New Mexico Department of Transportation 2022 Transportation Asset Management Plan

June 2022

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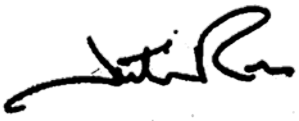
One of the New Mexico Department of Transportation's key priorities is to keep the state's bridges and pavements in a desired state of good repair. This Transportation Asset Management Plan (TAMP) is an important aspect of that effort. The TAMP will help to ensure the efficient and responsible investment of taxpayer dollars to achieve the best possible road and bridge conditions, given their current condition levels and anticipated funding.

The NMDOT TAMP addresses all the federal requirements described in 23 CFR 515.11(b). It is also Bipartisan Infrastructure Law (BIL) compliant. It provides an assessment of the condition of pavements and bridges on the Interstate and National Highway System and identifies future performance gaps based on current and anticipated finances and asset conditions. It also includes a description of the project selection process, how cost estimates are determined, the details of NMDOT's financial plan, and an assessment of the risks inherent in managing such an expansive set of assets. Meeting the federal requirements for the TAMP allows access to federal funding and enables the NMDOT to effectively plan for future infrastructure needs. Specifically, the TAMP helps improve decision-making on maintenance, preservation, rehabilitation, and replacement projects in order to achieve desired performance over the lifespan of the transportation system.

The NMDOT is moving forward as it implements the TAMP over time. I encourage everyone to learn more about NMDOT's efforts to maintain the state's roadways and bridges, work that is vital to New Mexico's economy and the well-being of its residents.

The New Mexico DOT hereby adopts this TAMP on the 29th day of June, 2022.



Justin Reese
Acting Cabinet Secretary
New Mexico Department of Transportation

New Mexico Department of Transportation 2022 Transportation Asset Management Plan

Executive Summary

June 2022

NEW MEXICO TRANSPORTATION NETWORK AT A GLANCE

28,118

Highway Lane Miles
Owned by NMDOT

2,977

Bridges
Owned by NMDOT

NEW MEXICO DOT VISION

NMDOT STRIVES TO CREATE A SAFE AND SUSTAINABLE MULTIMODAL TRANSPORTATION SYSTEM THAT SUPPORTS A ROBUST ECONOMY, FOSTERS HEALTHY COMMUNITIES, PROTECTS THE ENVIRONMENT, AND PRESERVES THE STATE'S UNIQUE CULTURAL HERITAGE.

ASSET MANAGEMENT : A strategic and systematic process of operating, maintaining, and improving physical assets effectively throughout their life cycles. Asset management involves moving beyond reactive repairs to a proactive approach that anticipates costs and maximizes investments.

NEW MEXICO DOT
DELIVERING ASSET PERFORMANCE

New Mexico's Transportation Asset Management Plan (TAMP) establishes the condition of highway and bridge assets across the state and provides a strategy for efficiently maintaining these assets in good condition over the long term. This document provides an introduction to the key elements of the TAMP.

Transportation Asset Management (TAM) utilizes business, economic, and engineering practices to help guide data-driven decisions for resource allocation and project selection.

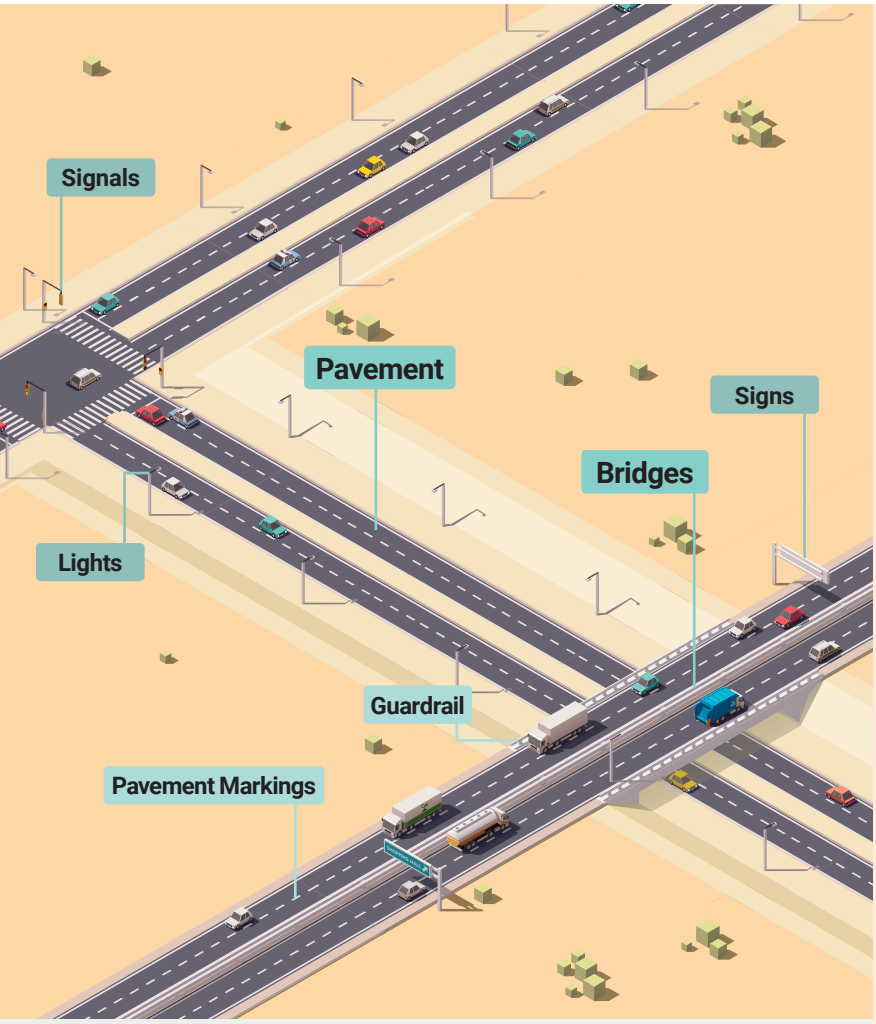
For New Mexico DOT (NMDOT), TAM ensures better operation, increased maintenance, and overall improvement of physical assets trough a process of continuous improvement – for example by better locating and understanding performance gaps, prioritizing and programming asset needs, and streamlining business processes.

In practice, these capabilities allow NMDOT to identify and execute the right projects in the right locations at the right time. Today these capabilities are more critical than ever before, as the agency seeks to maximize the use of limited public resources and strengthen the state's transportation infrastructure.

Together with the right investment levels to maintain and improve bridge and pavement conditions, TAM helps ensure a healthy transportation system that supports the mobility, safety, and economic development of New Mexico and of all New Mexicans.

New Mexico's TAMP complies with the Federal Highway Administration's requirements for National Highway System (NHS) TAMPs. It is also a living document that will be reviewed and updated regularly.

ROADWAY ASSETS: This plan reports on NMDOT's pavement and bridge assets, which together comprise the most significant share of the infrastructure assets managed by the agency. The illustration shows some of the wide variety of roadway assets maintained by NMDOT.



BUILDING A STRONG FOUNDATION

A healthy transportation system is critical to forging a strong economy and improving the quality of life in New Mexico. The transportation system managed by NMDOT connects people to jobs, schools, healthcare, recreation and their communities, as well as to the rest of the world.

WHERE ARE WE TODAY?

This plan summarizes NMDOT's asset information both for the entire NMDOT-maintained system and, as required by federal law, for the National Highway System (NHS), which includes both state and non-state-maintained facilities.

The New Mexico state-maintained highway system encompasses 28,118 lane miles of pavement and 2,977 bridges (with 19,119,701 square feet of deck area). The NHS consists of 11,369 lane miles of pavement and 1,617 bridges (with 11,815,228 square feet of deck area).

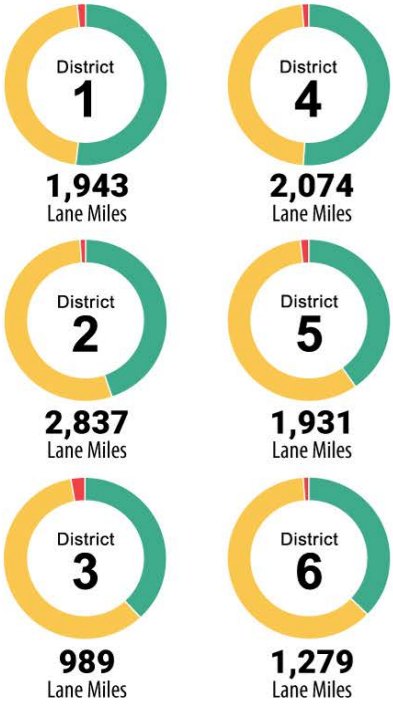
Over 95% of NMDOT-maintained bridges (by deck area) are in good or fair condition while 96% of NMDOT-maintained pavements are in good or fair condition. Over 97% of New Mexico NHS bridges (by deck area) are in good or fair condition while over 98% of New Mexico NHS pavements are in good or fair condition.

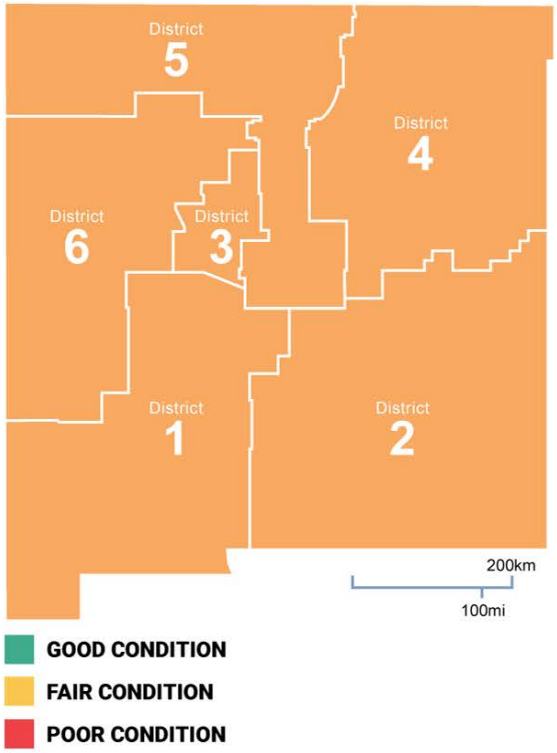
PAVEMENT AND BRIDGE ASSETS ON THE NHS

CURRENT CONDITION BY DISTRICT

NHS PAVEMENT

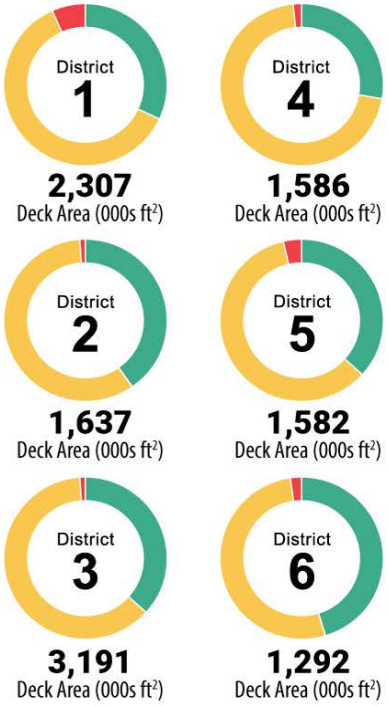
Condition and total NMDOT-owned lane miles by district.





NHS BRIDGES

Condition and total NMDOT-owned bridge deck area by district



TOTAL NHS LANE MILES

11,369

There are over 30,000 lane miles of pavement in New Mexico. Of this total, 11,369 are on the NHS.

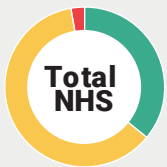
Statewide percentage of good/fair/poor NHS pavement lane miles.

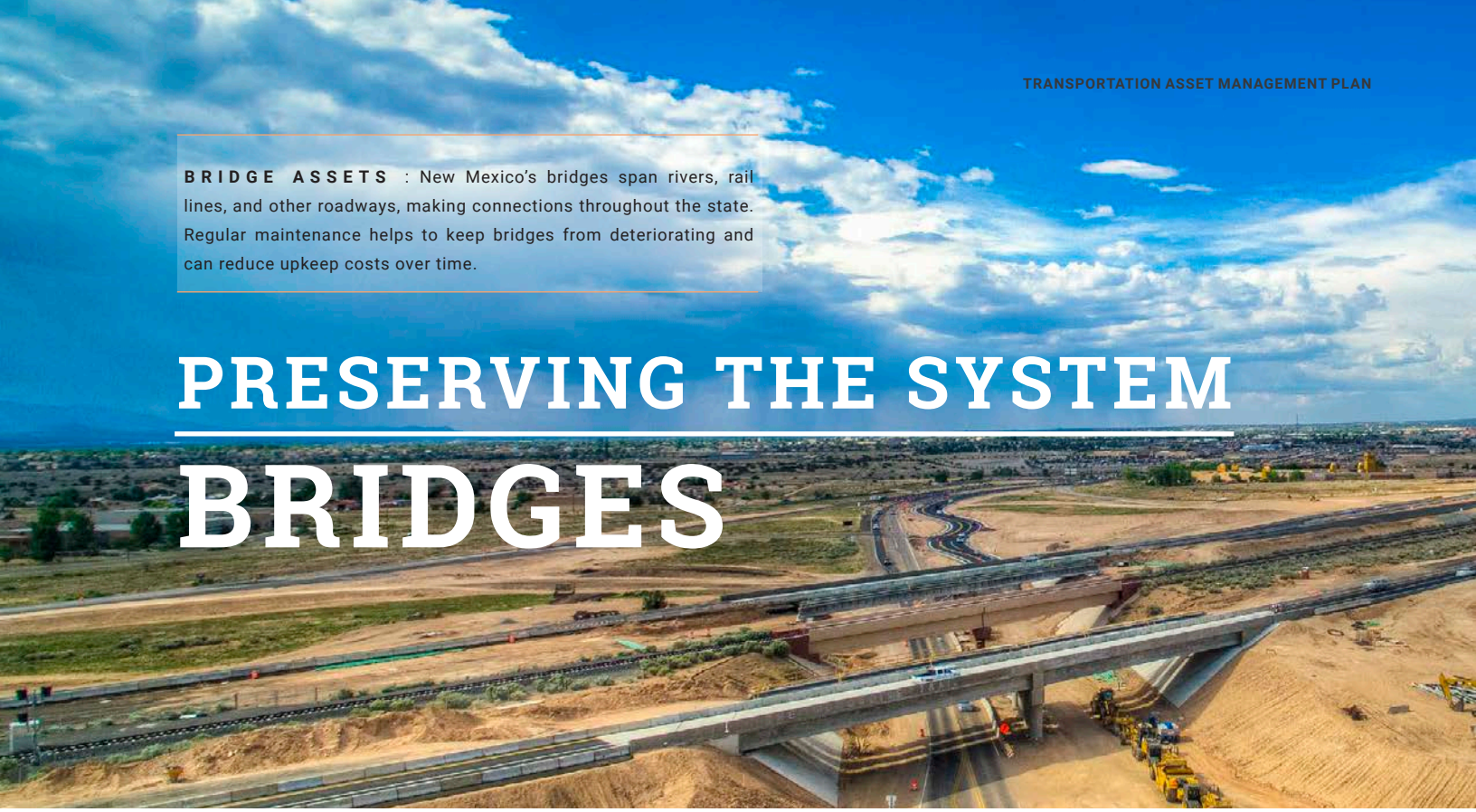
TOTAL NHS BRIDGES

1,617

There are nearly 4,000 bridges in New Mexico. Of these, 1,617 are on the NHS.

Statewide percentage of good/fair/poor NHS bridges by deck area.





BRIDGE ASSETS : New Mexico's bridges span rivers, rail lines, and other roadways, making connections throughout the state. Regular maintenance helps to keep bridges from deteriorating and can reduce upkeep costs over time.

PRESERVING THE SYSTEM
BRIDGES

MAKING THE INVESTMENT

Bridges provide road network connectivity, spanning water bodies and other natural features, rail lines, and other roadways. New Mexico's bridge inventory includes a number of landmark structures, such as the Rio Grande Gorge Bridge on Highway 64, as well as many smaller structures such as overpasses on the Interstate system.

New bridges are designed to last at least 75 years, and in practice, many bridges remain in service for much longer. However, bridges require periodic maintenance to replace individual components (such as decks) that have a shorter life than the bridge as a whole. If maintenance work on a bridge is deferred, the deterioration may accelerate to the point where more costly repairs are needed. In extreme cases deteriorated conditions may require restricting the loads the bridge can carry or closing the bridge until needed repairs are complete – which can mean costly detours for road users. Thus, it is in NMDOT's interest to maintain bridges in good condition as it can result in the lowest long-term costs both to NMDOT and road users.

DELIVERING RESULTS

Bridges have a finite lifespan and deteriorate over time. However, preventative maintenance strategies can greatly extend the life of a bridge and keep it in good condition. Sweeping and washing a bridge on a yearly basis, as well as painting and deck patching, are cost-effective ways to maintain a bridge in its current condition.

NMDOT chooses which treatment to apply to a bridge based on its condition. Basic maintenance is feasible for a bridge with a deck condition of 5 or 6 out of 9. Rehabilitation is feasible for a bridge with a deck condition of 4. Replacement is required for a bridge with a deck condition lower than 4.

Bridges in poor condition require more drastic rehabilitation and replacement efforts that are costly to implement. A major challenge in addressing the overall condition of the state's bridges is how to prioritize the major repairs required for the bridges in poor condition with the ongoing preventative maintenance activities for other bridges.

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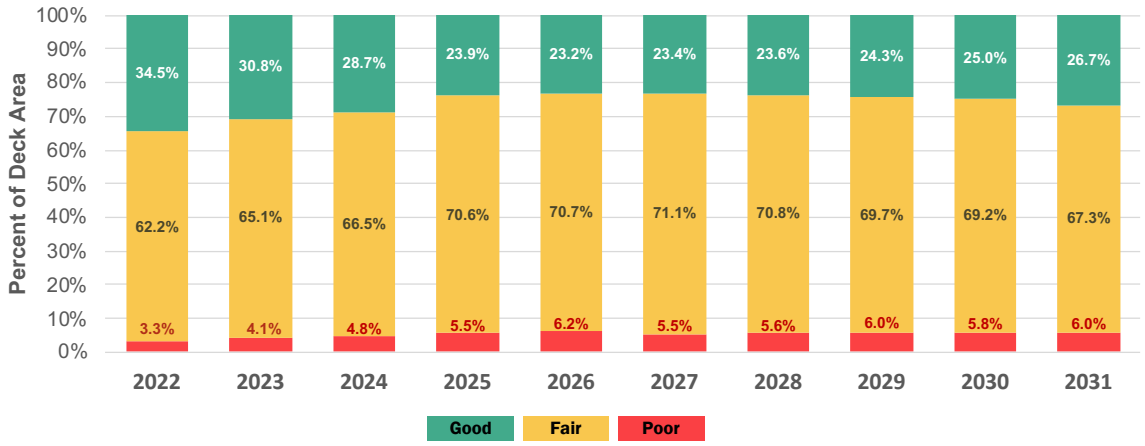
PLANNING FOR TOMORROW

Managing transportation assets throughout their life cycle requires looking to the future and projecting asset performance. Performance scenario analysis is a useful technique for examining the implications of different funding levels and allocations. It enables NMDOT to predict future conditions, compare these conditions against targets, define funding gaps, and inform resource allocation decisions.

With current funding, NHS bridge conditions are predicted to decline slightly, with deck area in poor condition increasing from 3.3% to 6.0%, well below the federal minimum condition threshold of 10%. Deck area in good condition is also predicted to decrease from 34.5% to 26.7%.

NHS BRIDGE PERFORMANCE



Life cycle planning means arranging the right treatments for the right assets at the right time to optimize system performance, lengthen asset life spans, and minimize maintenance costs. At NMDOT, life cycle planning is woven into the asset management framework. Life cycle planning focuses on network-level asset management strategies – the best sequence of maintenance and rehabilitation treatments for a given asset type, for example. For each asset, NMDOT has well-established processes for inspection and condition assessment, assignment of appropriate treatments, modeling of future asset condition based on realistic funding assumptions, and program monitoring to track the progress of asset preservation and gather information needed to improve condition forecasting.

PAVEMENT ASSETS : Well-maintained roads keep traffic flowing, reducing the cost and delays associated with poor quality pavement.

PRESERVING THE SYSTEM

ROADS

MAKING THE INVESTMENT

Roads get people where they need to go. They connect people in New Mexico to jobs, schools, healthcare, and recreation. They unite our communities, and also promote connections beyond. Businesses depend on the road network to move goods and deliver services.

Over time, pavement breaks down due to factors such as weather and traffic, which directly impacts drivers. Pavements in poor condition are rough and bumpy and show ruts and cracks. These roads offer an uncomfortable driving experience and contribute to increased wear and tear on vehicles. Severe deterioration can even increase risks to travelers' safety.

Delays and inefficiencies in the network can also be heightened by poor pavement conditions. Drivers face increased maintenance costs on their vehicles and they can spend more time in congested conditions. Businesses that depend on roads for shipping can see increased costs as well.

Pavement in good condition provides a smooth and comfortable driving experience. Instead of increasing costs and delays, pavement in good condition can help eliminate inefficiencies and improve consistency in journey time.

DELIVERING RESULTS

Highway pavements are designed to support anticipated traffic loads and provide a safe and relatively smooth driving surface. Most of the state highway system pavement is classified as "flexible" – hot mix asphalt or other bituminous-treated surface over a subgrade. A small portion of the inventory is "rigid" – constructed from concrete with no asphalt overlay. Pavement life varies based on a variety of design properties, construction practices, the traffic loads to which the pavement is subjected, and environmental conditions such as freeze-thaw cycles.

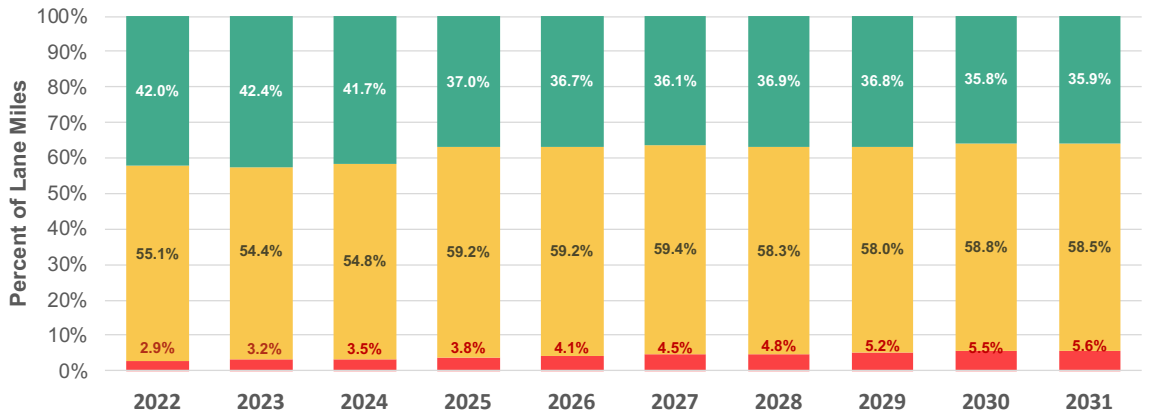
While flexible and rigid pavements deteriorate differently, in general pavements become rougher with age and exhibit cracking and other signs of distress. Keeping pavements in good condition lengthens their life, enhances safety, and helps reduce road users' operating costs. Numerous studies have shown that rough roads cause more wear and tear on vehicles and may result in decreased vehicle speeds.

PLANNING FOR TOMORROW

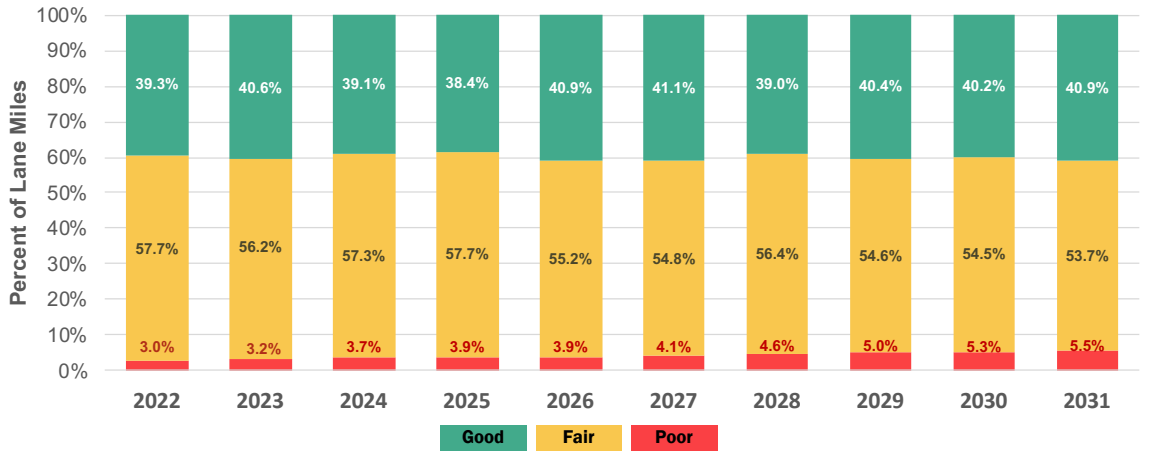
Interstate pavement condition is predicted to decline slightly under current funding constraints, with Interstate pavement in poor condition increasing from 2.9% to 5.6%, above the federal minimum condition threshold of 5%.

Non-Interstate NHS pavement condition is also predicted to decline slightly, with percent poor increasing from 3.0% to 5.5%, but percent good increasing from 39.3% to 40.9%.

INTERSTATE PAVEMENT PERFORMANCE



NON-INTERSTATE NHS PAVEMENT PERFORMANCE



TAM PROCESS : Asset management is an ever-improving process. Modifying and streamlining the process over time produces efficiencies and better results.

ASSET MANAGEMENT MISSION

PRIORITIES

NMDOT recently undertook a long-range planning activity for the next 25 years, with the New Mexico 2045 Plan, adopted in June 2021. The vision, goals, objectives, strategies, and performance measures in the plan guide the development of the TAMP. Specifically, one of the four goals of New Mexico 2045 is ***Asset Management: optimize spending to cost effectively preserve our transportation assets in the best possible condition over the long term.*** Three of the five objectives for this goal directly align with the TAMP.

- Maintain pavement in a state of good repair
- Maintain bridges in a state of good repair
- Assess and address system risks to improve resiliency

MAKING THE INVESTMENT

NMDOT's asset investment strategies are based on high level policies that emphasize preservation and ensure minimum standards based on different tiers of the transportation network. Available funds are allocated based on review of objective data about asset condition. Underlying the investment strategies are the performance targets and projections, life cycle planning, risk management analysis, and anticipated funding and cost of future work.

NMDOT policy has been to dedicate a significant portion of flexible spending to preservation of the existing system, to keep it in a state of good repair. Preservation allocations are balanced against the need to replace assets that have reached the end of their service life or require improvement to meet important safety and mobility needs. NMDOT's current processes for identifying and prioritizing pavement and bridge projects, and assigning funds to programs and projects in the STIP, continues to evolve as NMDOT works to improve its data and analysis capabilities. The agency continues to implement its shift from district-based allocation decision-making to needs-based and target driven decision-making at both a statewide and district level.

MANAGING RISK

Effective management of the risks to NMDOT's transportation system supports its broader goals of asset management, safety, mobility and accessibility, and program delivery. By identifying risks, planning mitigation strategies, and implementing mitigation activities, especially for the project delivery and climate & resiliency risks, NMDOT allows the life cycle plan to stay on track and helps achieve performance objectives.

CLIMATE CHANGE INITIATIVES

In January 2019, Governor Michelle Lujan Grisham issued Executive Order 2019-003 on Addressing Climate Change and Energy Waste Prevention, establishing an interagency task force that includes NMDOT. In response to that effort, NMDOT is implementing emission-reducing design changes including the use of warm-mix asphalt in pavement, the incorporation of Complete Streets strategies into the Design Manual, and the addition of green stormwater infrastructure guidelines into the Stormwater Manual. Warm-mix asphalt has been proven to reduce CO2 emissions by 30-40% by including recycled materials in the asphalt and reducing the fuel required to heat the asphalt..

NMDOT conducted a resiliency study in 2021 to better understand the risks to its infrastructure, and to prioritize vulnerable areas. The study included a screening of vulnerable state-owned roadways and bridges based on current condition and potential natural hazards such as wildfires, floods and rockfall. Through the study, the agency generated a ranked list of state-owned facilities according to their vulnerability. Further analysis identified eight areas where segments of the NMDOT network may be vulnerable to extreme weather, all but one of which is on the Interstate.

NEW MEXICO'S TRANSPORTATION ASSET MANAGEMENT PLAN

NMDOT's 2022 TAMP establishes the current condition of the highway and bridge assets in the state and provides a strategy for maintaining these assets in a state of good repair. The TAMP specifically addresses NMDOT's plan to achieve the performance goals set forth in recent federal legislation.

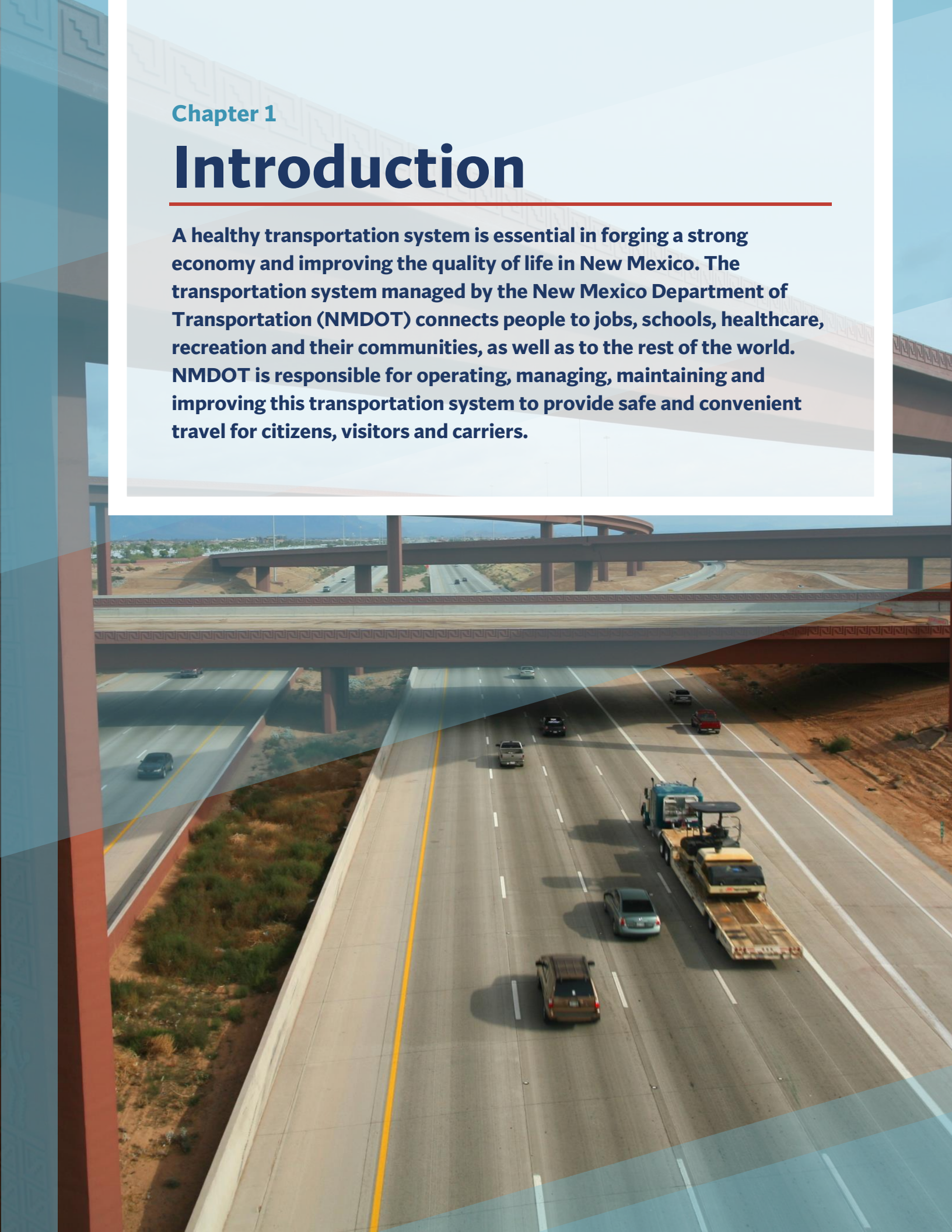
This executive-level report outlines the key elements of the plan, describes the investments needed to reach performance targets, and highlights the top priorities on the path to implementation. Once complete, the updated 2022 TAMP will published online at: **http://dot.state.nm.us**.

Table of Contents

Chapter 1

Introduction

A healthy transportation system is essential in forging a strong economy and improving the quality of life in New Mexico. The transportation system managed by the New Mexico Department of Transportation (NMDOT) connects people to jobs, schools, healthcare, recreation and their communities, as well as to the rest of the world. NMDOT is responsible for operating, managing, maintaining and improving this transportation system to provide safe and convenient travel for citizens, visitors and carriers.



Overview

Maintenance and preservation of infrastructure is a critical aspect of NMDOT's responsibilities. Infrastructure requires continual investment to remain in a safe and serviceable condition. Deferring investments for infrastructure preservation can result in higher long-term costs for repair and rehabilitation and can mean added costs and delays for travelers due to poor pavement conditions and posted bridges. Realities of limited funding mean that NMDOT must balance multiple competing needs for infrastructure preservation and system improvement and ensure that available dollars are invested in the most effective way possible. To this end, NMDOT uses Transportation Asset Management (TAM), a strategic and systematic process of operating, maintaining, and improving physical assets effectively throughout their life cycles. Figure 1-1 illustrates the different elements of a transportation asset management program.

Figure 1-1. Asset Management Elements

This Transportation Asset Management Plan (TAMP) describes how NMDOT intends to maintain its major infrastructure assets in a state of good repair. It describes the current state of the assets, projects future asset conditions and expenditures, and provides a roadmap for making continued improvements to NMDOT's asset management business processes and capabilities. The Plan presents measurable objectives and concrete strategies for maximizing the benefit of New Mexico's investments in its transportation infrastructure assets. The TAMP is a living document prepared by NMDOT's Asset Management & Planning Division. It will be reviewed and updated regularly.

Context for Transportation Asset Management at NMDOT

NMDOT's vision and goals provide the umbrella policy context for TAM – emphasizing the importance of maintaining existing assets as part of a balanced program to improve safety and mobility, foster economic vitality and provide excellent customer service.

Data-Driven Decision Making

Justin Reese, New Mexico DOT Deputy Secretary

The New Mexico DOT collects significant data on the condition and performance of its transportation system. "The data we collect is vital to our decision-making," says Deputy Secretary Justin Reese. "Our bridge and pavement management systems use that data to model future performance. That helps us choose the correct treatment for each segment of road, and for each bridge. It allows us to predict future system performance and continuously strive for a state of good repair."

"NMDOT's Strategic goals – safety, preservation, mobility, and economic vitality – align very well with Governor Lujan Grisham's goals for the state. Data-driven decision-making allows us to demonstrate to the public that we are using taxpayer dollars in the most effective way possible. It provides the basis for and supports the implementation of the TAMP. And it gives us confidence in the positive future performance of our transportation system. Relying on the data allows NMDOT to balance the needs of various parts of the State while still achieving its system condition and performance goals."

NMDOT Vision & Goals

NMDOT's vision is to set the standard for a safe, reliable, and efficient transportation system, for a safe and sustainable multimodal transportation system that supports a robust economy, fosters healthy communities, and protects New Mexico's environment and unique cultural heritage. Its four goals are to:

- Safety: Improve safety for all transportation system users
- Mobility & Accessibility: Efficiently and equitably invest in infrastructure and technology to provide reliable multimodal access and connectivity, improve mobility, foster economic growth, and minimize transportation's contribution to climate change
- Program Delivery: Deliver transportation programs through approaches and processes that improve resiliency, respect New Mexico's unique cultures, and promote fiscal and environmental stewardship
- Asset Management: Optimize spending to cost effectively preserve our transportaion assets in the best possible condition over the long term

TAM at NMDOT focuses on the fourth goal. NMDOT uses a data-driven, performance-based approach to make the best use of available resources to preserve its infrastructure assets over the long term.

NMDOT Transportation Asset Management Mission

NMDOT's TAM Mission is to use data-driven asset management to maximize the use of limited public resources and maintain the state's transportation infrastructure in the best possible condition. The implementation of the TAMP will allow NMDOT to:

- Manage assets better over the long term
- Locate and understand gaps in performance
- Prioritize gaps and asset needs
- Streamline business processes
- Meet MAP-21, FAST Act, and Bipartisan Infrastructure Law (BIL) TAM and TAMP requirements.

Key elements of this mission are reflected in this Transportation Asset Management Plan:

- **A data-driven approach** – using sound information on pavement and bridge condition to assess current performance, identify gaps to be addressed and set priorities for improvement considering risk
- **A long-term approach** – employing scenario analysis and best available information about future revenues and asset life cycles to predict future needs, set realistic performance targets and plan for the most cost-effective set of strategies to meet these targets
- **An integrated approach** – involving a connected process of policy formulation, planning, program development, implementation, and performance analysis
- **A transparent approach** – establishing clear goals, objectives, and performance targets, and reporting on progress in a manner that tells a clear story about which targets have been met, which have not, and what obstacles have prevented target achievement
- **A continuous improvement approach** – regularly taking stock of current asset management business practices, data and information systems and moving forward with priority initiatives for strengthening the data-driven, performance-based approach.

Scope of the TAMP

This version of NMDOT's TAMP focuses on pavement and bridge assets which are the foundation infrastructure for New Mexico's highway system. The plan covers all of the state-owned and maintained pavement and bridge assets, as well as the non-state-owned pavement and bridge assets in New Mexico that are on the National Highway System (NHS).

The NHS is a national network of 223,000 miles of the nation's most important roads including the Interstate Highway System and major freeways and arterials such as Interstate 40 and Highway 84. The NHS comprises only 5.4% of the nation's road miles but carries 58% of total highway traffic and at least 97% of total truck volume. The New Mexico portion of the NHS is depicted in Figure 2-2.

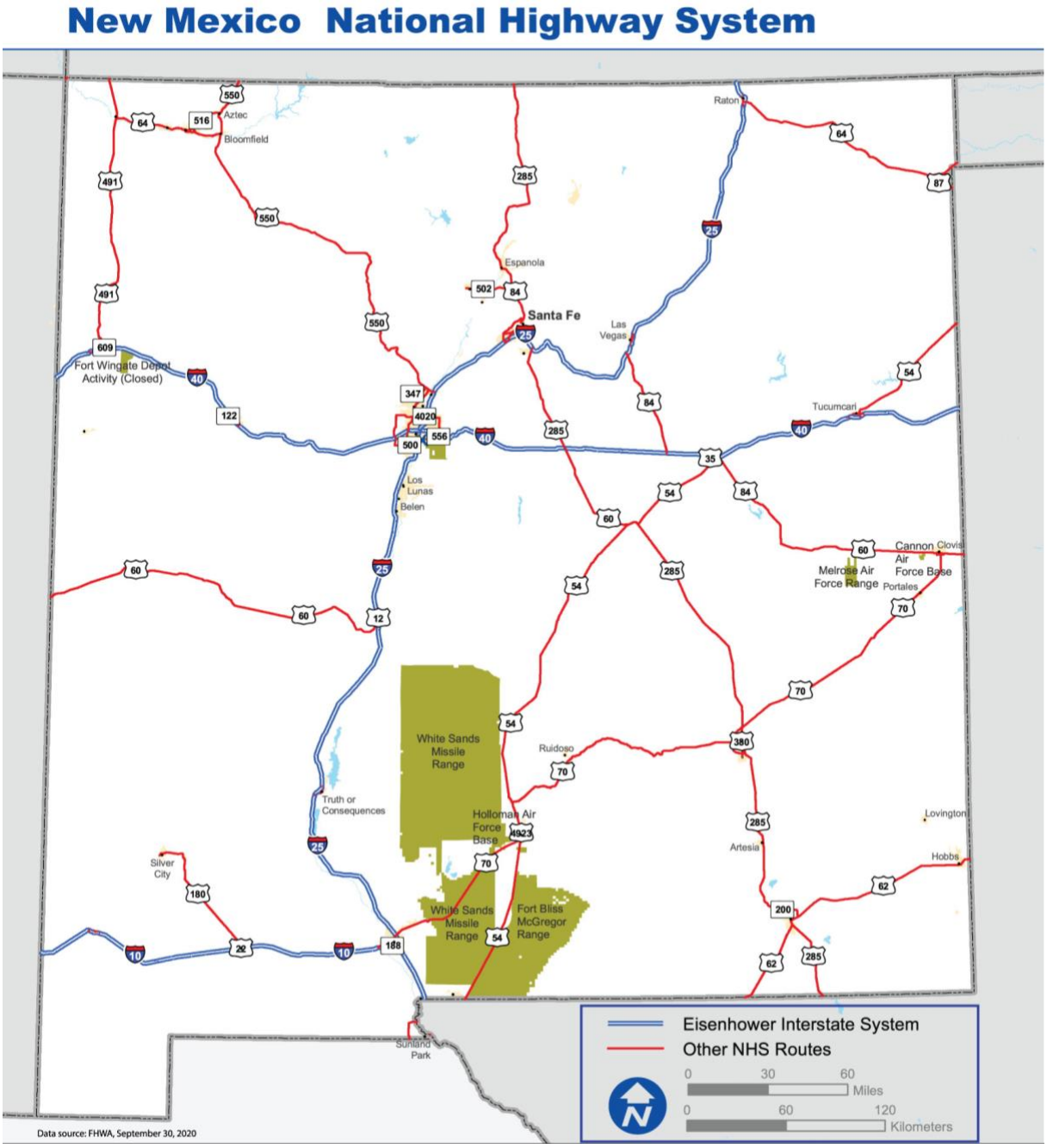


Figure 1-2. National Highway System in New Mexico

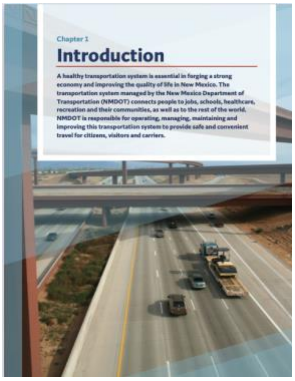
Relationship to Other Documents

New Mexico's transportation system extends well beyond the scope of this TAMP. It includes additional roadways owned by localities and others, as well as transit, rail, and aviation systems, all with a mix of publicly and privately owned assets. The agency periodically prepares a Long-Range Statewide Transportation Plan (LRSTP) that describes the full extent of the state's transportation system and includes projections of the future use of the system. The most recent LRSTP, The New Mexico 2045 Plan, was published in July 2021. Additional documents, such as the Statewide Transportation Improvement Plan (STIP), the New Mexico Freight Plan, New Mexico State Rail Plan, and the New Mexico Strategic Highway Safety Plan (SHSP), detail various aspects of the system, its use, and investment needs. This TAMP complements those other important resources.

TAMP Organization

The TAMP is organized into eight chapters, detailed below.

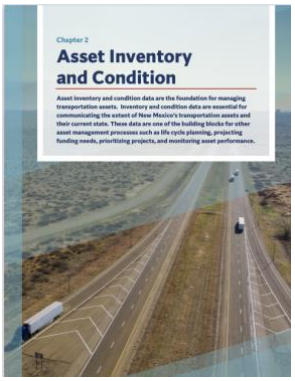
Introduction



This chapter summarizes the context, scope, and organization of the 2022 NMDOT TAMP. It discusses relevant federal requirements and describes how the TAMP satisfies these requirements.

- The NMDOT TAMP Overview sets the context and describes the scope of the 2022 TAMP
- The TAMP Organization summarizes the contents of each chapter of the TAMP

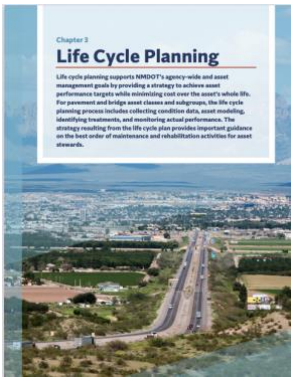
Inventory and Conditions



This chapter summarizes the inventory and condition of NMDOT-owned and NHS pavements and bridges. Asset data are broken down into various levels of detail.

- It summarizes the inventory and condition of NMDOT-owned assets.
- It also summarizes the extent and ownership of the NHS, as well as asset conditions representing the current state of NHS pavement and bridge assets

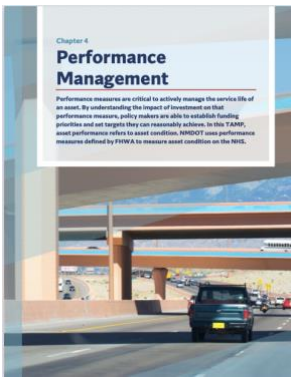
Life Cycle Planning



This chapter summarizes NMDOT's approach to life cycle planning, the process to estimate the network level cost of managing an asset while maintaining condition and minimizing cost.

- It provides an overview of life cycle planning and defines NMDOT's asset management approach and how it is used to guide investments.
- Bridge and pavement management systems use deterioration models, treatments, and funding scenarios to forecast asset conditions, recommend treatments, and generate prioritized lists of projects.
- The chapter also describes how life cycle planning fits into the NMDOT Planning and Programming process.

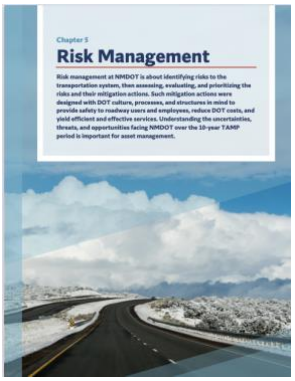
Performance Management



This chapter summarizes NMDOT's measures of asset condition for pavements and bridges, lists performance targets, provides predictions of future performance, and addresses performance gaps.

- It describes both state and federal performance measures for asset condition and how they are used to support TAM at NMDOT.
- The performance targets show NMDOT's 2- and 4-year performance targets, required by the Federal Highway Administration (FHWA) for NHS assets, that reflect anticipated conditions.
- The performance projections represent NMDOT's forecasts of pavement and bridge conditions based on current condition data, deterioration modeling, and estimated funding levels.
- The gap analysis shows any gaps between expected performance and desired performance, and identifies strategies to address forecasted deficiencies.

Risk Management



This chapter summarizes the NMDOT approach and actions for asset risk management.

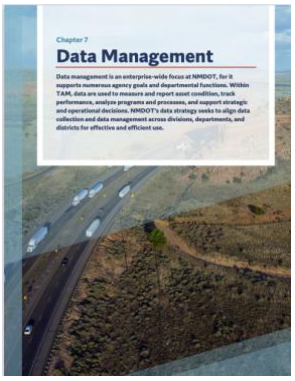
- It provides an overview of risk management and NMDOT's approach to risk management and resiliency.
- The resiliency initiatives communicate what has been done and what is underway at NMDOT to address risks, build resiliency and address climate change.
- Risk management processes at NMDOT describe the steps and sequence of activities to manage risks.
- The risk register represents NMDOT's identification of risks and the assessment of likelihood and impact.
- The mitigation plan describes the actions that NMDOT will take to reduce and monitor risks.
- It includes a description of assets with repeated damage due to emergency events, as required by federal law.

Financial Plan and Investment Strategies

This chapter summarizes the cost of future programmed work to implement the investment strategies outlined in this asset management plan and expected levels of funding over a 10-year period.

- It describes funding sources and how they are used to support TAM at NMDOT for the NHS and for the state system, comprised of all state-maintained roads and provides a valuation of assets included in the TAMP.
- The financial plan shows NMDOT's planned and estimated available funds for TAM and anticipated allotments for bridges and pavements over the 10-year period of the TAMP.
- The investment strategies represent an approach to applying the resources described in the financial plan, using the treatment strategies described in the Life Cycle Planning chapter, managing the risks presented in the Risk Management chapter, and closing the performance gaps detailed in Performance Management chapter.

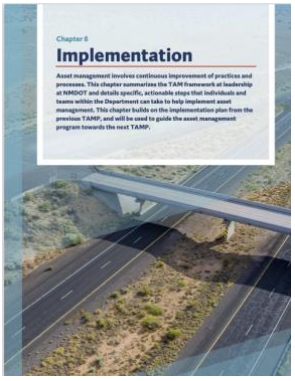
Data Management



This chapter presents how NMDOT manages its data and uses management systems to support TAM decision-making and operate its TAM program. Good data and systems provide a strong foundation for transportation asset and performance management.

- It describes the data and management systems used at NMDOT to guide investment decisions for pavements and bridges and link those decisions to the State Transportation Improvement Program.
- The Strategic Data Business Plan guides data management and governance for NMDOT and its partners.

Implementation

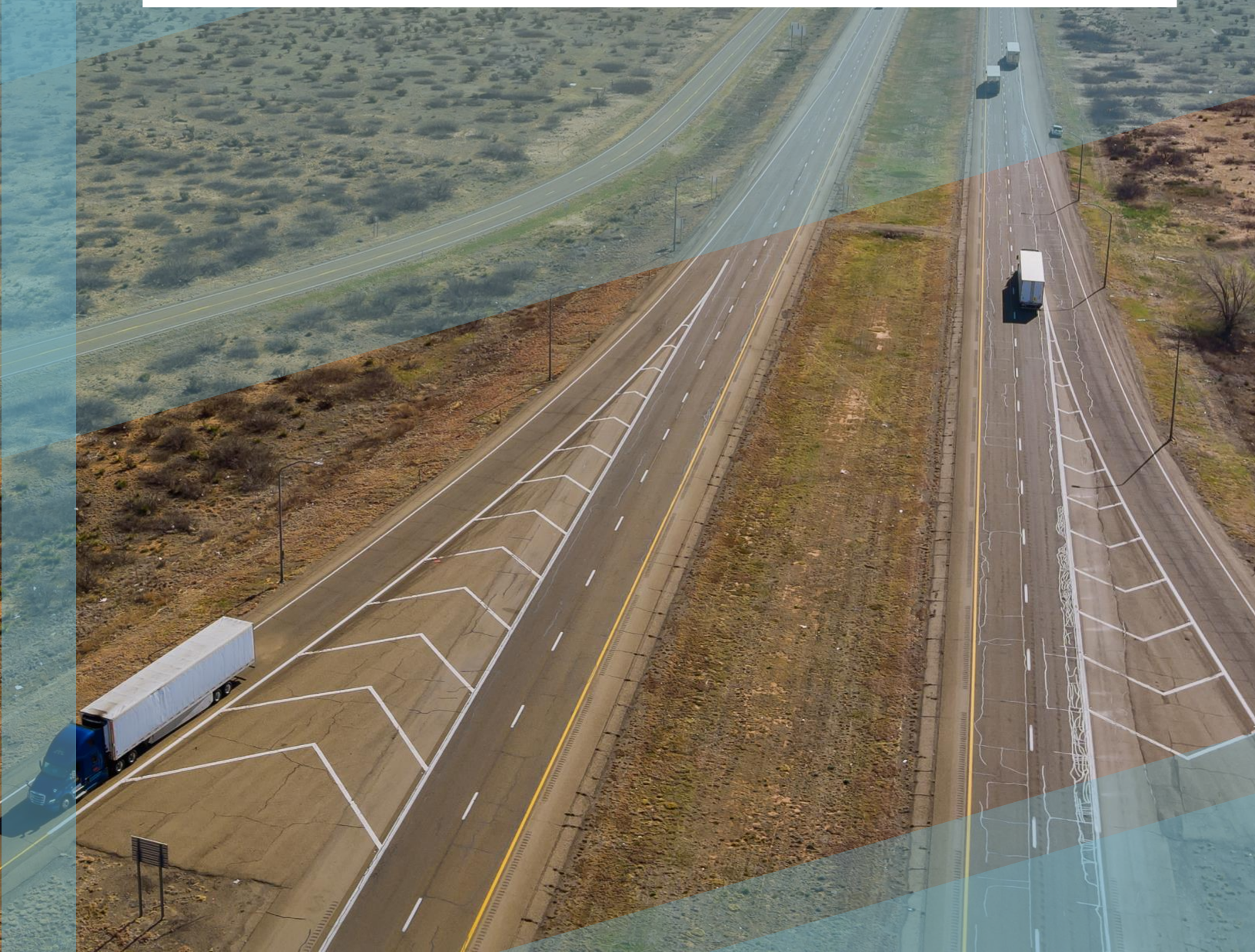


This chapter presents NMDOT's TAM framework and leadership, showing the organizational structures in place to support and implement TAM. The chapter also includes a summary of prioritized process improvements for the TAM program, identified by the Asset Management Steering Committee (AMESC).

Chapter 2

Asset Inventory and Condition

Asset inventory and condition data are the foundation for managing transportation assets. Inventory and condition data are essential for communicating the extent of New Mexico's transportation assets and their current state. These data are one of the building blocks for other asset management processes such as life cycle planning, projecting funding needs, prioritizing projects, and monitoring asset performance.



Overview

In this plan, asset information is summarized in two ways: 1) for the entire NMDOT-maintained system (portions of which are on the NHS), and 2) for the entire NHS (covering both state and non-state-maintained facilities). This TAMP asset data representing asset inventory and conditions as of 2021. The first view focuses on assets that are under NMDOTs direct control; the second view is consistent with federal requirements for the TAMP.

While pavement and bridge assets are the focus of this TAMP, it is important to recognize that the highway system consists of a wide variety of physical assets, as depicted in Figure 2-1. While these other assets are not specifically inventoried or itemized in this plan, in many cases replacement or rehabilitation of roads and bridges includes replacement or upgrades to ancillary assets. For instance, the cost of reconstructing or replacing a bridge includes the cost of guardrail, and pavement projects often include upgrades to associated traffic and safety assets. Where applicable, costs associated with these ancillary assets are included in the costs of maintaining bridges and pavement.

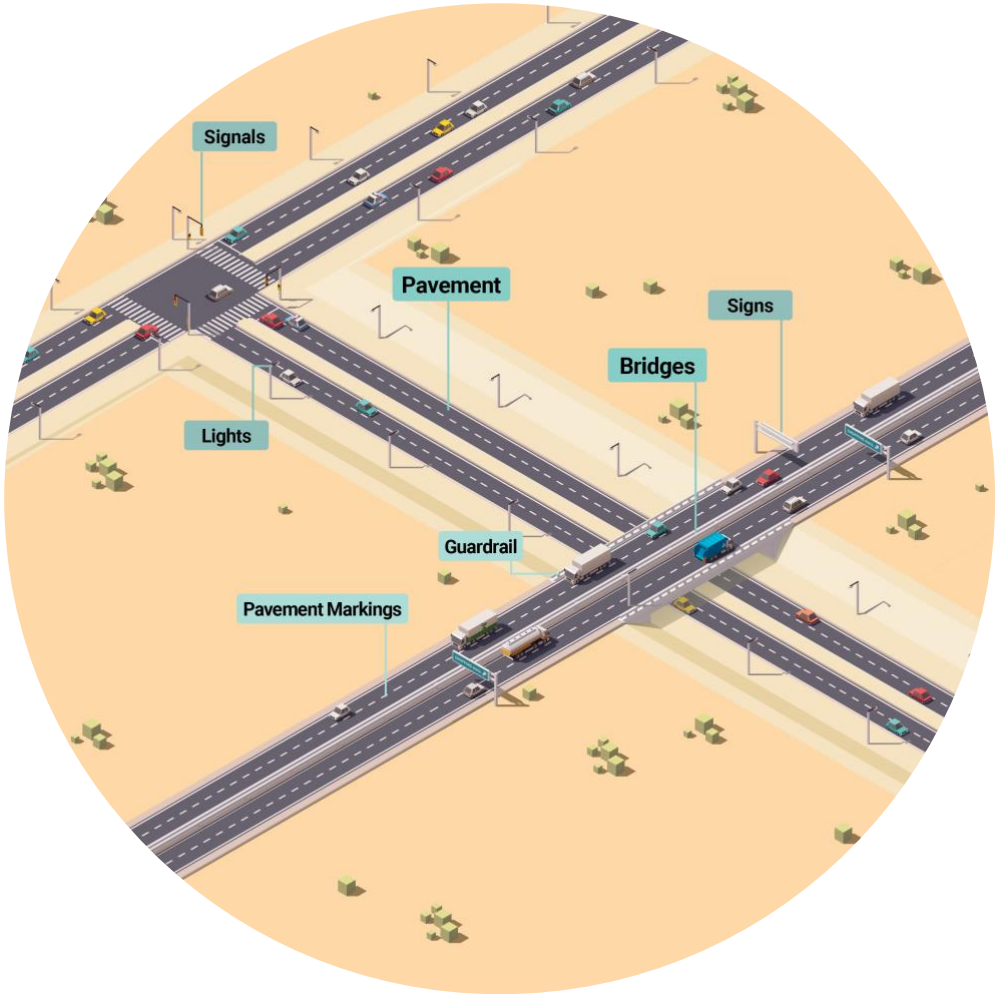


Figure 2-1. Typical Roadway Assets

The New Mexico state-maintained highway system encompasses 28,118 lane miles of pavement and 2,977 bridges (with 19,119,701 square feet of deck area). Over 95% of NMDOT-maintained bridges (by deck area) are in good or fair condition while 96% of NMDOT-maintained pavements are in good or fair condition.

The NHS consists of 11,369 lane miles of pavement and 1,617 bridges (with 11,815,228 square feet of deck area). Over 97% of New Mexico NHS bridges (by deck area) are in good or fair condition while over 98% of New Mexico NHS pavements are in good or fair condition.

Figure 2-2 below provides a summary of NMDOT-maintained NHS and total NMDOT-maintained bridge and pavement inventory and conditions by district. Further details are provided on bridges and pavement in the following sections.

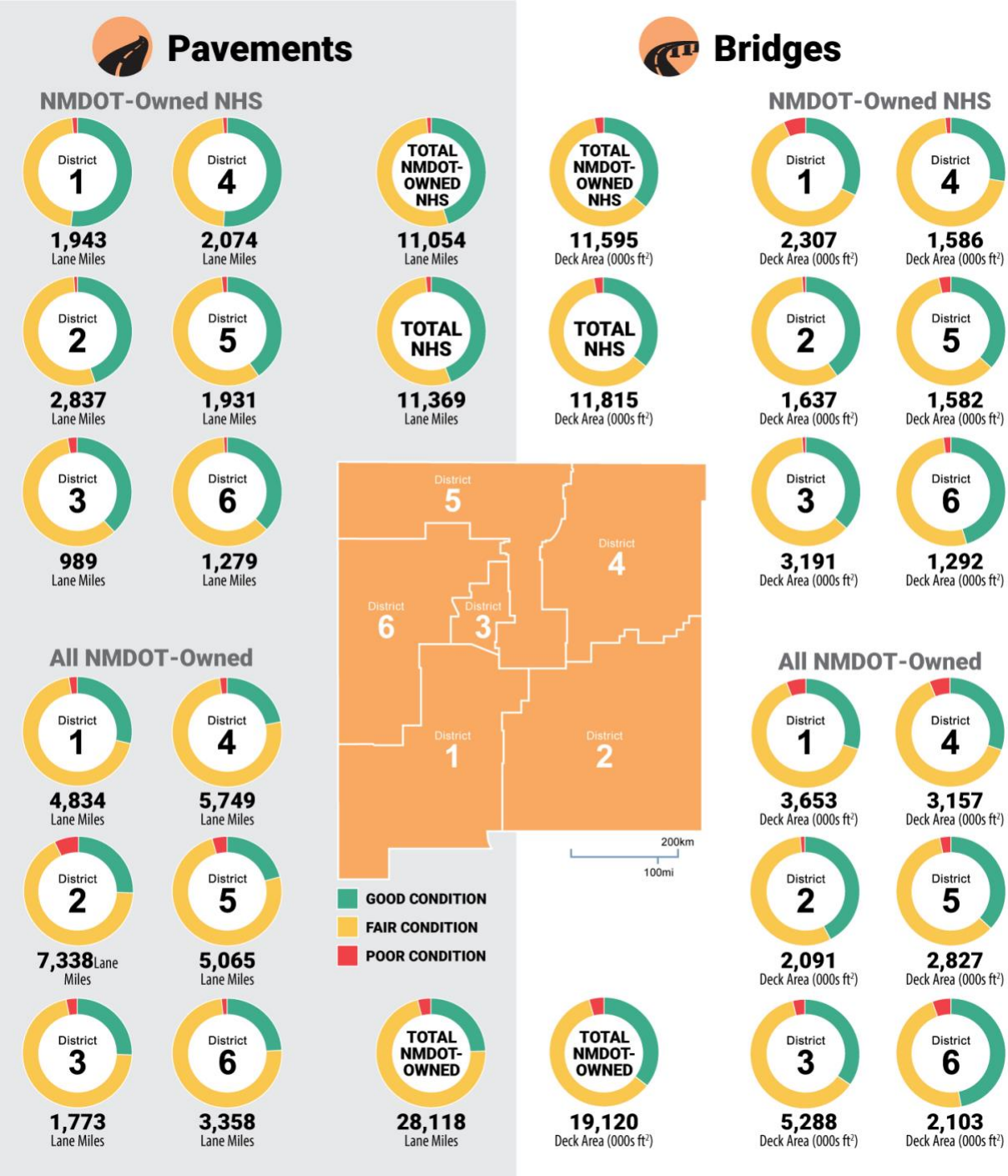


Figure 2-2. Summary NMDOT-Owned and all NHS Asset Conditions

Bridges

Bridges provide road network connectivity, spanning water bodies and other natural features, rail lines, and other roadways. New Mexico's bridge inventory includes a number of landmark structures, such as the Rio Grande Gorge Bridge on Highway 64, as well as many smaller structures such as overpasses on the Interstate system.

Today's bridges are designed to last at least 75 years. Many bridges remain in service for much longer. However, bridges require periodic maintenance to maintain or replace individual components (such as deck joints) that have a shorter life than the major components of the bridge. If maintenance work on a bridge is deferred, the deterioration may accelerate to the point where more costly repairs are needed. In extreme cases, deteriorated conditions may require restricting the loads the bridge can carry or closing the bridge until needed repairs are completed – which can lead to costly detours for road users. Thus, it is in NMDOT's interest to maintain bridges in good condition as it can result in the lowest long-term costs both to NMDOT and to travelers.

Bridge Inventory

Table 2-1 summarizes New Mexico's highway bridge inventory by whether the bridge is state-maintained (combined for both NHS and non-NHS bridges) or on the NHS network (combined for both state and locally maintained bridges). The table shows the number and the deck area of these bridges. Including deck area helps in estimating required future resources, as bridge rehabilitation and replacement costs are usually a function of bridge size.

NMDOT manages 2,977 bridges, 1,602 of which are on the NHS. There are 1,617 bridges on the NHS in total, including bridges owned and maintained by other agencies – predominantly cities and towns. Not included in the table below are 779 non-state-owned, non-NHS bridges included in New Mexico's bridge inventory that are subject to FHWA National Bridge Inventory (NBI) inspection standards.

Table 2-1. New Mexico Bridge Inventory

	Bridge Count	Deck Area
All State-maintained Highway Bridges	2,977	19,119,701
All NHS Bridges	1,617	11,815,228

2021 inventory and conditions from NMDOT Bridge Deck Report

Bridge Performance Measures

NMDOT follows FHWA NBI standards for inspecting all bridges on public routes in New Mexico except for federally owned bridges. Inspectors record overall ratings for a bridge's deck, superstructure, and substructure on a scale from 0 (failed) to 9 (excellent condition). Structures classified as culverts are included in the inventory if they are longer than 20 feet. For these structures, a single culvert rating is recorded using the same 0-9 scale.

Bridge condition ratings are used to classify the bridge as being in good, fair, or poor condition. The lowest of the three ratings for deck, superstructure and substructure determines the rating. If this value

is 7 or greater the bridge is classified as being in good condition. If it is 5 or 6 the bridge is classified as being in fair condition, and if it is 4 or less the bridge is classified as being in poor condition. A bridge in poor condition is considered Structurally Deficient (SD)[1]. While a bridge may be classified as SD, this does not mean that the bridge is unsafe, rather that deficiencies have been identified that require maintenance, rehabilitation or replacement.

NMDOT also performs element-level inspections that provide additional detail on individual components of a bridge. Element-level information is not factored into designation of SD or good, fair, poor condition ratings.

Bridge Condition

Table 2-2 summarizes the condition of the NMDOT-owned NHS and non-NHS bridge inventory and the locally owned NHS bridge inventory. The conditions are summarized by the percent of bridges in good, fair, and poor condition, weighted by deck area. 95.8% of NMDOT's bridges (weighted by deck area) are in good or fair condition and 4.2% are in poor condition.

Table 2-2. New Mexico Bridge Conditions

Owner	NHS Designation	Percent of Deck Area		
		Good	Fair	Poor
NMDOT	NHS	36.1%	61.2%	2.6%
	Non-NHS	34.9%	58.4%	6.7%
	Total	35.7%	60.1%	4.2%
Locally Owned	NHS	28.8%	71.2%	0.0%
NMDOT + Locally Owned	NHS	36.0%	61.4%	2.6%

2021 inventory and conditions from NMDOT Bridge Deck Report

As shown in Figure 2-3, New Mexico bridge condition has been steadily improving since 2002. The percentage of NMDOT bridges (weighted by deck area) classified as poor or SD has decreased from a high of over 16% in 2004 to less than 5% today. During this time, NMDOT has made a considerable investment in bridge preservation by funding rehabilitation projects to address bridges in poor condition and preventive maintenance projects to extend the service life of bridges in fair or good condition. Note Figure 2-3 only includes span bridges.

[1] Other factors besides condition ratings may result in an SD classification (e.g., waterway adequacy).

Figure 2-3. Percent of NMDOT Span Bridge Deck Area Classified as Poor

Telling the Story: Balancing Network Preservation Needs

Ben Najera, Engineer Manager, Bridge Bureau

With the average age of NMDOT's bridges being over 50 years, the Department faces a challenge in balancing its priorities between urban and rural routes and on roadway and bridge work. "NMDOT is currently below 5% of bridges identified as being in a poor condition. We would like to remain at the same level of condition or even further decrease our level of structurally deficient bridges," says Ben Najera, Bridge Management Engineer.

To help make it happen, the Department has set aside $13 million annually to develop bridge rehabilitation and bridge preventive maintenance projects. While federal regulations emphasize the performance of the NHS system, New Mexico's vast rural areas require an extensive roadway network connecting urban areas and providing access to the rural areas. Many of New Mexico's natural resource industries are found in outlying areas of the state.

"Being able to estimate our future bridge conditions and bridge needs is critical in prioritizing limited funding and limited resources", Ben says, "as the Department faces the challenge of determining where to spend these limited funds, more life cycle cost analysis will need to be performed to ensure that these funds are spent effectively and efficiently."

Pavements

Highway pavements are designed to support anticipated traffic loads and provide a safe and relatively smooth driving surface. Most of the state highway system pavement is classified as "flexible" – hot mix asphalt or other bituminous-treated surface over a subgrade. A small portion of the inventory is "rigid" – constructed from concrete with no asphalt overlay. Pavement life varies based on a variety of design properties, construction practices, the traffic loads to which the pavement is subjected, and environmental conditions (e.g. freeze-thaw cycles.)

While flexible and rigid pavements deteriorate differently, in general pavements become rougher with age and exhibit cracking and other signs of distress. Flexible pavements may develop ruts. Keeping pavements in good condition lengthens their life, enhances safety and helps reduce road users' operating costs. Numerous studies have shown that rough roads cause more wear and tear on vehicles and may result in decreased vehicle speeds.

Pavement Inventory

NMDOT manages a pavement network of over 13,000 centerline miles, or slightly over 28,000 lane miles. 99% of NMDOT's pavement network is flexible pavement, with the remainder rigid. Thirty nine percent (11,054 lane miles) of the state-maintained lane miles are on the NHS, including 4,182 Interstate lane miles. Other agencies maintain an additional 316 NHS lane miles in New Mexico. Table 2-3 summarizes the inventory of NMDOT and NHS roads owned by other agencies. Table 2-4 summarizes the pavement inventory by District.

Table 2-3. NMDOT and NHS Pavement Inventory

Owner	Functional Classification	Centerline Miles	Lane Miles
NMDOT	Interstate	999	4,182
	Non-Interstate NHS	3,050	6,872
	Non-NHS	9,070	17,064
	Total	13,119	28,118
Other	NHS	78	316
NMDOT + Other	Non-Interstate NHS	3,128	7,187
	All NHS	4,127	11,369

Source: NMDOT PMS 2021 data, 2022 reporting

Table 2-4. NMDOT Pavement Inventory by District

	Interstate		Non-Interstate NHS		Non-NHS		Total	
District #	Lane Miles	Centerline Miles	Lane Miles	Centerline Miles	Lane Miles	Centerline Miles	Lane Miles	Centerline Miles
District 1	1,437	350	506	524	2,891	1,655	4,834	2,529
District 2	0	0	2,837	807	4,501	2,183	7,338	2,990
District 3	665	131	325	206	784	383	1,773	719
District 4	1,167	291	907	607	3,676	2,152	5,749	3,050
District 5	384	95	1,547	545	3,134	1,659	5,065	2,299
District 6	529	132	750	361	2,079	1,038	3,358	1,532
Total	4,182	999	6,872	3,050	17,064	9,070	28,118	13,119

Source: NMDOT PMS 2021 data, 2022 reporting

Pavement Performance Measures

FHWA Pavement Measure

This TAMP uses pavement performance measures defined by FHWA to communicate the condition of pavements in New Mexico, both NHS and non-NHS. The FHWA has selected four pavement performance measures to determine the network condition level of the NHS pavements. The pavement data supporting these measures will be reported to the Highway Performance Monitoring System (HPMS). The four measures are calculated using quantitative data based on the following metrics:

- **Pavement roughness** is an indicator of discomfort experienced by road users traveling over the pavement, measured using the International Roughness Index (IRI).
- **Rutting** is quantified for asphalt pavement by measuring the depth of ruts along the wheel path. Rutting is commonly caused by a combination of heavy traffic and heavy vehicles.
- **Cracking** is measured in terms of the percentage of cracked pavement surface. Cracks can be caused or accelerated by excessive loading, poor drainage, frost heaves or temperature changes, and construction flaws.
- **Faulting** is quantified for concrete pavements. Faulting occurs when adjacent pavement slabs are vertically misaligned. It can be caused by slab settlement, curling, and warping.

For each of these metrics, depending on the pavement type, the FHWA has established criteria for each metric to measure good, fair, and poor condition (see Table 2-5). FHWA uses these pavement condition metrics to determine the pavement condition for each one-tenth mile pavement section.

Table 2-5. Federal Pavement Measure Criteria

Federal Pavement Condition Criteria				
Metric		**Good**	**Fair**	**Poor**
IRI (inches/mile)		<95	95 – 170	> 170
Cracking (%)	Asphalt	<5	5 – 20	> 20
	Jointed Concrete	<5	5 – 15	>15
	Continuously Reinforced Concrete	<5	5 – 10	>10
Rutting Asphalt (inches)		<0.20	0.20 – 0.40	>0.40
Faulting Concrete (inches)		<0.10	0.10 – 0.15	>0.15

An individual section is rated as being in good overall condition if all of the metrics are rated as good and poor when two or more are rated as poor. All other combinations are rated as fair. The overall performance of the network is summarized as the percentage of total lane miles in each of the three good, fair and poor condition categories.

In 2013, NMDOT began collecting pavement condition data through the use of an automated collection process. A consultant is responsible for collecting pavement condition data that meets the FHWA requirements included in 23 CFR 490 on the entire NMDOT-owned pavement network. The Interstate and non-Interstate NHS pavement condition data is collected on an annual basis and approximately 50% of the non-NHS pavement condition data is collected each year in order to have data that is no more than two years old. NMDOT also collects pavement condition data on the NHS that is not maintained by NMDOT. As part of this process, NMDOT coordinates through the Local Technical Assistance Program with MPOs and RPOs.

Telling the Story: Delivering Value to Customers

David Quintana, Chief Engineer.

NMDOT balances many different considerations as it develops projects, working hard to deliver the best value to its customers. "A good transportation system is vital to the everyday lives of the people of New Mexico," says David Quintana, Chief Engineer. "It's a responsibility we don't take lightly. When you think about building roads to get children safely to school, or to help their parents get to work, that's important. Delivering safe and efficient transportation for the traveling public, promoting economic development, preserving the beautiful environment of New Mexico, building a sense of community – these are all elements we keep in mind as we develop road and bridge projects. That's why it's so important to engage local New Mexicans, to encourage their participation, to hear how the transportation system works for them. To do the work efficiently and transparently, to help ensure equity in project selection, it's also critical that we work effectively with our partners throughout the state to improve overall mobility."

NMDOT Pavement Measure

In addition to the FHWA performance measures, NMDOT also calculates a state performance measure called Pavement Condition Rating (PCR). PCR is not reported in this TAMP, but is used for life cycle planning and to conduct the performance measure correlation for predicted future conditions described in Chapter 3. Life Cycle Planning. NMDOT's process collects more data than is required for the federal measure. PCR is a composite measure based on different distresses detailed below.

Data collected on NMDOT flexible pavements includes details on the following types of distresses:

- Roughness (measurements used to calculate the International Roughness Index or IRI)
- Alligator cracking
- Edge cracking
- Patch deterioration
- Transverse cracking
- Block cracking
- Weathering and raveling
- Skid resistance
- Bleeding
- Rutting

For rigid pavements NMDOT collects data on:

- Roughness
- Corner breaks
- Longitudinal cracking
- Mid-slab cracking
- Patch deterioration
- Joint seal damage
- Joint spalling
- Faulting
- Lane to shoulder drop off/separation
- Skid resistance

NMDOT has defined the following five pavement condition categories and suggested treatments based on PCR, shown in Table 2-6. As the vast majority of NMDOT's pavements are flexible, these suggested treatments are more typical for flexible pavements.

Table 2-6. NMDOT PCR Ranges

PCR Range	Condition	Suggested Treatment
100-86	Very Good	Monitor to minor preservation - fog seals or other surface coats
85-66	Good	Major preservation to minor rehabilitation – overlays to thin mill and inlay
65-46	Fair	Minor to major rehabilitation – mill and inlay between 2.5 and 5 inches
45-26	Poor	Major rehabilitation – mill and inlay 5 inches deep to PPC, FDR
25-0	Very Poor	Reconstruction

Pavement Condition

Table 2-7 below summarizes the condition of NMDOT and NHS pavement in terms of the percent of pavement lane miles in good, fair, and poor condition, using the FHWA performance measures. As indicated in the table, 44.1% of the NHS is in good condition, 54.2% is in fair condition, and 1.7% is in poor condition. 25.5% of the NMDOT-owned system is in good condition, 70.6% is in fair condition, and 3.8% is in poor condition. Of the NHS not owned by NMDOT, 16.6% is in good condition, 72.2% is in fair condition, and 11.2% is in poor condition.

Table 2-7. NMDOT Pavement Conditions – Federal Measure

Owner	Functional Classification	Percent of Lane Miles (2021) – Federal Measure		
		Good	Fair	Poor
NMDOT	Interstate	54.9%	44.2%	0.9%
	Non-Interstate NHS	38.8%	59.4%	1.8%
	Non-NHS	13.0%	81.6%	5.4%
	Total	25.5%	70.6%	3.8%
Other	NHS	16.6%	72.2%	11.2%
NMDOT + Other	Non-Interstate NHS	37.8%	60.0%	2.2%
	All NHS	44.1%	54.2%	1.7%

Figure 2-4 shows pavement conditions in New Mexico from 2014 to 2021, using the FHWA performance measure.

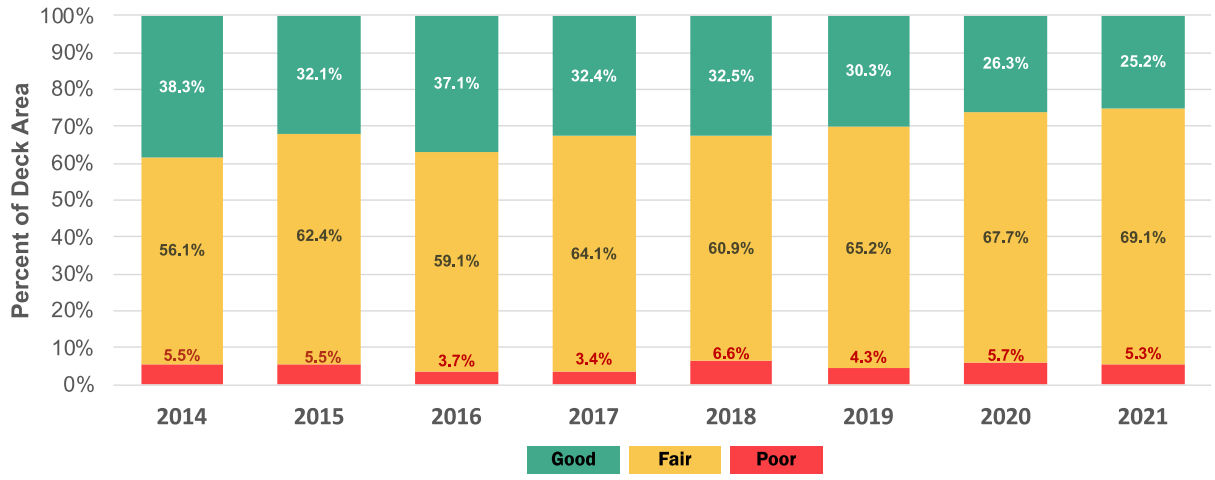


Figure 2-4. Historical Pavement Condition

Chapter 3

Life Cycle Planning

Life cycle planning supports NMDOT's agency-wide and asset management goals by providing a strategy to achieve asset performance targets while minimizing cost over the asset's whole life. For pavement and bridge asset classes and subgroups, the life cycle planning process includes collecting condition data, asset modeling, identifying treatments, and monitoring actual performance. The strategy resulting from the life cycle plan provides important guidance on the best order of maintenance and rehabilitation activities for asset stewards.

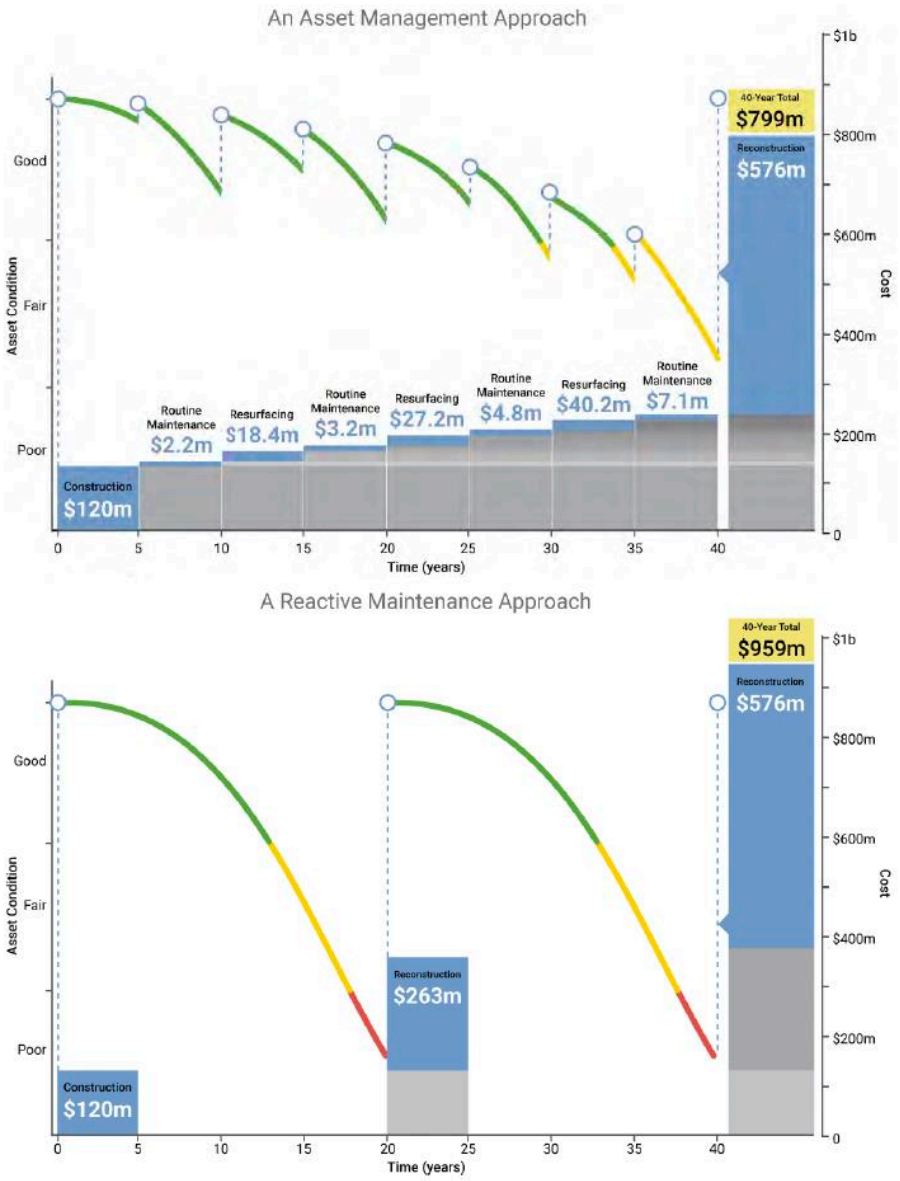
Overview

Life cycle planning means arranging the right treatments for the right assets at the right time to optimize system performance, lengthen asset life spans, and minimize maintenance costs. At NMDOT, life cycle planning is woven into the asset management framework. For all NHS and for many NMDOT-owned, non-NHS pavement and bridge assets, NMDOT undergoes the process of life cycle planning to inform their performance scenarios, financial plan, and investment strategies. To achieve effective life cycle planning, NMDOT plans and accounts for the factors impacting asset performance, treatment cost, and treatment efficiency. These factors include the risks identified in Chapter 5, current asset conditions, and future environmental and socioeconomic conditions across the state.

The NMDOT life cycle planning process begins with data collection and asset inspection, which feeds into asset management systems and predictive models. The model output informs treatment plans which are executed and simultaneously monitored via regular strategy reviews and condition assessments. For bridge and pavement asset types, NMDOT follows a well-established methodology, and each step in the process is described in detail in the subsequent sections.

Life Cycle Strategies

Life cycle strategies encompass both life cycle planning and Life Cycle Cost Analysis (LCCA). Life cycle planning focuses on network-level asset management strategies – the best sequence of maintenance and rehabilitation treatments for a given asset type, for example. LCCA supports project level decisions to select the design option that minimizes the initial cost, discounted future agency costs, user costs, and any other relevant costs over the analysis period. The basic principle underlying both life cycle planning and LCCA is that timely investments in an asset can result in improved condition and lower cumulative costs over the long term. This principle is illustrated by the graphs in Figure 3-1 below. The graphs show condition and costs over time for two example scenarios: an asset management approach of regular preventive maintenance (top panel) and a costlier reactive approach (bottom panel).



Asset Management saves money: Performing preventive maintenance keeps assets in better condition – at a lower cost over the long term.

Deferring maintenance costs more: Higher-cost reconstruction or replacement is needed when assets are not maintained in a state of good repair.

Figure 3-1. Proactive Maintenance vs. Reactive Maintenance

Source: Rhode Island DOT, Investing in Rhode Island's Future: A 10-Year Plan to Strengthen Our State's Transportation Systems. 2014. Based on an analysis published by TXDOT. Texas DOT, Typical Life Cycle Costs of a Highway, 2014. http://ftp.dot.state.tx.us/pub/txdot-info/tpp/2040/life-cycle-costs-of-a-highway.pdf

Telling the Story: Doing the Right Thing at the Right Time

John Romero, Highway Operations Support Division Director

Life cycle planning means investing in the right fix at the right time to extend the life of an asset for the lowest possible cost. John Romero, Highway Operations Support Division Director, understands the complexities of life-cycle planning and project selection. "The system has so many needs, and there are so many options for how to fix and when to fix an asset," he says. "Properly assessing roadway condition and implementing suitable treatments in a timely manner will extend the life of our infrastructure. Through appropriate preventative maintenance, we can keep resurfacing costs reasonably low while keeping our pavements in good condition. When pavements slip out of good condition, they can quickly deteriorate significantly increasing the cost to repair. An effective Transportation Asset Management Plan and the data we collect on the system's condition, will support the NMDOT's efforts to continue to improve its Life Cycle Planning."

In order to optimize the life of an asset, the agency should understand costs and benefits of different treatment types. Life cycle planning involves the use of predictive asset deterioration models for different treatment types. Ideally these models are developed based on the applied treatments and measured conditions over several years. In practice, these models are typically based on a combination of data and expert judgment.

Current NMDOT practices for bridge and pavement life cycle planning are described below. For each asset, NMDOT has well-established processes for inspection and condition assessment, assignment of appropriate treatments (including LCCA for pavements), modeling of future asset condition based on realistic funding assumptions, and program monitoring to track the progress of asset preservation and gather information needed to improve modeling assumptions over time.

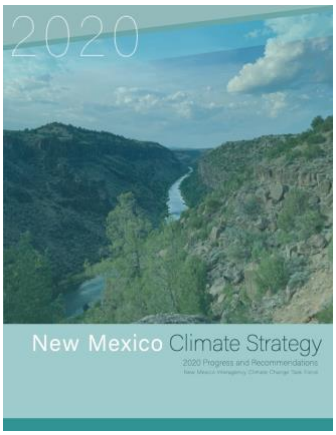
Federal Legislative Context

FHWA requires that State DOTs establish and follow a process for conducting life cycle planning at the network level for all NHS bridges and pavement. They define life cycle planning as a "process to estimate the cost of managing an asset class, or asset sub-group over its whole life with consideration for minimizing cost while preserving or improving the condition." The following elements must be included:

- Identification of deterioration models
- Potential work types, including treatment options and unit costs
- A strategy for minimizing life cycle costs and achieving performance targets
- Asset performance targets.

Climate Change and Resiliency

Transportation is the second largest source of greenhouse gas emissions in the state of New Mexico. To combat the threat of climate change, Governor Michelle Lujan Grisham established an interagency Climate Change Task Force, which developed a New Mexico Climate Strategy in 2019, later updated in



2020. The Climate Strategy report outlines methods for addressing greenhouse gas emissions in the highest-producing sectors in the state and developing emergency-preparedness and infrastructure resilience. Within transportation and the built environment, the report focuses on increasing the adoption of clean vehicles, reducing vehicle miles traveled, and improving infrastructure investments and designs. They reference the State Natural Hazard Mitigation Plan which culminates the hazard mitigation plans from county, municipal, and tribal governments into a state-wide plan covering the natural hazards of drought, wildfire, flooding, extreme heat and land subsidence. Since many of the resiliency modifications will likely be installed over the next 10-20 years, they must be considered when conducting life cycle analyses of NMDOT assets.

Examples of emission-reducing design changes include the use of warm-mix asphalt in pavement, the incorporation of Complete Streets strategies into the Design Manual, and the addition of green stormwater infrastructure guidelines into the Stormwater Manual. Warm-mix asphalt has been proven to reduce CO2 emissions by 30-40% by reducing the fuel required to heat the asphalt, and including recycled materials in the asphalt also reduces the environmental cost.

One recent success at NMDOT was the I-25/University Avenue Interchange Improvements Project, which was completed in October 2021 and received an Envision Silver rating from the Institute for Sustainable Infrastructure. The rating recognizes the project's wide-ranging sustainability achievements in improving overall community quality of life, demonstrating leadership in sustainability, using resources efficiently, protecting the environment, and improving climate resilience. The project included improvements to user safety, new pedestrian and bicycle connections, energy efficient lighting, and changes to reduce congestion.

Other pushes to increase environmentally-friendly projects and design come from state-wide goals and programs. For two federally funded-programs administered by NMDOT, the Transportation Alternatives Program and Congestion Mitigation and Air Quality Improvement Program, program administrators began to consider impacts to greenhouse gas emissions when scoring and selecting projects in the May 2021 call for applications. The push to reduce VMT also adds greater incentive for multimodal and active transportation projects.

The inclusion of metrics, projects, and designs that reduce the emissions of greenhouse gases and increase the infrastructure's resilience to natural hazards into NMDOT's life cycle planning is a key step towards meeting the state environmental goals and achieving compliance with the BIL.

Bridge

Life cycle planning for bridges requires an evaluation of the optimal sequence of treatments that minimize lifecycle costs required to maintain or improve bridge network conditions. It requires the development of deterioration models for bridge components, service life benefits of preventive maintenance and rehabilitation activities, and the costs associated with the preventive maintenance and rehabilitation efforts. Figure 3-2 summarizes the four main elements of the life cycle planning process: inspection, modeling, treatments, and monitoring.

Figure 3-2. Bridge Life Cycle Planning Process

A Bridge Management System (BMS) is a key tool used by DOTs for life cycle planning. A BMS uses bridge inspection data, gathered at the component and element levels as required for the NBI program, deterioration models, treatments, and costs to recommend treatments and estimate future conditions. A BMS may recommend treatments across a wide range of treatments for the deck, superstructure and substructure elements such as deck sealing, joint replacement, painting of steel elements, and concrete repair. Under constrained budgetary environments, the models will prioritize recommendations once the system managers or modelers define their agency rules. Those rules consider factors such as functional classification, load restrictions, preventative maintenance cycles and rehabilitation or replacement thresholds.

Inspection

NMDOT uses data from its bridge inspection program to establish overall bridge conditions and identify bridges that require treatment. All inspections follow the NBI requirements and include the collection of required NBI measurements and element-level condition data which is used to quantify element and bridge condition. Most bridges are inspected on a 24-month cycle and most NBI culverts are inspected on a 48-month cycle, following federal regulations.

Bridge inspection is overseen by the NMDOT Bridge Management Section, located within the General Office (GO) Bridge Bureau, and it is implemented by the Districts (75% of inspections) and New Mexico State University (NMSU) (25% of inspections). The District bridge management workforce consists of bridge engineers, engineer coordinators, and other designated staff who work under the Assistant District Engineer in each of the NMDOT Districts. Though staffing levels vary across Districts, the inspection process remains the same. Figure 3-3 summarizes bridge inspection at NMDOT.

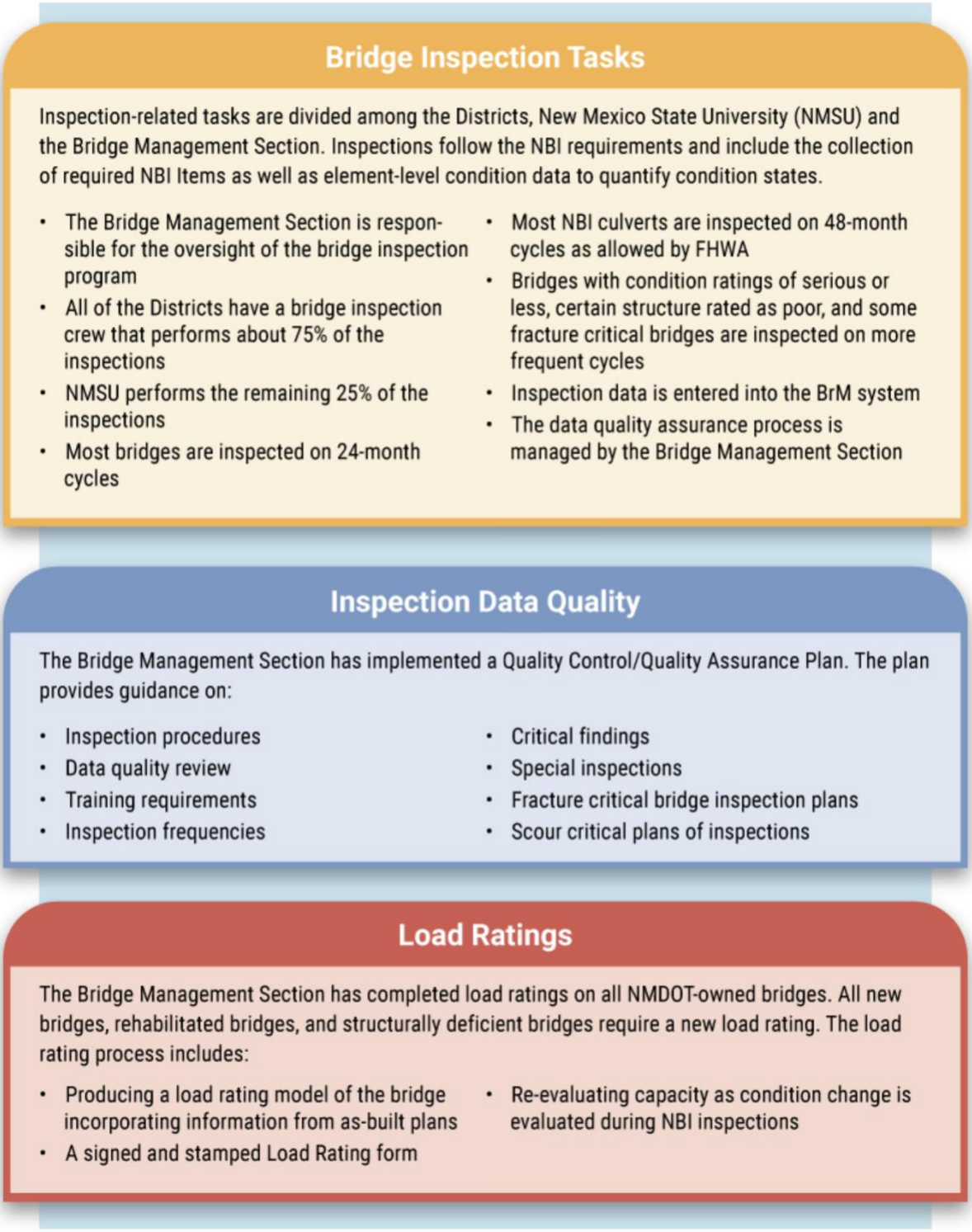


Figure 3-3. Bridge Inspection at NMDOT

Modeling

NMDOT utilizes a spreadsheet model to forecast bridge condition given the budget and suitable treatments. The spreadsheet was developed by NMDOT with the support of a consultant prior to the 2018 TAMP. NMDOT has been using and improving this model since 2018. The model accounts for the

condition of the bridge deck, superstructures, substructures, and culverts using rates specific to New Mexico that were published in NCHRP Report 713. The model applies a Markov approach to select the best treatment with the objective of minimizing total long-term cost.

Treatments

The optimal treatment for each asset is determined by analyzing the condition of bridges and their structural elements. Though decisions on specific treatments are made in a case-by-case manner, the following overarching strategy is applied to decide the amount of work needed. A summary of typical teatments and unit costs is presented in Table 3-1.

Table 3-1. Typical Bridge Treatments and Costs

Treatment Category	Unit Cost ($/sq ft)
Replacement	$639.53
Culvert Replacement	$959.30
Major rehabilitation	$479.65
Rehabilitation	$319.77
Maintenance / Preservation	$63.95

Note that the bridge treatment costs in Table 3-1 are higher than the latest costs submitted to FHWA. This is because the costs submitted to FHWA don't include any lump sum items (e.g. removal of structures and obstructions). The number shown in the TAMP intends to account for all bridge costs, and other mobilization costs, approach, and roadway work.

NMDOT has defined procedures for annual configuration review of the bridge analysis tool, including updates to treatments, treatment rules, deterioration performance models, analysis constraints, or analysis practice changes.

Program Monitoring

NMDOT's Bridge Management Section and Districts each monitor the implementation of the life cycle plan at the network and project levels. The Bridge Management Section tracks project status and analyzes bridge maintenance and construction spending across the state through the STIP. Districts also track project completion status.

Since the previous TAMP, NMDOT has implemented tracking of work and spending in the Maintenance Management System (MMS). Construction costs are tracked in AP Construction from project start to finish.

Pavement

Life cycle planning for pavements has similar elements to those for bridges – predictive models for how pavements will deteriorate following different types of treatments and calculation of life cycle costs associated with alternative treatment strategies. For pavements, application of preventive maintenance early in a pavement's life when it is still in relatively good condition can delay the need for rehabilitation or reconstruction and result in an overall lower life cycle cost. In addition, preventive maintenance can yield a higher level of pavement condition over time.

Figure 3-4. Pavement Life Cycle Planning Process

Data Collection

NMDOT collects pavement data on a number of different distresses in order to calculate the state performance measure, PCR, and the FHWA measure as well. These data are collected annually for all NHS roads, approximately half of the NMDOT-owned non-NHS roads, and other HPMS sample sections. According to FHWA regulations, pavement conditions are updated on a two-year cycle. The steps in the data collection process are summarized in Figure 3-4.

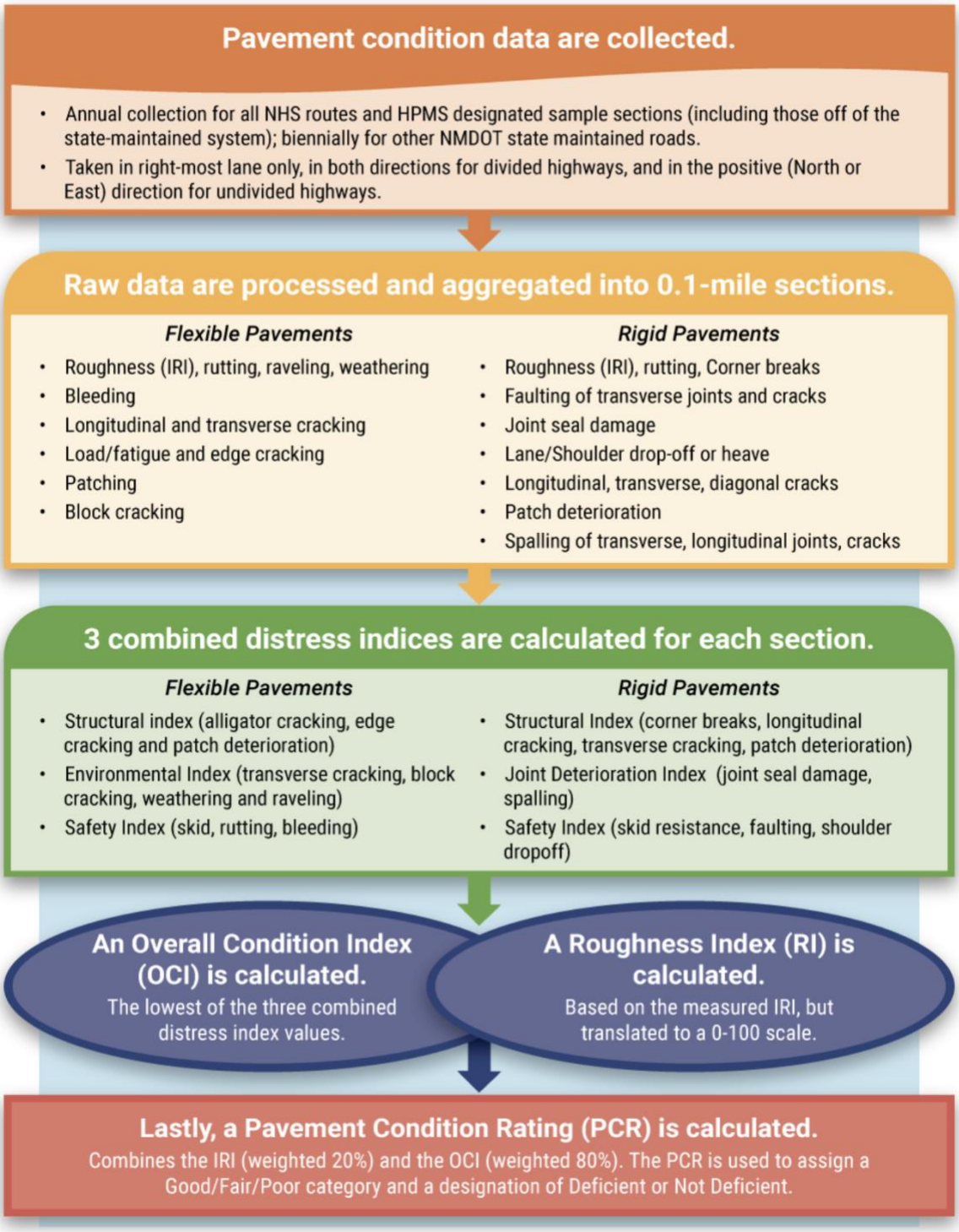


Figure 3-4. Pavement Data Processes

Modeling

NMDOT uses a Pavement Management System (PMS) to to summarize pavement conditions, recommend treatment priorities and predict future conditions given budget constraints and treatment strategies. Specifically, PMS inputs include current pavement conditions, deterioration models, feasible

treatments and budget constraints (specified by year, type of system and road network). The PMS then identifies those treatments that maximize the pavement condition within a given budget constraint. Based on the recommended treatments, the PMS results predict pavements conditions over the specified period.

NMDOT and FHWA Pavement Performance Measures

NMDOT has had its current PMS in place since 2016. A key function of the PMS is to forecast pavement performance using the state's pavement condition measure, PCR, anticipated funding levels, and detailed analytical models developed based on historical pavement condition and treatment performance data.

NMDOT can apply this approach to develop network-level estimates of future performance against state performance measures. However, due to the differences between the state and federal measures, it is not possible for NMDOT to directly forecast 0.10 mile federal performance. Instead, NMDOT developed a correlation between subsection performance by the New Mexico PCR measure and underlying 0.10 mile section performance by the overall federal performance measures. This correlation is then used to forecast federal performance based on PMS analysis results.

Subsection-level PCR condition and underlying 0.10-mile section federal overall condition measurements were compared to produce the correlation. For each subsection, the condition (by PCR) was related to the percentage of associated 0.10-mile sections rated in federal good, fair or poor condition. The correlation model was developed against these data, the results of which are applied to PMS investment optimization and condition forecasting analysis output to predict future federal performance. For example, for a given section of NHS pavement with a predicted PCR of 35, the correlation estimates that it will be 7% good and 11% poor using the FHWA measure.

Table 3-2 below provides a breakdown of the measured 0.10-mile federal performance (as a percentage of section lane mileage) by PCR range. This correlation is based on NHS pavement condition data collected in 2019 through 2021 and will continue to closely monitor the federal measures each year and compare the PMS projections against the actual outcomes to determine the adequacy of this process to meet federal TAMP and performance targeting requirements.

Table 3-2. NMDOT to FHWA Pavement Performance Measure Alignment for NHS

PCR Range	% Federal Good	% Federal Fair	% Federal Poor
PCR ≤ 30	3%	84%	13%
30 < PCR ≤ 40	7%	82%	11%
40 < PCR ≤ 50	14%	81%	5%
50 < PCR ≤ 60	24%	73%	3%
60 < PCR ≤ 70	41%	58%	1%
70 < PCR ≤ 80	60%	39%	1%
80 < PCR ≤ 90	82%	18%	0%
90 < PCR ≤ 100	82%	18%	0%

In April 2022 the FHWA New Mexico Division, in coordination with the FHWA Resource Center, reviewed the NMDOT correlation approach and found it to be an acceptable approach to meet the TAMP performance targeting and gap analysis requirements.

Treatments

NMDOT established recommended treatments for flexible and rigid pavements in the PMS, along with criteria for when each treatment is feasible. Table 3-3 summarizes typical treatments and unit costs modeled in the PMS. Treatment rules are updated regularly, following NMDOT's PMS Configuration Review procedure to update pavement types, treatments, treatment rules, decision trees, performance models, data collection calculations, analysis constraints, and analysis practice changes.

Districts are encouraged to use life cycle planning and consider the full life cycle costs of the different strategies when making project-level decisions.

Table 3-3. Typical Pavement Treatments and Unit Costs

Treatment Category	Description	Flexible Pavement ($/lane mile)	Rigid Pavement ($/lane mile)
Patch	Crack sealing and patching	$10,605	$18,285
Minor Preservation	Fog seals, chip seals, Nova Chip	$25,204	$32,913
Major Preservation	1.5" to 2.5" mill and inlay	$108,055	$60,950
Minor Rehabilitation	2.5" to 4.0" mill and inlay	$233,825	$129,213
Major Rehabilitation	>4.0" overlay, full depth reclamation	$332,907	$426,648

Treatment Category	Description	Flexible Pavement ($/lane mile)	Rigid Pavement ($/lane mile)
Reconstruction	Full rebuild	$1,218,994	$1,523,743

Telling the Story: Life Cycle Planning

Hashem Faidi, Pavement Engineer

When managing pavement life cycles, "one of most difficult aspects of pavement management is deciding the most effective treatment," says Hashem Faidi, NMDOT's Pavement Engineer. NMDOT's Pavement Management System helps identify the best match between pavement condition and treatment type. "As an engineer, I have to say it's very satisfying when the fix identified by the data in the system validates the fix recommended by staff based just on raw data from the field," Hashem says, "but sometimes PMS can identify a better life cycle approach, picking another treatment that's more cost-effective. And that can be satisfying in a different way."

The PMS has greatly enhanced understanding of pavement life cycle processes. "It's difficult to quantify the immediate benefits of some of these minimal treatments, so it can be hard to communicate to the public. But the long-term benefit is there, in that the fix we're using will extend the life and performance of the pavement. Continual maintenance is essential to the life cycle approach to asset management."

Program Monitoring

The NMDOT GO tracks pavement condition performance and, on a quarterly basis, reports completed and ongoing preservation work. NMDOT Districts monitor their budgets monthly and track the delivery of projects on-time and within budget. Several Districts schedule regular meetings with their operational staff to track the progress of project selection and delivery.

Since the previous TAMP, NMDOT has implemented tracking of work and spending in the MMS. Construction costs are tracked in AP Construction from project start to finish.

Chapter 4

Performance Management

Performance measures are critical to actively manage the service life of an asset. By understanding the impact of investment on that performance measure, policy makers are able to establish funding priorities and set targets they can reasonably achieve. In this TAMP, asset performance refers to asset condition. NMDOT uses performance measures defined by FHWA to measure asset condition on the NHS.

Overview

Asset Management best practices emphasize the use of performance management for transportation programs, shifting the decision-making framework towards data driven, proactive, goal-oriented investment choices. FHWA defines transportation performance management as "a strategic approach that uses system information to make investment and policy decisions to achieve national performance goals."

The cornerstone of FHWA's highway program transformation is the transition to a performance and outcome-based program. States now must measure condition and set performance targets for their transportation assets. These targets should be aligned with state goals and objectives, as well as national goals. Following the targets will help states make investment decisions that achieve individual targets while making progress toward national goals.

This chapter presents asset performance targets and results of scenario analysis for bridge and pavement performance over a 10-year period. A range of funding scenarios for both pavement and bridge were modeled in order to understand the sensitivity of performance to investment. Then, two combined scenarios were constructed based on these results – one representing current practice – continuation of current funding and historical budget allocations, and a second representing an increase in total funding.

Federal Legislative Context

FHWA requires states to include asset management measures and State DOT targets for asset condition for NHS bridges and pavements in their TAMPs as defined in 23 CFR 490.313. States may choose to include additional measures as well. Any asset included in the TAMP must have accompanying measures and targets. Using the measures of condition defined by FHWA, State DOTs must specify their desired "state of good repair" for the 10-year analysis period of the TAMP consistent with state asset management objectives. The desired state of good repair is the desired asset condition over the 10-year period of the TAMP. The desired state of good repair must also support progress towards achieving national goals.

As part of a separate FHWA rule on performance management, states must set 2 and 4-year asset condition performance targets. These targets shall be included in the TAMP but will also be reported separately to FHWA. As part of this performance management rule, states are also required to maintain NHS pavements and bridges to meet federally established minimum condition levels:

- States must maintain bridges on the NHS so that the percentage of deck area of bridges classified as SD does not exceed 10 percent of the overall deck area in a state. (Note that according to FHWA NBI standards for bridge inspection, a bridge in poor condition is considered SD.)
- States must ensure that no more than 5 percent of pavement lane miles on the interstate system are in poor condition using the federal performance measure for pavement condition.

FHWA requires that states establish a performance gap analysis process for transportation asset management plans. As part of the gap analysis, states must compare current asset performance to target performance levels, using FHWA's performance measures. They may also compare projected asset performance to target performance to calculate an expected gap. States are also required to discuss alternative strategies to close or address the gaps.

Asset Performance Targets

Asset performance targets specify conditions NMDOT seeks to achieve and sustain over a 10-year period to support agency goals and objectives and meet federal requirements. The targets presented in this chapter serve as fixed benchmarks against which past, present, and future performance can be evaluated. These targets are consistent with federal and state performance requirements and were developed based on analysis of what can be achieved for different levels of funding over the next ten years, assuming application of effective asset lifecycle management strategies.

As mentioned previously, federal regulation requires 2 and 4-year performance targets. The initial 2 and 4-year targets were for 2020 and 2022. While NMDOT has not yet finalized targets for 2024 and 2026, predictions of future conditions in the TAMP will be used to help set the next targets.

The implied 2 and 4-year targets from the 10-year projected condition based on expected funding are included in this TAMP. Additional coordination and collaboration with MPOs will occur as targets are established.

Table 4-1. Implied 2- and 4-Year Targets for the NHS

Performance Measure	2024	2026
Percentage of bridges on the NHS in Good condition	28.7%	23.2%
Percentage of bridges on the NHS in Poor condition	4.8%	6.2%
Percentage of Interstate pavements on the NHS in Good condition	41.7	46.7%
Percentage of Interstate pavements on the NHS in Poor condition	3.5%	4.1%
Percentage of Non-Interstate pavements on the NHS in Good condition	39.1%	40.9%
Percentage of Non-Interstate pavements on the NHS in Poor condition	3.7%	3.9%

Performance Projections

Managing transportation assets throughout their life cycle requires looking to the future and projecting asset performance. Performance scenario analysis is a useful technique for examining the implications of different funding levels and allocations. It enables NMDOT to predict future conditions, compare these conditions against targets, define funding gaps, and inform resource allocation decisions.

NMDOT predicted future conditions in two funding scenarios, current and desired. The current funding scenario is based on historical budget allocations, while the desired funding scenario represents an optimistic picture of what could be achieved with an increase in funding. These funding scenarios include the additional funding provided by the recent passage of BIL.

NHS Bridge Projections

The current funding scenario is aligned with the funding described in Chapter 6 Financial Plan and Investment Strategies. NMDOT expects to spend roughly $40 million per year on NHS bridges, with the

remainder of the budget dedicted to non-NHS assets. In the desired scenario, NMDOT expects to spend roughly $80 million per year on NHS bridges. Figures 4-1 and 4-2 show NMDOT's 10-year projections for NHS bridge condition.

In the current funding scenario, NHS bridge conditions are predicted to decline slightly, with deck area in poor condition increasing from 3.3% to 6.0%, well below the federal minimum condition threshold of 10%. Deck area in good condition is also predicted to decrease from 34.5% to 26.7%.

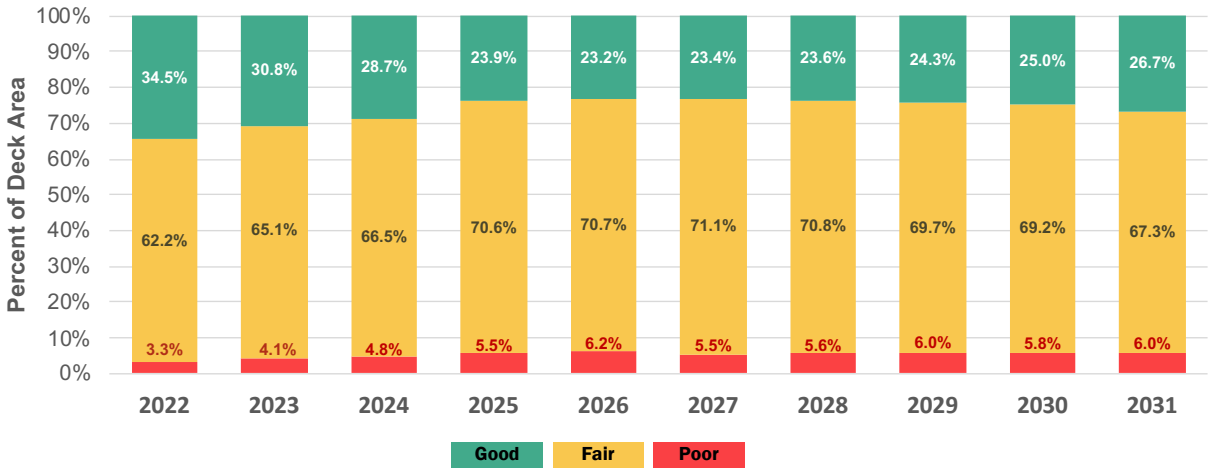


Figure 4-1. NHS Bridge Performance Projection – Current Scenario

In the desired funding scenario, NHS bridge conditions are predicted to improve considerably, with deck area in poor condition decreasing from 3.0% to 1.9% and deck area in good condition improving from 36.9% to 50.4%.

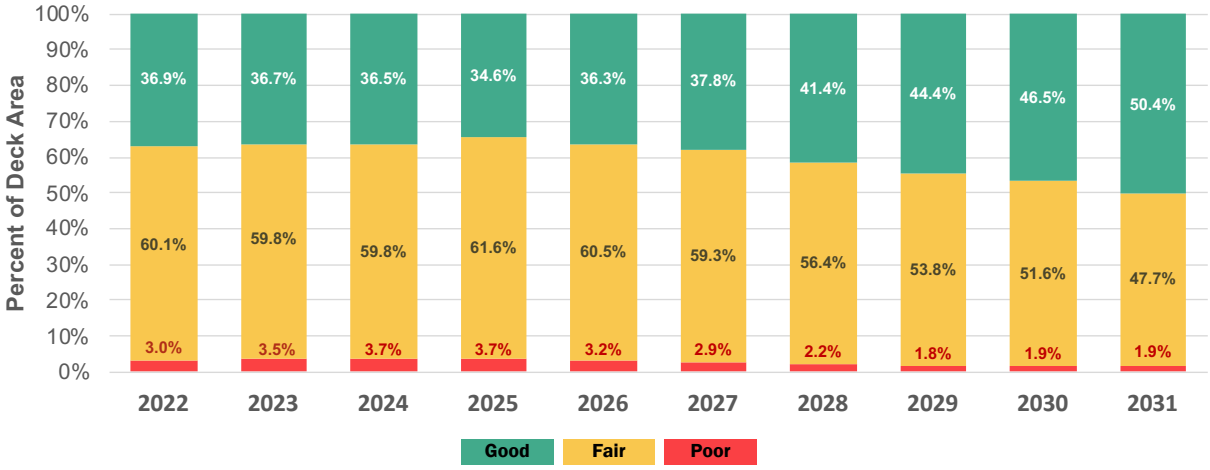


Figure 4-2. NHS Bridge Performance Projection – Desired Scenario

NHS Pavement Projections

The current funding scenario reflects the funding described in Chapter 6 Financial Plan and Investment Strategies. Of the total expected $358 million in annual pavement funding, roughly 30% ($105.2 million) is dedicated to Interstate and 48% ($168.3) dedicated to Non-Interstate NHS, with the remainder allocated to Non-NHS assets.

The desired scenario reflects a pavement funding level sufficient to keep the percent of Interstate in poor condition at 1% for the FHWA measure. The desired scenario also keeps the percent of Non-Interstate NHS pavement in poor condition at 1% for the FHWA measure. This means an estimated annual

investment of $182 million on the Interstate and $269 million for Non-Interstate NHS pavements. The desired scenario includes a gradual increase in preservation activities ($1 million per year) on the Interstate starting in 2026.

Figures 4-3 though 4-6 show NMDOT's 10-year projections for NHS pavement condition. In the current funding scenario, Interstate pavement condition is predicted to decline slightly, with Interstate pavement in poor condition increasing from 2.9% to 5.6%, above the federal minimum condition threshold of 5%.

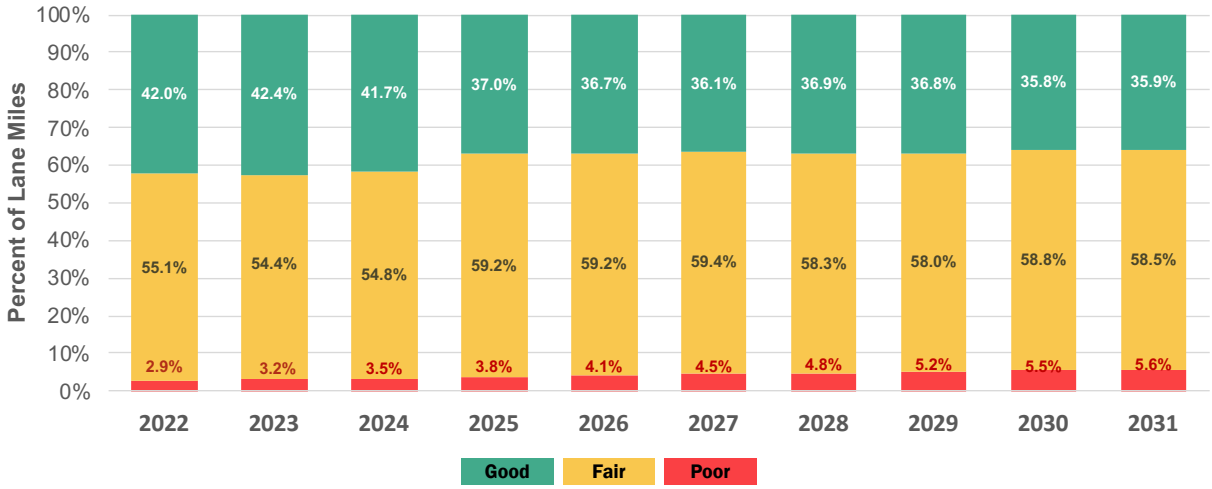


Figure 4-3. Interstate Pavement Performance Projection – Current Scenario

In the desired funding scenario, Interstate pavement condition is predicted to improve, with Interstate pavement in poor condition dropping from 2.6% to 1.4% (below the federal minimum condition threshold), and Interstate pavement in good condition increases from 41.5% to 57.2%.

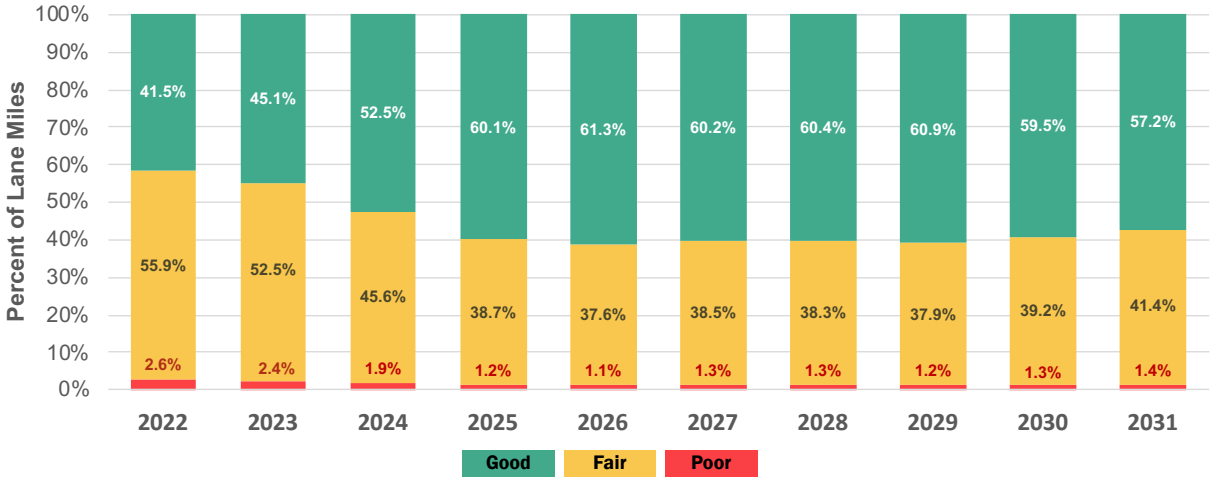


Figure 4-4. Interstate Pavement Performance Projection – Desired Scenario

In the current funding scenario, Non-Interstate NHS pavement condition is predicted to decline slightly, with percent poor increasing from 3.0% to 5.5%, but percent good increasing from 39.3% to 40.9%.

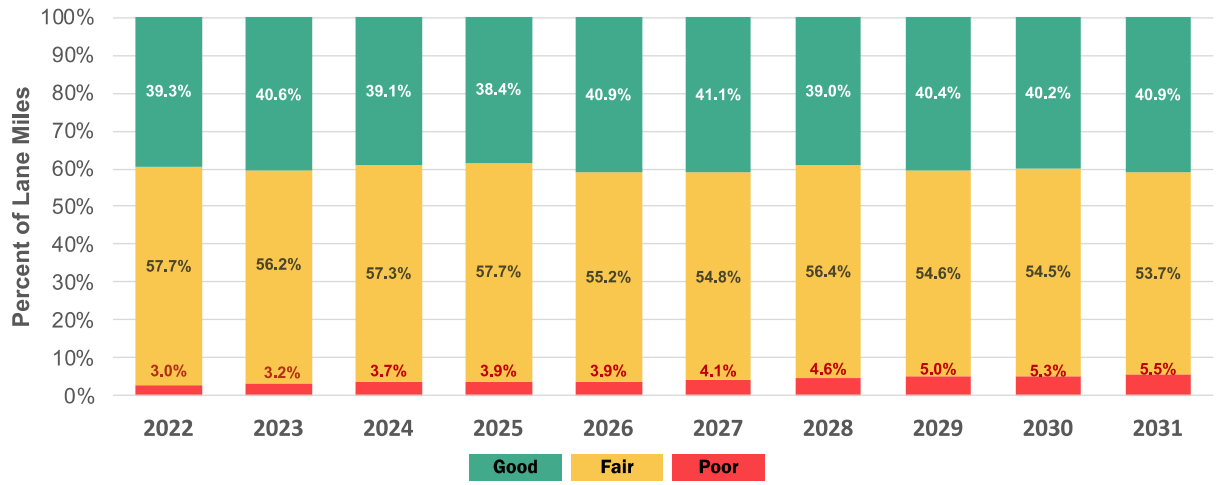


Figure 4-5. Non-Interstate NHS Pavement Performance Projection – Current Scenario

In the desired funding scenario, Non-Interstate NHS pavement condition is predicted to improve, with percent poor decreasing from 3.0% to 2.2% and percent good increasing from 36.5% to 49.4%.

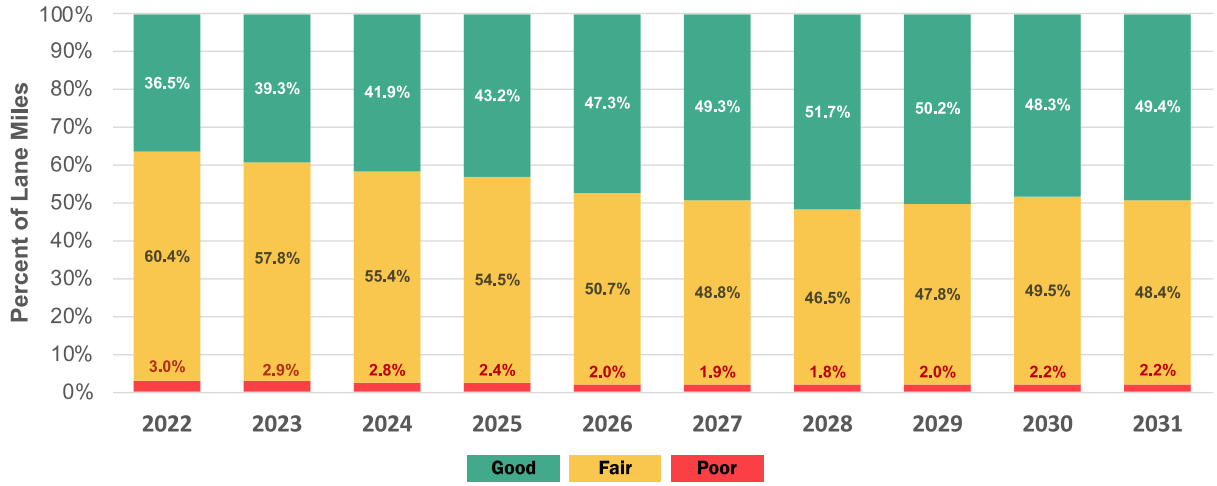


Figure 4-6. Non-Interstate NHS Pavement Performance Projection – Desired Scenario

Telling the Story: Aligning the STIP to Meet Condition Targets

Jolene Herrera, State Transportation Improvement Program (STIP) Staff Manager

Choosing projects that meet the performance measures and targets set through asset management and align with the goals in the New Mexico 2045 Plan is one of the most important things that we do at NMDOT. The Statewide Transportation Improvement Program (STIP) is the short-term planning document that lists all the federally funded projects in the state and shows New Mexicans and the traveling public how their tax dollars are allocated. Assuring that the project prioritization process is data-driven based on information from our pavement and bridge management systems is how we align the STIP with performance targets. We use these systems along with input from the public and funding allocations to project how selected projects will meet the goals of TAM and provide the greatest benefit to the public. It also helps us to identify funding gaps and allows us to shift allocations between pavement and bridge if necessary to address deficiencies and ensure our performance targets are met.

Performance Gap Analysis

Transportation asset management plans developed under MAP-21/FAST Act are expected to establish targets, articulate strategies, link agency processes to asset management and other performance strategies, and impact performance. Performance measures and targets are used to track progress and guide agencies towards short, medium, and long-term goals.

State DOTs are required to establish a process for conducting a gap analysis, evaluating any gaps between current and target condition and suggesting strategies to close the gaps. The FHWA defines a performance gap as "the gaps between the current asset condition and State DOT targets for asset condition, and the gaps in system performance effectiveness that are best addressed by improving the physical assets." Performance gaps are defined for both percent good and percent poor asset condition. Table 4-2 shows two types of performance gaps:

- A current gap is the difference between the 10-year desired state projection and the current performance. The gap quantifies the amount by which the 10-year desired state projection exceeds current performance. If current performance exceeds the 10-year desired state, the gap is shown as a negative number (in parentheses).
- A 10-year projected gap is the difference between the 10-year desired state projection and the 10-year current funding projection. The gap quantifies the amount by which the 10-year desired state projection exceeds the 10-year current funding projection. If the 10-year current funding projection exceeds the desired state projection, the gap is shown as a negative number (in parentheses).

Strategies to close gaps are discussed in in Chapter 6. Financial Plan & Investment Strategies.

Table 4-2. 10-Year Desired State Performance Projections and Performance Gaps

	Good	Fair	Poor
Interstate Pavements (Lane Miles)			
10-Year Desired State Projection	**57.20%**	**41.40%**	**1.40%**
Current Performance	**54.86%**	**44.20%**	**0.94%**
Current Gap	2.34%		(-0.46%)
10-Year Current Funding Projection	**35.91%**	**58.53%**	**5.56%**
10-Year Projected Gap	21.29%		4.16%
Non-Interstate NHS Pavements (Lane Miles)			
10-Year Desired State Projection	**49.43%**	**48.40%**	**2.18%**
Current Performance	**38.78%**	**59.45%**	**1.78%**
Current Gap	10.65%		(-0.40%)
10-Year Current Funding Projection	**40.86%**	**53.68%**	**5.46%**
10-Year Projected Gap	8.57%		3.28%

	Good	Fair	Poor
NHS Bridges (Deck Area)			
10-Year Desired State Projection	**50.36%**	**47.75%**	**1.89%**
Current Performance	**36.01%**	**61.41%**	**2.59%**
Current Gap	14.4%		0.7%
10-Year Current Funding Projection	**26.75%**	**67.26%**	**6.00%**
10-Year Projected Gap	23.61%		4.10%

Chapter 5

Risk Management

Risk management at NMDOT is about identifying risks to the transportation system, then assessing, evaluating, and prioritizing the risks and their mitigation actions. Such mitigation actions were designed with DOT culture, processes, and structures in mind to provide safety to roadway users and employees, reduce DOT costs, and yield efficient and effective services. Understanding the uncertainties, threats, and opportunities facing NMDOT over the 10-year TAMP period is important for asset management.

Overview

Effective management of the risks to NMDOT's transportation system supports NMDOT's broader goals of asset management, safety, mobility and accessibility, and program delivery. Though all directly related to asset management, many of the risks brought forth in this chapter also support challenges identified in the LRSTP, STIP, HSIP, and NM Climate Strategy documents. By managing these risks, NMDOT bolsters their agency-wide transportation vision.

Within the scope of the TAMP, risk management further supports life cycle management, performance management, and, in particular, investment planning. Each identified risk has the potential to disrupt NMDOT's goals for asset performance and plans for full life cycle management. By identifying risks, planning mitigation strategies, and implementing mitigation activities, especially for the project delivery and climate & resiliency risks, NMDOT allows the life cycle plan to stay on track and aids the fulfillment of the performance objectives. Furthermore, the risks outlined in this chapter highlight the areas within the agency that require greater financial assistance and investment. The asset management investment plan builds upon the risk analysis and accounts for these risks when laying out the investment strategies and financial plan.

Existing Practices

NMDOT has a long history of managing risks to the transportation network in New Mexico, including asset risks, financial risks, organizational risks, and external threats. Many existing risks are already identified, mitigated, and monitored through the agency's existing processes. This section summarizes some of the existing risk management practices at NMDOT, with a special focus on the evolving practice around climate change and resiliency. As climate change exacerbates extreme weather, strengthening resiliency and risk management at NMDOT will become increasingly important. These existing practices also form part of NMDOT's alignment with the climate change and resiliency requirements of the BIL.

Long Range Planning

NMDOT's 2045 LRSTP (the New Mexico 2045 Plan) covers all aspects of transportation planning and also includes resiliency and risk management. The scenario planning exercises used to help develop the plan included a Resiliency Challenged scenario, in which New Mexico faces a future where intense storms, droughts, floods and fires are more prevalent. Considering this scenario helped NMDOT officials better understand the risks associated with extreme weather and climate change. They concluded, among other things, that redundancy in infrastructure and a clear response to disruptions is critical for minimizing the risk to transportation system performance in response to such events.

Among the recommended strategies included in the plan is the need for NMDOT to develop a process for incorporating resiliency into asset management.

In addition, the plan recommends the agency conduct a study to identify risks to system assets and create a plan to address priority assets. This effort was undertaken in 2021 through the NMDOT Resiliency Initiative.

NMDOT Resiliency Initiative

NMDOT conducted the first phase of a resiliency study in 2021 to better understand the risks to its infrastructure and prioritize vulnerable areas. The study included a screening of state-owned roadways and bridges according to vulnerability criteria including current condition and potential natural hazards. Through the study, the agency generated a ranked list of state-owned facilities according to their vulnerability. The need and methodology for a second study phase was also identified. The second phase, to begin in 2022, will assess criticality of state-owned infrastructure based on factors such as economic criticality, importance to freight or tourism, equity, and redundancy.

The natural hazards analyzed in the vulnerability analysis included wildfires, floods, and rockfall. Unfortunately, FEMA flood data was incomplete and skewed to more urban areas where flood levels are more thoroughly monitored. As a result of this lack of data and other inaccessible data, NMDOT identified a need to revise the vulnerability analysis as data evolves.

NMDOT compared the results of the vulnerability analysis to the List of Vulnerable Transportation Assets Repeatedly Damaged by Emergency Events developed as part of the May 2020 NMDOT Transportation Performance Management Program. Repeatedly damaged assets include assets damaged on two or more occasions since 1997, based on historic data evaluating damage by fire, flooding, or other events. The list of damaged assets includes eight areas of significant interest, representing segments of the NMDOT network that may be vulnerable to extreme events; all but one of significant areas is on the Interstate.

The hazards used to generate the repeatedly damaged asset list do not specifically relate to asset management. Some include safety hazards for road users that may not impact asset condition. As a result, the List of Vulnerable Transportation Assets Repeatedly Damaged by Emergency Events provides a broader level of findings than the vulnerability analysis though the results are aligned. Segments within the eight areas of significant interest also rank very highly according to the asset condition vulnerability score.

The resiliency initiative provides an important first step in NMDOT's efforts to better understand system risks associated with climate change and severe weather events. The effort established a foundation to better assess and consider resiliency in system performance analysis but also exposed a range of methodology, data, and analysis challenges that need to be addressed to further advance NMDOT's resiliency planning efforts. For future resiliency analysis to be meaningful, NMDOT will need to determine how to incorporate the findings into its decision-making processes.

New Mexico Climate Change Task Force

In January 2019, Governor Michelle Lujan Grisham issued Executive Order 2019-003 on Addressing Climate Change and Energy Waste Prevention, establishing an interagency task force composed of the Secretary or designee of each state agency, including NMDOT. The order also directed each state agency to evaluate the impacts of climate change on their programs and operations and to integrate climate change mitigation and adaptation practices. The Climate Change Task Force published an initial New Mexico Climate Strategy document in 2019 identifying strategies for reducing greenhouse gas levels and improving adaptation and resilience, followed by an update in 2020. Recommendations from the Climate Strategy include:

Decarbonizing Transportation:

- Increase clean vehicle adoption
- Expand EV infrastructure
- Reduce VMT

Decarbonizing the Built Environment:

- Use warm-mix asphalt for road projects to reduce CO2 emissions
- Identify opportunities to incorporate greenhouse gas emissions in application stage for federally funded programs
- Increase clean vehicle adoption
- Incorporate Complete Streets and other sustainability strategies into NMDOT's Design Manual

Resilient Infrastructure:

- Develop resiliency initiative
- Incorporate green stormwater infrastructure guidelines into NMDOT Stormwater Manual
- Develop an inventory and GIS database for green stormwater infrastructure elements and develop and implement training for NMDOT maintenance staff on maintaining green infrastructure

NMDOT staff serve on various Climate Action Teams as part of the Climate Change Task Force.

Telling the Story: Building Resilience

Lisa Vega, District 6 Engineer, on building resilience in NM roads.

The impact of climate change, and how to mitigate it, has been an important focus for Governor Lujan Grisham. It is likewise a focus for NMDOT. For the department, the focus is more on resiliency and sustainability. "With climate change, as we prioritize projects, we have to expand our thinking," says Lisa Vega, District 6 Engineer. "We've long taken into account how the project will impact the natural and built environment, but now we also need to consider how the environment, through extreme weather events, might impact the project over time. Mitigating the risk of extreme weather, building assets with greater resiliency, these are steps NMDOT is taking to ensure the continued high performance of our system for the people of New Mexico, despite the changing climate, even as all of us work together to address the causes of that changing climate."

Risk Management Approach

The process for managing risk at NMDOT follows these five steps:

1. **Identify** – find the potential risks facing the agency based on the experience of agency experts and past risk assessments
2. **Assess** – determine the likelihood and impact of each of the identified risks and rank them in terms of their effect on the agency
3. **Plan** – develop a plan to mitigate the highest-priority risks including specific strategies and actions, the group responsible, and the necessary funding
4. **Mitigate** – implement the mitigation plan and adapt as needed to protect against changes in process or circumstance
5. **Monitor** – assess the plan's success, document lessons learned, and prepare ongoing assessments to prioritize the remaining risks

Figure 5-1. NMDOT's cyclical approach to risk management

As part of the 2022 TAMP development process, NMDOT's AMESC identified 15 initial risks. After further analysis, and contributions from 17 members of the AMESC, the list was narrowed down to 14 TAM risks. At a risk workshop held in March 2022, the AMESC prioritized the 14 risks and removed the two lowest priority risks, resulting in a final list of 12 TAM risks to consider for the risk register. The risk workshop attendees also helped assign responsibility for each risk to divisions and individuals within NMDOT and produced a complete set of mitigation strategies and more detailed mitigation actions for each risk owner to oversee. The following risk register displays the outcome of this process. Figure 5-2 illustrates the spread of risks reviewed in the AMESC risk workshop, highlighting the estimated likelihood and impact of each on a scale from 1 to 5 (low likelihood/impact to high likelihood/impact). In the risk workshop, the group further refined the risk register to determine the eight risks to prioritize for mitigation actions. Table 5-2 lists the mitigation strategies and actions for the eight priority risks.

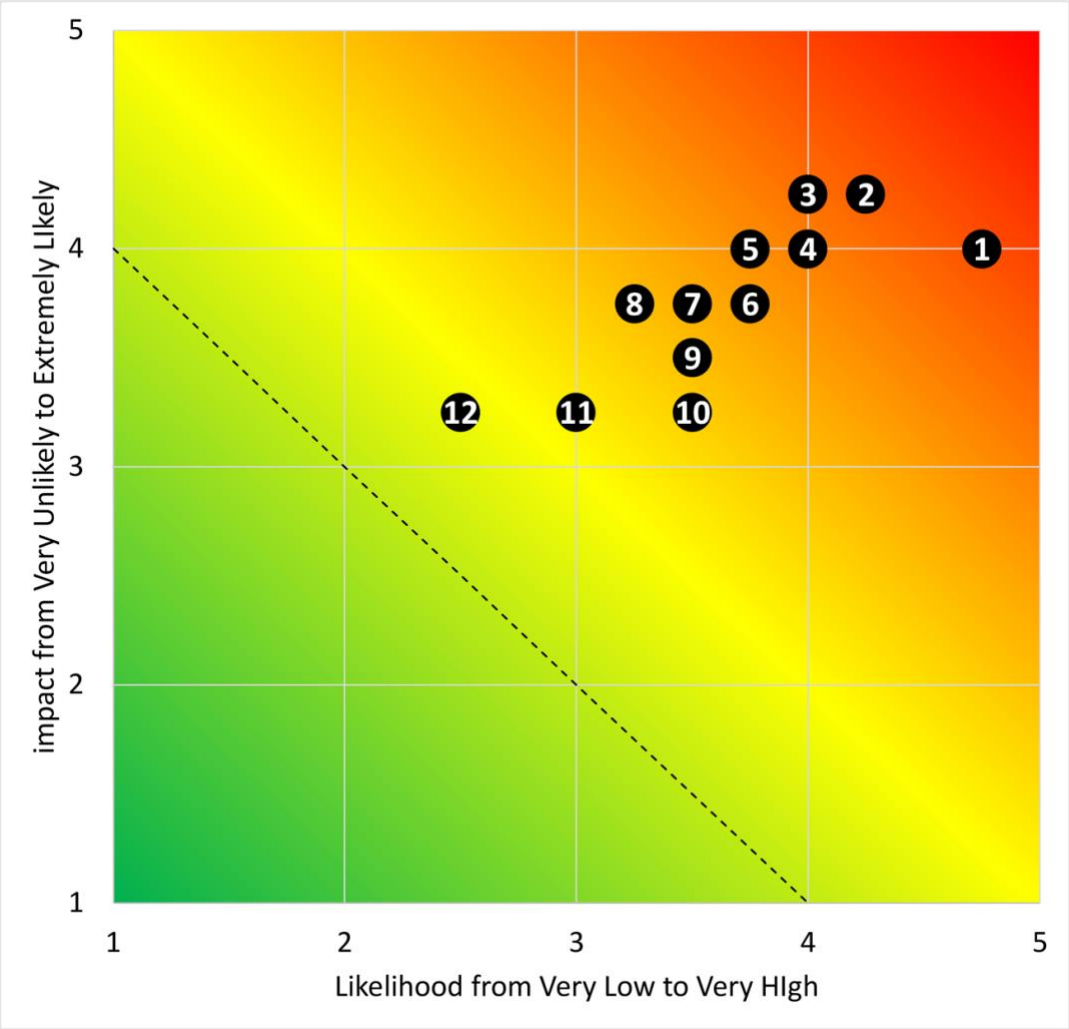


Figure 5-2. NMDOT's Prioritized TAM Risks

Risk Register

The risks shown in Figure 5-2 and included in Table 5-1 are prioritized based on their criticality score, which is the product of the likelihood and impact presented by each risk. These scores were gathered through a survey of AMESC members and adjusted based on ensuing discussions. Owners of each risk identified in the table include the offices and individuals within NMDOT who are best suited for implementing the mitigation plan.

Table 5-1. Risk Register

Risk (ID)	Description	Likelihood	Impact	Criticality Score	Owner
Staffing (1)	If NMDOT (and contractors) don't have adequate staffing, NMDOT may be unable to meet project delivery goals	4.75	4	4.75	Deputy Secretary, Chief Engineer, and District Engineers

Risk (ID)	Description	Likelihood	Impact	Criticality Score	Owner
Construction Inflation Rate (2)	If the average annual construction inflation rate differs from agency predictions, then the agency's financial assumptions about the adequacy of its asset management budgets will be at risk	4.25	4.25	4.25	STIP Unit for Reserve Money Strategy; NMDOT General Office, District Offices; Budget; and Design
Decline in Funding (3)	If the agency receives a decline in real funding (due to less revenue), then its asset conditions will be at risk If the agency receives a decline in inflation-adjusted funding (due to the economy) then its asset conditions will be at risk	4	4.25	4	Chief Engineer, Executive Director for Highway Operations, and District Engineers
Bridge Aging (4)	The risk of bridges aging and requiring more expensive repairs	4	4	4	Bridge Management Section Manager in the NMDOT Bridge Bureau
Workforce Training and Knowledge Management (5)	The risk of inadequate training and knowledge in the workforce caused by staffing levels and the loss of expertise as staff retire or leave	3.75	4	3.75	HR; Director of Communications
TAMP Political Support (6)	Continued political support is required to ensure the Asset Management Plan can be implemented as intended	3.75	3.75	3.75	Executive Staff with District Engineers
Climate Change & Resiliency (7)	The risk from disasters such as flooding, fires, slope failure and potential man-made disasters	3.5	3.75	3.5	Enterprise GIS; Manager of ITS Operations; Chief Engineer; Planning Division

Risk (ID)	Description	Likelihood	Impact	Criticality Score	Owner
Inaccurate Asset Condition Data (8)	Making wrong decisions and redirecting resources to the wrong assets because of inaccurate asset condition data	3.5	3.5	3.5	Bridge and Pavement Management Bureaus
Resource Management (9)	If those working on both projects and maintenance activities do not have an understanding of budget amounts, budget limitations, and the true cost of the projects and activities they run the risk of overspending on projects and maintenance activities and consuming resources that are needed elsewhere	3.25	3.75	3.25	Chief Engineer and District Engineers
Project Scoping (10)	If the agency lacks complete information on asset conditions, then projects can be scoped incorrectly leading to scope creep and not using funds cost-effectively, particularly as assets are added to a project (e.g. guardrail)	3.5	3.25	3.5	Chief Engineer
Cybersecurity (11)	Risk related to cybersecurity and NMDOT's network	3	3.25	3	Chief Information Officer
Management Buy-In for Preventative Maintenance (12)	The risk of management buy-in to preventive maintenance which is important to sustaining asset conditions over the long term	2.5	3.25	2.5	Secretary's Office

Monitoring and Mitigating Risks

NMDOT's mitigation plan covers the eight highest priority risks determined by the AMESC. It communicates the final three steps in their risk management process: plan, mitigate, and monitor. As seen in the spread of owners for these risks, the responsibility for monitoring and mitigating these TAM risks falls across multiple areas of the agency. The wide coverage of responsibility supports the central goals of NMDOT and helps to integrate the TAMP risk plan with that of other NMDOT planning and policy documents. Table 5-2 outlines the mitigation strategies and actions for each of the risks. It will be the responsibility of the risk owner to monitor the risks and assess the impact of their mitigation actions.

Table 5-2. Mitigation Actions and Strategies for Top 8 Priority Risks

Risk (ID)	Mitigation Strategies	Mitigation Actions
Staffing (1)	1. Improve recruitment of staff across all levels, but primarily within the younger generations. 2. Maintain consistency with the STIP.	1. Offer more competitive salaries to achieve adequate staffing levels. 2. Tie recruitment to the values of the incoming workforce, such as the availability of great outdoor activities in New Mexico. 3. Expand the regionalization of General Office functions. 4. Continue to diversify project delivery methods to include more private entities and public/private partnerships.
Construction Inflation Rate (2)	1. Adopt a conservative, yet flexible approach to project planning and programming. 2. Maintain a contingency plan for the scenario where costs are significantly higher than anticipated. 3. Continue to coordinate with the STIP	1. Consider different inflation scenarios during the financial planning processes. 2. Make conservative estimates on construction costs. For the event in which costs are overestimated, provide a healthy shelf of back-up projects, so NMDOT is ready and able to utilize the money available. 3. Apply condition analysis report (CAR) forms to assist in identifying which projects each district should prioritize and to organize the projects if additional money becomes available. 4. Set aside a state money in reserve to allow for adjustments to project plans as costs change.
Decline in Funding (3)	1. Research and identify lower cost treatments for asset maintenance. 2. Continue to use dual-year funding for large projects to provide an additional year of funding flexibility. 3. Reduce the scope of projects and adjust asset performance commitments to align with anticipated effort.	1. Apply lower cost treatments and methods for TAM. 2. Share experience across districts to make it easy to implement the strategies and access knowledge of more experienced district(s). 3. Review estimates at PS&E and production.

Risk (ID)	Mitigation Strategies	Mitigation Actions
Bridge Aging (4)	1. Improve the maintenance of joints and bearings which are experiencing accelerated deterioration. 2. Utilize the new bridge program and the local transportation project fund to extend preventative maintenance and reduce full repairs.	1. Develop a measure for bearings and joints using available element data. 2. Direct preventive maintenance funding to bridges with poor joints and bearings but otherwise in good or fair condition. Use price agreements and state funds to develop the project.
Workforce Training and Knowledge Management (5)	1. Improve recruitment and retention of staff across all levels. 2. Improve training opportunities for staff. 3. Implement more knowledge management practices.	1. Continue to rely on the current training program for new hires and transfers, and improve access to this training for long-term employees. 2. Encourage documentation and the development of how-to manuals for each agency position. 3. Build in-house expertise for various agency disciplines, especially engineering and project development. 4. Extend recruiting efforts to hire younger engineers and university graduates.
Climate Change & Resiliency (6)	1. Improve analysis and information related to climate vulnerabilities, disaster response, and detours. 2. Integrate climate change and resiliency data into project design and design standards to minimize risk and improve resilience. 3. Improve public communication in the event of a disaster. 4. Pursue research, educational, technical, and funding opportunities (e.g. PROTECT formula funding from BIL).	1. Update the vulnerability assessment and complete criticality assessment. 2. Consider detour routes in the event of an emergency; identify and improve the necessary routes. 3. Support update of the 100-year flood projections. 4. Continue efforts to improve the ITS system to inform the public in real time of disasters. Work with public relations on the public-facing EGIS system to help improve public awareness of events, detours. 5. Continue efforts to improve designs, such as those for sizing culverts more effectively, then implement these plans in new construction. 6. Develop a Carbon Reduction Strategy/Climate Action Plan 7. Track resiliency and mitigation performance for alignment with state and federal goals. 8. Develop a Resiliency Improvement Plan in alignment with the PROTECT Program.

Risk (ID)	Mitigation Strategies	Mitigation Actions
Project Scoping (7)	1. Update the business process for scoping projects.	1. Require completion of a full scoping report to get a project into the first four years of the STIP. 2. Continue to require a control number for the STIP. 3. Meet with District Engineers and conduct change management activities to invoke a new mindset for changes in project scope. 4. Update the design manual to prevent lack of consideration for improperly scoped elements.
Cybersecurity (8)	1. Balance agency security with functionality.	1. Provide support from district IT staff to each of the districts. 2. Research and identify other large organizations for their progressive IT policies. 3. Expand the regionalization of IT functions.

Telling the Story: Climate Change

Jessica Griffin, ACIP, Planning Division Director.

In 2019, New Mexico Governor Lujan Grisham established a statewide goal to reduce greenhouse gas emissions by at least 45 percent by 2030, relative to 2005 levels. As part of subsequent efforts, the state identified two transportation policies to pursue related to clean vehicle adoption and reducing statewide single-occupancy vehicle travel. In alignment with these statewide goals, NMDOT is developing a comprehensive program to respond to and reduce NMDOT contributions to climate change. NMDOT is building climate change response into its organization through staff additions and creation of resiliency and climate action plans.

Integrating climate action and resiliency into New Mexico's transportation system will be a collaborative and department-wide effort. Jessica Griffin, Planning Division Director, states "Climate change is already adversely impacting our public health, environment, communities, and economy. As transportation is the second largest greenhouse gas emitter in New Mexico and the largest contributor to U.S. greenhouse gas emissions, we need to change the way we plan and think about the transportation system. NMDOT is committed to doing our part to mitigate and adapt to climate change, including thoughtful planning and deployment of the existing and new resources available to the transportation industry."

Transportation Assets Repeatedly Damaged by Emergency Events

State DOTs are required to perform periodic evaluation of facilities that require repeated repair and reconstruction due to emergency events, including most projects that used Emergency Relief funds to resolve the emergency, per the federal Fiscal Management Information System (FMIS). The regulations require that state DOTs conduct statewide evaluations to determine if there are reasonable alternatives to pavements or bridges that have required repair or reconstruction more than once due to emergency events. Agencies are required to perform "an analysis that includes identification and consideration of any alternative that will mitigate, or partially or fully resolve, the root cause of the recurring damage, the costs of achieving the solution, and the likely duration of the solution."

Reasonable alternatives are defined as options that could partially or fully achieve the following:

1. Reduce the need for federal funds to be expended on emergency repair and reconstruction activities
2. Better protect public safety and health and the human and natural environment
3. Meet transportation needs as described in applicable federal, state, local, and tribal plans and programs

While the requirement for evaluation of assets that have repeat damage due to emergency events is a separate rule from the TAMP, the TAMP rules require that the risk management process include a summary of the evaluations for NHS bridges and pavements. NMDOT uses their MMS to track Emergency Events. When the Governor of New Mexico or the President declares a disaster, the emergency event is created in MMS to identify the repairs that need to be completed and the expenditures during the event in order to prepare a request for Federal Emergency Relief Funds. This data was reviewed to determine NHS routes that have been damaged due to a natural disaster or catastrophic event since January 1, 1997. Based on an analysis of the disaster declarations and data in MMS, there are no locations on the NHS that have required repair or reconstruction on two or more occasions.

Chapter 6

Financial Plan & Investment Strategies

Achieving the targets presented in Chapter 4 will depend on the level of future revenues that can be used for maintenance, repair, rehabilitation, and replacement of pavements and bridges. This chapter describes NMDOT's current revenues and its assumptions regarding future revenues available for asset preservation.

Overview

The following subsections present the TAMP financial plan, summarizing funding sources and uses and detailing the projected funding available for asset management uses over the next ten years. The financial plan is an estimate of projected revenue, detailing the resources available for helping meet the condition targets presented previously. Note that the financial plan is focused on funds available for pavement and bridges on the NMDOT-maintained highway system and the NHS.

Federal Legislative Context

FHWA requires each state DOT to include a financial plan that spans at least ten years and identifies funding and costs over that time in their TAMP. FHWA defines financial plan as "a long-term plan spanning 10 years or longer, presenting a State DOT's estimates of projected available financial resources and predicted expenditures in major asset categories that can be used to achieve State DOT targets for asset condition during the plan period, and highlighting how resources are expected to be allocated based on asset strategies, needs, shortfalls, and agency policies." The plan should provide a summary of financial resources and needs for pursuing asset management objectives and achieving performance targets.

FHWA also requires that states establish a process for developing a financial plan as part of the transportation asset management plan. Specific requirements for the process are:

- Estimated cost of expected future work to implement the investment strategies of the asset management plan by fiscal year and work type
- Estimated funding levels to address the costs of future work types by fiscal year
- Identification of anticipated funding sources
- Asset valuation estimate for NHS pavements and bridges assets and the needed annual investment to maintain asset value

Revenue Sources

New Mexico's transportation funding has historically been split 50-50 between federal and state sources. The majority of state and federal transportation funding is collected through fuel taxes. New Mexico's State Road Fund (SRF) is the main source of state funding and is used primarily to provide federal match and fund highway operations, DOT administrative costs and other non-federally eligible expenses. A Local Government Road Fund (LGRF) is funded from many of the same sources as the SRF. The funding sources and uses in this TAMP include the latest federal funding increases resulting from the BIL, signed into law in 2021. Table 6-1 presents a summary of NMDOT's total revenue sources, organized by federal and state sources. Federal funds shown in the table have already been reduced for debt service payments, specifically the National Highway Performance Program (NHPP) and the Surface Transportation Block Grant Program (STBG).

As Table 6-1 includes all $10.1 billion in NMDOT revenue sources, the total values are greater than the $4.9 billion in expected TAM investments shown in Table 6-2. The $5.2 billion difference represents NMDOT spending on non-TAM activities or on assets other than pavement and bridge.

Table 6-1. NMDOT Revenue Sources ($m by state fiscal year)

Description Sources	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Federal Funds										
NHPP	$219	$223	$227	$231	$235	$240	$244	$249	$254	$259
STBG	$92	$96	$100	$104	$108	$110	$112	$115	$117	$119
Freight	$13	$15	$17	$19	$21	$21	$22	$22	$23	$23
Bridge	$45	$45	$45	$45	$45	$46	$47	$48	$49	$50
Other*	$61	$65	$69	$73	$77	$79	$80	$82	$83	$85
Subtotal	$430	$444	$458	$472	$486	$496	$506	$516	$526	$537
State Funds										
SRF	$530	$532	$536	$544	$555	$566	$577	$589	$600	$612
HIF	$6	$6	$7	$7	$7	$7	$7	$7	$8	$8
State Debt Repayment	$(45)	$(50)	$(56)	$(54)	$(54)	$(50)	$(58)	$(58)	$(46)	$(9)
Subtotal	$491	$488	$487	$497	$508	$523	$526	$538	$562	$611
Total	**$921**	**$932**	**$945**	**$969**	**$994**	**$1,018**	**$1,032**	**$1,054**	**$1,088**	**$1,147**

*'Other' includes HSIP, CMAQ, Carbon Reduction, RR crossing funds, and the PROTECT funds.

State Funding Sources

The main source of state funding is the SRF. Because of this, NMDOT does not typically receive appropriations from the state's general fund. The SRF receives the majority of its funds from the following four main revenue sources: the gasoline tax, motor vehicle registration fees, the special fuel (diesel) tax, and weight distance taxes. Other state revenue sources also contribute to the SRF.

While not a state funding source, the LGRF receives revenue from many of the same sources as the SRF. However, the use of the LGRF is restricted to local governments only.

Federal Funding Sources

A large portion of funding for NMDOT's annual budget comes from federal surface transportation legislation.

MAP-21 was signed into law in 2012 in an effort to streamline and consolidate over 70 federal programs that often overlapped and created additional administrative burden. MAP-21 provided transportation agencies with greater flexibility to meet specific needs across the United States while increasing transparency and accountability.

The FAST Act, signed into law in 2015, supplements MAP-21 by stabilizing funding levels for state transportation agencies. As such, this authorization provided New Mexico with $1.9B in secure funding over a five-year period, ending in 2020.

Most recently, the BIL, signed into law in 2021, provides additional funds with some focus on resiliency investments.

NMDOT receives federal funds through the following programs:

- NHPP
- STBGP
- Bridge Formula Funding
- Highway Safety Improvement Program (HSIP)
- Congestion Mitigation and Air Quality (CMAQ) funds

The NHPP represents the single largest category of federal revenues for New Mexico and the majority of funding available for preservation of the state's highway and bridge assets. Portions of the STBGP also fall within the statewide discretion of NMDOT and are therefore considered eligible for asset management spending.

Funding Uses

NMDOT Budget Breakdown

NMDOT's budget is structured into four programs:

- **Project Design and Construction.** Project Design and Construction covers NMDOT's construction program (100% federal with state funds used as match) as well as planning, research, and local government road fund programs. Debt service represents a significant portion of this budget and is discussed further below.
- **Highway Operations.** Highway Operations covers routine pavement, bridge, and right-of-way maintenance activities performed by NMDOT's maintenance crews and contractors via established statewide price agreements.
- **Business Support.** This includes administrative activities such as Human Resources, Accounting and Finance, Public Relations, Information Technology, Training, and Buildings and Grounds.
- **Modal.** This includes Transit and Rail, Aviation, Traffic Safety (National Highway Traffic Safety Administration) and Ports of Entry. This program was established in State Fiscal Year 2017 as a new program area. The funds for this program are restricted to very specific purposes and equally split between federal and state sources.

Asset management projects, including most pavement preservation, rehabilitation and reconstruction, are funded from the Road Betterments portion of the Project Design and Construction budget and typically take up roughly 45% of the overall budget.

Telling the Story: Preserving the System

Trent Doolittle, District 1 Engineer, on the role of the District Engineer in TAM

Work at the district level has improved with the application of asset management principles and tools. The improved data management combined with good prioritization strategies has impacted work on the ground. Trent Doolittle of District 1 has a unique understanding of the dynamic between local and state priorities, and he believes that improved analysis capabilities based on good data have helped state and local interests negotiate a better solution through a give and take process.

District Engineers like Trent advocate for the needs of their individual districts while also having the responsibility of contributing to and supporting statewide priorities. Trent believes that implementing the TAMP with good communication and participation from the districts will ensure that the system-wide priorities will serve the districts as much as possible within funding constraints.

Table 6-2 shows NMDOT's financial plan for 2022 to 2031 for TAM spending for all NMDOT-owned pavement and bridges. Table 6-3 shows the financial plan for NHS pavement and bridges for this period.

Table 6-2 shows NMDOT's financial plan for 2022 to 2031 for TAM spending for all NMDOT-owned pavement and bridges. Table 6-3 shows the financial plan for NHS pavement and bridges for this period. Both tables show expenditures using the work types specified by FHWA. As shown in Table 6-2, estimated expenditures for NMDOT pavement and bridges total approximately $4.9 billion over the period from 2022 to 2031, with approximately 73% of the TAM-related expenditures for pavement and 27% for bridges.

Table 6-2. Expected NMDOT TAM Expenditures by Work Type

Work Type	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Pavement										
Initial construction	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Maintenance	$7.3	$7.5	$7.6	$7.8	$7.9	$8.1	$8.2	$8.4	$8.6	$8.7
Preservation	$187.1	$174.1	$181.1	$183.2	$214.4	$189.6	$193.4	$197.3	$201.2	$205.3
Rehabilitation	$122.0	$47.0	$78.0	$58.0	$112.0	$94.0	$95.9	$97.8	$99.8	$101.7
Replacement	$258.0	$63.0	$26.0	$27.0	$70.0	$44.0	$44.9	$45.8	$46.7	$47.6
Subtotal	$574.4	$291.6	$292.7	$276.0	$404.3	$335.7	$342.4	$349.3	$356.3	$363.4
Bridge										
Initial construction	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Maintenance	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1
Preservation	$31.8	$36.1	$35.5	$35.8	$40.2	$40.5	$41.3	$42.2	$43.0	$43.9
Rehabilitation	$18.0	$21.0	$19.0	$14.0	$14.0	$14.0	$14.3	$14.6	$14.9	$15.2
Replacement	$150.0	$42.0	$65.0	$76.0	$74.0	$76.0	$77.5	$79.1	$80.7	$82.3
Subtotal	$199.9	$99.2	$119.6	$125.9	$128.3	$130.6	$133.3	$135.9	$138.6	$141.4
Total	**$774.3**	**$390.8**	**$412.3**	**$401.9**	**$532.6**	**$466.3**	**$475.7**	**$485.2**	**$494.9**	**$504.8**

Approximately half of NMDOT's TAM-related expenditures will be made on the NHS. Table 6-3 shows that expenditures on the NHS are expected to total $2.3 billion, with approximately $1.9 billion used for pavement and $400 million for bridges. A large portion of the NHS expenditures will be used for maintenance and preservation work. Maintenance and preservation expenditures are expected to be approximately $1.4 billion, 61% of the total. Rehabilitation expenditures are expected to be approximately 23% of NHS TAM expenditures, and reconstruction/replacement expenditures are expected to be approximately 16% of the total.

The values shown in Table 6-3 are the basis for the expected funding scenario used to predict asset conditions in Chapter 4. Table 6-3 is also used to develop the implementation documentation used in the annual consistency review.

Table 6-3. Expected NMDOT NHS Expenditures by Work Type

Work Type	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Pavement										
Initial construction	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Maintenance	$3.5	$3.6	$3.7	$3.8	$3.8	$3.9	$4.0	$4.1	$4.2	$4.2
Preservation	$120.8	$116.6	$115.7	$118.0	$120.4	$122.8	$125.2	$127.7	$130.3	$132.9
Rehabilitation	$22.7	$30.6	$0	$36.6	$64.6	$68.2	$69.6	$71.0	$72.4	$73.8
Replacement	$58.9	$34.4	$14.0	$0	$2.6	$0	$0	$0	$0	$0
Subtotal	$205.9	$185.3	$133.4	$158.4	$191.4	$194.9	$198.8	$202.8	$206.8	$211.0
Bridge										
Initial construction	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Maintenance	$0.1	$2.8	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1	$0.1
Preservation	$12.5	$14.3	$13.1	$13.3	$13.6	$13.9	$14.1	$14.4	$14.7	$15.0
Rehabilitation	$0	$0	$0	$0	$0	$6.0	$6.1	$6.2	$6.4	$6.5
Replacement	$0	$0	$38.6	$55.4	$51.2	$22.0	$22.5	$22.9	$23.4	$23.8
Subtotal	$12.6	$17.1	$51.7	$68.7	$64.8	$41.9	$42.8	$43.6	$44.5	$45.4
Total	**$218.5**	**$202.4**	**$185.1**	**$227.1**	**$256.3**	**$236.8**	**$241.6**	**$246.4**	**$251.3**	**$256.4**

Expected expenditures for TAM were developed based on the following sources of data:

- Data for capital projects for preservation, rehabilitation, and reconstruction/replacement are detailed in the NMDOT STIP. Values from the STIP are specified for 2022 to 2027.
- Data for expenditures on maintenance and preservation performed by Department forces are specified in the MMS for 2022.
- Data for expenditures on maintenance and preservation performed by contract forces are specified in the Contract Maintenance (CM) database for 2022.

To develop a 10-year TAM financial plan, NMDOT supplemented these data sources assuming planned expenditures would continue at budgeted levels with 2% annual escalation. Thus, the 2027 values from the STIP were used to estimate 2028 to 2031 funding for capital projects. Likewise, the 2022 values from the MMS and CM were used to estimate 2023 to 2031 expenditures for maintenance and preservation actives performed by Department and contract forces, respectively.

It is important to note that in reviewing data from the STIP, NMDOT classified each project based on its primary work type. Particularly in the case of work classified as pavement work, there are cases where a project includes work on multiple asset classes and/or work types. For instance, a project that is primarily pavement rehabilitation would be shown in the planned expenditures for pavement rehabilitation, but a portion of the project may be used for safety improvements or bridge work.

Investment Strategies

Asset management investment strategies are the policies for resource allocation that will deliver the best asset performance given available funds and the goals and objectives of state and local agencies. Generating an asset management investment strategy involves assessing various funding scenarios designed to achieve and sustain a desired state of good repair and deliver the program efficiently.

Federal Requirements

FHWA requires that states include investment strategies as part of their transportation asset management plan. FHWA defines investment strategies as *"a set of strategies that result from evaluating various levels of funding to achieve State DOT targets for asset condition and system performance effectiveness at a minimum practicable cost while managing risks."* The asset management plan must discuss how the investment strategies make progress towards achieving a desired state of good repair over the life cycle of the assets in the plan, improving or preserving asset condition, achieving two and four-year state DOT targets for NHS asset condition and performance, and achieving national performance goals.

NMDOT's Investment Strategies

NMDOT's asset investment strategies are based on high level policies for emphasizing preservation and ensuring minimum standards based on different tiers of the transportation network. Available funds are allocated based on review of objective data about asset condition at network and asset-specific levels. Underlying the investment strategies are the performance targets and projections, life cycle planning, risk management analysis, and anticipated funding and cost of future work described in other chapters of this TAMP. The performance gap analysis, enabled by life cycle planning, helps define the investment needs of the system. Life cycle plans use the estimated cost of future work to establish network level strategies for managing assets. Available funding is a constraint for performance modeling, allowing New Mexico to more accurately predict future scenarios. Risk management tempers the analysis, adjusting potential outcomes based on positive and negative risks. NMDOT's investment strategies support the seven national transportation goals identified in 23 U.S.C. 150(b).

Goals, Objectives and Strategies: The New Mexico 2045 Plan

NMDOT recently undertook a long-range planning activity for the next 25 years, with the New Mexico 2045 Plan, adopted in June 2021. The vision, goals, objectives, strategies, and performance measures in the plan guide the development of the TAMP. Specifically, one of the four goals of New Mexico 2045 is ***Asset Management:*** *optimize spending to cost effectively preserve our transportation assets in the best possible condition over the long term.* Three of the five objectives for this goal directly align with the TAMP:

- Maintain pavement in a state of good repair
- Maintain bridges in a state of good repair
- Assess and address system risks to improve resiliency

New Mexico 2045 also identified a number of asset management strategies which will guide the TAMP and TAM investments in New Mexico:

- Continue to expand the scope and improve the quality of data collected to inform asset management decision-making. Examples include expanding data collection to pedestrian assets and improving the quality of Geographic Information System (GIS) spatial data.
- Integrate the Project Evaluation Process to advance performance-based asset management.

- Assess Connected and Autonomous Vehicles (CAV) related preservation needs, conduct roadway baseline assessment, develop an approach for integrating into asset management related decision-making.
- Identify data for and conduct a study to identify risks to system assets. Create a plan to address priority assets.
- Develop process for incorporating resiliency and impacts of increasingly severe weather and increased environmental stress into asset management and project design.
- Invest in staff and staff training to prepare the organization for changing technology standards and build organizational capacity to prepare for CAVs and advanced Intelligent Transportation Systems (ITS).

Overview of Resource Allocation and Prioritization

Allocation and prioritization of available funding emphasizes preservation of existing assets to maintain them in a state of good repair. NMDOT policy has been to dedicate a significant portion of flexible spending to preservation of the existing system. Allocations to preservation are balanced against needs to replace assets that have reached the end of their service life or require improvement to meet important safety and mobility needs. Resource Allocation within NMDOT today refers mostly to the process of distributing dedicated budgets to the appropriate programs and discretionary budgets among the six NM Districts. Discretionary funds are derived principally from the NHPP at the federal level and SRF at the state level.

Similar to many states, New Mexico District Engineers have substantial discretion over the allocation of funds once the funds are divided among the six districts. While districts vary in their approach to prioritizing assets, many are working to incorporate preventive maintenance activities to extend asset life. However, tight budgets and the need to act responsively, whether to address deterioration or to respond to emergency needs with direct driver impacts limits their ability to take on more preventative maintenance work.

NMDOT's STIP contains the results of the resource allocation and prioritization process. The STIP is a six-year program of projects. It is fiscally constrained for the first four years – funding is identified for each project from available sources. FHWA approves the STIP every two years, and it is amended quarterly.

Telling the Story: Funding

Mallery Manzanares, Administrative Services Director

Making the most effective investments in transportation infrastructure is a challenge, as it is subject to economic changes, the legislative process, and the amount of funding available to invest. Complicating those investment decisions is the need to achieve an appropriate balance across programs and across geographic regions of the state. Mallery Manzanares, Administrative Services Director, recognizes the need for balance and the importance of adequate investment. "The ability to rely on system condition data and modelling to help make financial planning decisions is critical," says Mallery "but there will always be a need for context in that decision-making process. You need to come to agreement about the budget for bridge investment versus pavement, for example. Or to find a balance between investment in rural infrastructure compared to urban assets. Good policy direction and public input are crucial to achieve a proper investment balance. It's a great thing for New Mexico that we can look forward to some additional funding from the federal government through the new infrastructure bill. It makes it just that much easier to prioritize projects and make project choices that provide benefits throughout the state."

The remainder of this chapter describes current processes for identifying and prioritizing pavement and bridge projects and assigning funds to programs and projects in the STIP. It should be noted that these processes are expected to evolve as NMDOT works to improve its data and analysis capabilities – providing a firmer foundation for data-driven investments. A shift from district-based resource allocation decision-making to a needs-based and target driven decision-making at both a statewide and district level is expected.

Identification of Bridge and Pavement Projects

Prioritization of capital bridge projects for the STIP is conducted through a collaborative process between the GO and the Districts. Figure 6-1 illustrates the basic process for bridges.

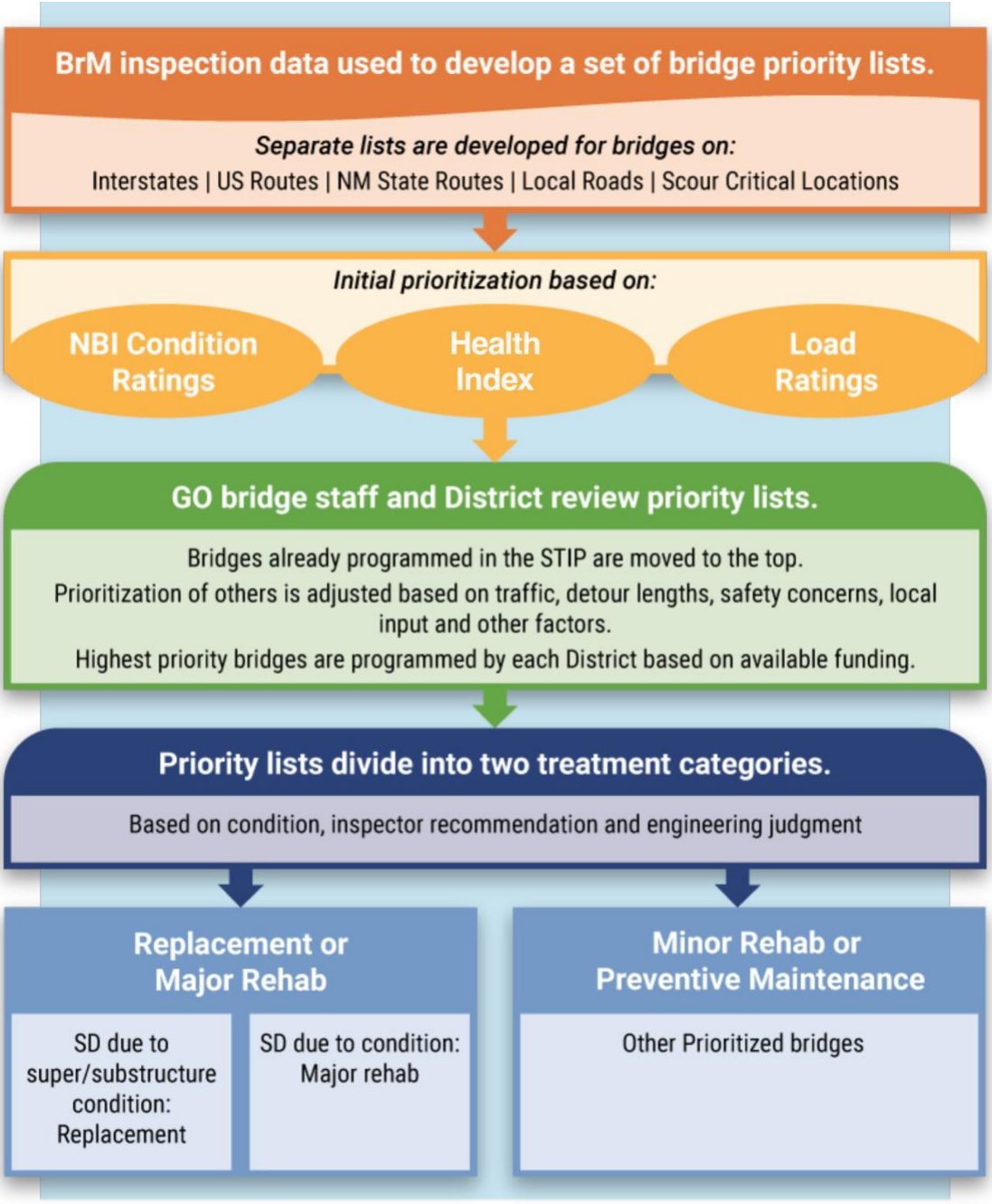


Figure 6-1. Bridge Project Prioritization Process

While there is variation across Districts in how paving projects are identified, prioritized, and programmed, the following steps in Figure 6-2 are typical.

The GO provides pavement condition data to the Districts. In addition, Districts do their own monitoring of pavement conditions via road patrols.

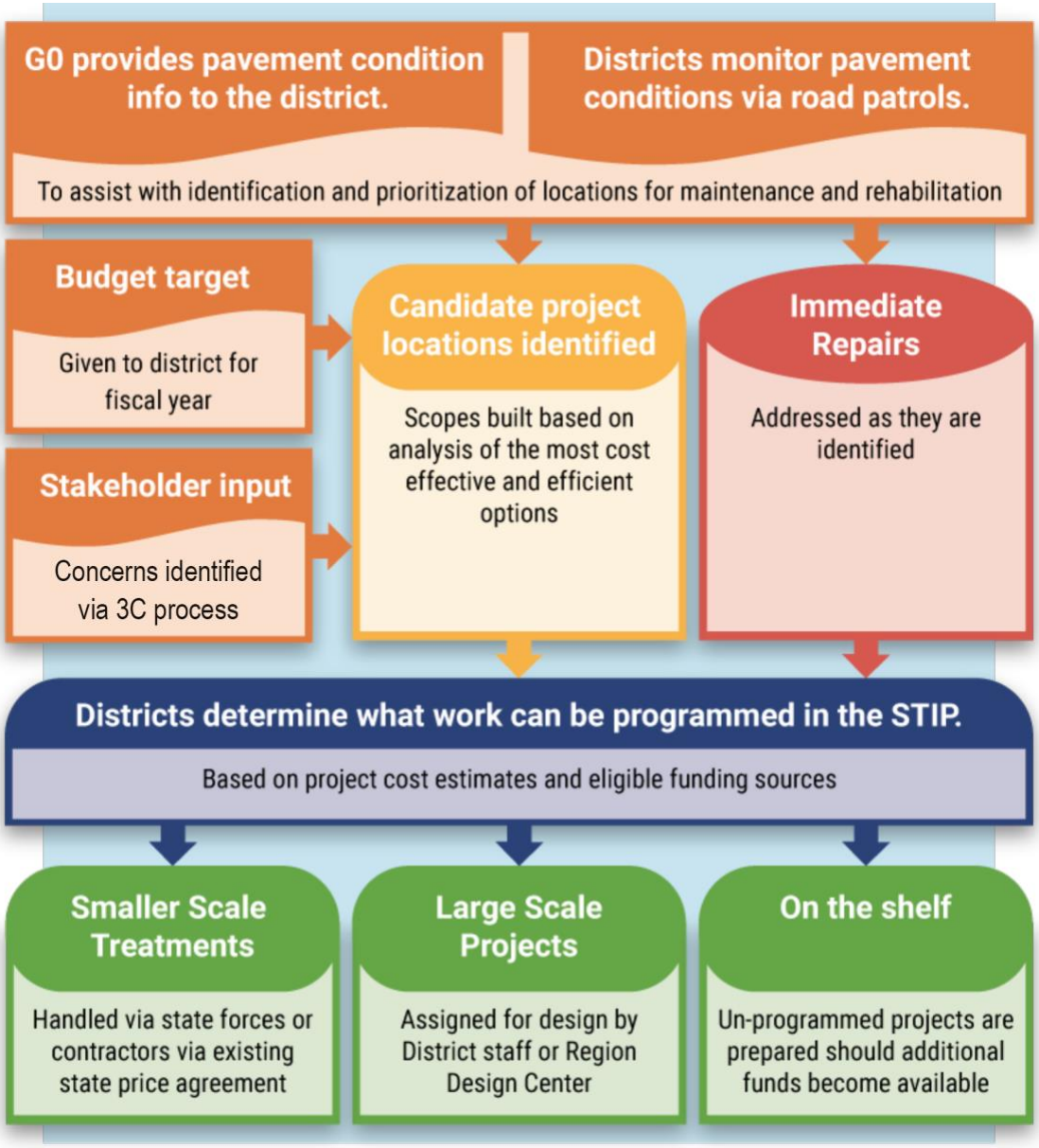


Figure 6-2. Pavement Project Prioritization Process

Programming Process

Resource allocation or programming at NMDOT follows the process in Figure 6-3. Dedicated resources are first programmed to debt service and obligatory budgets such as CMAQ. Depending on the year, the set-asides for dedicated programs leave approximately half of the annual budget for discretionary expenses including asset management.

Each District receives an allocation of available federal NHPP funds based on a formula that considers lane miles and vehicle miles traveled. Meanwhile, STBGP funds are allocated to Districts based on centerline miles and population. Districts can use NHPP and STBGP funds for pavement preservation and bridge replacement, rehabilitation and preventive maintenance projects.

Districts have discretion about how they allocate their available funds across different assets and types of needs – within the confines of funding eligibility restrictions. District spending targets are specified by funding source rather than by asset or route type.

In order to encourage bridge preventive maintenance, NMDOT has dedicated funding annually to a Bridge Preventive Maintenance Program. This program has been funded at an average of $13 million per year. Of this amount, roughly $12 million is from the NHPP for bridges on the NHS and $2 million is from the STBGP. These funds are distributed across the Districts based on a call for projects and cover approximately 40-50 projects per year.

Telling the Story: Life Cycle Planning

Leo Montoya, District 1 Maintenance Support Engineer, on the current use of life cycle tools for pavement and bridge

Early in its implementation, NMDOT's PMS was primarily used for verification, comparing PMS data to field conditions. Now, District 1 is extremely confident with the PMS data and have begun to prioritize the District's Pavement Preservation shelf program and Maintenance At A Glance (MAAG) based on pavement conditions. Allowing staff the understanding of the District's big picture allows it to allocate resources in places of need.

For example, the I-10 corridor from Arizona to Deming is one of the busiest in New Mexico, carrying a large volume of heavy truck traffic. Previously, District 1 was prioritizing bridge reconstruction over pavement preservation because of the need to meet other performance targets. More recently, the District has utilized PMS pavement condition rating to prioritize, design and shelf segments of the I-10 corridor for future funding. As of 2022, District 1 has successfully funded and constructed almost the entire corridor.

We still must consider a time lag between the PMS data and construction–in order to ensure consistency, the data must be reviewed annually or bi-annually depending how long plans sit on the shelf. We also must have an understanding of how NMDOT General Office and Districts prioritize bridge projects vs. roadway projects, knowing that funding is limited and trying to find balance between the two will always be a challenge.

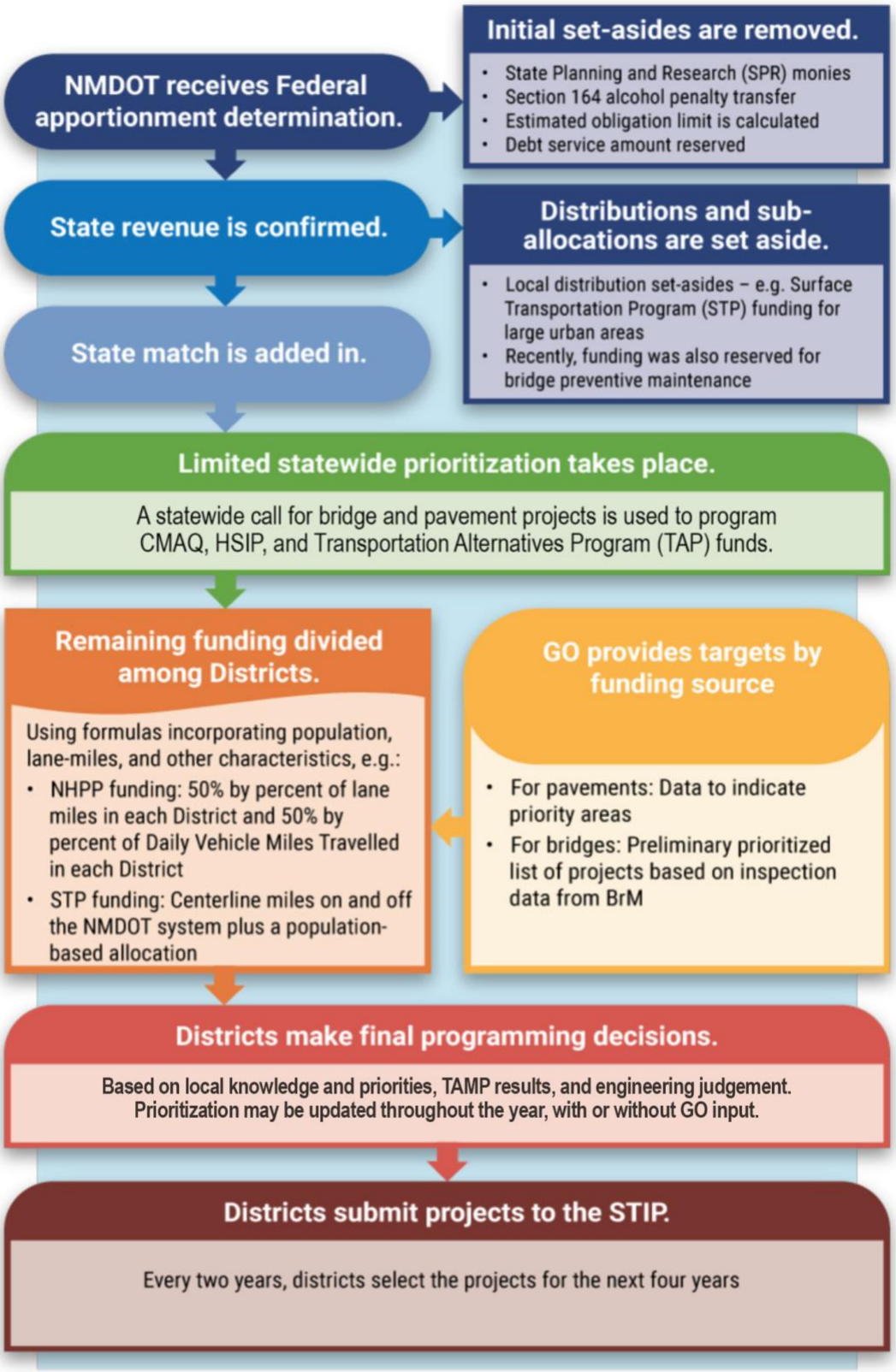


Figure 6-3. Programming Process

Asset Valuation

Estimates of asset value provide a basis for summarizing quantities of different types of infrastructure assets on a single scale – dollars – and for evaluating planned investments in the system. This section presents asset value calculations based on two commonly used methods – replacement value and depreciated asset value. However, it is important to keep in mind that these methods do not account for the full economic value provided by strengthening connections between New Mexico's communities and neighboring states.

Replacement Value

The first approach to asset valuation is based on estimating the costs of complete asset replacement. Replacement cost does not vary by asset condition – i.e. the replacement cost for a new bridge is the same as that for a 70-year-old deteriorated bridge of similar size, location, and design. This method is similar to the way the value of a house is established for insurance purposes. It provides a measure of the overall size of the system. The replacement value changes only as changes in the asset inventory and/or construction costs occur.

Table 6-3 summarizes the replacement value of NMDOT bridges and pavements and the replacement value of all New Mexico NHS bridges and pavement. The estimates on this table are based on unit replacement costs of $639.53 per square foot of deck area for bridges and $2,000,000 per lane mile for pavement.

For pavement, the unit cost was developed based on the average cost per lane mile in recently let projects.

For bridge, the unit cost was developed by averaging the 2021 FHWA Unit Cost Summary for NHS and Non-NHS Bridges. NHS unit cost was $370.35, non-NHS unit cost was $269.18, and the average was $319.77. NMDOT then used a multiplication factor of 2.0 to account for significantly higher costs than in previous years.

Table 6-4. Estimated Highway Replacement Costs

Owner	System	Asset Quantity		Replacement Value ($)		
		Bridge Deck Area (sq. ft.)	Pavement (lane miles)	Bridge	Pavement	Total
NMDOT	NHS	11,595,004	11,054	$7,415,353,087	$22,107,552,000	$29,522,905,087
	Total	19,119,701	28,118	$12,227,622,094	$56,235,386,000	$68,463,008,094
Locally Owned	NHS	220,224	316	$140,839,653	$631,123,290	$771,962,943
NMDOT +Locally Owned	NHS	11,815,228	11,369	$7,556,192,740	$22,738,675,290	$30,294,868,030

As detailed in the table, the replacement value of NMDOT's bridge and pavement inventory is approximately $68 billion. The replacement value of NHS bridges and pavement is approximately $30 billion.

Depreciated Value

A second approach to valuing assets uses the depreciated value reported in NMDOT's annual financial statements. NMDOT calculates the value of its capital assets for these statements following Generally Accepted Accounting Principles (GAAP), consistent with Government Accounting Standards Board (GASB) Statement 34. GASB Statement 34 was published in 1999 and restructured much of the way government agencies present financial information.

Its goal was for the public to "understand the extent to which the government has invested in capital assets, including roads, bridges, and other infrastructure assets." Statement 34 offers guidance on establishing a "book value" for infrastructure, though specific calculation methods vary across states.

Since 2002 NMDOT has valued its assets using the "straight line depreciation method" described in GASB Statement 34. This involves calculating the cost of asset acquisition or construction and then depreciating that cost based on the life of the asset. For instance, an asset with a 30-year life is assumed to have depreciated to half of its initial value when it reaches 15 years.

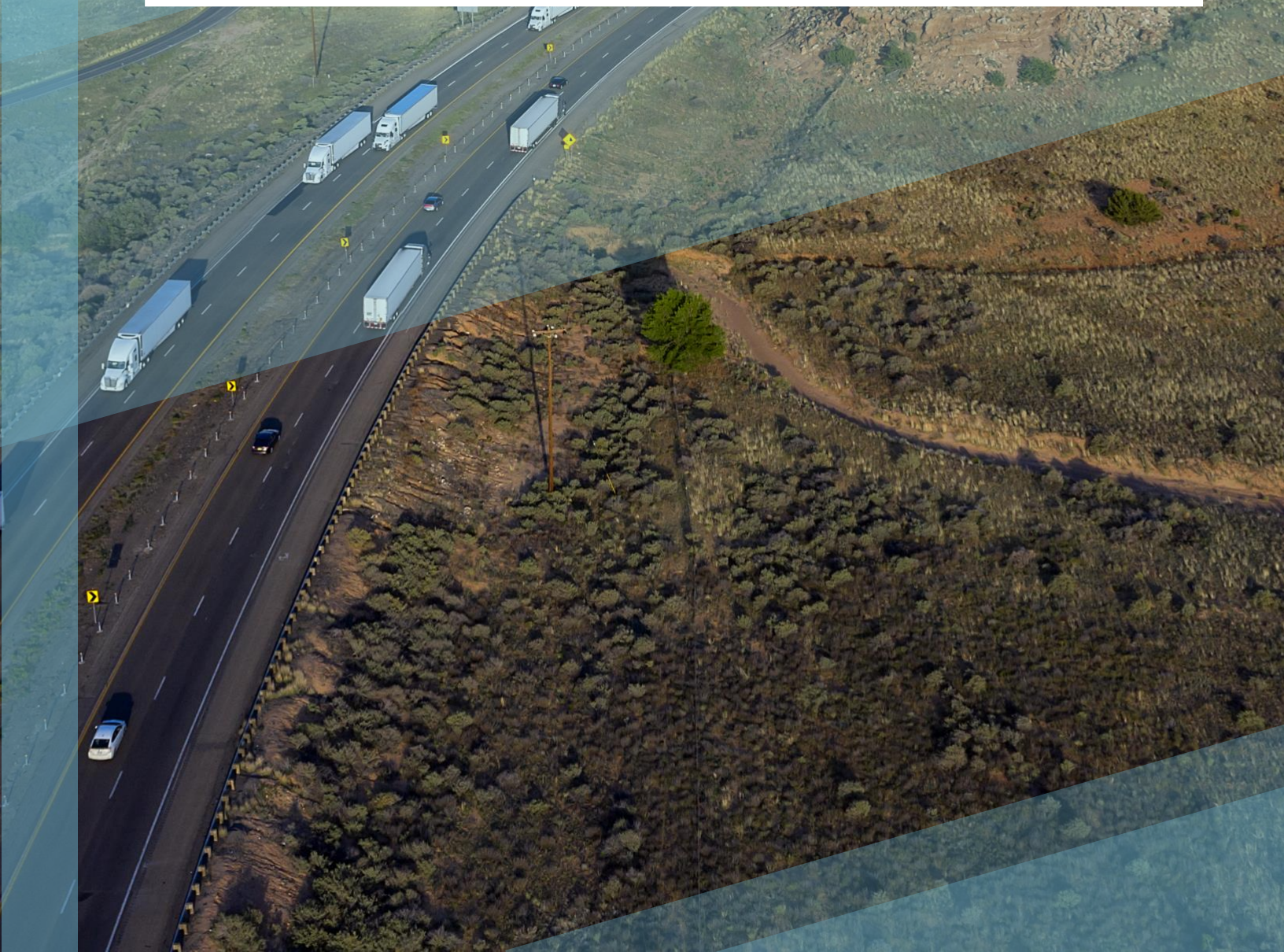
Because NMDOT did not possess the records of all past costs for highways and bridges, the agency initially estimated construction costs using the replacement cost of the asset and then deflated these estimates to the year of construction using the historic Consumer Price Index. Subsequently actual costs of assets were captured and depreciated using a straight-line method over a 25 to 30-year lifespan (30 years for Interstate roadway, bridges, culverts, etc.; 25 years for non-Interstate assets).

As of June 30, 2021, NMDOT reported a gross value of $12.7 billion for its infrastructure assets. Other assets such as land, right-of-way, library, and buildings are accounted for separately. Total accumulated depreciation for all NMDOT assets is $8.8 billion. An estimated $7.8 billion of that figure can be attributed to infrastructure based on infrastructure's proportion of gross asset value. Thus, the depreciated book value of NMDOT's infrastructure assets is estimated to be $4.9 billion ($12.7 billion less $7.8 billion). This figure is significantly lower than the replacement value described above, as the gross value is calculated in year of expenditure dollars, rather than using today's replacement cost, and the replacement cost does not incorporate depreciation.

Chapter 7

Data Management

Data management is an enterprise-wide focus at NMDOT, for it supports numerous agency goals and departmental functions. Within TAM, data are used to measure and report asset condition, track performance, analyze programs and processes, and support strategic and operational decisions. NMDOT's data strategy seeks to align data collection and data management across divisions, departments, and districts for effective and efficient use.



Overview

NMDOT relies on quality data to effectively maintain the state roadway network. Data supports better asset maintenance, real-time decision-making, and deployment of new technologies. It helps to have a better understanding of environmental impacts, societal impacts, and risks associated with projects and assets. It provides transparency to the public and garners buy-in for new projects and initiatives. Good data is crucial for making good decisions.

Improving data and managing progress on data's impact for TAM decisions has been a key focus of NMDOT's TAM program. Over the past ten years, there has been a series of initiatives to strengthen TAM capabilities at NMDOT so that greater progress on TAM is made. Some highlights of the impact of these initiatives include:

- Clearer communication with the public about assets including their condition, investments, and planned projects
- Shared information related to TAM across NMDOT units to coordinate programs and projects
- Improved data integration and standardization to allow for educated and thoughtful decision-making
- Access to current and historical condition and maintenance information for pavement and bridge assets
- Establishment of an enterprise-wide strategic data business plan with defined data roles and responsibilities
- Implementation of data communities of interest to discuss data challenges, share ideas, and improve collaboration

This chapter provides information focused on NMDOT data initiatives that support TAM.

Federal Legislative Context

FHWA requires State DOTs to use the best available data to develop their asset management plans. Furthermore, State DOTs must utilize bridge and pavement management systems to support the development of their asset management plan. Such management systems must include documented procedures for:

- Collecting, processing, storing, and updating inventory and condition data for NHS bridges and pavement
- Forecasting deterioration for NHS bridges and pavement
- Conducting life cycle analysis of alternative strategies for NHS bridges and pavement
- Identifying short- and long-term budget needs for managing condition for NHS bridges and pavement
- Determining the optimal strategies for identifying potential projects for NHS bridges and pavement
- Recommending programs and implementation schedules to manage condition for NHS bridges and pavement

Growing Importance of Data

As technology and data continues to change the way we do work, NMDOT is embracing the possibilities and focus on using these advancements to deliver better equity and connecting people, places and things. Data needs at NMDOT are growing in complexity and importance. The expansion of data's role means that a future focused reponse and a well-established process are more important than ever.

Agencies like NMDOT have new options for external data partners and tools, researchers are continuously coming up with new analytical methods, and new forms of data and data collection processes are offered by vendors. The spread of infrastructure-based tools and methods will push agencies to rely on digital resources. Similarly, the growth of remote work is bringing people together online in new ways, and all of this online activity opens up new avenues for greater cybersecurity risks. The rising importance of resiliency building, from an environmental and a security perspective necessitates attention on new data programs and applications. ITS are adding connections to real-time data and options for real-time monitoring of the entire transportation system, and the rise in electric vehicles offers both opportunities for better data and challenges for new risks. Alternative fuels and decreasing gas tax revenues are placing stress upon New Mexico's transportation funding landscape. New efficiencies and clever uses of data could be able to mitigate the risks. The growth of data's importance will continue to develop and improve asset management and NMDOT and its partners will be prepared to employ all of these to their advantage.

Telling the Story: Better Data Leads to Better Decisions

Phillip Montoya, Asset Management Bureau Chief

The key to asset management is making decisions based on data about system condition and performance. Phillip Montoya, Asset Management Bureau Chief, recognizes the importance of good data in that process. "We've collected data on the condition of the transportation system for many years. It's really gratifying to see it used so effectively as part of NMDOT's asset management approach. The data allows us to make better decisions about when and what type of repairs to make. As technology improves, and our data collection methods get better, we have a more robust understanding of the needs of the system and the most cost-effective and sustainable ways to address those needs. Good data definitely improves the decision-making process."

Data Resources

NMDOT has data resources which are used to track, analyze, forecast, and improve asset performance. Table 7-1 presents the current set of data resources which support TAM. Each data resource includes a subset of data types and IT systems used to conduct the relevant analyses and decisions.

Table 7-1. Data Types and Systems at NMDOT

Data Resource	Data Types Included	IT Systems
Data Warehouse	Various	
Performance Measures	Multiple performance measures – system condition, operations, agency efficiency	Microsoft suite, EGIS Data provided by business owners & compiled together
GIS	Geospatial Transportation Features, land and environmental features	Esri ArcGIS, EGIS (incl. Enterprise GIS Database systems, NMDOT Proprietary data, NMDOT analysis layers, Web Map Applications, Dynamic and Static Spatial Information Products, and Linear Referenced Systems of Data)
Traffic Monitoring	AADT, Vehicle Classification, Turning Movements, Volume, Speed, Intersection level of service, WIM Data	MS2
Planning/ Freight	Commodity Flows, Supply Chain data, Bottlenecks, Infrastructure, Travel Time Metrics	National Databases
Road Inventory	Mileage, classification, geometrics, etc. – including Model Minimum Inventory Elements (MIRE)	Esri Roads and Highways
HPMS	HPMS Data Elements – full extent and sample (road inventory, traffic, pavement, etc.)	Sourced from PMS, MS2, AASHTO BrM, compiled within Roads and Highways
Pavement Management	Pavement inventory, IRI, cracking, summary condition, layer history	Pavement Management System
Bridge Management	Structure inventory and inspection	AASHTO BrM
Capital Program/STIP	Federal Obligations, Construction Project Data, delivery performance (on-time, on-budget)	E-STIP, PPMS, Bid Express (BidX)

Data Resource	Data Types Included	IT Systems
Construction Projects	Construction Project data, materials tests, inspections, payments, civil rights, claims, as built plans	AASHTOWare Project AP Construction (payments) LCP Tracker and B2GNow (Civil Rights)
Design Schedules and Milestones	Survey request dates, design milestone dates	PMTM Tracker
Traffic Management	Real time traffic and travel time data NMROADS	Real time system management information program NMROADS hosted by Real Time Solutions
Maintenance Management	Work requests, work orders, work accomplishments, resource utilization, cost	Maintenance Management System
Motor Carrier	Motor Carrier safety, operating statistics, International Registration Plan (IRP), International Fuel Tax Agreement (IFTA), oversize/ overweight permits	Promiles - oversize overweight permits
Crash Records/FARS Reporting	Fatality Analysis Reoprting System (FARS) reports, police accident records, Crash location, Crash frequency	http://tru.unm.edu/ Maintained by University of New Mexico, Geospatial and Population Studies, Traffic Research Unit (TRU)
Safety Planning	Enforcement data (citations and convictions), injury surveillance, road safety audits, behavioral (seat belt and helmet compliance, etc.)	The NMDOT Traffic Safety Division maintains survey data on seat belt compliance. Road Safety Audits (RSAs) are conducted by the HSIP Program. Citation and conviction data are maintained by the NM Court System. Injury surveillance data are maintained by NM EMS Bureau
Rail/Transit Operations	Service Providers, Operating Statistics, Grant/ Financial Information	

The above table illustrates the broad set of data resources that support asset management and system performance. The following section provide more information on the bridge and pavement management data and systems.

Bridge Data

The NMDOT Bridge Management Section conducts bridge and culvert inspections on a 24-month cycle for most bridges and a 48-month cycle for most culverts. Assets with lower condition ratings and those rated structurally poor are inspected on a more frequent cycle, as needed. A majority of the inspections are undertaken by District staff, with about a quarter of the inspections carried out by New Mexico State University (NMSU). At each inspection, engineers gather the requisite data to meet the National Bridge Inspection Standards as well as element-level condition data used to determine element and asset condition.

The Bridge Management Section follows a carefully curated QA/QC plan which provides detailed guidance on inspection frequencies and procedures, inspector training requirements, special inspection criteria and procedures, fracture critical bridge inspection plans, scour critical inspection plans, and data quality review. As a part of the inspection process, the Bridge Management Section also calculates load ratings for all of the NMDOT-owned bridges. These ratings are updated for new construction, bridge rehabilitation, and structurally-deficient bridges.

Bridge data has many intended uses and users, for everything from federal reporting to project planning and programming. The following list includes the key uses and their purpose for asset management. It also identifies external users of the data where applicable:

- **Federal reporting** – to meet the federal requirements for the TAMP, NBI and Bridge and Pavement Performance Management Final Rule– also accessed by FHWA
- **Network lifecycle planning and analysis** – report the network-level inventory, condition, and maintenance needs
- **Bridge investment decision-making** – identify candidates for preventative maintenance, rehabilitation, and replacement, then prioritize the list
- **Project planning and programming** – also support the development of the STIP
- **Project design** – rehabilitation and replacement designs
- **Bridge load rating** – establish the bridge capacity of NMDOT-owned bridges
- **Bridge inspection targeting** – identify inspection needs and frequency – also accessed by NMSU
- **Bridge inventory tracking** – maintain an accurate bridge inventory including all new bridges – also accessed by NMSU

Pavement Data

NMDOT collects data on a number of different pavement distresses to calculate their combined indices and their PCR for 0.1-mile pavement segments. The specific distresses examined for flexible and rigid pavement are described further in Chapter 3. The PCR feeds into the PMS used to operate and maintain the NMDOT pavement network. Data are gathered on a 24-month cycle, following the FHWA regulations for all NHS roads, half of the NMDOT-owned non-NHS roads, and other sample sections for the HPMS.

In addition to calculating the PCR, pavement data is important for many other aspects of TAM:

- **Federal reporting** – to meet the federal requirements in the TAMP, the federal target setting requirements for pavements, and the HPMS
- **Network lifecycle planning and analysis** – report the network-level inventory, condition, and maintenance needs

- **Pavement investment decision-making** – identify candidates and prioritize investment for preventative maintenance, rehabilitation, and replacement
- **Project planning and programming** – and support for the development of the STIP
- **Maintenance work planning and implementation** – support district work activities
- **Project design** – design pavement resurfacing, recycling, and replacement
- **Pavement inspection**– identify inspection needs and frequency
- **Pavement inventory tracking** – maintain an accurate pavement inventory including all new pavement.

NMDOT has formal guidance for the collection of pavement data and data quality management. The Data Collection Manual, published in December 2018, explains the procedures for collecting and rating asphalt pavements, jointed plain concrete pavements, and continuously reinforced concrete pavements. It also describes control site evaluation and the certification process for pavement inspectors.

The Pavement Distress Data Quality Management Plan describes the process adopted by NMDOT to evaluate and validate pavement condition data collection. The plan includes in-depth information on the deliverables, collection protocols, and quality standards; quality control; independent verification; data acceptance and corrective actions; quality-related roles and responsibilities; and a reporting plan including documentation of all activities and standards.

Coordination With Other NHS Owners

23 CFR 515.7(f) requires the TAMP to include a provision to obtain necessary data from other NHS owners in a collaborative and coordinated effort. NMDOT has taken responsibility for this data collection effort. As part of its existing processes, NMDOT inspects all NHS bridges and collects all NHS pavement data in New Mexico, regardless of asset owner. NMDOT also coordinates with tribal and local public entities within the five New Mexico MPOs on TAM implementation and target setting. Most recently, the TAM Working Group attended the New Mexico MPO Quarterly Meeting on December 6, 2021 to present on the 2022 TAMP and discuss opportunities for MPO engagement with TAM. The presentation included a summary of FHWA's comments on the 2019 TAMP, planned improvements for the 2022 TAMP, and a draft outline. The slides also provided examples of best practice coordination between other state DOTs and MPOs.

TAM-Related Information Management Systems

For bridge and pavement assets, key asset and project-related information is maintained in NMDOT's management systems. These systems support condition forecasting and program prioritization, as well as data generation for the federally required NBI and HPMS submittals. This section includes a description of the management systems that are used at NMDOT, including the assets supported, data required and used, functions and uses, and challenges.

Bridge Spreadsheet Tool and BrM

To manage bridge data and predict future conditions under different funding scenarios, NMDOT uses AASHTOWare Bridge Management software (BrM) in conjunction with a forecasting spreadsheet based on the BrM data. BrM is the authoritative source for bridge location and condition information, and it is the primary database used by NMDOT to store and process bridge inspection data. To maintain the quality of data in the BrM, the database is regularly queried for errors. Any inconsistencies or deficiencies found are promptly mitigated.

A spreadsheet tool was developed by NMDOT to be able to respond to the federal requirement to forecast ten year bridge performance. This spreadsheet tool uses deterioration models developed by the University of New Mexico that used New Mexico bridge data to model future bridge behavior based on varying investment levels.

Bridge inventory and condition data are performed to ensure data are up-to-date and meeting quality expectations. Data quality review procedures are defined in NMDOT's TAMP Analysis Procedure Guidance document.

Data Sources

The system compiles, stores, and analyzes annual bridge data collected by the Bridge Management Section through bridge inspections.

Information Products

The BMS predicts future bridge conditions under different funding and programming scenarios and a prioritized list of bridge maintenance projects.

Pavement Management System

The PMS is a third-party management system used to maintain and operate the pavement network at NMDOT. The PMS uses current pavement condition data, feasible pavement treatments, and budgetary data to recommend a prioritized set of treatments. Based on the conditions and budgets provided, the PMS also forecasts future condition. The PMS serves as the main repository for pavement data, and it is regularly monitored for quality control under the Data Quality Management Plan.

Data Sources

The system compiles, stores, and analyzes pavement condition data collected through contractors.

Information Products

The PMS produces forecasted future pavement conditions under the supplied budgets and feasible treatment scenarios. It also generates a prioritized list of treatments which optimizes the overall pavement condition.

System Challenges

Not all fields in the PMS are completely populated, which can result in insufficient data for some analyses.

Maintenance Management System

The MMS includes information on work orders and contract maintenance for all maintenance work. It details the expenditures for transportation asset management across the agency. Districts are asked to update the database monthly, and work orders are updated within two days of the work completion. The Maintenance Performance Management Section at NMDOT oversees the databased and runs monthly reports to check for null or blank fields.

Data Sources

Work orders and contract maintenance for all assets at NMDOT are held in this database.

System Challenges

For work orders, most of the data is 100% complete; however there are still gaps for the inventory of pavement and bridge. Under contract maintenance, more data are missing across the board. Completing the dataset for these two areas will support better analysis and forecasting of maintenance needs and expenses.

AP Construction

AP Construction is an AASHTOWare construction management tool which supports the reporting and analysis of project costs. It tracks costs from contract initialization through construction and final project completion. This tool is easily integrated with other AASHTOWare products and may be queried directly by users to produce a variety of different reports. While this system contains additional data and functionality, the information below is strictly related to the TAMP.

Data Sources

Construction project costs from start to finish.

Information Products

Project cost reports and data management.

System Challenges

The data input into the system is not always consistent or complete, leading to some inaccuracies in reporting.

State Transportation Improvement Program

Every federally funded or regionally significant capital project in NMDOT's six-year STIP is available online for public access via the electronic STIP (eSTIP). The eSTIP is the authoritative source for titles, scope and description, type, location, lead agency, phase, and programmed funding for all planned projects. Every project is lead by NMDOT and Tribal/Local Public Agencies within one of the five MPOs within New Mexico: Mid-Region MPO, Santa Fe MPO, Farmington MPO, Mesilla Valley MPO, and El Paso MPO, and each of these agencies is responsible for updating the database. Data for these projects are frequently updated by the agencies and checked for quality by the Statewide Transportation Improvement Program Unit.

In the eSTIP, project location is displayed through an interactive map for easy identification and navigation by the public. The eSTIP is searchable by county, agency, and project type, with results easily exported to an Excel document.

Data Sources

Statewide Transportation Improvement Program projects are added to the database and regularly updated by NMDOT or one of the MPOs responsible.

Information Products

The eSTIP presents a visualization of the current and planned projects across the state, and it allows for easy navigation of the program by the public. A spreadsheet export is available from the site too.

System Challenges

Obligation amounts are not always reliable nor regularly updated in the eSTIP.

Enterprise Geographic Information System

The Enterprise Geographic Information System (EGIS) is a platform intended to make the NMDOT Roadway Inventory System data available across the agency. It provides a centralized location for data resources and offers numerous visualization capabilities. The data for EGIS is stored in a simple data warehouse comprising data from BrM for bridge data, PMS for pavement data, AP Construction for construction cost data, and eSTIP for project data. Data are available via a map interface or queries, and a variety of reports are available too.

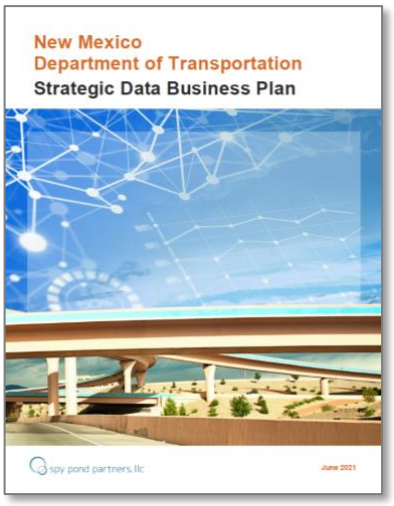
Data Sources

The sources of data for EGIS include BrM, PMS, AP Construction, and the eSTIP.

Information Products

EGIS is a centralized platform used to visualize and analyze data from the entire NMDOT Roadway Inventory System.

Strategic Data Business Plan



NMDOT has developed a Strategic Data Business Plan (SDBP) to ensure that the agency is collecting and managing data in an efficient and effective manner that supports business priorities, including TAM. The SDBP consists of the following elements:

- Context and Current State – to make the connection between NMDOT's goals and priorities with the SDBP and review the current state of data management practice at NMDOT
- Strategic Framework for Data Management and Improvement
  - A Vision that succinctly portrays NMDOT's desired future state
  - Principles that establish the foundation for guiding future actions
  - Goals that more specifically describe what NMDOT hopes to achieve
- Strategies and Actions that will be used to accomplish the goals
- An Implementation Roadmap that defines the sequencing of actions over the next 3-5 years

The SDBP defined the following vision for data at NMDOT that is governing how TAM data improvements are being pursued.

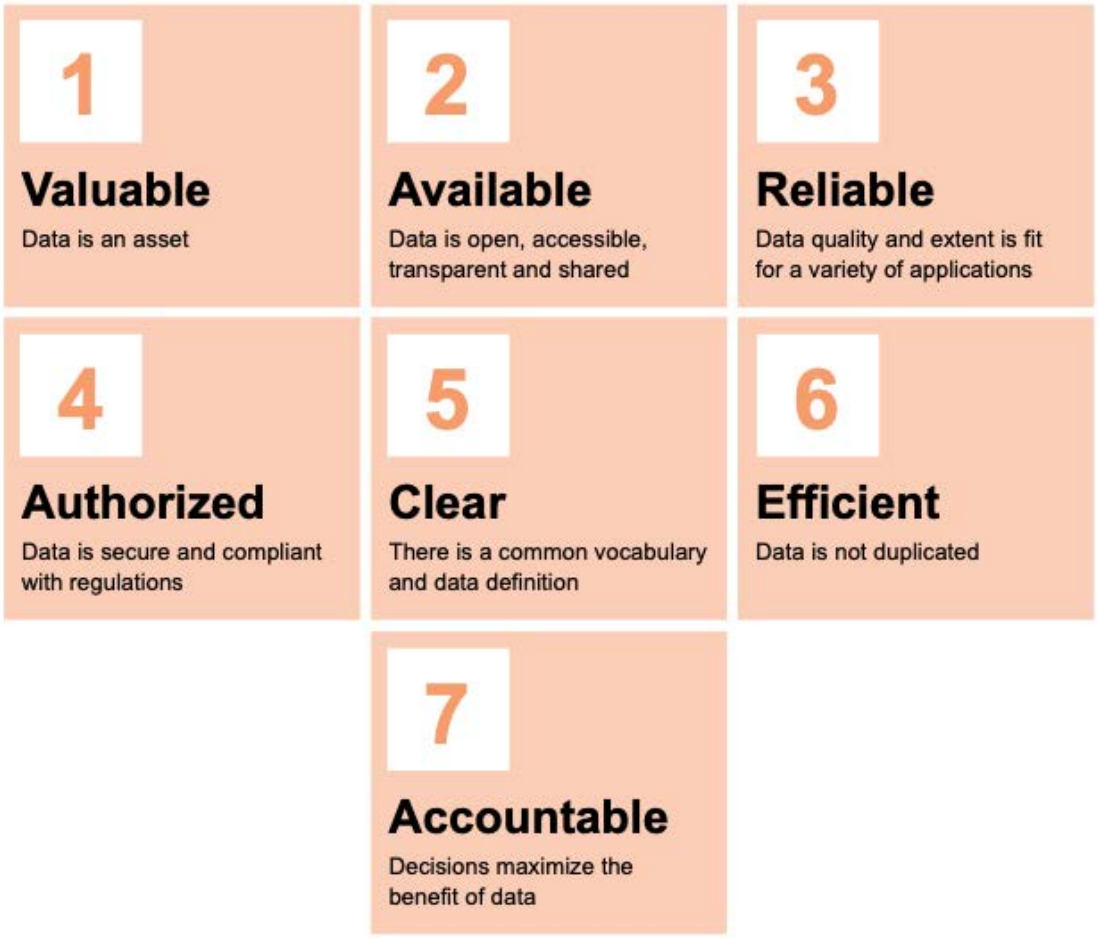
> *NMDOT makes effective use of data to guide decisions, deliver better results, and provide transparency and accountability.*

This vision recognizes that the purpose of data is to inform agency and traveler decision making and improve stakeholder understanding of transportation issues and NMDOT activities.

Data Governance

NMDOT has adopted recommendations in the SDBP for data governance to ensure that they are collecting and managing data in an efficient and effective manner that supports business priorities. The agency had a decentralized approach to data management in the past that was not sustainable. A key focus of the SDBP was on data governance so that all data at the NMDOT could be managed in a coordinated way and that with the proliferation of new data, the agency can add business value with the new information.

AASHTO's data management prinicples shown below were adopted as an underlying foundation for data governance at NMDOT.



The following activities are currently being implemented to improve data governance at NMDOT.

- Formalize Data Governance Bodies and Roles
- Create and Maintain a NMDOT Data Governance Web Site
- Identify and Track Database/Application Owners and Business Data Stewards
- Facilitate Executive Data Committee Meetings and Data Program Committee Meetings
- Create Data Directives

Data Committees

The SDBP has laid the groundwork for the establishment of two data committees at NMDOT. These committees are key components of NMDOT's data management program that support advancements in TAM practice.

- Executive Data Committee - support the activities of the Data Program Committee, provide direction, champion proposals and assess performance
- Data Program Committee (DPC) - serve as the primary working group for matters related to data governance at NMDOT

The DPC conducts the following activities:

- Develops and proposes enterprise data governance policy, standards, and best practices

- Coordinates and supports efforts to produce consistent and complete data documentation
- Coordinates and supports efforts to improve data sharing and access
- Coordinates and supports efforts to improve data quality management processes
- Addresses issues related to lack of data standardization
- Promotes adherence to enterprise data governance policy, practices, and standards
- Promotes a trained workforce

More information on these committees and data governance can be found in the NMDOT Strategic Data Business Plan that was published in June 2021.

Chapter 8

Implementation

Asset management involves continuous improvement of practices and processes. This chapter summarizes the TAM framework and leadership at NMDOT and details specific, actionable steps that individuals and teams within the Department can take to help implement asset management. This chapter builds on the implementation plan from the previous TAMP, and will be used to guide the asset management program towards the next TAMP.

TAM Framework and Leadership

To ensure a successful TAM program, the TAMP building process has included a focus on NMDOT's leadership structure and organizational framework as well as the alignment of these components needed to define improved business processes and guide the change that is inherent in the TAMP development and implementation process. Figure 8-1 represents the basic TAM relationships at NMDOT, with more details following.

Figure 8-1. TAM Relationships

TAM Leadership

Leadership for TAM at NMDOT is guided by a TAM Executive Steering Committee, led by a TAM champion. Primary stakeholders included in the TAM oversight are designed to be broad and inclusive across departments, with participation from planning, programs, asset management, engineering, operations, and districts.

The Executive Steering Committee oversees the development of the TAMP. This team sets the direction of the plan considering transportation goals and objectives to move the NMDOT into a Performance-Based decision-making organization. Further, the committee is responsible for aligning the organization, developing the TAMP, and verifying the necessary processes, tools, and systems are in place to support TAMP implementation.

Ensuring district engagement in the TAM process is a key element of success. TAM leadership is collaborating with districts that have typically operated independently of each other in an effort to gain district participation, integrate business processes, align performance standards, and establish standard data management principles.

The NMDOT Executive Steering Committee was established on November 15, 2018 and includes

- Secretary of Transportation
- Deputy Secretary of Transportation
- Capital Program and Investments Acting Division Director
- Senior Executive Engineer
- Director of Highway Operations
- Executive Director of Executive Projects
- All Six District Engineers
- FHWA Liaison
- Asset Management Bureau Chief

TAM Working Group

The TAM Working Group works collaboratively with the TAM leadership and the Executive Steering Committee to provide feedback and improve the TAM implementation process. This team, similar to the TAM Executive Steering Committee, consists of a diverse representation of NMDOT personnel, including members from bridge management, pavement management, maintenance, planning, finance, and districts. They are tasked with providing consistent and timely input during the TAMP development and ensuring that it is delivered on schedule.

This past year, the TAM Working Group has met together with the Executive Steering Committee during the development of the 2022 TAMP. This was partly due to the fact that people were still working remotely at the beginning of this process. As people come back to the office, the TAM Working Group will be working with the Asset Management Bureau to implement the TAMP.

The TAM Working Group also joined the New Mexico MPO December Quarterly Meeting on December 6, 2021 to present on the 2022 TAMP and discuss opportunities for MPO engagement with TAM. The presentation included a summary of FHWA's comments on the 2019 TAMP, planned improvements for the 2022 TAMP, and a draft outline. The slides also provided examples of best practice coordination between other state DOTs and MPOs.

Decision Making Structure for TAM

The current structure for TAM-related decisions is spread across NMDOT, with the program and project development process predominantly managed by each district. The GO provides guidance for bridge and pavement decisions to the districts by sharing analysis results from the pavement and bridge management systems. The implementation of this TAMP will result in improved decision making processes from a statewide perspective in order to assist the districts with prioritizing the most impactful projects and meeting the established targets.

Relationship with Other Initiatives at NMDOT

TAM and New Mexico 2045 Plan (2045 Plan) activities require coordination given that asset management and long-range planning are closely related. Both plans contain state of good repair performance targets and identify future investment needs by asset type to meet those targets. In order for NMDOT to derive the maximum benefit from the 2045 Plan and the TAMP, the two plans were coordinated to provide compatible recommendations. Figure 8-2 provides an overview of the asset

management planning process and how the different plans and programs fit together to work towards NMDOT's vision.

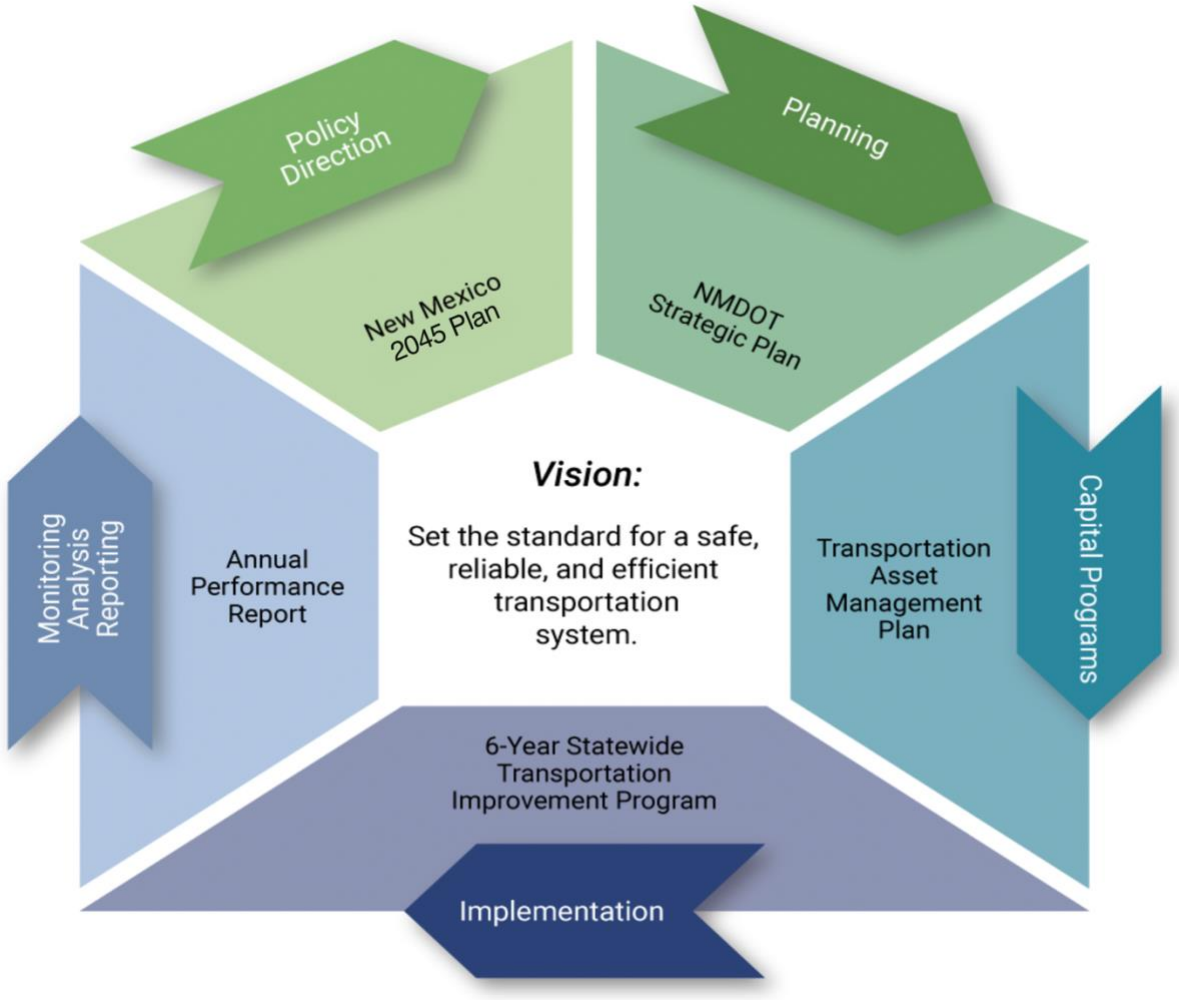


Figure 8-2. NMDOT Asset Management Planning Process

Data-Driven Decision Making

NMDOT is responsible for the management of all state-owned assets, with the largest asset classes being bridges and pavements. These assets are the lead actors in this TAM story. The primary plot of NMDOT's TAMP is the directive to implement data-driven decision making throughout NMDOT's business practices. Data-driven decisions provides NMDOT a framework to make the best decisions with the available resources to maximize benefits to its customers.

In implementing this TAMP, NMDOT will:

- Develop and implement policies focusing on the use of data to make transportation infrastructure decisions
- Collect and utilize reliable, accurate, and timely data on the condition of pavement and bridge assets in the state transportation system
- Determine the correct treatment at the right time to maintain the existing statewide infrastructure in the best condition over time within constrained resources

- Maintain condition and reduce deterioration of the state's infrastructure through innovation and engineering
- Improve access to NMDOT information

Implementation of the TAMP is dependent on accurate information and advanced data analysis capabilities. Data-driven decision making utilizes a range of data types including granular asset condition details; locations of crash sites, rumble strips, and centerlines; maintenance schedules; and location referencing data. NMDOT's information vision drives the imperative to improve data in order to make better decisions, link related information, and ultimately provide better outcomes. Improved data vision is aimed at enabling a "one-stop shop" for asset information for better communication with the public as well as sharing data across NMDOT units. Figure 8-3, below, illustrates the objective of creating a data-driven decisions environment.

NMDOT's Asset Management and Planning Divisions Collaboration

Jerry Valdez, Executive Director of Executive Projects

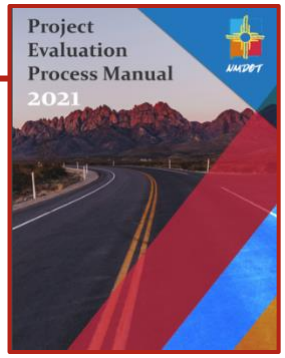
For asset management to be truly effective, it needs to be an integral part of the project selection process. That's why NMDOT created the Capital Program and Investments Division. Jerry Valdez, who directs that division as well as the Planning Division, understands the critical link between project planning and asset management. "Asset management is not a one-off, a box to be checked. It's a way of doing business, and it informs our thinking throughout the department. That will be especially important in the next few years, as we make use of new federal funding available to us through the federal infrastructure bill. Our pavement and bridge models can demonstrate how our assets will perform under a specific budget. The model helps us support the districts as they make project decisions, because it helps them identify projects that will deliver the best value for the people of New Mexico. We can then use our metrics to track performance of the system. We carry that asset management thread through with our other plans too, like the Long-Range Statewide Transportation Plan, or the Strategic Highway Safety Plan, or the Statewide Transportation Improvement Program. It's a comprehensive way of managing the system."

Objective: Develop a Department Policy requiring the use of data to make TAM-related infrastructure decisions

Outcome: A portion of bridge and pavement projects should be programmed and developed based on data-driven decisions

Metric: Percent of total annual TAM program invested in asset-management model recommendations

2019 to 2022 Progress: NMDOT implemented the project selection process in June 2021. A manual with the process documents the data driven investment decision process.



Objective: Collect and utilize reliable, accurate, and timely data on the condition of pavement and bridge assets in the state transportation system

Outcome: Enhance use of data in district-driven project and treatment selections.

Metric:
Pavement: % fair or better condition (PCR)
Bridge: % fair or better condition

2019 to 2022 Progress: New data collection contracts for pavement data. Districts are utilizing the bridge and pavement inventory and condition information for project development.

Objective: Determine the correct treatment at the right time to maintain the statewide existing infrastructure

Outcome: Reduce the department's preservation backlog.

Metric: Reduce the % of reconstruction and rehabilitation funding and shift to preservation funding.

2019 to 2022 Progress: Greater focus on treatments has been a NMDOT priority. Bridge and pavement programs are examining the outcomes of their treatment recommendations.

Objective: Maintain condition or reduce deterioration of the state's infrastructure through innovation and engineering

Outcome: Implement innovative strategies and engineering practices to improve current procedures

Metric: Change in percentage of lane miles achieving target pavement condition rating, measured after establishing the baseline.

2019 to 2022 Progress: Ongoing research and exploration of innovations is enabling NMDOT to continuously push its asset management practices.

Objective: Improve access to NMDOT information

Outcome: Decrease of requests to NMDOT staff for information. Increase in transparency to public.

Metric: Increased hits to NMDOT web pages with TAM data or decreased calls to Communications Office requesting data.

2019 to 2022 Progress: The implementation of EGIS has greatly improved access to asset information. NMDOT emloyees can view asset-related information on New Mexico's transportation network on their own with the recently-implemented application.

Figure 8-3. NMDOT Objectives, Outcomes, and Metrics

Priority Action Items

The AMESC participated in a series of meetings that resulted in the identification of process improvements to the TAM program that should ultimately improve the performance of NMDOT assets. Below is a list of the eight highest priority improvement actions. Each action item is described in greater detail in the following section.

Each initiative has identified champions, the key objectives, and a target completion date for the initial set of activities. Current status is indicated for each action item, to highlight the level of progress towards delivering the action. Status is categorized as follows:

- Stage A: Crawl (indicates being in the earliest stage of implementation and maturity)
- Stage B: Walk (indicates that the action area is well underway)
- Stage C: Run (indicates a high level of maturity and impact in the action area)

In addition to this status indication, a description of the progress is included.

Figure 8-4. Priority Action Items

Priority Action 1: Strengthen Pavement Management System Implementation			
Champion	Hashem Faidi		
Objective	To have decision making use management system outputs		
Target Date	December 2022		
Status	Crawl	**Walk**	Run
Recommendations	• LRS integration - The linear referencing system (LRS) of the roadway network in PMS and MMS will be updated, leading to better and more accurate analysis of the network. • Deterioration models will be updated - There is enough data to refine existing models to have better prediction and model Federal measures directly. • Implementation of preservation policy - Considering incorporating more pavement preservation treatments for Interstate highways.		

Priority Action 2: Continue Implementation of the Project Evaluation/Selection Process			
Champion	Phillip Montoya		
Objective	Make data-driven decisions based on condition analysis report form for projects The project evaluation process allows for objective rankings of proposed projects and enables NMDOT to evaluate the extent to which individual projects address a range of NMDOT goals, needs, and priorities. This evaluation process can be understood as part of larger efforts to ensure data-driven decision-making. NMDOT GO is responsible for coordinating with each district to complete the Conditions Analysis Report which is part of the project evaluation process in order to identify projects for the Capital Investment Plan. Available funds are allocated based on review of objective data about asset condition at both the network and asset-specific levels.		
Target Date	Ongoing		
Status	**Crawl**	Walk	Run
Recommendations	• Monitor use of the new project evaluation/selection process in district. • Conduct trainings on use of the new approach. • Document successful implementation and share with other districts.		

Priority Action 3: Continue to Implement the Strategic Data Business Plan			
Champion	Data Program Committee, cochaired by Jeff Woodman and Phillip Montoya		
Objective	Improve data quality and use at NMDOT		
Target Date	Ongoing		
Status	Crawl	**Walk**	Run
Recommendations	• As part of one of the actions identified in the previous TAMP, NMDOT developed a SDBP to help coordinate the leverage NMDOT's data assets. In this action, NMDOT will continue to implement the SDBP. • Conduct regular meetings of the Data Program Committee to report on progress and to support implementation of the SDBP.		

Priority Action 4: Address Bridge Aging			
Champion	Jeff Vigil & Ben Najera		
Objective	Proactively address needs related to aging bridge		
Target Date	June 2023		
Status	Crawl	**Walk**	Run
Recommendations	• Identify the bridges to be addressed in this program. • Determine policies and guidance for addressing aging bridges. • Provide guidance to districts on how to treat specific bridges. • Prioritize bridges that are in this program.		

Priority Action 5: Strengthen Workforce Management for TAM			
Champion	Phillip Montoya		
Objective	Improve staffing stability		
Target Date	Ongoing		
Status	Crawl	**Walk**	Run
Recommendations	• Develop clear roles and responsibilities. • Conduct interviews with recent past staff to better understand reasons for departures. • Initiate actions to stabilize staff who are working in TAM.		

Priority Action 6: Strengthen TAM Knowledge Management			
Champion	Virginia Rae C. Stubella		
Objective	Better capture and re-use of knowledge		
Target Date	Ongoing		
Status	**Crawl**	Walk	Run
Recommendations	• Determine where there are the greatest opportunities with better reuse of information. • Develop an action plan to strengthen knowledge management for TAM.		

Priority Action 7: Build Repeatable TAM Financial Planning Process			
Champion	Phillip Montoya		
Objective	Establish connections between TAMP and financial planning		
Target Date	December 2022		
Status	**Crawl**	Walk	Run
Recommendations	• Define and document process used to develop TAMP financial plan. This will involve a number of different staff and groups within NMDOT. • Explore potential for automating financial plan development process.		

Priority Action 8: Support New Mexico Climate and Resiliency Initiatives			
Champion	Jessica Griffin		
Objective	Provide the input needed for statewide climate and resiliency initiative		
Target Date	December 2022		
Status	Crawl	**Walk**	Run
Recommendations	• Establish a climate action team. This is underway with three employees working on climate change activities. • Implement the resiliency study recently performed for NMDOT. The results of the study will be used to identify projects.		

Enhanced Financial Planning

Francisco Sanchez, District 2 Engineer

Adequate funding is important for major infrastructure improvement efforts across NMDOT's districts. For Francisco Sanchez, District 2 Engineer, new infrastructure funding will help NMDOT achieve its goals. New Mexico is one of the top five crude oil-producing states in the nation. The growth in freight and passenger traffic driven by the expansion of energy-based employment opportunities within southeast New Mexico has put tremendous stress on state highway system. Corridors within southeast New Mexico classified as major collectors are handling traffic volumes and heavy commercial vehicles comparatively to principal arterials. "The new funds from the federal infrastructure bill will allow us to undertake some projects that might have had to wait," he explains. "Predictable funding is the most important thing, because it allows us to make solid plans for future projects. The additional funding opens up possibilities for us, prioritizing critical projects that will advance the mobility, quality of life for New Mexico residents and improve safety for all road users. It's important to make the best use of those funds, to select the right projects and the right fixes to improve system condition. It's also important that we don't overload the schedule, that we take the time to program, contract, and ensure the right manpower and equipment."

NMDOT TAMP DRAFT Glossary of Acronyms

AADT – Annual Average Daily Traffic

AASHTO – American Association of State Highway and Transportation Officials

ADT – Average Daily Traffic

AMESC – Asset Management Executive Steering Committee

AUB – Average Unit Bid

BIL – Bipartisan Infrastructure Law

BMS – Bridge Management System

BrM – Bridge Management Software

CAV – Connected and Automated Vehicles

CM – Contract Maintenance

CMAQ – Congestion, Mitigation and Air Quality

DOT – Department of Transportation

DPC – Data Program Committee

EGIS – Enterprise Geographic Information System

FARS – Fatality Analysis Reporting System

FHWA – Federal Highway Administration

FMIS – Fiscal Management Information System

GAAP – Generally Accepted Accounting Principles

GASB – Government Accounting Standards Board

GIS – Geographic Information System

GO – General Office

HPMS – Highway Performance Monitoring System

HSIP – Highway Safety Improvement Program

IFTA – International Fuel Tax Agreement

IRI – International Roughness Index

IRP – International Registration Plan

IS – Interstate System

IT – Information Technology

ITS – Intelligent Transportation Systems

LCCA – Life Cycle Cost Analysis

LCP – Life Cycle Planning

LGRF – Local Government Road Fund

LRSTP – Long-Range Statewide Transportation Plan

MAP-21 – Moving Ahead for Progress in the 21st Century Act

MMS – Maintenance Management System

MPO – Metropolitan Planning Organization

NBI – National Bridge Inventory
NHPP – National Highway Performance Program
NHS – National Highway System
NMDOT – New Mexico Department of Transportation
NMSU – New Mexico State University
OCI – Overall Condition Index
PCR – Pavement Condition Rating
PMS – Pavement Management System
QA/QC – Quality Assurance/Quality Control
RI – Roughness Index
RTPO - Regional Transportation Planning Organizations
RSA – Road Safety Audit
SD – Structurally Deficient
SDBP – Strategic Data Business Plan
STBGP – Surface Transportation Block Grant Program
SRF – State Road Fund
STIP – State Transportation Improvement Program
TAM – Transportation Asset Management
TAMP – Transportation Asset Management Plan
TRU – Traffic Research Unit
VMT – Vehicle Miles Traveled