Chapter 1

INTRODUCTION
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INTRODUCTION

Overview

The 14,000-mile state highway system constructed, operated, managed, and maintained by the Minnesota Department of Transportation (MnDOT) represents 74 percent of the State-owned capital assets. This transportation network is critical to Minnesota’s economic competitiveness and quality of life, providing transportation connections that are necessary for thriving communities and successful businesses. It is imperative to maintain the performance and value of the state transportation assets to enable Minnesota to continue to provide safe and high-level service to its citizens.

Successful management of the state highway system relies on sound investment strategies that consider constituent input, legislative requirements, engineering needs, and fiscal constraints. Since the 1990s, MnDOT has used performance management tools to evaluate its services and to guide its plans, projects, and investment strategies.

Purpose

On July 6, 2012, the Moving Ahead for Progress in the 21st Century Act (MAP-21) was signed into law. It is the first long-term highway authorization enacted since 2005 to fund surface transportation programs. MAP-21 creates a streamlined, performance-based, and multimodal program to address the many challenges facing the nation’s transportation system. These challenges include improving safety, maintaining infrastructure condition, reducing traffic congestion, improving efficiency of the system and freight movement, protecting the environment, and reducing delays in project delivery.

Under MAP-21, performance management transforms federal highway programs and provides a means to more efficient investment of federal transportation funds. It focuses on national transportation goals, increasing the accountability and transparency of the federal highway programs, and improving transportation investment decision making through performance-based planning and programming.

MAP-21 requires states to develop a risk-based asset management plan (i.e. TAMP) for the National Highway System (NHS) to improve or preserve the condition of the assets and the performance of the system. Figure 1-1 summarizes the characteristics and benefits of a transportation asset management program. The legislation focuses on the development

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1 MnDOT’s Office of Materials and Roads Research collects pavement condition data annually on 14,000 state highway system roadway miles. “Roadway miles” is equal to the total of undivided centerline miles of road in addition to two times the number of divided centerline roads.
2 http://www.fhwa.dot.gov/map21
3 Adapted from FHWA 2006, available online at: http://www.fhwa.dot.gov/infrastructure/assetmgmt/tpamb.cfm
of a TAMP for bridges and pavements on the NHS, but encourages states to include other infrastructure assets within the right-of-way corridor.

MnDOT elected to expand the TAMP beyond the MAP-21 requirements and include pavements and bridges on the entire state highway system as well as highway culverts, deep stormwater tunnels, overhead sign structures, and high-mast light tower structures (see Figure 1-2). Because MnDOT had already begun the implementation of asset management principles prior to MAP-21 legislation, it was in a better position to expand beyond the requirements of MAP-21.

Chapter 4: Asset Inventory and Condition includes folios that describe each asset category in greater detail.

The TAMP will serve as an accountability and communication tool and will inform established capital and operations planning efforts from this point forward. In addition to being a Federal requirement, the TAMP is a planning tool by which MnDOT can more thoroughly evaluate risks and develop mitigation strategies, analyze life-cycle costs, establish asset condition performance measures and targets, and develop investment strategies. It formalizes and documents the following key information, to meet MAP-21 federal requirements, into a single document:

- Description and condition of pavements and bridges on the NHS
- Asset management objectives and measures
- Summary of gaps between targeted and actual performance
- Life-cycle cost and risk management analysis
- Financial plan that addresses performance gaps
- Investment strategies and anticipated performance

Figure 1-1: Characteristics and Benefits of a Transportation Asset Management Program

- Track system condition, needs, and performance.
- Consider public expectations and desires when setting strategic objectives.
- Align agency investment decisions to achieve strategic goals.
- Use an objective process to maintain and manage assets; should consider needs, available funding, risks, operational constraints, and maintenance costs over the life of the assets.
- Determine the optimal time to improve assets based on performance data.

Figure 1-2: Benefits of Applying Transportation Asset Management Principles

- Optimize and improve transportation system performance.
- Improve customer satisfaction.
- Minimize life-cycle costs.
- Match level of service provided to public expectations.
- Make more informed, cost-effective program decisions and better utilize existing assets.
- Develop an unbiased methodology to balance trade-offs between competing objectives.
Figure 1-2: Minnesota’s State Highway System

Pavements*
- NHS Pavements: 7,595 roadway miles
- Non-Pavements: 6,736 roadway miles

Bridges*
- NHS Bridges: 1,951 (count)
- Non-NHS Bridges: 2,592 (count)

Hydraulic Infrastructure
- Highway Culverts: 47,157 (count)
- Deep Stormwater Tunnels: 7 tunnels (50 segments; 69,272 linear feet)

Other Traffic Structures
- Overhead Sign structures: 2,359 (count)
- High-Mast Light Tower Structures: 476 (count)

*Locally-owned inventory not included
Asset Management Planning at MnDOT

MnDOT's asset management policy is established and continually updated through statewide performance based planning initiatives. The Minnesota GO Vision, Statewide Multimodal Transportation Plan, State Highway Investment Plan (MnSHIP), and Highway System Operations Plan (HSOP) set policy objectives and performance based targets. The Annual Minnesota Transportation Performance Report documents system performance and informs future policy and investment planning.

MINNESOTA GO VISION AND STATEWIDE MULTIMODAL TRANSPORTATION PLAN

The Minnesota GO Vision and Statewide Multimodal Transportation Plan provide the policy framework used to shape subsequent MnDOT plans and investment decisions. Both documents stress the importance of asset management—strategically maintaining and operating transportation assets.

STATE HIGHWAY INVESTMENT PLAN

The State Highway Investment Plan (MnSHIP) is MnDOT's vehicle for determining and communicating capital investment priorities for the state highway system over a 20 year planning horizon. MnSHIP establishes asset condition targets for state highway pavement and bridge assets and sets funding levels for asset management at $5.1 billion (representing 68 percent of planned capital expenditures) over the first 10 years (2014-2023).
HIGHWAY SYSTEMS OPERATION PLAN

The Highway Systems Operation Plan (HSOP) provides a framework for managing key operations and maintenance activities throughout Minnesota. A key focus of HSOP is infrastructure asset management and being able to make decisions using total life-cycle costs by considering trade-offs in maintenance activities.

ANNUAL TRANSPORTATION PERFORMANCE REPORT

The (2012) Annual Transportation Performance Report describes trends in the condition and service levels for Minnesota’s transportation systems. It summarizes the plans, investments, strategies and innovations MnDOT and its partners use to optimize performance, and tracks progress in 10 performance areas, asset management being one.

The report indicates:

“MnDOT expects pavement preservation needs to grow faster than available resources. Anticipating this scenario, MnSHIP directs MnDOT to focus pavement investment on the NHS with the objective of maintaining existing ride quality through 2023. Doing this also means the percentage of non-NHS highways with Poor ride quality will grow from 7.5 percent in 2012 to 12 percent in 2023. Minnesota’s bridges will remain safe. Under current projections, by 2033 the share of NHS deck area in Poor condition will rise to between six and eight percent.”
Process

This Transportation Asset Management Plan is the product of a 12 month process that involved a Steering Committee, Project Management Team, and four technical Work Groups.

The Steering Committee provided direction and oversight during TAMP development, and included broad representation across the agency and from Minnesota’s Federal Highway Administration (FHWA) Division office. Steering Committee representation included:

- FHWA Division Office
- Minnesota Department of Transportation
- Bridge
- Data & Analysis
- Districts
- Executive Management
- Finance
- Investment Planning
- Maintenance & Operations
- Materials (Pavement)
- Performance Measures
- Policy Planning
- Risk
- Traffic, Safety, and Technology
- Transportation Systems Management

The Project Management Team (PMT), a sub-set of the Steering Committee, was responsible for day-to-day work activities.

Work Groups were developed for each broad asset category: pavement, bridge, hydraulics, and other traffic structures. Each was comprised of subject matter technical experts and had a group lead or main contact. Highway culverts and deep stormwater tunnels were discussed together with the Hydraulic Work Group, while overhead sign structures and high-mast light tower structures were discussed together by the Other Traffic Structures Work Group. Work Groups were invaluable with efforts to document current practices, determine data availability, assess risks and propose mitigation strategies, and identify targets and investment strategies.

TAMP Themes

Four themes emerged during development of the TAMP that influenced recommendations, refined investment strategies, and identified enhancements.
• **Improve the consideration of maintenance costs in capital investment decisions.** In most transportation agencies, long-term maintenance costs associated with capital improvements are not fully considered when making investment decisions. While developing the TAMP, steps were taken to improve the consideration of maintenance costs when evaluating capital investments.

• **Reduce business and asset-specific risks.** A number of business process changes were identified to reduce agency risk. Several of these changes have already been implemented and are currently being implemented. For example, MnDOT is in the process of developing a Transportation Asset Management System (TAMS) that will allow MnDOT to better manage roadside infrastructure data: location; work activity history; equipment; materials; and staffing needs. Asset-specific undermanaged risks and mitigation strategies were also identified and incorporated in the TAMP.

• **Build on existing plans, information, and processes.** MnDOT has a history with and commitment to risk-based and performance-based planning. (e.g., MnSHIP, HSOP, etc.). The intent of the TAMP is to build upon and enhance but not supplant established planning processes.

• **Identify and address gaps in data and business processes.** MnDOT elected to expand the use of asset management principles to a broader collection of assets beyond pavements and bridges, even though limited information was available for these assets. As a result, MnDOT has a better understanding of the information needed to more effectively manage these assets and has taken steps to obtain this information in support of both ongoing asset management and future capital and operational planning efforts.

**TAMP Content**

The TAMP is presented in nine chapters.

• **Chapter 1: Introduction** – This chapter provides an overview of current asset management policy and investment plans, purpose for developing a TAMP, general process during development, and information contained in each chapter.

• **Chapter 2: Asset Management Planning and Programming Framework** – This chapter summarizes the connection of existing asset management direction, policy, and programming at MnDOT to the TAMP.
• Chapter 3: Asset Management Performance Measures and Targets – This chapter summarizes MnDOT’s existing (pre-TAMP) performance measures and MnSHIP targets for pavement and bridge, and the new (TAMP) target terminology that will replace existing MnSHIP target definitions.

• Chapter 4: Asset Inventory and Condition – This chapter summarizes information about all six asset categories analyzed in this TAMP, and includes data on inventory, condition, and replacement value.

• Chapter 5: Risk Management Analysis – This chapter provides an overview of risk and why it’s important, a summary of MnDOT’s current risk structure, and risks associated with undermanaging transportation assets and strategies to mitigate these risks.

• Chapter 6: Life-Cycle Cost Considerations – This chapter describes life-cycle cost analysis and highlights strategies for managing assets. It includes a cost-effectiveness comparison of MnDOT’s current (or typical) approach vs. other approaches (i.e. desired or worst-first) to managing each asset.

• Chapter 7: Performance Gaps – This chapter highlights existing performance measures and targets identified in MnSHIP, MnDOT’s new direction for targets and agency commitments, and new TAMP target recommendations for consideration during development of the next MnSHIP.

• Chapter 8: Financial Plan and Investment Strategies – This chapter presents a financial outlook based on recent trends and assumptions, summarizes capital and maintenance investments for the next 10 years, and describes how different capital investment scenarios considered risk. It also outlines the committed revenue and revenue needs to meet expected performance outcomes over the next 10 years.

• Chapter 9: Implementation and Future Developments – This chapter summarizes the important actions or desired takeaways identified during the development of this TAMP. Governance of the TAMP is also important, and this chapter identifies implementation steps to continually make progress toward better asset management. It also presents recommendations for future updates to the TAMP.

In addition to the TAMP, a Technical Guide was prepared and published separately. The Technical Guide includes additional information on each chapter of the TAMP. It frames information around “process” and “supporting data and documentation,” and includes additional technical information to supplement the TAMP.