

BRIDGE PERFORMANCE MANAGEMENT NEWSLETTER

2022-2025 PERFORMANCE PERIOD – BASELINE REPORT

BRIDGE CONDITION

Title 23 CFR §650, Subpart C - National Bridge Inspection Standards (NBIS), defines a bridge as a structure carrying traffic with a span greater than 20 feet and requires that all bridges be inspected every two years to monitor and report condition ratings. The FHWA requires that for each applicable bridge, the performance measures for determining condition be based on the minimum values for substructure, superstructure, deck, and culverts. The FHWA further requires counting this condition by the respective deck area of each bridge and express condition totals as a percentage of the total deck area of bridges in a state.

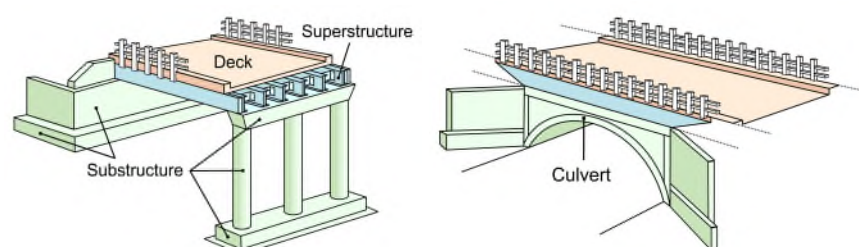
Condition ratings are based on a 0-9 scale and assigned for each culvert, or the deck, superstructure and substructure of each bridge. These ratings are recorded in the National Bridge Inventory (NBI) database. Condition ratings are an important tool for transportation asset management, as they are used to identify preventative maintenance needs, and to determine rehabilitation and replacement projects that require funding.

REPORTING ON BRIDGE CONDITION

Title 23 CFR §490, National Performance Management Measures, Subpart D, designates recurring four-year performance periods for which MDOT is required to develop, in coordination with MPOs, two-year and four-year State targets for bridge condition on the National Highway System (NHS). The two performance measures for assessing bridge condition are:

- % of NHS bridges in Good Condition; and
- % of NHS bridges in Poor Condition.

In accordance with regulation and FHWA guidance, targets are data-informed, analysis driven, realistic predictions of future performance constrained to projected program funding. These short-term predictions are intended to evaluate and support the most effective investment strategies for achieving long-term performance goals and expectations in State and MPO planning documents. The pavement measures are limited to the National Highway System (NHS), regardless of ownership, and the NHS represents a subset of the entire pavement network managed by MDOT, MPOs and local governments



ANATOMY OF A BRIDGE OR CULVERT

NBI Condition Ratings			
7-9	Good Condition		Routine maintenance candidate.
5-6	Fair Condition		Preventative maintenance and minor rehabilitation candidate.
4	Poor Condition	Poor	Major rehabilitation or replacement candidate.
2-3		Serious or Critical	Emergency repair or high priority major rehabilitation or replacement candidate. Unless closely monitored it may be necessary to close until corrective action can be taken.
0-1		Imminent Failure or Failed	Major rehabilitation or replacement candidate. Bridge is closed to traffic.

REPORTING ON BRIDGE CONDITION, CONTINUED

By June 14, 2023 (180 days following establishment of State targets), MPOs are required to develop 2- year and 4-year targets for each bridge measure in coordination with MDOT. MPOs have two options for target development: (1) agree to plan and program projects that support State targets, or (2) develop to a quantifiable target for the respective metropolitan planning area. MPO target elections can be made on a per measure basis. For example, an MPO can elect to support the State 2-year good condition target, and develop an MPO boundary 2-year poor condition target.

While FHWA does not make a significant progress determination of MPO targets, whether the MPO elects to support the State target or develop an MPO boundary target, the MPO is required to report progress in a system performance report. Also note, an MPO is not subject to any regulatory consequence or penalty if significant progress is not achieved regardless of whether the election was to support a State target or develop an MPO boundary target.

Baseline NHS Bridge Condition by Deck Area - Statewide								
Owner	Good		Fair		Poor		Total (sft)	
Trunkline	7,290,726	22%	23,690,343	71%	2,242,167	7%	33,223,236	88%
Bridge Authority	320,575	16%	1,676,900	83%	11,944	1%	2,009,419	5%
Local	717,498	29%	1,354,360	55%	381,037	16%	2,452,895	7%
Total	8,328,799	22%	26,721,604	71%	2,635,147	7%	37,685,550	

Baseline NHS Bridge Condition by Count – Statewide (for reference only)								
Owner	Good		Fair		Poor		Total	
Trunkline	663	24%	1910	70%	170	6%	2743	92%
Bridge Authority	4	44%	4	44%	1	11%	9	<1%
Local	83	37%	101	45%	40	18%	224	8%
Total	750	25%	2015	68%	211	7%	2976	

BASELINE NHS BRIDGE CONDITION

Structures that meet the definition of a bridge according to the NBIS are recorded in the Michigan Bridge Inventory database through a web-based system called MiBRIDGE. MDOT's Bureau of Bridges and Structures (BOBS) in turn submits this information to the National Bridge Inventory (NBI). Using this database, BOBS compiles the number of bridges and deck area for each of the categories required by the Performance Management requirements.

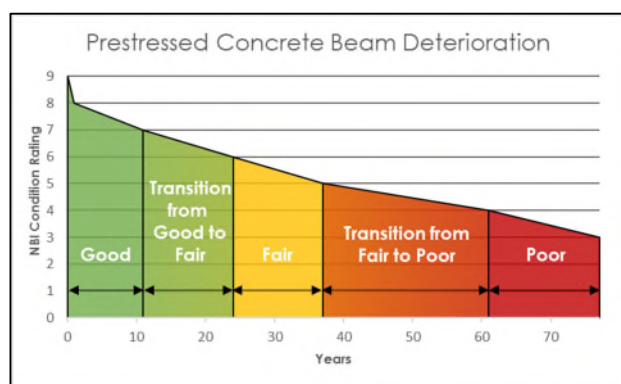
While the National Bridge Inspection Standards applies to all publicly owned highway bridges, the TPM Targets are only applied to those bridges carrying routes on the NHS including bridge on- and off-ramps connected to the NHS. The NHS consists of roadways important to the nation's economy, defense, and mobility. The NHS includes the following subsystems of roadways: interstate, other principal arterials, strategic highway network, major strategic highway network connectors, and intermodal connectors. condition totals as a percentage of the total deck area of bridges in a state.

The FHWA requires calculating the NHS condition by the respective deck area of each bridge and express condition totals as a percentage of the total deck area of bridges in a state. The area is computed using the NBI Structure Length and Deck Width or Approach Roadway Width (for some culverts). Tables above represent the data submitted to the FHWA on March 13, 2022.

Local agencies own 7 percent of the NHS bridge deck area in Michigan, while MDOT and the Bridge Authorities maintain ownership of approximately 93 percent of bridge deck area. MDOT and MPO targets must cover the entire NHS, regardless of ownership. To account for this, the rule requires MDOT and MPOs to coordinate target setting, planning, and programming, ensuring targets are feasible, and projects are geared toward achieving them.

BRIDGE DETERIORATION MODELS

As a bridge ages, its condition declines and an increasing amount of work is required to restore condition or extend the usable life of the bridge. By tracking the rate at which bridges have declined in the past, MDOT is able to predict the rate at which a bridge will decline in the future. MDOT has an established process through which trends in bridge deterioration rates can be evaluated at regular intervals. These periodic reviews will show whether preventive maintenance and other small actions taken on bridges are effective over time. This process is documented in the report “A Process for Systematic Review of Bridge Deterioration Rates” which is available on the MDOT website at: http://www.michigan.gov/documents/mdot/A_Process_for_Systematic_Review_of_Bridge_Deterioration_Rates_522422_7.pdf.



As shown in the image above, the minimum NBI condition rating is the y axis, and the number of years in each condition state is the x axis. As the Target setting periods are two and four years, the key transition times for this analysis are the Transition from Good to Fair (the time it takes to drop from 7 to 6) and the Transition from Fair to Poor (the time it takes to drop from 5 to 4). Outside of the initial drop for 9 (Excellent) to 8 (Very Good), a bridge would not be *predicted* to fall multiple condition ratings over a span of four years as it is based on statewide averages. This can sometimes occur in practice and is part of the error involved in predictions.

PROJECT IMPACTS

MDOT PROJECT SELECTION - As the product of ongoing asset management by MDOT and our local agencies, projects are programmed each year to extend life or improve condition throughout the bridge network. MDOT analyzes the candidates for each of the major work types – preventive maintenance, rehabilitation and replacement – and identifies a strategy that is the most cost-effective means to achieve

and sustain a state of good repair within financial constraints. Starting from this initial strategy, the regions then perform more detailed analysis and scopes, coordinating with other programs such as road, and selecting projects through the annual Call for Projects process.

A small number of MDOT bridges are managed centrally within the Big Bridge Program. The Big Bridge Population is a unique subset of MDOT’s trunkline bridge population that includes sixteen large deck bridges (deck area in excess of 100,000 sq ft), nineteen complex bridges, and twelve moveable bridges. These fifty-one bridges are unique not only from an engineering standpoint, but they also represent large capital investments in terms of their initial construction costs and in terms of their long-term preservation and rehabilitation costs. Because of the significant investment these bridges represent, MDOT’s goal is to preserve and maintain the Big Bridge inventory in a continuously good or fair condition state. This population is also of unique importance to the Performance Management Target Settings as the 39 structures that carry NHS comprise 14% of the trunkline NHS deck area.

LOCAL AGENCY PROJECT SELECTION - As the product of ongoing asset management by MDOT and our local agencies, projects are programmed within JobNet, and local agency bridge projects included in this analysis are those that have been selected through the local bridge program. Legislation enacted October 1, 2004 created a local bridge fund, a local bridge advisory board (LBAB) and seven regional bridge councils (RBC). The legislation places control of the funding allocations of the local bridge fund in the hands of the local agencies of Michigan through the LBAB and RBCs. A call for applications is sent to all local agencies on an annual basis. The submitted applications are reviewed by the staff of MDOT local agency program’s bridge unit for completeness and funding eligibility. Formula rating points are computed and each region’s applications are submitted to their respective RBC for addition of discretionary points. A 3-year bridge program is maintained by each RBC.

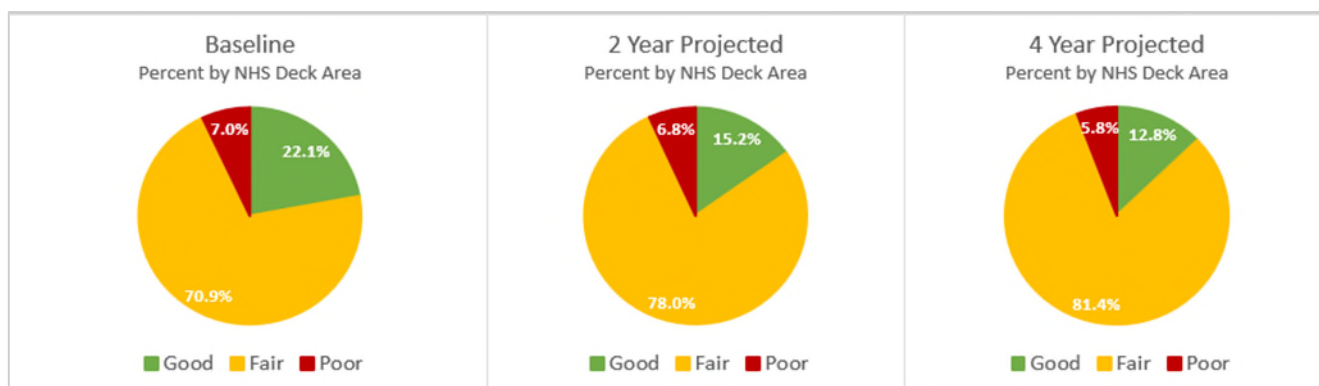
Local Agencies may also identify bridge projects through their Metropolitan Planning Organization or Rural Task Force, although because of the dollar amounts available these projects are rare. Many local agencies do projects on their bridges with their Act 51 fund distributions. These projects, however, do not have to be entered as a programmed project within JobNet and would not be reflected in the results. Due to the relatively small amount of local agency deck area, this is considered an acceptable omission at this time, but is an area identified for future improvement.

DEVELOPING TARGETS

Starting from the condition reported with the NBI submittal on March 13, 2022, the expected improved condition from projects and reduced condition from deterioration was summarized into projected 2-Year and 4-year condition. The deck areas in good, fair and poor conditions at each year was summarized. To account for uncertainty, the amount of deck area in good condition was conservatively reduced by 1%, and the amount of deck area in poor condition was increased by 1%. A 1% reduction for uncertainties reflects about 30 average size structures that either deteriorated faster than predicted or that did not see as much of an improvement as predicted.

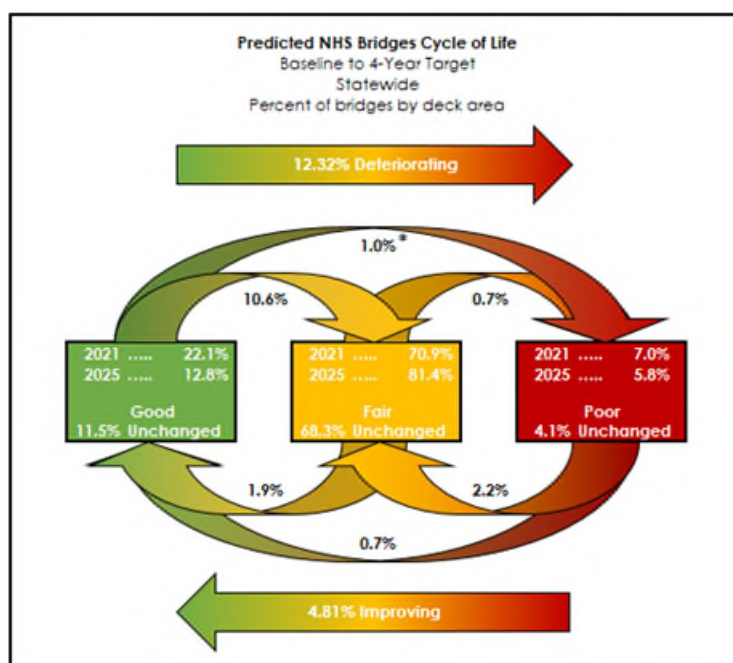
ANALYZING TARGETS

Overall, the number of good bridges is expected to decline significantly as preservation efforts tend to extend life in fair condition. While the amount of bridges in good condition is predicted to decrease, the amount of deck area in poor condition is also predicted to decrease. While the decrease in poor deck area is important towards achieving/maintaining a state of good repair, the amount of fair deck area will require a sustained commitment to preservation in order to prevent an unsustainable number of fair bridges from falling into poor condition.



EVALUATING GOOD CONDITION

The target for Good condition was set as a combination of estimating the deck area that is expected to deteriorate and the deck area that is expected to be improved. This is demonstrated in Cycle of Life, which shows that 10.6% of the NHS deck area is predicted to leave Good condition and 1.9% is expected to enter Good condition during the time period.



MPO COORDINATION

Shown below is the 2021 NHS bridge deck area estimated condition for each MPO's population of bridges. As discussed earlier, the method used to predict bridge deterioration for State targets applies statewide average deterioration rates to all bridges. Some bridges will deteriorate faster while others will deteriorate slower. At the network level, these differences tend to balance. When looking at smaller populations, such as at an MPO boundary level, the difference between specific bridge deterioration and statewide averages can lead to large differences between predictions and measured values. When the performance values are measured in terms of deck area rather than count, large bridges can exacerbate this discrepancy.

MDOT also created a Transportation Performance Measures Dashboard for MPOs and bridge owners to aid in reviewing

State bridge targets. The 2022 baseline data (bridge inspection data collected between March 2021 and March 2022) can be found via [the NHIS Bridge Inventory](#). This page represents a snapshot of data of the NHS bridges in the NBI submittal to FHWA, and is what will be used by FHWA to evaluate the respective 2-year and 4-year State target achievement for the performance period. For more current information, all NBI bridge data is updated monthly at the [NBIS website](#).

MPO	Good		Fair		Poor		Total	
	Deck Area	Percentage	Deck Area	Percentage	Deck Area	Percentage	Deck Area	Percentage
Battle Creek Area Transportation Study	3,429	1%	420,443	92%	31,720	7%	455,593	100%
Bay City Area Transportation Study	104,804	17%	465,703	76%	45,655	7%	616,162	100%
Genesee County Metropolitan Planning Commission	138,432	7%	1,561,627	81%	233,080	12%	1,933,138	100%
Grand Valley Metropolitan Council	1,034,362	26%	2,663,907	68%	244,662	6%	3,942,932	100%
Jackson Area Comprehensive Transportation Study / Region 2 Planning Commission	15,419	5%	277,594	82%	44,780	13%	337,793	100%
Kalamazoo Area Transportation Study	199,736	37%	271,815	51%	65,117	12%	536,668	100%
Macatawa Area Coordinating Council	44,805	15%	255,007	84%	4,149	1%	303,960	100%
Midland Area Transportation Study	41,127	21%	154,374	79%	-	0%	195,501	100%
Niles Area Transportation Study	8,757	3%	254,883	97%	-	0%	263,640	100%
Saginaw Area Transportation Agency	186,425	8%	1,995,579	90%	31,484	1%	2,213,489	100%
Southeast Michigan Council of Governments	5,274,541	32%	10,086,998	61%	1,290,294	8%	16,651,833	100%
Tri-County Regional Planning Commission	41,937	2%	1,990,461	86%	287,576	12%	2,319,974	100%
Twin Cities Area Transportation Study	23,312	3%	747,123	96%	6,655	1%	777,089	100%
West Michigan Metropolitan Planning Program	36,164	5%	617,306	92%	15,841	2%	669,311	100%
Outside MPO Boundaries	1,175,550	18%	4,958,783	77%	334,134	5%	6,468,467	100%
All NHS	8,328,799	22%	26,721,604	71%	2,635,147	7%	37,685,550	100%

For More Information

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