TxDOT Statewide TSMO Performance Measures

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Prepared By

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Date	Version	Description
10-14-20	1.0	Traffic Division Review (Prepared by AECOM)
2-12-21	2.0	Addresses AECOM Review Comments

List of Acronyms

Acronym	Definition
ATMS	Advanced Traffic Management System
CCTV	Closed Circuit Television
DMS	Dynamic Message Sign
FAST Act	Fixing America's Surface Transportation Act
FHWA	Federal Highway Administration
ITD	Information Technology Division
ITS	Intelligent Transportation Systems
LCE	Low-Cost Enhancement
LRTP	Long Range Transportation Plan
MAP-21	Moving Ahead for Progress in the 21st Century Act
MODA	Multi Objective Decision Analysis
MPO	Metropolitan Planning Organization
MTP	Metropolitan Transportation Plan
NHS	National Highway System
SLRTP	Statewide Long-Range Transportation Plan
STIP	State Transportation Improvement Program
TIM	Traffic Incident Management
TIP	Transportation Improvement Program
TMC	Transportation Management Center
TRF	Traffic Division (Central Office)
TMS	Traffic Management System
TSMO	Transportation Systems Management & Operations
TTP	Texas Transportation Plan
TxDOT	Texas Department of Transportation
USDOT	United States Department of Transportation
UTP	Unified Transportation Program

1.0   Introduction

Performance measurement is described by the Federal Highway Administration (FHWA) as the use of statistical evidence to determine progress toward specific defined organizational objectives. This includes quantitative measurements of measures such as travel times and pavement surface smoothness, as well as qualitative measures including road users' perception that could be measured through a customer satisfaction survey. Performance measures provide information to managers about how well the transportation system is performing relative to objectives that have been defined by the agency and should also reflect the satisfaction of the end users that are the general public.

In addition, the National Performance Review provides a complimentary definition of performance measurement: "A process of assessing progress toward achieving predetermined goals, including information on the efficiency with which resources are transformed into goods and services (outputs), the quality of those outputs (how well they are delivered to clients and the extent to which clients are satisfied) and outcomes (the results of a program activity compared to its intended purpose), and the effectiveness of government operations in terms of their specific contributions to program objectives." Performance measures can be gathered to assess the transportation system as a whole, or an individual system to evaluate whether it has met specific project level objectives.

The purpose of this technical report is to support the Texas Department of Transportation's (TxDOT) Traffic Division (TRF) and Information Technology Division (ITD) to promote the development of a standard set of performance measures that have a common definition statewide and are consistent with the Moving Ahead for Progress in the 21st Century Act (MAP-21) requirements, as well as the performance-based planning requirements that guide project selection criteria and funding distributions in the Unified Transportation Program (UTP). In addition, recommendations are provided regarding performance measures to be monitored in real-time at transportation management centers (TMC) to improve situational awareness.

2.0   Performance Measures

Performance measures have been adopted by TxDOT over the past decade to evaluate transportation system performance per federal and state requirements. These measures help to identify areas where the overall system is meeting established targets to serve the needs of the general public that relies upon the system. This section provides an overview on how performance measures relate to Transportation Systems Management & Operations (TSMO) strategies and how TxDOT currently reports transportation system performance measures.

2.1   TSMO Strategies

TSMO includes a broad range of strategies in which Intelligent Transportation Systems (ITS) may be applied. The list below presents several of the operations strategies that have been applied across the country and that have

contributed to substantial positive impacts on the safety, mobility and reliability of surface transportation networks.

- Work Zone Management

- Traffic Incident Management

- Service Patrols

- Special Event Management

- Road Weather Management

- Transit Management

- Freight Management

- Traffic Signal Coordination

- Traveler Information

- Ramp Management

- Managed Lanes

- Active Traffic Management

- Integrated Corridor Management

- Rural Emergency Management

These strategies, in which ITS and traffic signal improvements play a major role, are most effective when they are considered during early stages of the project development process, sustained over time with dedicated funding, and optimized via coordination among transportation agencies within the region. Some TSMO strategies have already been deployed or are currently being researched for use in various parts of the state.

These strategies are relatively low in cost compared to adding capacity, can be implemented in two to three years and offer substantial benefits. Specifically, these benefits include savings in travel time, delay, reliability, vehicle operating costs, and crashes. A methodology for conducting benefit-cost analyses for TSMO projects is included in the United States Department of Transportation (USDOT) publication "TSMO Benefit Cost Analysis Compendium," July 2015.

While TSMO can be very beneficial to metro and urban areas, there is also a need for TSMO in rural areas. These types of TSMO projects include minor operational improvements, or low-cost enhancements (LCE) which are defined as small, low-cost projects that can be implemented quickly to improve operational safety or reduce congestion on the highway system. Below are several low-cost enhancement strategies:

- **Channelization** - can be used to restrict or direct traffic flow or to change a roadway's type. It can allow motorists to move at different speeds and in conflicting directions as well as provide areas for pedestrians. Channelization can be created with pavement markings, islands or curbs.

- **Delineation** - refers to methods used to define vehicular travel paths for drivers. Delineation can include one or a combination of devices used on and adjacent to the roadway, such as painted, thermoplastic, or other durable pavement markings (e.g., chevrons), light retroreflecting guideposts and post-mounted delineators, raised pavement markers and rumble strips. Delineation is often part of channelization.

- **Low-Cost Safety Enhancements** - a collection of minor operational roadway improvements that allow TxDOT to increase safety without expending major resources or without a major planning or design effort. Some examples of low-cost safety enhancements include (1) adding clear zones at the side of the road to provide a clear, traversable area in which a vehicle can recover if it runs off the roadway; (2) flattening the sides of the roadway to improve the roadway cross-section and reduce the chances that an errant vehicle will become airborne; (3) improving the super-elevation of the bank of a roadway along a horizontal curve so that motorists can safely and comfortably maneuver the curve at reasonable speeds; and (4) installing new rumble strips or altering existing ones, to reduce the risk of run-off-the-road crashes.

- **Signage** - regulates the flow of traffic and provides information, guidance, and warnings to drivers and other roadway network users, such as pedestrians and bicyclists. TxDOT publications such as the "Texas Manual on Uniform Traffic Control Devices" provides standards and guidance for roadway signage. Installing signage is often a low-cost TSMO solution. Linking signs with message boards or flashing lights to detectors can create smart signs.

- **Traffic Calming** - relies on physical design and other measures to slow vehicle speeds and reduce traffic volumes by obstructing traffic flow and by increasing the cognitive load of drivers. The goals of traffic calming include altering driver behavior, improving conditions for non-motorized street users and reducing the impacts of motor vehicle use. Furthermore, technologies such as variable message signs posting driver's speed may be considered.

2.2   Federal Performance Measure Guidance

MAP-21 enacted in 2012 and the Fixing America's Surface Transportation Act (FAST Act) enacted in 2015 by the USDOT and FHWA defined an approach for transportation performance management for Departments of Transportation (DOTs) and Metropolitan Planning Organizations (MPOs) at the state level as part of their federally-required transportation planning and programming activities. The approach requires the establishment and use of a coordinated performance-based approach to transportation decision-making to support national goals for the federal-aid highway and public transportation programs. In 2016, the FHWA and the Federal Transit Administration issued a statewide and non-metropolitan Transportation Planning Metropolitan Transportation Planning Final Rule referred to as 23 CFR 450.314. This regulation implements the transportation planning and transportation performance management provisions of MAP-21 and the FAST Act. MAP-21 established the following seven national performance goals for federal highway programs that are presented in Table 1.

Table 1: FHWA National Goals from MAP-21

Goal Area	National Goals
Safety	Achieve significant reduction in traffic fatalities & serious injuries on public roads
Infrastructure condition	Maintain the highway infrastructure asset system in a state of good repair
Congestion reduction	Achieve a significant reduction in congestion on the National Highway System
System reliability	Improve the efficiency of the surface transportation system
Freight movement and economic vitality	Improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development
Environmental sustainability	Enhance the performance of the transportation system while protecting and enhancing the natural environment
Reduced project delivery delays	Reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in the project development and delivery process, including reducing regulatory burdens and improving agencies' work practices

To achieve the performance goals listed above, the following performance measures were defined by FHWA to be measured by state DOTs:

- Pavement condition on the Interstate System and remainder of National Highway System (NHS)

- Performance of the Interstate System and the remainder of the NHS

- Bridge condition on the NHS

- Fatalities and serious injuries including number and rate per vehicle mile traveled on all public roads

- Traffic congestion

- On-road mobile source emissions

- Freight movement on the Interstate System

2.3 TxDOT State Level Goals and Performance Measure Reporting

TxDOT has developed several state-level goals that are consistent with federal goals established within MAP-21. Table 2 presents TxDOT's seven goals and a brief description of each. These goals are aligned with a series of objectives and performance measures to guide in assessing how the agency is meeting its goals over time.

Table 2: TxDOT Goals and Related Key Performance Measures

TxDOT Goals	Goal Description	Key Performance Measures
Goal 1 - Optimize System Performance	Develop and operate an integrated transportation system that provides reliable and accessible mobility and enables economic growth	Congestion and Reliability Indexes Vehicle Miles Travelled Annual Delay Per Person
Goal 2 - Deliver the Right Projects	Implement effective planning and forecasting processes that deliver the right projects on time and on budget	% Highway Infrastructure Contracts Completed on Time % Highway Infrastructure Contracts Completed on Budget
Goal 3 - Promote Safety	Champion a culture of safety	Annual Fatalities and Fatality Rate Annual Serious Injuries and Serious Injury Rate Fatality Emphasis Areas Employee Injury Rate
Goal 4 - Preserve TxDOT's Assets	Deliver preventive maintenance for TxDOT's system and capital assets to protect investments	% Lane Miles in Good or Better Condition Bridge Condition Score
Goal 5 - Focus on the Customer	People are at the center of everything TxDOT does.	% Customer Complaint Cases Closed on Time Customer Complaints (Top 5) Average TxDOT Call Wait Time Average TxTag Call Handle Time
Goal 6 - Value our Employees	Respect and care for the well-being and development of TxDOT's employees	Employee Engagement Score
Goal 7 - Foster Stewardship	Ensure efficient use of state resources	Disadvantaged Business Enterprise Attainment Historically Underutilized Business Attainment Direct Transportation Funding

TxDOT has developed an approach for performance measure reporting based upon guidance and requirements provided by the USDOT and FHWA. In February 2018, the TxDOT Commission approved by Minute Order 115152 the transportation system goals, strategies, performance measures and a set of 10-year targets. The transportation system goals and strategies were adopted by the TxDOT Commission as part of the 2019-2023 Strategic Plan. These measures are presented in Table 3. The performance measures and 10-year targets were presented to the TxDOT Commission in January 2018.

Table 3: TxDOT 2019-2023 Strategic Plan Goals and Performance Measures

Strategic Plan Goal	Performance Vision	Key Performance Measures (KPM)	Projected 2027 Outcomes	2027 Target
Promote Safety	Reduce crashes and fatalities through targeted infrastructure improvements, technology applications, and education	Safety: Fatalities per Year	4,120	3,708
		Safety: Fatality Rate (Per 100 Million Vehicle Miles Travelled)	1.36	1.16
Preserve Assets	Maintain and preserve system / asset conditions though targeted infrastructure rehabilitation, restoration, and replacement	Pavement Condition Preservation (% of Interstate System in Good or Better Condition	88.0%	90%
		Statewide Bridge Condition Score (% of NHS Bridges Classified as in Good Condition)	89.1%	90%
Optimize system performance	Enhance mobility, reliability, connectivity, & mitigate congestion through targeted infrastructure & operational improvements	Congestion: Urban Congestion Index (Vehicle travel density on major roads in urban area)	1.23	1.20
		Connectivity: Rural Reliability Index (Ratio of the 80th percentile travel time to the free-flow travel time)	1.12	1.12

Given these measures, TxDOT has measured agency progress towards achieving the performance targets and has made them available for public review through the following website: http://www.dot.state.tx.us/dashboard/index.htm. TxDOT notes that the measures are continually refined as methods of data collection and analysis are improved, which may impact how the measures are presented in the future. Figure 1 below presents one of many performance dashboards, this one for Goal 1 (optimize system performance).
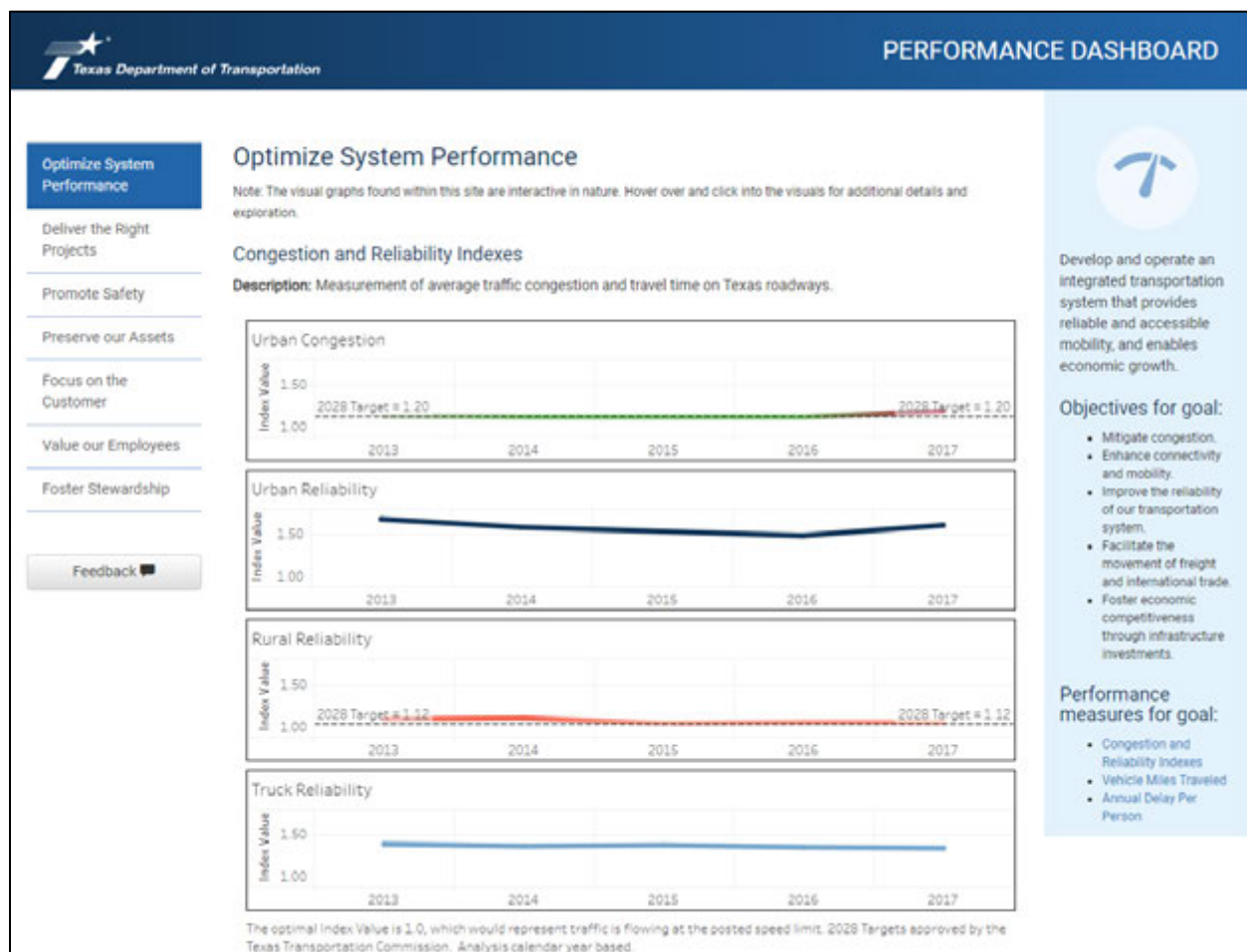

Figure 1: TxDOT Performance Dashboard "Optimize System Performance"

TxDOT has also worked closely with its divisions, districts and the MPOs to configure and train users on a Multi Objective Decision Analysis (MODA) system that uses data from TxDOT (and where applicable MPOs) management systems for pavement, bridges, crash data, roadway inventory and project specific descriptive data to score and rank projects based on cost and anticipated performance. This tool has been made available to all TxDOT, MPO, and Council of Government employees for the purpose of optimizing programs of projects to achieve performance targets adopted by TxDOT and MPOs.

TxDOT's planning and programing activities are guided by the following key documents: Texas Transportation Plan 2040 (TTP 2040), Unified Transportation Program, and Statewide Transportation Improvement Program. These documents are described briefly as follows.

- **TTP / Statewide Long-Range Transportation Plan (SLRTP)** – The official, Statewide, multimodal transportation plan covering no less than 20 years developed through the Statewide transportation planning processes.

- **Unified Transportation Program (UTP)** – TxDOT's ten-year intermodal program of transportation projects, consistent with the Long-Range Transportation Plan (LRTP) and planning processes as well as metropolitan plans, Transportation Improvement Programs (TIP), and processes.

- **Statewide Transportation Improvement Program (STIP)** – A Statewide prioritized listing of transportation projects covering a period of four years that is consistent with the LRTP, metropolitan transportation plans (MTP), and TIP, and is required for projects to be eligible for funding under title 23 U.S.C. and title 49 U.S.C. Chapter 53.

TxDOT has recently developed a new LRTP - the TTP 2050. This plan sets the direction for the future of Texas' multimodal transportation system by informing investment strategies tailored to make progress toward TxDOT's performance goals and objectives. TTP 2050 provides an objective and transparent decision-making framework, better manage transportation infrastructure, prioritize multimodal needs, and align resources to achieve the most beneficial performance outcomes to meet long-term goals and objectives.

2.4 Other State Level Performance Measure Reporting

The FHWA has recently completed a survey and report on several state DOTs through its Traffic Management Center (TMC) Pooled Fund Study regarding their usage of performance measure dashboards. These dashboards can present a summary of key performance measures for any DOT on a single viewable screen to TMC operators and supervisors for review. The report notes the primary reasons for developing these dashboards as the following:

- Processing, managing, and displaying large amounts of data in a visual format;

- Customizing information for different stakeholders which are beginning to include non-TMC staff;

- Assisting short and long-term transportation decision-making within and outside of DOTs; and

- Justifying the benefits of TMC facilities that can monitor and report on performance measures.

Through surveys and outreach to a total of 34 agencies around the country, a summary of the key output measures that are commonly displayed on performance dashboards are provided below:

- ITS device and asset uptime to indicate operational status of field devices

- Service patrol operations and status (e.g., vehicle locations, response times, and incident clearance times)

- Crashes along roadway network, including status of response, locations of crashes, and potential patterns in crash types and locations

- Website hits to identify usage patterns of the dashboards, either by internal agency staff or by external dashboard users

- Regional maps enabling users to click on areas of the map and be provided quick access to details regarding events, such as crashes or ITS device information (e.g., camera views of a certain area)

- For other DOTs that desire to develop performance measure dashboards, the report noted the following as common data needs among agencies that were surveyed:

- Low latency data collection to be able to present measures in near real-time for TMC operators and supervisors

- High speed analytic capability to be able to provide a view of multiple measures on the dashboard from a variety of different data sources

- Ability to present data into different types of measures inputs, with some measures presented as static or slow changing, and some measures as dynamic

- Figures 2 and 3 below present some graphical examples of performance measure dashboards from other agencies including the Maryland State Highway Administration in Figure 2 and the Florida Department of Transportation in Figure 3.
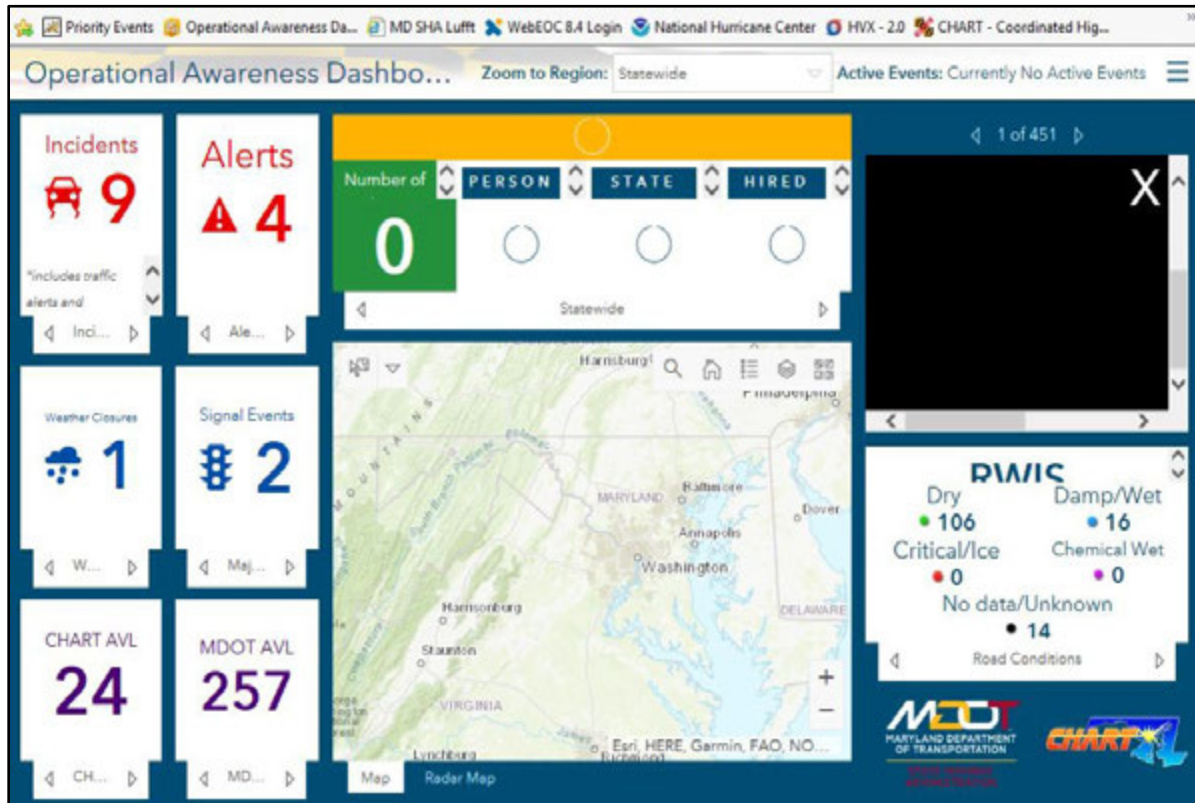

Figure 2: Maryland State Highway Administration Performance Dashboard

Figure 3: Florida Department of Transportation District Four Near Real-Time Performance Measures

The Florida DOT District Four (Fort Lauderdale) uses the TMC video wall to provide near real time situational awareness. The video wall provides near real time performance metrics including:

- number of active incidents occurring in each of the five counties

- number of emergency generators currently in use where power is lost for ITS devices (e.g., DMS)

- average incident clearance time, year to date

- number of ITS devices that are currently unavailable whether there are cuts in the fiber-optic communications network, status of reversible operations along express lanes, travel time reliability measures, and signal phasing and timing data at critical intersections.

At the Florida DOT District Six (Miami) TMC, near real time displays of travel speeds are posted by lane and by segment for both general purpose and express lanes. This enables TMC operations to be more proactive in observing traffic congestion build-up and implementing countermeasures to avoid congestion and safety hot spots before they become a problem.

3.0   Performance Measure Reporting Policies

Given the state-level overview on performance measure development, the following sections present a series of recommendations for districts related to performance measure reporting.

3.1   Use of Lonestar™, ServiceNow, and SolarWinds for Performance Measure Reporting

Lonestar™ is TxDOT's Advanced Traffic Management System (ATMS) software connecting TMCs with ITS field devices such as vehicle detectors, dynamic message signs, and closed-circuit television (CCTV) cameras. Lonestar™ enables operational control of these devices and reports their health, status, and any operational data or responses back to the software, which sends commands and requests to devices. Lonestar™ software makes real-time data received from devices available to all other processes via the command and status distribution process. The database contains configuration and other pertinent information about device identification, location, and communication parameters as well as other details of how the software should behave. Lonestar™ has a TMC-to-TMC interface for external systems to provide live traffic data in lieu of field devices as well as providing a channel to send information out for dissemination. The software integrates these devices and data interfaces in many ways that are useful to other operations. Lonestar™ has several software processes that are not device specific to process data and make it usable for various operations. Travel times and event management are two examples.

A total of 24 out of 25 TxDOT Districts use the Lonestar™ ATMS software to control and configure ITS technologies and applications. Lufkin is the only district that does not use the software. TxDOT is currently assessing operational usage of Lonestar™ by districts throughout the state to understand what types of improvements can be made that would enable a more productive usage of the software. The Lonestar™ ATMS software, in combination with asset management software systems (i.e., ServiceNow, SolarWinds), has the capability to provide valuable performance measure information and generate reports.

3.2   Regional / District Level Performance Measure Reporting

Beginning in 2018, the TxDOT metro districts utilized Lonestar™ ATMS and Tableau software to develop a performance measure dashboard that provides a summary level view of performance measures on a monthly basis. These measures are defined below and presented in Figure 4:

- **District Asset Uptime** – A measure of the percent of traffic cameras, speed sensors, and main-line dynamic message signs which are operational more than 75% of the time.
- **District Average Incident Clearance Time** – A measure of the average time (in minutes) from incident detection to clearance for collisions (including overturns and fires), and disabled vehicles (plus stalls and abandoned vehicles).

- **Level of Travel Time Reliability on Interstate Highways** – A measure of the percentage of interstate highway segments within the metro area in which drivers experience relatively predictable travel time across various times of the day.
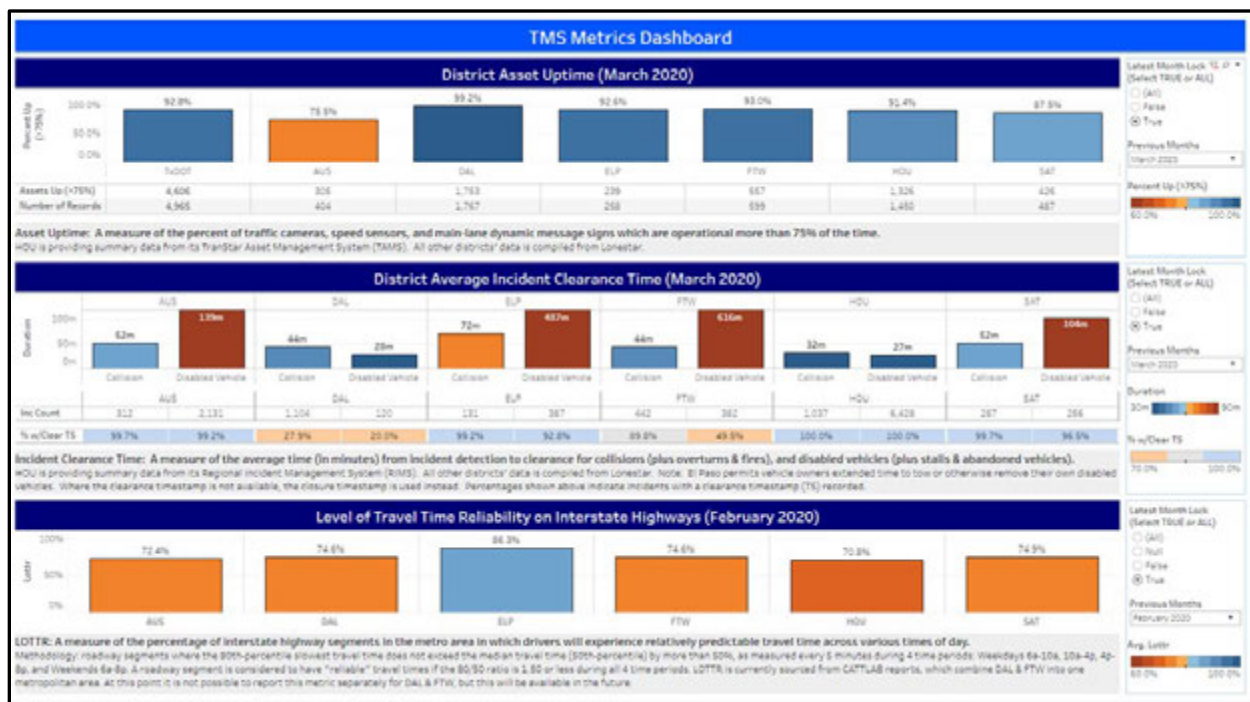

Figure 4: Performance Measure Dashboard for TxDOT Metro Districts

These three performance measures relate to the three statewide strategic plan goals of promoting safety, preserving assets, and optimizing system performance. The initial TxDOT districts that began to report performance measures in 2018 through the dashboard include Austin, Dallas, El Paso, Fort Worth, Houston, and San Antonio. The use of the dashboard was also expanded to coastal area TxDOT districts in 2019.

Given the use of the Lonestar™ ATMS by TxDOT districts for ITS device management among other applications, it is recommended that additional TxDOT districts report these three performance metrics when possible. TxDOT's rural districts that only manage CCTV cameras and DMSs through the Lonestar™ ATMS can measure district TMS asset uptime as a performance measure using this dashboard.

Metro- and urban-level TxDOT districts with a larger amount of ITS field equipment can report additional performance measures of average incident clearance times and travel time reliability depending on their current use of the Lonestar™ ATMS. Table 4 presents a summary of the proposed district level performance measures that rural, urban and metro districts can measure using Lonestar™ ATMS software.

Table 4: Recommended District-Level Performance Measures

TxDOT Districts by Area	District Level Performance Measures
Rural Districts (Amarillo, Abilene, Atlanta, Brownwood, Childress, Lufkin, Odessa, Paris, San Angelo, Wichita Falls, Yoakum)	District TMS Asset Uptime
Urban Districts (Beaumont, Bryan, Corpus Christi, El Paso, Laredo, Lubbock, Pharr, Tyler, Waco)	District TMS Asset Uptime District Average Incident Clearance Time (where use of Lonestar™ ATMS allows for reporting) Level of Travel Time Reliability on Interstate Highways (where use of Lonestar™ ATMS allows for reporting)
Metro Districts (Austin, Dallas, Fort Worth, Houston, San Antonio)	District TMS Asset Uptime District Average Incident Clearance Time Level of Travel Time Reliability on Interstate Highways

TxDOT is currently assessing operational usage of Lonestar™ by districts throughout the state to understand what improvements can be made to enable better usage of the software. It is recommended to allow the assessment to be completed and improvements to be implemented prior to utilizing the Lonestar™ ATMS for performance measure reporting.

3.3   *Relating District Level Performance Measures to TSMO Strategies*

Performance measures reported by TxDOT districts can be directly or indirectly influenced by a broad range of TSMO strategies in which ITS systems and technologies may be applied. Table 5 lists several TSMO strategies and their relation to the performance measures that TxDOT currently measures at the district level. Collectively, these measures can have substantial positive impacts on the safety, mobility and reliability of surface transportation networks.

It is recommended for TxDOT to relate district-level performance measures back to TSMO operations strategies to allow district level staff to better understand how these performance measures relate to the larger effort of implementing TSMO strategies on a statewide scale. Relating district-level performance measures to statewide TSMO operations strategies would enable TxDOT to apply these measures to continuously improve operations and communicate to the general public on how TSMO is providing measurable benefits.

Table 5: TSMO Operations Strategies and Related Performance Measures

TSMO Operations Strategies	TxDOT Goals	District Level Performance Measures
Work Zone Management	Goal 3 - Promote Safety	Number of primary and secondary crashes Number of workers struck by a vehicle Employee Injury Rate
	Traffic Management System Metrics	Travel Time Reliability on Interstate Highways
Traffic Incident Management	Goal 3 - Promote Safety	Annual Fatalities and Fatality Rate Annual Serious Injuries and Serious Injury Rate
	Traffic Management System Metrics	District Average Incident Clearance Time
Service Patrols	Goal 3 – Promote Safety	Number of secondary crashes
	Goal 5 – Focus on the Customer	Customer Satisfaction based on surveys for Motorist Assists
	Traffic Management System Metrics	District Average Incident Clearance Time
Special Event Management	Goal 5 – Focus on the Customer	Customer Satisfaction (# complaints)
	Traffic Management System Metrics	Travel Time Reliability on Interstate Highways
Road Weather Management	Goal 3 – Promote Safety	Number of primary and secondary crashes
Freight Management	Goal 1 – Optimize System Performance	Urban Congestion Index (Vehicle travel density on major roads in urban area) Rural Reliability Index (Ratio of the 80th percentile travel time to the free-flow travel time)
Traffic Signal Coordination	Goal 1 – Optimize System Performance	Urban Congestion Index (Vehicle travel density on major roads in urban area) Rural Reliability Index (Ratio of the 80th percentile travel time to the free-flow travel time)
Traveler Information	Goal 5 – Focus on the Customer	Percentage of Customer Complaint Cases Closed on Time

TSMO Operations Strategies	TxDOT Goals	District Level Performance Measures
Ramp Management	Goal 1 – Optimize System Performance	Urban Congestion Index (Vehicle travel density on major roads in urban area)
	Traffic Management System Metrics	Travel Time Reliability on Interstate Highways
Managed Lanes	Goal 1 – Optimize System Performance	Urban Congestion Index (Vehicle travel density on major roads in urban area)
	Traffic Management System Metrics	Travel Time Reliability in Managed Lanes
Active Traffic Management	Goal 1 – Optimize System Performance	Urban Congestion Index (Vehicle travel density on major roads in urban area)
	Traffic Management System Metrics	Travel Time Reliability on Interstate Highways
Integrated Corridor Management	Goal 1 – Optimize System Performance	Urban Congestion Index (Vehicle travel density on major roads in urban area) Person throughput on integrated corridors
	Traffic Management System Metrics	Travel Time Reliability on Interstate Highways
Rural Emergency Response	Goal 3 - Promote Safety	Annual Fatalities and Fatality Rate Annual Serious Injuries and Serious Injury Rate
	Traffic Management System Metrics	District Average Incident Clearance Time

3.4 Relating District Level Performance Measures to TxDOT Strategic Plan Goals

The performance measures reported by TxDOT districts are also related to the larger goals established as part of the TxDOT 2019-2023 Strategic Plan. Table 6 lists the TxDOT Strategic Plan Goals and key performance metrics that are reported and how they relate to the performance measures used by TxDOT at the district level. The district level efforts on increasing TMS asset uptime, reducing the average incident clearance time, and increasing the level of travel time reliability on Interstate highways is critically important in allowing the state to achieve its strategic plan goals in the coming years.

It is recommended that TxDOT aligns strategic plan goals and district-level performance measure reports provided by TxDOT districts. If additional performance measures are reported by TxDOT districts, a connection should also be established with the TxDOT Strategic Plan to demonstrate that relationship.

Table 6: Relation of TxDOT Strategic Plan Goals to District Level Performance Measures

TxDOT Strategic Plan Goal	Performance Vision	Key Performance Measures	District Level Performance Measures
Promote Safety	Reduce crashes and fatalities through targeted infrastructure improvements, technology applications, and education	Safety: Fatalities per Year Safety: Fatality Rate (Per 100 Million Vehicle Miles Travelled)	District Average Incident Clearance Time District Average Incident Clearance Time
Preserve Assets	Maintain and preserve system / asset conditions though targeted infrastructure rehabilitation, restoration, and replacement	Pavement Condition Preservation (% of Interstate System in Good or Better Condition Statewide Bridge Condition Score (% of NHS Bridges Classified as in Good Condition)	% Lane Miles in Good or Better Condition Bridge Condition Score
Optimize system performance	Enhance mobility, reliability, connectivity, and mitigate congestion through targeted infrastructure and operational improvements	Congestion: Urban Congestion Index (Vehicle travel density on major roads in urban area) Connectivity: Rural Reliability Index (Ratio of the 80th percentile travel time to the free-flow travel time)	Travel Time Reliability on Interstate Highways

4.0   Summary of Recommendations

The following recommendations are provided for TxDOT to advance the practice of reporting on Performance Measures:

1. **Determine Technology Solution for Performance Measure Reporting** – TxDOT should continue to reach out to district staff to determine the path forward with the technology solution that will enable performance measure reporting in the coming years. TxDOT is currently assessing operational usage of Lonestar™ by districts throughout the state to understand what types of improvements can be made that would enable a greater usage of the software. The next steps are to conduct one-on-one calls with district staff to better understand their experiences in working with the Lonestar™ software, to document their needs, and to determine the appropriate path forward. Similar efforts should be made for the ServiceNow and SolarWinds systems for asset management.

2. **Expand Usage of Performance Measures to All TxDOT Districts** – Additional TxDOT districts should report on performance metrics similar to how metro and some urban districts have used the Lonestar™ ATMS, ServiceNow, and SolarWinds to report on district TMS asset uptime, average incident clearance times, and travel time reliability.

3. **Relate Performance Measures to TSMO Strategies** – TxDOT should relate district-level performance measures back to TSMO operations strategies for district level staff to view the relation of their reporting to understand how performance measures relate to the larger effort of implementing TSMO strategies on a statewide scale. Relating district level performance measures to TSMO operations strategies would enable TxDOT to apply these measures to continuously improve operations and communicate to the general public on how TSMO strategies are providing measurable benefits.

4. **Relate Performance Measures to TxDOT Strategic Plan Goals** – TxDOT should align statewide strategic plan goals and the district-level performance measure reports. The district level work on increasing TMS asset uptime, reducing the average incident clearance time, and increasing the level of travel time reliability on Interstate highways is critically important in allowing the state to achieve its strategic plan goals in the coming years. If additional performance measures are reported by TxDOT districts, a connection should also be established with the TxDOT Strategic Plan to demonstrate that relationship.

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