Chapter 9

IMPLEMENTATION AND FUTURE DEVELOPMENTS
This page intentionally left blank.
IMPLEMENTATION AND FUTURE DEVELOPMENTS

Overview

An effective Transportation Asset Management Plan will require regular updates to reflect the dynamic nature of managing a transportation network. For MnDOT, efficient asset management is an established objective within existing policy, investment, and operations plans. Therefore, success will be largely determined by the extent to which the principles and initiatives outlined in this document are incorporated, along with existing plans, into MnDOT’s business practices. This final chapter outlines MnDOT’s governance approach moving forward, summarizes implementation priorities, and concludes with a set of “lessons learned” during the development of the plan.

TAMP Governance

In accordance with MAP-21, the TAMP development process must be reviewed by the FHWA and certified as meeting the requirements established by the Secretary of Transportation. The process used to develop and maintain the TAMP must be reviewed and recertified at least once every four years; FHWA will identify specific actions that are necessary to correct any deficiencies. Additionally, MAP-21 requires that states make significant progress toward achieving their targets for the National Highway System.

While meeting federal requirements was certainly an objective, MnDOT’s primary focus in developing this plan has been to improve the life-cycle management of its transportation assets. Therefore, governance responsibilities must be extended beyond those required under the legislation. They must include plans for expanding the assets that are covered in future TAMPs and for monitoring the agency’s success. It was recommended that an Asset Management Steering Committee be established and assigned responsibility for the development, update, and monitoring of the enhancements outlined in the TAMP, and oversight of Transportation Asset Management System (TAMS) development and other asset management initiatives. The Steering Committee will be championed by MnDOT’s Modal Planning and Program Management, Engineering Services, and Operations Division Directors, and include representatives from Engineering Services, Transportation System Management, and Operations and Maintenance. Direct communication with Finance; Districts; Traffic, Safety, and Technology; Materials; Bridge; and other asset categories will be important. The Steering Committee will report directly to the Division Director champions and MnDOT’s Senior Leadership Team, and meet on a regular basis to address the following:
• Modifying the draft TAMP to address any requirements outlined in the final rules issued by the Secretary of Transportation

• Establishing a regular cycle for updating the TAMP in conjunction with updates to MnSHIP and other relevant documents

• Developing and implementing guidance for expanding the TAMP to include other transportation assets; this guidance should include factors such as:
  • Availability of data
  • Overall maturity of business processes to support management of the asset
  • Importance of preservation actions to maintain the asset
  • Funds spent on the asset
  • Level of risk associated with asset failure
  • Monitoring progress toward performance targets and recommending adjustments

In addition to having responsibility for governance of the TAMP, the Steering Committee would also be assigned responsibility for ensuring that the asset management principles promoted in the TAMP are fully embraced at all levels of the agency to help ensure that the anticipated performance outcomes are met. This will require clear lines of responsibility and accountability for each of the assets included in the TAMP and an agency-wide commitment to completing scheduled inspections for highway culverts, overhead sign structures, and high-mast light tower structures. It will also necessitate timely application of preservation treatments by each district and other strategies to reduce the overall life-cycle cost of managing MnDOT’s transportation assets.

The Steering Committee would also work with several units of the Office of Transportation System Management and the larger Modal Planning and Program Management Division to coordinate the next update to MnSHIP, ensuring that the TAMP recommendations are used to drive future investment plans. The interrelationship between the TAMP and other MnSHIP planning and programming products is shown in Figure 9-1. As shown in the graphic (and discussed in Chapter 2), the TAMP serves as a link between the long-term statewide plans (such as MnSHIP) and the projects programmed into the STIP and Annual Work Plans.
CHAPTER 9          IMPLEMENTATION AND FUTURE DEVELOPMENTS

Implementation Priorities

PRIORITIES IDENTIFIED THROUGH RISK PROCESS

Chapter 5 of this plan explored the concept of risk as it relates to transportation, as it influences planning and management at MnDOT, and as it was incorporated into the TAMP. It also presented a series of prioritized strategies intended to help mitigate identified undermanaged risks – areas in which there are clear opportunities for improvement at MnDOT (see Technical Guide for more on the prioritization process). Figure 9-2 offers more detail on these strategies, including responsible offices, expected timeframes, and estimated implementation costs.

Timeframes and costs were estimated by the TAMP Work Groups but could not be determined with certainty for several of the strategies.
### Figure 9-2: Prioritized Strategies for Mitigating Undermanaged Risks

<table>
<thead>
<tr>
<th>PRIORITY LEVEL 1 STRATEGY</th>
<th>PURPOSE(S)</th>
<th>RESPONSIBLE OFFICE</th>
<th>EXPECTED TIMEFRAME</th>
<th>ESTIMATED COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annually track, monitor, and identify road segments that have been in Poor condition for more than five years and consistently consider them when programming.</td>
<td>To provide additional information when prioritizing projects; to highlight roads that have been in Poor condition for an extended period of time; to help MnDOT improve level of service for customers statewide</td>
<td>MnDOT Materials Office</td>
<td>1-2 years (to develop)</td>
<td>Approximately $5 thousand (staff time)</td>
</tr>
<tr>
<td>Address the repairs needed on the existing South I-35W deep stormwater tunnel system.</td>
<td>To improve condition of South I-35W deep stormwater tunnel; to alleviate safety concerns and reduce overall percentage of deep stormwater tunnel system in Poor and Very Poor condition (thereby helping MnDOT meet targets)</td>
<td>MnDOT Metro District; City of Minneapolis</td>
<td>1-2 years (currently programmed)</td>
<td>Approximately $14.5 million (for repairs; funded)</td>
</tr>
<tr>
<td>Investigate the likelihood and impact of deep stormwater tunnel system failure.</td>
<td>To improve understanding of the likelihood for failure of the deep stormwater tunnel system (located entirely in MnDOT’s Metro District) and the likely impacts of such an event; to aid planning and management of the system</td>
<td>MnDOT Bridge Office; MnDOT Metro District</td>
<td>1-3 years</td>
<td>Approximately $150 thousand (for study)</td>
</tr>
<tr>
<td>Develop a thorough methodology for monitoring highway culvert performance.</td>
<td>To increase availability of information; to develop a systematic and objective methodology to monitor culverts; to manage culverts more effectively</td>
<td>MnDOT Operations</td>
<td>1-2 years (currently underway)</td>
<td>$5-10 thousand (to develop procedures)</td>
</tr>
</tbody>
</table>
Develop and adequately communicate construction specifications for overhead sign structures and high-mast light tower structures.

To prevent installation problems that lead to premature deterioration and reduced asset life; to ensure that MnDOT inspectors and vendors understand and adhere to requirements (e.g. torque thresholds)

MnDOT Maintenance – Metro District; MnDOT Maintenance – Other Districts

1 year

Approximately $50 thousand (to develop and implement)

Track overhead sign structures and high-mast light tower structures in a Transportation Asset Management System (TAMS).

To more deliberately and effectively manage these asset categories; to include more assets in TAMS, thereby improving cross-asset tradeoff decision-making

MnDOT Office of Transp. System Management; MnDOT Metro District

2-4 years

TBD

<table>
<thead>
<tr>
<th>PRIORITY LEVEL 2 STRATEGY</th>
<th>PURPOSE(S)</th>
<th>RESPONSIBLE OFFICE</th>
<th>EXPECTED TIMEFRAME</th>
<th>ESTIMATED COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collect and evaluate performance data on ramps, auxiliary lanes, and frontage road pavements for the highway system in the Twin Cities Metro Area.</td>
<td>To determine current inspection procedure is sufficiently capturing needs; to more effectively manage non-mainline highway pavements</td>
<td>MnDOT Metro District; MnDOT Materials Office</td>
<td>1-3 years</td>
<td>Approximately $200 thousand (for data collection/analysis)</td>
</tr>
<tr>
<td>Augment investment in bridge maintenance modules and develop related measures and tools for reporting and analysis.</td>
<td>To develop performance models to predict changes in bridge performance over time; to more effectively manage bridges</td>
<td>MnDOT Bridge Office</td>
<td>1-3 years (currently underway)</td>
<td>Approximately $2 million (software upgrades; funded)</td>
</tr>
<tr>
<td>Include highway culverts in MnDOT’s TAMS.</td>
<td>To more deliberately and effectively manage highway culverts; to include more assets in TAMS, thereby improving cross-asset tradeoff decision-making</td>
<td>MnDOT Bridge Office</td>
<td>2-4 years</td>
<td>TBD</td>
</tr>
<tr>
<td>Place pressure transducers in deep stormwater tunnels with capacity issues.</td>
<td>To place pressure transducers in deep stormwater tunnels that will collect better capacity-specific data such as pressure impact by water volume</td>
<td>MnDOT Metro District</td>
<td>1-2 years</td>
<td>Approximately $50 thousand</td>
</tr>
</tbody>
</table>
Incorporate the **deep stormwater tunnel** system into the bridge inventory.

- **Purpose**: To improve regularity of deep stormwater tunnel inspections by adding the tunnel system to the bridge inventory, with inspection frequency tied to reported condition
- **Responsible Office**: MnDOT Metro District; MnDOT Bridge Office
- **Expected Timeframe**: 1-2 years
- **Estimated Cost**: TBD

Develop a policy requiring a five-year inspection frequency for **overhead sign structures**, as well as related inspection training programs and forms.

- **Purpose**: To establish a formal inspection program for overhead sign structures, based on MnDOT’s best knowledge of structure condition, deterioration rates, and inspection needs
- **Responsible Office**: MnDOT Maintenance – Metro District; MnDOT Maintenance – Other Districts
- **Expected Timeframe**: 1 year (currently underway)
- **Estimated Cost**: $150 thousand (staff time)

<table>
<thead>
<tr>
<th>PRIORITY LEVEL 3 STRATEGY</th>
<th>PURPOSE(S)</th>
<th>RESPONSIBLE OFFICE</th>
<th>EXPECTED TIMEFRAME</th>
<th>ESTIMATED COST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repair or replace highway culverts in accordance with recommendations from the TAMS (once it is implemented).</td>
<td>To improve overall system quality and management; to meet newly established and vetted asset targets</td>
<td>MnDOT Maintenance – Various Districts; MnDOT Bridge Office</td>
<td>10 years</td>
<td>$100 million ($10 million per year)</td>
</tr>
</tbody>
</table>

**OTHER PRIORITIES IDENTIFIED DURING TAMP DEVELOPMENT**

To further improve its overall asset management practices and achieve lowest life-cycle cost, MnDOT considered factors beyond risk during development of the TAMP. As a result, several overarching business process enhancements have been proposed and are summarized in **Figure 9-3**. Timeframes and costs for these broad improvements have not been estimated.
<table>
<thead>
<tr>
<th>PRIORITY</th>
<th>PURPOSE(S)</th>
<th>RESPONSIBLE PARTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establish a single process governing the development of all MnDOT performance measures and targets. Incorporate process into MnDOT’s performance-based planning framework.</td>
<td>To promote a consistent approach to performance measurement that is in line with traveler expectations and MnDOT’s strategic direction; to provide a mechanism for acting on target recommendations provided in this TAMP</td>
<td>Performance, Risk and Investment Analysis Unit (MnDOT Office of Transportation System Management)</td>
</tr>
<tr>
<td>Implement strategies that reduce life-cycle costs for managing assets.</td>
<td>To improve consideration of total cost of ownership in capital investment decisions, including tracking preventive maintenance activities; to re-scope projects to realize life-cycle cost savings (candidate for Investment Opportunity Plan)</td>
<td>MnDOT Office of Transportation System Management</td>
</tr>
<tr>
<td>Identify new operational performance targets and reporting protocols covering preventive maintenance.</td>
<td>To ensure that asset-specific preservation activities are being completed on a timely basis; to regularly monitor progress and assess achievement</td>
<td>Asset Management Steering Committee; Operations Division; Materials Office</td>
</tr>
<tr>
<td>Evaluate investment impacts across asset categories.</td>
<td>To improve cross-asset decision-making processes by integrating tradeoff analyses (more comprehensive tradeoff analyses will be possible as asset registers and risk assessments are completed for additional asset categories)</td>
<td>MnDOT Office of Transportation System Management</td>
</tr>
<tr>
<td>Shift to a corridor management approach.</td>
<td>To more comprehensively consider safety, mobility, and preservation needs when making investment decisions; to select projects based on more than just pavement and bridge conditions</td>
<td>MnDOT (agency-wide)</td>
</tr>
</tbody>
</table>
RESEARCH PRIORITIES

Along with risk-based strategies and overall business process enhancement recommendations, the development of this TAMP illuminated a number of research needs. Such applied research would help MnDOT better understand asset performance and would lead to more informed investment decision-making. These research opportunities could be addressed via formal research studies or by program offices using data available to them. Identified research needs include:

- Overall
- Development of robust asset-specific or network-level deterioration models (for each material type used, if possible)
- Investigation of return-on-investment associated with capital and maintenance expenditures (the probabilities and impacts of not investing in assets are poorly understood)
- Pavements
- Better understanding of performance and benefit-costs of pavement preservation treatments applied in Minnesota
- Improved analysis of maintenance cost data for use in life-cycle costing
- Better understanding of performance of pavement rehabilitation activities (structural overlays, full depth reclamation, etc.) in relation to pavement age and condition
- Bridges
- More complete understanding of bridge performance by type of material (steel, concrete, timber, etc.)
- Better understanding of impact of routine maintenance activities on bridge performance and life-cycle costs
- Hydraulic Infrastructure
- Development of deterioration models for various types of culverts and tunnels
- Better understanding of impacts of various maintenance treatments
- Overhead Sign Structures and High-Mast Light Tower Structures
• Development of deterioration models and more accurate average service life

• Better understanding of impacts of various treatments performed on these structures in varying ages and conditions

Recommended Targets

Another important result of this TAMP development is the establishment of condition targets for asset categories or sub-categories not explicitly addressed in MnSHIP. A summary of these Work Group-developed and Steering Committee-vetted targets is included at the end of the previous chapter (Figure 8-10). Many of the implementation priorities discussed in Figure 9-2 and Figure 9-3 will directly or indirectly contribute to MnDOT achieving these targets within 10 years (and sustaining them thereafter). For a more detailed discussion the recommended condition targets, see Chapter 8: Financial Plan and Investment Strategies.

Lessons Learned

The TAMP development process was beneficial in that it helped formally document the asset management procedures currently being used at MnDOT for managing pavements and bridges. These existing procedures provided a framework for managing additional roadside assets now and in the future. As a result of the TAMP process, MnDOT also has a better understanding of the risks associated with undermanaged assets and is poised to improve many of its business processes.

As other states begin development of their own asset management plans, they may benefit from the following lessons learned during MnDOT’s TAMP development process.
1. MnDOT has strong pavement and bridge management programs in place that have been used for years to support agency planning and programming activities. However, even with strong programs in place, several business process improvements were identified that will further strengthen the programs. The development of the TAMP also helped justify improvements that were already underway, such as completing bridge management tools to improve predictions of future conditions and formalizing the inspection of overhead sign structures and high-mast light tower structures to help reduce the risk of failure. For assets without formal management processes in place, such as overhead sign structures, high-mast light tower structures, highway culverts, and stormwater tunnels, the TAMP framework served as a proof-of-concept for expanding the scope of future TAMPs.

2. The process of using existing data to develop the TAMP provided insight into the completeness and reliability of the data and a better understanding of the risks associated with undermanaging the assets. For example, the potential risk of failure associated with the I-35W South deep stormwater tunnel contributed to MnDOT programming $12 million to address needed repairs. Similarly, the plan led to the observation that there are many miles of access roads, ramps, frontage roads, and auxiliary lanes that are not currently being monitored and tracked.

3. Evaluating the life-cycle cost of overhead sign structures led to the observation that most performance issues were related to inadequate construction practices (loose nuts). As a result, new design standards were initiated to eliminate this issue from occurring in the future.

4. MnDOT has a risk management framework for managing agency risks effectively at the enterprise level. By focusing on risks associated with achieving the performance outcomes documented in the TAMP, MnDOT was able to uncover risks associated with undermanaging assets that had not previously been at the forefront, such as the need for prediction models to better manage bridges and the need for a formal inspection process for overhead sign structures and high-mast light tower structures.

5. The multi-disciplinary nature of the Steering Committee and the Project Management Team served MnDOT well because of the different perspectives it provided. Similarly, the formation of the technical Work Groups was instrumental in providing the content required to complete the TAMP. Therefore, the breadth of the team is important to provide guidance, but the technical nature of the TAMP content requires input from in-house technical specialists.
6. The TAMP is intended to provide upper management, elected officials, and the public with a summary of the plans for managing existing transportation assets over a 10 year period. Therefore, the TAMP needs to be written at a fairly high level. However, there is a lot of documentation that should be captured as part of the development process and MnDOT elected to capture that documentation in a separate Technical Guide document that can serve as a reference during future TAMP updates.

Moving Forward

The development of MnDOT’s first TAMP has already begun to improve and refine many aspects of the agency’s policies and methods related to asset management. By demonstrating the value of life-cycle costing, the TAMP will have a positive effect on future investment decision-making. In addition, the TAMP development process focused attention on data gaps that exist at the agency and led to initiatives aimed at improving the sophistication of data collection and analysis methods. MnDOT plans to continue moving forward with asset management planning in the coming years, with each new task building on previous work and adding additional asset categories, increasing the breadth and precision of data available to decision makers. These and similar actions will help MnDOT achieve its overarching goal of enhancing financial effectiveness. When combined with the forthcoming Transportation Asset Management System (TAMS, see Chapter 2), the TAMPs will help guide and improve policy and programming decisions at MnDOT, leading to more efficient and effective management of infrastructure assets and helping the agency meet the high standard of service expected by all Minnesotans.