

Policy 3: Maintenance and Security



Summary

Maintain and operate the statewide transportation system in an efficient, cost-effective, and secure manner. Mn/DOT will utilize the increase in operating funds provided through the 2008 Minnesota Legislature to address high priority maintenance needs, including snow and ice removal; bridge, pavement, and drainage maintenance; and safety and traffic operations. Mn/DOT will revamp its bridge inspection process to meet new federal requirements, document follow-up procedures to improve the effectiveness of the bridge inspection program, and emphasize preventive maintenance to ensure public safety and extend bridge life. Mn/DOT will continue to pursue a wide range of opportunities to share costs, resources, and best practices with its transportation partners and thereby achieve efficiencies across systems.

- 3A. Bridge Inspection, Follow-up, and Preventive Maintenance:** Review and modify bridge inspection processes and follow-up procedures, and implement bridge preventive maintenance strategies that ensure public safety and extend overall bridge life.
- 3B. Level of Highway Maintenance:** Staff and fund maintenance and operations to address high-priority areas including snow and ice removal, pavement patching, drainage, safety, and traffic operations needs.
- 3C. Efficiencies Across all Jurisdictions:** Work to advance efficiencies in maintenance operations through innovation, partnering, and cost-sharing.
- 3D. Maintenance of Other Modes:** Other public and private transportation partners should maintain their respective transportation infrastructure.
- 3E. Security:** Maintain the security of the state's road, rail, waterway, and aviation systems.

Background and Context

Maintaining the transportation system is critical to the safety and mobility of the traveling public. This policy focuses on both preventive and reactive maintenance activities as well as ensuring transportation infrastructure security. These activities not only keep the system operating in all weather and traffic conditions, but are central to extending infrastructure life and lowering overall ownership costs as well. This is especially important as much of the highway system is aging and nearing the end of its design life.

The transportation system has many parts that must not only physically connect at a system level but also work together at an operational level (e.g., signal timing, plowing activities, etc.). In 2005, Mn/DOT developed the first Highway Systems Operations Plan (HSOP), which included a formalized process for developing and

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tracking the performance of key maintenance and operations activities within Mn/DOT. The HSOP resulted in an annual transfer of over \$8 million from the state road construction budget to the operations and maintenance budget from fiscal year (FY) 2006 to FY 2009. Most of these funds are targeted toward pavement reactive maintenance (pavement patching) and bridge preventive maintenance activities. In addition to this funding, the 2008 Minnesota Legislature passed a new transportation funding bill, Chapter 152, that designated \$41 million to operations and maintenance starting in FY 2009.

Many of the transportation facilities interface with one another, and a high level of coordination is required to ensure seamless operations.

As a general rule, each jurisdiction and/or facility owner has the responsibility for maintaining and operating their own infrastructure (e.g., highways, rail, pedestrian, transit, bicycle, and ports). However, many of the transportation facilities interface with one another, and a high level of coordination is required to ensure seamless operations. For example, it does not make sense for a local jurisdiction to plow their roads within two hours of a storm event if the regional system is not plowed in a similar timeframe.

Another element to this policy area is transportation infrastructure security. Transportation security is an issue that has become more important since the tragic events of 2001. This area is complicated by the large number of factors influencing it, including multiple jurisdictions as represented by individuals, businesses, agencies, and governments. The security issue is present in both public and private transportation services and infrastructure. The focus of the discussion in this policy pertains to the security of public transportation services and infrastructure including critical highway, transit, passenger rail, water, and air infrastructure and services.

Strategies

All transportation infrastructure requires maintenance to not only extend its life but also to maintain safety and operational functionality. In addition, critical infrastructure needs to be secure to provide safe and predictable travel. The following strategies have been identified to address these areas.

3A. Bridge Inspection, Follow-up, and Preventive Maintenance

Review and modify bridge inspection processes and follow-up procedures, and implement bridge preventive maintenance strategies that ensure public safety and extend overall bridge life.

Significant scrutiny was focused on Mn/DOT bridge inspection and maintenance activities following the I-35W Bridge collapse. Based on these investigations and analysis, significant changes will be made to the Mn/DOT's bridge inspection and maintenance programs. These changes are intended to improve inspection practices as well as maintenance and follow-up activities. Mn/DOT specifically will implement the following strategies:

- a. Review and enhance, where appropriate, the state's bridge inspection programs to ensure personnel are well-trained and have the proper equipment. Complete all scheduled inspections annually and report conditions for all state highway bridges.

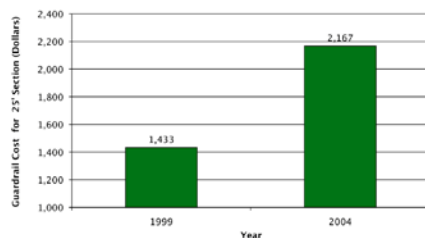
- b. Establish processes to identify and prioritize bridge maintenance needs from bridge inspection reports. Improve linkages between bridge work repairs and condition reporting programs (e.g., potential link between WMS and PONTIS). Also investigate enhancements to bridge management systems to link different investment strategies to life-cycle cost elements.
- c. Give priority to bridge preventive maintenance activities as outlined by HSOP (e.g., joint repairs, deck flushing, crack sealing, deck and rail sealing, and spot painting) to extend bridge life and lower long-term ownership costs.
- d. Prioritize and complete other bridge maintenance activities as needed to maintain structural integrity and safety (e.g., structural damage, pavement spalling, bearing adjustments, section loss).
- e. Provide greater access to bridge condition and bridge system performance information, and provide regular status reports to legislature on bridge maintenance and replacement programs.

3B. Level of Highway Maintenance

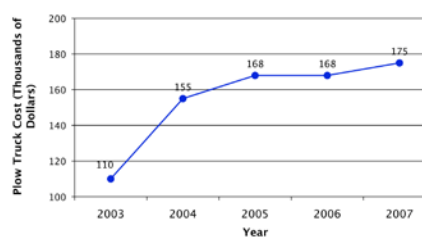
Staff and fund maintenance and operations to address high-priority areas including snow and ice removal, pavement patching, drainage, safety, and traffic operations needs.

The cost of highway maintenance has grown over time and this is anticipated to continue.

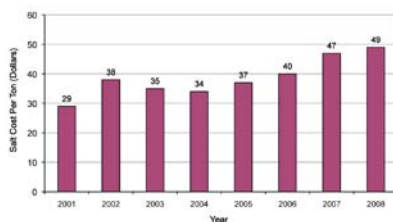
The cost of highway maintenance has grown over time and this is anticipated to continue. This is due to, among other things, an aging highway system, deteriorating pavement conditions, and increasing costs for fuel, equipment, and materials. Additionally, the system has become more complex in order to address safety, mobility, and/or environmental regulations. For example, drainage systems have become more sophisticated with ponds and treatment areas to ensure runoff is filtered before discharging to other water bodies. Numerous miles of cable median barrier have been installed to prevent serious cross-median crashes. More signals and lighting have been installed to improve traffic flow and safety. All of these systems require maintenance.



Guardrail Cost



Plow Truck Cost



Salt Cost

These figures provide examples of the cost increases that transportation agencies face annually as they maintain and operate a large, complex system.



Bridge anti-icing systems help reduce safety issues on bridge decks.

Mn/DOT will increase the level of resources for maintenance and operations to address ongoing highway system needs including:

- a. Placing a high priority on maintenance activities that directly affect the user and user safety, including snow and ice removal, pavement patching, guardrail replacement, enhancements to pavement markings and signing, and increased signal and lighting maintenance. Maintenance levels will also be increased in rest areas or other areas that receive a high level of public use.
- b. Expanding capability to monitor maintenance performance, assess maintenance needs, and manage maintenance costs consistent with direction set by the HSOP. This would include completion of the drainage database, Hydinfra, as well as ways to track and report the condition and maintenance of signs, guardrails, rest areas, signals, and lighting.
- c. Evaluating staffing needs with careful consideration of staffing needed to meet performance targets, resulting impacts on program delivery, and the level of use of temporary employees.

Mn/DOT has developed and deployed many innovative processes and products that have increased efficiencies and reduced overall maintenance costs.

3C. Efficiencies Across all Jurisdictions

Work to advance efficiencies in maintenance operations through innovation, partnering, and cost-sharing.

Mn/DOT has developed and deployed many innovative processes and products that have increased efficiencies and reduced overall maintenance costs. These activities are critical to providing maintenance for an ever-changing, more complex system. Examples include numerous changes in snowplow equipment and truck technology and the application of de-icing materials to increase efficiencies. Mn/DOT has also made significant efforts to partner with local transportation agencies to share work space and equipment and has recently experimented with sharing of plow routes. Mn/DOT will work to advance efficiencies in maintenance by doing the following:

- a. Pursue innovation in technology and best practices, including:
 - Use of automatic vehicle location, maintenance decision support systems, Tow Plow (an innovative plow configuration), pavement temperature sensors, and spreader calibration in snow and ice removal.
 - Explore use of fuel purchase hedging to achieve greater cost stability.

- Continue to investigate new, cost-effective materials and methods that improve functionality and reduce maintenance operation costs. Examples include pavement markings with improved visibility, especially at night and in wet weather conditions, and better overhead lamps that use less electricity and reduce the frequency of re-lamping.
 - Continue to consider maintenance costs when developing new designs or material standards such as those for the cable median barriers.
 - Evaluate potential for greater equipment sharing with strong consideration toward meeting performance targets.
 - Continue to encourage Mn/DOT's Best Practices program that identifies cost-effective processes and practices for implementation statewide.
- b. Develop or strengthen partnerships and cost-sharing arrangements. Examples include:
- Explore opportunities with cities and counties to increase maintenance efficiencies through shared facilities, equipment, and routes.
 - Take steps to increase restitution recovery for guardrails (i.e., increase the frequency of "yellow tags" by working more closely with local law enforcement and using technology to identify who is responsible for damage).
 - Continue to group maintenance activities into large group contracts to maximize efficiency and minimize staff. Examples include electrical and re-lamping work.
 - Expand maintenance activities to include preventive maintenance work; consider pooling preventive maintenance work with cities and counties.
 - Optimize work between Mn/DOT crews and contract maintenance; expand use of safety rest area contractors where possible.

3D. Maintenance of Other Modes

Other public and private transportation partners should maintain their respective transportation infrastructure.

Maintenance of other transportation infrastructure in Minnesota is also a concern. For example, a significant maintenance issue has emerged at the Port of Duluth where unusual corrosion of the steel sheet piling throughout the Duluth Superior harbor is occurring. To ensure Minnesota's entire transportation infrastructure is maintained, transportation authorities should pursue the following:



Rail conditions are important to moving grain, coal, and other bulk materials.

- a. Mn/DOT will work with rail companies to address maintenance at railroad grade crossings including traffic safety signals and signage and to better define inspection and maintenance responsibilities for the 60 Mn/DOT-owned railroad bridges over state highways.¹
- b. U.S. Army Corps of Engineers should continue to maintain the Mississippi River channel including yearly dredging and keeping the locks and dams in good working order. It should also continue to work with the Port of Duluth to stabilize and maintain Port of Duluth dock structures.²



Airport pavement condition is important to aviation safety.

- c. Local road authorities should work with Mn/DOT to improve maintenance and signage on designated highway freight routes and port connectors.
- d. Transportation agencies should ensure that bicycle and pedestrian facilities are maintained year round, including summer maintenance, and snow and ice removal where appropriate.³
- e. Local municipalities will continue to be responsible for maintaining and operating publicly owned airports. Mn/DOT will assist through the administration of the Airport Maintenance and Operations Grant program and through administration of the statewide airport re-striping contract.⁴
- f. Transit operators should continue to do preventive maintenance work to extend equipment life cycles.
- g. Mn/DOT and the Metropolitan Council will continue to work together to address maintenance of light rail transit (LRT) systems.⁵

3E. Security

Maintain the security of the state's roads, rail, waterway, and air service systems.

Operating a secure transportation system is important to all citizens, businesses and transportation agencies. Security measures are evolving for many parts of the transportation infrastructure. These will continue to evolve as security tactics and technology change. The provision of a secure system requires effort from many partners including law enforcement, transportation agencies, and private companies.

Mn/DOT will review and update security plans and procedures to protect and maintain the state's critical infrastructure.

Mn/DOT will periodically review and update its security plans and procedures to protect and maintain the state's critical infrastructure. These plans will ensure that proper coordination occurs with other agencies and that individual and organizational training takes place to prepare for potential incidents. It will also provide for a liaison to the federal, state and local emergency response community. Additionally, Mn/DOT will ensure that countermeasures are developed to address areas that have been identified as having higher risk.

This plan will also encourage private sector transportation providers (i.e., rail, water, and ports) as well as other agencies to have their own security plans and procedures.

Performance Measures and Indicators

Performance measures, indicators, and targets provide quantitative information to transportation authorities and decision makers. This information is tracked over time to monitor maintenance and investment levels as well as the changes in maintenance given changes in investment levels. Numerous performance measures and indicators have been either developed or identified for this policy area. Measures in **bold** have been selected as prime examples and are presented in this section. A full description of all performance measures and indicators associated with this plan is provided in Appendix D.

- **Bridge Inspection**
- **Bridge Reactive Maintenance**
- **Bridge Preventive Maintenance**
- **Snow and Ice Removal**
- Pavement Patching
- Pavement Markings Meeting Life Expectancy and Retro-Reflectivity Standards
- Customer Satisfaction with State Highway Maintenance

Developmental Measures

- Road Drainage Infrastructure Maintenance and Repair
- Guardrail and Median Barrier Repair
- Retro-Reflectivity of Pavement Markings
- Traffic Signal, Lighting, and ITS Maintenance

Bridge Inspection

National Bridge Inspection Standards (NBIS) requires inspections to be conducted within 24 months of the most previous inspection. Mn/DOT requires more frequent inspections for bridges in poor condition. Mn/DOT utilizes a standardized bridge inspection maintenance assessment for inspections. Bridge inspection progress was first reported at Mn/DOT in early 2009.

Bridge Reactive Maintenance

The 2008 Legislative Auditor Report recommended that Mn/DOT establish standard procedures for documenting, communicating, and following up on bridge inspectors' maintenance recommendations. This measure will report the percentage of high priority reactive maintenance projects completed. High priority reactive maintenance includes items that are hazards to the public and items that may degrade quickly to impact the safe function of a bridge. A standardized bridge maintenance planning spreadsheet is being used for prioritizing maintenance needs and reporting completion of required reactive bridge maintenance repairs.

Bridge Preventive Maintenance

Preventive bridge maintenance activities extend bridge life and lower long-term ownership costs. Activities include joint repairs, deck flushing, crack sealing, deck and rail sealing, and spot painting. Preventive maintenance activities only apply to bridges with decks having a NBIS rating of 6 or above; and only to elements in fairly good condition (elements in poor condition should be scheduled for reactive maintenance). Preventive maintenance is scheduled based on inspected element condition ratings and guidelines.

Snow and Ice Removal

Enhancing the safety of Minnesota’s roads for the traveling public is the primary goal of Mn/DOT’s snow and ice removal operations. Citizens expect to be able to carry out normal activities through most weather events, and to have transportation facilities that safely accommodate travel shortly after the event has passed. Snow and ice management can also greatly reduce congestion caused by weather events.

This performance measure tracks whether the target regain time (the time when bare lane is achieved following a weather event) was met or exceeded for each plow route for each event. These route specific figures are aggregated over an entire winter season. A draft target has been established stating that target regain be met over the winter season 70 percent of the time.

Targets are also set for the number of hours after a weather event ends before bare lane is achieved for five specific roadway categories. The targets set for the overall system and five types of roadways are shown in Table 7.3.1.

Table 7.3.1 Target Clearance Times for Snow and Ice Removal

Roadway Category	Average Daily Traffic	Target Clearance Time	2007 - 2008 Average Clearance Time
Super Commuter	Over 30,000	0 to 3 hours	2.5 hours
Urban Commuter	10,000 - 30,000	2 to 5 hours	5.3 hours
Rural Commuter	2,000 - 10,000	4 to 9 hours	6.9 hours
Primary Collector	800 - 2,000	6 to 12 hours	8.2 hours
Secondary Collector	Under 800	9 to 36 hours	12.9 hours

Source: Mn/DOT Office of Maintenance

Historically, Mn/DOT has met established clearance time targets for all five roadway categories in most years. As a result, Mn/DOT has exceeded the draft target for the past seven winters as displayed in Figure 7.3.1. The most recent winter season for which data is available, 2007-2008 winter season, the target clearance time was met 75 percent of the time.

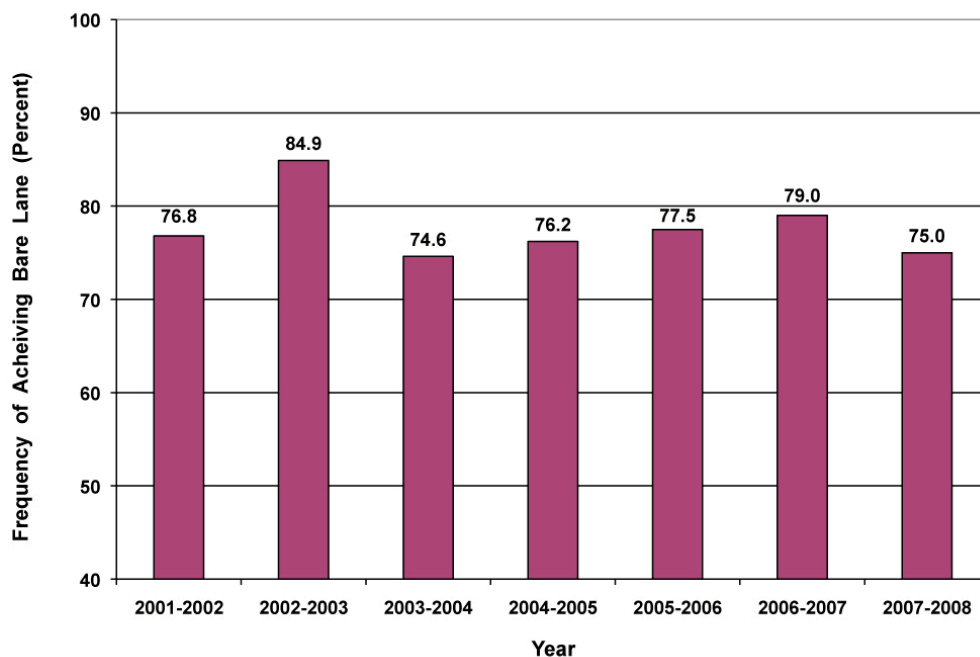


Figure 7.3.1 Frequency of Achieving Bare Lane within Targeted Number of Hours - All Classifications

Source: Mn/DOT Office of Maintenance

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- ¹ Mn/DOT owns approximately 60 railroad bridges in the state serving as highway overpasses on state highways (the other 50 or so are owned by the railroads). The railroads maintain the track and roadbed structure on the bridge, and normally include these bridges in their private bridge inspection rotations. Mn/DOT also inspects these structures regularly and performs routine maintenance.
 - ² The U.S. Army Corps of Engineers dredges the river yearly to maintain at least a nine foot deep channel for towboats and loaded barges to carry their cargo throughout the navigable rivers of the United States. The Corps of Engineers also controls all 29 locks and dams on the Upper Mississippi River, and does annual maintenance to keep the locks in good functioning order. They also maintain the Duluth Superior Port to 27-foot depth.
 - ³ Maintenance and operations of most bicycle and pedestrian paths and trails are a local government responsibility. These facilities need to comply with the Americans with Disabilities Act of 1990 (ADA).
 - ⁴ Mn/DOT administers Airport Maintenance and Operations Grants to assist 136 municipalities in performing routine maintenance such as snow plowing, pavement patching and crack sealing at publicly owned airports in Minnesota.
 - ⁵ Maintenance of the LRT system on state right-of-way as outlined in the agreement between Mn/DOT and the Metropolitan Council.