

Bridge Condition

A SYSTEM STEWARDSHIP INVESTMENT

Bridge Condition is one of the thirteen investment categories of MnSHIP, a fiscally constrained plan MnDOT uses to balance the needs and risks of Minnesota's state highway network. Folios for each investment category describe potential levels of investment and associated outcomes. Through MnSHIP, MnDOT will create an investment direction that guides state highway capital investments for the next 20 years.

INVESTMENT CATEGORY DETAILS

What types of bridges are included?

Investments in Bridge Condition include repairs and replacement of existing bridge structures. This investment category includes five types of state owned bridge structures: vehicle bridges, pedestrian bridges, railroad bridges (repair on non-state owned), tunnels, and culverts longer than ten feet long.

Why is Bridge Condition important?

There are approximately 20,000 bridges in the state of Minnesota. Over 4,500 of these bridges serve the state highway system and are therefore under MnDOT jurisdiction. Most bridges last 70 to 80 years before needing replacement, if maintained at optimal points. Proactive, preventive maintenance helps MnDOT maximize the service life of bridges, while delaying repairs can lead to higher maintenance and life-cycle costs.

How does investing in a high-quality bridge network support the Minnesota GO Vision and the Statewide Multimodal Transportation Plan?

Investing in bridges supports the guiding principles laid out in the 50-year vision for the state's transportation system, Minnesota GO. Among those are:

- Providing safe, convenient, efficient, and effective movement of people and goods;
- Strategically fixing the system; and
- Systematically improving safety for all forms of transportation.
- Building upon these principles, investment in Bridge Condition strengthens multiple strategies identified in the Statewide Multimodal Transportation Plan (SMTP), notably:
 - Prioritize maintaining and operating assets on identified priority networks;
 - Keep Minnesota's transportation system on a sustainable track for the future; and
 - Ensure that safety, operations, and maintenance needs are considered and addressed in transportation planning and programming.

How has the planning context for Bridge Condition changed since 2013 MnSHIP?

The Moving Ahead for Progress in the 21st Century Act (MAP-21) is a federal transportation funding bill that was signed in July 2012. As part of the bill's requirements, MnDOT and other state transportation agencies must report on the condition of bridges on the National Highway System (NHS). The passage of this bill has strengthened MnDOT's focus on preserving and maintaining NHS bridges, including a new requirement that no more than 10% of total bridge deck area will be in poor condition. This marks a change from 2013 MnSHIP, where condition was reported and investment was classified based on Principal Arterial and non-Principal Arterial bridges.



MN Highway 43 over the Mississippi River in Winona, MN.

How does MnDOT measure performance in Bridge Condition?

MnDOT conducts regular inspections on the state-owned 4,500 bridges to assess the condition of their decks, superstructures

Tips for using this table

Performance levels

- **Performance Level 0 (or PL 0)** represents a strategy in which Bridge Condition would receive less than current funding. PL 0 corresponds to the most extreme risk level MnDOT would potentially consider.
- MnDOT's current spending in Bridge Condition corresponds to approximately **PL 3**.
- PLs for Bridge Condition are independent of other investment categories.

Investment Levels

- The **pie charts** represent MnSHIP's total planning investment for years 2022-2037 (\$17.1 billion) and the portion of it which will be dedicated to Bridge Condition investment at each PL.
- **Base investment for other categories** is the amount required to invest at PL 0 in every other category.
- **Remaining revenue available** is the additional investment beyond the base investment for all categories in MnSHIP.

Outcomes

- Highlights key outcomes associated with each PL. For [investment category], outcomes correspond with key performance measures.

Risks

- Identified as **high**, **medium**, or **low** in each PL; each risk decreases in severity from left to right.

System Investment Strategies

- Details the steps MnDOT would make to mitigate risk at each PL.

and substructures, as well as culverts greater than ten feet. Each bridge is rated as having good, satisfactory, fair, or poor structural condition. The condition at each level is represented as a percentage of the total deck area on state owned bridges. MnDOT's targets for bridges are as follows:

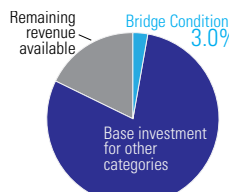
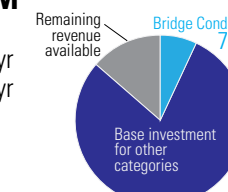
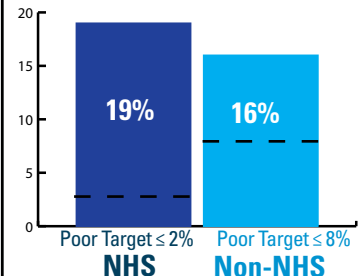
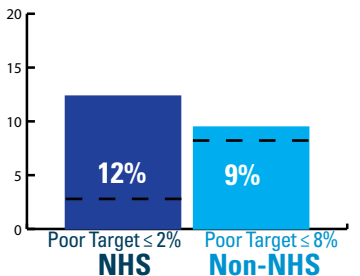
NHS	Non-NHS
• Good: 55% or greater	• Good: 50% or greater
• Good or Satisfactory: 84% or greater	• Good or Satisfactory: 80% or greater
• Fair or Poor: 16% or fewer	• Fair or Poor: 20% or fewer

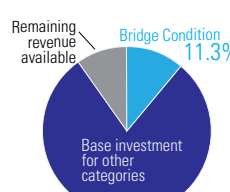
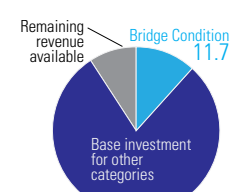
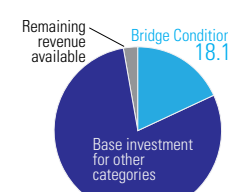
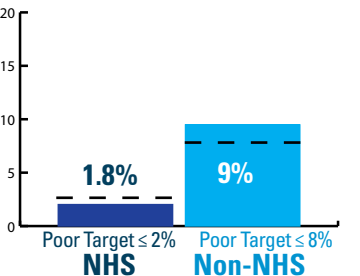
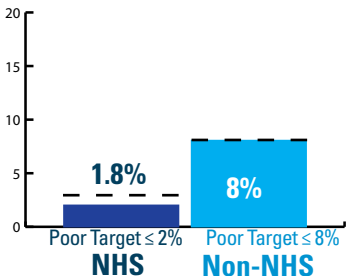
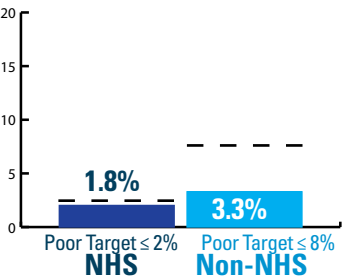
• Poor: **2%** or fewer

• Poor: **8%** or fewer

How did MnDOT create the investment levels?

The performance levels outlined in the table represent plausible investment levels for Bridge Condition. A risk-and performance-based analysis was undertaken in the summer of 2015 to illustrate

Bridge Condition		
Overarching Goal: Maintain a safe and sustainable system of Minnesota highway bridges for passenger vehicles, freight, transit, pedestrian, and bicycle users.		
	Performance Level 0 <i>Lowest cost, greatest risk</i>	Performance Level 1 <i>Lower cost, higher risk</i>
Investment Approach <i>(See Approaches Folio)</i>	Approach C	PL does not correspond with an Investment Approach
Investment Level <i>Total</i>	\$507 M Years 5-10 (2022-2027) Years 11-20 (2028-2037) \$25.1 M/yr \$35.7 M/yr 	\$1,206 M \$59.8 M/yr \$84.7 M/yr 
Investment Description	Address NHS highest priority bridges and no non-NHS other than critical safety.	NHS bridges with a remaining service life (RSL) of less than 15 years or less and highest priority non-NHS.
Outcomes <i>To what extent would MnDOT meet performance targets for Bridge Condition?</i>		
Risks	High • Deferring investment leads to unmanageable needs • Higher life-cycle costs • Service interruptions and weight restrictions leads to inefficient freight movement and lower quality of life Medium • Hazardous conditions	High • Deferring investment leads to unmanageable needs • Higher life-cycle costs • Service interruptions and weight restrictions leads to inefficient freight movement and lower quality of life Low • Hazardous conditions
System Investment Strategies <i>What strategies would MnDOT use to manage risk?</i>	<ul style="list-style-type: none"> • Increased focus on maintenance activities to avoid hazardous conditions • Defer most non-critical fixes • Close some bridges; impose weight restrictions on many others to avoid hazardous conditions 	<ul style="list-style-type: none"> • Maintenance activities focus on avoiding hazardous conditions • Defer many long-term fixes • Close bridges as needed; impose weight restrictions on some others to avoid hazardous conditions

Performance Objectives: Prioritize system safety while optimizing investments that maintain a sustainable system of bridges; ensure public confidence in infrastructure; provide an efficient transportation system; and implement timely and appropriate investments in preservation and safety.		
Performance Level 2 <i>Greater cost, lower risk</i>	Performance Level 3 <i>Greater cost, lower risk</i>	Performance Level 4 <i>Greatest cost, lowest risk</i>
Approach B	Approach A	Approximately corresponds with current investment
\$1,873 M \$92.8 M/yr \$131.6 M/yr 	\$1,949 M \$96.6 M/yr \$137.0 M/yr 	\$3,010 M \$149.2 M/yr \$211.5 M/yr 
Meet targets for NHS (2% poor) highest priority on non-NHS.	Meet targets for NHS (2% poor) and non-NHS (8% poor).	Meet targets for NHS (2% poor) and non-NHS (8% poor), and make the right fixes at the right time to minimize life-cycle costs.
		
Medium • Deferring investment leads to unmanageable needs • Higher life-cycle costs • Service interruptions and weight restrictions leads to inefficient freight movement and lower quality of life Low • Hazardous conditions	Medium • Service interruptions and weight restrictions leads to inefficient freight movement and lower quality of life Low • Hazardous conditions • Deferring investment leads to unmanageable needs • Higher life-cycle costs	Low • Hazardous conditions • Deferring investment leads to unmanageable needs • Higher life-cycle costs • Service interruptions and weight restrictions leads to inefficient freight movement and lower quality of life
<ul style="list-style-type: none"> • Maintenance activities able to include some preventive repairs • Defer some long-term fixes • Impose occasional weight restrictions to avoid hazardous conditions 	<ul style="list-style-type: none"> • Maintenance activities focus on preventive repairs • Defer few long-term fixes 	<ul style="list-style-type: none"> • Implement cost-effective preventive maintenance program

potential future scenarios. Performance levels reflect investments between 2022 and 2037 (2018-2021 funding levels influenced by 2013 MnSHIP). PL 0 through 4 represent a range of options to help stakeholders and decision-makers understand outcomes, risks, and system investment strategies for Bridges.

How does MnDOT typically invest in Bridge Condition?

MnDOT determines which bridges to invest in based on the Bridge Replacement and Improvement Management (BRIM) system which assesses bridge condition, traffic demand, and other structural ratings to determine bridges in greater need of investment. Experts from the Bridge Office, District bridge engineers, and District planners then decide which bridges need to receive future investment and when to program those investments.

Where is MnDOT headed?

Under funding levels established in 2013 MnSHIP, MnDOT is projected to spend an average of \$153 million annually on Bridge Condition until 2023. This approximately corresponds to Performance Level 4 in the Performance Level Option table (page 3). In 2024, due to increasing deterioration of state bridge conditions and decreased buying power due to the cost of inflation, MnDOT shifts additional investments into bridge condition. From 2024 through 2033, the 2013 investment direction directs an average of \$189 million annually for bridges.

What risks are addressed through increased investment in Bridge Condition?

Generally, the more MnDOT invests in Bridge Condition, the more MnDOT is able to reduce these key risks:

- Deferring long-term investments leads to unmanageable needs and a financially unsustainable bridge system;

Find more information with these additional folios!

Asset Management

- Pavement Condition
- Roadside Infrastructure Condition
- Jurisdictional Transfer
- Facilities

Traveler Safety

- Traveler Safety

Critical Connections

- Twin Cities Mobility
- Greater Minnesota Mobility
- Bicycle Infrastructure
- Accessible Pedestrian Infrastructure

Transportation In Context

- Regional + Community Improvement Priorities

Other Investments

- Project Delivery
- Small Programs

- Inability to make timely and appropriate investments results in reduced bridge service life, higher life-cycle costs, and inefficient spending; and
- More frequent service interruptions and bridge weight restrictions compromise the efficiency of the system, impacting mobility, economic viability, and quality of life.
- Bridge conditions become potentially hazardous (such as deteriorated railings or concrete) and require significant repairs.

How is MnDOT enhancing financial effectiveness through Bridge Condition?

MnDOT manages its bridges with the goal of minimizing the life-cycle costs of bridges and dollars spent on maintenance and improvements. MnDOT prioritizes the following strategies to optimize bridge investments:

- Bridge inspections—Frequent, thorough inspections lead to timely maintenance activities and capital investments. MnDOT expects to complete all bridge safety inspections on time every year. Occasionally, there are delays due to weather or conflicting construction activities. In 2014, 99.96% of bridge safety inspections were completed on time.
- Bridge preservation—MnDOT invests in preventive maintenance to ensure the safety and structural conditions of its bridges.
- Bridge improvement—Investing in rehabilitation projects at appropriate times during the bridges approximately 70-80 year life-cycle helps MnDOT get full use of its bridge infrastructure before needing to replace it.

These cost-effective approaches to bridge management assist MnDOT in providing a safe and reliable system for travelers while maximizing the life-cycle of the infrastructure.

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