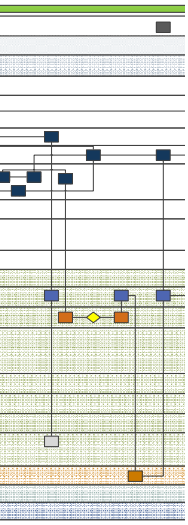
TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS (TSMO)



BRYAN DISTRICT PROGRAM PLAN

May 2022

Texas Department of Transportation

Document Control

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List of Acronyms

Acronym	Definition
AADT	Average Annual Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials
ARC-IT	Architecture Reference for Cooperative and Intelligent Transportation
ATSPM	Automated Traffic Signal Performance Measure
AUS	Austin District
BCRMA	Brazos County Regional Mobility Authority
BCS MPO	Bryan/College Station Metropolitan Planning Organization
BP	Business Process
BRY	Bryan District
BVCOG	Brazos Valley Council of Governments
CCTV	Closed-Circuit Television
CMF	Capability Maturity Framework
CMM	Capability Maturity Model
CO	Collaboration
CRIS	Crash Records Information System
CU	Culture
DAL	Dallas District
DBE	Disadvantaged Business Enterprise
DDE	Deputy District Engineer
DE	District Engineer
DMS	Dynamic Message Sign
DMV	Department of Motor Vehicles
DOT	Department of Transportation
DPS	Department of Public Safety
EA	Engineering Assistant
EOC	Emergency Operations Center
FAST	Fixing America's Surface Transportation
FHWA	Federal Highway Administration
FM	Farm-to-Market
FTE	Full Time Equivalent (referring to full-time staff position)
GPS	Global Positioning System
HCRS	Highway Condition Reporting System
H-GAC	Houston-Galveston Area Council

Acronym	Definition
HOU	Houston District
HSIP	Highway Safety Improvement Program
HUB	Historically Underutilized Business
I	Interstate
ITD	Information Technology Division
ITS	Intelligent Transportation System
KPI	Key Performance Indicator
LFK	Lufkin District
LOS	Level of Service
LOTTR	Level of Travel Time Reliability
MAP-21	Moving Ahead for Progress in the 21st Century Act
MPO	Metropolitan Planning Organization
MTP	Metropolitan Transportation Plan
N/A	Not Applicable
NHS	National Highway System
NPMRDS	National Performance Management Research Data Set
NWS	National Weather Service
O&M	Operations & Maintenance
OW	Organization and Workforce
PCMS	Portable Changeable Message Sign
PIO	Public Information Office
PM	Performance Measurement
PMT	Person Miles Travelled
PTZ	Pan-Tilt-Zoom
RTI	Research and Technology Implementation (TxDOT Division)
SH	State Highway
SHRP	Strategic Highway Research Program
SHSP	Strategic Safety Highway Plan
SOP	Standard Operating Procedures
ST	Systems and Technology
SWZ	Smart Work Zone
TBD	To Be Determined
TDM	Travel Demand Management
TIM	Traffic Incident Management
TMA	Truck Mounted Attenuator

Acronym	Definition
TMC	Transportation Management Center
TMP	Traffic Management Plan
TMS	Traffic Management System
TP&D	Transportation Planning & Development
TRF	Traffic Division (Central Office)
TSMO	Transportation Systems Management and Operations
TTI	Texas A&M Transportation Institute
TxDOT	Texas Department of Transportation
TYL	Tyler District
US	United States
US DOT	United States Department of Transportation
VMT	Vehicle Miles Travelled
WAC	Waco District
YKM	Yoakum District

Executive Summary

The Bryan District Transportation Systems Management and Operations (TSMO) Program Plan documents the Bryan District's strategic vision, mission, and goals; current TSMO processes; and recommended actions to implement data-driven decisions to make the transportation network safer, more efficient, and reliable.

The TSMO Plan includes recommendations to improve workforce development, business practices, systems and technology, collaboration, and performance management to support, streamline, and institutionalize TSMO projects and practices.

This Executive Summary highlights:

- Example TSMO strategies in use
- TSMO benefits
- TSMO vision, mission, and goals
- Proposed early action items
- Plan update process

WHAT IS 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)

EXAMPLES OF TSMO STRATEGIES CURRENTLY IN USE

TSMO Benefits

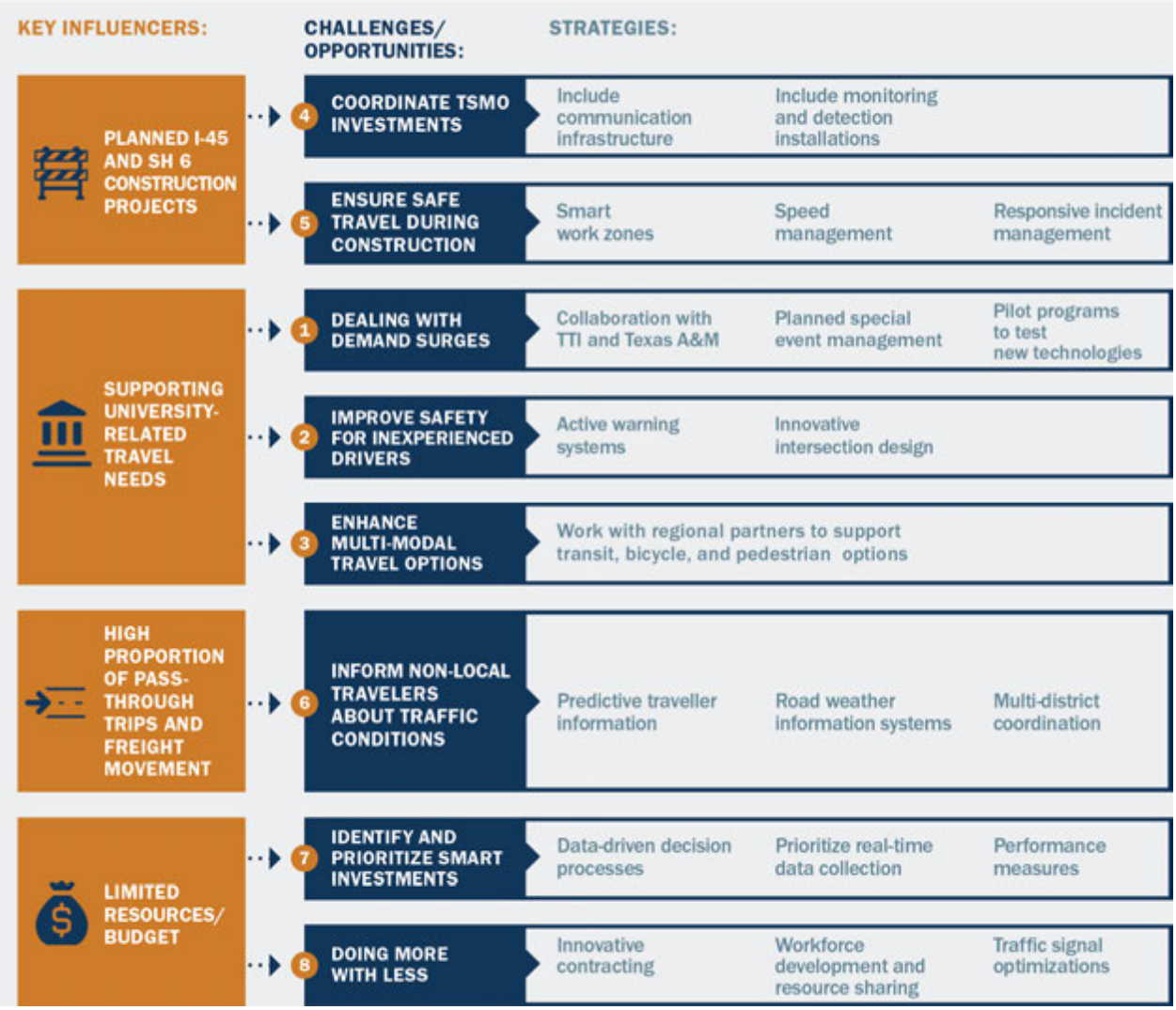
TSMO provides agencies with the guidance to manage and operate their existing transportation roadway infrastructure more efficiently and effectively before making additional infrastructure investments. It benefits every step of the project life cycle. One of the primary tools used in TSMO is intelligent transportation system (ITS) infrastructure, which enables the transportation agency to better respond to the immediate needs of the road user, such as incident response. ITS can also be leveraged for planning purposes to define what, when, and where for future roadway and ITS infrastructure improvements.

TSMO Vision, Mission, and Goals

The district's TSMO vision, mission, and goals support those of TxDOT's statewide TSMO program. For each goal, targeted objectives, many of them measurable, are included in the main body of the report.

The Business Case for TSMO

The Bryan District has successfully used TSMO strategies to mitigate the impacts of weather incidents, planned special events, and congestion in urban areas. The strategies in this TSMO plan are aimed at the current key influencers shown below.



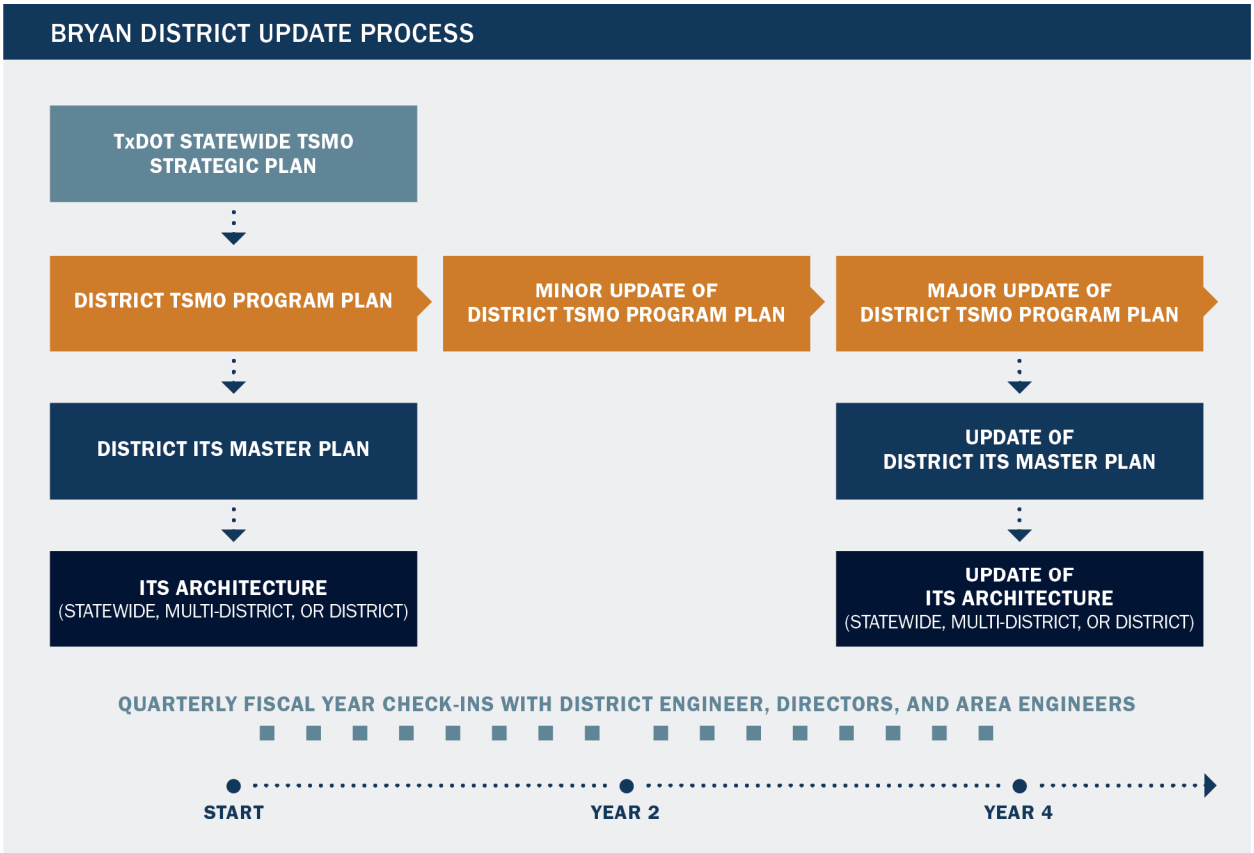
Proposed Early Actions

Action items identified for implementation by the Bryan District within the next 12 to 18 months:

	Business Processes (BP)
BP 01	Formalize ITS agreement with TxDOT Dallas District (DAL) and update agreement with Houston District (HOU) as needed.
BP 02	Formalize incorporation of TSMO into project delivery. Review and update district processes and tools to formally include TSMO elements in all aspects of project delivery.
BP 03	Develop documentation of standard operating procedures (SOPs) to support business processes and organization and workforce.
BP 05	Develop a Traffic Signal Management Plan
	Systems and Technology (ST)
ST 01	Procure system hardware and technology to permit traffic responsive operations. Deploy decision support system to assist with real-time operational decision making.
ST 02	Expand the use of monitoring devices and systems in construction contracts. Consider including traffic management system (TMS) asset uptime as a requirement for contractors.
	Performance Measurement (PM)
PM 01	performance metrics. Establish reliability thresholds for traffic signal system infrastructure. Establish baseline criteria for a minimum level of equipment performance (i.e., state of good maintenance) that is agreeable to all regional agencies.
	Organization and Workforce (OW)
OW 01	Work to improve staff experience by identifying staff roles and career path. Improve workforce efficiency through remote communication and shared staff with other districts.
	Collaboration (CO)
CO 02	Update contact lists and distribute regularly, including Bryan District points of contact for external stakeholders: general traffic management, work zones, weather events, incidents, planned special events.
CO 03	Coordinate with law enforcement, formalize efforts at county level first, identify how district can help law enforcement on and off the scene of an incident and how to coordinate regarding the impacts of minor stops and road closures on highway safety and operations.
CO 04	Use SHRP2 traffic incident management training to build relationships between stakeholders.
	Culture (CU)
CU 01	Keep relational culture and supplement strong personal communication with technology, including develop and distribute dashboard and establish a practice of sharing information and access to resources and reach out to external partners to let them know what TxDOT is doing to improve the transportation system and vice versa.

The Update Process

The Bryan District plans to review TSMO action item implementation status on a quarterly basis during the District Supervisors' Meeting and to update the entire plan on a four-year cycle.



Introduction

The Bryan District Transportation Systems Management and Operations Plan (Bryan TSMO Plan) elaborates safe, reliable, efficient, customer-oriented, collaborative, and integrated strategies for the operations and management of the existing transportation infrastructure to utilize it at its full potential. The Bryan TSMO Plan supports the TxDOT Statewide Strategic Plan (TxDOT, 2018) by providing a district-level approach. Strategies including traffic incident management, traveller information, work zone management, and freight management will help transportation engineers and planners to proactively manage the system in real time and improve system efficiency. As such, they are key tools to prepare for ever-increasing congestion, limited funding, and the expanding role of technology in our transportation network.

The Bryan TSMO Plan includes recommendations to improve various process and institutional dimensions within the district:

- Business processes
- Systems and technology
- Performance measurement
- Culture
- Organization and workforce
- Collaboration (both internal and external)

These improvements will support, streamline, and institutionalize TSMO projects and practices across the district and with external stakeholders. Implementing the Bryan TSMO Plan will improve project delivery processes by integrating mobility-focused solutions throughout planning, programming, design, construction, operations, and maintenance phases of project life cycles. By continuing collaboration with partner agencies and implementing processes that support data-driven decisions, the transportation network will be safer, more efficient, and more reliable for all users.

Program Plan Format

Key components of the Bryan TSMO Plan:

- An introduction to TSMO and description of the Bryan District boundaries
- The business case for why TSMO is needed in the Bryan District
- The Bryan District mission, vision, goals, and objectives, which form the foundation of the action items in the implementation plan
- A discussion of the Capability Maturity Model (CMM) dimensions with the successes and challenges of the district identified in each of the six dimensions
- A TSMO Implementation Plan of actions including priority, Bryan District lead, partners (e.g., adjacent districts, Traffic Safety Division, external agencies) resources, and measures of success
- Considerations for future tactical plans

Why Develop a TSMO Program Plan?

Traditionally, roadway capacity expansion has been the primary tool for managing transportation congestion and improving operations. However, capacity expansion does not adequately address the needs of the modern transportation system Other fundamental issues that argue for TSMO-based solutions rather than capacity expansion are:

- **Induced travel demand**, which can overwhelm new capacity projects even before completion
- **Limited funding**, which often requires departments to choose between maintaining the system they have or adding more capacity

- **Expanding capabilities of technology**, which can be leveraged to address future mobility needs, including connected and automated vehicles, traveller information, system maintenance, crash mitigation, and other safety improvements

Implementing a TSMO plan encourages the Bryan District and partners to evaluate a broad range of options, in addition to considering capacity solutions, to solve safety, mobility, and reliability challenges.

The Bryan TSMO Plan supports district Traffic Management Systems performance measures, a priority identified by TxDOT's Chief Engineer. Initial metrics identified include:

- TMS asset operational uptime
- Incident clearance times
- Level of travel time reliability
- Geographic TMS coverage

The Chief Engineer's memos are included in the appendix of the TxDOT TSMO Statewide Strategic Plan (TxDOT, 2018).

TSMO PROGRAM BENEFITS

TSMO programs incorporate skills and capabilities of project delivery with effective systems management, traffic operations, technological innovations, and other activities that improve travel safety and reliability, enhance traveller information and user experience, and maximize the agency s return on capital investments.
(Federal Highway Administration, 2017)

TSMO will be integrated into existing plans, programs, and business processes as much as possible. Like the Bryan District, each TxDOT district is developing a District TSMO Program Plan.

Bryan District Boundaries

The Bryan District is shown in Figure 2. It includes 10 counties, three Area Offices, and 10 Maintenance Offices (one located in each county within the district) as listed in Table 1.

Two metropolitan planning organizations (MPOs) fall within the Bryan District. The Bryan/College Station MPO (BCS MPO) encompasses Brazos County, which includes the Bryan-College Station area. The Houston-Galveston Area Council (H-GAC) includes Walker County within the Bryan District plus other counties in the

Houston and Beaumont Districts. Beyond Bryan-College Station and a handful of urbanized cities, the Bryan District is largely rural. The Brazos County Regional Mobility Authority (BCRMA) can independently generate revenue and covers Brazos County with the goal to improve the transportation network in Brazos County. The Bryan District is home to several universities and colleges: Texas A&M University (in Bryan/College Station), Sam Houston State University (in Huntsville), and Blinn College (in Bryan and Brenham).

TABLE 1. OFFICES WITHIN THE BRYAN DISTRICT

District Office	Area Offices	Maintenance Offices		
Bryan		Brenham Bryan Buffalo Caldwell	Cameron Fairfield Hearne	Huntsville Madisonville Navasota

The Bryan District (BRY) is an urban district adjacent to seven other TxDOT districts, serving as a hub that connects travel between three major metropolitan areas:

- Dallas (DAL) – metro
- Tyler (TYL) – urban
- Lufkin (LFK) – rural
- Houston (HOU) – metro
- Yoakum (YKM) – rural
- Austin (AUS) – metro
- Waco (WAC) – urban

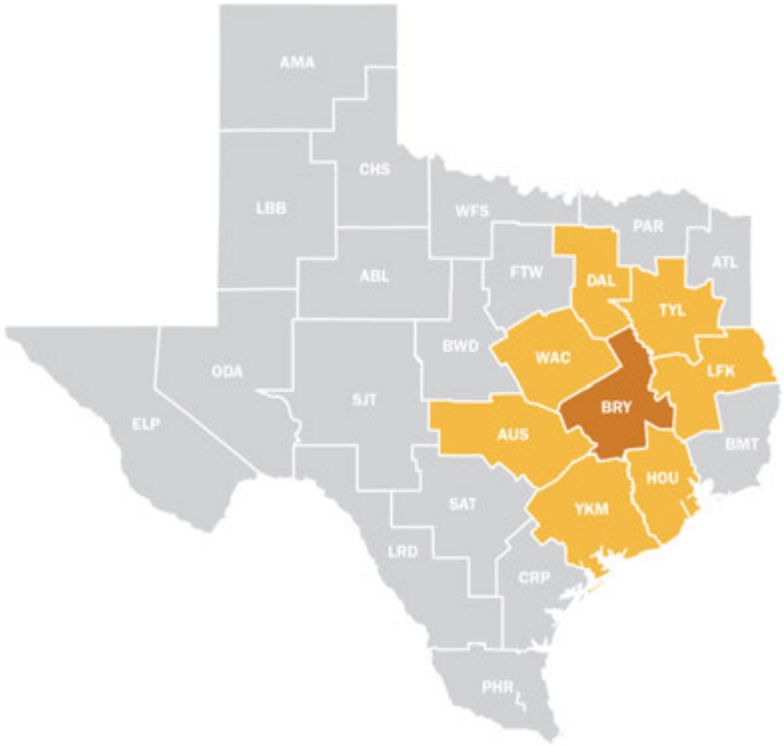


FIGURE 1: BRYAN DISTRICT LOCATION WITHIN TXDOT DISTRICTS

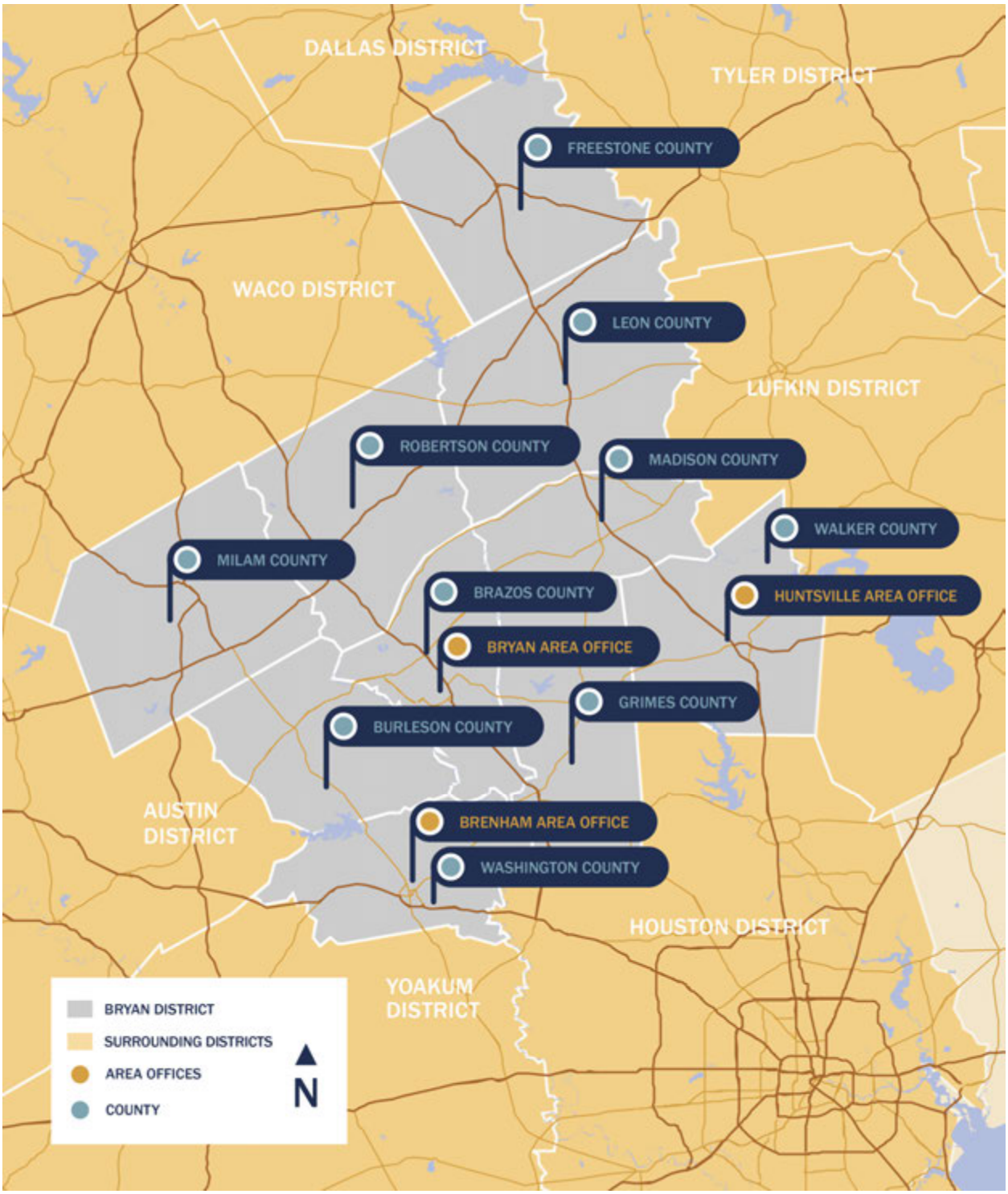


FIGURE 2: BRYAN DISTRICT AREA MAP

Current Bryan District TSMO State of the Practice

The Bryan District plans, programs, designs, constructs, operates, and maintains the transportation roadway network within the district. Within each of these areas, the district is already applying TSMO strategies at varying levels. Table 2 provides an overview of current TSMO strategies within each of these steps starting with districtwide strategies and then progressing through transportation planning and development (TP&D), construction, operations, and maintenance. Additional details and supporting documents are provided in the Bryan District State of the Practice Report (TxDOT Bryan District, 2020). The current TSMO activities were reviewed as part of the Capability Maturity Model, described later in this Plan.

TABLE 2: BRYAN DISTRICT TSMO CURRENT STATE OF THE PRACTICE

Group	TSMO Activity
Districtwide	
TP&D	▪ Permanent intelligent transportation systems to support TSMO strategies are starting to be included during project planning and programming phases ▪ TSMO investments along major hurricane evacuation routes are starting to be prioritized to support both day-to-day and emergency operating conditions ▪ Many ongoing and upcoming design projects (e.g., I-45, US 190, SH 6, SH 21) provide an opportunity to include ITS and communications
Construction	
Operations	▪ District plans to have communications to all traffic signals within the next few months and plans to connect with the statewide central signal system under development ▪ An ITS Master Plan is currently under development that describes existing and planned infrastructure (dynamic message signs, cameras, detection/third party data, weather systems, communications infrastructure, etc.) and includes a prioritized deployment plan (TxDOT Bryan District, 2021) ▪ Active day-to-day traffic management is primarily handled by the Houston District at the Houston TranStar ▪ Bryan District uses Lonestar to manage ITS devices for major events (e.g., weather, crashes) ▪ Houston District monitors some cameras and sensors in the district from the Houston TranStar Traffic Management Center (TMC) to monitor conditions at the district boundaries ▪ Well-established multi-agency operations are in place for management of planned special events, particularly large events in the Bryan/College Station area

Group	TSMO Activity
Maintenance	▪ Standard operating procedures (SOPs) for ITS and traffic signal maintenance (preventive and troubleshooting) are under development ▪ Working toward more regular preventive maintenance for TMS ▪ District maintenance crews respond to traffic incidents when requested by law enforcement or local jurisdictions; maintenance contracts are used to support traffic incident requests on I-45

Stakeholder Involvement

Stakeholders from a variety of practice areas within the district were engaged in the development of the Bryan TSMO Plan through a series of meetings, workshops, and phone calls between June 2020 and February 2021. Representatives from each practice area participated on a Working Group that guided the development of this Plan.

The workshops included participation from external stakeholders such as cities, counties, universities, and law enforcement. The stakeholder process is shown in Figure 3 and stakeholders are listed in Appendix A.

Virtual workshop on planned special events

FIGURE 3: STAKEHOLDER OUTREACH PROCESS

How Can TSMO Improve Equity in the Bryan District?

Equity refers to the distribution of "benefits and burdens" of the transportation system on vulnerable members of the community such as low-income residents, minorities, children, persons with disabilities, and older adults (US DOT, 2013). These community members may rely on public transportation for access to grocers, schools, medical facilities, and employment. Nationally, only 30 percent of urban jobs are accessible via a 90-minute ride via public transportation (Mobility Lab, 2019). Access to reliable transportation is critical to addressing poverty and unemployment. Applying TSMO ideas: pavement management system—overlay with demographics—make sure that disadvantaged communities are prioritized; provide accessibility at all bus stops; transit signal priority demonstration projects in transit dependent areas to get people to their jobs faster and more reliably; checklist for incorporation of bicycles and pedestrians for new projects or improving safety of existing crosswalks (partnership opportunity); talking pedestrian signals; school zone safety – automate systems, remote flashers, fill gaps in Safe Routes to School networks, etc. These types of initiatives may be led by a variety of groups in addition to Operations such as by the Bryan District pedestrian and bicycle coordinator or by TxDOT's Transit Division at headquarters.

Following are some excerpts:

- TSMO strategies can increase public awareness of suitable travel options. Through the use of transportation options marketing, travel demand management (TDM), and traveller information programs, travellers can make more informed decisions about their mode choice, travel time, and/or travel routes, leading to smarter, more efficient use of the transportation network (US DOT, 2012).
- TSMO strategies can provide greater social equity by increasing travel options for disadvantaged populations and communities. TSMO strategies that improve multimodal safety are strategies that promote social equity amongst all populations including senior citizens, children, and those with disabilities.
- TSMO strategies preserve existing communities by maximizing the efficient use of existing infrastructure. ITS and operations investments require minimal new rights of way or construction, thereby preserving existing transportation infrastructure while improving operations. TSMO may reduce the need for potentially costly and disruptive capital investments that may be out of character with communities they serve.

Maximizing the liveability and sustainability benefits of TSMO strategies requires a balanced approach. Not all TMSO strategies support liveability and sustainability outcomes equally. For example, traffic signals that prioritize vehicle traffic flow but do not consider the mobility and access needs of pedestrians, bicycles, and transit can work against liveability and sustainability principles. In contrast, signal timing plans and roundabouts that support liveability and sustainability objectives will provide improved mobility in a way that balances vehicular and bus traffic, pedestrians, and bicycle access, in order to support community vitality, safety, and the environment.

A balanced approach to TSMO provides a framework that helps practitioners consider trade-offs, better understand potential impacts on liveability and sustainability, and avoid unintended results. Most importantly, this framework encourages practitioners to evaluate transportation system operations from a variety of perspectives and consider how the system can be optimized in multiple ways to achieve different performance measures and goals.

Business Case for TSMO in the Bryan District

The Bryan District plans, designs, builds, operates, and maintains the state transportation system in 10 counties: Brazos, Burleson, Freestone, Grimes, Leon, Madison, Milam, Robertson, Walker, and Washington. The district is responsible for two major corridors, I-45 and SH 6. Other key corridors include US 290, US 190, US 84, and SH 21. Major projects currently underway include widening I-45 to six lanes in Walker County, FM 2818 widening in College Station, and SH 105 Brazos River Bridge replacement. Additionally, the Bryan District serves as a hub for TxDOT's hurricane response. Many state highways throughout the area have been designated as hurricane evacuation routes, and the district supports TxDOT's statewide plan by strategically placing resources (e.g., fuel trucks) throughout the district during hurricane season. The district has a strong history of implementing TSMO strategies for planned special events, and these strategies can be leveraged across other program areas, such as traffic management and work zone management, to improve effective use of capacity by directly addressing recurring and nonrecurring congestion.

Considering the profile of the district, the business case of TSMO stems from the ability of TSMO strategies to support travel reliability, economic activity and transportation safety in the region. TSMO brings together many disparate activities currently underway in the district under a unifying umbrella that builds connections both within the agency (between various sections in the district – planning, design, construction, operations, maintenance) and with regional partners (law enforcement, cities, counties, weather service, etc).

Figure 4 summarizes the business case for TSMO in the Bryan District, highlighting the key influencers in the district, challenges and/or opportunities resulting from these influencers, and relevant TSMO strategies to address them. The sub-sections that follow provide additional discussion about the business case.

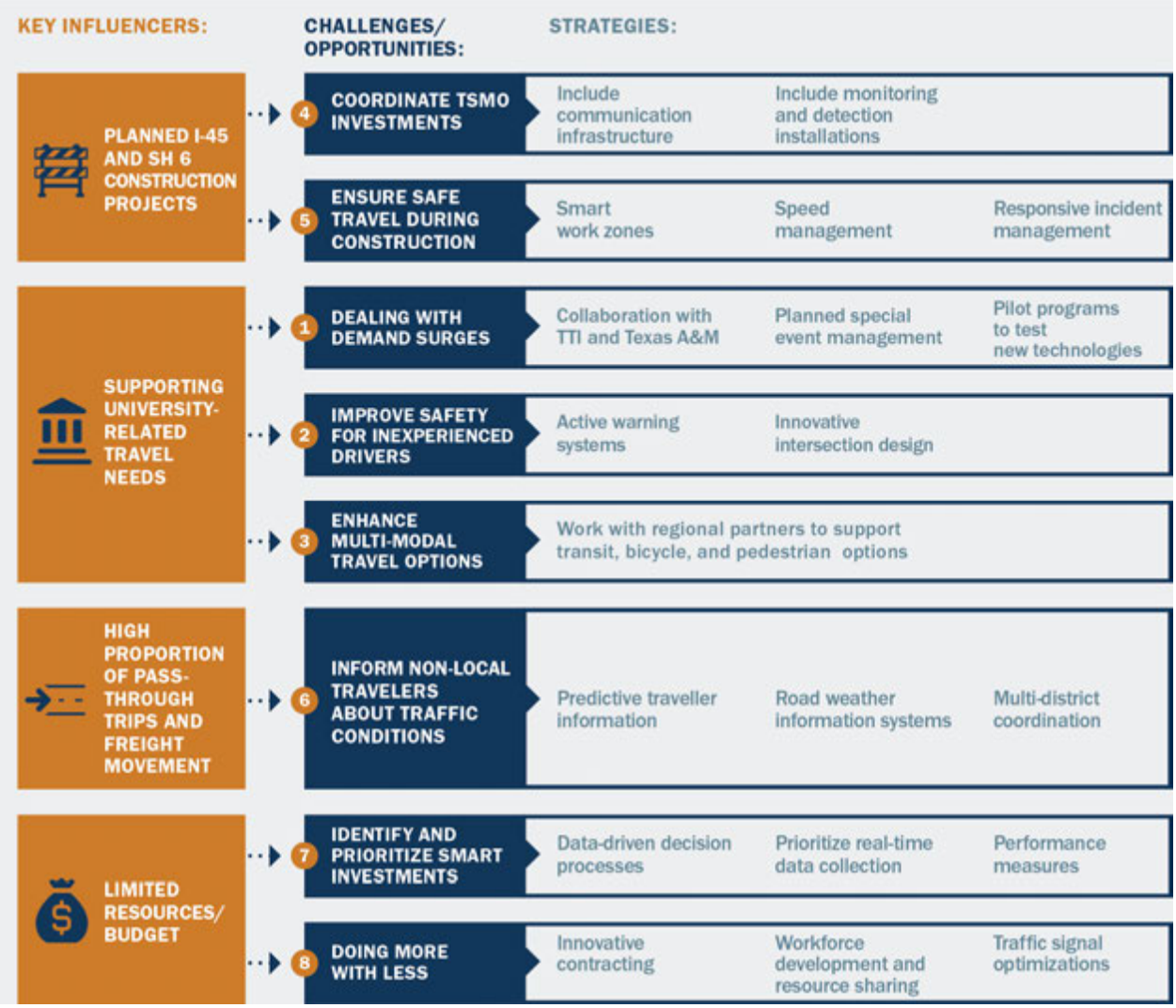


FIGURE 4: BRYAN DISTRICT BUSINESS CASE FOR TSMO — DRIVERS, CHALLENGES/ OPPORTUNITIES, AND STRATEGIES

Addressing Demand Surges

Texas A&M University has a population of more than 70,000 students. In terms of collaboration, the Bryan District, Texas A&M University, the Texas A&M Transportation Institute (TTI), BCS MPO, Brazos County and the Cities of Bryan and College Station have created a high level of capability in some TSMO areas, such as planned special events. Regular demand surges, such as football games and graduation ceremonies, have allowed Texas A&M University and TTI, with support from the Bryan District, to develop formal processes and advance the region's capability to effectively manage surges in demand. Looking toward the future, the collaborative environment in the Bryan College Station area and the presence of TTI fosters the opportunity to test new technologies and pilot opportunities for advancing innovative operations strategies.

Improving Safety for Inexperienced Drivers

The large university population equates to a younger driving population with a regular turn-over. This regular turn-over along with travelling family members adds a disproportionate amount of unfamiliar drivers with the existing travel network. Similar to destination vacation spots, the district can leverage their communications protocol for planned special events to enhance their active warning systems (e.g., at crosswalks) as well as integrating safety measures into TSMO, such as roundabouts, pedestrian underpasses, bike/pedestrian shared use paths, and curve speed warnings.

Maintaining Traffic and Mobility During Construction

The Bryan District uses statewide decision tools effectively to engage law enforcement, lower speed limits, and determine if a specific Smart Work Zone (SWZ) strategy is needed as part of a construction project. They have standard practices for construction traveller information. There is an opportunity for the district to develop a menu of technology available to support work zone management and to train work zone designers and operations personnel on how existing technology resources can be used for work zone management. Effective work zone management can reduce queues, reduce overall delays, improve safety of travellers and responders, and support overall freight movement.

Supporting Long Distance Travel and Efficient Freight Movement

Decisions about travel, especially for freight and long-distance through travel are made outside the district boundaries. Consequently, travellers and truck traffic arriving in the Bryan District may not be aware of work zones, lane closures, or weather-related capacity restrictions. TSMO strategies like predictive traveller information, especially for long-distance travel on I-45 or US 290, might be particularly useful in combination with statewide resources and when used in conjunction with the adjacent districts (Houston and Dallas Districts for I-45 and Houston and Austin Districts for US 290). Road weather information systems can reduce traveller delay and lower crash rates.

Conserving Limited Resources / Budget

TSMO strategies are generally low-cost compared to roadway capacity investments. More importantly, they are extremely cost-effective in terms of the impacts produced. By using the data generated by TSMO and combining it with existing TxDOT resources, investments for both TSMO and other transportation investments can be based on performance. TSMO is a catalyst to establish and ensure the availability of reliable real-time data sources, expert staff, and clear performance measures to effectively collect, report, and share data and to monitor performance for the district. For example, the district could use Automated Traffic Signal Performance Measures (ATSPMs) to improve signal timing, and subsequently improve the travel time and reliability of a roadway without requiring roadway widening. Additionally, the presence of TTI fosters research opportunities to evaluate the use of crowd sourced data for situational awareness (also the Federal Highway Administration (FHWA) Every Day Counts initiative) that could help the Bryan District overcome challenges associated with funding and maintaining fixed ITS infrastructure.

TSMO Vision, Mission, Goals, and Objectives

The Bryan District has developed district specific TSMO vision, mission, and objectives while supporting the statewide goals as described in this section.

Bryan District TSMO Goals and Objectives

The Bryan District supports each of the six statewide TSMO goals (safety, reliability, efficiency, customer service, collaboration, and integration) and has developed objectives for the district under each goal to support ongoing monitoring of the effectiveness of the TSMO Plan. Measurable objectives have been set where baseline data is available to track performance. Other objectives are aspirational and should be re-visited with future TSMO Plan updates once the district has established more performance metrics and data sources. The Bryan District objectives are listed in Table 3 along with the corresponding statewide goals.

TABLE 3: STATEWIDE AND BRYAN DISTRICT TSMO GOALS AND OBJECTIVES

TSMO Goal	Strategic Objectives	Bryan District TSMO Program Objectives
Safety 	Reduce crashes and fatalities through continuous improvement of traffic management systems and procedures.	▪ Reduce 5-year rolling average fatalities by half by 2035. ▪ Reduce fatalities to approach zero by 2050. ▪ Reduce severe injury crashes by an amount two percent more than the projected crashes for each fiscal year ▪ Increase benefit/cost ratio of Road to Zero funded projects ▪ Reduce the number of pedestrian-/bicyclist-involved crashes ▪ Reduce work zone crashes ▪ Reduce secondary crashes through faster detection of primary incidents and quicker and more appropriate primary response ▪ Review fatality and serious injury crashes annually to determine countermeasure strategies ▪ Increase the implementation of data-driven safety countermeasures on district highways and review status annually
Reliability 	Optimize travel times on transportation systems in critical corridors to ensure travellers are reaching their destinations in the amount of time they expected for the journey.	▪ Improve travel time reliability of person-miles travelled on I-45. ▪ Improve travel time reliability of person-miles travelled on the non-Interstate national highway system (NHS) (e.g., US 290, SH 6). ▪ Increase TMS assets in use for incident and emergency detection/response on I-45 to 100 percent coverage at decision points by 2030. ▪ Reduce average incident clearance time on Interstate and NHS roadways ▪ Maintain 90% or greater TMS asset operational uptime monthly. ▪ Track mean time to respond to corrective maintenance work orders: o Achieve 90% or greater of corrective work orders completed on-time. o Achieve 90% or greater of all corrective work orders completed within 30 days. ▪ Track mean time to repair for corrective maintenance work orders: o Achieve 90% or greater of corrective work orders repaired within time limits set by priority ▪ Perform preventive maintenance on all traffic signals at least once per year. o Meet performance targets for asset uptime and availability during emergencies for strategic infrastructure.

TSMO Goal	Strategic Objectives	Bryan District TSMO Program Objectives
Efficiency 	Implement projects that optimize existing transportation system capacity and vehicular throughput.	▪ Maintain a program of evaluating 100 percent of signals for retiming every five years. ▪ Review speed zones in urban areas every three to five years and in rural areas every five to 10 years ▪ Conduct periodic bottleneck studies to identify where additional capacity is needed. ▪ Maintain the rate of growth in facility miles experiencing recurring congestion as less than the population growth rate.
Customer Service 	Provide timely and accurate travel information to customers so they can make informed mobility decisions.	▪ Increase number of repeat visitors to Bryan District section of DriveTexas.org during major events (e.g., flooding, tornadoes, hurricanes, winter weather, crashes with long-term lane closures) ▪ Increase number of subscribers to Bryan District social media platforms ▪
Collaboration 	Proactively manage and operate an integrated transportation system through multi-jurisdictional coordination, internal collaboration, and cooperation between various transportation disciplines and partner agencies.	▪ Meet once per fiscal year annual with representatives from the four core sections and the three Area Offices to review TSMO implementation status. ▪ Attend after-action review meetings with attendance from most of the agencies involved in the response to a major incident/emergency or adverse weather event. ▪ Address ITS and TSMO components during the design conference and design reviews of 100 percent of capital projects. ▪ Seek out annual input on TxDOT systems/functions that can be cooperatively used by partner agencies.
Integration 	Prioritize TSMO as a core objective in the agency's planning, design, construction, operations, and maintenance activities.	▪ Ensure technicians are trained annually in their areas of responsibilities to keep up to date on newer technology and software. ▪ Hold regular meetings and conduct joint training exercises in the district and/or region that support shared implementation of TSMO strategies. ▪ Identify sustainable funding for TMS improvements and ongoing operations and maintenance. ▪ Identify sustainable resources needed to support staff TSMO training and development. ▪ Evaluate technology priorities annually across the district between what is needed to meet the needs versus what needs to be replaced/upgraded

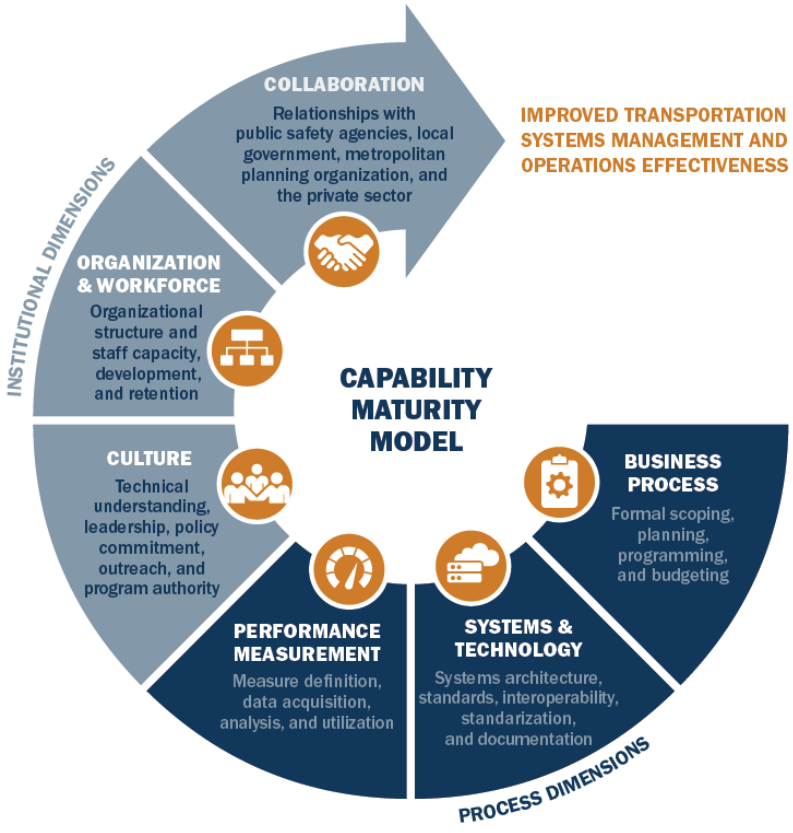
Capability Maturity Model

This section includes an introduction to the CMM process and summarizes the assessment of how each of the six dimensions applies to the Bryan District: 1) business processes, 2) systems and technology, 3) performance measurement, 4) organization and workforce, 5) culture, and 6) collaboration (FHWA, 2020).

Introduction to the CMM Process

Existing capabilities, gaps, and needs for TSMO in the Bryan District were identified through a combination of interviews and workshops. Tools used to gather capabilities were the TSMO Capability Maturity Model and Frameworks. The CMM self-assessment framework, shown in Figure 5, is comprised of six dimensions of capability—three process-oriented dimensions and three institutional dimensions. The Capability Maturity Frameworks (CMFs) are based on the same dimensions but are focused on specific aspects of TSMO such as work zone management and traffic incident management.

The use of the capability maturity concepts provides an approach to review common barriers to adoption and success of TSMO and allows agencies to understand and identify actions for improvement of institutional issues that an agency faces on a continual and consistent basis. The process fosters an agency's ability to develop consensus around needed agency improvements; identify their immediate priorities for improvements; and identify concrete actions to continuously improve capabilities to plan, design, and implement TSMO.



Source: Strategic Highway Research Program (SHRP2), American Association of State and Highway Officials (AASHTO), and Federal Highway Administration (FHWA-HOP-17-017)

FIGURE 5: CAPABILITY MATURITY DIMENSIONS

Consistent with the Strategic Highway Research Program 2 (SHRP2, 2017) guidance and other federal CMM and CMF guidance (AASHTO, 2014; FHWA, 2017), the capabilities for each dimension are described as a matrix that defines the process improvement areas and levels (from Level 1, ad-hoc, to Level 4, optimized level of capability). Table 4 includes this matrix, which shows how each of the six dimensions are assessed for each level. Following a self-assessment process, specific actions are identified to increase capabilities across the desired process areas.

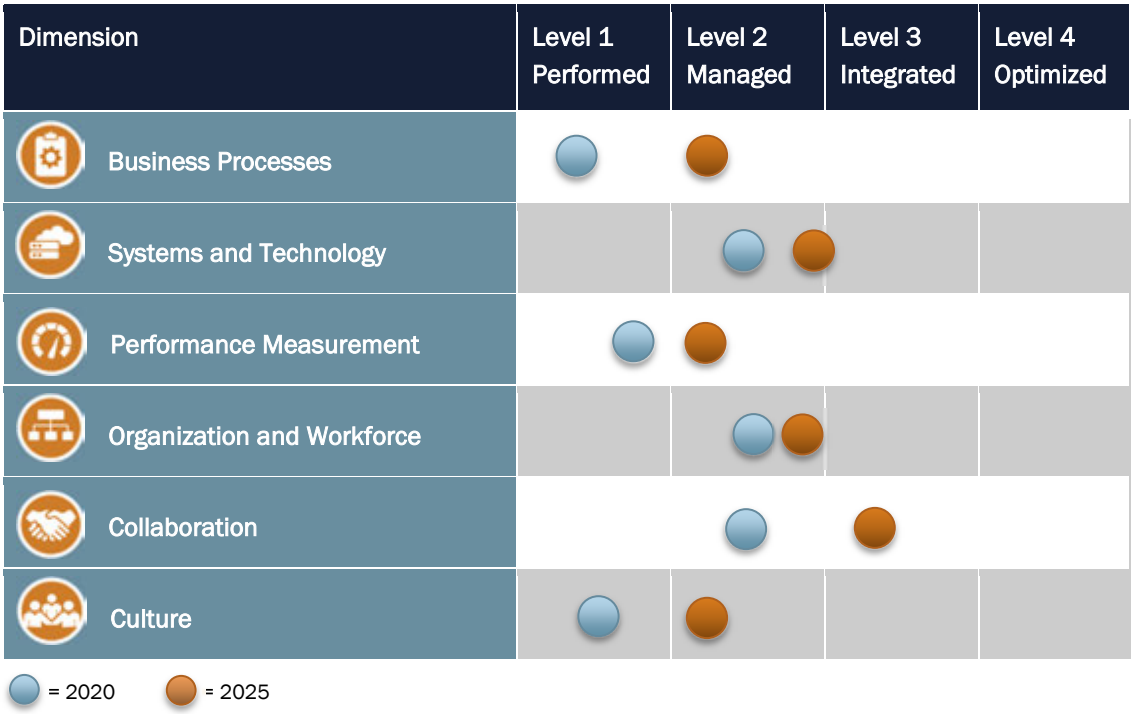
The capability assessment process, tool, and instructions were discussed with stakeholders during the CMM workshop (TxDOT Bryan District, 2020). The overall assessment of capability provided in Table 5 is based on the input provided during the workshop. Workshop participants rated themselves at a Level 2 for systems and technology, organization and workforce, and collaboration. They rated themselves a Level 1 for business processes, performance measurement, and culture. Table 5 also shows how the capabilities will become more advanced by 2025, especially as the district implements the actions in this plan over the next four fiscal years.

TABLE 4: CMM ASSESSMENT CRITERIA

Dimension	Level 1 Performed	Level 2 Managed	Level 3 Integrated	Level 4 Optimized
Business Processes	Processes related to TSMO activities ad hoc and un-integrated	Multiyear statewide TSMO plan and program exists with deficiencies, evaluation, and strategies	Programming, budgeting, and project development processes for TSMO standardized and documented	Processes streamlined and subject to continuous improvement
Systems & Technology	Ad hoc approaches outside systematic systems engineering	Systems engineering employed and consistently used for Concept of Operations, architecture, and systems development	Systems and technology standardized, documented, and trained statewide, and new technology incorporated	Systems and technology routinely upgraded and utilized to improve efficiency performance
Performance Measurement	No regular performance measurement related to TSMO	TSMO strategies measurement largely via outputs, with limited after-action analyses	Outcome measures identified and consistently used for TSMO strategies improvement	Mission-related outputs/ outcomes data routinely utilized for management, reported internally and externally, and archived
Organization & Workforce	Fragmented roles based on legacy organization and available skills	Relationship among roles and units rationalized and core staff capacities identified	Top level management position and core staff for TSMO established in central office and districts	Professionalization and certification of operations core capacity positions including performance incentives
Collaboration	Relationships on informal, infrequent, and personal basis	Regular collaboration at regional level	Collaborative interagency adjustment of roles/ responsibilities by formal interagency agreements	High level of operations coordination institutionalized among key players – public and private
Culture	Value of TSMO not widely understood beyond champions	Agency-wide appreciation of the value and role of TSMO	TSMO accepted as a formal core program	Explicit agency commitment to TSMO as key strategy to achieve full range of mobility, safety and liveability/ sustainability objectives

Source: Strategic Highway Research Program (SHRP2), American Association of State and Highway Officials (AASHTO), and Federal Highway Administration (FHWA-HOP-17-017)

TABLE 5: CAPABILITY MATURITY ASSESSMENT BY WORKSHOP STAKEHOLDERS



The following sections breakdown the Bryan District's existing capabilities and needs across the six dimensions.

Business Processes

This section describes the Bryan District organization and incorporation of TSMO into the project delivery process.

The TSMO program at the Bryan District is championed by the Director of Transportation Operations with support from a TSMO Program Coordinator, who is helping advance TSMO in the district in addition to many other responsibilities in the Operations section. Directors of the TP&D, Construction, Transportation Operations, and Maintenance sections report to the District Engineer and Deputy District Engineer and conduct TSMO practices in their domain. As TSMO is related to all four sections within the district, the four Directors practice TSMO at varying degrees. The three Area Offices in Bryan, Brenham, and Huntsville coordinate the TSMO process at the field level. The Area Engineer for each Area Office reports directly to the District Engineer (DE) and Deputy District Engineer (DDE) but also coordinates TSMO efforts with the Directors and support staff of the four core sections. The Safety Office and Public Information Office (PIO) supports all districtwide functions, including TSMO.

Figure 6 provides a high-level overview of the Bryan District's organizational chart. Staff at the district may find the current detailed organizational chart with additional sub-sections, names of district leadership, and full-time equivalent (FTE) numbers at any time on TxDOT's Intranet.

The following sub-section provides an overview of the business processes related to the project delivery process.

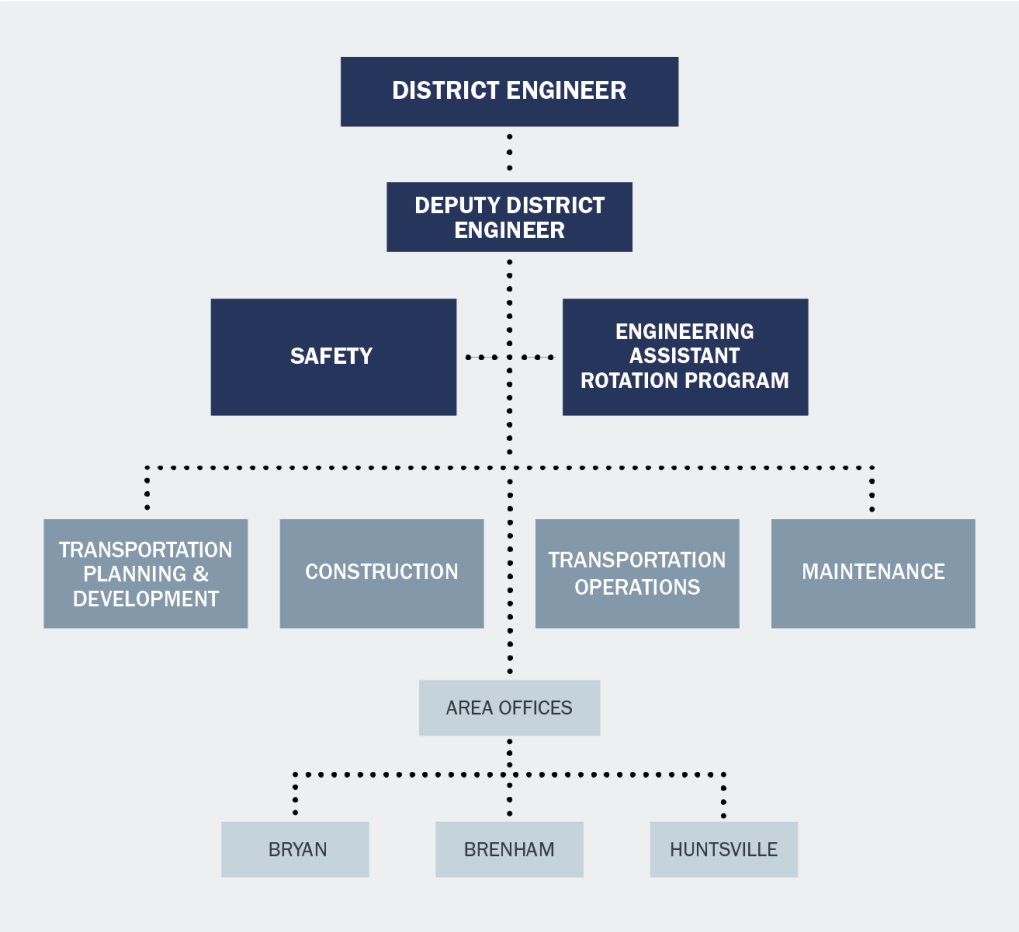


FIGURE 6: BRYAN DISTRICT ORGANIZATIONAL CHART

Project Delivery Process

The Bryan District is responsible for planning, programming, design, construction, operations, and maintenance of projects within the district. Within each of these areas, the Bryan District is already applying TSMO strategies at varying levels and consistency.

At the CMM workshop, participants rated the business processes at a Level 1. The Bryan District has a four-year planning process, and the district meets with each Area Office to discuss projects and priorities. The Bryan District has a documented process in place for programming and budgeting. They have a formal four-year plan for pavement preservation and a recently developed safety plan. Workshop participants noted that the Bryan District design group excels at considering operations in planning and design discussions, and this focus could be extended to maintenance.

The project development process at the Bryan District comprises of six steps: Planning, Programming, Design, Construction, Operations, and Maintenance. While this process has typically been used to develop more traditional capital improvement projects, it also supports the development of projects that use TSMO strategies. Projects are initially identified during the planning process. Then, prioritized projects progress through the rest of the process as funding and resources permit. Figure 7 illustrates that successes or challenges experienced in the process are communicated back to groups responsible for earlier stages so that

practices are improved. Some performance metrics are also used to support the project development cycle. In the Bryan District, staff wear many hats and are often involved in multiple steps within the project development process. This allows TSMO to be more easily integrated throughout all steps.

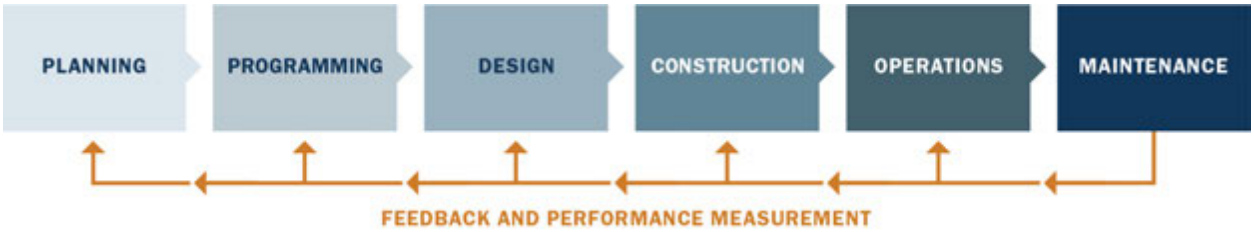


FIGURE 7: PROJECT DEVELOPMENT PROCESS AND FEEDBACK LOOP

The workshop participants noted the need to formalize some of their business process to support the district's strong relational culture and support effective TSMO. Implementation of the following recommended actions by fiscal year 2025 will advance capability maturity for business processes:

- Identify process (i.e., regularly scheduled meetings) to be more proactive with rural towns/counties within the district.
- Formalize incorporation of TSMO into project delivery (e.g., update checklists and forms, identify district TSM preferences).
- Formalize ITS agreements with the TxDOT Houston and Dallas Districts (i.e., funding, roles, responsibilities).
- Consider documentation of standard operating procedures to support business processes and organization and workforce.

Systems and Technology

This section describes the systems engineering process, processes to vet innovative technologies, and the regional ITS architecture, and existing and planned tools for traffic management systems.

Systems Engineering Analysis Process

The effective and optimized use of systems and technology for management and operational needs is essential to integrate TSMO within TxDOT. Systems and technology are the vehicle to ensure the activities identified in the Program Plan are carried out in an efficient and seamless manner.

The Systems Engineering approach offers a structured way of thinking to achieve project goals and objectives. This approach combines skills associated with engineering, project management and soft sciences (economic, social, and legal). It helps to address all project issues and provide completeness to the system. Systems Engineering also provides for "traceability", which is important when considering future changes to the system design, operation, verification, and testing. Traceability is the capacity to track every requirement in the system to the system component that satisfies it. Through the Systems Engineering approach, a traceability matrix is deployed. This matrix provides the basis for construction testing and acceptance by the Project Engineer, as well as the link between completion of individual pay items and implementation of the basic purpose and scope of the project.

Processes to Vet Innovative Technologies

The "V" Diagram or Model is a visual illustration of the Systems Engineering process used for ITS, with each step involved as the project progresses through development. The left side of the "V" Diagram provides a 'top-down' approach for system planning and design development while the right side provides 'bottom-up' implementation approach for systems testing and verification. The left side of the "V" must take into account the corresponding processes across on the right side of the "V". The "V" diagram is a composition of three different perspectives, namely user's perspective, engineer's perspective, and contractor's perspective.

The Stakeholder's (user's) perspective helps to present the list of requirements. These requirements provide detailed definitions need to support system design. The perspective of a systems engineer is focused on detailed subsystem components design to achieve stated requirements. The perspective of a contractor is focused on the actual deployment of the system components, which ensures compliance with the design specifications.

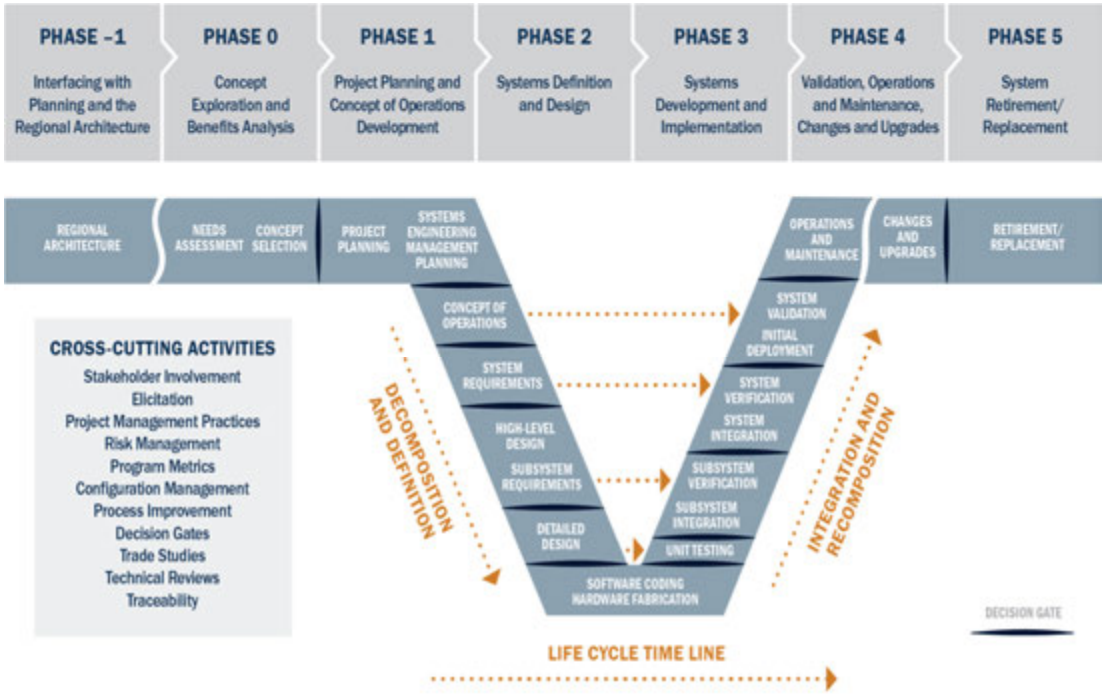


FIGURE 8: SYSTEMS ENGINEERING "V" DIAGRAM

The Bryan District noted that they are comfortable with their current systems engineering capabilities and want to advance their capabilities. The district has a project planned for US Highway 79, an evacuation route that crosses three counties – they are replacing signal components and adding cameras. The dstrict is working on remote connectivity and noted that the cost of interface is a factor. The district is currently working to standardize practices for maintenance.

The Bryan District currently has several systems and technology assets related to TSMO. It is imperative to manage these assets correctly in terms of productivity and safety. Determination of end of life is based on cost of operating, maintenance, and replacement. The following describes some of the issues and strategies being considered by the Bryan District for managing the assets.

System issues and strategies for TSMO equipment lifecycles:

- Traffic signals – The district operates approximately 112 traffic signals. Some of the signals are 45-50 years old. Approximately 60 of the locations have cell modems. Additional cell modems are being installed. There is limited interconnect within the signal system. Need ability to put signals into flash remotely during evacuations.
- Replace outdated signals in Huntsville and Brenham and add connectivity.
- Dynamic Message Signs (DMSs) – The district has 7 fixed messaging signs that are mapped for the ITS plan. The district uses portable messaging signs for incidents, but there is no remote access. Additional DMS are needed along I-45 at Huntsville, Madisonville, and Buffalo. Need for remote access to DMS.
- Cameras –The district would like to have more pan-tilt-zoom (PTZ) and/or fish-eye cameras at high priority intersections and are currently installing additional cameras with new and upgraded signals.
- Vehicle Detection - Signals do not have detection now but when a signal is upgraded or a new signal is added, radar detection is included.
- Closed-Circuit Television (CCTV) cameras on SH 6 is mounted such that the district cannot reach them with existing bucket trucks. TxDOT Traffic Safety Division is considering camera lowering systems.
- Communications Equipment – The district has approximately 103 signals connected by cell modems at limited locations. There is presently limited interconnect. The district is currently expanding ITS infrastructure and communications network with ongoing and upcoming construction projects. The district would like to expand fiber along SH 6 to Navasota.
- Currently, the district does not have a video wall. It would be useful to have access to view camera feed. There are ongoing discussions about where to put video monitors (likely traffic shop, Emergency Operations Center (EOC) and Director of Traffic Operations office). The district prefers to spend funds on additional CCTV and DMS rather than a TMC or video wall.
- Improve reliability in Smart Work Zones, troubleshoot and upgrade equipment where necessary.
- Lack of connectivity among Smart Work Zones in adjacent work zones, equipment not compatible with other jurisdictions,
- Existing equipment not reliable (asset uptime is approximately 35%).
- Address issue with data transmission to TTI.

Some of the technology initiatives that are being considered for the Bryan District:

- Create a top 10 systems and technology list (i.e., upgrade, replacement).
- Develop a plan to allow cities and law enforcement to have access to TxDOT cameras.
- Incorporate future statewide plan for video brokerage, asset systems, signal control, and third-party data use (e.g., INRIX, WAZE).
- Develop a life cycle plan to replace aging ITS infrastructure, particularly larger investments such as dynamic message signs
- Develop a plan to identify opportunities for innovation/pilots or tests of advanced TSMO strategies.

Regional ITS Architecture

The Brazos Valley Region ITS Architecture developed in 2004 (Kimley-Horn and Associates, Inc and ConSysTec, 2004) covers all ten counties that comprise the TxDOT Bryan District. The regional ITS architecture provides a framework for ITS systems, services, integration, and interoperability, and the regional. ITS deployment plan identifies specific projects and timeframes for ITS implementation to support the vision developed by stakeholders in the architecture.

Per the Chief Engineer's memo from July 2016, all new roadway construction projects should include infrastructure that supports TMS, including the underground conduit that supports a fiber optic-based communications network (TxDOT, 2016). The Chief Engineer's memo from April 2017 requires that TMS be included in each project's planning, programming, design, construction, maintenance, and operation (TxDOT, 2017). Specific TMS projects must be identified where gaps exist between typical road and bridge projects. The regional architecture should be updated at regular intervals, no less than every five years.

Stakeholders from throughout the Brazos Valley Region and neighbouring Regions participated in the development of the Brazos Valley Regional ITS Architecture and Deployment Plan. Key participants included representatives from TxDOT, the City of College Station, City of Bryan, Brazos County, Metropolitan Planning Organization, and Council of Governments. TxDOT will serve as the lead agency for maintaining both the Brazos Valley Regional ITS Architecture and the ITS Deployment Plan, however, these plans will continue to be driven by stakeholder consensus rather than a single stakeholder.

Performance Measurement

This section provides an overview of national performance measurement, Bryan District performance measure capability, and a performance measurement assessment.

National Performance Measurement

The Moving Ahead for Progress in the 21st Century (MAP-21) Act of 2012 established performance-based planning and management to improve the transparency and accountability of investment decisions for Federal-aid highway programs. A performance-based approach ensures transportation investments are linked to agency goals and objectives through structured performance evaluation, monitoring and reporting methods. MAP-21 requires State DOTs and MPOs to establish performance targets and track progress made toward seven national performance goals: safety, infrastructure condition, congestion reduction, system reliability, freight movement and economic vitality, environmental sustainability, and reduced project delivery delays. The Fixing America's Surface Transportation (FAST) Act of 2015 continues this approach and requires States to invest in projects that collectively make progress toward national goals (US DOT, 2015).

TxDOT Agency-Wide Performance Measures

TxDOT launched a Performance Dashboard in 2018 to quantitatively track statewide performance and targets relative to its core mission, goals, and objectives (TxDOT, 2018). The dashboard is grouped according to seven goal areas and includes 19 performance measures, as summarized in Table 6. TxDOT's goals related to system performance and safety include TSMO-oriented performance measures (denoted in italics).

TABLE 6: TXDOT AGENCY-WIDE PERFORMANCE DASHBOARD GOALS, OBJECTIVES, AND PERFORMANCE MEASURES

TxDOT Goal	Objectives	Performance Measures (*Italics denote TSMO oriented measures*)
Optimize System Performance	▪ Mitigate congestion ▪ Enhance connectivity and mobility ▪ Improve the reliability of our transportation system ▪ Facilitate the movement of freight and international trade ▪ Foster economic competitiveness through infrastructure improvements	▪ Congestion and Reliability Indexes o *Urban Congestion* o *Urban Reliability* o *Rural Reliability* o *Truck Reliability* ▪ Vehicle Miles Travelled ▪ *Annual Delay per Person*
Deliver the Right Projects	▪ Use scenario-based forecasting, budgeting, and resource-management practices to plan and program projects ▪ Align plans and programs with strategic goals ▪ Adhere to planned budgets and schedules ▪ Provide post-delivery project and program analysis	▪ Percent of Highway Infrastructure Contracts Completed on Time ▪ Percent of Highway Infrastructure Contracts Completed on Budget
Promote Safety	▪ Reduce crashes and fatalities by continuously improving guidelines and innovations along with increased targeted awareness and education ▪ Reduce employee incidents	▪ *Annual Fatalities & Fatality Rate* ▪ *Annual Serious Injuries & Serious Injury Rate* ▪ *Fatality Emphasis Areas involving:* o *Run off the road* o *Distracted driving* o *Driving under the influence* o *Intersections* o *Pedalcyclist* o *Pedestrian* ▪ Employee Injury Rate
Preserve Our Assets	▪ Maintain and preserve system infrastructure to achieve a state of good repair and avoid asset deterioration ▪ Procure, secure, and maintain equipment, technology, and buildings to achieve a state of good repair and prolong life cycle and utilization	▪ Percentage of Lane Miles in Good or Better Condition ▪ Bridge Condition Score
Focus on the Customer	▪ Be transparent, open, and forthright in agency communications ▪ Strengthen our key partnerships and relationships with a customer service focus	▪ Percentage of Customer Complaint Cases Closed on Time ▪ Customer Complaint Case Type (Top 5) ▪ Average TxTag Call Wait Time ▪ Average TxTag Call Handle Time

TxDOT Goal	Objectives	Performance Measures (*Italics denote TSMO oriented measures*)
	▪ Incorporate customer feedback and comments into agency practices, project development, and policies ▪ Emphasize customer service in all TxDOT operations	
Value our Employees	▪ Emphasize internal communications ▪ Support and facilitate the development of a successful and skilled workforce through recruitment, training and mentoring programs, succession planning, trust, and empowerment ▪ Encourage a healthy work environment through wellness programs and work-life balance	▪ Employee Engagement Score
Foster Stewardship	▪ Use fiscal resources responsibly ▪ Protect our natural resources ▪ Operate efficiently and manage risk	▪ Disadvantaged Business Enterprise (DBE) Attainment ▪ Historically Underutilized Business (HUB) Attainment ▪ Direct Transportation Funding

Bryan District Performance Measure Capability

Agencywide and districtwide performance measures enable management of safety and mobility strategies to ensure work efforts are contributing to the improvement of the program. To successfully integrate TSMO activities into agency processes, performance measures should be developed to continually track progress. These metrics should align with objectives established by TxDOT's mission, vision, and goals.

The Bryan District noted that their current performance measurement is informal or qualitative. The district does not have the staff available to actively monitor for events. The workshop participants noted the need to determine available data to be able to develop meaningful performance measures. There are automated ways to generate good travel time/speed performance measures.

Performance Metrics

As part of a statewide plan to measure the reliability of ITS field devices, TxDOT began quantifying asset uptime. This effort allows each district to create, plan, and address maintenance needs. The objective is for each district to achieve a 90% or better uptime on all assets (field devices). Each field device is required to be operational 75% of the time for the goal to be achieved. Since March 2017, this data has been collected using Lonestar. Currently, only traffic cameras, speed sensors, and main-lane DMS, which are identified by Lonestar, are used in the calculation of this TMS metric.

Plan to Achieve 90% Uptime Score

The Bryan District has already initiated steps to repair/replace existing TMS infrastructure and is now at 90% or better uptime, as shown in Table 7. To maintain that goal, the district will utilize the ITS Maintenance Contract

through the San Antonio District and in-house crews. The system will be monitored on a regular basis using Lonestar ITS to identify non-responsive cameras and equipment. Over time, the Bryan District will be able to determine appropriate resource allocation and specific funding for ITS maintenance and develop a plan for expansion and maintenance of the system.

TABLE 7: BRYAN DISTRICT TMS UPTIME

Jul 2019	Aug 2019	Sept 2019	Oct 2019	Nov 2019	Dec 2019	Jan 2020	Average
89.3%	93.1%	96.4%	96.4%	96.4%	96.6%	93.1%	94.5%

Begun as part of MAP-21 and continued in the FAST Act, State DOTs and MPOs are required to move towards a performance-based planning process with an emphasis on project selection based on specific planning factors. In the BCS MPO 2040 Metropolitan Transportation Plan (MTP) developed under MAP-21, the MPO focused on the following factors for selection of projects in its Fiscally Constrained Project List:

- **Highway Safety:** Five-year average of auto-related fatal and incapacitating crashes within the project limits
- **Bicycle and Pedestrian Safety:** Five-year average of bicycle and pedestrian-related fatal and incapacitating crashes within the project limits
- **Congestion:** Modeled Annual Hours of Delay/mile
- **Mobility:** Bicycle and pedestrian level-of-service

Under Map-21, States are required to set annual safety performance targets. The annual measures States set targets for include:

- Number of fatalities (The total number of persons suffering fatal injuries in a motor vehicle crash during a calendar year).
- Rate of fatalities per 100 million vehicle miles travelled (VMT) (The ratio of total number of fatalities to the number of vehicle miles travelled (VMT expressed in 100 Million VMT) in a calendar year).
- Number of serious injuries (The total number of persons suffering at least one serious injury in a motor vehicle crash during a calendar year).
- Rate of serious injuries per 100 million VMT (The ratio of total number of serious injuries to the number of VMT (VMT expressed in 100 Million VMT) in a calendar year).
- Number of non-motorized fatalities and number of non-motorized serious injuries combined (The combined total number of non-motorized fatalities and non-motorized serious injuries involving a motor vehicle during a calendar year).

The Texas Department of Transportation established the statewide targets to support the Strategic Highway Safety Plan (SHSP) and the Highway Safety Improvement Program (HSIP). Once the State of Texas set their safety targets, MPOs within Texas were required to either adopt the Texas targets or set their own that would help

achieve the statewide target. The Bryan/College Station MPO chose to adopt the state targets. The statewide targets for 2020:

- Total Traffic Fatalities Per Calendar Year: 3,840
- Rate of Traffic Fatalities Per 100M VMT: 1.406
- Number of Serious Injuries: 17,394
- Rate of Serious Injuries Per 100M VMT: 6.286
- Number of Non-Motorized Fatalities and Serious Injuries: 2,285

Finally, the state and MPOs are required to set Travel Time Reliability targets as part of their performance measures. The Bryan/College Station MPO set targets more stringent than the state target. These targets were adopted in December 2018 and are:

- 2020 Target: Not applicable (N/A)
- 2022 Target: 75%

In reviewing the data provided to the Bryan District by TxDOT prior to its submission to the Federal Highway Administration (FHWA), the district was asked to make changes to reflect local growth rate and to consider what should be done with Person Miles Travelled (PMT) that was greater than 1.4 but less than 1.5. The MPO understands that any PMT with a value greater than 1.5 is considered unreliable and that PMT between 1.4 and 1.5 could become unreliable if a small change in conditions were to occur. The MPO chose a 5% growth rate which reflects observed local growth rate instead of the 2% assumed by TxDOT. Even with this change the reliable PMT was 83% (with the assumption that all segments between 1.4 and 1.5 would become unreliable).

After considering the State Target and the need for some areas of the State to have a more aggressive target than the one selected by TxDOT to balance some of the larger urban areas that could not meet the state target, the Bryan/College Station MPO adopted a more stringent target. The MPO selected a target of 75% for several reasons. First, the change in data sets and the limited amount of experience with this data gave them pause to not select the 83% PMT that is reliable in case unforeseen variability in the new data set had not yet been revealed. Second, the MPO has two major roadways in the area that have been selected for Category Two funding and will be under construction between now and 2022.

The Bryan District believes that target setting should be an attempt by the MPO to develop a useful measure upon which project selection can be based. Adopting the state target does not change the level of urgency necessary to focus funding on segments that would be considered unreliable in the Bryan/College Station area. They have therefore have not adopted the State target and instead adopted a target more stringent than the state target.

Proposed Performance Measurement Initiatives to be Incorporated into TSMO:

1. Formalize process to access data for use in performance measurement.
2. Consider pilot programs for traffic incident management.
3. Consider how to collaborate with cities, counties, universities/colleges, and law enforcement for performance management.
4. Identify what performance metrics would be useful to the Bryan District.
5. Develop a metric for incident clearance time.

6. Develop a metric for asset uptime.
7. Incorporate national incident response and clearance time metrics into after action reviews.
8. Develop district dashboard with relevant info for cities/counties about traffic signals based on input of what data other agencies want.

One target in the BCS MPO area that is of great concern to residents is travel time reliability. To that end the MPO has programmed $174.3 million on one project:

- SH 6 between SH 21 and SH 40. Traffic volumes of 93,000 vehicles per day on a four-lane section result in numerous crashes and congestion delay along this corridor. The project will add one lane in each direction and include additional operational improvements including interchange U-turn lanes, collector/distributor lanes, and frontage road geometric improvements. The ITS Master Plan includes deployment plan projects to install things such as cameras and dynamic message signs that will help improve travel time reliability by providing traveler information and supporting traffic incident and event management. Other TSMO action items in this plan such as a Traffic Incident Management (TIM) tactical program also support travel time reliability.

Performance measurement is a critical activity to test and improve how TSMO is advancing progress toward state and district goals of Safety, Reliability, Efficiency, Customer Service, Collaboration, and Integration. The implementation plan identifies Performance Measures action items to formalize processes to access data and to develop metrics for asset uptime, incident clearance time, and evacuation-related congestion management. Suggested performance measures are provided over the next few pages in Table 8 and will advance performance measurement for the Bryan District to a solid Level 2 by 2026.

TABLE 8: TSMO PLAN PERFORMANCE MEASURES

Goal / Performance Measure	Calculation	Data Required	Data Source	Update Frequency	Reference
Safety					
Number of fatalities	5-year rolling average $\frac{K_n+K_{n-1}+K_{n-2}+K_{n-3}+K_{n-4}}{}$ where: K = number of fatalities N = year of calculation	▪ Total number of deaths in reportable motor vehicle traffic crashes each calendar year for the past five years on all public roads in the Bryan District	TxDOT Crash Records Information System (CRIS)	Annually	(1)
Number of serious injuries	5-year rolling average $\frac{n+\ n-1+\ n-2+\ n-3+\ n-4}{}$ where: A = number of incapacitating injuries N = year of calculation	▪ Total number of incapacitating injuries in reportable motor vehicle traffic crashes each calendar year for the past five years on all public roads in the Bryan District	CRIS	Annually	(1)
Number of work zone crashes	5-year rolling average $\frac{n+\ n-1+\ n-2+\ n-3+\ n-4}{}$ where: C = number of work zone crashes N = year of calculation	▪ Total number of work zone crashes each calendar year for the past five years on all public roads in the Bryan District. ▪ Work zone crash defined using the following CRIS crash database table codes: Crash Road Construction Zone Flag ID = "Y", or Crash Road Construction Zone Worker Flag ID = "Y", or OTHR_FACTR = 49 or 50 or 51 or 52	CRIS	Annually	N/A

Goal / Performance Measure	Calculation	Data Required	Data Source	Update Frequency	Reference
Reliability					
Percent of person-miles travelled on the Interstate system that are reliable (Alternatively, TTI has some ideas on simpler measures to use with existing data sets)	▪ Determine 80th and 50th percentile travel times for all reporting segments. ▪ Calculate Level of Travel Time Reliability (LOTTR) as the ratio of longer travel times (80th percentile) to a normal travel time (50th percentile). LOTTR is calculated for each reporting segment of the Interstate system for each of four time periods for an entire year: AM peak 6am-10am weekdays; midday 10am-4pm weekdays; PM peak 4pm-8pm weekdays, and weekends 6am-8pm. ▪ Determine if reporting segment is included in measure calculation (reliable person miles). A segment is reliable if the LOTTR is less than 1.5 for *all four* time periods. If one or more time periods has a LOTTR of 1.5 or above, that segment is unreliable. ▪ Calculate person miles travelled that are reliable as Segment Length × Annual Traffic Volume × Average Vehicle Occupancy for all Interstate reporting segments with LOTTR < 1.50 for all four time periods. ▪ Calculate total person-miles of travel as Segment Length × Annual Traffic Volume × Average Vehicle Occupancy for all Interstate reporting segments. ▪ Calculate measure as the ratio of person-miles of travel that are reliable to total person-miles of travel.	▪ Reporting segment length ▪ Travel time on segment (all vehicles) in 15-minute intervals for the hours of 6 AM to 8 PM each day for an entire year. ▪ Highway type (Interstate NHS) ▪ Annual Average Daily Traffic (AADT) for each segment ▪ Average vehicle occupancy for all vehicles	FHWA's National Performance Management Research Data Set (NPMRDS) or TxDOT-approved equivalent	Biennially	(2)

Goal / Performance Measure	Calculation	Data Required	Data Source	Update Frequency	Reference
Percent of person-miles travelled on the non-Interstate NHS that are reliable	▪ Same as above, but the LOTTR ratio is calculated for each reporting segment of non-Interstate NHS. Alternatively, TTI has some ideas on simpler performance measures to use with existing data sets.	▪ Reporting segment length ▪ Travel time on segment (all vehicles) in 15-minute intervals for the hours of 6 AM to 8 PM each day for an entire year. ▪ Highway type (non-Interstate NHS) ▪ AADT for each segment ▪ Average vehicle occupancy for all vehicles	FHWA's NPMRDS or TxDOT-approved equivalent	Biennially	(2)
Annual person hours of work zone delay	▪ Estimate average travel time per vehicle for each 15-minute interval on reporting segments impacted by work zones. ▪ Estimate free flow travel time per vehicle for each 15-minute interval on reporting segments ▪ Calculate delay as the difference between average travel time and free flow travel time for each 15-minute interval on reporting segments impacted by work zones. Convert to hours of delay. ▪ Calculate person-hours of work zone delay for each 15-minute interval on reporting segments as the Delay × 15-minute traffic volume × average vehicle occupancy. ▪ Calculate annual person-hours of work zone delay by summing across all reporting segments and 15-minute intervals impacted by work zones.	▪ Location and duration of work zones ▪ Length of reporting segments impacted by work zones ▪ Travel time or speeds on segment (all vehicles) in 15-minute intervals for the duration of the work zone ▪ Free-flow travel time or speeds in work zones ▪ 15-minute traffic volumes on reporting segments impacted by work zones ▪ Percent of total traffic for cars, buses, and trucks ▪ Average vehicle occupancy for cars, buses, and trucks	FHWA's NPMRDS or TxDOT-approved equivalent	Annually	N/A

Goal / Performance Measure	Calculation	Data Required	Data Source	Update Frequency	Reference
Average incident clearance time	▪ For each incident, calculate the time between first recordable awareness of the incident and the time the last responder leaves the scene. ▪ Calculate the average incident clearance time for all incidents of interest in the region for an entire year.	▪ Incident notification time and time last responder leaves the scene for each incident of interest in the region	Public safety/first responders (police, fire, medical), Bryan District Area and Maintenance Offices	Annually	(3)
Evacuation clearance time	▪ Evacuation clearance time is the time necessary for people to evacuate from the point when a mandatory evacuation order is issued until the last evacuee can leave the evacuation zone. ▪ The base evacuation time is the worst-case scenario with 100% of people in each zone evacuating at the same time. ▪ The operational evacuation time is based on information from the Regional Planning Councils and local Emergency Management offices that is specific to their region and county. It accounts for the behaviour of residents, traffic patterns, roadway construction, etc.	▪ Base evacuation time for each evacuation zone ▪ Operational evacuation time	Regional planning councils Local emergency management offices	Annually (or following event occurrence)	None

Goal / Performance Measure	Calculation	Data Required	Data Source	Update Frequency	Reference
Efficiency					
Rate of growth in NHS facility miles experiencing recurring congestion	▪ Establish threshold for recurring congestion. Examples include speed < 45 mph, level of service (LOS) F, volume-to-capacity ratio > 1.0. ▪ Estimate average travel time per vehicle for each 15-minute interval on reporting segments during the AM and PM peak periods: AM peak 6am-10am weekdays; PM peak 4pm-8pm weekdays. ▪ Determine if reporting segment is included in measure calculation (experiencing recurring congestion). A segment is congested if travel conditions exceed the threshold for any length of time during the AM and PM peak periods. ▪ Calculate sum of NHS facility miles that experience recurring congestion during the AM and PM peak periods. ▪ Compare rate of growth in NHS facility miles experiencing recurring congestion to population growth rate between previous and current calendar year.	▪ Length of reporting segments ▪ Travel time or speeds on segment (all vehicles) in 15-minute intervals ▪ Urbanized area population	FHWA's NPMRDS or TxDOT-approved equivalent 5-year population estimates from American Community Survey (US Census Bureau)	Annually	N/A
Percent of traffic signals retimed	Divide the number of traffic signals retimed by the total number of traffic signals on TxDOT maintained roadways in the Bryan District.	▪ Number of traffic signals on TxDOT maintained roadways retimed ▪ Total number of traffic signals on TxDOT maintained roadways in the Bryan District	TxDOT Bryan District Operations technicians	Annually	N/A

Goal / Performance Measure	Calculation	Data Required	Data Source	Update Frequency	Reference
Customer Service					
Repeat visitors to Bryan section of DriveTexas.org	▪ Divide the number of return visitors to the Bryan section of the DriveTexas.org website by the number of total unique visitors for a calendar year.	▪ Number of return visitors to Bryan section of DriveTexas.org website ▪ Number of unique visitors to Bryan section of DriveTexas.org website	TxDOT Travel Information Division TxDOT Bryan District Public Information Office	Annually	N/A
Number of subscribers to Bryan District social media platforms	▪ Social media platforms or Hootsuite can provide the Bryan District PIO tools to automatically calculate social media metrics	▪ Number of subscribers across all district social media platforms	Twitter, Hootsuite, etc.	Monthly	N/A
Number of complaints received and resolved	▪ Use the statewide system TRACK to record the number of complaints received ▪ Calculate percentage of complaints that are resolved and closed within 10 days	▪ Number of complaints received ▪ Number of complaints resolved within 10 days	TRACK	Monthly	N/A
Collaboration					
Number of TSMO implementation status meetings	▪ Number of meetings with representatives from the four core sections (TP&D, Construction, Maintenance, and Transportation Operations) and the three Area Offices to review TSMO implementation status. ▪ Number of meetings with external stakeholders.	▪ Number and dates of TSMO implementation status meetings	TSMO Champion	Annually	N/A

Goal / Performance Measure	Calculation	Data Required	Data Source	Update Frequency	Reference
Number of after-action review meetings	▪ Number of after-action review meetings with attendance from at least 90 percent of agencies involved in the response to a major incident/emergency or adverse weather event.	▪ Number, date, and percent of responder agencies represented at after-action review meetings	TSMO Champion	Annually	N/A
Percent of capital projects reviewed for regional construction coordination	▪ Percent of capital projects reviewed for regional construction coordination.	▪ Number of capital projects submitted for review ▪ Capital project anticipated and actual schedules ▪ Number of capital projects that included review for regional construction coordination	TSMO Champion	Annually	N/A
Integration					
TMS system coverage	▪ Divide the number of Interstate or NHS centerline roadway miles equipped with ITS equipment and communications for incident and emergency detection/response by the total number of Interstate centerline roadway miles.	▪ Total centerline miles of I-45 and NHS highways in the district ▪ Total centerline miles equipped with ITS-related assets for incident and emergency detection/response	To be determined (TBD)	Annually	N/A
Percent TMS asset operational uptime	▪ For each TMS asset of interest, divide the number of hours (or other time increment) the asset is operational by the total number of hours (or other time increment) in a calendar year. ▪ Calculate the average percent TMS asset operational uptime across all TMS assets.	▪ Number of hours (or other time increment) each TMS asset is operational	TBD	Annually	N/A

Goal / Performance Measure	Calculation	Data Required	Data Source	Update Frequency	Reference
Percent traffic signals monitored through the network and equipped with automatic failure alerts	▪ Divide the number of traffic signals monitored through the network and equipped with automatic failure alerts by the total number of traffic signals.	▪ Number of traffic signals monitored through the network and equipped with automatic failure alerts ▪ Total number of traffic signals	TBD	Annually	N/A
Number of joint training exercises conducted	▪ Number of joint training exercises in the region that support shared implementation of TSMO strategies	▪ Number and dates of joint training exercises in the region	TSMO Champion	Annually	N/A

References:

(1) Safety Performance Measures Fact Sheet. https://safety.fhwa.dot.gov/hsip/spm/docs/safety_pm_fs.pdf

(2) Overview of Performance Measures: Travel Time Reliability (NHPP) and Annual Hours of Peak Hour Excessive Delay (CMAQ), September 2017. https://www.fhwa.dot.gov/tpm/workshop/az/reliability.pdf

FHWA Computation Procedure for Travel Time Based and Percent Non-Single Occupancy Vehicle (non-SOV) Travel Performance Measures. FHWA HIF-18-024. May 2018. https://www.fhwa.dot.gov/tpm/guidance/hif18024.pdf

(3) FHWA Traffic Incident Management Performance Measurement Presentation. https://ops.fhwa.dot.gov/publications/fhwahop10010/tim_pm_pres.ppt

Collaboration

The TxDOT Bryan District staff have well-established collaboration internal to TxDOT and with external partners. Its strong relational culture is supported by technology. The Bryan District is a hub that abuts seven districts and has pass-through traffic between three major metro areas (i.e., Houston, Dallas, and Austin). Additionally, hurricane evacuation routes pass through the district.

Internal Partnerships

The ability of divisions, districts, partner agencies, and other stakeholders to work together to achieve goals is a defining characteristic for all TSMO programs. Internal collaboration provides input from all disciplines and streamlines the project development process, focusing on efficiency and mobility-specific strategies. The Bryan District is isolated from other TxDOT TMCs (Houston and Dallas) however the district receives operations support from the Houston and Dallas Districts and is currently developing standard operating procedures for ITS maintenance. The Bryan District sees an opportunity to leverage statewide TxDOT technology efforts (e.g., central signal control, video control, asset management, and statewide ITS design manual).

External Partnerships

The Bryan District plans, designs, builds, operates, and maintains the state transportation system in the following counties: Brazos, Burleson, Freestone, Grimes, Leon, Madison, Milam, Robertson, Walker and Washington. The district has nearly completed adding remote communication to all traffic signals for which TxDOT is responsible in the district. There may be an opportunity for collaboration along corridors among TxDOT, cities, and other agencies.

The district has strong relationships at all levels including strong coordination and collaboration with law enforcement, first responders, and cities. To facilitate collaboration with cities and counties, the Bryan District and has a strong partnership with the Bryan, College Station MPO (BCS MPO). Partners in the Bryan-College Station area excel at managing transportation for planned special events. TSMO strategies already refined for planned special events (e.g. A&M football games, graduation) are transferrable to other events or incidents. Regular standing meetings are held with the Cities of Bryan, College Station, Brenham, and Huntsville and periodic meetings are scheduled with the City of Navasota. Each Area Engineer is the go-to person for collaboration with cities within their area. TxDOT has deployed local ITS infrastructure in the Bryan-College Station area and in spot locations in the district. City of College Station has good tools and has invested in system upgrades (pan-tilt-zoom cameras, etc.). The City of College Station operates a TMC on an as-needed basis and there is an opportunity for potential TMC collaboration and data access and sharing in the Bryan-College Station area.

TTI and Texas A&M University regularly collaborate with the Bryan District and the Cities of Bryan and College Station to test out new technologies and strategies. The district embraces innovation (e.g., diverging diamond interchanges, super streets, and roundabouts).

Proposed Initiatives Related to Collaboration:

- Develop a Bryan District “Whom to Contact” list for TSMO. The district website has a contact page, but it does not tell a user how each person could help them.
- Use SHRP2 traffic incident management training to build relationships between stakeholders.
- Develop relationship with National Weather Service (NWS) to have earlier access to weather data to support emergency operations and Department of Public Safety (DPS).

Organization and Workforce

The existing organizational structure of the Bryan District is comprised of members from TP&D, Construction, Operations, and Area Offices. Many of these district employees already perform some TSMO activities; however, standardizing collaboration in all projects will promote TSMO, and defining the person responsible for ensuring this activity is carried out further enables the success of TSMO in the district. The Bryan District has identified potentially new and expanded staff positions for consideration:

TSMO Coordinator – Coordinate district progress toward mainstreaming TSMO including integrating TSMO into all stages of project development and delivery, funding requests, training, and interagency coordination. This position may only require a partial FTE and will become important as more ITS infrastructure is constructed, and more traffic signals are brought online and connected to a central signal system. With current mindset shifts in the positive direction regarding teleworking, this could be an opportunity to share a TSMO Coordinator that supports more than one district. In the near term, the role of TSMO Coordinator primarily falls under the responsibility of the District Traffic Engineer.

Traffic Engineer – The Bryan District ITS Master Plan identified the need for an additional traffic engineer FTE (TxDOT Bryan District, 2022)

Traffic/ITS Maintenance Technician -The Bryan District ITS Master Plan also identified the need for one additional FTE traffic/ITS maintenance technician (TxDOT Bryan District, 2022). This additional FTE is needed to operate and maintain new ITS infrastructure under design and construction or programmed for future installation. The exact timing of the additional FTE will need to be monitored and assessed.

Currently, TSMO activities are diffused across many positions within TxDOT. To promote retention, a career path for operations within TxDOT could be identified more broadly across TxDOT.

The workshop participants rated organization and workforce at a Level 2, primarily because of the Bryan District's strong Engineering Assistant (EA) rotational program and focus on succession planning. The rotation includes construction, maintenance, transportation, and district lab, and if an EA is involved in a big project, they will hold that person longer in a certain area to allow them to finish the project to gain experience. The Bryan District has added a staff position focused on ITS. To advance capability maturity for organization and workforce, the district plans to focus on identifying a career path for operations staff within TxDOT and developing a flowchart for TSMO processes that includes staff roles. Additionally, workshop participants noted the benefits developing a training plan and possibly leveraging staff from other districts to support TSMO in the Bryan District.

Culture

The Bryan District has a strong relational culture, and it is important to supplement the personal communication with technology. The workshop participants rated culture at Level 1 and noted that they need to justify the business case for TSMO within the district to understand the benefits and costs and to prioritize projects. There is an opportunity to leverage the Bryan District's expertise in planned special events to support TSMO in other program areas, such as traffic management and traffic signal management. The workshop participants also identified the need to reach out to municipalities in the more rural areas of the district to identify opportunities to implement TSMO strategies. To advance capability maturity, the Bryan District intends to:

- Develop and distribute a Bryan District dashboard and establish a practice of sharing information.
- Develop the business case model that shows the benefit both for TxDOT operations/maintenance, first responder safety, and the public operation/user costs.
- Reach out to external partners to let them know what TxDOT is doing to improve the transportation system and find out what they are doing that could be incorporated into TxDOT efforts.. Discuss potential options for resource sharing.
- Keep relational culture and supplement strong personal communication with technology.

Capability Maturity Framework

During the workshop stakeholders also assessed each of the six dimensions for six frameworks. Table 9 includes the overall assessment and a detailed assessment report and survey are included in the CMF Assessment (TxDOT Bryan District, 2020).

TABLE 9: CAPABILITY MATURITY FRAMEWORK ASSESSMENT BY WORKSHOP STAKEHOLDERS

Framework	Capability Level	Framework Description
Traffic Management 	2	Ability to monitor and control traffic and the roadway network to coordinate traffic information
Traffic Signal Management 	2	Planning, design, integration, maintenance, and proactive operation of a traffic signal system
Work Zone Management 	2-3	Assessment of work zone impacts and implementing strategies to minimize or mitigate impacts
Traffic Incident Management 	2	Planned and coordinated multi-disciplinary process to detect, respond to, and clear traffic incidents
Road Weather Management 	2	Manage traffic flow and operations before and during adverse weather conditions
Planned Special Events 	3	Advanced operations planning, stakeholder coordination, resource sharing, and public awareness of potential travel impacts

Traffic Management

The Bryan District's traffic management strategies are deployed dynamically (e.g., special events), and the district has formal procedures for event management. By leveraging their robust experience in this program area and focusing on expertise in traffic management and communication, the district has a strong program for other areas of traffic management including incident management and work zone management. The Bryan District staff identified the need for regional traffic management objectives.

Traffic Signal Management

The Bryan District has nearly completed adding remote communication to all traffic signals for which TxDOT is responsible in the district. TxDOT Traffic Safety Division is rolling out a central control system for districts to use. The district noted the need to increase staffing to monitor signals once all the communications are in place. The Bryan District currently supplements signal maintenance staffing through maintenance contracts. They schedule preventive maintenance annually. The district is currently working with a consultant to develop district signal design guidelines, and they noted that a traffic signal management plan would help document what has been done to prioritize work.

Work Zone Management

The Bryan District focuses on continuous improvement in work zones. Their 60-percent design review provides a process to discuss lessons learned from previous projects when planning work zones and typically incorporate those lessons into the general notes of the plan sheets for similar projects. The Bryan District is interested in leveraging existing technology to support work zone management. The district has a high level of collaboration with municipalities and law enforcement, and the PIO is proactive in communicating upcoming construction projects / work zones.

Traffic Incident Management

When incidents occur, law enforcement notifies the Bryan District if traffic control is needed. On I-45, the Bryan District has a total highway maintenance contract that includes incident management. TxDOT and their contractor rely on the DPS to make the call for traffic control for traffic incident management, and the district is highly responsive when called. The Bryan District has a process to respond to hazardous materials spills. The district's strong relational culture and collaboration with the Bryan police department and DPS, as well as strong communication by the PIO, support traffic incident management.

Road Weather Management

Flooding and icing are the most common weather events that impact Bryan District roadways. Most of the Bryan District's training around road weather management is focused on the calibration of equipment for pre-treatment. The district recently developed guidelines for roadway flooding related to traffic control, monitoring, and barricades. Additionally, the district serves as a hub for hurricane evacuation. When tropical depressions / storms form in the Gulf of Mexico, the district is involved in statewide calls and coordination to prepare for potential hurricane events. Their strong relationships with law enforcement support the management of detours and road closures.

Planned Special Events

The region excels at managing traffic for planned special events. Regular events associated with Texas A&M University have provided a laboratory of sorts for the Bryan District and its stakeholders, including the Cities of Bryan and College Station, Texas A&M University, and the Texas A&M Transportation Institute, to develop the process to execute planned special events seamlessly. The Bryan District and its partners understand how to manage transportation systems and expectations for large planned special events, such as Texas A&M football games. Their procedures are scalable – for example, they successfully executed their procedures with six days' notice for George H.W. Bush's memorial and interment. The Bryan District uses technology effectively to support planned special events, and their strong relationships and regular communication with its stakeholders support successful planned special events.

TSMO Implementation Plan

This section includes a prioritized implementation plan for advancing TSMO in the Bryan District over the next four years. Bases on the discussions and action needs for the Bryan District brought forward in the Working Group meetings, stakeholder meetings within the district, and then further discussed through the CMM and CMF surveys and workshops, numerous action items were identified. This section summarizes TSMO strategy action items for implementation within the next four years, longer-term actions that should be assessed during the next major TSMO program plan update, regional TSMO efforts that may be championed by partners, links to efforts in adjacent districts, statewide TSMO efforts, and the process for implementing and update the TSMO program plan. For each action item a graphic follows that includes the following:

- **Action Number:** Provides a number for identification and tracking of the action. The initials stand for the related CMM dimension: business processes (BP), systems and technology (ST), performance measurement (PM), culture (CU), organization and workforce (OW) and collaboration (CO).
- **Action Description:** Provides a brief description of the action, which may include multiple steps.
- **Goal Alignment:** Identifies which of the TSMO goals the action supports. Some actions may not directly support a goal, but their implementation will help in achieving the goal. The six statewide TSMO goals supported by the district are described in Table 3: safety, reliability, efficiency, customer service, collaboration, and integration.
- **Priorities:** A priority level (high, medium, low) has been identified for each action item within the next six years. These targets were set based on the time it will take to implement an action, the urgency of the action, whether there are dependencies on other actions, or available resources. Priorities may shift as major events occur or staffing and funding resources change.
- **TxDOT Bryan District Lead:** Identifies the individual at the Bryan District who will take ownership of the action and will oversee that implementation progresses as planned.
- **Partners:** Identifies TxDOT Districts or Divisions or external stakeholders needed for coordination or resources for successful action implementation.
- **Resources:** Identifies staff, funding, and other tools needed to support the action.
- **Measures of Success:** Provides performance metrics that will help action tracking and reporting.

This Bryan TSMO Plan includes actions to advance the TSMO program within the district. The Bryan District ITS Master Plan includes a prioritized project list of field devices or systems (e.g., signal upgrades, DMSs) and field equipment (e.g., PCMSs, truck mounted attenuators (TMAs)) (TxDOT Bryan District, 2022).

Focus Area: Business Process

ACTION ITEM: BP-01

Formalize ITS agreement with TxDOT DAL and upgdate agreement with HOU as needed.

Determine framework for how Bryan District ITS devices are operated around the clock, including support from adjacent metro districts for active monitoring and control of devices. This includes identifying how operations responsibilities are divided (e.g., by device, by highway, by county).

Develop or update formal ITS operations agreements with TxDOT Houston District (HOU) and/or Dallas District (DAL) to specify funding, roles, and responsibilities of each district in terms of active operations and management of ITS devices and systems.

ACTION ITEM: BP-02

Formalize incorporation of TSMO into project delivery.

Review and update district processes and tools to formally include TSMO elements in all aspects of project delivery, including considerations of

- Updating checklists/forms used for planning, programming, and design.
- District design preferences for traffic management systems.
- Post-construction reviews to identify lessons learned and future TMS construction improvements.
- Periodic maintenance reviews to assess design or operations changes that will improve device/system maintainability.

Focus Area: Business Process

ACTION ITEM: BP-03

Develop documentation of standard operating procedures (SOPs) to support business processes and organization and workforce, including:

- Develop SOPs for troubleshooting and preventive maintenance of TMS field equipment. Initial SOP development is underway
- Implement system for tracking requests for operational changes/troubleshooting and create a better way to track trouble calls by site

ACTION ITEM: BP-04

Update the district's Work Zone Management Plan, including considerations for:

- Understand criteria for determining when and how to use law enforcement for work zone management purposes.
- Develop a process to gain input from the Area Office/inspector engineer.
- Develop and periodically update information resources for work zone designers and managers regarding availability and expected effect of new work zone management technologies and innovations

Focus Area: Business Process

BP-05

Develop a Traffic Signal Management Plan, including considerations for:

- Identify monitoring needs.
- Create a signal database that includes a current update on signal status.
- Develop regional standards for maintaining traffic signal system technologies and systems in a state of good repair.
- Where signal communication exists, address issues with time clock drift (using GPS).
- Develop strategies and consensus for operating traffic signals across regional jurisdictional boundaries (i.e., TxDOT/local)
- Consider a process to mitigate signal timing issues and develop a plan for when they are impacted by construction.
- Develop traffic signal maintenance logbook.
- Develop and/or participate in regional traffic signal operations/traffic signal timing program.
- Develop a concept of operations for regional traffic signal operations, including defining corridor operating objectives.
- Develop and implement a policy for identifying traffic signal priority for transit and emergency vehicles.
- Develop criteria for different signal operating modes, including flashing operations.
- Establish special timing plans for alternate routes for incident management, special events, and construction activities.
- Develop criteria for automatic notification of equipment outages and service interruptions.
- Consider professional services contracts for signal timing.
- Finalize district guidelines for signal design. Use annual preventive maintenance to improve design standards.
- Develop dashboard with relevant information for cities/counties about traffic signals based on input of what data other agencies want.

Focus Area: Business Process

ACTION ITEM: BP-06

Develop a Traffic Incident Management (TIM) Tactical Plan. See Tactical Plan section for full list of considerations.

Implement SHRP2 training as a high priority action item separate from the tactical plan. See Action Item CO-04.

Focus Area: Business Process

ACTION ITEM: BP-07

Develop a project feedback mechanism, including considerations for:

- Gather contractor feedback through annual/quarterly reporting and during the contractor evaluation at project close-out.
- Improve process to gather anonymous contractor comments.
- Conduct and document debriefings after major projects to obtain input on successes and lessons learned.

Focus Area: Business Process

ACTION ITEM: BP-08

Develop a Road Weather Management Plan, including considerations for:

- Best practices from FHWA Pathfinder Project (see Action Item CO-05)
- Identify agency champion and stakeholders and develop communication protocol and information dissemination procedure for cross-jurisdictional collaboration among operating agencies, weather agency, and community.
- Establish "sensor triggers" to notify operations staff, partner TMCs and maintenance staff when specific sensors or stations indicate a weather condition.
- Define key output metrics for road weather management, including material use, labor, and cost. Generate post-event summary reports to provide a record for future events.

Focus Area: Systems and Technology

ACTION ITEM: ST-01

Procure system hardware and technology to permit traffic responsive operations. Deploy decision support system to assist with real-time operational decision making.

ACTION ITEM: ST-02

Expand the use of monitoring devices and systems in construction contracts. Consider including TMS asset uptime as a requirement for contractors.

Focus Area: Systems and Technology

ACTION ITEM: ST-03

Develop a Data Management Plan, including considerations for:

- Identify data interests and needs of all parties (e.g., law enforcement, cities, public) and develop data sharing protocol.
- Review existing processes to identify modifications to allow for more data collection.
- Incorporate future statewide plans for video brokerage, asset systems, signal control, and third-party data use.
- Develop procedures to standardize data from various sources and improve the data management system to support multiple data sources.

ACTION ITEM: ST-04

Develop a Systems Engineering approach to identify functional requirements for traffic signal system infrastructure. Identify system technologies needed to provide an on-demand assessment of traffic signal performance. Use automated traffic signal performance measures (ATSPMs) and camera access to improve operations.

Focus Area: Systems and Technology

ACTION ITEM: ST-05

Update regional ITS architecture or participate in a multi-district or statewide ITS architecture.

ACTION ITEM: ST-06

Update the significant project procedures form to include newer options under the consideration of technology section.

Focus Area: Performance Measurement

ACTION ITEM: PM-01

Develop performance metrics relevant to traffic signal management, including safety related performance metrics. Establish reliability thresholds for traffic signal system infrastructure. Establish baseline criteria for a minimum level of equipment performance (i.e., state of good maintenance) that is agreeable to all regional agencies.

ACTION ITEM: PM-02

Develop a Performance Measurement State of the Practice and Needs Assessment, including considerations of:

- Identify what performance metrics would be useful.
- Identify available data and technology for developing, automatically processing, and tracking performance measures.
- Consider how to collaborate with cities, counties, and law enforcement for performance management.
- Develop an organizational approach for assessing changes in system performance for routes of regional significance.

Focus Area: Performance Measurement

ACTION ITEM: PM-03

Develop a Performance Measurement Implementation Plan for districtwide traffic management, including considerations of:

- Establish project-level performance measures and define "good basic service concept" performance measures.
- Develop key performance indicators (KPIs) for tracking asset uptime, incident clearance times, frequency of preventive maintenance, response time, etc.
- Link performance to value of investment.
- Define outcome-based performance measures needed to evaluate high interest work zone management strategies and Traffic Management Plan (TMP) effectiveness.
- Identify target corridors, including possible nearby arterials to be included in performance management.

Focus Area: Organization and Workforce

ACTION ITEM: OW-01

Work to improve staff experience and workforce efficiency:

- Identify a career path for operations staff within TxDOT.
- Develop a flowchart for TSMO processes and identify staff roles. Codify what district staff should do.
- Use workforce efficiently through remote communication and shared staff with other districts.
- Establish a core group for traffic management that includes staff for key roles requiring redundancy.

ACTION ITEM: OW-02

Provide funding to support formalized training and professional knowledge building for:

- Professional traffic signal operations and maintenance staff.
- Work zone designers and operations personnel on how existing. technology resources can be used for work zone management.
- Maintenance staff on traffic incident management.
- Increase staff who have completed the Strategic Highway Research Program 2 (SHRP2) traffic incident management training. See Action Item CO-04.

Focus Area: Organization and Workforce

ACTION ITEM: OW-03

Conduct needs assessment for TMC and consider district TMC versus shared funding or staffing for a TMC.

Focus Area: Collaboration

ACTION ITEM: CO-01

Develop a plan to identify opportunities for innovation/pilots or tests of advanced TSMO strategies.

Continue to work with local universities to research traffic operations issues, such as how to archive data or evaluate performance measures, and to pilot test emerging technologies.

ACTION ITEM: CO-02

Update contact lists and distribute regularly, taking into consideration:

- Bryan District points of contact for external stakeholders:
  - General traffic management
  - Work zones
  - Weather events
  - Incidents
  - Planned special events

The Brazos Valley Council of Governments (BVCOG) allows agencies to make presentations during their monthly Board meetings. Consider this forum for updating contact lists and providing updates on TSMO efforts.

Focus Area: Collaboration

ACTION ITEM: CO-03

Coordinate with law enforcement, formalize efforts at county level first, identify how district can help law enforcement on and off the scene of an incident and how to coordinate regarding the impacts of minor stops and road closures on highway safety and operations.

ACTION ITEM:CO-04

Use SHRP2 traffic incident management training to build relationships between stakeholders.

Focus Area: Collaboration

ACTION ITEM: CO-05

Implement the Pathfinder Project developed by the Federal Highway Administration (FHWA) and the National Weather Service (NWS) to support emergency weather operations and coordination with DPS, including:

- Identify partners, establish point person at each participating entity, and determine qualifying collaboration events.
- Select communication mediums, set procedures, and create shared Impact message for the public.
- Synchronize forecast schedules and create shared resources.
- Conduct post event review, archive data, and document operating procedures.

Focus Area: Culture

ACTION ITEM: CU-01

Keep relational culture and supplement strong personal communication with technology, including considerations for:

- Develop and distribute dashboard and establish a practice of sharing information.
- Reach out to external partners to let them know what TxDOT is doing to improve the transportation system and find out what external partners are doing that can be incorporated into TxDOT efforts. Include discussions on potential resource sharing.

ACTION ITEM: CU-02

Develop the business case model that shows the benefit of TSMO both for TxDOT operations/maintenance, first responder safety, and the public operation/user costs.

Focus Area: Culture

ACTION ITEM: CU-03

Identify process to be more proactive with rural towns/counties within the district.

Regional Action Items that may be Championed by Partners

Some action items were identified during the development of this plan, such as broader regional planning efforts or planned special events with a larger impact on local agency roadway networks, that may be best championed by other partners. Table 10 summarizes actions that may be championed by partners.

TABLE 10: REGIONAL ACTION ITEMS

Action Item	Potential Champion
Look for more ways to leverage the existing well-executed processes in place used to manage planned special events	TTI or Texas A&M University

Advancing Statewide TSMO Actions in the Bryan District

In addition to efforts led by the Bryan District, part of the implementation plan includes working with TxDOT Traffic Safety Division to roll out statewide initiatives at the district or working with other districts who may be leading efforts. Table 11 includes an overview of other TxDOT initiatives and the Bryan District's role. This list will continue to evolve as more statewide initiatives are rolled out and the Bryan District continues to collaborate with other districts.

TABLE 11: IMPLEMENTATION OF TSMO STATEWIDE INITIATIVES

Initiative	Bryan District Role
TxDOT ITS Design Manual- The development of a statewide manual is underway. Traffic Safety Division has been reaching out to the districts to gather existing practices, standards, and specs.	Provide existing documentation to Traffic Safety Division. Review draft manuals based on experience.
Third Party Data Integration- Traffic Safety Division is currently working with third party data providers to evaluate how to supplement TxDOT mobility data (e.g., volume, speed) to provide coverage where there are currently gaps.	Bryan District Traffic Engineer & PIO: Provide input on gaps on system coverage as requested by Traffic Safety Division.
Data Lake- TxDOT is collecting data from several sources (including Lonestar™ and CRIS) to create a repository of unstructured data and also working to develop a Data Mart, which is a structured data platform that can be brokered for specific user needs.	Coordinate with Traffic Safety Division and Information Technology Division (ITD) to incorporate Bryan District data sources

Initiative	Bryan District Role
TSMO Training- Traffic Safety Division has provided and will continue to provide training opportunities for TSMO, including presentations and discussions at the annual Traffic Safety/Operations/ Maintenance Conference and annual Short Course. Other webinars or in-person trainings may also be available. Traffic Safety Division is currently developing approximately 30 TSMO training modules	Participate in available training opportunities. Share new knowledge with applicable Bryan District staff.
Develop Methodology to Allocate ITS/Signals Operations and Maintenance (O&M) Funding to Align with TSMO Goals	Provide input and guidance for help allocating more TMS O&M funding.
Develop Statewide Standard Operating Procedures to Improve Operational Interoperability	Consider using SOPs to cover any gaps.
Improve Procurement Processes to Support TSMO Program Objectives	Provide existing procurement processes. Apply new processes as applicable.
Develop Emergency Response Plan to Improve Preparedness, Response, and Recovery	Provide current capabilities and provide feedback on areas to improve within the Bryan District.
Develop Enhanced Traffic Signal System Implementation Plans	Provide existing enhanced traffic signal implementation plans and work to expand existing program.
Strengthen Traffic Incident Management (TIM) Teams Collaboration with Stakeholders to Safely Reduce Incident Clearance Times	Work with Traffic Safety Division to expand interagency agreements in the region if deemed applicable.
Highway Conditions Reporting System (HCRS)- Determine if there is an external interface for district partners (e.g., cities, counties) to enter planned and ongoing construction information into HCRS, which also populates the DriveTexas.org website.	If an external interface is or becomes available, provide outreach and training to stakeholders within the district.

TSMO Implementation Plan Process

The Bryan District TSMO Implementation plan is intended to be a living document that is updated as progress on actions gets made or as things change, as illustrated in Figure 9. A key activity in maintaining the plan is the quarterly check-in of progress of the implementation plan. The TSMO coordinator is recommended to utilize the quarterly supervisors meeting to check in on TSMO action status. This will allow staff to provide status updates on progress made on action items and discuss if any changes are needed to upcoming action items. Part of this check-in will include an ongoing performance assessment using the objectives and measures established as part of this plan. As the district continues to refine performance metrics and include new data sources, existing and aspirational objectives should be re-visited as part of the TSMO Plan update process.

Overall, the Bryan District plans to update the TSMO Program Plan (including CMF surveys), ITS Master Plan, and ITS architecture on a four-year cycle with an interim minor update to the TSMO Program Plan every two years as shown in Figure 9. The Bryan District is currently developing an ITS Master Plan. As discussed previously, the regional ITS architecture has not been updated for some time. The Traffic Safety Division is assessing whether every district needs a separate ITS architecture or if broader architectures should be developed. The Bryan District noted a preference for a multi-district or statewide ITS architecture on which the district provides input but does not maintain.

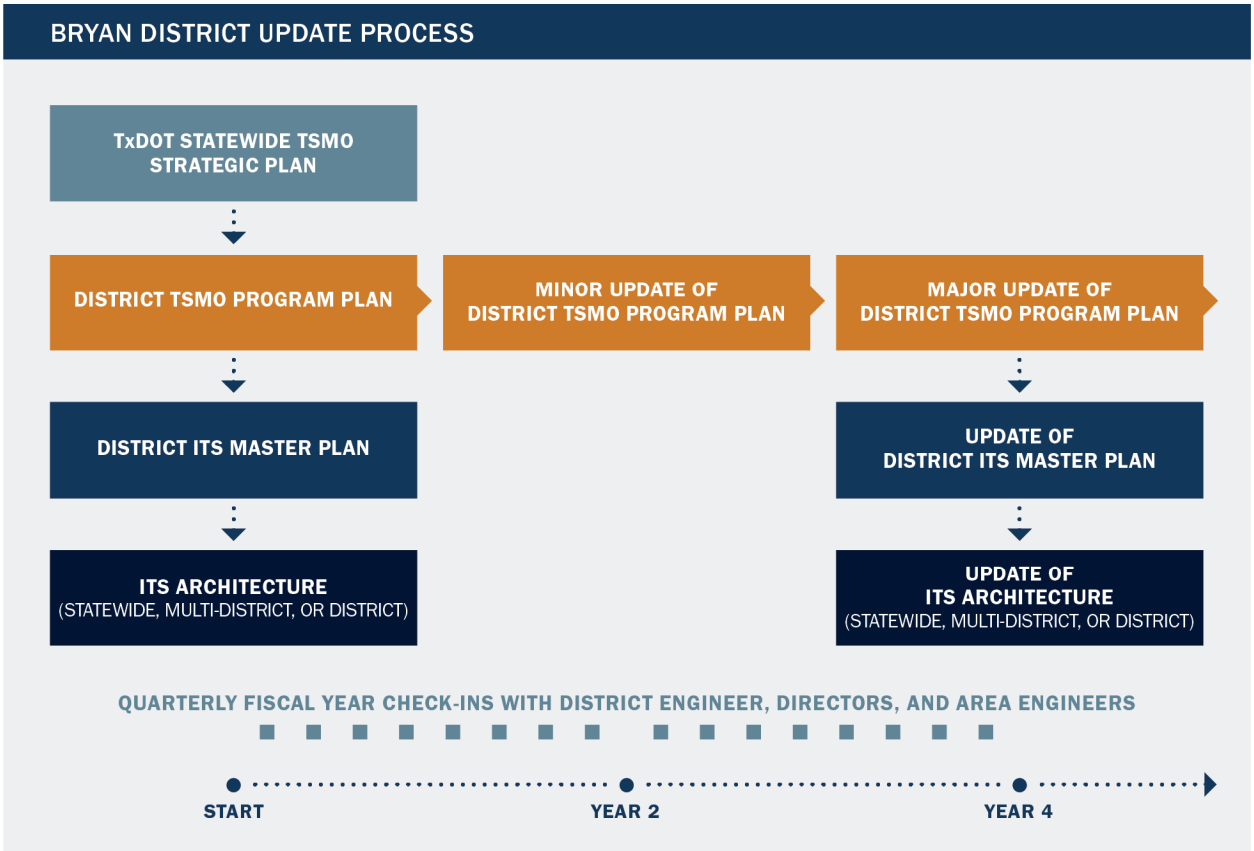


FIGURE 9: BRYAN DISTRICT TSMO PLAN UPDATE PROCESS

TSMO Tactical Plan Assessment

This TSMO Program Plan has established the Bryan District's *strategic* elements—relating TSMO strategies to the district's mission, vision, and goals—and *programmatic* elements—organizational structure and business processes necessary to support TSMO implementation. This third and final piece focuses on the *tactical* elements—the actions necessary to operationalize the services, programs, and priorities identified in the Implementation Plan.

A TSMO Tactical Plan should be developed for each of the Bryan District prioritized services, activities, or projects to be advanced in the near-term. This section describes tactical plan criteria, tactical plan components, and recommended tactical plans.

Tactical Plan Criteria

Tactical criteria were developed by the Traffic Safety Division using qualitative descriptors with the intent that, as tactical plans advance to implementation, quantitative analyses will be performed (e.g., cost estimates, benefit-cost ratios, funding sources, detailed schedules). Criteria for tactical plans applied at the strategic plan level are as follows:

- Alignment with TxDOT's mission, vision, and goals (safety, reliability, efficiency, customer service, collaboration, and integration)
- TxDOT Bryan District staff support (e.g., low, medium, high)
- Stakeholder partnerships (e.g., internal, external)
- Costs (e.g., low, medium, or high for initial and recurring costs)
- Return-on-investment (e.g., low, medium, high)

Tactical Plan Components

A TSMO Tactical Plan will be developed for each of the Bryan District's prioritized services, activities, or projects, as identified in the next section on Recommended Tactical Plans. Each Tactical Plan will contain the following components:

1. A description of the prioritized service, activity, or project
2. An identification of the key enabling implementation guidelines and policies
3. An investment/financial plan
4. An annual action/deployment plan
5. An identification of the performance measures to be used to monitor and evaluate investments

These five tactical plan components are described more fully below.

Description of the Prioritized Service, Activity, or Project

Describe the initiative and how it supports the district's TSMO goals and objectives. Describe existing services such as devices and systems, staffing, priorities, and stakeholder coordination. Perform a gap analysis to review how emerging technologies, operating models, data acquisition and utilization, resources and staffing, and business process relate to the initiative. Describe the future of the initiative.

Supporting Implementation Policies and Guidelines

Identify the relevant TxDOT, district, or federal policies and guidelines needed for the specific service or strategy. Examples include standards and specifications for communications technologies, guidelines for selection or deployment of ITS devices, policies and guidance on public/private data sharing initiatives, decision-making guidelines for implementation, and service levels standards for devices.

Investment/Financial Plan

Effective planning for TSMO involves identifying the costs associated with deployment of services, which may include new infrastructure investments, technology purchases, staff time and resources, or other resources. Use benefit/cost or other criteria analysis methods to support project prioritization and funding requests. Identify current funding resources for the deployment and any potential funding sources that could be matched to the initiative or each action item or project.

Annual Action Plans

Drawing from funding resources and opportunities to integrate TSMO in other activities and projects, develop a set of specific actions for deployment, on an annualized timeframe. These annual plans should be developed in coordination with larger district or agency planning efforts and integrated in standard programs, which often have a four-year timeframe.

Tracking Progress: Performance Assessment

Finally, the TSMO Tactical Plan should address how performance analysis will be conducted to measure the effectiveness of tactics in meeting program objectives. Select from the metrics identified earlier in this Program Plan to be used to conduct on-going monitoring of system performance and project evaluation. Clearly identify how we will measure how well we are meeting the program's stated objectives. Also identify what data are currently available and what additional data is still needed. Finally, consider ways that data can be used to tell success stories to justify future TSMO investments and to promote a TSMO culture within the district.

Recommended Tactical Plans

One primary tactical plan that is recommended for the Bryan District is develop a **Traffic Incident Management (TIM)** tactical plan to establish coordination channels and formalize existing efforts to improve the efficiency of TIM, improve safety and reduce traffic impact of incidents. This recommended tactical plan is assessed against the strategic level tactical criteria as shown in the following table.

Regional Traffic Incident Management Tactical Plan Assessment									
Goal Alignment						**Resources**			
Safety					Integration	District Staff Support			Return on Investment

Key Considerations

- Develop traffic management objectives at a regional level
- Formalize TIM tactics on a county-by-county basis
- Develop a metric for incident clearance time
- Evaluate traffic management issues within the district to identify opportunities for improvements
- Develop a method for tracking incident locations to determine incident hot spots in the district. This can help determine where more resources may be needed
- Identify a process to use technology (e.g., Bluetooth, INRIX) to track congestion and possible incidents
- Identify the steps needed and the external stakeholder agencies that should be involved in the development of a formal traffic incident management program
- Develop a uniform process for traffic incident management response by district maintenance staff
- Develop policies including formalized procedures to manage traffic flows through and around an incident area
- Consider how the daily incident log could be used to support traffic incident management (i.e., additional codes could help pull information from the system)
- Use off-the-shelf technologies to collect traffic incident management-related data to support performance measurement and management
- Identify asset needs and how additional assets could support TIM
- Identify and understand the applicability of "Quick Clearance Laws" (e.g., Move Over Laws, Driver Removal Laws, Authority Removal Laws)
- Increase public awareness of traffic incident management laws. Consider statewide and/or district campaigns
- Identify a process to establish TIM after-action reviews, incorporating national incident response and clearance time metrics
- Consider pilot programs for traffic incident management

References

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- TxDOT (2018) *Performance Dashboard*
- FHWA (2016) *Safety Performance Measures Fact Sheet* (FHWA-SA-16-044)
- FHWA (2017) *Overview of Performance Measures: Travel Time Reliability (NHPP) and Annual Hours of Peak Hour Excessive Delay (CMAQ)*
- FHWA (2018) *FHWA Computation Procedure for Travel Time Based and Percent Non-Single Occupancy Vehicle (non-SOV) Travel Performance Measures* (FHWA-HIF-18-024)
- FHWA (2009) *Traffic Incident Management Performance Measurement Presentation* (FHWA-HOP-10-010, Appendix A)
- TxDOT (2018) *Transportation Systems Management & Operations*

Bryan District TSMO Plan

TSMO Program Plan

APPENDIX

Appendix: Contents

Appendix A: List of Stakeholders and Acknowledgments

(Note: Some stakeholders changed positions during the development of this plan. These acknowledgments reflect the position held during the core plan development.)

TxDOT Bryan District – Operations
Jeff Miles, TxDOT Project Manager
Andrew Holick
Orlando Winkfield

TxDOT Bryan District – TP&D
Neal Riddle

TxDOT Bryan District – Construction
Jennifer Mascheck

TxDOT Bryan District – Maintenance
Carl Schroeder

TxDOT Bryan District – Public Information Office
Bobby Colwell

TxDOT Bryan District – Area Offices
Eric Bennett (Brenham)
James Kreamer (Brenham)
Ashley Hill (Bryan)
Jace Lee (Huntsville)

TxDOT Bryan District – Deputy District Engineer
Chad Bohne

TxDOT Traffic Safety Division
Barbara Russell, TSMO Program Manager
David McDonald
Jianming Ma

FHWA
Millie Hays

City of College Station
Troy Rother

City of Brenham
Dane Rau

City of Bryan
Marcelo Lovato

City of Huntsville
Y.S. “Ram” Ramachandra

City of Madisonville
Camilla Viator

Grimes County
Judge Joe Fauth

Brazos Valley Council of Governments
Madison Thomas

Central Texas Council of Governments
Uryan Nelson

Houston-Galveston Area Council
David Fink

Bryan College Station Metropolitan Planning Organization
Dan Rudge

Texas A&M University- Transportation Services
Peter Lange

Texas A&M Transportation Institute

Tim Lomax
Debra Albert

Madison County Emergency Management

Shelly Butts

Grimes County Emergency Management

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Melissa Abadie

JM Engineering

Jay Weinberger
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Kerri Snyder
Kristina Heggedal
Robert Kay

Appendix B: Consolidated Bryan District TSMO Implementation Action Item List

Bryan District TSMO Implementation Plan Actions

ACTION NUMBER	ACTION DESCRIPTION	SUPPORTS DISTRICT TSMO GOALS						PRIORITY	TxDOT BRYAN DISTRICT LEAD	PARTNERS	RESOURCES	MEASURES OF SUCCESS
		SAFETY	RELIABILITY	EFFICIENCY	CUSTOMER SERVICE	COLLABORATION	INTEGRATION					
BUSINESS PROCESSES (BP)												
BP 01			✓	✓		✓		High	Director of Operations	HOU, DAL, Houston TranStar	Staff hours, legal documentations	% complete until finalized
BP 02					✓	✓	✓					
BP 03		✓	✓	✓	✓			High	TSMO Coordinator	Director of Operations, Traffic Safety Division	Staff hours	% complete until finalized
BP 04												

ACTION NUMBER	ACTION DESCRIPTION	SUPPORTS DISTRICT TSMO GOALS						PRIORITY	TxDOT BRYAN DISTRICT LEAD	PARTNERS	RESOURCES	MEASURES OF SUCCESS
		SAFETY	RELIABILITY	EFFICIENCY	CUSTOMER SERVICE	COLLABORATION	INTEGRATION					
BP 05		✓	✓	✓	✓	✓	✓	High	TSMO Coordinator	Director of Maintenance, Director of Construction Traffic Safety Division, cities/counties, transit agencies, Texas A&M University	Staff hours	% complete until finalized
BP 06												
BP 07				✓	✓	✓		Medium	Director of Construction	Director of Operations, Director of Maintenance, contractors	Staff hours	% complete until process finalized, % of major projects that generate feedback

ACTION NUMBER	ACTION DESCRIPTION	SUPPORTS DISTRICT TSMO GOALS						PRIORITY	TxDOT BRYAN DISTRICT LEAD	PARTNERS	RESOURCES	MEASURES OF SUCCESS
		SAFETY	RELIABILITY	EFFICIENCY	CUSTOMER SERVICE	COLLABORATION	INTEGRATION					
BP 08					✓	✓	✓					
SYSTEMS AND TECHNOLOGY (ST)												
ST 01												
ST 02	Expand the use of monitoring devices and systems in construction contracts. Consider including TMS asset uptime as a requirement for contractors.	✓		✓	✓	✓		High	Director of Construction	Director of Operations	Staff hours	% complete until finalized
ST 03						✓	✓					
ST 04			✓	✓	✓			Medium	TSMO Coordinator	Director of Operations	Staff hours	% complete until finalized
ST 05												
ST 06	Update the significant project procedures form to include newer options under the consideration of technology section.			✓			✓	Medium	TSMO Coordinator	Director of Operations	Staff hours	% complete until finalized

ACTION NUMBER	ACTION DESCRIPTION	SUPPORTS DISTRICT TSMO GOALS						PRIORITY	TxDOT BRYAN DISTRICT LEAD	PARTNERS	RESOURCES	MEASURES OF SUCCESS
		SAFETY	RELIABILITY	EFFICIENCY	CUSTOMER SERVICE	COLLABORATION	INTEGRATION					
PERFORMANCE MEASUREMENT (PM)												
PM 01	Develop performance metrics relevant to traffic signal management, including safety related performance metrics. Establish reliability thresholds for traffic signal system infrastructure. Establish baseline criteria for a minimum level of equipment performance (i.e., state of good maintenance) that is agreeable to all regional agencies.	✓	✓	✓	✓	✓	✓	High	TSMO Coordinator	Director of Operations, external stakeholder agencies	Staff hours	% complete until finalized
PM 02						✓	✓					
PM 03		✓	✓	✓	✓	✓	✓	Medium	Director of Operations	Director of Maintenance, Director of Construction, Traffic Safety Division, cities/counties, local law enforcement, TTI	Staff hours	% complete until finalized
ORGANIZATION AND WORKFORCE (OW)												
OW 01			✓	✓	✓	✓		High	Director of Operations	Other districts	Staff hours, agreement with other districts on staff sharing	% complete until finalized
OW 02												
OW 03	Conduct needs assessment for TMC and consider district TMC versus shared funding or staffing for a TMC.		✓	✓	✓	✓	✓	Low	Director of Operations	HOU, DAL, College Station TMC	Staff hours	% complete until finalized

ACTION NUMBER	ACTION DESCRIPTION	SUPPORTS DISTRICT TSMO GOALS						PRIORITY	TxDOT BRYAN DISTRICT LEAD	PARTNERS	RESOURCES	MEASURES OF SUCCESS
		SAFETY	RELIABILITY	EFFICIENCY	CUSTOMER SERVICE	COLLABORATION	INTEGRATION					
COLLABORATION (CO)												
CO 01			✓	✓		✓	✓	Ongoing	TSMO Coordinator	TxDOT Research and Technology Implementation (RTI) Division, Texas A&M University, local universities/ colleges, TTI	Staff hours	% complete until finalized
CO 02			✓	✓	✓	✓						
CO 03	Coordinate with law enforcement, formalize efforts at county level first, identify how district can help law enforcement on and off the scene of an incident and how to coordinate regarding the impacts of minor stops and road closures on highway safety and operations.	✓	✓	✓	✓	✓		High	Director of Operations	Area Engineers, Maintenance Supervisors, local law enforcement	Staff hours	% complete until finalized
CO 04	Use SHRP2 traffic incident management training to build relationships between stakeholders.			✓		✓			Director of Operations	Stakeholder agencies	Staff hours	% complete until finalized
CO 05	Implement the Pathfinder Project developed by the Federal Highway Administration (FHWA) and the National Weather Service (NWS) to support emergency weather operations and coordination with DPS, including: ▪ Identify partners, establish point person at each participating entity, and determine qualifying collaboration events. ▪ Select communication mediums, set procedures, and create shared Impact message for the public. ▪ Synchronize forecast schedules and create shared resources. ▪ Conduct post event review, archive data, and document operating procedures.								Director of Operations	NWS, DPS	Staff hours	% complete until finalized
CULTURE (CU)												
CU 01	Keep relational culture and supplement strong personal communication with technology, including considerations for: ▪ Develop and distribute dashboard and establish a practice of sharing information. ▪ Reach out to external partners to let them know what TxDOT is doing to improve the transportation system and find out what external partners are doing that can be incorporated into TxDOT efforts. Include discussions on potential resource sharing.			✓	✓	✓		High	Director of Operations, PIO	Stakeholder agencies	Staff hours	% complete until finalized

ACTION NUMBER	ACTION DESCRIPTION	SUPPORTS DISTRICT TSMO GOALS						PRIORITY	TxDOT BRYAN DISTRICT LEAD	PARTNERS	RESOURCES	MEASURES OF SUCCESS
		SAFETY	RELIABILITY	EFFICIENCY	CUSTOMER SERVICE	COLLABORATION	INTEGRATION					
CU 02												
CU 03	Identify process to be more proactive with rural towns/counties within the district.				✓	✓	✓	Medium	Director of Operations	Area Engineers, rural towns/counties	Staff hours	% complete until finalized

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