



# Trunk Highway Bridge Improvement Program Chapter 152

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Prepared by

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# Legislative request

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This report is issued to comply with Minn. Stat. 2012, section 165.14, subdivision 6.

## Subdivision 1. **Definition**

For purposes of this section, "program" means the trunk highway bridge improvement program established under this section.

## Subd. 2. **Program created**

The commissioner shall develop a trunk highway bridge improvement program for accelerating repair and replacement of trunk highway bridges throughout the state. The program receives funding for bridge projects as specified by law.

## Subd. 3. **Program requirements**

(a) The commissioner shall develop an inventory of bridges included in the program. The inventory must include all bridges on the trunk highway system in Minnesota that are classified as fracture-critical or structurally deficient, or constitute a priority project, as identified by the commissioner. In determining whether a bridge is a priority project, the commissioner may consider national bridge inventory (NBI) condition codes, bridge classification as functionally obsolete, the year in which the bridge was built, the history of bridge maintenance and inspection report findings, the average daily traffic count, engineering judgments with respect to the safety or condition of the bridge, and any other factors specifically identified by the commissioner.

(b) For each bridge included in the inventory, the commissioner must provide the following information: a summary of the bridge, including but not limited to, county and department district, route number, feature crossed, the year in which the bridge was built, average daily traffic count, load rating, bridge length and deck area, and main span type; the condition ratings for the deck, superstructure, and substructure; identification of whether the bridge is structurally deficient, functionally obsolete, or fracture-critical; the sufficiency rating; a brief description of the work planned for the bridge, including work type needed; an estimate of total costs related to the bridge, which may include general and planning cost estimates; and, the year or range of years in which the work is planned.

## Subd. 4. **Prioritization of bridge projects**

(a) The commissioner shall classify all bridges in the program into tier 1, 2, or 3 bridges, where tier 1 is the highest tier. Unless the commissioner identifies a reason for proceeding otherwise, before commencing bridge projects in a lower tier, all

bridge projects within a higher tier must to the extent feasible be selected and funded in the approved state transportation improvement program, at any stage in the project development process, solicited for bids, in contract negotiation, under construction, or completed.

(b) The classification of each tier is as follows:

(1) tier 1 consists of any bridge in the program that (i) has an average daily traffic count that is above 1,000 and has a sufficiency rating that is at or below 50, or (ii) is identified by the commissioner as a priority project;

(2) tier 2 consists of any bridge that is not a tier 1 bridge, and (i) is classified as fracture-critical, or (ii) has a sufficiency rating that is at or below 80; and

(3) tier 3 consists of any other bridge in the program that is not a tier 1 or tier 2 bridge.

(c) By June 30, 2018, all tier 1 and tier 2 bridges originally included in the program must be under contract for repair or replacement with a new bridge that contains a load-path-redundant design, except that a specific bridge may remain in continued service if the reasons are documented in the report required under subdivision 5. Bridges that are not originally included in the program and additional bridges identified for contract after the trunk highway bridge improvement program concludes on June 30, 2018, must be prioritized according to subdivision 7.

(d) All bridge projects funded under this section in fiscal year 2012 or later must include bicycle and pedestrian accommodations if both sides of the bridge are located in a city or the bridge links a pedestrian way, shared-use path, trail, or scenic bikeway.

Bicycle and pedestrian accommodations would not be required if:

a comprehensive assessment demonstrates that there is an absence of need for bicycle and pedestrian accommodations for the life of the bridge; or

there is a reasonable alternative bicycle and pedestrian crossing within one-quarter mile of the bridge project.

All bicycle and pedestrian accommodations should enable a connection to any existing bicycle and pedestrian infrastructure in close proximity to the bridge. All pedestrian facilities must meet or exceed federal accessibility requirements as outlined in Title II of the Americans with Disabilities Act, codified in United States Code, title 42, chapter 126, subchapter II, and Section 504 of the Rehabilitation Act of 1973, codified in United States Code, title 29, section 794.

(e) The commissioner shall establish criteria for determining the priority of bridge projects within each tier, and must include safety considerations as a criterion.

#### **Subd. 5. Statewide transportation planning report**

In conjunction with each update to the Minnesota statewide transportation plan, or at least every six years, the commissioner shall submit a report to the chairs and ranking minority members of the House of Representatives and senate committees with jurisdiction over transportation finance. The report must include:

- (1) an explanation of the criteria and decision-making processes used to prioritize bridge projects;
- (2) a historical and projected analysis of the extent to which all trunk highway bridges meet bridge performance targets;
- (3) a summary of bridge projects (i) completed in the previous six years or since the last update to the Minnesota statewide transportation plan, and (ii) currently in progress under the program;
- (4) a summary of bridge projects scheduled in the next four fiscal years and included in the state transportation improvement program;
- (5) a projection of annual needs over the next 20 years;
- (6) a calculation funding necessary to meet the completion date under subdivision 4, paragraph (c), compared to the total amount of bridge-related funding available; and
- (7) for any tier 1 fracture-critical bridge that is repaired but not replaced, an explanation of the reasons for repair instead of replacement.

**Subd. 6. Annual report**

Annually by January 15, the commissioner shall submit a report on the program to the chairs and ranking minority members of the House of Representatives and senate committees with jurisdiction over transportation finance. The report must include the inventory information required under subdivision 3, and an analysis, including any recommendations for changes, of the adequacy and efficacy of

- (1) the program requirements under subdivision 3, and
- (2) the prioritization requirements under subdivision 4.

**Subd. 7. Prioritization of subsequent trunk highway bridge projects.**

The trunk highway bridge improvement program described in subdivisions 1 through 6 concludes on June 30, 2018, and applies to bridge projects identified at the inception of the program. Additional bridges that did not qualify for the initial trunk highway bridge improvement program under the tiered classification system that may subsequently need repair or replacement must be prioritized as follows:

- (1) the commissioner shall develop a prioritization method for scheduling bridge repairs and replacements that will include consideration of the risk of service interruption resulting in temporary road closures or restrictions of existing bridges;

(2) the prioritization system must consider factors including but not limited to bridge condition, age, load capacity, type of bridge, susceptibility to flood damage, fracture-critical design features, traffic volume, detour length, and functional classification of highway route;

(3) the prioritization system must be utilized in conjunction with department knowledge of the bridge infrastructure to establish the repair and replacement program; and

(4) the commissioner shall establish a risk-based prioritization system no later than February 1, 2011.

The cost of preparing this report is \$16,000.

# Summary

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## Purpose and scope of the report

This Trunk Highway Bridge Improvement Program Report, the fifth since 2009, is submitted in accordance with the requirements of Minn. Stat. 165.14. The information in this report is current as of November 2013.

All of the bridge projects in this report are part of a master bridge list developed on March 1, 2008 (revised on April 23, 2008) identifying 172 bridges that met the criteria established in Laws of Minnesota 2008, Chapter 152. This program focuses on those bridges classified as either structurally deficient or fracture critical.

Of the 172 bridges identified as part of the Chapter 152 program, an estimated 120 bridges will be under contract to be replaced or rehabilitated by June 30, 2018. The remaining bridges were either under construction at the time the program was established; classified as “Tier 3” under the priority system and were not required to be funded as part of the program (although many were already programmed for work); privately owned; or have been determined to not need work beyond routine maintenance until after June 30, 2018.

## Project status

The status of the 172 bridges is as follows:

- 87 bridges are substantially complete
- 9 bridges will be complete by the end of the 2014 construction season
- 41 bridges are scheduled to be under contract for repair or replacement in 2015-2018
- 32 bridges need only routine maintenance during the Chapter 152 program years
- 2 bridges are privately owned
- 1 bridge is closed to traffic and therefore won't receive any work under Chapter 152

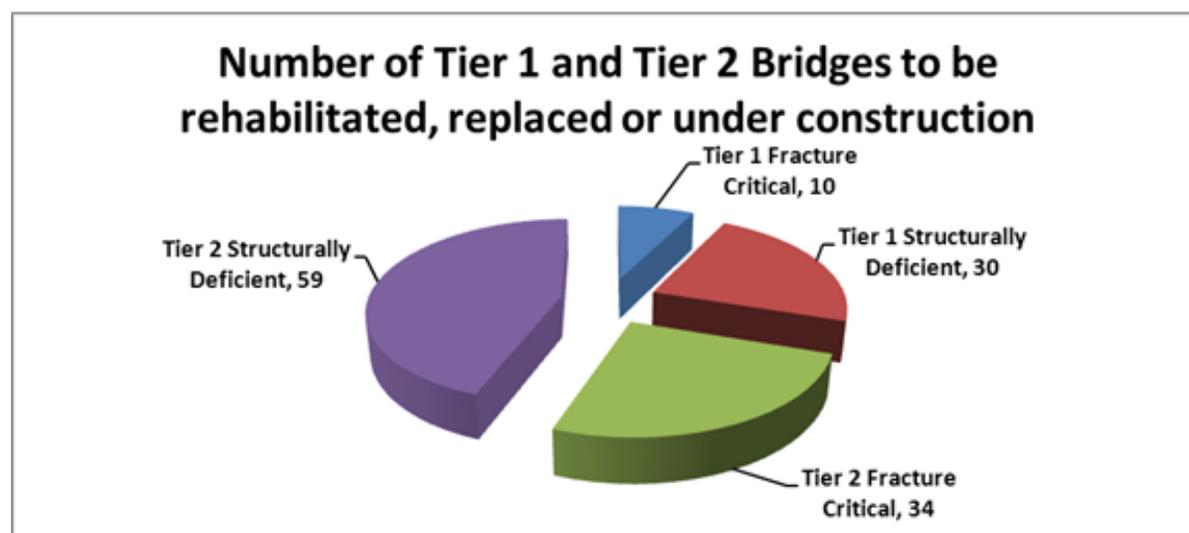
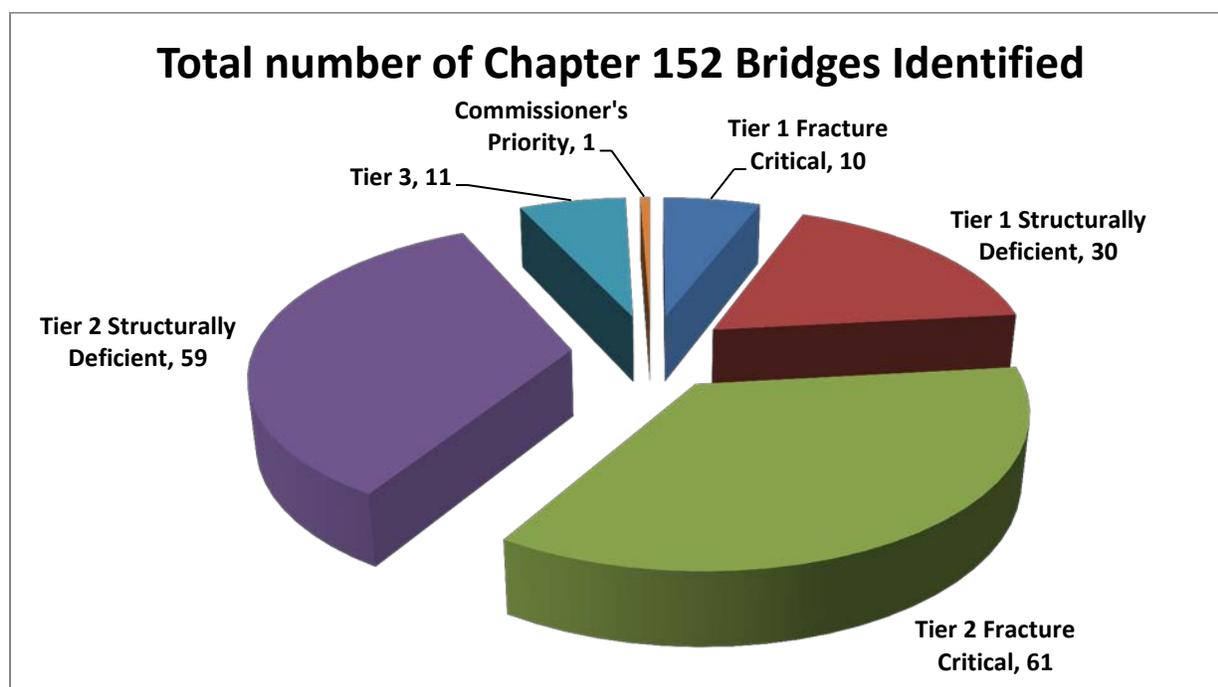
## Tier system

The legislation included a tier system to prioritize bridges. All bridges inventoried have been classified as a Tier 1, 2 or 3 bridge, where Tier 1 is the highest priority tier. Unless the commissioner identifies a reason for proceeding otherwise, all bridge projects within a higher tier must to the extent feasible be selected and funded in the approved state transportation improvement program, before beginning bridge projects in a lower tier. This can occur at any stage in the project development process—during bid solicitation, contract negotiations, construction or at completion.

- Tier 1: Any bridge with an average daily traffic count greater than 1,000 and a sufficiency rating that is at or below 50; or is identified by the commissioner as a priority project.

- Tier 2: Any bridge that is not a Tier 1 bridge, and is classified as fracture critical, or has a sufficiency rating that is at or below 80.
- Tier 3: Any other bridge meeting the program criteria (structurally deficient) that is not a Tier 1 or Tier 2 bridge.

The Bridge Office and the Office of Transportation System Management met with all MnDOT districts at the time the program was established to review their Tier 1 and Tier 2 bridge projects. Together they identified the needed improvement for each bridge (rehabilitation, redeck, minor maintenance or replacement). The outcome of those meetings provided the districts with the ability to determine project scopes, cost estimates and preliminary construction dates associated with the identified bridge improvements. Scopes and cost estimates for the bridge projects were completed in December 2008 and updated annually. There are several major bridges included in this program for which ownership is shared with Canada, Wisconsin or North Dakota. For the purposes of this report, only Minnesota's cost share of those bridges is reported.



# Chapter 152 bridge inventory

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A bridge inventory has been included in this report with the following information:

- Bridge number
- County
- MnDOT district
- Route number
- Facility carried and feature crossed
- National Bridge Inspection Standards condition ratings (deck, superstructure, substructure)
- Bridge classification(s): structurally deficient, fracture-critical or functionally obsolete
- Sufficiency rating
- Year built
- Average daily traffic count
- Load (operating) rating
- Length
- Deck area
- Main span type
- Brief description of the work planned
- Total project costs
- Year (or range of years) in which the work is planned
- Any notes on the bridge regarding history of bridge maintenance and inspection report findings, engineering judgments about the safety or condition of the bridge, or any other factors specifically identified by the commissioner

Projects within the four-year State Transportation Improvement Program have a total project cost estimate associated with them. Projects planned for years beyond the STIP time frame have a total project cost estimate range identified.

In accordance with the legislative intent, MnDOT will accomplish the following by June 30, 2018:

- Tier 1: All 10 fracture critical bridges (as of 11/30/2013) will be replaced, renovated or under construction.
- Tier 1: All 30 of the structurally deficient bridges that are not fracture critical (as of 11/30/2013) will be replaced, renovated or under construction.
- Tier 2: Of the 61 fracture critical bridges (as of 11/30/2013), it is estimated that 13 will be replaced. Of the remaining fracture critical bridges, 24 will be repaired or renovated, two are currently under study to determine if they will be replaced or rehabilitated, and three are privately owned or do not carry trunk highway traffic. The remaining Tier 2 fracture critical bridges that are not being repaired or replaced

within this 10-year program have performed well and are only in need of routine maintenance at this time. Some of these bridges are planned for replacement just beyond 2018.

- Tier 2: Of the 59 structurally deficient bridges (as of 11/30/13), all will be replaced or repaired based on load posting status, maintenance history, condition and sufficiency ratings.
- Tier 3: Of the 11 structurally deficient bridges, replacements will be prioritized based on load posting status, maintenance history and condition ratings.
- Commissioner's Priority: One load-posted bridge (neither structurally deficient nor fracture critical) was added to this program as a commissioner's priority.
- Additional bridges that become structurally deficient during the next decade will be programmed for replacement or repaired as needed or as funding allows.

Assumptions that may affect this program include:

- The current appropriation schedule for bond funds during the 10-year program does not match the current schedule for bridge improvements, which creates a negative balance in the program. Redistribution of bond appropriations may be needed to match the current bridge schedule and estimates.
- Current projection of inflation rates were used to inflate current cost estimates to year of construction or mid-year of construction for multi-year, large-scale bridges. (Large-scale bridges are defined as projects that have a construction cost exceeding 50 percent of the annual Area Transportation Partnership's federal funding target.) There were 13 large-scale bridges identified in the inventory. The inventory spreadsheet for these bridges is shown on next page. TH 99 over the Minnesota River in St. Peter will be rehabilitated in-place and is no longer considered a large-scale bridge project.
- Schedule changes for any individual large-scale bridge may require a shift in schedule for one or more of the other large-scale bridges.
- Current bridge conditions were used to develop this program. Significant changes in bridge conditions may affect the order and magnitude of funding needed to deliver this program.
- One-time, near-term funding allocations may affect the completion schedule of the Chapter 152 Bridge Improvement Program.

As better information is provided regarding these assumptions, any negative change could adversely impact the bridge program and potentially delay MnDOT's ability to deliver this entire program by June 30, 2018.

# Scheduling

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Scheduling of projects will occur according to the following priorities:

1. Bridge projects currently programmed in the 2014-17 STIP will be delivered as planned.
2. Large-scale bridges will be scheduled based on bond availability, project readiness, remaining bridge life and condition.
3. Other bridge projects will be scheduled prior to the end of the program as follows:
  - a. Remaining bridges will be replaced in order of tiers.
  - b. Within the tiers, projects generally were ranked in the following priority:
    - i. Load posted
    - ii. History of maintenance issues or inspection findings
    - iii. Condition Code Four or less for superstructure
    - iv. Condition Code Four or less for substructure
    - v. Sufficiency rating less than 50
    - vi. Permit restricted
    - vii. Sufficiency rating less than 80
    - viii. Functional class (principal arterials before others)

# Analysis of requirements and recommendations for changes

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Per Minn. Stat. 165.14, subdivision 6, the commissioner is to report on the adequacy and efficacy of (1) the program requirements under subdivision 3, and (2) the prioritization requirements under subdivision 4.

The program requirements under subdivision 3 require the commissioner to develop an inventory of bridges on the trunk highway system that are classified as fracture critical or structurally deficient, or constitute a priority project. In determining whether a bridge is a priority project, the commissioner may consider national bridge inventory condition codes, bridge classification (such as functionally obsolete), the year in which the bridge was built, the history of bridge maintenance and inspection report findings, the average daily traffic count, and engineering judgments with respect to the safety or condition of the bridge.

## **Structurally deficient bridges**

Prior to the enactment of this legislation, structurally deficient bridges were considered for replacement or rehabilitation as a part of programming and planning bridge projects. Prioritization occurred using the same criteria established in this legislation. For further discussion on prioritization, refer to the “Scheduling” section above.

## **Newer fracture critical bridges**

Only certain fracture critical bridges have been considered by the commissioner to be programmed or planned for replacement within the time frame of this program. Many fracture critical bridges on the trunk highway system were built after the mid-1970s, when the engineering community came to know more about steel fatigue. These newer bridges were designed and fabricated with improved details for resistance to fatigue. Steel specifications in the mid-1970s required steel "toughness" properties that provide resistance to fatigue. A Fracture Control Plan published in 1978 by the American Association of State Highway and Transportation Officials also served as a guide for fabricating bridges using improved welding techniques for assembly. Many of these bridges need only regularly scheduled maintenance or minor repairs within the time frame of this program and are not recommended by the commissioner for replacement until they near the end of their usable life. For this reason, the commissioner has taken a broad interpretation of the legislation to allow specific bridges to remain in service if the reasons are documented.

## **Historic fracture critical bridges**

MnDOT has coordinated with the Federal Highway Administration to implement this program. Under Section 106 of the National Historic Preservation Act, older fracture critical bridges eligible for the National Register of Historic Places required an in-depth study of the feasibility of rehabilitating these bridges prior to moving forward with a replacement project. As a part of these rehabilitation feasibility studies, MnDOT examined the potential for retrofitting fracture critical structures in order to provide load path redundancy. This is feasible for some types of fracture critical bridges. In other cases, such as truss bridges, the retrofit options examined did not provide designs that yield the 75-year service life expected from such a large investment. Additionally, some of the options examined would have created visual impacts that render the structure ineligible for the National Register. As with the newer fracture critical bridges described above, historic fracture critical bridges also are being considered as candidates for continued service.

## **Tier system**

Prioritization parameters under Minn. Stat. 165.14, subd. 4 require the commissioner to classify all bridges in the program into Tier 1, 2 or 3, with Tier 1 as the highest priority tier. Unless the commissioner identifies a reason to proceed otherwise, before beginning a bridge project in a lower tier, all bridge projects within a higher tier must be funded in the approved State Transportation Improvement Program; in some stage of the project development process, including in bid solicitation, contract negotiation or under construction; or completed. The prioritizing criteria in the legislation are part of the criteria the commissioner used to prioritize bridges prior to the legislation, with the exception that the commissioner had not previously categorized bridges in tiers. Since the Chapter 152 program was implemented based on MnDOT's understanding of the intent of the legislation, MnDOT has found the tier system workable and has no changes to suggest regarding its adequacy and efficacy.

## **Other factors considered in delivering projects**

Due to MnDOT's large program and the complexities in delivering large bridge projects requiring engineering, public involvement, environmental process, right of way acquisition, permits, utilities relocation, etc., not all Tier 1 bridges will be under construction prior to addressing Tier 2 bridges. However, all are currently in some stage of project development.

# Bicycle and Pedestrian Accommodations

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Legislation passed during the 2010 session requires all bridge projects funded under this program in fiscal year 2012 or later to include bicycle and pedestrian accommodations if both sides of the bridge are located within a municipality or the bridge links a pedestrian way, shared-use path, trail or scenic bikeway. Bicycle and pedestrian accommodations are not required if a comprehensive assessment demonstrates that there is no need or there is a reasonable alternative within one-quarter mile of the bridge project. Bicycle and pedestrian accommodations are being implemented in accordance with the requirements of the legislation.

# Prioritization of subsequent trunk highway bridge projects

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## Assessing Risk

Legislation passed during the 2010 session requires expansion of the current planning process to include risk-based criteria for project identification outside of the Chapter 152 Bridge Improvement Program. The intent of introducing risk assessments is to provide a comprehensive look at factors that affect the likelihood of a service interruption and impacts of an interruption to the traveling public. The risk assessment process considers the following factors: condition of the deck, condition of the superstructure, condition of the substructures, age, fracture criticality, scour susceptibility, geometric factors, special vulnerabilities, traffic volume, heavy commercial traffic, detour length and highway classification.

MnDOT has developed a process called Bridge Replacement and Improvement Management to incorporate the risk assessment tool. BRIM has been developed and calibrated and is being used in the planning of bridge improvements and replacements. The BRIM process consists of three steps: identifying improvement needs, ranking each bridge based on the bridge planning index and conducting an expert review.

Improvement needs are developed based on bridge inspection and inventory data for each individual bridge using the expected deterioration of each bridge. The result is a draft list of bridge needs, including cost and schedule. The next step incorporates the BPI, which applies the principles of risk assessment to the planning process that includes the factors mentioned previously. The BPI rates each individual bridge from 0 (highest priority) to 100 (lowest priority). The last step in the BRIM process is the expert review with the MnDOT district offices. This step provides an opportunity for local experts with a more intimate knowledge of their bridges to ensure projects are programmed appropriately based on the local transportation needs, scope and schedule.

The expert review process is further refined by meeting with the MnDOT districts and making final changes based on the feedback collected. The updated bridge improvement needs will be used as a basis for planning investments in state trunk highway bridges.

## **Statewide Performance and District Risk Management programs**

For many years MnDOT has allocated most revenue to its eight districts to make progress towards performance targets and key objectives, and to address district-specific risks. With the passage of MAP-21, federal policy and performance requirements direct the majority of federal funds to the NHS. Continuing to allocate all revenue to the eight districts might not meet NHS targets in an optimal way. Further, MnDOT must carefully manage the risk that the condition of state highways might negatively affect Minnesota's bond rating. MnDOT developed the Statewide Performance Program and District Risk Management Program to respond to these changes.

Project selection in both programs (SPP and DRMP) will continue to require coordination with local and regional units of government and the eight Area Transportation Partnerships, as well as outreach and information sharing with other stakeholders and the general public.

The SPP will focus on federal performance requirements identified in MAP-21, which require MnDOT to make progress towards pavement, bridge, safety and congestion performance targets. Failure to do so results in the loss of some federal funding flexibility. MnDOT's functional and district offices will work collaboratively to select projects. Projects will focus on existing pavement, bridges, roadside infrastructure rehabilitation and replacement, and include some lower cost, high-benefit projects that improve safety and mobility.

The DRMP will focus on non-NHS highways and address unique conditions at the district level. Revenue will be allocated to the districts to identify and prioritize projects in this program; however, project selections will be evaluated across districts in a collaborative process to ensure that each district is balancing district-level risks as well as making progress towards statewide goals. Projects will focus on pavement, bridge, roadside infrastructure, safety and mobility.

## Appendix A: Status of large-scale bridge projects

<b>Name/Location</b>	<b>County</b>	<b>District</b>	<b>Bridge No.</b>	<b>Status</b>
DeSoto, in St. Cloud TH23 over Mississippi River & Riverside Dr.	Stearns	3	6748	Replacement complete
Robbin-Drayton TH11 over Red River of the North	Kittson	2	6690	Replacement complete
Hastings US61 over the Mississippi River, RR, Streets	Dakota	Metro	5895	Replacement complete
Lafayette US52 over the Mississippi River, RR & Streets	Ramsey	Metro	9800	Replacement underway
Dresbach I-90 over the Mississippi River	Winona	6	9320	Replacement underway
St. Peter TH99 over the Minnesota River	LeSueur	7	4930	Rehabilitation planned for FY 2014*
Cayuga I-35 over Cayuga Street & BNSF RR	Ramsey	Metro	6515	Replacement underway
St. Croix River Crossing in Stillwater TH36 over the St. Croix River	Washington	Metro	4654	Replacement underway
Winona TH43 over the Mississippi River, RR, Streets	Winona	6	5900	Rehabilitation and New bridge planned for FY 2015
Sorlie Bridge, E Grand Forks US 2B over the Red River of the North	Polk	2	4700	Rehabilitation planned for FY 2018
TH72 over the Rainy River in Baudette	Lake of the Woods	2	9412	Rehabilitation or replacement planned for FY 2018
Red Wing US63 over Mississippi River & CP Rail	Goodhue	6	9040	Rehabilitation or replacement planned for FY 2018
New Ulm TH14 over the Minnesota River	Brown	7	9200	Replacement planned for FY 2018

\* TH 99 over the Minnesota River in St. Peter will be rehabilitated in-place and is no longer considered a large-scale bridge project.

## Appendix B: Abbreviations and definitions

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Abbreviation	Definition
ADT	Average daily traffic
Bridge length	Length of bridge from abutment to abutment
Bridge number	Unique number assigned to a specific bridge
CH 152 work planned	Type of work planned for bridge
Chap. 152 tier	Classification created by the Legislature - See Summary
Condition (NBIS rating)	National Bridge Inspection Standards rating given to a part of a bridge to identify its condition
Construction year planned	Estimated year construction is to begin
County	County
Deck area	Total bridge deck area (square feet)
Deck	Deck rating
District	MnDOT construction district; there are eight MnDOT districts
Facility/feature crossed	Facility carried by the bridge/feature being crossed by bridge
Fracture critical (Y=Yes, N=No)	A fracture critical bridge typically has a steel superstructure with load (tension)-carrying members arranged in a manner in which, if one fails, the bridge would collapse. Examples of fracture critical bridges are two-girder bridges or truss bridges. The classification of fracture critical does not mean the bridge is inherently unsafe.

Abbreviation	Definition
Functionally obsolete (Y=Yes, N=No)	A functionally obsolete bridge is one that was built to standards that no longer meet the minimum federal clearance requirements for a new bridge. These bridges are not automatically rated as structurally deficient, nor are they inherently unsafe. Functionally obsolete bridges include those that have sub-standard geometric features such as narrow lanes, narrow shoulders, poor approach alignment or inadequate vertical under clearance. The classification of a bridge as functionally obsolete also indicates a priority status for federal funding eligibility.
Load (operating) rating	Load ratings based on the operating rating level generally describe the maximum permissible live load to which the structure may be subjected. Allowing unlimited numbers of vehicles to use the bridge at operating level may shorten the life of the bridge.
Main span type	Type of main span superstructure
Notes	Notes on a specific bridge
OL	Overlay
PT	Paint
RDK	Re-deck
Rehab	Rehabilitation
RE-OL	Re-overlay
Route Number	Trunk Highway, US Highway or Interstate on which project is located
RPL	Replace
Structurally deficient (Y=Yes, N=No)	Bridges are classified as structurally deficient if they have a general condition rating of 4 or

Abbreviation	Definition
	less for the deck, superstructure, substructure or culvert, or if the road approaches regularly take on water due to flooding. The fact that a bridge is structurally deficient does not imply that it is unsafe. For bridge owners, the classification is a reminder that the bridge may need further analysis that may result in load posting, maintenance, rehabilitation, replacement or closure. If unsafe conditions are identified during a physical inspection, the structure will be closed. Structurally deficient is a term used to indicate a priority for federal funding eligibility.
SP #	State project number
SUB	Substructure rating
Substantially complete	Bridge is open to traffic
Sufficiency rating	Sufficiency rating is a computed numerical value that is used to determine eligibility for federal funding. The sufficiency rating formula result varies from 0 to 100. The formula includes factors for structural condition, bridge geometry and traffic considerations. The sufficiency rating formula is contained in the December 1995 edition of the "Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges." A bridge that is structurally deficient or functionally obsolete with a sufficiency rating of 80 or less is eligible for federal rehabilitation funding. Of those, a bridge with a sufficiency rating of less than 50 is eligible for federal replacement funding.
SUP	Superstructure rating
Total project cost estimate	All project costs associated with the construction, engineering and right of way acquisition (including inflation out to the mid-year of construction and contingency)

<b>Abbreviation</b>	<b>Definition</b>
Value in ( )	Current value, updated from the 2008 value
Year built	Year the bridge was originally constructed
Year of substantial completion	Year the bridge is open to traffic after construction of the planned Chapter 152 work

## Appendix C: Fracture critical and structurally deficient bridges

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See attached Appendix C: Fracture Critical and Structurally Deficient Bridges.