coordinator in the TxDOT Dallas District would provide TxDOT and partner agency staff with a point person to direct TIM-related questions. The presence of a staff member whose role is to actively champion TIM efforts in the region will also help move forward regional initiatives related to incident management that have languished in the past due to a lack of available staff resources.



OW-03: Establish Dedicated Work Zone Coordinator Position

Focus Area:

Traffic Incident Management



Action Item Lead:

District Director of Construction

Partners:

TxDOT TRF, DAL & FTW Operations, DAL & FTW Construction, NCTCOG

Goals Addressed:

Safety	
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	✓
Integration	

Objective: Establish regional-level work zone coordinator position for coordination of construction closures to avoid conflicts and ensure communication to impacted stakeholders. (Note that this position may be staffed at TxDOT or possibly through NCTCOG.)

The construction coordinator will 'harvest' data related to planned construction activities from within the Districts and local cities within the Districts. This role could be accommodated using a contractor who may serve one or more districts. The Coordinator will need to work with TDOT Area Offices and local government agencies to resolve conflicts as they arise.

Generally, coordination of work zone activities between the Districts and local governments is ad hoc. There are many reports of frequent and reoccurring meetings between the Area Office and local government personnel to announce and coordinate their respective construction activities with local and regional impact. The challenge is that this level of coordination is not consistent, nor is the widespread distribution of planned construction activities other than respective social media campaigns.

Implementation Step #1: Leverage the automated construction notification application identified in Systems & Technology. This tool may be populated and/or used by the construction coordinator.

Implementation Step #2: Provide an electronic report of the notification to all District and local agency public information offices.

Implementation Step #3: Meet regularly with appropriate District and local agency personnel to distribute and coordinate construction activity information. This should be done in conjunction with existing regularly scheduled meetings.

Implementation Step #4: The above steps should be performed routinely, perhaps monthly.

Expected Benefits: Knowledge of construction activity that will have minimal to major impacts to the traveling public can have positive impacts to emergency response fleets, first responders, and transit agencies.



OW-04: Establish Regular Training for Work Zone Technologies

Focus Area:

Work Zone Management



Action Item Lead:

District Director of Construction

Partners:

TxDOT TRF, DAL & FTW Operations, Construction, Area Engineers, Local Transportation Agencies

Goals Addressed:

Safety	
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	
Integration	✓

Objective: Establish regular training sessions for TxDOT staff that provide education on available work zone technologies, how and when each are most effective, installation procedures, and planning for budgets and contracts.

The TxDOT Dallas and Fort Worth Districts agreed that WZM and technology implementation is done well for large construction projects, but technology applications for smaller projects are often overlooked. This may occur because many smaller projects are managed by area office staff that are unfamiliar with the availability of technologies to support traffic operations and safety in work zones.

Implementation Step #1: Take inventory of existing and desired work zone technology deployments.

Implementation Step #2: Identify internal experts for existing deployments and external training resources for desired deployments.

Implementation Step #3: Establish and lead regular training sessions for operations, construction, and area engineer staff. Update trainings based on improvements to existing deployments, as well as new technologies and strategies that become available.

Expected Benefits: Providing regular trainings that cover current best practices in available WZM technology will allow TxDOT staff to make informed decisions on which tools to deploy for certain work zones. Making staff aware of the technologies that are available may increase the number of projects for which these technologies are used, thereby increasing the number of work zones in each District that deploy technology to support traffic operations, traveler information, and road worker and road user safety.

Strategy and Best Practice

The Virginia Department of Transportation (VDOT) has three training courses for Work Zone Traffic Control (WZTC). For installing temporary traffic control devices there is a one-day Basic WZTC course. There is a two-day Intermediate WZTC course for inspectors and contractor superintendents. Another two-day Advanced WZTC course was implemented for the design of traffic control plans. VDOT requires that every design team must have a member who has completed the Advanced course. Every installation crew must have at least one Basic WZTC trained member and a supervisor who has completed the Intermediate course.



OW-05: Manage Road Weather Equipment

Focus Area:

Road Weather Management



Action Item Lead:

District Maintenance Supervisor

Partners:

DAL & FTW Operations, DAL & FTW Area Engineers, DAL & FTW Maintenance, Vendors

Goals Addressed:

Safety	
Reliability	
Efficiency	
Customer Service	
Collaboration	
Integration	✓

Objective: Develop and provide training for operation, maintenance, and asset management of road weather management equipment.

Stakeholders noted a need to grow the institutional capacity within each District to operate and manage the region’s deployed RWM equipment. Much of the equipment was deployed 15 or more years ago, and many of the staff who maintained and used the equipment when it was initially deployed have either retired or moved to a new job. As a result, there are existing knowledge gaps as to the age and working condition of some of the field devices that have been deployed. In some cases, deployed devices are no longer used because they no longer provide reliable information and are not actively maintained.

Implementation Step #1: Inventory existing road weather technology deployments within the Districts.

Implementation Step #2: Determine which road weather technologies are still actively in use and identify internal experts and external resources to support capable operation and maintenance of those technologies.

Implementation Step #3: Establish and regularly conduct road weather technology training sessions for District Operations and Maintenance staff.

Expected Benefits: Building the institutional capacity to better manage existing and future road weather equipment will improve the Districts’ ability to properly maintain and operate the equipment. In turn, these actions will increase the likelihood that the equipment functions reliably and that the information these devices provide can be interpreted by staff to assist with TxDOT’s decision-making processes when needed during flooding or winter weather events.



Strategy and Best Practice

The Minnesota Department of Transportation (MnDOT) is the lead agency for Clear Roads, a program for researching weather maintenance materials, equipment, and methods for highway maintenance crews. Clear Roads provides hands-on and online webinar training for operating and supervising various road weather management equipment.



OW-06: Develop a Traffic Signal Training and Staff Development Program

Focus Area:

Traffic Signal Management



Action Item Lead:

District Transportation Engineering Supervisor

Partners:

TxDOT TRF, DAL & FTW Area Engineers, DAL & FTW Operations, DAL & FTW Signal Shops, Local Transportation Agencies

Goals Addressed:

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

Objective: Develop and implement a formal training program to improve capability and staff development of TxDOT traffic signal staff and local partners.

Staff from both TxDOT Districts (as well as local agency partners) noted that one of the largest challenges related to the Organization & Workforce capability dimension was the difficulty agencies across the region have with hiring and retaining qualified traffic signal technicians. Within TxDOT, these challenges extended to hiring and retaining ITS design staff as well. Many technicians who leave one agency are soon hired by another agency within the region, so efforts focused on increasing training opportunities available to signal technicians, both internal to TxDOT and externally, stand to benefit signal operations among agencies regionwide.

Implementation Step #1: Identify available internal TxDOT trainings for signal technicians and design staff, and set internal District goals to have a certain number of staff complete those training programs each year.

Implementation Step #2: Identify capacity-building training opportunities offered either by TxDOT or external trade associations, such as the National Electrical Manufacturers Association, and explore opportunities to pool funding with local agency partners and NCTCOG to organize regional training opportunities (potentially as part of regional signal forums recommended in Action Item CO-05).

Implementation Step #3: Create new or modify existing signal technician and signal staff development plans so that completion of appropriate training is a requirement of overall career development for these TxDOT staff.

Expected Benefits: Making it easier for signal staff to access training will improve the overall level of capability among the region’s technicians and designers. Technicians will have better working familiarity of the signal controller types deployed throughout the region, ideally reducing the time required to address maintenance issues. ITS and signal designers will have better familiarity with existing internal TxDOT design standards as well as other state and national best practices in design, which can reduce the frequency with which common safety or operations-related pitfalls are included in designs.



OW-07: Develop a Training Program and Career Advancement Process for Traffic Management Staff

Focus Area:

General Traffic Management



Action Item Lead:

District Director of Operations

Partners:

TxDOT TRF, DAL & FTW Area Engineers, DAL & FTW Operations, DAL & FTW TMC Staff, Local Transportation Agencies

Goals Addressed:

Safety	✓
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	
Integration	✓

Objective: Create a formal certification and training program as part of a clearly defined career advancement process for all traffic management operators.

Both TxDOT Districts employ staff that work as operators at the Daltrans TMC (in the Dallas District) and the TransVision TMC (in the Fort Worth District). These operators are key staff at the front lines of many TSMO-related efforts, including TIM, emergency management operations, WZM, and traveler information.

Capabilities among operators are generally passed down from more senior operators to newer team members, but there is no existing formal training and certification program in place to establish a base level of capabilities among TMC operators.

Implementation Step #1: Interview existing TMC managers and other operations staff to develop a list of abilities that each District considers as essential functions required of TMC operators. Develop a separate list of abilities that each District considers as other supporting functions of TMC staff that benefit operations and further TSMO objectives within the region.

Implementation Step #2: Develop or adapt other districts' internal training content that addresses functions from both lists described in Step 1. Content should be organized into modules that focus on different roles that operators have or different programs that they use in the course of their duties.

Implementation Step #3: Organize training modules for essential functions into a formal certification program and require operators to complete these modules within a certain timeframe from the date of hire. Offer training opportunities for other supporting functions in both a virtual, on-demand format and as part of scheduled presentations specifically for TMC operators.

Expected Benefits: Formalizing a certification and training program that is required of all TMC operators upon hiring will establish a standard across both Districts regarding how TMC operators are expected to assist with traffic management challenges. In time, both internal and external partners will have a more consistent expectation of how best to partner with TMC staff to more effectively manage traffic incidents, freeway work zones, and other events that have traffic impacts.



Detailed Recommendations – Collaboration

The TSMO collaboration component is vital to emphasize the importance of partner agencies and stakeholders to work 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 throughout implementation of projects, programs, and services. Considerations should include partnerships among different levels of government, stakeholder collaboration, partnerships with public safety agencies, internal agency collaboration, and partnerships with the private sector. Table 17 shows the recommended Collaboration action items for the TxDOT Dallas and Fort Worth Districts.

Table 17: TxDOT Dallas and Fort Worth TSMO Action Items - Collaboration

CMM Capability Dimension	Action Item Number	Target District/ Division	Action Item Description
Collaboration 	CO-01	DAL & FTW	Conduct Quarterly TxDOT District TIM Meetings
	CO-02	NCTCOG, TRF & DAL	Expand the Regional TIM Team in the Dallas District
	CO-03	DAL & FTW	Conduct After-Action Reviews for Major Incidents
	CO-04	DAL & FTW	Include Planned Special Events in Traffic Management Team Meetings
	CO-05	DAL, FTW, & TRF	Conduct Quarterly Signal Technician Forums
	CO-06	DAL & FTW	Improve Signal Timing Coordination Across Jurisdictional Boundaries
	CO-07	DAL & FTW	Create Contact List for Special Signal Timing Notifications
	CO-08	DAL	Conduct Traffic Management Team Meetings with Cities



CO-01: Conduct Quarterly TxDOT District TIM Meetings

Focus Area:

Traffic Incident Management



Action Item Lead:

District Director of Operations

Partners:

DAL & FTW Operations, DAL & FTW Area Engineers, DAL & FTW Maintenance, DAL & FTW TMC Staff

Goals Addressed:

Safety	
Reliability	
Efficiency	
Customer Service	
Collaboration	✓
Integration	✓

Objective: Conduct quarterly TIM meetings between TxDOT Dallas and TxDOT Fort Worth Districts.

Both the TxDOT Dallas and Fort Worth Districts discuss TIM initiatives internally, and the Fort Worth District participates in regional TIM team meetings with other local partners in their jurisdiction. Currently, TIM stakeholders from both Districts meet annually to complete the region’s TIM self-assessment as requested by FHWA, but there are no other existing standing meetings to allow operations staff from both Districts to convene to discuss TIM initiatives

Implementation Guidance: Schedule a quarterly standing meeting to discuss TIM, involving staff from both Districts. Include operations staff, TMC managers, and the TxDOT Statewide TIM Coordinator as part of these discussions. Also invite representatives from other District departments, area offices, and maintenance sections as needed. Discussion topics may include internal after-action reviews of major incidents, updates related to TIM from TxDOT Traffic Safety Division Staff, presentations of lessons learned from either internal staff or external TIM partners, and review of District-wide performance measurements related to TIM.

Expected Benefits: Conducting quarterly TIM meetings between districts and limiting these meetings to TxDOT staff will allow for both Districts to address TIM-related challenges and initiatives candidly among internal personnel. The Districts will also be able to use these meetings to discuss the progress of regional TIM initiatives either championed by or specific to TxDOT, including internal TMC operations, progress on regional plans to expand TIM-related services such as safety service patrols, or TIM considerations for upcoming District major construction projects.



CO-02: Expand the Regional TIM Team in the Dallas District

Focus Area:

Traffic Incident Management



Action Item Lead:

District Director of Operations

Partners:

TxDOT Statewide TIM Coordinator, DAL Operations, DAL Area Engineers, NCTCOG, Local Transportation Agencies, Local Public Safety Agencies

Goals Addressed:

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

Objective: Partner with NCTCOG to expand the attendance and participation in the Regional TIM Team in the Dallas District and formalize after-action reviews.

The TxDOT Fort Worth District has four TIM Teams organized by geographical regions, and stakeholders are in the process of reorganizing these into six TIM teams. The TIM Teams have proven effective in establishing the interagency relationships necessary for coordinating quick responses to traffic incidents. The Dallas District currently has one TIM Team that meets regularly. If there is sufficient interest, attendance at the Dallas TIM Team meeting could be increased or multiple TIM Teams could be formed. The TxDOT Dallas District and NCTCOG also identified the opportunity to incorporate more regular after-action incident reviews into the agendas of Dallas TIM Team meetings.

Implementation Step #1: Identify first responder and traffic management agencies in the Dallas area that have not regularly participated on the TIM Team.

Implementation Step #2: Meet individually with the identified agencies to encourage participation and identify barriers to participation.

Implementation Step #3: Incorporate a standing agenda item for after action incident reviews, with incidents to review selected by TIM Team leadership for each meeting when applicable. TxDOT has an After Action Report (AAR) form (see Appendix C) for TIM to outline details such as what agencies were involved, what resources were needed, what went well, training needs, and lessons learned.

Expected Benefits: TIM is a highly coordinated process to detect, respond to, and remove traffic incidents and restore traffic capacity as safely and quickly as possible. This coordinated process involves several public and private sector stakeholders and works best when a formal TIM Team exists to build interagency relationships away from the incident scene. These interagency relationships represent a benefit that often permits quicker and better coordinated incident response. This in turn improves traffic flow, reduces travel times, improves travel time reliability, and improves motorist and TIM responder safety.



CO-03: Conduct After-Action Reviews for Major Incidents

Focus Area:

Traffic Incident Management



Action Item Lead:

District Director of Operations

Partners:

TxDOT Statewide TIM Coordinator, DAL & FTW Area Engineers and Operations, Local Transportation and Public Safety Agencies

Goals Addressed:

Safety	
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	✓
Integration	✓

Objective: Establish criteria for determining which incidents require after-action reviews and conduct reviews as needed.

The TxDOT Dallas and Fort Worth Districts do not have a standard protocol for conducting after-action reviews following major traffic incidents. The Districts also identified collaboration among agencies and communication on scene as ongoing challenges in the region. This ongoing lack of coordination between agencies could be addressed in part by formalizing a process for conducting after-action reviews following significant traffic incidents, or following traffic incidents where the management process did not go as planned.

Implementation Step #1: Establish formal thresholds that determine when after-action incident reviews are warranted. For example, if a crash takes a certain amount of time or longer to be cleared or if a crash involves more than a specified number of vehicles, then a review could be required.

Implementation Step #2: Develop a review meeting format based upon existing statewide guidance. TxDOT has an After Action Report (AAR) form (see Appendix C) for TIM to outline details such as what agencies were involved, what resources were needed, what went well, training needs, and lessons learned.

Implementation Step #3: Conduct after-action incident reviews with all agencies that were involved in the response. The Statewide AAR form includes a checklist to ensure that every piece of information about the incident is recorded and analyzed.

Expected Benefits: Identifying what worked well and what needs to be improved during incident response and clearance is essential in minimizing delays, which in turn can reduce other incident issues, such as the occurrence of secondary crashes. Without after-action reviews, responders do not have an ability to collaboratively revisit past incidents that provided challenges in scene management.

Strategy and Best Practice

Virginia's Department of Transportation's (VDOT) Operations Division produced an instructional and informational memorandum (IIM) to establish a standard operating procedure for After Action Reviews (AAR). The document outlines criteria for when an AAR should be conducted and the process in which it should be done. This IIM includes a facilitator's guide, AAR report contents, and various input forms for those involved in the incident and review process.



CO-04: Include Planned Special Events in Traffic Management Team Meetings

Focus Area:

Planned Special Events



Action Item Lead:

District Director of Operations

Partners:

TxDOT TRF, DAL & FTW Operations, DAL & FTW Maintenance, Local Transportation Agencies

Goals Addressed:

Safety	
Reliability	✓
Efficiency	✓
Customer Service	
Collaboration	✓
Integration	

Objective: Add discussion on planned special events and invite planned special event managers to the regional Traffic Management Team (TMT) meetings.

Special events can cause large traffic impacts which are exacerbated when not planned for properly. Typically, traffic control plans are created for large events without any additional deployment of operational strategies or technologies to share real-time information with stakeholders and motorists. There are many proven transportation countermeasures to reduce unnecessary traffic delays that many special event managers can work with the TxDOT Dallas and Fort Worth Districts to implement.

Implementation Guidance: Special event planning and coordination should be discussed as part of existing regional TMT meetings where staff can gather information from event managers such as location, time, duration, and demand expected for their PSE. TxDOT Dallas and Fort Worth Districts should then consider methods to minimize the effects these events may have on traffic.

Some large events that could be considered for special event TMT meetings are listed below.

- AT&T Red River Showdown
- BMW Dallas Marathon
- State Fair of Texas
- Dallas Saint Patrick’s Day Parade and Festival
- Deep Ellum Arts Festival
- Fort Worth Stock Show and Rodeo

Expected Benefits: The proactive planning and management of travel for PSE yields numerous benefits to transportation system operations, including:

- Reduced traffic congestion
- Improved mobility
- Improved partnerships among transportation agencies and event organizers
- Opportunities to share resources in support of event management
- Opportunities to incorporate new procedures, plans, and practices into regional event management operation



CO-05: Conduct Quarterly Signal Technician Forums

Focus Area:

Traffic Signal Management



Action Item Lead:

District Traffic Engineer

Partners:

TxDOT TRF, DAL & FTW Area Engineers, Operations, and Signal Shops, Local Transportation Agencies

Goals Addressed:

Safety	
Reliability	
Efficiency	
Customer Service	✓
Collaboration	✓
Integration	✓

Objective: Conduct quarterly signal technician forums for TxDOT and partner agencies to improve collaboration, share best practices, and establish a regional competency regarding signal maintenance and operations.

Signal technicians working both for TxDOT and other local agencies often manage signals that are similar in terms of deployed technology and configurations. The capability of each agency’s technicians, however, is largely dependent upon the agency’s institutional knowledge and capability to train and retain their technicians. Stakeholders expressed interest in organizing quarterly 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 quarterly 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 that support traffic signal operations and maintenance

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



CO-06: Improve Signal Timing Coordination Across Jurisdictional Boundaries

Focus Area:

Traffic Signal Management



Action Item Lead:

District Traffic Engineer

Partners:

DAL & FTW Area Engineers, DAL & FTW Operations, NCTCOG

Goals Addressed:

Safety	
Reliability	✓
Efficiency	✓
Customer Service	✓
Collaboration	✓
Integration	

Objective: Work with partner agencies to provide active assistance to NCTCOG in the development of incident and corridor timing plans.

Traffic signal coordination and timing improvements are an ongoing effort that agencies implement to mitigate the effects of constantly changing traffic patterns. Traffic signal corridor plans and incident response timing plans should be evaluated approximately every three years. Stakeholders from across the region noted a need for better cooperation between agencies on signal corridor retiming efforts for corridors that extend across jurisdictional boundaries.

Implementation Guidance: Coordinate with adjacent jurisdictions and NCTCOG when conducting corridor signal retiming efforts along arterial corridors that cross jurisdictional boundaries, and encourage local partner agencies to do the same. As TxDOT develops updates to its existing timing plans, staff should contact neighboring jurisdictions to request timing plan information for signals that those agencies maintain. Coordination on corridor-specific signal timing efforts can also occur as part of planned forums and meetings described in Action Items CO-05 and CO-08.

Expected Benefits: Developing or updating signal timing plans and incident timing plans in coordination with partner agencies offers many benefits to the traveling public. These efforts increase mobility along corridors by facilitating the orderly movement of traffic and increasing vehicle throughput at signalized intersections. Coordination will help ensure that those benefits extend along the full length of a corridor, regardless of which agency is operating and maintaining each signal.



CO-07: Create Contact List for Special Signal Timing Notifications

Focus Area:

Traffic Signal Management



Action Item Lead:

District Director of Operations

Partners:

DAL & FTW Area Engineers, DAL & FTW Operations, DAL & FTW Maintenance, Local Transportation Agencies

Goals Addressed:

Safety	
Reliability	
Efficiency	
Customer Service	
Collaboration	✓
Integration	✓

Objective: Create a service/email exchange contact list for notification of implementation of incident-based traffic signal timing plans.

Special signal timing plans and coordination may at times be implemented on short notice in response to unexpected conditions. Often, public safety officials or maintenance personnel note that the implementation of special signal timing plans would be beneficial, but they are unsure of who to contact to put these plans into place. Furthermore, when these timing plans are put into place, their traffic effects often spill over to other parts of an arterial signal network. TxDOT staff and their partners identified a need to create a contact list to assist with dissemination of special signal timing information to other transportation agency partners in the region.

Implementation Guide: Coordinate with local jurisdictions to identify personnel responsible for special event and incident signal timing throughout the Dallas-Fort Worth Region. Ideally, a single point of contact would be identified for each jurisdiction as well as a backup point of contact. However, there may be a variety of personnel responsible within a jurisdiction either depending upon time of day or area within the jurisdiction. Compile these contacts into a distribution list and provide the distribution list to all personnel and agencies. Request that agencies use the list to contact their partners when they are implementing signal timing changes that may lead to traffic impacts on signal systems managed by others.

Expected Benefits: Maintaining a contact list for signal timing notifications will expedite communication and reduce the time needed to determine availability of personnel for implementing or terminating special signal timings. It will also allow for notification of these signal timings to be passed along to those operating signal systems nearby who could experience unusual traffic patterns due to the timing changes.



CO-08: Conduct Traffic Management Team Meetings with Cities

Focus Area:

General Traffic Management



Action Item Lead:

District Director of Operations

Partners:

DAL Area Engineers, DAL Operations, Local Transportation Agencies

Goals Addressed:

Safety	
Reliability	
Efficiency	✓
Customer Service	
Collaboration	✓
Integration	

Objective: Conduct traffic management team meetings between the TxDOT Dallas District and cities on a regular basis similar to the TxDOT Fort Worth meetings.

The TxDOT Dallas District has expressed an interest in establishing regular traffic management meetings with local agency transportation departments, similar to meetings that the TxDOT Fort Worth District will conduct with cities in their jurisdiction.

Implementation Guidance: Conduct traffic management meetings with cities on an as-needed basis to discuss topics including, but not limited to:

- Sharing news on TxDOT led initiatives related to data sharing (Action Item BP-09) or the availability of probe-based INRIX data to partner agencies (Action Item PM-09).
- Discussing updates or modifications needed for interagency municipal maintenance agreements (Action Item BP-06).
- Planning for traffic corridor management and regional traffic signal network-related traffic management strategies (Action Item ST-08).
- Planning for and mitigating traffic impacts related to upcoming major TxDOT construction projects.
- Reviewing traffic operations performance data within a local agency's jurisdiction to identify bottlenecks or other operational breakdown areas and identify appropriate countermeasures.

Expected Benefits: Conducting traffic management team meetings with local agency transportation departments will help to keep everyone on the same page when planning traffic management initiatives of a regional nature. TxDOT's willingness to meet with cities as needed to coordinate on these efforts is also an important step in further fostering a regional sense of collaboration among transportation partners in the Dallas District.

TSMO Tactical Plan Assessment

TSMO Tactical Plans allow the TxDOT Dallas and Fort Worth Districts 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 staffing requirement 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 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 Dallas and Fort Worth Districts. These recommended Tactical Plans are shown in Table 18. Plans are displayed according to the following criteria:

- Alignment with the TxDOT Dallas and Fort Worth TSMO Goals: Safety, Reliability, Efficiency, Customer Service, Collaboration, and Integration
- Stakeholder partnerships required for successful implementation
- Level of anticipated ongoing fiscal investment anticipated for successful implementation
- Level of ongoing District staff support anticipated for successful implementation
- Expected return on investment anticipated, pending successful implementation
- Action items from this TSMO Program Plan 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 Districts and region, including who is responsible, a schedule of when and how the activities should be completed, 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
- 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

Table 18: TxDOT Dallas and Fort Worth 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	Expected Return on Investment for District	TSMO Action Items Addressed
	Safety	Reliability	Efficiency	Customer Service	Collaboration	Integration					
Safety Service Patrol Expansion Plan	✓	✓	✓			✓	DAL & FTW Operations, DAL & FTW Area Engineers, DAL & FTW TMC Staff, Dallas County Sheriff	\$\$\$		Highest	ST-02
Dallas District ITS Master Plan	✓	✓	✓	✓	✓	✓	DAL Operations, DAL Area Engineers	\$\$\$		Highest	BP-11
Traffic Management System Device Maintenance Plan		✓	✓			✓	DAL & FTW Operations, DAL & FTW Maintenance	\$\$		High	BP-10
Work Zone Technology Deployment Expansion Plan		✓		✓		✓	DAL & FTW Operations, DAL & FTW Area Engineers, DAL & FTW Construction	\$		High	BP-03, ST-03
Regional Probe-Based Data Integration Plan		✓	✓	✓	✓	✓	TxDOT Traffic Safety Division, DAL & FTW Operations, DAL & FTW Area Engineers, Local Transportation Agencies	\$		High	PM-08, PM-09
Traffic Management and Signal Staff Development Plan					✓	✓	TxDOT Traffic Safety Division, DAL & FTW Area Engineers, DAL & FTW Operations, DAL & FTW Signal Shops, Local Transportation Agencies	\$		High	OW-06, OW-07
Planned Traffic Event Notification System Concept of Operations			✓			✓	TxDOT Traffic Safety Division, DAL & FTW Construction, DAL & FTW Operations, DAL & FTW Area Engineers, Local Transportation Agencies, Event Organizers	\$\$		Medium	ST-04
ATSPM Regional Expansion and Deployment Plan	✓	✓	✓		✓	✓	TxDOT Traffic Safety Division, DAL & FTW Operations, DAL & FTW Area Engineers, Local Transportation Agencies, NCTCOG	\$\$		Medium	PM-07, CO-06
Regional TIM Database Concept and Architecture	✓	✓	✓		✓	✓	TxDOT Traffic Safety Division, DPS and Local Law Enforcement, DAL & FTW Operations, Local Transportation Agencies, NCTCOG	\$		Medium	PM-01, PM-02

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Appendix A – Stakeholder Involvement Database

TxDOT Dallas and Fort Worth TSMO Program Plan Stakeholder Database					
Organization	Name	Position/Role	Leadership Meeting Participant	Outreach/CMM Participant	Solutions/CMF Participant
City of Allen	Asma Tuly	Traffic Engineer			X
City of Allen	Chris Flanigan	Director of Engineering	X		X
City of Arlington	Daniel Burnham	Traffic Engineer	X		
City of Arlington	Monsur Ahmed	Public Works - ITS Coordinator		X	
City of Bedford	Christopher Techau	Operations Trainer	X		
City of Bedford	David Smyth	Operations Manager	X		
City of Burleson	Aaron Russell	Director of Public Works	X		
City of Carrollton	Jody Byerly	Director of Public Works		X	
City of Carrollton	John Romberger	Transportation Engineer			X
City of Carrollton	Jonathan Wheat	Engineering Director			X
City of Carrollton	Joshua Cohron	Public Works Manager		X	
City of Carrollton	Kevin Pike	Public Works Manager		X	X
City of Colleyville	Larry Wright	City Engineer			X
City of Dallas	Joseph Marchione	Senior Traffic Engineer		X	
City of Dallas	Michael Rogers	Director of Transportation		X	
City of Dallas	Srinivasa Veeramallu	Senior Program Manager		X	X
City of Denton	Brian Jahn	City Traffic Engineer	X		
City of Flower Mound	David Stallings	Traffic Operations Manager			X
City of Flower Mound	Matt Hotelling	Traffic Engineer		X	
City of Fort Worth	Aziz Rahman	Senior Professional Engineer	X		X
City of Fort Worth	Rajnish Gupta	City Traffic Engineer		X	X
City of Fort Worth	Yang Jin	Engineering Manager		X	X
City of Frisco	Brian Moen	Assistant Director of Transportation	X		X
City of Frisco	Curtis Jarecki	Public Works - ITS Manager	X	X	
City of Frisco	Paul Knippel	Director of Engineering Services			X
City of Garland	Paul Luedtke	Director of Transportation			X
City of Garland	Wayne Kurfees	Transportation Operations Administrator		X	
City of Grand Prairie	Caryl DeVries	Traffic Engineer	X		X
City of Grand Prairie	Walter Shumac	Director of Transportation Services			X
City of Grapevine	Richard Larkins	Traffic Engineer		X	X
City of Haltom City	Gregory Van Nieuwenhuize	Director of Public Works	X		
City of Hurst	Duane Hengst	Managing Director of Engineering and Construction			X
City of Irving	Daniel Vedral	Director of Traffic and Transportation	X		
City of Irving	Nathan Benditz	Traffic Engineering Manager		X	
City of Keller	Alonzo Linan	Director of Public Works	X	X	X
City of Lewisville	Sagar Medisetty	Traffic Engineer		X	
City of Mansfield	David Boski	Assistant Director of Public Works	X		
City of McKinney	Gary Graham	Director of Engineering	X		
City of McKinney	Thuan Huynh	Traffic/Transportation Engineer		X	
City of Mesquite	Eric Gallt	Traffic Engineer	X		
City of Plano	Brian Shewski	Transportation Engineering Manager	X		X
City of Plano	Robert Saylor	Senior Transportation Engineer		X	X

TxDOT Dallas and Fort Worth TSMO Program Plan Stakeholder Database					
Organization	Name	Position/Role	Leadership Meeting Participant	Outreach/CMM Participant	Solutions/CMF Participant
City of Richardson	Mark Nelson	Director of Transportation & Mobility		X	
City of Richardson	Rama Dhanikonda	Transportation Program Manager		X	X
City of Rockwell	Amy Williams	Director of Public Works	X	X	
City of Southlake	Bill Hollings	Traffic Supervisor	X		
Dallas Area Rapid Transit	Abed Abukar	Director of ITS			X
Dallas Area Rapid Transit	Todd Plesko	Vice President of Service Planning and Scheduling		X	X
DFW International Airport	Gregory Royster	Senior Airport Planner	X	X	
DFW International Airport	Kelly Rattan	Infrastructure Engineering Manager		X	
Federal Highway Administration	Amelia Hayes	Safety & Transportation Operations Specialist			X
North Central Texas Council of Government	Camille Fountain	Transportation Planner			X
North Central Texas Council of Government	Collin Moffett	Transportation Planner	X	X	
North Central Texas Council of Government	Eric Quintana	Transportation Planner	X	X	
North Central Texas Council of Government	Gregory Masota	Transportation Planner - ITS	X	X	X
North Central Texas Council of Government	Jeff Hathcock	Freight Planning Program Manager	X	X	
North Central Texas Council of Government	Marian Thompson	Transportation System Operations Supervisor - ITS		X	X
North Central Texas Council of Government	Mike Johnson	Freight Planning Principal Transportation Planner		X	
North Central Texas Council of Government	Natalie Bettger	Senior Program Manager		X	X
North Central Texas Council of Government	Shannon Stevenson	Transit Management and Planning Senior Program Manager		X	
North Central Texas Council of Government	Sonya Landrum	Travel Demand Management and Safety Program Manager		X	
North Central Texas Council of Government	Tom Bamonte	Automated Vehicle Technology Senior Program Manager		X	
North Texas Tollway Authority	Eric Hempell	Director of System and Incident Management	X		
North Texas Tollway Authority	Yang Ouyang	Senior Traffic Engineering Manager		X	
Town of Flower Mound	Matthew Hotelling	Traffic Engineer			X
TxDOT Atlanta District	Rebecca Wells	Transportation Engineer		X	
TxDOT Dallas District	Alan McNeil	ITS Design Engineer	X	X	
TxDOT Dallas District	Amanda Moser	Dallas Area Engineer	X		
TxDOT Dallas District	Brandi Bush	Traffic Projects Engineer	X		
TxDOT Dallas District	Brenan Honey	Mesquite Area Engineer	X		X
TxDOT Dallas District	Ceason Clemens	Deputy District Engineer	X		
TxDOT Dallas District	Chris Blain	Traffic Systems Administrator	X		X
TxDOT Dallas District	Craig Burgan	Traffic Systems Administrator	X		X
TxDOT Dallas District	David Morren	Transportation Engineer Supervisor	X	X	
TxDOT Dallas District	Jeffrey Bush	Director of Construction	X	X	X
TxDOT Dallas District	John Hudspeth	Director of Operations		X	
TxDOT Dallas District	Juan Paredes	Corsicana Area Engineer		X	
TxDOT Dallas District	Lane Selman	Kaufman/Rockwell Area Engineer		X	
TxDOT Dallas District	Matthew Sneed	Senior Traffic Technology Architect		X	
TxDOT Dallas District	Mohammed Bur	District Engineer		X	
TxDOT Dallas District	Rick Cortez	Transportation Engineer Supervisor		X	
TxDOT Dallas District	Roxanne Cortez	Transportation Engineer		X	
TxDOT Dallas District	Terry Blocker	Cedar Hill, Hutchins, and Mesquite Maintenance Supervisor		X	
TxDOT Dallas District	Timothy Powers	Director of Business Planning		X	
TxDOT Dallas District	Tina Massey	Denton Area Engineer		X	

TxDOT Dallas and Fort Worth TSMO Program Plan Stakeholder Database					
Organization	Name	Position/Role	Leadership Meeting Participant	Outreach/CMM Participant	Solutions/CMF Participant
TxDOT Fort Worth District	Anthony White	Traffic Incident Management Coordinator	X		X
TxDOT Fort Worth District	Carlos Molina	Transportation Engineer	X	X	X
TxDOT Fort Worth District	Chukwuma Osemeke	Transportation Engineer			X
TxDOT Fort Worth District	Curtis Hanan	Advanced Planning Engineer	X	X	
TxDOT Fort Worth District	David Fowler	Stephenville Area Engineer			X
TxDOT Fort Worth District	Dicky White	Transportation Engineer	X		X
TxDOT Fort Worth District	Edrean Cheng	Decatur Area Engineer			X
TxDOT Fort Worth District	Federico Hernandez	Transportation Engineer	X		
TxDOT Fort Worth District	Joey Mims	Engineering Specialist		X	
TxDOT Fort Worth District	John Cordary Jr	Deputy District Engineer		X	
TxDOT Fort Worth District	John Forbes	Traffic Systems Specialist			X
TxDOT Fort Worth District	Kimberly Clarida	Contract Management Specialist		X	X
TxDOT Fort Worth District	Korin Adkins	Transportation Engineer		X	X
TxDOT Fort Worth District	Loyl Bussell	District Engineer		X	
TxDOT Fort Worth District	Matt McCarty	Intelligent Transportation Systems Analyst		X	X
TxDOT Fort Worth District	Matthew Evans	Director of Maintenance			X
TxDOT Fort Worth District	Matthew Pate	Lead TMC Operator			X
TxDOT Fort Worth District	Mohammad Al Hweil	District Advanced Transportation Planning Director			X
TxDOT Fort Worth District	Mohammed Quadeer	Transportation Engineer			X
TxDOT Fort Worth District	Paula Meyer	Special Project Coordinator		X	
TxDOT Fort Worth District	Randy Bowers	Fort Worth Area Engineer		X	
TxDOT Fort Worth District	Ricardo Gonzalez	Director of Transportation, Planning & Development		X	
TxDOT Fort Worth District	Sara Finch	Advanced Transportation Planning Engineer		X	
TxDOT Fort Worth District	Theresa Poer	Director of Operations		X	X
TxDOT Traffic Safety Division	Barbara Russell	TSMO Statewide Project Manager	X		X
TxDOT Traffic Safety Division	David McDonald	TIM Coordinator			X
TxDOT Traffic Safety Division	Jianming Ma	Regional Engineering Support	X	X	
TxDOT Traffic Safety Division	Joseph Hunt	Traffic Management Section Director		X	X

Appendix B – Action Items Sorted by Focus Area

Appendix B – Action Items Sorted by Focus Area

Action No.	District or Division	 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	Reliability	Efficiency	Customer Service	Collaboration	Integration					
BP-01	DAL & FTW	Implement TIM Response Measures for Major Construction: Develop process and procedures for incident management within construction work zones prior to letting of all major construction contracts.	56	District Director of Construction	✓	✓		✓	✓	DAL & FTW Construction, DAL & FTW Operations, DAL & FTW Area Engineers, First Responders	\$\$	<div style="width: 25%;"></div>		ST-03	
ST-01	DAL & FTW	Establish Standardized Radio Communications for TIM Response Dispatch Information: Establish documented standard communication protocol for timely public safety information sharing with TxDOT.	69	District Director of Operations	✓			✓	✓	DAL & FTW Operations, TxDOT Traffic Safety Division, DAL & FTW Public Information Offices, Local Public Safety Agencies	\$	<div style="width: 25%;"></div>			
ST-02	DAL & FTW	Develop and Implement Plan for Regional Courtesy/Service Patrol Program Expansion: Develop regional courtesy/service patrol plan for expansion; considering network coverage, hours of operation, and baseline of services provided.	70	District Director of Operations	✓	✓	✓		✓	DAL & FTW Operations, DAL & FTW Area Engineers, DAL & FTW TMC Staff, Dallas County Sheriff	\$\$\$	<div style="width: 50%;"></div>			
PM-01	DAL, FTW, & TRF	Improve TIM Performance Collection and Reporting: Improve TIM related data collection and reporting, with a focus on recording incident response time, roadway clearance time, incident clearance time, secondary crash data and time to return to normal flow on all incidents tracked in Lonestar.	80	District Director of Operations	✓	✓	✓		✓	TxDOT Traffic Safety Division, DPS and Local Law Enforcement, DAL & FTW Operations	\$	<div style="width: 25%;"></div>		BP-09, PM-02, CO-03	
PM-02	NCTCOG, TRF, DAL & FTW	Develop Regional TIM Database: Develop regional TIM database in partnership with NCTCOG and local agencies to track TIM quick clearance performance on routes throughout the DFW Region.	81	TxDOT TRF Statewide TIM Coordinator	✓				✓	NCTCOG, DPS, Local Law Enforcement, Local Transportation Agencies	\$\$	<div style="width: 25%;"></div>		BP-09, PM-01	
OW-01	NCTCOG, TRF, DAL & FTW	Provide Recurring Regional TIM Training: Continue partnering with NCTCOG and other agencies to identify agencies that have not been involved with training and provide recurring regional TIM training in a multidisciplinary setting.	93	TxDOT TRF Statewide TIM Coordinator	✓	✓		✓	✓	TxDOT Statewide TIM Coordinator, TxDOT Traffic Safety Division, DAL & FTW Operations, DAL & FTW TMC Managers, Local Transportation Agencies, Local Public Safety Agencies, NCTCOG	\$\$	<div style="width: 50%;"></div>		OW-02, CO-01, CO-02	
OW-02	DAL	Establish Dedicated TIM Coordinator Position: Establish a dedicated TIM coordinator position in the Dallas District to support TIM activities throughout this District.	94	District Director of Operations	✓	✓	✓		✓	TxDOT Statewide TIM Coordinator, TxDOT Traffic Safety Division, DAL Operations	\$\$	<div style="width: 25%;"></div>		OW-01, CO-02, CO-03	
CO-01	DAL & FTW	Conduct Quarterly TxDOT District TIM Meetings: Conduct quarterly meeting between TxDOT Dallas and TxDOT Fort Worth Districts.	101	District Director of Operations					✓	DAL & FTW Operations, DAL & FTW Area Engineers, DAL & FTW Maintenance, DAL & FTW TMC Staff	\$	<div style="width: 25%;"></div>		OW-01	

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Action No.	District or Division	 Traffic Incident Management (TIM) Action Item Descriptions <i>(Continued)</i>	Program Plan Page #	Action Lead	Supports District TSMO Goals						Partners	Cost	Effort	TSMO Capability Dimension	Related Action Items
					Safety	Reliability	Efficiency	Customer Service	Collaboration	Integration					
CO-02	NCTCOG, TRF & DAL	Expand the Regional TIM Team in the Dallas District: Partner with NCTCOG to expand the attendance and participation in the Regional TIM Team in the Dallas District and formalize after-action reviews.	102	District Director of Operations	✓	✓	✓	✓	✓	✓	TxDOT Statewide TIM Coordinator, DAL Operations, DAL Area Engineers, Local Transportation Agencies, Local Public Safety Agencies	\$	<div style="width: 25%;"></div>		ST-02, OW-01, OW-02
CO-03	DAL & FTW	Conduct After-Action Reviews for Major Incidents: Establish criteria for determining which incidents require after-action reviews and conduct reviews as needed.	103	District Director of Operations		✓	✓		✓	✓	TxDOT Statewide TIM Coordinator, DAL & FTW Area Engineers, DAL & FTW Operations, Local Transportation Agencies, Local Public Safety Agencies	\$	<div style="width: 25%;"></div>		PM-01, OW-01, OW-02






Action No.	District or Division	 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	Reliability	Efficiency	Customer Service	Collaboration	Integration					
BP-02	DAL & FTW	Conduct Post-Construction Event Reviews: Conduct post-construction event reviews to determine level of delay, evaluate safety, and determine potential areas of improvement.	57	District Director of Construction		✓	✓		✓	✓	DAL & FTW Construction, DAL & FTW Operations, DAL & FTW Area Engineers, Local Transportation Agencies	\$	<div style="width: 25%;"></div>		BP-03, PM-03, OW-03
BP-03	DAL & FTW	Establish Procedures for Collecting and Analyzing Work Zone Road User Cost Data: Establish procedures for collecting work zone road user cost data occurring at significant projects and compare to predictions made during project development.	58	District Director of Operations		✓		✓		✓	DAL & FTW Construction, DAL & FTW Operations	\$	<div style="width: 25%;"></div>		BP-02
ST-03	DAL & FTW	Utilize Decision Tool to Expand Work Zone Technology Deployments: Standardize an approach or decision tool for when to deploy certain work zone ITS technologies. Expand deployment of work zone technology throughout both Districts to support improved work zone monitoring, localized real-time traveler information, end of queue warning, and worker safety.	71	District Director of Construction	✓	✓	✓	✓		✓	DAL & FTW Operations, DAL & FTW Area Engineers, DAL & FTW Construction, TxDOT Construction Division	\$\$	<div style="width: 25%;"></div>		BP-01, PM-03, OW-04
ST-04	DAL & FTW	Develop Automated Construction Notification Application: Develop a universal platform aimed at construction that will provide for notifications to self-subscribed users.	72	District Director of Operations			✓			✓	TxDOT Traffic Safety Division, DAL & FTW Construction, DAL & FTW Operations, DAL & FTW Maintenance, DAL & FTW Area Engineers, Local Transportation Agencies, Event Organizers	\$\$\$	<div style="width: 25%;"></div>		CU-01, OW-03

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Action No.	District or Division	 Work Zone Management (WZM) Action Item Descriptions <i>(Continued)</i>	Program Plan Page #	Action Lead	Supports District TSMO Goals						Partners	Cost	Effort	TSMO Capability Dimension	Related Action Items
					Safety	Reliability	Efficiency	Customer Service	Collaboration	Integration					
ST-05	DAL & FTW	Provide Work Zone Closure Information Through Third-Party Apps: Partner with third-party navigation apps to expand and provide accurate information for travelers related to work zone closures.	73	District Public Information Officer		✓		✓	✓	✓	Private Third-Party Providers, DAL & FTW Operations, DAL & FTW Construction	\$			
PM-03	DAL & FTW	Measure Work Zone Travel Time Delay: Measure and report travel time delay in work zones.	82	District Director of Construction		✓	✓			✓	DAL & FTW Operations, DAL & FTW Construction	\$			BP-02, ST-03
PM-04	DAL & FTW	Establish a Work Zone Management Dashboard: Establish a dashboard of key work zone performance measures that can be continually updated and viewed by agency personnel, other agencies, and the public.	83	District Director of Construction		✓	✓		✓		DAL & FTW Construction, DAL & FTW Operations, DAL & FTW Maintenance, DAL & FTW Area Engineers	\$			BP-09
CU-01	DAL & FTW	Prioritize Communicating Work Zone Information to Local Partners: Prioritize communication with local agencies regarding both initial construction notices and subsequent construction plan or schedule changes.	90	District Public Information Officer	✓			✓	✓	✓	DAL & FTW Area Engineers, DAL & FTW Construction, DAL & FTW Public Information Offices	\$			ST-04
OW-03	DAL & FTW	Establish Dedicated Work Zone Coordinator Position: Establish regional-level work zone coordinator position for coordination of construction closures to avoid conflicts and ensure communication to impacted stakeholders.	95	District Director of Construction		✓	✓		✓		TxDOT Traffic Safety Division, DAL & FTW Operations, DAL & FTW Construction, NCTCOG	\$\$			BP-02, ST-04
OW-04	DAL, FTW, & TRF	Establish Regular Training for Work Zone Technologies: Establish regular training sessions for TxDOT, education on work zone technologies, how and when each are most effective, installation procedures, and planning for budgets and contracts.	96	District Director of Construction		✓	✓			✓	TxDOT Traffic Safety Division, DAL & FTW Operations, DAL & FTW Construction, DAL & FTW Area Engineers, Local Transportation Agencies	\$			ST-03

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Action No.	District or Division	 Road Weather Management (RWM) Action Item Descriptions	Program Plan Page #	Action Lead	Supports District TSMO Goals						Partners	Cost	Effort	TSMO Capability Dimension	Related Action Items
					Safety	Reliability	Efficiency	Customer Service	Collaboration	Integration					
BP-04	DAL & FTW	Conduct After Action Reviews for Weather Events: Conduct after action reviews to improve emergency weather event response times and lines of communication.	59	District Director of Operations	✓	✓		✓	✓	DAL & FTW Operations, DAL & FTW Maintenance, Local Transportation Agencies	\$			PM-05, CU-02	
ST-06	FTW	Deploy Flood Warning and Closure Devices: Implement technology for closing roads or warning drivers in areas that frequently flood.	74	District Director of Operations	✓			✓	✓	FTW Operations, FTW Maintenance, FTW Area Engineer	\$\$				
PM-05	DAL & FTW	Develop Online Weather Event Dashboards: Develop online dashboards that provide summary statistics of response for weather events.	84	District Director of Operations	✓	✓		✓	✓	DAL & FTW Area Engineers, DAL & FTW Maintenance	\$			BP-04, CU-02	
CU-02	DAL & FTW	Improve Communication of Road Weather Impacts and Response with Local Partners: Improve communication with local stakeholders regarding TxDOT weather-related road closures and ice prevention operations.	91	District Public Information Officer	✓	✓	✓	✓	✓	DAL & FTW Operations, DAL & FTW Maintenance, DAL & FTW Public Information Officers, Local Transportation Agencies, Local Public Safety Agencies	\$			BP-04, PM-05	
OW-05	DAL & FTW	Manage Road Weather Equipment: Develop and provide training for operation, maintenance and asset management of road weather management equipment.	97	District Director of Maintenance					✓	DAL & FTW Operations, DAL & FTW Area Engineers, DAL & FTW Maintenance, Vendors	\$				

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Action No.	District or Division	 Planned Special Events (PSE) Action Item Descriptions	Program Plan Page #	Action Lead	Supports District TSMO Goals						Partners	Cost	Effort	TSMO Capability Dimension	Related Action Items
					Safety	Reliability	Efficiency	Customer Service	Collaboration	Integration					
BP-05	DAL & FTW	Conduct Post-Planned Special Event Reviews: Conduct post-planned special event reviews to determine level of delay, evaluate safety, and determine potential areas of improvement.	60	District Director of Operations		✓	✓		✓	✓	DAL & FTW Construction, DAL & FTW Operations, DAL & FTW Area Engineers, Local Transportation Agencies, Event Organizers	\$			ST-08, PM-06
ST-07	DAL & FTW	Expand Planned Special Event Closure Information Through Third-Party Apps: Partner with third-party navigation apps to expand and provide accurate information for travelers related to planned special events.	75	District Public Information Officer		✓		✓	✓	✓	Private Third-Party Providers, DAL & FTW Operations, DAL & FTW Public Information Offices, Event Organizers	\$			
PM-06	DAL & FTW	Measure Planned Special Event Impacts: Measure and report travel time delay and other impacts of planned special events.	85	District Director of Operations		✓	✓			✓	DAL & FTW Operations, Local Transportation Agencies, Event Organizers	\$			BP-05, CO-04
CO-04	DAL & FTW	Include Planned Special Events in Traffic Management Team Meetings: Add discussion on planned special events and invite planned special event managers to the regional Traffic Management Team (TMT) meetings.	104	District Director of Operations		✓	✓		✓		DAL & FTW Area Engineers, DAL & FTW Operations, Local Transportation Agencies, Event Organizers	\$			BP-05, PM-06










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Action No.	District or Division	 Traffic Signal Management (TSM) Action Item Descriptions	Program Plan Page #	Action Lead	Supports District TSMO Goals						Partners	Cost	Effort	TSMO Capability Dimension	Related Action Items
					Safety	Reliability	Efficiency	Customer Service	Collaboration	Integration					
BP-06	FTW	Improve Local Partner Knowledge of Existing Agreements: Improve local agency institutional knowledge of agreements involving municipal maintenance, signal maintenance, and illumination.	61	District Director of Operations				✓	✓		FTW Operations, FTW Area Engineer, Local Transportation Agencies	\$	<div style="width: 25%;"></div>		
BP-07	DAL & FTW	Establish Regional Resource Sharing Agreements: Pursue resource sharing agreements per the region's ITS architecture, including agreements to share CCTV camera feeds as well as physical infrastructure such as conduit and fiber.	62	District Director of Operations			✓		✓		TxDOT Traffic Safety Division, DAL & FTW Operations, Local Transportation Agencies, NCTCOG	\$	<div style="width: 25%;"></div>		ST-09
ST-08	DAL & FTW	Establish Special Timing Plans: Establish special timing plans for alternate routes for planned special events and construction.	76	District Traffic Engineer			✓	✓		✓	DAL & FTW Operations, Local Transportation Agencies	\$	<div style="width: 25%;"></div>		BP-05, CO-07
PM-07	DAL & FTW	Develop and Implement Automated Traffic Signal Performance Measures: Develop a formal program and implement necessary technology and software to support Automated Traffic Signal Performance Measures operations on key District corridors.	86	District Director of Operations		✓	✓			✓	DAL & FTW Operations, DFW Area Engineers	\$\$\$	<div style="width: 25%;"></div>		
OW-06	DAL, FTW, & TRF	Develop a Traffic Signal Training and Staff Development Program: Develop and implement a formal training program to improve capability and staff development of TxDOT traffic signal staff and local partners.	98	District Transportation Engineering Supervisor	✓	✓		✓	✓	✓	TxDOT Traffic Safety Division, DAL & FTW Area Engineers, DAL & FTW Operations, DAL & FTW Signal Shops, Local Transportation Agencies	\$	<div style="width: 50%;"></div>		CO-05
CO-05	DAL, FTW, & TRF	Conduct Quarterly Signal Technician Forums: Conduct quarterly signal technician forums for TxDOT and partner agencies to improve collaboration, share best practices, and establish a regional competency regarding signal maintenance and operations.	105	District Traffic Engineer				✓	✓	✓	TxDOT Traffic Safety Division, DAL & FTW Area Engineers, DAL & FTW Operations, DAL & FTW Signal Shops, Local Transportation Agencies	\$	<div style="width: 25%;"></div>		OW-06
CO-06	DAL & FTW	Improve Signal Timing Coordination Across Jurisdictional Boundaries: Work with partner agencies to provide active assistance to NCTCOG in the development of incident and corridor timing plans.	106	District Traffic Engineer		✓	✓	✓	✓		DAL & FTW Area Engineers, DAL & FTW Operations, NCTCOG	\$	<div style="width: 25%;"></div>		ST-09
CO-07	DAL & FTW	Create Contact List for Special Signal Timing Notifications: Create a service/email exchange contact list for notification of implementation of incident-based traffic signal timing plans.	107	District Director of Operations					✓	✓	DAL & FTW Area Engineers, DAL & FTW Operations, DAL & FTW Maintenance, Local Transportation Agencies	\$	<div style="width: 25%;"></div>		ST-08

Table continued on next page.

Action No.	District or Division	 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	Reliability	Efficiency	Customer Service	Collaboration	Integration						
BP-08	TRF	Revise TxDOT Design Summary Report to Increase Emphasis on Operations: Revise the TxDOT Design Summary Report form to increase focus on TSMO related strategies including Smart Work Zones during construction, and traffic signals and ITS post-construction.	63	District Director of TP&D	✓	✓	✓			✓	TxDOT Traffic Safety Division, DAL & FTW Construction, DAL & FTW Operations, DAL & FTW Area Engineers, Local Transportation Agencies, NCTCOG	\$	<div style="width: 25%;"></div>			
BP-09	DAL & FTW	Support Regional Traffic Data Sharing Agreements: Support NCTCOG agreements for sharing collected traffic data among local agencies.	64	District Director of Operations		✓		✓	✓		DAL & FTW Operations, DAL & FTW Area Engineers, Local Transportation Agencies, Local MPOs, NCTCOG	\$	<div style="width: 25%;"></div>		PM-01, PM-02, PM-04	
BP-10	DAL & FTW	Develop a Multi-Year TMS Maintenance Plan: Develop a multi-year TMS maintenance plan that includes replacement cycles, preventative maintenance, warranties and procurement cycles.	65	District Director of Maintenance		✓	✓			✓	DAL & FTW Operations, DAL & FTW Maintenance	\$	<div style="width: 25%;"></div>			
BP-11	DAL	Develop TxDOT Dallas ITS Master Plan: Develop an ITS Master Plan for the TxDOT Dallas District to identify and prioritize ITS and communication infrastructure deployments throughout the District.	66	District Director of TP&D	✓	✓	✓	✓	✓	✓	DAL Operations, DAL Area Engineers	\$\$	<div style="width: 25%;"></div>			
BP-12	TRF	Establish Notification Process to Cities for Over Height/Oversize Vehicles Permits: Establish a process within TxDOT permitting to notify local agencies when over-height/oversize vehicles will be traveling through their jurisdictions so they can plan for and monitor these movements.	67	District Director of Operations	✓					✓	TxDOT Traffic Safety Division, DAL & FTW Operations, DAL & FTW Maintenance, Local Transportation Agencies	\$	<div style="width: 25%;"></div>			
ST-09	DAL, FTW, & TRF	Improve Regional Data and Video Sharing Capabilities: Use cloud-based technology platforms to overcome individual agency difference for data sharing such as CCTV camera video feeds and automated traffic signal performance measures (ATSPMs).	77	District Director of Operations			✓			✓	✓	TxDOT Traffic Safety Division, DAL & FTW Operations, DAL & FTW TMC Staff, Local Transportation Agencies	\$\$\$	<div style="width: 25%;"></div>		BP-07, CO-06
ST-10	DAL & FTW	Support Connected and Automated Vehicle Deployment and Smart Corridor Design: Provide TxDOT District support to statewide and regional initiatives aimed at testing and deployment of connected and automated vehicles (CAV) and Smart Corridor Design.	78	District Director of Operations	✓	✓	✓			✓	TxDOT Traffic Safety Division, DAL & FTW Operations, DAL & FTW Area Engineers, Local Transportation Agencies	\$	<div style="width: 25%;"></div>			

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Action No.	District or Division	 General Traffic Management (TM) Action Item Descriptions <i>(Continued)</i>	Program Plan Page #	Action Lead	Supports District TSMO Goals						Partners	Cost	Effort	TSMO Capability Dimension	Related Action Items
					Safety	Reliability	Efficiency	Customer Service	Collaboration	Integration					
PM-08	TRF	Establish Standard Operating Procedures for District Traffic Management Systems Performance Measures: Establish standard operating procedures to ensure consistency in how District Traffic Management System (TMS) performance measures are collected.	87	TxDOT TRF Traffic Management Section Director	✓	✓	✓		✓	✓	DAL & FTW Operations, DAL & FTW TMC Staff, TxDOT Traffic Safety Division	\$			
PM-09	TRF	Develop Implementation Plan for Regional Data Usage: Develop implementation plan to maximize the region's utility of available probe-based INRIX and Streetlight data.	88	TxDOT TRF Traffic Management Section Director		✓	✓	✓	✓	✓	TxDOT Traffic Safety Division, DAL & FTW Operations, DAL & FTW Area Engineers, Local Transportation Agencies	\$			
OW-07	DAL & FTW	Develop a Training Program and Career Advancement Process for Traffic Management Staff: Create a formal certification and training program as part of a clearly defined career advancement process for all traffic management operators.	99	District Director of Operations	✓	✓	✓		✓		TxDOT Traffic Safety Division, DAL & FTW Area Engineers, DAL & FTW Operations, DAL & FTW TMC Staff, Local Transportation Agencies	\$			
CO-08	DAL	Conduct Traffic Management Team Meetings with Cities: Conduct traffic management team meetings between the TxDOT Dallas District and cities on a regular basis similar to the TxDOT Fort Worth meetings.	108	District Director of Operations			✓		✓		DAL Area Engineers, DAL Operations, Local Transportation Agencies	\$			

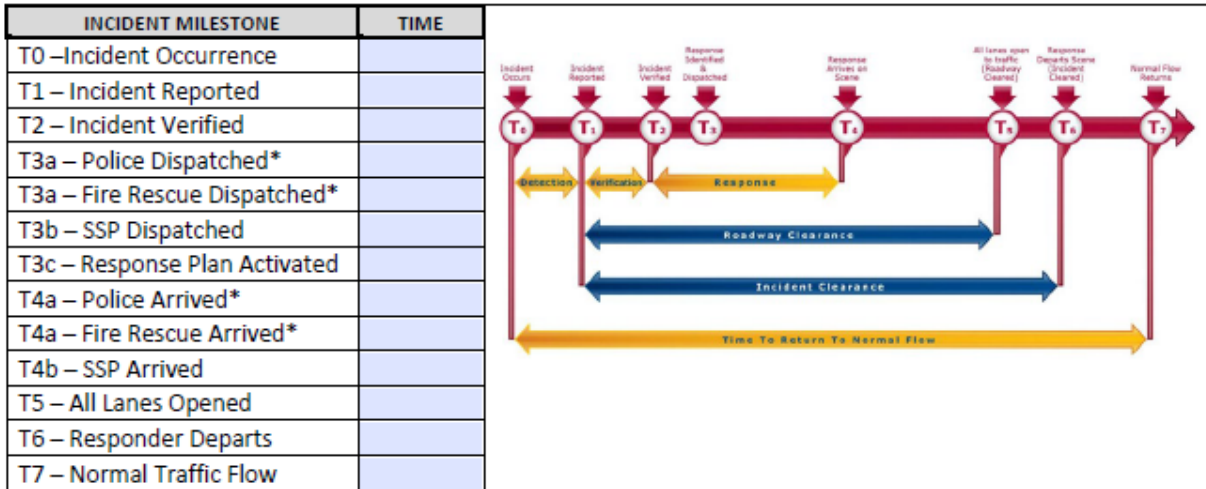
Appendix C – TxDOT After Action Report Form



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

INCIDENT INFORMATION					
District: <input type="text" value="Lonestar#"/>	Level: <input type="text" value="Select Level"/>	Conditions: <input type="text" value="Select Condition"/>			
Select Day: <input type="text"/>	Date: <input type="text"/>	Time: (HR:MM) <input type="text"/>	Incident Type: <input type="checkbox"/> Traffic Crash		
Location: <input type="text"/>			<input type="checkbox"/> HAZMAT <input type="checkbox"/> Oil Spill		
CMV: <input type="checkbox"/> Yes <input type="checkbox"/> No	Construction Zone: <input type="checkbox"/> Yes <input type="checkbox"/> No		PD/FD CAD# <input type="text"/>		
Secondary Crash: <input type="checkbox"/> Yes <input type="checkbox"/> No					

INCIDENT TIMELINE



*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 <input type="text"/>	
Wrecker			
Police			
Fire Rescue			

INCIDENT SUMMARY:

1

Reviewed by: <input type="text"/>
Position: <input type="text"/>
Date: <input type="text"/>



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

AAR MEETING LOCATION AND MODERATOR:

Light blue shaded area for meeting location and moderator information.

MEETING NOTES/QUESTIONS/COMMENTS:

Light blue shaded area for meeting notes, questions, and comments.

RESOURCES NEEDED:

Light blue shaded area for resources needed.



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

ISSUES:
WHAT WENT WELL?
TRAINING NEEDS?



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

ACTION ITEMS/LESSONS LEARNED/RECOMMENDATIONS:

A large, empty rectangular box with a light blue background and a black border, intended for reporting action items, lessons learned, and recommendations.



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 file 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.
- 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.

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 AAR meetings are an opportunity to realize future benefits and understanding each agencies needs and objectives at crashes.



**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