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MEMORANDUM

May 13, 2020

To: Executive Leadership Team & Senior Leadership Team

From: Kristina Swallow, P.E., Director

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Kristina Swallow
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Subject: NDOT Statewide TSMO Program Plan

The mission of the Nevada Department of Transportation (NDOT) is to:

> *Provide, operate, and preserve a transportation system that enhances safety, quality of life, and economic development through innovation, environmental stewardship, and a dedicated workforce.*

With increasing demand on our highways and new opportunities available through innovation and technology, we recognize that the management and operation of our transportation system plays as much a role in achieving our mission as do the maintenance and expansion of our physical infrastructure.

Transportation Systems Management and Operations (TSMO) is a performance-based approach to integrating the management and operations of our transportation system into the project development process to optimize the operations and safety of existing and new infrastructure. TSMO has proven to be effective at helping departments of transportation across the nation maximize the safety and efficiency of their highway systems.

To further NDOT's mission, we have developed a TSMO Program—founded on the NDOT TSMO Program Plan—and are now in the process of incrementally implementing it. This Program Plan provides specific guidelines to implement the TSMO Program and lays the foundations to mainstream TSMO at the agency level. I encourage all NDOT divisions to work collaboratively and follow the recommended steps within this document to instill TSMO in our everyday business.

I ask, and thank you in advance, for your support and contribution in this effort to continue to improve the safety and efficiency of the transportation system in our state.

Attachment: NDOT Statewide TSMO Program Plan

cc: Darin Tedford, Assistant Director Operations
Denise Inda, Chief Traffic Operations Engineer

NEVADA DOT
SAFE AND CONNECTED

NDOT STATEWIDE
TSMO PROGRAM PLAN

JANUARY 2020

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Member of the SNC-Lavalin Group

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EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

1.1 WHAT IS TSMO?

The Moving Ahead for Progress in the 21st Century Act (MAP-21) defines Transportation Systems Management and Operations (TSMO) as: "Integrated strategies to optimize the performance of existing infrastructure through the implementation of multi-modal and intermodal, cross-jurisdictional systems, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system" (MAP-21, 2012).

1.2 WHY TSMO?

Strategies offered by TSMO are used to proactively address transportation challenges (such as recurring and/or non-recurring congestion, safety, mobility, and reliability). This performance-driven program focuses on the surface transportation system and the policies, business processes, technologies, infrastructure, and systems that are applied to manage and operate this system more efficiently.

1.3 NDOT'S HISTORY WITH TSMO

Both MAP-21 and Fixing America's Surface Transportation (FAST) Act bills strongly support TSMO and encourage state departments of transportation (DOTs) and agencies such as Metropolitan Planning Organizations and Regional Transportation Commissions to consider initiatives and projects that improve the efficiency, safety, and mobility of transportation systems. The Nevada Department of Transportation's (NDOT) first step on its TSMO journey was the 2014 TSMO capability maturity self-assessment workshop. The assessment used the Capability Maturity Model (CMM) as a tool and estimated the extent and maturity of TSMO activities under six key dimensions. The results from the CMM self-assessment were used as the basis for development of NDOT's TSMO Program.

1.4 WHAT WILL TSMO DO FOR NDOT?

As demonstrated in the Business Case, TSMO solutions can significantly contribute to addressing transportation challenges. Therefore, internal stakeholders (such as NDOT Divisions) and external stakeholders (such as Regional Transportation Commissions and other local agencies) will effectively implement TSMO as a core function and will utilize TSMO elements such as a TSMO Evaluation Tool to identify opportunities for integrating TSMO solutions and addressing operational challenges. This tool will enable NDOT to maximize the exposure to and integration of TSMO in the scoping phase of every project, ensuring TSMO and its recommended strategies are formally considered and evaluated.

The implementation of NDOT's TSMO Program, as described in the NDOT Statewide TSMO Program Plan, will result in a safer, more reliable, and more efficient transportation system through collaborative, performance-based, and targeted investments. The program is currently managed within the Traffic Operations Division with the goal to be mainstreamed at a statewide level in the future.

The NDOT TSMO Program Plan presents a five-year action plan to implement the TSMO Program as part of a cross-jurisdictional approach to achieve Nevada's transportation vision and objectives. The Program Plan includes three main components:

- **Strategic Elements:** Provide a high-level strategic direction toward achieving the statewide transportation vision through TSMO.
- **Programmatic Elements:** Complement the Strategic Elements by providing a more-detailed approach to identify the required structure for the implementation of a successful TSMO Program.
- **Tactical Elements:** Define detailed and specific strategies and actions required to achieve TSMO goals and objectives.

These components and elements are developed in alignment with the Federal Highway Administration (FHWA) TSMO Primer as well as the One Nevada Transportation Plan to ensure transportation efforts are aligned at both national and agency levels. This plan includes recommendations on the update cycle of the specific elements to ensure all TSMO efforts are up to date.

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LIST OF ACRONYMS/ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
AMP	Asset Management Plan
ARTIMIS	Advanced Regional Traffic Interactive Management and Information System
ATM	Active Traffic Management
ATMS	Active Traffic Management Systems
BTS	Bureau of Transportation Statistics
CAMPO	Carson Area Metropolitan Planning Organization
CAV	Connected and Automated Vehicle
CMAQ	Congestion Mitigation and Air Quality
CMM	Capability Maturity Model
COBRA	Colorado Bottleneck Reduction Alternatives
ConOps	Concept of Operations
CTR	Commute Trip Reduction
DOT	Department of Transportation
DPS	Department of Public Safety
ESF	Emergency Support Functions
FAC	Freight Advisory Committee
FAST Act	Fixing America's Surface Transportation Act
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GOED	Governor's Office of Economic Development
HAR	Highway Advisory Radio
HCAS	Highway Cost Allocation Study
HSIP	Highway Safety Improvement Program
IPT	Investment Prioritization Tool
ITS	Intelligent Transportation System
KSA	Knowledge, Skills, and Abilities
MAP-21	Moving Ahead for Progress in the 21st Century Act
MMS	Maintenance Management System
MODA	Multi Objective Decision Analysis
MPO	Metropolitan Planning Organization
NDEM	Nevada Division of Emergency Management
NDOT	Nevada Department of Transportation
NFM	National Freight Movement
NHMPC	Nevada Hazard Mitigation Planning Committee
NHP	Nevada Highway Patrol
NHPP	National Highway Performance Program
NHS	National Highway System
NHTSA	National Highway Traffic Safety Administration
PDC	Project Development Committee
PLANA	Planning and Needs Assessment
PRIIA	Passenger Rail Investment and Improvement Act
QoL	Quality of Life
ROI	Return on Investment
RRR	Resurfacing, Restoration, and Rehabilitation
RTC	Regional Transportation Commission
RTC Washoe	Regional Transportation Commission of Washoe County
RTC FAST	RTC Freeway and Arterial System of Transportation
RTCSNV	Regional Transportation Commission of Southern Nevada
RTP	Regional Transportation Plan
RWIS	Road Weather Information System
SCEMP	State Comprehensive Emergency Management Plan
SDP	Strategic Deployment Plan
SERT	State Emergency Response Team
SHRP 2	Second Strategic Highway Research Program
SNL	Senior NDOT Leadership
SOV	Single Occupancy Vehicles
STIP	Statewide Transportation Investment Program
STP	Statewide Transportation Plan
TAMP	Transportation Asset Management Plan
TAP	Transportation Alternatives Program
TCT	TSMO Champion Team
TDM	Travel Demand Management
TIBP	Transportation Investment Business Plan
TIM	Traffic Incident Management
TMPO	Tahoe Metropolitan Planning Organization
TRIP	The Road Information Program
TSM	Transportation System Management
TSMO	Transportation Systems Management and Operations
USDOT	U.S. Department of Transportation
UTIP	Unified Transportation Investment Plan
VMT	Vehicle Miles Traveled
VOC	Vehicle Operation Cost
WDP	Workforce Development Plan
WPS	Work Performance Standards
WSDOT	Washington Department of Transportation

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1.0 INTRODUCTION

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This document is a program plan for placing Transportation Systems Management and Operations (TSMO) into practice throughout the Nevada Department of Transportation (NDOT). The TSMO Program introduces a set of strategies that support the integration of transportation systems management and operations into the planning process. These strategies can be implemented faster and more cost effectively than new construction. In addition, they support NDOT's environmental and sustainability goals and objectives through reducing congestion and minimizing the need for significant construction options.

The program plan describes the rationale and the need for a statewide TSMO Program, delineates the strategic approach to improve mobility across all modes of transportation through incorporation of TSMO, and defines a programmatic approach to establish necessary actionable items within an identified timeframe to successfully implement the TSMO Program. It includes a TSMO Investment Prioritization Tool (IPT) to help identify the state's TSMO transportation priorities to achieve transportation goals and objectives in the most sustainable and efficient way. In addition, it also includes Strategic, Programmatic, and Tactical elements, and aligns with MAP-21, NDOT's TAMP, Maintenance Management System (MMS), and Statewide long-range plans. The project team looked at multiple planning documents to identify areas of TSMO and/or TSMO elements to ensure maximum alignment (further details of this analysis are described in Section 4.8 of this document).

The NDOT TSMO Program Plan builds on a performance-based planning approach to management and operations of the transportation system by highlighting the successful accomplishment of currently implemented TSMO initiatives in the state of Nevada. This mobility-focused approach identifies end users' specific needs, institutionalizes TSMO activities and mobility strategies, and introduces cost-effective solutions to maximize the efficiency of the existing transportation system through addressing the identified end users' needs. This program has been prepared in collaboration with Senior NDOT Leadership (SNL) and sections that follow will define TSMO and its unique approach in detail.

1.1 WHAT IS TSMO?

The Moving Ahead for Progress in the 21st Century Act (MAP-21) defines TSMO as: "Integrated strategies to optimize the performance of existing infrastructure through the implementation of multi-modal and intermodal, cross-jurisdictional systems, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system" (MAP-21, 2012). TSMO incorporates specific activities to improve safety, efficiency, and reliability by considering systems management and operations—from project conception through planning, design, construction, operations, and maintenance.

TSMO takes a collaborative approach within all NDOT divisions to optimize the existing infrastructure through better coordination, integration, and implementation of operational strategies. It aligns resources to determine the full capacity of the existing transportation system. It increases safety, improves reliability and mobility, and targets challenged areas using logical and available performance measures to deliver performance-based efforts and solutions.

TSMO offers low-cost high-benefit operations and management improvements by using past and existing investments to their maximum potential through integrated solutions that enhance the overall performance and operation of the transportation system. TSMO should be implemented after the statewide operational needs are identified through the analysis of TSMO Program Elements within the Traffic Operations Division to maximize the efficiency of the existing infrastructure and new infrastructure.

TSMO strategies are used to manage the transportation system cohesively and proactively by addressing challenged areas. TSMO will enhance collaboration, partnerships, and communications among stakeholders to (1) improve mobility through integrated and innovative operations and management solutions that maximize existing capacity as a way to eliminate the need to add capacity, (2) ensure that the safety and functionality of capacity projects are optimized, and (3) contribute to environmental sustainability.

1.2 WHAT WILL TSMO DO FOR NEVADA?

With projected population and traffic growth in Nevada, increases in system demand, technological advancements, and limited funding, NDOT recognizes the significance of embracing TSMO to facilitate more comprehensive management and operations of the transportation system. This performance-driven program focuses on the surface transportation system and the policies and business processes that are applied to manage and operate this system.

From project conception through maintenance, the current management and operation of the transportation system is performed in a compartmentalized manner, within respective departmental disciplines. The TSMO Program introduces an innovative approach by integrating multiple disciplines, breaking down unproductive barriers, and formalizing processes to maximize collaboration among NDOT divisions.

1.3 CONSISTENCY WITH THE NATIONAL PROGRAMS

MAP-21 established a performance-based approach for planning and programming to improve the operation and safety of transportation systems nationwide (MAP-21, 2012). MAP-21 identified four general goals, as shown in Table 1.

Section 1203 of MAP-21 established seven national TSMO performance goals for federal highway programs, as listed below (MAP-21, 2012):

1. **Safety**—To achieve a significant reduction in traffic fatalities and serious injuries on all public roads
2. **Infrastructure Condition**—To maintain the highway infrastructure asset system in a state of good repair
3. **Congestion Reduction**—To achieve a significant reduction in congestion on the NHS
4. **System Reliability**—To improve the efficiency of the surface transportation system
5. **Freight Movement and Economic Vitality**—To improve the national freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development
6. **Environmental Sustainability**—To enhance the performance of the transportation system while protecting and enhancing the natural environment
7. **Reduced Project Delivery Delays**—To 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.

Table 1. MAP-21 National Performance Goals

National Goals	Description
National Highway Performance Program (NHPP)	To provide support for the condition and performance of the National Highway System (NHS), for the construction of new facilities on the NHS, and to ensure that investments of federal-aid funds in highway construction are directed to support progress toward the achievement of performance targets (FHWA, 2016).
Highway Safety Improvement Program (HSIP)	To achieve a significant reduction in traffic fatalities and serious injuries on all public roads, including non-state-owned roads and roads on tribal land. The HSIP requires a data-driven, strategic approach to improving highway safety on all public roads with a focus on performance (FHWA, 2017).
Congestion Mitigation and Air Quality (CMAQ) Program	To support surface transportation projects and other related efforts that contribute air quality improvements and provide congestion relief (FHWA, 2017).
National Freight Movement (NFM)	To assess and improve efficient movement of freight on the interstate systems (MAP-21, 2012).

In December 2015, the Fixing America's Surface Transportation (FAST) Act was passed and it continues to support the use of TSMO strategies. Except as specified below, the FAST Act made no changes to the performance management provisions established by MAP-21, shown in Table 2.

Both national transportation bills strongly support TSMO and encourage state departments of transportation (DOTs) and agencies such as Metropolitan Planning Organizations (MPOs) and Regional Transportation Commissions (RTCs) to consider initiatives and projects that improve the efficiency, safety, and mobility of transportation systems.

NDOT currently is moving forward with several TSMO initiatives, including Transportation Asset Management Program (TAMP); Active Traffic Management (ATM) Systems; Smart Work Zone Management; Wrong Way Driver Detection; Traffic Incident Management (TIM); Road Weather Management Programs; Intelligent Transportation Systems (ITS); Connected and Automated Vehicle (CAV) Systems; Data Collection, Storage, Utilization, Analytics, and Decision Support Systems; ITS Strategic Deployment Plan; and more. These initiatives enable a focused attention on the operations of transportation systems and are consistent and compliant with national goals. Implementing the TSMO Program further supports the directives provided in the national act, and also complements the investments that Nevada has made in the existing infrastructure to gain maximum return, both socially and financially. The TSMO Program emphasizes performance goals through developed strategies and formalizes the prioritization of mobility through innovative and technological solutions.

Table 2. MAP-21 National Performance Goals Modified by FAST Act

Performance Goal	Description of Adjustment by FAST Act
Freight Performance Measure	Explains how the state must describe in its next performance report to the U.S. Department of Transportation (USDOT) the actions it will take to achieve targets if the state has failed to meet them within two years after establishment of targets.
Performance Period Adjustment	Adjusts the timeframe for states and MPOs to make progress toward meeting their performance targets under the NHPP and clarifies the significant progress timeline for the HSIP performance targets.
Interstate System Condition	Adjusts the timeframe for review to trigger the penalty by removing the requirement that this decline in condition level is shown during "two consecutive reporting periods."

Source: https://www.fhwa.dot.gov/fastact/factsheets/performancemgmtfs.cfm

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2.0 NDOT TSMO PROGRAM PLAN OVERVIEW

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This document presents a five-year action plan to implement the TSMO Program as part of a cross-jurisdictional approach to achieve Nevada's transportation vision and objectives. The program has been developed through a collaborative effort between NDOT divisions and partnering agencies led by the Traffic Operations Division. It focuses on innovative and collaborative solutions to maximize the safety, reliability, mobility, and efficiency of the existing transportation infrastructure, while ensuring that new infrastructure is sustainable and fully optimized.

NDOT is currently implementing TSMO initiatives within the state. This plan builds on a proven track record of TSMO success stories, both within the state of Nevada and nationwide. It aims to formalize TSMO activities and apply statewide performance-based decision making to prioritize transportation solutions.

2.1 TSMO PROGRAM INTEGRATION PROCESS

To coordinate efforts between the TSMO Program and other transportation investments, NDOT recognizes the need to incorporate TSMO-related steps within its core values and in the project development process. Figure 1, below, represents the TSMO Program integration process, and outlines the details of incorporating TSMO within NDOT. This ensures a direct link between operations and the transportation management process in a manner that is continuously evaluated and improved.

2.2 TSMO PROGRAM EVALUATION AND CAPABILITY MATURITY MODEL

The first step for NDOT to develop a TSMO program was the 2014 Capability Maturity Model self-assessment workshop. Under the supervision of the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO), and through research conducted by the Second Strategic Highway Research Program (SHRP 2), NDOT was one of the first DOTs selected to undertake a self-assessment workshop to evaluate the effectiveness of Nevada's transportation systems management and operations. The assessment used the Capability Maturity Model (CMM) as a tool and estimated the extent and maturity of TSMO activities under the six key dimensions shown in Figure 2. These CMM dimensions are interrelated and the success of one depends on the performance of another. These six CMM dimensions will be integrated formally throughout NDOT existing processes to carry out the mobility objectives.

Figure 1. TSMO Program Integration Process

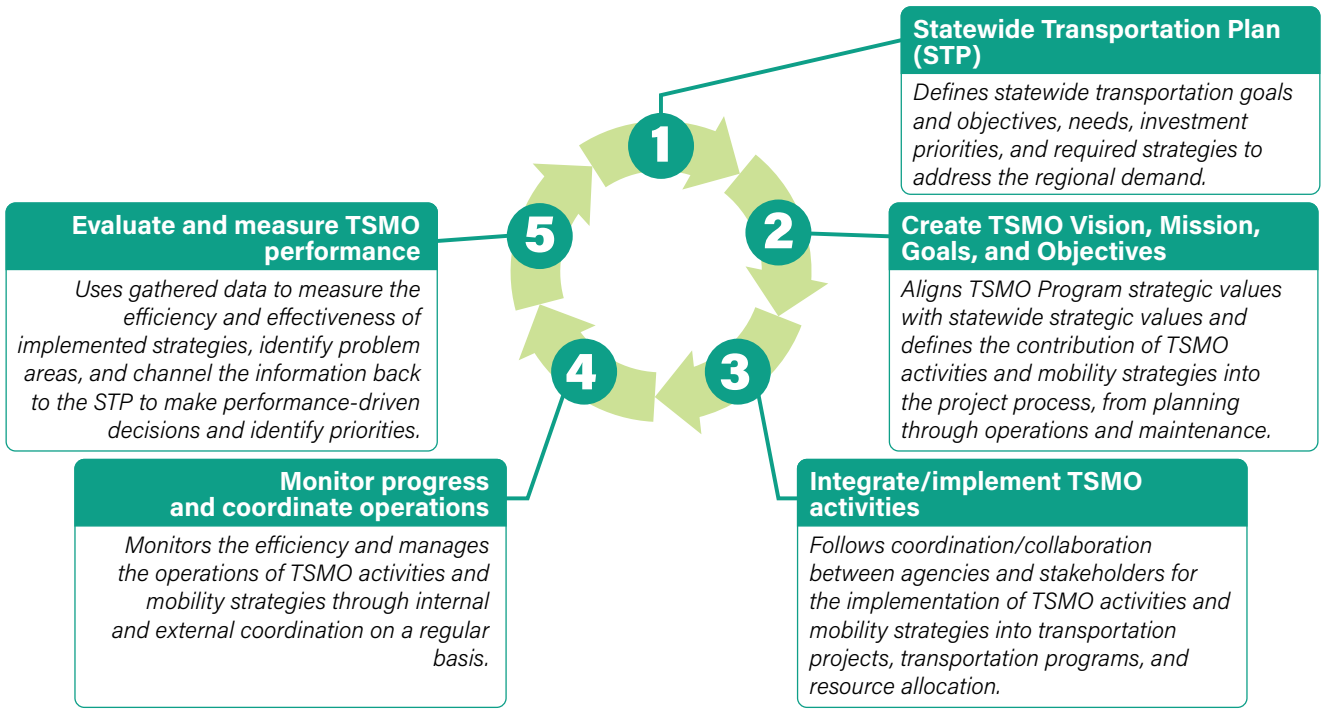
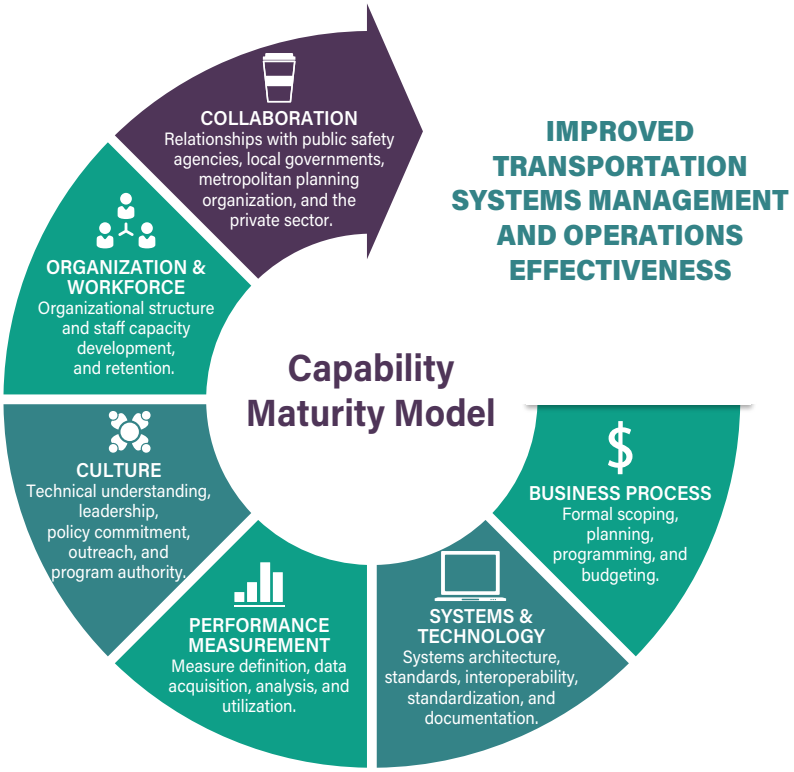


Figure 2. CMM Dimensions



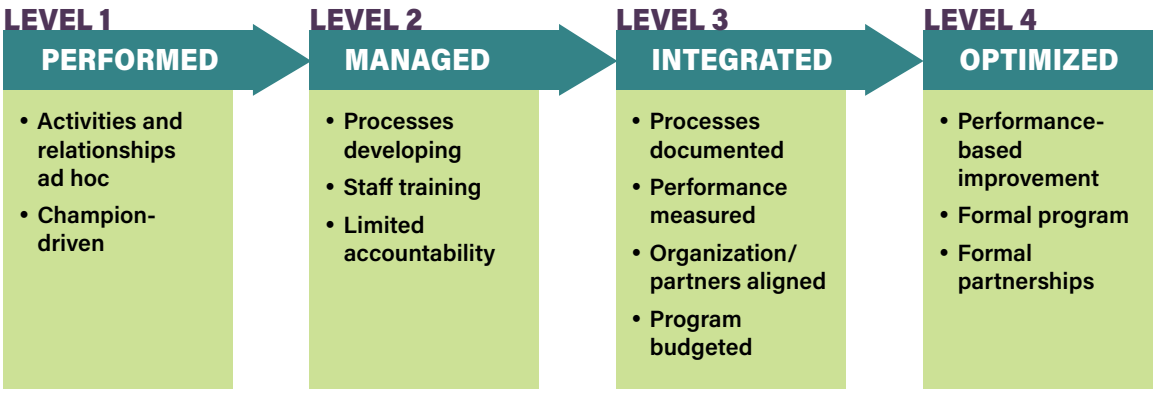
Source: https://ops.fhwa.dot.gov/publications/fhwahop17017/ch3.htm

NDOT evaluated its performance using the CMM levels of maturity shown in Figure 3. NDOT assessed all of the dimensions at a Level 1: Performed, except for the Systems and Technology dimension that was rated at Level 2: Managed. This means that TSMO activities, for the most part, have been implemented on an ad-hoc basis and are limited to informal departmental activities.

Appendix A provides additional details of the 2014 self-assessment workshop.

NDOT used the CMM dimensions as its framework for the TSMO Program Plan to ensure the undertaking of targeted action items that will address all six dimensions.

Figure 3. CMM—Maturity Levels



Source: Creating an Effective Program to Advance Transportation Systems Management and Operations, FHWA, Jan 2012

2.3 NDOT TSMO PROGRAM PLAN COMPONENTS

The NDOT Statewide TSMO Program Plan is developed with specific considerations to the following:

- NDOT 2014 CMM Assessment Workshop
- Statewide Transportation Plan Vision, Mission, Goals, and Core Values
- One Nevada Plan and Multi Objective Decision Analysis (MODA)
- Collaboration within NDOT (such as Planning, Engineering, etc.)
- National TSMO best practices
- Collaboration with SNL
- Existing NDOT transportation long-range plans and documents

The following is a brief introduction to and description of each TSMO Program Plan component and its purpose.

1. NDOT TSMO Strategic Elements

The NDOT TSMO Strategic Elements focus on a high-level strategic approach toward achieving statewide safety, mobility, sustainability, and transportation efficiency, as well as implementation of a successful TSMO Program that supports the state's transportation vision (as outlined in current transportation plans and documents). These establish the overarching need, purpose, and framework for NDOT's TSMO Program. NDOT TSMO Strategic Elements include the following:

- Business Case for TSMO
- TSMO Vision, TSMO Mission, TSMO Strategic Goals and Objectives

2. NDOT TSMO Programmatic Elements

The TSMO Programmatic Elements provide detailed activities to implement NDOT's TSMO Program. NDOT TSMO Program objectives have been identified and actionable items have been developed in alignment with Strategic Elements. The Programmatic Elements provide the details of the required processes, procedures, and resources to achieve the TSMO Vision, Mission, and Goals outlined within the Strategic Elements. Through application of the evaluation and reporting process identified within these elements, NDOT can ensure that the state's transportation objectives are prioritized and that the TSMO Program is on track. The NDOT TSMO Programmatic Elements include:

- TSMO Program Objectives
- Organizational Structure
- Business Processes and Program Management
- Resources Management
- Communication and Collaboration
- TSMO Program Elements Actionable Items
- Investment Prioritization Tool
- How Does TSMO Relate to Existing Plans and Documents
- TSMO Evaluation Tool
- NDOT TSMO Champion Team

3. NDOT TSMO Tactical Elements

The Tactical Elements provide detailed TSMO activities, strategies, projects, and services that advance the TSMO Program objectives. They provide detailed recommendations, projects, and actions based on the identified program objectives and the recommended actionable items. Tactical Elements include items such as specific projects, funding, timeframes, districts, etc. Implementation of the Tactical Elements will enable NDOT to better analyze opportunities, challenges, and gaps within traffic operations activities, which can be used to prioritize and implement TSMO strategies.

4. TSMO Program Plan Update Cycle

The TSMO Program Plan Update Cycle includes recommendations of how frequently the program plan and its specific components should be reviewed and updated to ensure all TSMO efforts are up to date, on track, and successfully moving forward.

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3.0 NDOT TSMO STRATEGIC ELEMENTS

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The TSMO Strategic Elements outline the overall direction for the TSMO Program and identify priorities to achieve NDOT's Vision and Core Values as outlined in the department's current transportation plans and documents.

Section 3.1 summarizes the business case for TSMO, identifying current and future documented transportation challenges NDOT faces. Appendix A provides a more detailed understanding of the contribution and success stories of TSMO activities—both statewide and nationwide—that can be applied to address the identified transportation challenges.

Section 3.2 provides details on TSMO Vision, Mission, Goals, and Objectives.

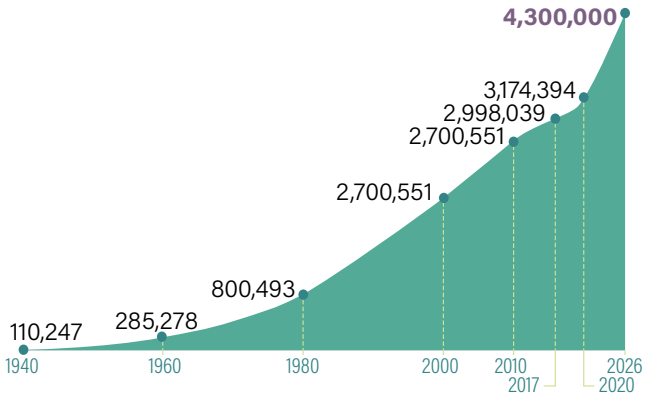
3.1 BUSINESS CASE FOR TSMO

As outlined in the STP and further elaborated on in The Road Information Program (TRIP), the state of Nevada is facing challenges associated with **population growth, congestion, safety, increase in Vehicle Miles Traveled (VMT), a tourism-based economy, deficient roads and bridges, and trucks and freight movement**. The following subsections describe these challenges and how TSMO will contribute in dealing with these challenges.

3.1.1 POPULATION GROWTH

Congestion levels are increasing rapidly due to the growth in population and increased demand on Nevada roadways. The current population for Nevada in 2019 is estimated at 3.1 million, a sizeable increase from its 2.7 million population at the 2010 Census (Nevada Population, 2019). The 2.1 percent growth between 2017 to 2018 made Nevada one of the fastest growing states in the nation (United States Census Bureau, 2018) . As shown in Figure 4, the population is expected to continue to grow to 4.3 million by 2026 (NDOT, 2008), which will lead to even bigger transportation demands and dilemmas.

Figure 4. Nevada Population Growth Chart



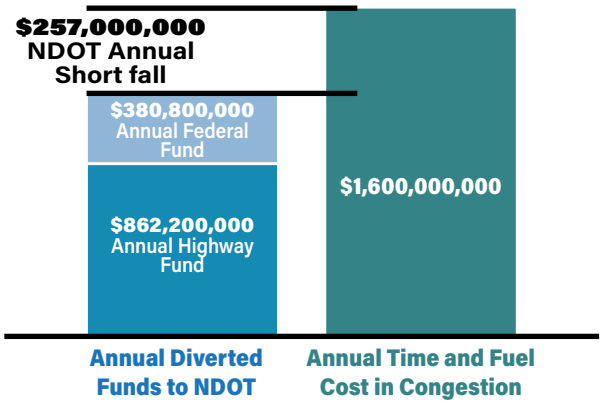
Source: https://www.census.gov/newsroom/press-releases/2018/estimates-national-state.html

The Need for TSMO	▪ Increase in demand, congestion, and delay ▪ Reduction of capacity, transportation safety, and reliability
TSMO Benefits	Implement solutions on existing roadways and collaborate within NDOT to include TSMO strategies such as Traffic Incident Management, Work Zone Management, Special Event Management, and Road Weather Management. Design new infrastructure that can increase efficiency, reduce congestion and crashes, and increase the reliability of NDOT roadways to help to accommodate this growing population.
TSMO Contribution	**Ohio-Kentucky-Indiana Regional Council of Governments benefits from TSMO strategies:** Advanced Regional Traffic Interactive Management and Information System (ARTIMIS) program yielded a benefit of 12:1, while the capacity-adding project would have had a benefit of only 1.1:1. Additionally, the ARTIMIS program cost was 1/20th the cost of the capacity-adding project.

3.1.2 CONGESTION

According to the Texas Transportation Institute (TTI) 2015 Urban Mobility Scorecard, delays from congestion resulted in an extra 6.9 billion hours in travel time and the purchase of an extra 3.1 billion gallons of fuel in 2014, totaling $160 billion in congestion costs nationwide (David Schrank, Tim Lomax, Bill Eisele, 2011). TRIP indicates that, "... 40 percent of Nevada's urban Interstates experience congestion during peak hours" and "... Traffic congestion costs American motorists $121 billion a year in wasted time and fuel cost" (TRIP, 2016). Based on the TTI estimates, and as shown in Figure 5, "... the value of lost time and wasted fuel in Nevada is approximately $1.6 billion per year." Lost time and wasted fuel due to congestion cost the average Las Vegas driver $984 (46 hours), while the average Reno-Tahoe driver spends $383 (18 hours) annually.

Figure 5. Cost of Congestion to Nevada vs. Available Annual Funds



Note: The Annual Highway Fund does not include the Annual Federal Fund. (NDOT, 2018 Facts and Figures).

Source: https://www.nevadadot.com/Home/ShowDocument?id=16044

The Need for TSMO	▪ Wasted time and vehicle operating costs ▪ Hundreds of lost lives ▪ Increased chance of secondary incidents
TSMO Benefits	TSMO focuses on easily implementable and cost-effective solutions that have measurable benefits to existing roadways and maximizes the efficiency of new infrastructure. Solutions such as Traffic Responsive Freeway Ramp Metering can decrease delay and improve trip reliability, which in turn reduces traffic crashes.
TSMO Contribution	**The Pennsylvania DOT benefits from TSMO strategies:** Incident Response Management reduced incident response times by 8.7 minutes, incident clearance times by 8.3 minutes, and hours of delay by 547,000 hours per year, with a total monetary savings of $6.5 million per year. **Nevada WayCare Project:** The WayCare Project reduced congestion and incident response times by leveraging real-time predictive analytics to identify high-risk incident locations. Therefore, agencies such as NDOT, Department of Public Safety-Nevada Highway Patrol (DPS-NHP), and RTC Freeway and Arterial System of Transportation (FAST) can now take proactive preventative measures accordingly.

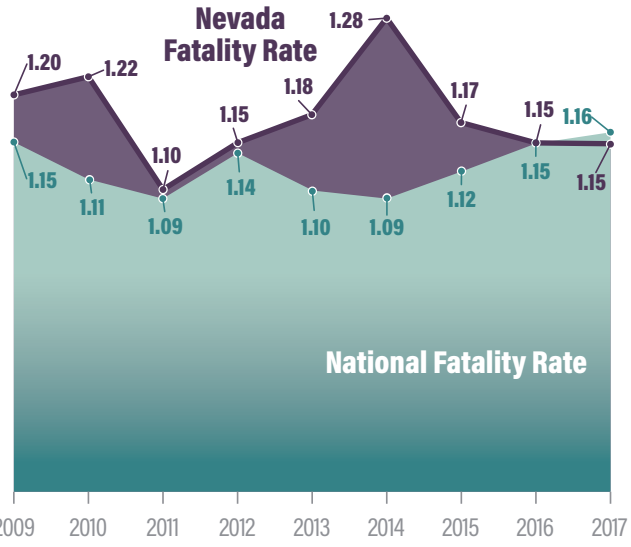
3.1.3 SAFETY

In 2014, congestion cost Americans $160 billion, but the impact goes far beyond financial. For every minute a lane is blocked during peak hour, it leads to roughly four to five minutes of delay (National Traffic Incident Management Coalition, 2006) and a 2.8-percent increased chance of a secondary crash (NDOT Facts and Figures, 2016)—which represent more than 20 percent of total crashes and usually are deadlier than the initial incident (SAIC & ATRI, 2010). These secondary crashes are to blame for 18 percent of overall fatalities on the interstate highway system (SAIC & ATRI, 2010).

Figure 6 illustrates the Nevada Fatality Rates versus National Fatality Rates. In general, Nevada mirrors national trends; however, there have been times when Nevada exceeded the national rates. In addition (Key Facts about Nevada Surface Transportation, 2017):

- There were 331 traffic fatalities in 2018 in Nevada, the largest fatality count in the last decade (Safety O. o., 2019).
- Traffic crashes in Nevada imposed a total of $1.98 billion in economic costs in 2017 (Safety A. f., 2019).
- Motor vehicle crashes cost Nevada motorists $906 million per year in medical costs, lost productivity, travel delays, workplace costs, insurance costs, and legal costs. (Key Facts about Nevada Surface Transportation, 2017)

Figure 6. Nevada Fatality Rates vs. National Fatality Rates



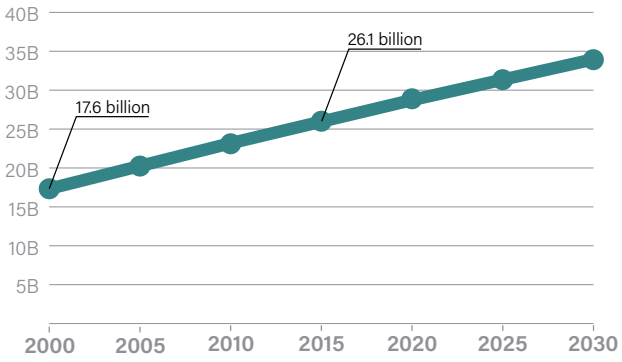
Source: 2018 Nevada Transportation Facts and Figures

The Need for TSMO	Traffic crashes have a demonstrable negative effect on the operations of NDOT roadways and cost billions of dollars to the economy.
TSMO Benefits	TSMO focuses on increasing the efficiency of roadways, reducing congestion, and helping to eliminate the causal factors of these crashes. It is most effective at reducing the secondary crashes that are associated with the congestion that results from the primary crash. Through Integrated Statewide Traffic Incident Management Programs and real-time traffic monitoring, these primary crashes can be identified and cleared quickly.
TSMO Contribution	**Traffic Incident Management (TIM):** NDOT implemented this effective TSMO strategy to more efficiently detect, respond to, and resolve traffic incidents to restore traffic capacity as safely and quickly as possible through planned and coordinated processes between various public agencies and private sectors.

3.1.4 VEHICLE MILES TRAVELED

As seen in Figure 7, the VMT in Nevada increased by 48 percent from 17.6 billion miles in 2000 to 26.1 billion miles in 2015, the largest VMT increase in the nation. This statistic emphasizes the substantial growth in demand and subsequent congestion on an already "overcrowded and underfunded transportation system" (TRIP, 2016). The VMT in Nevada in 2018 is reported at 27.1 billion miles (NDOT 2018 Facts and Figures Report). By 2030, VMT in Nevada is projected to increase by another 30 percent (TRIP, 2016).

Figure 7. Nevada Increase in VMT



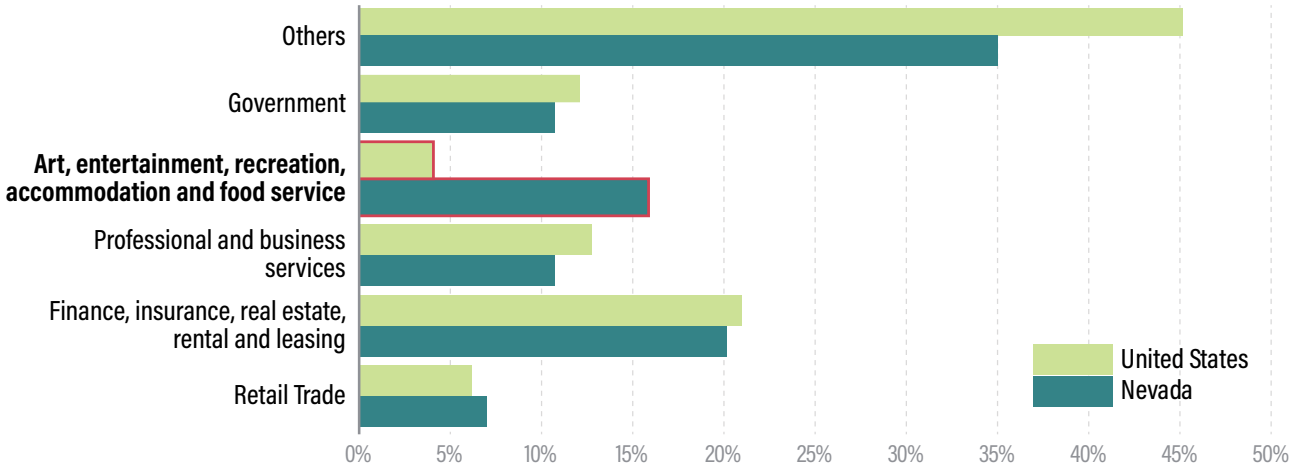
Source: http://www.tripnet.org/docs/NV_Transportation_by_the_Numbers_TRIP_Report_October_2016.pdf
https://www.nevadadot.com/Home/ShowDocument?id=16044

The Need for TSMO	With VMT demand increasing at a rapid rate, the need for efficient and reliable roads to accommodate this demand is paramount.
TSMO Benefits	Improvements to non-motorized facilities (pedestrian and bicycle paths) to reduce the demand on motorized facilities, switching mode choices (bus rider or ride share) to reduce the number of vehicles on the roadway, and real-time traffic information to help with trip pre-planning, and trip rerouting due to congestion or incidents will help to make the roadway more efficient and reduce the potential for traffic crashes.
TSMO Contribution	**Washington DOT (WSDOT), Commute Trip Reduction (CTR) Program:** In 2009, WSDOT's CTR program implemented strategies such as encouraging vanpools, carpools, condensed work weeks and telecommuting to help shift commuters out of single-occupancy automobiles and into alternative modes. The program was implemented across the nine most populous counties within the state and is credited with reducing the average daily weekday morning peak-period trips by 28,000, congestion delays by 12,900 hours, annual VMT by 62 million miles, and fuel consumption by 3 million gallons. This equates to a reduction of approximately 27,500 metric tons of carbon dioxide emissions (WSDOT, 2010).

3.1.5 TOURISM-BASED ECONOMY

Tourism and supporting industries are a significant contributor to Nevada's economy as a result of the gaming and resort industry (centered in Las Vegas, Reno, and Lake Tahoe), as shown in Figure 8. Recent data from the Nevada Governor's Office of Economic Development indicates that the number of jobs created by Nevada's tourism industry is 125% above the national average (Nevada's Tourism, Gaming, and Entertainment Sector , 2018). However, over the last eight years, the percentage change in tourism-based jobs on a national level is higher than in Nevada. Therefore, it is imperative that the state of Nevada provide, maintain, and operate a safe, reliable, and efficient transportation network for its residents and tourists to remain competitive in the tourism industry and minimize the interruption and negative impact of congestion to the state's third highest source of revenue.

Figure 8. Nevada Top Five State Industries as a Percent of Total GDP in 2018



Source: Bureau of Economic Analysis, 2018

The Need for TSMO	To remain competitive in the highly selective tourism industry, Nevada must; ▪ Provide a reliable transportation system for efficient mobility of tourists. ▪ Provide, maintain, and operate a safe, reliable, and efficient transportation network to support the state's third highest source of income.
TSMO Benefits	Easily implementable and cost-effective TSMO strategies such as real-time traffic information to plan efficient and reliable work trips, encouraging ridership on public transportation to reduce the number of vehicles on the road, and providing safe alternatives such as pedestrian and bicycle paths will help to reduce congestion and subsequent crashes.
TSMO Contribution	**The Colorado DOT benefits from TSMO strategies,** such as the Freeway Service Patrol, I-70 Peak Period Shoulder Lane, and Colorado Bottleneck Reduction Alternatives (COBRA) Project. These projects have: ▪ High benefit-cost ratios, typically 10:1 and as much as 40:1 ▪ Readily implementable in less time (usually within 12 months) and for less money than adding lanes ▪ Highly visible, many times but not always, and noticeable improvements ▪ Quantifiable reduction in delay and improvement in travel time reliability ▪ Measurable safety-related improvements ▪ Improvements that continue to provide value even when long-term construction projects are completed.

3.1.6 DEFICIENT ROADS AND BRIDGES

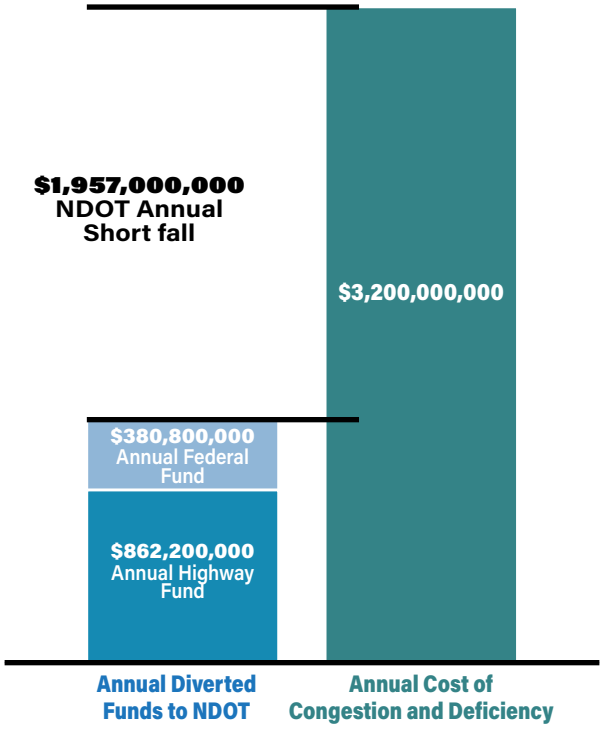
A safe, efficient, and reliable transportation system requires a well maintained infrastructure. Deficient infrastructure costs Nevada motorists a total of $3.2 billion every year in three different forms of Vehicle Operating Costs (VOC), traffic crashes (safety), and congestion-related delays (congestion) as presented in Table 3. This cost is approximately three times more than Nevada's annual highway fund (see Figure 9).

Table 3. Cost of Inadequate Surface Transportation per Driver in Urban Areas

	VOC	Safety	Congestion	Total
Las Vegas	$356	$404	$984	**$1,744**
Reno-Tahoe	$482	$327	$383	**$1,192**
Statewide Total	**$812 Million**	**$804 Million**	**$1.6 Billion**	**$3.2 Billion**

According to statistics in the STP, only 5 percent of bridges are rated as structurally deficient statewide. However, by 2020, a $24 million deficit has been projected in the bridge preservation program (NDOT, 2008), which means there will be less budget available for other transportation investments. Additionally, the 2016 TRIP indicates that 11 percent of Nevada's bridges are functionally obsolete. Lack of sufficient funds together with the increasing maintenance need results in the need for a more efficient and cost-saving solution to manage and operate the transportation system. TSMO's performance-based approach facilitates the collaboration to ensure NDOT efficiently responds to the growing demand of infrastructure maintenance.

Figure 9. NDOT's Annual Funds vs. Cost of Inadequate Surface Transportation in Nevada's Urban Areas



Note: The Annual Highway Fund does not include the Annual Federal Fund. (NDOT, 2018 Facts and Figures)

Source: https://www.nevadadot.com/Home/ShowDocument?id=126211

The Need for TSMO	NDOT's yearly operating budget is not sufficient to keep up with operations and maintenance, let alone to keep up with the demands for new infrastructure.
TSMO Benefits	TSMO tries to focus on easily implementable, low-cost, high-return solutions with highly visible results. When these low-cost solutions produce the required results, it has the potential to save money, which then can be reallocated to help solve more problems.
TSMO Contribution	In 2018, NDOT restriped the I-515/I-215 interchange for the southbound to westbound movement. This solution improved roadway efficiency, delayed the need for major rehabilitation and reconstruction, increased safety, and improved mobility at the cost of approximately $800,000, which was substantially lower than the cost to rebuild the entire interchange.

3.1.7 TRUCKS AND FREIGHT MOVEMENT

Commerce depends on reliable and efficient transportation to move goods and products. Therefore, the efficiency and reliability of the transportation system is critical to the health of Nevada's economy. Transportation access and convenience for customers and markets is critical (TRIP, 2016). Currently[1]:

- $144 billion in goods and products are shipped, mostly by truck, to and from the state of Nevada.
- On an annual basis, 73 percent of goods and products are carried by trucks.
- Highway accessibility and reliability was ranked number two as a site selection factor, after skilled labor, according to Area Development Magazine. Therefore, it is critical for Nevada to maintain the quality of its highways and transportation system.

Even the smallest interruption in performance will adversely affect trucks and freight movement and, accordingly, will negatively impact the economy.

The Need for TSMO	▪ Negative effect on the economy of Nevada. ▪ Delay has a negative effect on the cost of goods and products.
TSMO Benefits	Several TSMO strategies can be implemented to help provide a reliable and efficient roadway system for truckers. Each dollar spent on typical road, highway, and bridge improvements results in an average benefit of $5.20 in the form of reduced vehicle maintenance costs, reduced delays, reduced fuel consumption, improved safety, reduced road and bridge maintenance costs, and reduced emissions. TSMO strategies are expected to greatly increase this average benefit.
TSMO Contribution	**Wyoming Freight:** Truckers use a dedicated radio band on SiriusXM Radio that provides them with Real-Time Traffic Information on WYDOT roads. This service increases trip reliability and allows the industry to make informed decisions on their routes. **Smart Truck Parking Systems:** Real-time systems allow truckers to more efficiently plan their routes and determine where they can safely park and rest between pick-ups and deliveries. The State of Michigan is currently implementing this TSMO strategy with much success throughout the state.

3.1.8 CONCLUSION

NDOT recognizes that increasing capacity is not the only way to reduce congestion and that TSMO strategies have been proven to be cost effective and should be considered along with, or instead of, physical capacity improvements. Recognizing the impending transportation funding shortfalls, it is crucial to find ways to maximize the efficiency of the existing transportation system. TSMO provides the opportunity to address challenged areas through a performance-based approach to maximize mobility. TSMO identifies transportation priorities and defines strategies to enhance the safety, efficiency, and reliability of the state's transportation system.

NDOT's adaptive leadership culture continuously looks for innovative means to better address the customers' needs and meet their demands. Currently, the multiple skilled divisions, disciplines, and programs within NDOT—as well as stakeholders statewide—are working collaboratively to deliver mobility solutions. It is important to acknowledge that TSMO is not meant to replace or rebrand the current efforts, but to enhance and support NDOT's transportation efforts.

1 *Sources of information include the FHWA, AASHTO, the Bureau of Transportation Statistics (BTS), the U.S. Census Bureau, TTI, and the National Highway Traffic Safety Administration (NHTSA).*

3.2 TSMO VISION, MISSION, GOALS AND OBJECTIVES

NDOT's current vision, mission, core values, and goals are as follows:

- **Mission:** Provide, operate, and preserve a transportation system that enhances safety, quality of life, and economic development through innovation, environmental stewardship, and a dedicated workforce.
- **Vision:** To be a leader and partner in delivering effective transportation solutions for a safe and connected Nevada.
- **Core Values:**
  - Respect—Treat others with dignity and value their contributions.
  - Integrity—Do the right thing.
  - Accountability—Take pride in our work and be accountable for our actions.
  - Communication—Communicate with transparency and responsiveness both internally and externally.
  - Teamwork—Foster collaborative and effective partnerships both internally and externally.
  - Flexibility—Be responsive to changing conditions and open to new ideas.
- **Goals:**
  - Safety first.
  - Cultivate environmental stewardship.
  - Efficiently operate and maintain the transportation system in Nevada.
  - Promote internal and external customer service.
  - Enhance organizational and workforce development.

Source: https://www.nevadadot.com/doing-business/about-ndot

NDOT's TSMO vision, mission, and goals and objectives have been developed to help advance NDOT's guiding principles and core values and, therefore, reflect the state's transportation priorities. The TSMO vision, mission, and goals and objectives determine the strategic direction of the TSMO Program and are described in the following subsections.

3.2.1 TSMO VISION

Deliver a safe and connected multi-modal transportation system that links Nevadans and supports the state's economic vitality through TSMO solutions.

3.2.2 TSMO MISSION

Proactively manage, operate, and improve the transportation system through the integration of TSMO throughout NDOT.

3.2.3 TSMO STRATEGIC GOALS AND OBJECTIVES

TSMO strategic goals and objectives were identified in conjunction with NDOT's vision and in collaboration with other divisions. It is important to understand the rationale behind the identified TSMO Goals and Objectives. The following section outlines the importance of each strategic goal in enhancing the Quality of Life (QoL) for Nevadans as well as efficiently managing and operating the transportation system on a statewide level.

3.2.3.1 Enhance Safety

In weighing the importance of identifying safety as a TSMO Strategic Goal, it is crucial to understand the real cost when safety is absent. The real cost of incidents goes beyond the physical damage to people, vehicles, and infrastructure to encompass both direct and indirect impacts, such as mental and emotional stress, effects on family members, financial costs, loss in productivity, skill replacement, health insurance, etc. **NDOT has recognized Safety as an essential aspect of QoL and has developed initiatives such as Zero Fatalities (https://zerofatalitiesnv.com/) to improve the safety of both residents and visitors.**

3.2.3.2 Preserve Infrastructure

Due to the rapid growth in population and demand, NDOT recognizes the significance of addressing the needs of aging infrastructure and maintaining the state's transportation assets efficiently. Considering limited available funds and increased competition in securing sufficient funds, NDOT—in alignment with MAP-21 and the FAST Act—is taking a balanced approach to address infrastructure preservation through TSMO. Pavements, bridges, and ITS assets in poor condition directly impact the citizens, freight users, and visitors and, therefore, will impact the economy. **To efficiently manage the transportation system infrastructure, better serve the needs of users, and align with national programs, NDOT identified Infrastructure Preservation as a significant strategic goal to ensure continuous improvement in QoL and economic vitality.**

3.2.3.3 Enhance Reliability

Reliability has been identified as one of the most important variables influencing customer service and economic benefits. It is influenced by several factors including, but not limited to, the driver and the vehicle, interaction of road users, traffic regulations, traffic management systems, incidents and special events, weather, etc. **Through focusing on enhancing users' experiences, NDOT recognizes Reliability as a contributing factor toward improving QoL, as well as an essential element for economic vitality and, therefore, it has been identified as a TSMO Strategic Goal**.

3.2.3.4 Optimize Mobility

Within the context of transportation, mobility refers to the movement of people, goods, and services along the transportation network. Through a user-focused approach, mobility (as a goal) will maximize the efficiency of the transportation system and enhance the user experience. It recognizes the experience of movement as an end, rather than just the means to an end, and allows equal consideration to all modes of transportation. It is an essential element in shaping a sustainable transportation system through maximizing the efficiency of all modes of transportation, offering convenient and widespread transportation choices. **NDOT identified Mobility as a TSMO Strategic Goal to support safe, efficient, and accessible movement of people, goods, and services throughout the state of Nevada**.

3.2.3.5 Optimize Customer Service

Customer service is a key element of success of the transportation system since good customer service will improve customer satisfaction levels. **In a continuous effort to further enhance customer satisfaction, NDOT has identified Customer Service as a TSMO Strategic Goal to ensure the necessary measures are considered and undertaken**. These measures include, but are not limited to, providing timely, accurate, and easy access to travel information; a means to improve customer relationships; and initiatives for a more personalized experience.

3.2.3.6 Enhance Collaboration

Effective coordination and collaboration are the foundations to the successful operation of the transportation system. Within the context of TSMO, collaboration among internal and external stakeholders is crucial for safe, seamless, and reliable journeys across all modes of transportation. Efficient coordination and collaboration has a significant impact on the performance of the transportation system as it ensures that the decisions related to transportation management and operations consider a regional perspective of the system's performance. TSMO is an objectives-driven, performance-based program and implementing a successful TSMO program requires effective collaboration among internal and external stakeholders. **Therefore, NDOT has identified Collaboration as a necessary TSMO Strategic Goal to ensure effective collaborative efforts are thoroughly executed**.

3.2.3.7 Foster Sustainability

Sustainable transportation is a key element of sustainable urban development. Cities consume approximately two-thirds of the global energy and are responsible for the production of 70 percent of carbon dioxide emissions (Lindau, 2016). Integrating planning, management, and operations can accommodate growth and maximize efficiency without necessarily increasing capacity. In addition, TSMO strategies improve congestion and reduce the need for additional capacity, and therefore, contribute to environmental sustainability through reduction in both carbon dioxide emissions and utilization of natural resources. **NDOT recognizes the necessity of identifying Sustainability as a TSMO Strategic Goal to ensure development of a transportation system through an appropriate framework that balances design, operations, and maintenance**.

3.2.3.8 Strengthen TSMO Integration

For TSMO to be successful, it has to be integrated into existing NDOT policies, plans, and procedures. The integration will allow for improved performance management and business intelligence and enable informed decision-making. **NDOT recognizes the necessity of identifying TSMO Integration as a Strategic Goal to ensure internal and external integration activities and strategies are prioritized.** This will empower and mainstream TSMO at a statewide level.

Table 4. NDOT TSMO Strategic Goals and Objectives

Strategic Goals	Strategic Objectives
Enhance Safety	Reduce crashes, injuries, fatalities, and achieve Vision Zero Initiative.
Preserve Infrastructure	Maintain transportation assets to preserve investments.
Optimize Mobility	Maximize system efficiency by reducing congestion and/or promoting multi-modal transportation.
Foster Sustainability	Develop a sustainable transportation system through sustainable and balanced design, operations, and maintenance.
Enhance Reliability	Improve economic competitiveness and enhance quality of life through reliable travel times.
Optimize Customer Service	Provide timely and accurate travel information to internal and external customers to enable informed decision-making.
Enhance Collaboration	Maximize coordination and cooperation between NDOT divisions and partnering agencies to proactively manage and operate an integrated transportation system.
Strengthen TSMO Integration	Incorporate and prioritize TSMO as a core objective in NDOT's planning, design, construction, operations, and maintenance activities.

4.0 NDOT TSMO PROGRAMMATIC ELEMENTS

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TSMO Programs have been recognized as a powerful way for agencies to cost effectively improve mobility and safety on their transportation networks. At the core of a TSMO Program is the integration of operations and management into all aspects of the project delivery process. This includes institutionalizing the consideration of TSMO Programmatic Elements during needs assessment and planning, prioritizing, designing, constructing, operating, managing, and maintaining existing and new transportation infrastructure. TSMO Programmatic Elements will identify the processes, procedures, and specific activities to accomplish this and to achieve the TSMO strategic goals and objectives.

The overall goal of this program is to improve NDOT's capabilities in the management and operation of the state's transportation system by prioritizing TSMO efforts. **The primary goal is to integrate TSMO efforts into the core activities of both NDOT divisions and partnering agencies.** This is an institutionalized process involving all existing plans and initiatives, as well as those that will be developed in the future addressing both internal and external coordination and collaboration. The structure offered within the Programmatic Elements will ensure clear and consistent efforts to achieve strategic goals and objectives across all departments, disciplines, and projects.

This framework has been developed based on the current state of the practice, studies, and plans (listed in the References in Section 7.0 of this document), while significant consideration also has been given to the unique nature and needs of management and operations of the transportation system in the state of Nevada. The framework includes:

- **TSMO Program Objectives**—Defines key program objectives and how they will be incorporated within NDOT's current business to achieve TSMO strategic objectives.
- **Organizational Structure**—Provides a clear organizational and leadership structure to implement TSMO and advance a TSMO culture.
- **Business Processes and Program Management**—Includes the specific activities required for and related to decision making to deliver a successful TSMO program.
- **Resource Management**—Includes consideration of the required staffing and financial resources to implement TSMO, especially investments, and resource management (including both funding and work development processes and procedures).
- **Communication and Collaboration**—Identifies the essential strategies to develop and maintain both internal and external communication and collaboration with stakeholders.
- **Investment Prioritization Tool**—Outlines a decision-making process to identify the priorities for project planning, design, and implementation.
- **TSMO Program Elements Actionable Items**—Outlines specific immediate, short-term, and long-term action items.
- **How Does TSMO Relate to Existing Plans and Documents**—Outlines how TSMO will be aligned and integrated into current plans and programs through a comprehensive review of the existing long-range plans.
- **TSMO Evaluation Tool**—Evaluates all projects within NDOT to identify opportunities for integrating TSMO solutions to address operational challenges, depending on funding and other factors. Using this tool, NDOT can consider TSMO opportunities during the project development process.
- **NDOT TSMO Champion Team (TCT)**—Establishes designated staff (TSMO champions) responsible for the implementation and administration of the TSMO Program in collaboration with SNL. This team will continue its TSMO efforts as the "TSMO Steering Committee" in the future.

4.1 TSMO PROGRAM OBJECTIVES

The detailed program objectives are designed in alignment with the strategic objectives to ensure the TSMO Program achieves strategic goals, efficiently moving forward and continuously improving. TSMO Program objectives provide the foundation for projects and services that provide a structured mechanism to monitor and manage the overall effectiveness and efficiency of TSMO activities and mobility strategies.

NDOT's key program objectives, performance measures, and data sources are listed in Table 5 and are aligned with each strategic goal. They may support more than one goal, however, and are not considered exclusive.

Table 5. TSMO Program Objectives, Measures, and Data Sources

Strategic Goals	Program Objectives	Performance Measures	Data Source	Baseline Target
Enhance Safety	▪ Reduce the number of incidents. ▪ Reduce the state's fatality rate. ▪ Reduce the number of secondary incidents.	▪ Number of incidents ▪ Number of incidents with injuries ▪ Number of fatalities ▪ Rate of fatalities for 100 million VMT ▪ Number of non-motorized fatalities ▪ Number of non-motorized injuries ▪ Number of secondary incidents ▪ Incident density ▪ Number of incidents in work zones	▪ NDOT Traffic safety application ▪ Annual NDOT traffic safety report ▪ Burn blue reports	▪ Decrease the projected 5-year rolling average of traffic fatalities by at least 1 {12}[2] ▪ Decrease the projected 5-year rolling average of serious injuries by at least 1 {12} ▪ Decrease the projected 5-year rolling average of fatalities per 100M VMT by at least 0.5 {12} ▪ Decrease the projected 5-year rolling average of non-motorized fatalities & serious injuries by 1 {12}
Preserve Infrastructure	▪ Preserve and maintain the transportation system.	▪ TAMP measures ▪ Identification of NDOT ITS assets ▪ Condition of NDOT assets ▪ Age of NDOT assets ▪ Status of assets	▪ TAMP document and database ▪ NDOT ITS assets repository ▪ Asset Management Plan (AMP)	▪ >35% of bridges in "good" condition and <7% in "poor" condition {5} ▪ <10% structurally deficient bridges [3] ▪ >75% of Interstate Pavements and >45% of Non-Interstate NHS Pavements in good condition [3] ▪ <5% of Interstate Pavements in poor condition [3] ▪ Age of the device is less than 80% of the manufacturers' recommended service life to classify it in good condition, 80%-100% for low-risk condition, 100%-125% for medium-risk condition, and >125% for high-risk condition [3]
Optimize Mobility	▪ Optimize efficiency of the highway transportation system. ▪ Maximize efficiency of all modes of transportation. ▪ Implement Travel Demand Management (TDM) strategies.	▪ Average travel time by mode (urban and rural) ▪ Travel Time Reliability ▪ Buffer index	▪ Signal timing ▪ INRIX data ▪ Waze data ▪ Google analytics ▪ VMT ▪ Bicycle and pedestrian level of service	▪ Percent of person-miles traveled: 85% for Interstate and 65% for Non-Interstate {6} ▪ 12 hours of peak hour excessive delay per capita {6}

[2] *{xx} indicates performance measure # from NDOT 2018 Performance Management Report*

[3] *(NDOT, Transportation Asset Management Plan , 2018)*

Unless otherwise stated, baseline targets are from the NDOT 2018 Performance Management Report NDOT. (2018). 2018 Performance Management Report. Carson City: NDOT.

Strategic Goals	Program Objectives	Performance Measures	Data Source	Baseline Target
Foster Sustainability	▪ Increase multi-modal travel.	▪ Percent of non-Single Occupancy Vehicle (SOV) travel in Nevada urbanized areas ▪ Ensure alignment with CMAQ performance measures	▪ VMT ▪ Carbon dioxide emissions ▪ Bicycle and pedestrian level of service ▪ America Community Survey ▪ US Census	▪ 20% non-single occupancy vehicle travel in urbanized areas {6}[4] ▪ 12 hours of peak hour excessive delay per capita {6}[4]
Enhance Reliability	▪ Improve and optimize travel time reliability. ▪ Increase transportation system resilience. ▪ Reduce delay during special events. ▪ Implement Transportation System Management (TSM) strategies	▪ MAP-21 measures ▪ Peak hour excessive delay in urban areas ▪ Average incident-related delay ▪ Average duration of impact from weather-related events ▪ Average delay related to special events ▪ Roadway and incidents clearance time	▪ INRIX data ▪ TIM reports ▪ Freeway service patrol statistics ▪ Waze data ▪ Waycare data	▪ 12 hours of peak hour excessive delay per capita ▪ Incidents with no injuries removed from the travel lane in <30 minutes[5] ▪ Incidents with injuries removed from the travel lane in <60 minutes [5] ▪ Incidents with a fatality cleared in <90 minutes [5]
Optimize Customer Service	▪ Provide timely and accurate travel information to all transportation users.	▪ Near real-time updates to 511[6] ▪ Near real-time updates to website ▪ Near real-time updates to DMS ▪ Number of visits to Travel Information webpage on the NDOT website	▪ Google analytics ▪ Customer surveys ▪ Website reviews ▪ Spillman logs ▪ Crowdsourcing data	▪ 75% Positive Satisfaction Level (Annual Customer Service Survey) ▪ Increase Facebook likes to 10,000 by end of fiscal year {5} ▪ Increase Twitter followers to 25,000 by end of fiscal year {5} ▪ Increase Twitter retweets by 10% by end of fiscal year {5} ▪ Increase YouTube views by 10% by end of fiscal year {5} ▪ Increase Instagram followers to 1,000 by end of fiscal year {5} ▪ Information on website updated/archived quarterly by content editors {5} ▪ Respond to all simple requests from reporters immediately. More complex questions answered within one business day {5}

4 *Meet CMAQ Traffic Congestion Measures*

5 *(Applied Engineering Management Corp. and Texas A&M Transportation Institute, n.d.)*

6 *Near real time: the time between when an incident is discovered until the public is notified of the incident.*

Unless otherwise stated, baseline targets are from the NDOT 2018 Performance Management Report NDOT. (2018). 2018 Performance Management Report. Carson City: NDOT.

Strategic Goals	Program Objectives	Performance Measures	Data Source	Baseline Target
Enhance Collaboration	▪ Collaborate across divisions and districts. ▪ Collaborate with external partner agencies. ▪ Coordinate with neighboring states to proactively manage common transportation routes.	▪ Additional scheduled TCT meetings annually ▪ Increased participation with TSMO coalitions ▪ Additional relevant agreements with partners and neighboring states ▪ Use of collaboration tools ▪ Results from surveys and questionnaires ▪ Participation in TIM coalition meetings	▪ Success of collaborative policies with internal and external stakeholders (this may include shared agreements, MOUs, etc.) ▪ CMM assessments ▪ Success of participation in interagency meetings ▪ Feedback from internal and external stakeholders (may include surveys or questionnaires) ▪ Number of integrated strategies with internal and external stakeholders	▪ 75% Positive Satisfaction Level (Annual Customer Service Survey)
Strengthen TSMO Integration	▪ Integrate TSMO into existing NDOT policies, plans, and procedures ▪ Coordinate TSMO strategies with external partners	▪ Executed policies, plans, and procedures that reference TSMO strategies ▪ Executed multi-agency activities and agreements to promote TSMO	▪ CMM assessments ▪ Number of executed plans and policies that have integrated TSMO strategies ▪ Success of participation in interagency meetings ▪ Number of executed integrated strategies with internal and external stakeholders	▪ To be identified within the TSMO Performance Management Program.

Unless otherwise stated, baseline targets are from the NDOT 2018 Performance Management Report NDOT. (2018). 2018 Performance Management Report. Carson City: NDOT.

4.2 ORGANIZATIONAL STRUCTURE

The current organizational structure within NDOT (referred to as Phase 0) is very well defined; NDOT Traffic Operations Division currently is responsible for TSMO activities. However, based on input from the Traffic Operations Division and input from relevant stakeholders, it is suggested that the Division's organizational structure be realigned to accommodate TSMO in a more formalized manner. The changes to Traffic Operations' organizational structure are suggested based on specific requirements, including:

- Supporting the anticipated changes in staffing for the TSMO Program
- Accommodating the emerging needs in skills and expertise for TSMO
- Integrating the TSMO Program into the districts
- Coordinating with stakeholders for TSMO activities
- Enabling a TSMO-related decision-making process
- Supporting and formalizing a sustainable TSMO Program
- Adding dedicated staff (TCT) that supports implementation of the TSMO Program and will transition to TSMO Steering Committee in the future.

Figure 10 illustrates the current organizational structure of the Traffic Operations Division.

The primary areas under this division include:

- Technology Group
- Signals, Lighting, and ITS Design
- Signing, Striping, and Traffic Control
- Operations and Network Analysis
- Planning and Operations

One of the key suggestions in the development of a more TSMO-centric organizational structure is to establish the new TSMO Program Manager with dedicated TSMO staff to ensure the appropriate level of involvement required to fully integrate TSMO. To make a smooth and efficient transition, a phased approach was identified to establish the TSMO Program Manager. The proposed organizational structure is illustrated in Figure 11 and Figure 12. The current structure is referred to as Phase 0 (Figure 10) and Figure 11 and Figure 12 illustrate the phased approach, specifically:

PHASE 1

Review of Work Performance Standards (WPS) at all levels to ensure inclusion of TSMO responsibilities within job elements. This phase is planned to be implemented between 2020 and 2022 in the following steps:

- **2020 to 2021:** Revise WPS
- **2021 to 2022:** Implement Phase 1
- **2022 to mid-2022:** Evaluate and revise the WPS defined in Phase 1

PHASE 2

Minor changes at program and tactical levels to accommodate programmatic and tactical elements within the organization job elements. This is planned to be implemented between 2022 and 2025 in the following steps:

- **Mid-2022 to 2023:** Implement Phase 2
- **2023 to 2024:** Evaluate Phase 2 and begin the TSMO Workforce Development Plan (WDP). The new TSMO positions will be determined in this step.
- **2024 to 2025:** Develop and Implement Phase 3 with TSMO positions as defined in the WDP

Figure 10. Existing Organizational Structure of the NDOT Traffic Operations Division (Phase 0)

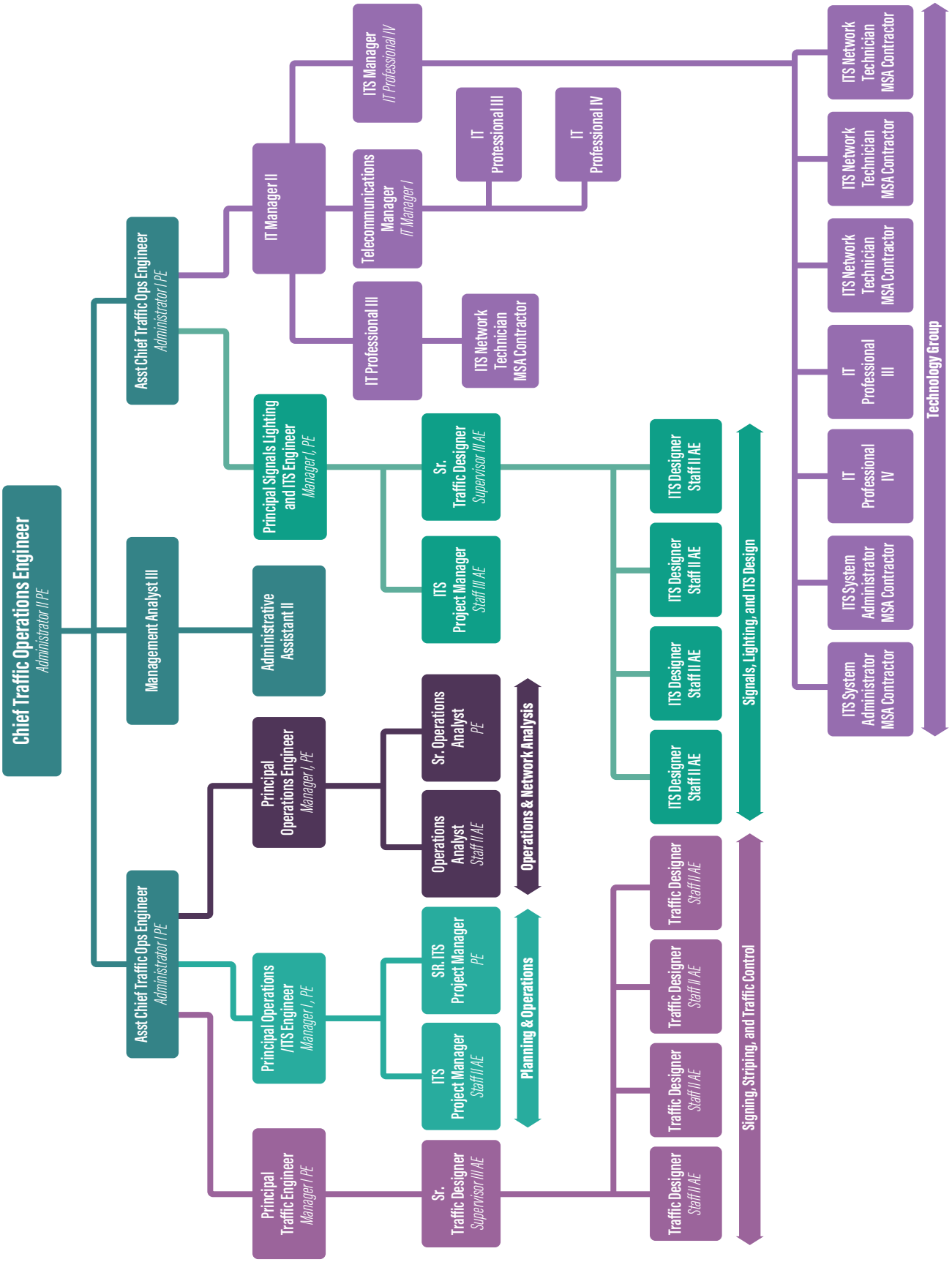


Figure 11. Phase 1 of Organizational Structure Transition

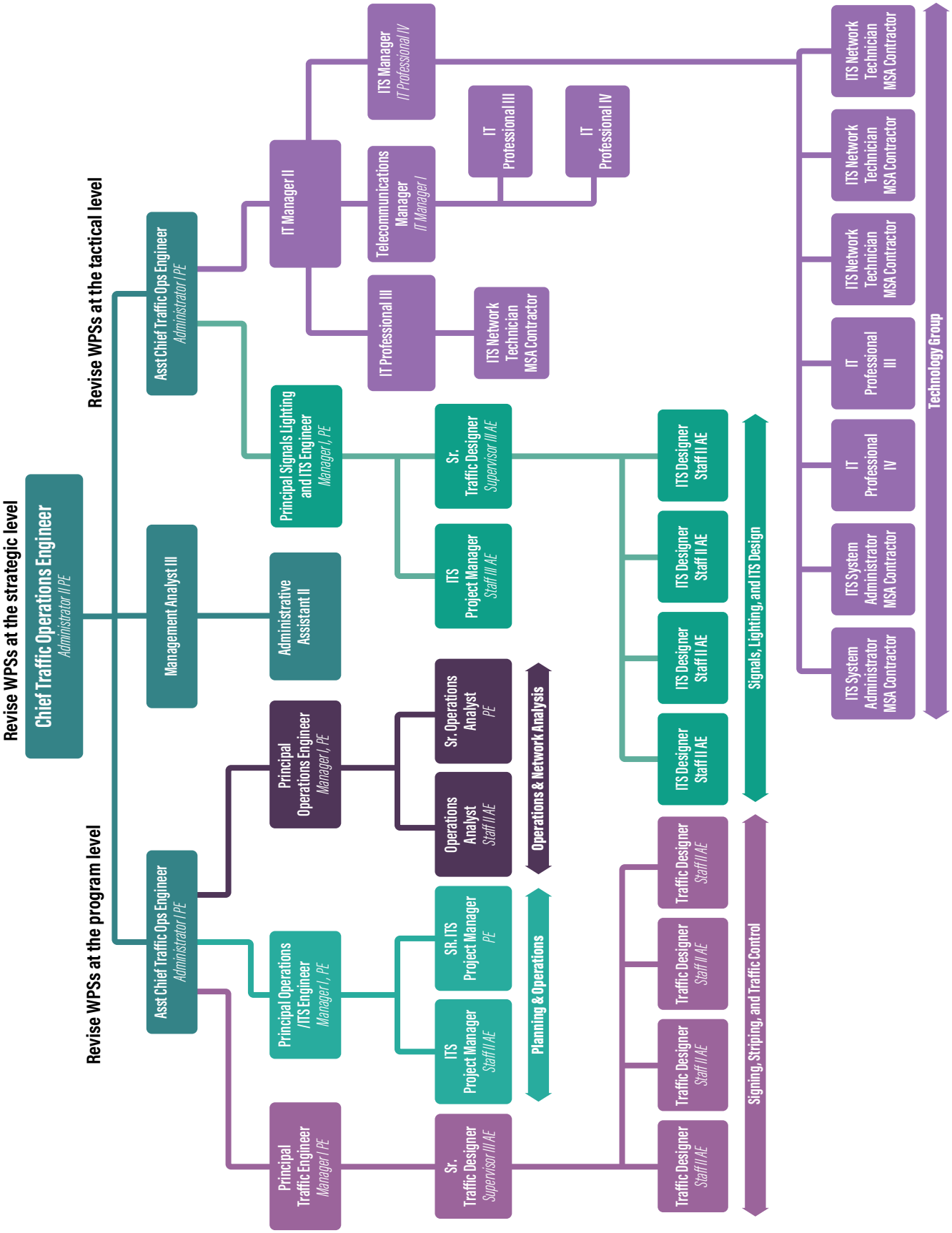
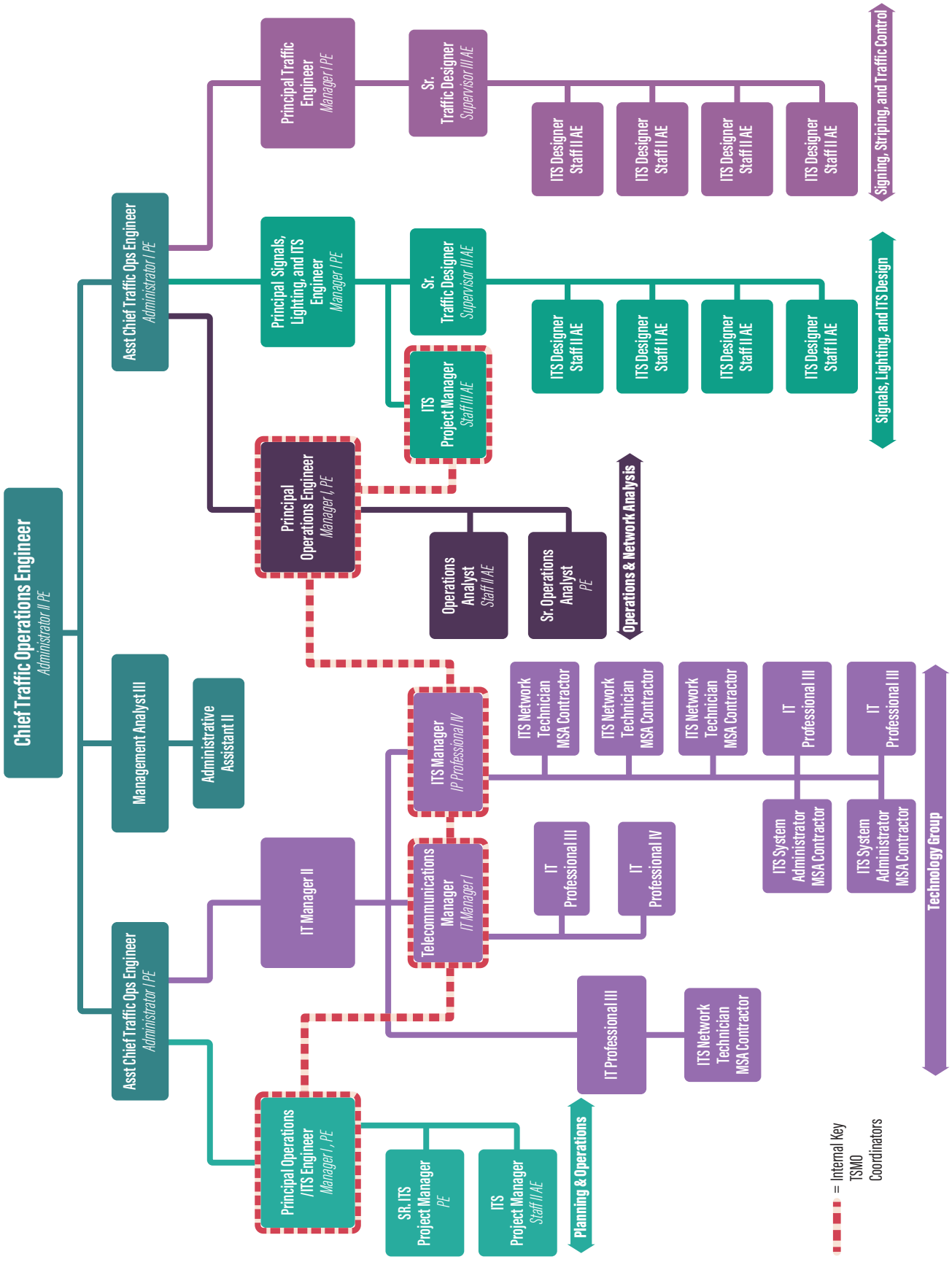


Figure 12. Phase 2 of Organizational Structure Transition



The following recommendations and considerations were developed to facilitate the necessary changes in organizational structure to support implementation of the TSMO Program:

- Modify the existing responsibilities of the Assistant Chief Traffic Operations Engineer to include management of the TSMO Program. This position will manage all TSMO activities and lead the TCT (and TSMO Steering Committee in the future)
- Establish a TSMO Steering Committee to help with the efficient integration of TSMO throughout NDOT.
- Integrate TSMO across all of NDOT.
- Formalize collaboration with external agencies and partners.
- Develop the TSMO WDP.

Although TSMO positions and responsibilities are based within the Traffic Operations Division at NDOT, districts are primarily responsible for performing and/or assisting with the implementation of TSMO projects, activities, and services to ensure efficient mobility and operations throughout the state of Nevada. Therefore, TSMO roles and positions are recommended to be identified at the district level and requested in conjunction with the legislative session within two years from the organizational restructure within the Traffic Operations Division.

Specific changes in the Phase 3 transition will be identified following the development of TSMO WDP and will include, but are not limited to:

- Development of new TSMO positions and descriptions
- Review of existing professional education and training programs
- Identify required knowledge, skills, and expertise
- Develop strategic management framework for recruiting and retaining TSMO-related staff.

It is important to acknowledge that the IT/Technology group has a significant role in performing TSMO activities, especially in the context of emerging technologies, data, asset management, and maintenance. This group is currently the fastest growing group in the Traffic Operations Division. Following the TSMO implementation (both within the Division and at the agency level), the IT/Technology staff will have increased responsibilities; therefore, the IT/Technology WPSs will undergo more comprehensive changes compared to other groups within the Division. These changes are expected to result in a significant increase in their roles and responsibilities, as well as their need for TSMO skillsets. Therefore, it is recommended to separate the IT/Technology group from the Design and Engineering group in the Phase 3 transition, in preparation for upcoming changes, as well as creating a more balanced organizational structure considering the group's growth in staff.

4.3 BUSINESS PROCESSES AND PROGRAM MANAGEMENT

Developing TSMO processes requires specific and structured tasks related to decision-making. It includes developing processes for formal planning, programming, scoping, budgeting, and project development with respect to TSMO activities throughout the state of Nevada.

This element addresses the required business processes and procedures that the Traffic Operations Division will put in place to optimize TSMO activities within NDOT. It helps to ensure TSMO efforts are institutionalized and relevant tasks and activities are formalized within the organization. During discussions with the Traffic Operations Division, the following categories were identified to be assessed and analyzed in an effort to identify required areas of enhancement (either by revising processes and procedures or developing new processes and procedures):

- Data Management
- Performance Management
- Research and Development
- Administrative Processes
- Procurement and Contract Management

Existing business processes and program management strategies were reviewed to highlight opportunities and challenges associated with the implementation of all TSMO activities. Analyses indicate that there is a lack of formalized tasks/activities to perform TSMO in a structured manner. With divisions and districts performing activities in silos, it is necessary for the Traffic Operations Division (further collaborating with the TSMO Steering Committee in the future) to develop processes and procedures to support the implementation of TSMO throughout the lifecycle of a project, while also supporting internal and external communications and collaboration. The following recommendations and considerations were identified to assist the division in developing the required processes for TSMO program management:

- Develop a performance management program.
- Develop processes to identify new positions.
- Develop an investment prioritization tool for TSMO.
- Identify administrative processes that should be revised to accommodate TSMO-specific needs.

Through completion of the recommended action items, business processes and procedures and program management will evolve to become more TSMO oriented, accommodating efficient implementation of emerging solutions to deliver new services to help achieve strategic goals and objectives.

4.4 RESOURCE MANAGEMENT

This dimension includes both financial and staffing resources. Analyses of staffing and financial resource management were performed by the NDOT Traffic Operations Division in collaboration with relevant divisions to identify specific challenges associate with each element. The following sections detail the analysis and discussions.

4.4.1 STAFFING AND WORKFORCE DEVELOPMENT

Delivering a robust and sustainable TSMO Program is dependent on staffing and workforce with appropriate TSMO knowledge and skills. NDOT recognizes the importance of expanding the department's activities beyond traditional planning, design, construction, operation, and maintenance skills to broaden the tasks and responsibilities to incorporate TSMO. Several staffing and workforce areas were reviewed and analyzed in collaboration with internal relevant divisions to identify TSMO staffing and workforce requirements within the Traffic Operations Division.

The element recommends supporting the required skillsets and staff to implement emerging technologies and solutions associated with specific skills within TSMO. One of the key considerations is close coordination with human resources to identify staff development opportunities and resource needs for implementation of the TSMO Program.

Analyses performed on existing WPSs, job elements/descriptions, and staffing and recruitment procedures identified four primary areas of concern for staffing and workforce development, including:

1. Staff, positions, and job elements to support implementation of TSMO Program
2. Required skillsets and resources
3. Career progression for TSMO staff
4. TSMO training

The NDOT Traffic Operations Division staff currently represents a variety of skills in both engineering and non-engineering disciplines. NDOT identified the development of new positions as the main challenge in staffing and workforce development. Establishing a staffing and workforce development plan will assist NDOT in the short term to fill the vacant positions and/or to request new hires with the required skillsets for TSMO, and in the long term to prepare the rationale for hiring the required staff.

In establishing the WDP for TSMO, a comprehensive analysis of the existing positions and skills was performed. This step identified what positions could support implementation of TSMO activities and mobility strategies and what positions lack this capability. Table 6 summarizes the skills identified as important when requesting new positions to ensure availability of sufficient TSMO skills and capabilities. Table 7 lists the requested positions in alignment with required TSMO capability areas listed in Table 6.

Table 6. TSMO Staffing and Workforce Plan Requirements

Required Areas of TSMO Capabilities (TBC)
Emerging Technologies and Innovative Programs Management (such as Connected and Automated Vehicles)
Performance Planning and Management
TSMO Strategies Management
TSMO Program Engineer and Management
Regional TSMO Coordination
Data/Asset Management

Table 7. Requested Positions Aligned with Required TSMO Capability Areas

Recently Requested Positions
IT Manager I
IT Professional IV
IT Professional III (3)
IT Professional II
Professional Engineer
TSMO Performance Manager
TSMO Engineer

In addition, staffing and workforce development for TSMO also may include outsourcing or using contractors in the areas of staff shortage. Specific skills and capabilities within TSMO are evolving to include emerging technologies. There may be opportunities to use staff from the private sector to supplement NDOT staff to implement TSMO activities and mobility strategies.

4.4.2 FINANCIAL RESOURCES MANAGEMENT

Financial resources, planning, and budgeting procedures play significant roles in implementing an effective and successful TSMO Program. Planning for the TSMO Program should include the evaluation of both available and required resources to efficiently identify areas of investment. At NDOT, there is not a single, dedicated funding stream for TSMO projects and activities.

The traditional approach in budgeting and funding allocation generally is project-focused. But TSMO will introduce a new focus to include budget for ongoing services, deployment, operations, and maintenance of transportation systems assets. To identify NDOT's need to develop TSMO-centric financial procedures that support all aspects of TSMO activities and mobility strategies, analyses were performed on the following areas:

- Identification of TSMO funding
- Prioritization process for TSMO funding and investments
- Identification of existing dedicated funding levels, needs, and sources
- Funding of ongoing services and programs
- Integration of TSMO into NDOT financial planning and programming
- Interaction of TSMO assets with agency's asset management planning
- Additional resources for maintenance of TSMO assets

NDOT currently performs programs (such as TAMP) to efficiently maintain the transportation system assets and ensure optimum performance; however, analysis indicated that ad hoc processes determine the financial needs and there is a lack of formal processes for resource allocation with no specific considerations given to making performance-based decisions. The following were identified to assist shifting the focus to TSMO:

- Develop and implement a TSMO investment prioritization tool.
- Integrate the TSMO investment prioritization tool into the statewide planning process.
- Integrate TSMO into TAMP.

4.5 COMMUNICATION AND COLLABORATION

Communication and collaboration between internal and external agencies and stakeholders is an essential element for success of the TSMO Program. In addition, collaboration is one of the six CMM dimensions that NDOT intends to reinforce. TSMO activities need to be appropriately coordinated to deliver effective safety and mobility improvements. NDOT continually advances its communication and collaboration with partnering agencies by introducing a variety of programs such as TIM, ATM, etc. The TSMO Program will introduce processes to ensure that collaborative efforts are formalized.

The main categories of focus in this topic include **Internal and External Communication and Marketing and Outreach with Users**. Within the state of Nevada, there are several internal and external stakeholders and jurisdictions with responsibilities in various aspects of TSMO activities. Therefore, in this region where multiple stakeholders and jurisdictions need to coordinate their activities to deliver a successful TSMO Program, communication and collaborations for both identified categories is critical and essential.

4.5.1 INTERNAL COMMUNICATION AND COLLABORATION

One of the primary areas of concern identified by NDOT is the need to improve internal communication and collaboration between divisions to coordinate TSMO activities. Most coordination activities currently occur after the project planning process and scoping of Resurfacing, Restoration, and Rehabilitation (RRR) projects and they do not specifically consider operations, which limits the opportunity for integration of TSMO activities. NDOT recognizes the need to prioritize operations (introducing TSMO as the "Hub of the Wheel") in the center of the project planning process to determine how it can integrate with other divisions and projects. Some opportunities to enable this integration include adding TSMO topics to regular division head meetings, project development meetings, manuals and guides that are currently used within the agency, developing a TSMO Tool, etc.

The following recommendations have been identified as initial steps to integrate TSMO internally within NDOT divisions:

- Provide training and information to all NDOT staff on TSMO.
- Integrate TSMO in all current planning and project development processes.

4.5.2 EXTERNAL COMMUNICATION AND COLLABORATION

NDOT recognizes the critical role of external partners and stakeholders in operating a successful multi-modal transportation system that meets users' needs. The TSMO Program will address collaboration among statewide partners to coordinate activities between multiple disciplines. External communication is a key element in the implementation of a successful TSMO Program as system safety and reliability is highly dependent on the level and type of cooperation developed between agencies, law enforcement, and emergency responders. In addition, coordination with the local stakeholders is essential to the effective implementation of mobility strategies.

Advanced communication and collaboration with external agencies also will enhance and expand existing relationships, enable building of new partnerships, and formalize relevant processes and programs between stakeholders.

Through the development of the TSMO Program, the existing formal agreements will be addressed as a starting point to identify gaps and needs in formalizing structured external engagement processes and programs. Recommendations to advance external communications and expand relationships with stakeholders include:

- Develop a database for tracking internal NDOT and external TSMO activities.
- Assist external agencies and partners with coordinating TSMO projects and funding.
- Develop processes and programs for meetings with stakeholders on a regular basis to discuss TSMO activities.
- Provide TSMO training and information to external partners

4.5.3 COMMUNICATION, MARKETING, AND OUTREACH WITH USERS

This component addresses communication with systems users. The TSMO Program facilitates the development of outreach programs and events for customers to identify their expectations and needs. This will build user support for the operational solutions of the program.

Currently, there are no formalized outreach processes and programs for user interaction. A recommendation to address this gap is to develop formalized outreach programs to showcase TSMO efforts.

4.6 TSMO PROGRAMMATIC ELEMENTS ACTIONABLE ITEMS

This section includes information on specific actionable items and identified timeframes. Actionable items have practical value and represent specific actions that must be taken to move the TSMO Program forward. They are designed in line with the TSMO Strategic Objectives to help deliver TSMO in a structured manner, enabling NDOT to track its progress. They have been designed to target CMM dimensions and are categorized in three priorities of immediate, short-term, and long-term actionable items.

- **Immediate Actionable Items** are to be completed in less than a year and are required to be implemented for immediate results to lay the appropriate foundation for building a successful TSMO Program.
- **Short-Term Actionable Items** are to be completed within a two-year timeframe and are second in implementation priority, aimed at results that will take approximately longer than a year to achieve.
- **Long-Term Actionable Items** are to be completed within five years and include tasks that are aimed at results that will help achieve overall TSMO Program Objectives. Table 8 provides a summary of these actionable items.

Table 8. Summary of TSMO Programmatic Elements Actionable Items

TSMO Programmatic Elements	Recommendations/ Considerations	Immediate Actionable Items *(To be completed in less than a year)*	Short-Term Actionable Items *(To be completed within 2 years)*	Long-Term Actionable Items *(To be completed within 5 years)*	Targeted CMM Dimension
Organizational Structure: To accommodate TSMO in a more formalized manner.	▪ Modify the existing responsibilities of the Assistant Chief Traffic Operations Engineer to include management of the TSMO Program. This position will manage and staff the TCT. ▪ Establish TSMO Steering Committee to help the efficient integration of TSMO throughout NDOT. ▪ Integrate TSMO across NDOT, including safety, planning, maintenance, multi-modal, and districts. ▪ Formalize collaboration with external agencies and partners.	▪ Redefine job elements within Traffic Operations to include TSMO responsibilities. ▪ Develop job elements and requirements for TSMO Program Manager position. ▪ Schedule regular TSMO Steering Committee meetings to facilitate the integration of TSMO. ▪ Create an inventory of all the interagency agreements with external agencies and partners. ▪ Identify additional interagency agreement needs.	▪ Work with TCT to identify TSMO integration opportunities. ▪ Approve and fill TSMO Program Manager position.	▪ Develop additional TSMO positions under TSMO Program Manager.	 *Organization & Workforce*  *Culture*  *Collaboration*

TSMO Programmatic Elements	Recommendations/ Considerations	Immediate Actionable Items *(To be completed in less than a year)*	Short-Term Actionable Items *(To be completed within 2 years)*	Long-Term Actionable Items *(To be completed within 5 years)*	Targeted CMM Dimension
Business Processes and Program Management: To develop TSMO processes and structured tasks related to performance-based and informed decision-making.	▪ Develop a performance management program.[7] ▪ Develop processes to identify new positions. ▪ Develop an Investment Prioritization Tool (IPT) for TSMO. ▪ Identify administrative processes that should be revised to accommodate TSMO-specific needs.	▪ Define the performance management criteria. ▪ Identify existing data and new data needs for traffic operations performance management. ▪ Develop the performance management dashboard.	▪ Develop processes to obtain the identified new data for traffic operations performance management. ▪ Define process to develop actions based on performance. ▪ Develop process to efficiently evaluate, select, and prioritize new technology and pilot projects. ▪ Identify procurement and contract processes to be modified to accommodate TSMO. ▪ Develop and document a performance management program. ▪ Develop processes to identify the required TSMO positions within Traffic Operations. ▪ Perform CMM assessment.	▪ Review NDOT manuals and guidance documents to include TSMO-related activities (e.g., Construction Design Manual). ▪ Benchmarking of TSMO action items. ▪ Perform CMM assessment.	*Business Process* *Performance Measurement* *Systems & Technology*

[7] *NDOT current performance measures are listed in Appendix C*

TSMO Programmatic Elements	Recommendations/ Considerations	Immediate Actionable Items *(To be completed in less than a year)*	Short-Term Actionable Items *(To be completed within 2 years)*	Long-Term Actionable Items *(To be completed within 5 years)*	Targeted CMM Dimension
Staffing and Workforce Development: To develop staffing and workforce with appropriate TSMO knowledge and skills.	▪ Revision of the existing WPSs ▪ Create the WDP for TSMO Program throughout NDOT divisions, including: – TSMO Positions – Staffing and recruitment plan – Required training opportunities.	▪ Identify current needs of the ITS maintenance staff and triggers for additional staff. ▪ Review and revise existing job elements and WPSs. ▪ Identify administrative staff for TSMO Steering Committee meetings. ▪ Implement Phase 1, transition of organizational structure.	▪ Identify the required skillsets and capabilities to implement TSMO. ▪ Develop TSMO training program for NDOT staff. ▪ Develop TSMO training program plan for both existing and new employees. ▪ Evaluate Phase 1 implementation and revise the WPSs (defined in Phase 1 implementation) in preparation for transition to Phase 2. ▪ Implement Phase 2.	▪ Identify required TSMO training opportunities for staff. ▪ Evaluate Phase 2 implementation and begin the TSMO Program WDP. ▪ Develop and Implement Phase 3 with TSMO positions as defined in the TSMO WDP.	*Organization & Workforce* *Culture*
Financial Resources Management: To ensure evaluation of both available and required resources to efficiently identify areas of investment for TSMO.	▪ Implement TSMO IPT. ▪ Integrate TSMO IPT into statewide planning process. ▪ Integrate TSMO into TAMP.	▪ Identify available funding sources for TSMO activities.	▪ Apply the TSMO IPT for project selection on annual basis. ▪ Work with planning division to develop TSMO-specific inputs into the statewide planning process. ▪ Include TSMO consideration in update to TAMP. ▪ Develop a TSMO 5-year plan. ▪ Develop funding guidance tool for TSMO funding, including basic descriptions of funding requirements and application processes.	▪ Develop regularly scheduled meetings to ensure financial plans are aligned with TSMO funding.	*Business Process* *Collaboration*

TSMO Programmatic Elements	Recommendations/ Considerations	Immediate Actionable Items *(To be completed in less than a year)*	Short-Term Actionable Items *(To be completed within 2 years)*	Long-Term Actionable Items *(To be completed within 5 years)*	Targeted CMM Dimension
Communication and Collaboration: **To appropriately coordinate TSMO activities in delivering TSMO goals and objectives.**	Internal: ▪ Provide training and information to all NDOT staff on TSMO. ▪ Integrate TSMO in all current planning and project development processes. External: ▪ Develop a database for tracking internal NDOT and external TSMO activities. ▪ Assist external agencies and partners with coordinating TSMO projects and funding. ▪ Develop processes and programs for meetings with stakeholders on a regular basis to discuss TSMO activities. Marketing and Outreach: ▪ Develop formalized outreach program to showcase TSMO efforts.	▪ Ensure engagement of TSMO staff in development of long-range plans. ▪ Develop a TSMO webpage to ensure easy access of both internal and external stakeholders to relevant TSMO information. ▪ Establish Statewide TSMO Steering Committee.	▪ Identify existing means of internal communication and collaboration and the missing links for effective coordination. ▪ Develop communication processes to identify and document TSMO issues prior to Project Development Committee (PDC) meetings. ▪ Develop training program for internal and external user education of performance measures. ▪ Develop TSMO training program for internal and external agencies. ▪ Develop quarterly TSMO newsletter and circulate it internally and externally. ▪ Identify and develop required interagency processes and protocols.	▪ Develop interagency agreements to enhance collaboration with external agencies.	*Collaboration* *Business Process* *Culture* *Performance Measurement*

4.7 TSMO IPT

Historically, project selection within NDOT has been accomplished through qualitative deliberations, negotiations, and making the business case by involved parties. Although it allows the divisions to set their own priorities, this approach—especially with respect to implementing a statewide TSMO program—could be improved by prioritizing projects based on their alignment with NDOT goals and projected performance-based outcomes.

The Traffic Operations Division recognizes the importance of developing and introducing a new system, the TSMO IPT, which will prioritize projects efficiently, allocate resources, and ensure alignment of the division's efforts with the TSMO Vision, Mission, and Goals and Objectives. At strategic and planning levels, it will result in more efficient management and operation of the transportation system. This approach will increase the alignment and focus on the strategic goals and objectives of TSMO, simplify the decision-making process, and help in building the mindset and culture of TSMO integration across the division and, ultimately, throughout the state.

The TSMO IPT is designed based on specific criteria to address TSMO strategic goals, funding, risks, and strategic values, including but not limited to the following:

- **Alignment with TSMO Strategic Goals and Objectives**—To ensure the project/activities/services will help achieve the goals and objectives of the TSMO Program. Table 9 summarizes the items for consideration under this criterion.
- **Cost**—Listed four categories between $0 to > $5 million.
- **Implementation Timeframe**—Aligned with the existing implementation timeframes of the Division within the ITS SDP.
- **Dependencies, Business Risk, and Limitations**—Qualitative measures on the level of risks and degree of impact of a specific project/technology.
- **Benefit/Cost Ratio**—Listed in three categories depending on the proven benefit/cost ratio of the proposed technology.
- **Strategic Value**—To assess whether there is a high demand or need for the implementation of the project.

Table 9. Goals and Objectives to be Considered for Project Prioritization Process

Strategic Goals	Strategic Objectives
Enhance Safety	Reduce incidents, injuries, and fatalities.
Preserve Infrastructure	Maintain transportation assets to preserve investments.
Optimize Mobility	Maximize system efficiency by reducing congestion and/or promoting multi-modal transportation.
Foster Sustainability	Develop a sustainable transportation system through sustainable and balanced design, operations, and maintenance.
Enhance Reliability	Improve economic competitiveness and enhance quality of life through reliable travel times.
Optimize Customer Service	Provide timely and accurate travel information to internal and external customers to enable informed decision-making.
Enhance Collaboration	Maximize coordination and cooperation between NDOT divisions and partnering agencies to proactively manage and operate an integrated transportation system.

As part of the TSMO IPT, it is important to understand that establishing a portfolio for a project/initiative is not a one-time effort. It is an ongoing process of reviewing and updating the portfolio. It is recommended that the decision-making committee:

- Add a TSMO IPT Review item to the agenda of regular TSMO meetings
- Schedule annual sessions for a comprehensive portfolio review on regular basis
- Update the criteria and weighting values every other year (to ensure they are up to date with changes in core NDOT values, department-wide and/or statewide legislation, new priorities, etc.)

4.8 HOW DOES TSMO RELATE TO EXISTING PLANS AND DOCUMENTS

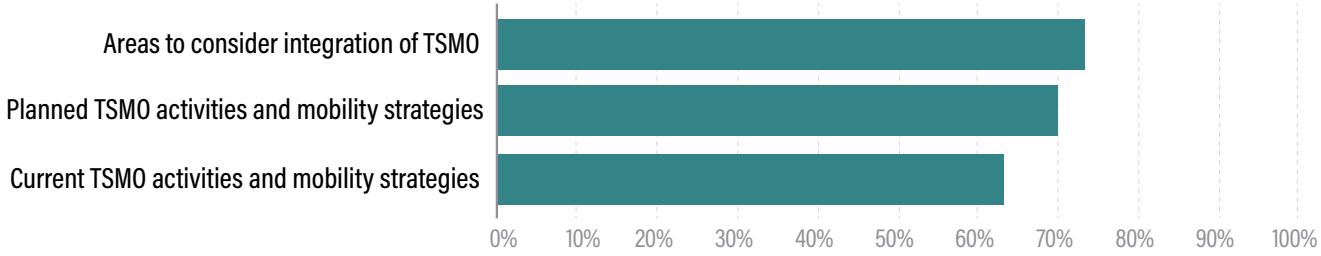
Currently, there are several statewide transportation plans and documents established both within NDOT or through coordination with NDOT by the local MPOs. For the TSMO Program to be implemented successfully, monitored, and maintained, it should be fully integrated with the existing statewide plans and documents.

Existing plans and documents were reviewed and evaluated to identify the following:

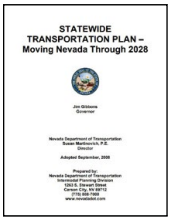
- Opportunities for integration with TSMO
- Currently planned and/or implemented TSMO activities and mobility strategies;
- How TSMO activities and mobility strategies are addressed in project planning; processes, and resource allocation levels and
- Available funds and financial resources

Figure 13 summarizes the occurrence frequency of three core areas in alignment with the TSMO Program. Although TSMO areas were identified, none of the plans and documents reviewed specifically identified TSMO. Activities that fall within TSMO were identified (including goals, objectives, funding, etc.) for integration with the TSMO program.

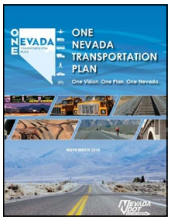
Figure 13. Occurrence Frequency of TSMO Areas in Existing Statewide Plans and Documents



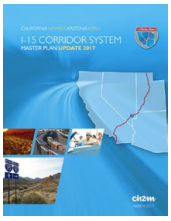
The following list describes current long-range plans and documents that were reviewed, along with a brief explanation of the plans and documents' components.



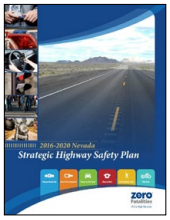
1. **Statewide Transportation Plan:** A policy document intended to provide strategic direction for NDOT over the next 20 years. The plan outlines the statewide vision, mission, guiding principles, goals, and core values of transportation. It is prepared by NDOT with the assistance of statewide transportation stakeholders, agencies, and partners. The STP is a multi-modal plan, developed in accordance with the federal transportation bill. The current plan was developed in 2008 and includes transportation strategies through 2028 (NDOT, 2008).



2. **One Nevada Transportation Plan:** The plan is an update to Nevada's Long-Range Transportation Plan (and required by the federal government) to prepare plans that ensure the movement of people and goods over a 20-year planning horizon, including the following key components: (1) Identify specific transportation goals and objectives, (2) Identify, track, and report performance measures to the public and decision makers, (3) Make informed and transparent project decisions, (4) Improve project prioritization and project certainty, and (5) Improve collaboration to ensure the plan is on track, moving forward, and achieving measurable transportation objectives while adapting to changing conditions and technologies (One Nevada Plan, 2017)

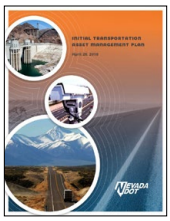


3. **I-15 Corridor System Master Plan:** The plan defines a multi-decade multi-modal transportation system vision, governance, and implementation strategy and provides prioritized projects that serve the needs of all modes of transportation between involved agencies among the states of Nevada, California, Utah, and Arizona—known as the I-15 Mobility Alliance (I-15 Corridor System Master Plan, 2017).

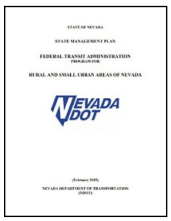


4. **Nevada Strategic Highway Safety Plan:** : A statewide safety plan identifying the main causes of serious injuries and fatalities on Nevada roadways and a coordinated framework for reducing crashes causing those incidents. The plan establishes goals and critical emphasis areas with a focus on the four Es of traffic safety (Engineering, Education, Enforcement, and Emergency) (Strategic Highway Safety Plan, 2016-2020).

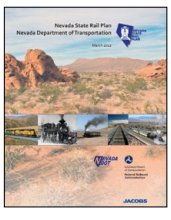
5. **Nevada State Freight Plan:** A plan that has developed a strategic framework to enhance freight mobility in collaboration with the state Freight Advisory Committee (FAC); focuses on economic development strategies (Nevada State Freight Plan, 2017).



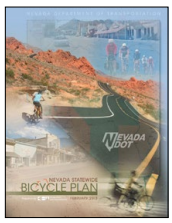
6. **Transportation Asset Management Plan (TAMP):** A plan developed by NDOT to help identify strategies to manage investments in transportation assets, summarizing the condition of certain assets and agency's management plans for the next 10 years (Transportation Asset Management Plan, 2018).



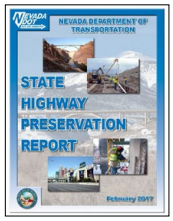
7. **Nevada State Management Plan:** The State Management Plan documents the procedures of the State of Nevada in managing and using federal funds to assist public, Tribal, private for-profit, and private nonprofit passenger transportation systems in Nevada. This document includes the state's objectives, policies, procedures, and administrative requirements in a form that is readily accessible to NDOT staff, the Federal Transit Administration (FTA), potential subrecipients, and the public. The plan outlines specific performance metrics that are the basis for grant funding applications scoring (Nevada State Management Plan—Federal Transit Administration Program for Rural and Small Urban Areas of Nevada, 2015).



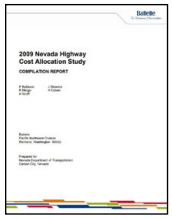
8. **Nevada State Rail Plan:** The document is developed to provide the state of Nevada with a plan for implementing passenger and freight rail service improvements; it is a guide for the state's initiatives and fulfills requirements of the 2008 Federal Passenger Rail Investment and Improvement Act (PRIIA) (Nevada State Rail Plan, 2012).



9. **Nevada Statewide Bicycle Plan:** The plan includes design policies and guidance for accommodating bicyclists on state highways; it addresses the implementation of U.S. Bicycle Routes and encourages jurisdictions to address connectivity across boundary limits within the state of Nevada (Nevada Statewide Bicycle Plan, 2013).

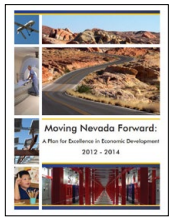


10. **Nevada State Highway Preservation Report:** A report prepared biennially by NDOT summarizing the work performed and anticipated workload required for the preservation of the state-maintained roadway network and bridge infrastructure assets. The report determines whether future revenues are adequate to preserve and maintain the state's infrastructure assets at a feasible and acceptable level (State Highway Preservation Report, 2017).



11. **Nevada Highway Cost Allocation Study (HCAS)—2009:** The study examines the equity of the state's user tax structure and determines the fair share of costs that each road user class should pay for the construction, operation, maintenance, and related costs of highways, roads, and bridges in a state (2009 Nevada Highway Cost Allocation Study, 2009).

12. **Linking Tahoe: Draft Regional Transportation Plan and Sustainable Communities Strategy, 2017-2040:** Developed by Tahoe Regional Planning Agency, the plan sets out a key vision to develop a safe first-class transportation system prioritizing bicycling, walking, and transit serving residents and visitors while ensuring environmental sustainability and socioeconomic development. The goal is to maximize transportation connectivity around three major categories of transit, trails, and technology focusing on three main groups of users, including recreational travel, regional entry and exit travel, and residential and workforce travel. The plan identifies four key concepts (goals) and three performance metrics (Tahoe Regional Planning Agency, 2017).

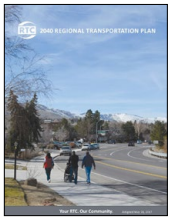


13. **Moving Nevada Forward: A Plan for Excellence in Economic Development 2012-2014:** A study to identify the state's economic policy, potentials, strategic initiatives, and strengths for economic diversity and development. The goal (of economic development) is a core focus of the Office of the Governor, with emphasis on regional economic development and innovation to align resources and engage economic development through regional collaboration. The study has established a specific vision, mission, and goals and objectives, as well as performance metrics and opportunity recommendations (GOED, 2012).

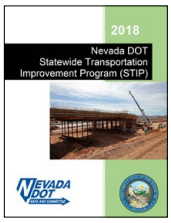
14. **Transportation Investment Business Plan (TIBP)—Regional Transportation Commission of Southern Nevada (RTCSNV):** The plan develops a framework for economic and transportation infrastructure development through strategic mobility planning in the Las Vegas metropolitan area. It looks at transportation infrastructure as a tool to enhance multi-modal access for users (both residents and visitors). An integrated planning approach was used for three interrelated systems—economic, urban, and transportation—to understand the interactions that drive the economy and to help identify the types of infrastructure improvements that create the greatest return on investment. The recommendations of the TIBP identify the capital improvements, construction, policy and program innovations, and modern technology solutions needed to provide an advanced system of mobility for visitors and residents alike—while also preserving the unique character and spirit of Las Vegas (One Nevada Plan, 2017) (RTCSNV, Transportation Investment Business Plan, 2015).

15. **Regional Transportation Plan for Southern Nevada, 2017-2040, RTCSNV:** Also known as Access2040, the plan was created to ensure compliance with federal standards and to enhance mobility in Southern Nevada. The plan includes a vision statement, primary and secondary goals, performance metrics, policy and design recommendations, and key defining regional characteristics (Access2040, 2017).

16. **2040 Regional Transportation Plan—Carson Area Metropolitan Planning Organization (CAMPO):** A long-term planning document analyzing the transportation network, identifying current and future needs, and maintaining safe, efficient, and sustainable transportation in the Carson Metropolitan Area representing Carson City, northern Douglas County, and western Lyon County. The plan supports development with specific goals and objectives outlined within the document and with respect to FAST Act requirements (2040 Regional Transportation Plan, 2016).

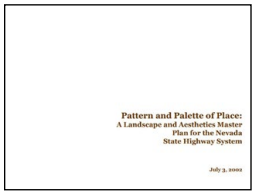


17. **2040 Regional Transportation Plan (RTP)—RTC of Washoe County:** A plan identifying long-term transportation investments in collaboration with the community, federal, state, and local partnering agencies. The plan also outlines guiding principles, vision, goals, and transportation investments (2040 Regional Transportation Plan, 2017).

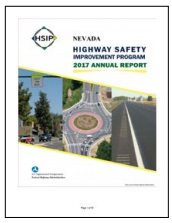


18. **Nevada DOT Statewide Transportation Improvement Program (STIP):** A statewide program for transportation capital improvement including federally and regionally funded projects. It is approved by the FHWA Federal Transit Administration (FTA) and is required to be updated every four years at minimum. NDOT is developing/updating this program on an annual basis (Nevada DOT Statewide Transportation Improvement Program, 2018).

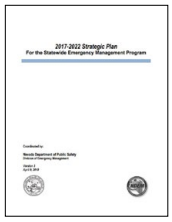
19. **2035 Nevada, Unified Transportation Investment Plan (UTIP) Review:** A 20-year investment plan developed in coordination with Nevada's major transportation agencies, including NDOT, RTCSNV, RTC Washoe County, TMPO, and Tahoe Transportation District, and CAMPO. It looks at availability of funding and resources for planned projects across the state to identify needs (of additional funding) and required strategy approach. The goals and objectives within this plan are aligned with the STP with no specific performance measures identified (One Nevada Plan, 2017).



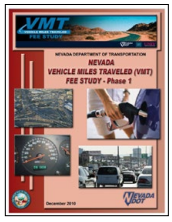
20. **Pattern and Palette of Place, A Landscape and Aesthetics Master Plan for Nevada State Highway System:** The plan identifies the process for landscaping and aesthetics of the state throughout the life of NDOT projects. Landscaping and aesthetics are incorporated during the major steps of highway design, including corridor planning, project design, construction, operations, and maintenance. This master plan represents the statewide policy and guidelines of aesthetic and landscape elements. This plan identifies a vision statement with specific goals and objectives. It does not identify any performance metrics; however, it outlines statewide policies for planning and implementation of aesthetic elements (One Nevada Plan, 2017).



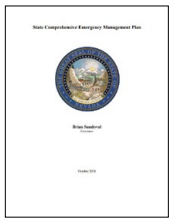
21. **Nevada Highway Safety Improvement Program (HSIP):** The plan summarizes the activities of HSIP within NDOT in line with the FAST Act. HSIP is a federal-aid program with the purpose of reducing fatalities and incidents causing serious injuries on roadways. The activities outlined within HSIP are designed primarily to improve safety and develop safety projects for the three main areas of (1) systematic roadway improvements, (2) pedestrian-related crash mitigation, and (3) tribal low-cost safety improvements. The 2016 annual report of HSIP outlines goals and objectives, performance metrics, and strategies related to safety improvement and projects (Nevada Highway Safety Improvement Program, 2016).



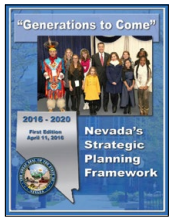
22. **Nevada Division of Emergency Management (NDEM) Strategic Plan:** This plan provides an overview of NDEM's roles and responsibilities as outlined in statute, regulation, policy, and through budgetary measures. It assesses how the division's activities are executed and can be used to develop an action plan for the way ahead. It outlines vision, mission, and strategic goals for the division; however, it does not include any performance metrics (NDEM Overview and Strategic Plan, 2016).



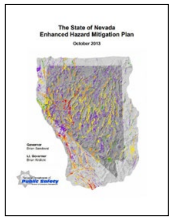
23. **Nevada Vehicle Miles Traveled Fee Study:** A study to evaluate and assess the feasibility and workability of an alternative, sustainable, easy-to-use, equitable, cost-effective, and future-oriented viable transportation funding mechanism that will potentially replace the current fuel tax funding mechanism and that will adequately meet the future transportation needs of Nevada. The study also identifies goals and objectives, performance measures, and strategies (One Nevada Plan, 2017).



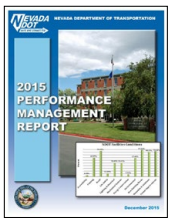
24. **State Comprehensive Emergency Management Plan (SCEMP):** A plan that specifies the procedure for handling an emergency, reducing possible consequences, reducing possible damages to infrastructure, and ensuring all levels of government are able to mobilize as a unified emergency organization. It is a master emergency operations document that describes the process through which the State Emergency Response Team (SERT) will mobilize resources during an emergency. The plan also developed 17 Emergency Support Functions (ESF) structured to enable efficient and coordinated response. Each primary state agency is selected to lead an ESF depending on the agency's resources and capabilities (State Comprehensive Emergency Management Plan, 2014).



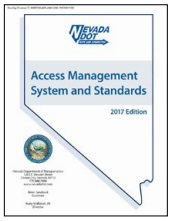
25. **"Generations to Come," Nevada Strategic Planning Framework, 2016-2020:** The plan sets out vision, mission, strategic goals and objectives, and core values that will guide state government on the path to achieving the four over-arching strategic priorities as the foundation of the state's government (Generations to Come: Nevada's Strategic Planning Framework, 2016).



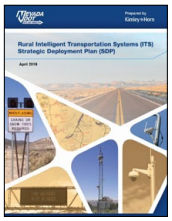
26. **State Enhanced Hazard Mitigation Plan:** Developed by the Nevada Hazard Mitigation Planning Committee (NHMPC) of the Nevada Department of Public Safety and composed of federal, state, tribal, and local entities and private sector organizations. The plan is the official statement of Nevada's statewide hazard mitigation goals, strategies, and priorities. It identifies hazards and risks, and provides the state's blueprint for reducing losses, mitigating impacts, and managing hazards. The goal is to reduce loss of life and property by fostering disaster-resilient communities (Nevada Hazard and Mitigation Plan, 2013).



27. **2015 Performance Management Report:** The report is developed to describe and assess NDOT's performance-based decision process. NDOT has established 15 performance measures to track, monitor, and report the performance of major divisions and programs with a focus on the critical aspects of an integrated and collaborative performance-driven approach. The plan has identified goals and objectives and a comprehensive list of performance measures (found in federal requirements); it includes recommendations for performance improvement based on performance measurement (Performance Measure Report , 2015).



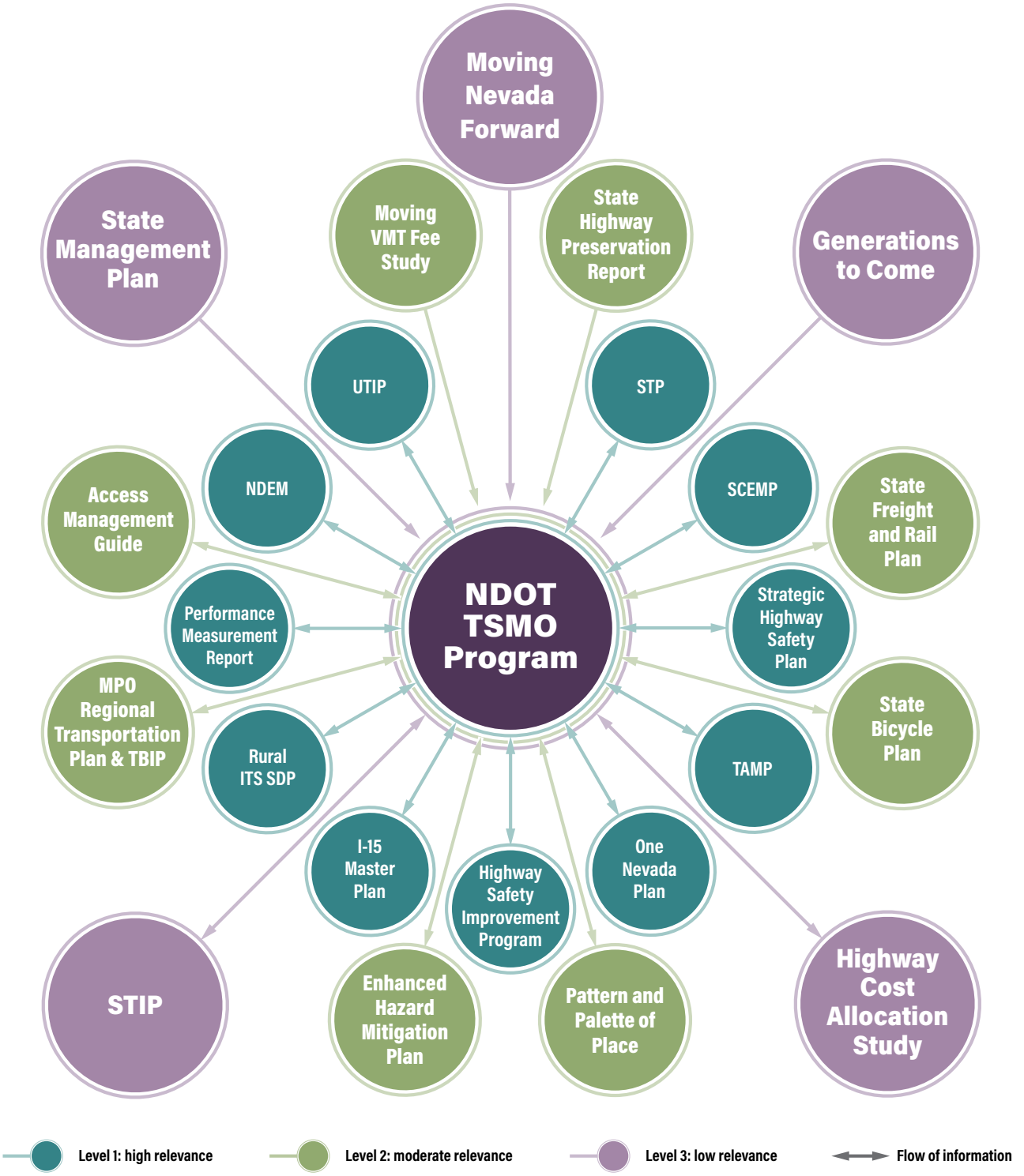
28. **Access Management System and Standards:** Developed by NDOT, the Access Management System and Standards provides standards to regulate access onto state roadways to protect the public's health, safety, and welfare; improve traffic operations for the movement of people and goods; and preserve the planned functions of state roadways. The guide describes administrative procedures for implementing the guide, the roadway classifications and types of access connections, and their respective design standards and specifications (NDOT, Access Management System and Standards, 2017).



29. **NDOT Rural ITS Strategic Deployment Plan:** Developed by NDOT, the 10-year plan describes the process to identify ITS programs for the next 10 years for NDOT to manage its statewide transportation network more efficiently. It identifies technologies currently used and recommendations for filling gaps with existing ITS infrastructure, detour routes, and applications to use for implementation of this plan (NDOT, Rural Intelligent Transportation Systems (ITS) Strategic Deployment Plan (SDP), 2018).

Figure 14 is a visual representation of how TSMO is related to these plans and program. This two-dimensional figure represents the relationship and the flow of content and information between the TSMO Program Plan and other long-range programs and plans.

Figure 14. TSMO Program Relationship with Long-Range Plans



4.9 TSMO EVALUATION TOOL

The TSMO Evaluation Tool will be used to evaluate all projects within NDOT to identify opportunities for integrating TSMO solutions and addressing operational challenges. It uses the TSMO Strategic Goals as the basis of this evaluation. The evaluation will be conducted early in NDOT's project development/initiation process to identify and incorporate potential improvements aligned with the TSMO strategic goals in the project.

At this stage, TSMO evaluation will be initiated and completed by a Traffic Operations Division representative. The representative will evaluate each project against a set of specific questions that are developed associated with each strategic goal and provide comments and/or recommendations depending on the project's potentials.

This tool will enable NDOT to maximize the integration of TSMO in the scoping phase of every project, ensuring TSMO and its recommended strategies are formally considered and evaluated. Once the deployment of the TSMO Evaluation Tool has been successfully completed within the Traffic Operations Division, the goal will be to roll the tool out to all other NDOT Divisions to ensure the successful integration of TSMO and TSMO strategies across NDOT.

This tool has been developed in a separate document.

4.10 NDOT TSMO CHAMPION TEAM

The TSMO Champion Team (TCT), established in early 2018, was introduced within NDOT as a critical step toward formalizing TSMO activities within its culture and organizational structure. This section includes an overview of tasks and responsibilities of TCT members.

The Traffic Operations Division, in collaboration with other internal and external divisions/stakeholders, will expand the TCT and its responsibilities in the future as TSMO develops within NDOT. The TCT will transition to the TSMO Steering Committee in the future.

The TCT consists of members from divisions and districts within NDOT to maximize coordination and collaboration regarding TSMO understanding and activities within NDOT. The TCT will continue to hold meetings on a regular basis and will be accommodated with dedicated administrative support to ensure meetings and activities are on track and continue to occur on a regular and as-needed basis.

Divisions and external stakeholder(s) that currently have representatives on the TCT include:

- FHWA
- Traffic Operations
- Roadway, Structures
- Planning
- Bike and Pedestrian
- Right of Way
- Construction
- Stormwater
- Safety
- Asset Management
- Maintenance
- Districts

External stakeholders and agencies will be involved in future stages of TSMO Program Plan roll out.

5.0 NDOT TSMO TACTICAL ELEMENTS

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This section provides examples of relevant TSMO activities and mobility strategies to achieve TSMO goals and objectives. The recommended structure outlines specific details such as specific projects and activities, locations, timeframes, cost, responsible parties, targeted strategic goals, and targeted CMM dimensions.

Table 10 and Table 11 summarize the identified tactical elements and strategies for NDOT for the next five years.

Table 10. Examples of TSMO Tactical Elements

TSMO Tactical Elements	Description	Current Activities	Future Actions
Real-time Traveler Information	A program with focus on information for all sorts of travel on our surface transportation networks—how the information is collected, how it's processed, how it's provided to consumers, and how it may be used by transportation system operators to improve travel for everyone. *Source: https://ops.fhwa.dot.gov/travelinfo/about/aboutus.htm*	▪ NDOT utilizes multiple data sources to collect speed, classification, delay, incident response times and incident clearance times to optimize the flow of traffic on the roadways. ▪ NDOT has partnered with RTCSNV to monitor this real-time data to aid in real-time operations.	▪ Integrate data from static sources into a user-friendly dashboard to more proactively manage the network. ▪ Investigate utilizing big data to supplement static sources to further determine areas of need and possible solutions.
Connected and Automated Vehicles	Programs that consider opportunities to deploy Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) connectivity to improve safety, mobility, environmental performance, and organizational efficiency on major travel corridors. *Source: https://ops.fhwa.dot.gov/publications/fhwahop17001/ch1.htm*	▪ NDOT has established a new innovation office, NV2X, with a focus on assisting with the development of an overarching strategy for the implementation and integration of emerging transportation technologies. ▪ NDOT is actively supporting connected and automated vehicle initiatives in southern Nevada.	▪ Implementation of initiatives championed by the NV2X office. ▪ Development of connected and automated vehicle implementation policies and guidelines. ▪ Coordination between the NV2X office and the newly requested TSMO staff.
Active Traffic Management (ATM)	Provide the ability to dynamically manage recurring and non-recurring congestion based on prevailing and predicted traffic conditions and maximize the effectiveness and efficiency of the facility. *Source: https://ops.fhwa.dot.gov/atdm/approaches/atm.htm*	▪ NDOT, through the ITS SDP, has planned on implementing ITS devices (such as DMS) to help implementation of ATM. ▪ Recently, NDOT constructed multiple Active Traffic Management Systems (ATMS) signs along I-15 to support ATM.	▪ Implementation and refinement of ATMS along I-15. ▪ Installation of ATMS along other NDOT major roadways.

TSMO Tactical Elements	Description	Current Activities	Future Actions
Traffic Incident Management	A planned and coordinated program that develops a process to detect, respond to, and remove traffic incidents and restore capacity as safely and as quickly as possible. *Source: https://ops.fhwa.dot.gov/eto_tim_pse/about/tim.htm*	▪ NDOT's TIM Coalition has been established to formalize coordination and collaboration of first responders in response to incidents. ▪ NDOT has partnered with Waycare and successfully reduced incident response times.	▪ Further deployment of Waycare at a statewide level. ▪ Additional coordination with partnering agencies such as Nevada Highway Patrol (NHP)
Transportation Asset Management	Act as a focal point for information about the assets, their management strategies, long-term expenditure forecasts, and business management processes. *Source: https://www.fhwa.dot.gov/asset/plans.cfm*	▪ NDOT's Traffic Operations Division is currently developing a comprehensive database of ITS assets to integrate into the overall asset management program. ▪ NDOT is developing a TSMO Asset Management Business Plan to enhance the maintenance of the agency's TSMO assets.	▪ Completion of the comprehensive ITS database through integration of TSMO assets. ▪ Integration of the TAMP dashboard to better respond to maintenance needs.
Transportation Performance Management	A strategic approach that uses system information/data to make investment and policy decisions to achieve national performance goals. *Source: https://www.fhwa.dot.gov/tpm/about/tpm.cfm*	▪ NDOT is developing a TSMO Performance Measures Business Plan that will define performance targets for TSMO assets. ▪ NDOT has incorporated the IPT into the ITS strategic deployment process.	▪ The NDOT Performance Management Program will define performance measures to monitor the efficiency of TSMO activities. ▪ Collaboration with the new TSMO Program Manager position in monitoring the agency's TSMO activities.
ITS Database and Communications	Includes, but is not limited to, mobile and fixed sensors, cameras, DMS, Highway Advisory Radio (HAR) Systems, Road Weather Information Systems (RWIS), ITS communication infrastructure, etc.	▪ NDOT's ITS SDP identifies short, mid, and long-term projects for deployment of necessary ITS devices such as RWIS, closed-circuit television (CCTV), DMS, etc. ▪ The ITS SDP also identified the required ITS communication infrastructure.	▪ Ensure timely deployment of the prioritized ITS SDP projects. ▪ Annual review of the ITS SDP projects and the IPT to determine prioritized projects based on needs and TSMO objectives.

Table 11. NDOT Tactical Projects

No.	PCEMS No.	Project, Services, or Activities	Location (specific or District or statewide)	COST					Responsible Parties/ Stakeholders	TARGETED STRATEGIC GOAL							Targeted CMM Dimension	TSMO Score	Comments
				2020	2021	2022	2023	2024		Enhance Safety	Optimize Mobility	Enhance Reliability	Preserve Infrastructure	Foster Sustainability	Optimize Customer Service	Enhance Collaboration			
DISTRICT 1 PROJECTS																			
D1-33	2-03276	RWIS and CCTV PTZ	US 95 (south of Searchlight)	$120,000.00					NDOT and District 1	X		X	X		X	X	Collaboration, Systems & Technology	13	Project chosen given high TSMO score and its alignment with existing package K.
D1-35	2-03276	RWIS and Chain Control	US 95 (near Searchlight)	$290,000.00					NDOT and District 1	X		X	X	X	X	X	Collaboration, Systems & Technology	14	Project chosen given high TSMO score and its alignment with existing package K.
D1-37	2-03276	RWIS and CCTV PTZ	North of US 95/ SR 164 intersection	$120,000.00					NDOT and District 1	X		X	X		X	X	Collaboration, Systems & Technology	13	Project chosen given high TSMO score and its alignment with existing package K.
D1-19-2	8-00249	RWIS	North of US 95/ SR 164 intersection	$220,000.00					NDOT and District 1	X		X	X		X	X		13	Project chosen due to high TSMO score. Will be grouped with lower-priority projects in the area given available funding.
D1-41	8-00249	RWIS and CCTV PTZ	US 93/ SR 375/ SR 318 intersection	$700,000.00					NDOT and District 1	X		X	X		X	X	Collaboration, Systems & Technology	11	Project chosen due to high TSMO score. Will be grouped with lower-priority projects in the area given available funding.
D1-43	8-00249	Curve Warning System	US 93 (south of US 93/ SR 375 intersection)	$120,000.00					NDOT and District 1	X		X	X		X			9	Grouped with higher-priority projects in the area given available funding.
D1-44	8-00249	DMS Type 2 , CCTV PTZ and Chain Control	US 93/ SR 375/ SR 318 intersection	$700,000.00					NDOT and District 1	X		X	X	X	X	X		10	Grouped with higher-priority projects in the area given available funding.
D1-47	8-00249	CCTV and RWIS	US 93/ SR 318 intersection	$460,000.00					NDOT and District 1	X		X	X		X	X	Collaboration, Systems & Technology	13	Project chosen due to high TSMO score. Will be grouped with lower-priority projects in the area given available funding.
D1-49	8-00249	Chain Control	US 93 (west of Caliente)	$220,000.00					NDOT and District 1	X				X	X		Collaboration	9	Grouped with higher-priority projects in the area given available funding.
D1-50	8-00249	CCTV PTZ, DMS Type 2 and Chain Control	US 93 (near Caliente)	$1,200,000.00					NDOT and District 1	X		X		X	X	X		9	Grouped with higher-priority projects in the area given available funding.
D1-19-3	To Be Assigned (TBA)	RWIS and CCTV PTZ	SR 157 (west of SR 158)		$220,000.00				NDOT and District 1	X		X	X		X	X	Collaboration, Systems & Technology	13	
D1-19-4	TBA	RWIS and CCTV PTZ	SR 156 (west of SR 158)		$220,000.00				NDOT and District 1	X		X	X		X	X	Collaboration, Systems & Technology	13	
D1-19-5	TBA	RWIS and CCTV PTZ	US 95/ SR 157 intersection		$220,000.00				NDOT and District 1	X		X	X		X	X	Collaboration, Systems & Technology	13	

No.	PCEMS No.	Project, Services, or Activities	Location (specific or District or statewide)	COST					Responsible Parties/ Stakeholders	TARGETED STRATEGIC GOAL							Targeted CMM Dimension	TSMO Score	Comments
				2020	2021	2022	2023	2024		Enhance Safety	Optimize Mobility	Enhance Reliability	Preserve Infrastructure	Foster Sustainability	Optimize Customer Service	Enhance Collaboration			
D1-80	TBA	CCTV PTZ and RWIS site just west of intersection	US 157/ US 158 intersection, Mt. Charleston		$220,000.00				NDOT and District 1	X		X			X	X	Collaboration, Systems & Technology	11	
D1-59	TBA	Chain Control and CCTV PTZ	US 93 (north of Pioche)			$220,000.00			NDOT and District 1	X		X	X	X	X	X	Collaboration, Systems & Technology	12	
D1-27	TBA	CCTV PTZ and Signage	US 93/ I-15 intersection			$220,000.00			NDOT and District 1	X		X		X	X	X	Collaboration, Systems & Technology	11	
D1-26	TBA	DMS Type 1	I-15/ US 93 intersection			$630,000.00			NDOT and District 1	X		X			X	X	Collaboration, Systems & Technology, Performance Measures	9	
D1-61	TBA	Chain Control	US 93/ SR 322 intersection			$100,000.00			NDOT and District 1	X				X	X		Collaboration	9	
D1-53	TBA	Chain Control	US 93 (Caliente)			$220,000.00			NDOT and District 1	X				X	X		Collaboration	9	
D1-20	TBA	DMS Type 2, RWIS and CCTV PTZ	SR 160 (Mountain Springs)				$470,000.00		NDOT and District 1	X		X	X		X	X	Collaboration, Systems & Technology, Performance Measures	12	
D1-39	TBA	CCTV PTZ	US 95 (south)/ SR 164 intersection (Searchlight)				$100,000.00		NDOT and District 1	X		X			X	X	Collaboration, Systems & Technology	10	
D1-19-1	TBA	DMS Type 1	US 95 (southbound) before SR 160				$630,000.00		NDOT and District 1	X		X			X	X	Collaboration, Systems & Technology, Performance Measures	10	At the decision point to avoid issues. Combine with D1-15
D1-40	TBA	CCTV PTZ	US 95/ SR 165 Intersection				$100,000.00		NDOT and District 1	X		X			X	X	Collaboration, Systems & Technology	10	
D1-18	TBA	CCTV PTZ	SR 160/ SR 159 intersection				$100,000.00		NDOT and District 1	X		X			X	X	Collaboration, Systems & Technology	10	
D1-13	TBA	DMS Type 2 and Signage	US 95 (north)/ SR 374 intersection				$590,000.00		NDOT and District 1	X		X			X	X	Collaboration, Systems & Technology, Performance Measures	9	
D1-9	TBA	DMS Type 2	US 95 (south of Goldfield)				$500,000.00		NDOT and District 1	X		X			X	X	Collaboration, Systems & Technology, Performance Measures	9	
D1-3	TBA	CCTV PTZ, DMS Type 2	US 6/ US 95 intersection (Tonopah)				$600,000.00		NDOT and District 1	X		X			X	X	Collaboration, Systems & Technology, Performance Measures	9	
D1-62	TBA	Chain Control	US 93/ SR 319 (east) intersection					$100,000.00	NDOT and District 1	X				X	X		Collaboration	9	
D1-63	TBA	Chain Control	SR 319 near Utah/ Nevada State line					$100,000.00	NDOT and District 1	X				X	X		Collaboration	9	
NA	TBA	Freeway service patrol program	Las Vegas	$2,433,470.00	$2,433,470.00	$2,433,470.00	$2,627,500.00	$2,627,500.00	NDOT, DI, NHP								Collaboration, Performance Measures		

No.	PCEMS No.	Project, Services, or Activities	Location (specific or District or statewide)	COST					Responsible Parties/ Stakeholders	TARGETED STRATEGIC GOAL							Targeted CMM Dimension	TSMO Score	Comments
				2020	2021	2022	2023	2024		Enhance Safety	Optimize Mobility	Enhance Reliability	Preserve Infrastructure	Foster Sustainability	Optimize Customer Service	Enhance Collaboration			
DISTRICT 2 PROJECTS																			
D2-15	TBA	RWIS and CCTV PTZ	US 95 (north of Walker Lake)		$220,000.00				NDOT and District 2	X		X	X		X	X	Collaboration, Systems & Technology	13	
D2-19-11	TBA	DMS Type 2	US 95 (north)/ SR 361 intersection		$250,000.00				NDOT and District 2	X		X			X	X	Collaboration, Systems & Technology, Performance Measures	10	
D2-21	TBA	RWIS and CCTV PTZ	SR 447 (south of Empire, Kumiva Peak)			$220,000.00			NDOT and District 2	X		X	X		X	X	Collaboration, Systems & Technology	12	
D2-1	TBA	DMS Type 1	I-80 (eastbound near Vista)			$320,000.00			NDOT and District 2	X		X			X	X	Collaboration, Systems & Technology, Performance Measures	10	Looking to it as a District contract. Is this still a good investment considering the technological advancement? Statewide training on use of emerging technologies. Betterments in FY20 will have DMS installed.
D2-19-1	TBA	Ramp meters	Westbound Ramp for East McCarran and Pyramid Interchange			$75,000.00			NDOT and District 2	X		X		X	X		Collaboration, Systems & Technology, Performance Measures	9	Risk is physical characteristics for the queue.
D2-2	TBA	DMS Type 1	I-80 eastbound/ westbound near I-80/ SR 439 intersection (USA Parkway interchange)			$630,000.00			NDOT and District 2	X		X			X	X	Collaboration, Systems & Technology, Performance Measures	9	Budget constraints coordinate with I-80 project. Flashers/ queue detection could be alternative or short-term solution.
D2-19-4	TBA	Intelligent animal warning systems	USA Parkway SR 439				$120,000.00		NDOT and District 2	X		X		X	X	X	Collaboration, Systems & Technology	11	
D2-19-5	TBA	Intelligent animal warning systems	US 95				$120,000.00		NDOT and District 2	X		X			X	X	Collaboration, Systems & Technology	11	
D2-19-6	TBA	Intelligent animal warning systems	US 50				$120,000.00		NDOT and District 2	X		X			X	X	Collaboration, Systems & Technology	10	
D2-19-7	TBA	Intelligent animal warning systems	US 395 (North Valley)				$120,000.00		NDOT and District 2	X		X			X	X	Collaboration, Systems & Technology	10	
D2-19-8	TBA	Upgrade/ Lifecycle replacements of ITS devices	ITS devices on I-80 from Robb to Vista and I-580 from I-80 to Moana						NDOT and District 2	X		X	X		X	X	Business Processes, Performance Measures, Collaboration,	8	
NA	TBA	Freeway service patrol program	Reno/ Sparks	$539,840.00	$539,840.00	$539,840.00	$733,840.00	$733,840.00	NDOT, D2, NHP	X		X			X	X	Collaboration, Performance Measures		

No.	PCEMS No.	Project, Services, or Activities	Location (specific or District or statewide)	COST 2020	2021	2022	2023	2024	Responsible Parties/ Stakeholders	TARGETED STRATEGIC GOAL: Enhance Safety	Optimize Mobility	Enhance Reliability	Preserve Infrastructure	Foster Sustainability	Optimize Customer Service	Enhance Collaboration	Targeted CMM Dimension	TSMO Score	Comments
DISTRICT 3 PROJECTS																			
D3-31	TBA	RWIS & CCTV PTZ	US 6 (west of Ely)		$220,000.00				NDOT and District 3	X		X	X		X	X	Collaboration, Systems & Technology	12	
D3-14	TBA	Chain Control Station and CCTV PTZ	US 50 (west)/ Co Road 3 intersection (White Pine County Road 3)			$220,000.00			NDOT and District 3	X		X		X	X	X	Collaboration, Systems & Technology	12	
D3-10	TBA	DMS Type 2, CCTV PTZ	US 50/ SR 305 intersection			$350,000.00			NDOT and District 3	X		X			X	X	Collaboration, Systems & Technology, Performance Measures	11	
D3-9	TBA	DMS Type 2, Chain Control Station, and CCTV PTZ	US 50/ SR 278 intersection			$600,000.00			NDOT and District 3	X		X		X	X	X	Collaboration, Systems & Technology, Performance Measures	10	Provides versatility.
D3-19-10	TBA	RGB Full Matrix Sign mounted DMS	SR 277 & MP 5				$300,000.00		NDOT and District 3	X		X			X	X	Collaboration, Systems & Technology, Performance Measures	11	Only way out to Elko and I-80 during major incidents, fires, crashes, snow drifts.
D3-19-11	TBA	RGB Full Matrix Sign mounted DMS	SR 277 & MP 7				$300,000.00		NDOT and District 3	X		X			X	X	Collaboration, Systems & Technology, Performance Measures	11	Only way out to Elko and I-80 during major incidents, fire,s crashes, snow drifts.
D3-19-9	TBA	RGB Full Matrix Sign mounted DMS	SR 277 & MP 2				$300,000.00		NDOT and District 3	X		X			X	X	Collaboration, Systems & Technology, Performance Measures	11	Only way out to Elko and I-80 during major incidents, fires, crashes, snow drifts.
D3-19-1	TBA	Chain Control	Garden Pass MP 25-33					$100,000.00	NDOT and District 3	X				X	X	X	Collaboration	10	
TOTAL				$4,150,000.00	$1,570,000.00	$3,805,000.00	$4,470,000.00	$300,000.00											

6.0 TSMO PROGRAM PLAN UPDATE CYCLE

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As TSMO activities and mobility strategies become increasingly integrated, NDOT will need to review the TSMO Program Plan components to ensure they are up-to-date, aligned with the divisions' and agencies' progress, in line with emerging technologies, and reflect the latest TSMO state of the practice.

Table 12 shows the 10-year update cycle that has been identified to help NDOT stay current. The timeframes below are minimum recommended timeframes. These elements can be reviewed and updated on an as-needed basis.

Table 12. TSMO Program Plan Component Update Cycle

Plan/Program Description	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
TSMO Strategic Elements					✓					✓
TSMO Program Elements					✓					✓
TSMO IPT		✓		✓		✓		✓		✓
CMM Self-Assessment	✓			✓					✓	
TSMO Program Actionable Items		✓			✓		✓			✓
TSMO Tactical Actionable Items		✓			✓		✓			✓

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7.0 REFERENCES

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8.0 APPENDICES

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APPENDIX A—
December 2014 CMM Workshop Results

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Nevada Department of Transportation (NDOT)

Statewide CMM Assessment Workshop

Carson City, NV
December 3, 2014

BUSINESS PROCESSES

Strengths Cited	Weaknesses Cited
▪ Design has made strides in incorporating operations into their process ▪ Funds set aside for ITS deployment ▪ Some effort in communicating project priorities ▪ Governing board has been more engaged with a strong desire to understand NDOT in the past. ▪ Collaboration with safety on ITS ▪ Good grasp on ITS standards, currently updating ▪ I-80 Coalition. Good communications with freight (multi-state) ▪ Good working relationship with local agencies on signal timing ▪ MPO includes NDOT in CMP Process ▪ Successes in TIM training and coalition. Good communication with NHP ▪ Some use in traffic analysis tools ▪ ITS included in TAMP	▪ Unsure that senior leadership and other colleagues in NDOT does not fully understand what the Traffic Operations section is trying to accomplish ▪ Difficulty in communicating accomplishments and benefits of traffic operations to senior leaders and elected officials ▪ Challenge in integrating TSMO in planning processes ▪ ITS has historically be cut on projects if budgets decrease ▪ No process in identifying the right TSMO strategy ▪ RWIS stations not communicating with operations center ▪ Many TSMO strategies have been deployed but not utilized to its full potential ▪ Local agencies have not had much focus on TSMO ▪ Some departments have been reactive, not proactive, in bringing in operations ▪ While NDOT has many tactics, it is unsure what they strategies are ▪ Political decisions have significantly impacted operations and maintenance, has created roadblocks that they must adjust to (Tesla) ▪ Informing the governor and state legislature on the benefits of operations ▪ Informal B/C process on operations/ITS ▪ ITS Strategic Plan has not been updated in many years, tied to diminished opportunity for federal funds ▪ Communications in rural areas not reliable ▪ Confusion with UP on rail crossing ITS ▪ Challenge in understanding how changing trucking laws can affect operations ▪ No money budgeted for ITS maintenance

Level	1 — Performed	2 — Managed	3 — Integrated	4 — Optimized
Criteria	Processes related to TSM&O activities ad hoc and un-integrated	Multi-year statewide TSM&O plan and program exists with deficiencies, evaluation, and strategies	Programming, Budgeting, and project development processes for TSM&O standardized and documented	Processes streamlined and subject to continuous improvement
Consensus	1+			

Workshop Actions to Advance to the Next Level

Actions Items:

- Establish and formalize an ITS/TSMO plan
- Process to prioritize and communicate on TSMO projects
- Process to link TSMO plan to other plans
- Plan to educate on TSMO

SYSTEMS AND TECHNOLOGY

Strengths Cited	Weaknesses Cited
▪ ITS Architecture is in process of being updated; will include the ATM; regional and statewide ▪ Follow the SE process ▪ Proactive to make a presentation to the Trans Board on the various processes associated with TMC and TSMO related deployment ▪ Integrating with other systems of TSMO activities (includes traffic signals) ▪ IT system within the NDOT ▪ Ability to design and procure internally in the ITS/ops section ▪ Standing committee to vet issues with 511 ▪ National Weather Service provides better weather updates than the contractor. ▪ Data warehouse in place	▪ ITS Architecture not communicated with Planning (understand and would like to be involved) ▪ Not a consistent manager of the ITS Architecture and then ends up on the shelf; does not use in everyday processes (need staff assistance) ▪ RWIS not integrated with TMC (lack communication); connectivity challenging; variable speed on US 395 ▪ Radio system not reliable; end of live; only a voice system, not a data system ▪ Challenges of operating the RWIS in times of inclement weather! ▪ Procurement for ITS is "all over the place." Some consistency on like state contracts ▪ IT system within the NDOT, but challenges to procure with forces to support ▪ Signals (local ownership) have an indirect tie to the challenges NDOT supports. ▪ Minimal justification to deploy ITS ▪ 511 system is weak (basically not doing what it was intended – I-15); went live, when it was not supposed to.; overload issues ▪ 511 issues, perhaps, with new vendor vs. previous ▪ Contracted meteorologist "not steller"; disputes locals on on-the ground weather; located out of the state; issues with microclimates ▪ Rural issues with not planned weather event (recent example with snow bank) ▪ Only report restrictions, not conditions ▪ Social networking is limited due to government blocks ▪ Staff retention (see org and staffing)

Level	1 — Performed	2 — Managed	3 — Integrated	4 — Optimized
Criteria	Ad hoc approaches outside systematic systems engineering	Systems engineering employed and consistently used for ConOps, 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
Consensus		2+		

Workshop Actions to Advance to the Next Level

Actions Items

- TAMP, when compete, will help; but to educate and have the right people for developing and making use of the ITS architecture
- TAMP action plan
- Educating the ranks for deploying and maintaining ITS and the state wide radio/data network systems (need a journeyman program)
- In rural, before deploying – should have a reliable and adequate communication system
- Vendor administration; holding the contractor/vendor more accountable – how to?
- Review the resources (money and people) to support the efforts associated with S & T

PERFORMANCE MEASUREMENT

Strengths Cited	Weaknesses Cited
▪ PMs reported to legislators yearly ▪ CAD has the capability to mine PM data ▪ Urban areas use devices to collect data ▪ Clearance data used for CMAQ justification ▪ Currently meeting MAP-21 PM requirements ▪ PMs in place for WZ activities…limitations on closures ▪ Moving towards having a central depository for data ▪ Public Information officer in place to for public relations issues ▪ National award winning FAST system ▪ Fact and figures box to demonstrate PMs ▪ FAST data beginning to be linked with Mobility and Travel Time Reliability	▪ Currently there aren't any "agreed" upon measures for travel time reliability. (currently under development) ▪ PM reporting to legislators not the same as the PMs in MAP-21 ▪ PMs reporting vary across the state (stovepipes) ▪ There is no state requirement for PM reporting ▪ PMs not being used to its potential ▪ Dashboard in place but not being used to demonstrate B/C ▪ Difficult to utilize PMs in rural areas to justify equipment deployment

Level	1 — Performed	2 — Managed	3 — Integrated	4 — Optimized
Criteria	No regular performance measurement related to TSM&O	TSM&O strategies measurement largely via outputs, with limited after-action analyses	Outcome measures identified and consistently used for TSM&O strategies improvement	Mission-related outputs/outcomes data routinely utilized for management, reported internally and externally, and archived
Consensus	**Statewide - 1**	**FAST Region - 2.0**		

Workshop Actions to Advance to the Next Level

Actions Items

- Implementation of "SPILLMAN" (CAD systems)
- Identify all sources of data
- Come to a consensus on what to measure statewide
- Use PM to make business case for TSMO
- Provide a means for staff to appreciate PMs for all TSMO strategies
- Promote Facts and Figures book to politicians… perhaps add an executive summary for their consumption
- Massage FAST data for public consumption
- Use PMs to tell the state's operations story to the public, Sr. Leadership, and politicians
- Use PMs to celebrate what the agency is doing well and promote to the public, Sr. Leadership, and politicians
- Research how other states are using PMs to promote successes

CULTURE

Strengths Cited	Weaknesses Cited
▪ Prior success in prioritizing projects and setting targets ▪ Project development committee that champions 5-year plan on prioritizing ▪ Ongoing effort to improve business case ▪ Statewide ITS annual awards ▪ Improved effort with PIO ▪ Some successes in PR and press releases ▪ Public access in cameras ▪ Some training with construction personnel on signals and ops ▪ Successes in hiring PR firm to sell public on sensitive projects ▪ Front office supportive and will to listen to recommendations	▪ Challenge in gaining understanding for operations projects from senior leadership ▪ Challenging in selling TSMO ▪ Budget and staffing constraints prevent NDOT from moving to the next level ▪ Some resistance in changing organizational focus from construction to operations ▪ No formal meetings to discuss TSMO strategies for improving mobility ▪ Personnel not vetted in operations, lawyers, making policy without consideration to operations. More focused on potential liability. ▪ Not looking our beyond the current projects

Level	1 — Performed	2 — Managed	3 — Integrated	4 — Optimized
Criteria	Value of TSM&O not widely understood beyond champions	Agency-wide appreciation of the value and role of TSM&O	TSM&O accepted as a formal core program	Explicit agency commitment to TSM&O as key strategy to achieve full range of mobility, safety and livability/ sustainability objectives
Consensus	**1 - HQ**	**2 - Districts**		

Workshop Actions to Advance to the Next Level

Action Items

- Educate and communicate within the department as a whole on future projects and plans
- Better project coordination between the departments
- Add elements and players to existing committees to reflect TSMO priorities
- Present TSMO activities and benefits to other departments
- Develop common sense approaches to achieve engineering and operations missions without too much control from lawyers

ORGANIZATION AND STAFFING

Strengths Cited	Weaknesses Cited
▪ Districts are champions to support traffic operations ▪ Need license to qualify for some positions ▪ Model for state training ▪ Regional Operations Forum benefits ▪ Used CMM in the past to rate within own division ▪ Rotator (entry level available to get experience) ▪ Would like to see a mid-career rotational between divisions ▪ Beginning to think succession planning	▪ Difficulty hiring due to pay scales (help retain staff – Idaho DOT example) ▪ Lack of staffing ▪ Organizational Chart not actually organized for the current times ▪ Uncertain of leadership support to review TSMO/traffic operations organization ▪ Not a stellar training program ▪ Nonstop interviews (twice a week) ▪ Inexperience (example: more snowplow drivers without experience than snowplow drivers with experience) ▪ State personnel misidentifies the classification for the job needed ▪ Traffic Engineering/Operations job pool only from a handful of colleges ▪ Need a license to qualify for some positions ▪ Career paths are not there (State not structured properly for the right job) ▪ You could go only so far without a license (i.e. PE) ▪ Struggle may exist in the Districts for OJT ▪ Other state agencies want to take NDOT's IT ▪ Civil Engineering trait will change with connected vehicle ▪ No training matrix/program/plan

Level	1 — Performed	2 — Managed	3 — Integrated	4 — Optimized
Criteria	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 TSM&O established in central office and districts	Professionalization and certification of operations core capacity positions including performance incentives
Consensus	1 - HQ	2 - Districts		

Workshop Actions to Advance to the Next Level

Actions Items

- Journeyman program for communication/ITS tech.
- IT position (advisor/champion) in the director's office
- Training; generational training (aging staff)
- Understanding of the roles and responsibilities with IT and that there are some fundamental differences (IT will support the systems but do not want to design the systems)
- Education of what we do, why we do it,
- More aggressive in-house and out of the house training
- Review classification of positions
- More resources / more training
- Training program/plan development (Mid-career Rotational Program)

COLLABORATION

Strengths Cited	Weaknesses Cited
▪ TIM program is a success story – District offices and DPS are the TIM leaders ▪ Collaboration is good in the work zone arena – monthly coordination meeting held with stakeholders during WZ activities ▪ Good collaboration with local agencies ▪ Nevada is the lead for I-80 corridor coalition ▪ Participates in the I-15 corridor coalition ▪ ATM in Vegas region ▪ NDOT personnel are passionate about what they do – the agency has a "can do" attitude. ▪ Data warehouse – the agency is reaching out to other departments to make they aware of the data ▪ Collaboration extensive with FAST ▪ Collaboration is good with NHP	▪ Shortage of staff… multiple meetings and the same folks are being tapped to participate ▪ Collaboration efforts lacking internally ▪ Planning and Operations collaboration lacking – Partnering internally is struggling. Efforts are more reactive than proactive. ▪ Collaboration mediocre with the Reno MPO ▪ Turn-over internally and externally hurting collaboration (NHP etc.)

Level	1 — Performed	2 — Managed	3 — Integrated	4 — Optimized
Criteria	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
Consensus	**NDOT (internal) - 1**		**NDOT (external) - 3; Districts - 3.5**	

Workshop Actions to Advance to the Next Level

Actions Items

- Retreat to discuss internal coordination efforts and overall collaboration.
- Peer exchanges to share information internally.
- Making meeting meaningful – actually implementing actions
- Make an effort to communicate with other disciplines/divisions
- Scope out meetings yearly to determine which are important to advance TSMO
- Department should have a more active role in the operations of the Freeways
- Department should be more aware and active in FAST activities
- Catered meeting to improve team building

APPENDIX B—
Business Case Summary Sheets

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WHY TSMO

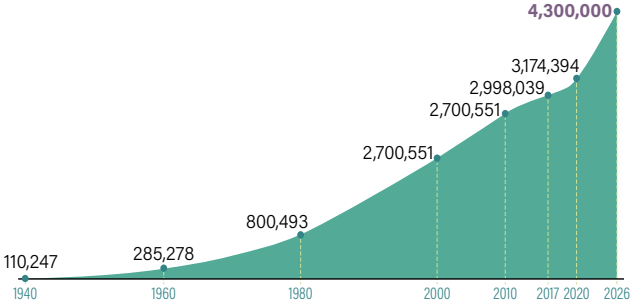
POPULATIONS

CURRENT CHALLENGES

133% 1990—2008, fastest growing State in the nation.

3 Million Population in 2018, fastest growing in the nation based on U.S. Census Bureau.

4.3 Million
Projected population by 2026



NEED:

- Increase in demand, congestion, and delay
- Reduction of capacity, transportation safety, and reliability

TSMO'S CONTRIBUTION

BENEFIT:

Implement solutions on existing roadways and collaborate within NDOT to include TSMO strategies such as Traffic Incident Management, Work Zone Management, Special Event Management, and Road Weather Management as well as the design of new infrastructure that can increase efficiency, reduce congestion and crashes, and increase the reliability of NDOT roadways to help to accommodate this growing population.

Ohio—Kentucky—Indiana Regional Council of Governments benefits from TSMO strategies:

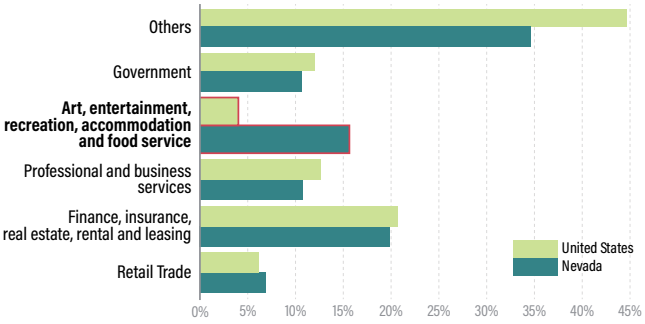
- Advanced Regional Traffic Interactive Management and Information System (ARTIMIS) program yielded a benefit of 12:1, while the capacity-adding project would have had a benefit of only 1.1:1.
- Additionally, the ARTIMIS program cost was 1/20 the cost of the capacity-adding project.

TOURISM-BASED ECONOMY

CURRENT CHALLENGES

Service sector employs about
half of Nevada's workers

Tourism sustains
27%
of all jobs in Nevada



NEED:

- NDOT must provide, maintain, and operate a safe, reliable, and efficient transportation network for its workers and tourists

TSMO'S CONTRIBUTION

BENEFIT:

Easily implementable and cost-effective TSMO strategies such as real-time traffic information to plan efficient and reliable work trips, encouraging ridership on public transportation to reduce the number of vehicles on the road, and providing safe alternatives such as pedestrian and bicycle paths will help to reduce congestion and subsequent crashes.

The Colorado DOT benefits from TSMO strategies such as the Freeway Service Patrol, I-70 Peak Period Shoulder Lane, and Colorado Bottleneck Reduction Alternatives (COBRA) Project. These projects have:

- High benefit-cost ratios typically 10:1 and as much as 40:1
- Readily implementable in less time (usually within 12 months) and for less money than adding lanes
- Highly visible, many times but not always, and noticeable improvements
- Quantifiable reduction in delay and improvement in travel time reliability
- Measurable safety-related improvements
- Improvements that continue to provide value even when long-term construction projects are completed

WHY TSMO

CONGESTION AND ASSOCIATED COSTS

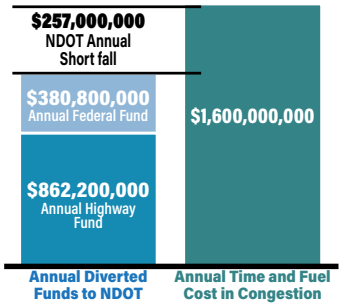
CURRENT CHALLENGES

↑ $121 B In wasted time and fuel cost in U.S. per year.

$1,400 & 60 hrs Cost of congestion to average driver in Nevada annually.

$1.6 Billion

Value of lost time and fuel in Nevada



Roadway incidents account for:

25% of travel delay,

4 minutes for every minute of congestion, and

2.8% increased chance of secondary incident

NEED:

- Wasted time and vehicle operating costs
- Hundreds of lost lives
- Increased chance of secondary incidents

TSMO'S CONTRIBUTION

BENEFIT:

TSMO focuses on easily implementable and cost-effective solutions that have measurable benefits to existing roadways and maximizes the efficiency of new infrastructure. Solutions such as Traffic Responsive Freeway Ramp Metering can decrease delay and improve trip reliability, which in turn reduces traffic crashes.

The Pennsylvania DOT benefits from TSMO strategies:

- Incident Response Management reduced incident response times by 8.7 minutes, incident clearance times by 8.3 minutes, and hours of delay by 547,000 hours per year, with a total monetary savings of $6.5 million per year.

Nevada WayCare pilot program:

- The WayCare Project reduced congestion and incident response times by leveraging real-time predictive analytics to identify high-risk incident locations. Therefore agencies such as NDOT, DPS-NHP, and RTC FAST can now take proactive preventative measures accordingly.

VEHICLE MILES TRAVELED (VMT)

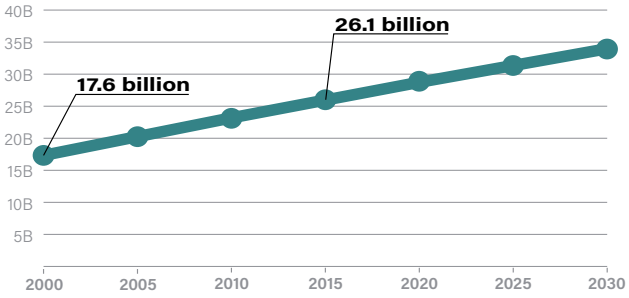
CURRENT CHALLENGES

↑ 48% From 17.6 billion in 2000 to 26.1 billion in 2015

Projected increase of **30%** by the year 2030 to:

34 Billion

VMT



NEED:

- With VMT demand increasing at rapid rate, the need for efficient and reliable roads to accommodate this demand is paramount.

TSMO'S CONTRIBUTION

BENEFIT:

Improvements to non-motorized facilities (pedestrian and bicycle paths) to reduce the demand on motorized facilities, switching mode choices (bus rider or ride share) to reduce the number of vehicles on the roadway, real-time traffic information to help with trip pre-planning, and trip rerouting due to congestion or incidents will help to make the roadway more efficient and reduce the potential for traffic crashes.

Washington DOT Commute Trip Reduction (CTR) Program:

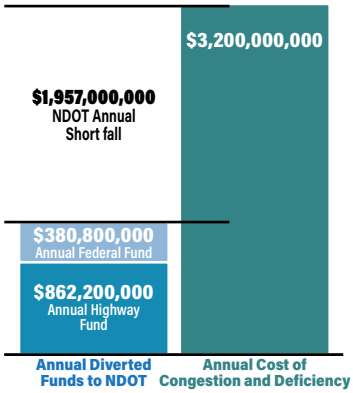
- In 2009, WSDOT's CTR program implemented strategies such as encouraging vanpools, carpools, condensed work weeks and telecommuting to help shift commuters out of single-occupancy automobiles and into alternative modes. The program was implemented across the nine most populous counties within the State and is credited with reducing the average daily weekday morning peak-period trips by 28,000, congestion delays by 12,900 hours, annual VMT by 62 million, and fuel consumption by 3 million gallons. This equates to a reduction of approximately 27,500 metric tons of carbon dioxide emissions .

WHY TSMO

DEFICIENT ROADS AND BRIDGES

CURRENT CHALLENGES

$3.2 Billion Annual cost to Nevada motorists due to inadequate roads.



$24 M Deficit has been projected in bridge preservation by 2020

NEED:

- NDOT's yearly operating budget is not sufficient to keep up with operations and maintenance, let alone to keep up with the demands for new infrastructure.

TSMO'S CONTRIBUTION

BENEFIT:

TSMO tries to focus on easily implementable, low-cost, high-return solutions with highly visible results. When these low-cost solutions produce the desired results, it has the potential to save money, which then can be reallocated to help solve more problems.

NDOT I-515/215 Restriping:

- In 2018, NDOT restriped the I-515/I-215 interchange for the southbound to westbound movement. This solution improved roadway efficiency, delayed the need for major rehabilitation and reconstruction, increased safety, and improved mobility at the cost of approximately $800,000, which was substantially lower than the cost to rebuild the entire interchange.

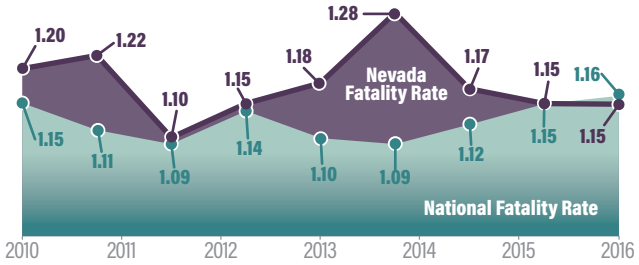
SAFETY

CURRENT CHALLENGES

331 People died in Nevada in 2018.

$1.9 B Economic cost of traffic crashes in 2017.

$906 M Annual cost to Nevada motorists from medical costs, lost productivity, etc.



NEED:

- Traffic crashes have a demonstrable negative effect on the operations of NDOT roadways and cost billions of dollars to the economy.

TSMO'S CONTRIBUTION

BENEFIT:

TSMO focuses on increasing the efficiency of roadways, reducing congestion, and helping to eliminate the causal factors of these crashes. It is most effective on reducing the secondary crashes that are associated with the congestion that results from the primary crash. Through Integrated Statewide Traffic Incident Management Programs and real-time traffic monitoring, these primary crashes can be identified and cleared quickly.

Traffic Incident Management (TIM):

- Nevada DOT implemented this effective TSMO strategy to more efficiently detect, respond to, and resolve traffic incidents to restore traffic capacity as safely and quickly as possible through planned and coordinated processes between various public agencies and private sectors.

WHY TSMO

TRUCKS AND FREIGHT MOVEMENT

CURRENT CHALLENGES

The efficiency of the transportation system is critical to the health of the state's economy in Nevada. The key to success is the level of access and convenience for customers and markets.

$144 Billion

Goods and products are shipped mostly by truck to and from the state of Nevada

73%

of goods and products are carried by trucks annually.

NEED:

- Negative effect on the economy of Nevada.
- Delay has a negative effect on the cost of goods and products.

TSMO'S CONTRIBUTION

BENEFIT:

Several TSMO strategies can be implemented to help provide a reliable and efficient roadway system for truckers. Each dollar spent on typical road, highway, and bridge improvements results in an average benefit of $5.20 in the form of reduced vehicle maintenance costs, reduced delays, reduced fuel consumption, improved safety, reduced road and bridge maintenance costs, and reduced emissions. TSMO strategies are expected to greatly increase this average benefit.

Wyoming Freight:

- Truckers use a dedicated radio band on SiriusXM Radio that provides them with Real-Time Traffic Information on WYDOT roads. This service increases trip reliability and allows the industry to make informed decisions on their routes.

Smart Truck Parking Systems:

- These types of real-time systems allow truckers to more efficiently plan their routes and determine where they can safely park and rest between pick-ups and deliveries. The State of Michigan is currently implementing this TSMO strategy with much success throughout the state.

ASSET & PERFORMANCE MANAGEMENT

CURRENT CHALLENGES

NDOT Asset Management Program has identified

$23 Billion

replacement cost for pavements, bridges, and ITS assets.

Over 20% of state pavements are more than 10 years old

Most of the state bridges have already or will soon exceed their design life of **50 years**

$1.21 B or approximately 24% of the NDOT's annual budget in preservation activities between 2017 to 2027 to extend the assets' lives

NEED:

- Cost to maintain is increasing while funding is stagnant.
- To efficiently maintain infrastructure, NDOT needs to develop a comprehensive database and management strategies to establish priorities.

TSMO'S CONTRIBUTION

BENEFIT:

TSMO strategies will help NDOT to more efficiently spend their limited funds on their aging infrastructure. The benefits of Asset Management include:

- Improves and embraces decision-making based on long-term life-cycle cost considerations.
- Allows NDOT to efficiently prioritize maintenance projects.
- Increases safety and reliability of the transportation system.

NDOT ITS Asset Management Database and Dashboard:

- NDOT's Traffic Operations developed a comprehensive database of ITS and communication devices. This database provides real-time information on the conditions and performance of ITS assets that helps to efficiently operate NDOT roadways.

NDOT Transportation Asset Management Plan (TAMP):

- NDOT developed its TAMP that includes pavement, bridge, and ITS assets. It outlines NDOT's planned investments over the next 10 years, placing priority on actively preserving these assets so they continue to operate as efficiently and effectively as possible.

APPENDIX C—
Current NDOT Performance Measures

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Performance Measures

1. Reduce Workplace Accidents
2. Provide Employee Training
3. Improve Employee Satisfaction
4. Streamline Agreement Process
5. Improve Customer and Public Outreach
6. Reduce and Maintain Traffic Congestion
7. Streamline Project Delivery—Bidding to Construction
8. Maintain State Highway Pavement
9. Maintain NDOT Fleet
10. Maintain NDOT Facilities
11. Emergency Management, Security and Continuity of Operations
12. Reduce Fatal and Serious Injury Crashes
13. Project Delivery—Schedule and Estimate for Bid Advertisement
14. Maintain State Bridges
15. Streamline Permitting Process

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APPENDIX D—
Investment Prioritization Tool

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Project Information				Project Prioritization Criteria													
				Alignment with TSMO Strategic Goals and Objectives													
SDP P#	Project/Services/ Activities	Project Location	PCEMS No.	Enhance Safety	Optimize Mobility	Enhance Reliability	Preserve Infrastructure	Foster Sustainability	Optimize Customer Service	Enhance Collaboration	Cost	Implementation	Dependencies, Business Risks, and Limitations	Risk Severity	Benefit/Cost Ratio	Strategic Value	TSMO Score (DO NOT FILL IN) The higher the score, the higher return on investment. (Max 17)
D3-31	CCTV PTZ & RWIS	US 6, west D16:F16 of Ely	TBD	1	0	1	1	0	1	1	4	3	Coordination with NWS	-1	1	0	12
D3-28	CCTV PTZ and RWIS and Weather (Signage) Chain Control	US 6, east of US 6/ SR 379 intersection	TBD	1	0	1	1	1	1	1	4	2	Comms to site required, Coordination with NWS	-1	1	0	12
D3-19-10	RGB Full matrix Sign mounted DMS	SR 227 & MP5	TBD	1	0	1	0	0	1	1	4	3		0	0	0	11
D3-10	DMS Type 2 (US 50 EB/WB), CCTV PTZ	US 50/SR 305 intersection	TBD	1	0	1	0	0	1	1	4	3		0	0	0	11
D3-9	DMS Type 2 (US 50 EB/WB), Weather (Signage) Chain Control Station and CCTV PTZ	US 50/SR 278 intersection	8-00251	1	0	1	0	1	1	1	3	3	Coordination with NWS	-1	0	0	10
D3-50	RWIS and CCTV PTZ	SR 318, South of Junction US 6	TBD	1	0	1	1	0	1	1	4	2	Coordination with NWS	-1	0	0	10
D3-40	CCTV PTZ	US 50/SR 376 intersection	TBD	1	0	1	0	0	1	1	4	1		0	0	0	9
D3-24	DMS Type 2 (US 93 NB), RWIS, CCTV PTZ	US 93,Ely @ McGill	8-00251	1	0	1	0	1	1	1	3	1	Comms to site required, Coordination with NWS	-1	1	0	9
D3-33	DMS Type 2 (US 93 SB) & CCTV	US 93, near Warm Springs - US 93S SR229 Ruby Intersection	TBD	1	0	1	0	0	1	1	4	1		-1	0	0	8
D3-19-6	Speed Feedback Sign	SR 227 & MP 7	TBD	1	0	0	1	0	1	0	4	2		-1		0	8
D3-19-4	Speed Differential Signs, Slow Trucks Ahead Study	Emmigrant	TBD	1	0	0	0	0	1	1	4	2		-1		0	8
D3-18	DMS Type 2 (US 50 WB)	US 50, Nevada/Utah State Line	TBD	1	0	1	0	0	1	1	4	1	Power and comms potential issue	-2	0	0	7
D3-19-8	Wildlife Crossings Decommission	Pequop, Silver Zone, W. of Pequop (I-80 and 93)	TBD	0	0	0	1	0	1	0	4	1		-1	0	0	6
D3-19-7	Wind Warning System	Pilot Valley	TBD	1	0	0	0	1	1	0	3	1	Power needed, Coordination with NWS	-1		0	6

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APPENDIX E—
TSMO Evaluation Tool

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NDOT TSMO Evaluation Tool

If you have any questions or concerns, contact:
LaShonn Ford: lford@dot.nv.gov
Will Johnson: will.johnson@atkinsglobal.com
Ati Abad: atefeh.abad@atkinsglobal.com

ATKINS

NDOT TSMO Evaluation Tool Instructions

Initializing TSMO Evaluation Tool:

Step 1: Fill out the 'Project Information' Tab
Step 2: Fill out all the tabs using the following instructions. Each color represents an NDOT TSMO strategic goals.
Step 3: All representatives are required to update the Recommendations tab. Instructions are described below.

Level 1 Analysis Instructions

- To complete the Level 1 Analysis, start by filling out your name and the date under “Name of representative filling out this form” and “Form start date”
- Answer each question using the “Yes”, “No", "TBD", or "NA".
- If you have comments on the questions, add that information under the “Comments” column (column F).
- For the questions with no predetermined recommendations, add your recommendations under the "Recommendation" column (column G).
- Where ever you see a button that looks like this: [+] you can click on it to add rows in order to add additional information for that question. If you add to many rows, click this button: [-] to remove additional rows
- If you would like to request a Level 2 Analysis, select "Yes" on the far right column. The comments box will turn yellow to remind you to add comments about a particular topic you would like studied further.
- The Level 1 Analysis should be done before or by project scoping meeting.
- Revise the Analysis status on the top right of each tab to the appropriate status.

Recommendations Tab Instructions

- Any text in the "Comments" and “Recommendations” column will be pulled into this document, after you click the appropriate buttons.
- To pull comments and recommendations on Enhance Safety tab, click the button that says, “Insert all Enhance Safety Recommendations.”
- To pull comments and recommendations on Preserve Infrastructure tab, click the button that says, “Insert all Preserve Infrastructure Recommendations.”
- To pull comments and recommendations on Enhance Reliability tab, click the button that says, “Insert all Enhance Reliability Recommendations.”
- To pull comments and recommendations on Optimize Mobility tab, click the button that says, “Insert all Optimize Mobility Recommendations.”
- To pull comments and recommendations on Optimize Customer Service tab, click the button that says, “Insert all Optimize Customer Service Recommendations.”
- To pull comments and recommendations on Enhance Collaboration tab, click the button that says, “Insert all Enhance Collaboration Recommendations.”
- To pull comments and recommendations on Foster Sustainability tab, click the button that says, “Insert all Foster Sustainability Recommendations.”
- To pull comments and recommendations on Strengthen TSMO Integration tab, click the button that says, “Insert all Strengthen TSMO Integration Recommendations.”
- If you need to start over, click the “Click here to clear” button.

Final Report Instructions

- To create the final report, print the yellow tabbed sheets: “Project Information” and “Recommendations.”

Transportation Systems Management & Operations
Evaluation Request Form

Request Date:
District:
Project Manager:
Email Address:
Phone:
Project Description:
Project Type:
Expected Scoping Date:
Project Area:
Begin MP:
Ending MP:
District Representative:
TSMO/TCT Representative:
Provide project scope and any necessary notes:
Primary funding sources/provider codes:
Participating (federal) funds:
Existing assets and ITS devices:
Description of existing assets and ITS devices:
New/replace assets and ITS devices:
Description of new assets and ITS devices:

TSMO Evaluation Status Summary	
Enhance Safety	
Preserve Infrastructure	
Enhance Reliability	
Optimize Mobility	
Optimize Customer Service	
Enhance Collaboration	
Foster Sustainability	
Strengthen TSMO Integration	

ENHANCE SAFETY ANALYSIS - General Information					Enhance Safety Analysis Status:		
Name of the representative filling out this form:							
Form start date:	8/19/2019						
The following questions are standard recommendations that are found in all safety assessments. Please answer these questions based on your review of the project. If you answer yes to any of the questions, add detail in comments column. **A Level 2 Safety Analysis is required if it meets the following criteria: (1) Speed study indicates safety issues, (2) Any recent traffic fatalities or serious injuries.**							
Level 1 Safety Analysis	**Select one**	**Location**	**Begin MP**	**End MP**	**Comments**	**Recommendations**	**Select Yes or No if Level 2 Analysis is necessary**
Are there any known safety issues in the project area? If yes, what are the safety issues and how are they proposed to be addressed?							
Has a speed study been completed for the project? If yes, attach a copy of the speed study							
Does this project align with current/future statewide safety initiatives?							
Is there safety funding set aside for this project? If yes, what is the source and the amount?							
Are there any physical characteristics in the project area that could contribute into safety issues?							
Are there opportunities to achieve a significant reduction in traffic fatalities and serious injuries within the project area?							
Are there any physical characteristics that may need to be addressed? If yes, identify the characteristics and the applicable requirements							
Does the existing pavement markings, signing, and delineation need to be replaced or improved? For example, do advance warning signs for curves need to be installed?							
Does the project include any specific TSMO strategies addressing safety? If yes, list the TSMO strategies that are being utilized?							
Does the project include performance measures and performance measurement for safety improvements?							
Use + or - to add or remove rows for Level 1 analysis.						+	-
Level 2 Safety Analysis	**Select one**	**Location**	**Begin MP**	**End MP**	**Comments**	**Recommendations**	**Select Yes or No if Level 2 Analysis is necessary**
Use + or - to add or remove rows for Level 2 analysis.						+	-

NDOT TSMO Evaluation Tool
Summary Sheet

If you have any questions or concerns, contact: LaShonn Ford: lford@dot.nv.gov

2019 Version

Project Information	
Request Date:	District:
Project Manager:	District Representative:
Project Type:	Beging MP:
Project Area:	End MP:
Summary of Comments	Summary of Recommendations

Click here to clear

Insert all Enhance Safety Recommendations

Insert all Preserve Insfrastucture Recommendations

Insert all Enhance Reliability Recommendations

Insert all Optimize Mobility Recommendations

Insert all Optimize Customer Service Recommendations

Insert all Enhance Collaboration Recommendations

Insert all Foster Sustainability Recommendations

Insert all Strengthen TSMO Integration Recommendations

TSMO Evaluation Status Summary	
Enhance Safety	
Preserve Infrastructure	
Enhance Reliability	
Optimize Mobility	
Optimize Customer Service	
Enhance Collaboration	
Foster Sustainability	
Strengthen TSMO Integration	

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NEVADA DOT
SAFE AND CONNECTED

NDOT STATEWIDE
TSMO PROGRAM PLAN

ATKINS
Member of the SNC-Lavalin Group