

Iowa DOT Pavement and Bridge Performance Measures

October 2022

Required performance measures

Through the Moving Ahead for Progress in the 21st Century (MAP-21) Act, Congress required the establishment of measures to assess performance in several areas, including pavement condition of the Interstate and non-Interstate National Highway System (NHS), codified in 23 CFR 490.307, and bridge condition of the NHS, codified in 23 CFR 490.407. Departments of Transportation (DOTs), as well as Metropolitan Planning Organizations (MPOs) with applicable roadways within their metropolitan planning areas, set targets for the following performance measures, known as “PM2.”

1. Percentage of pavements of the Interstate System in Good condition
2. Percentage of pavements of the Interstate System in Poor condition
3. Percentage of pavements of the non-Interstate NHS in Good condition
4. Percentage of pavements of the non-Interstate NHS in Poor condition
5. Percentage of NHS bridges classified as in Good condition
6. Percentage of NHS bridges classified as in Poor condition

Targets are set for all roadways on the applicable system within a state or MPO, regardless of ownership. Target setting occurs for 4-year periods, with the first targets having been established in 2018 for the performance period of calendar year (CY) 2018-2021. States must now set 2- and 4-year targets for the second reporting period of CY 2022-2025. Once states establish targets, MPOs will have 180 days to take action to either support the state’s 4-year targets or set their own.

Pavements

Iowa has more than 240,000 lane-miles of roadway across state, county, and municipal systems. Iowa DOT is responsible for maintaining 23,825 lane-miles of highways, including highways on the Interstate System, the majority of the NHS, and other state highways. Local governments maintain the remaining pavements. Table 1 shows the number of lane-miles of Interstate highways and non-Interstate NHS highways in Iowa, which are the systems that targets are being set for.

Table 1: Lane-miles of Interstates and non-Interstate NHS highways in Iowa

Highway system	Lane-miles
Interstate	3,479
Non-Interstate NHS (DOT + Local)	12,867
DOT NHS (Non-Interstate)	12,426
Local NHS	441

Iowa DOT collects pavement data on Interstates every year, the remainder of the NHS and Iowa DOT highways every two years, and all other paved roads in the state every four years. Local jurisdictions can choose to fund participation in more frequent collection than every four years if desired. Data from these inspections form the basis for determining condition levels and help owners determine pavement maintenance needs. More information about NHS pavements and how they are managed can be found in Iowa’s Transportation Asset Management Plan (TAMP).

Target setting methodology

Targets are to be set based on 0.1-mile sections of the through travel lanes of mainline highways on the applicable highway systems. The Federal Highway Administration (FHWA) definitions of good, fair, and poor for pavement are determined based on the condition of three attributes - the pavement section's International Roughness Index (IRI), the pavement's cracking condition, and the pavement's rutting rating (concrete) or faulting rating (asphalt). Per FHWA's definitions, a pavement section is considered "poor" if two of these three ratings are poor. A pavement section is considered "good" if all three ratings are good. Otherwise, it is considered "fair." Pavement that is part of a bridge deck is excluded from metric calculations. Missing, invalid, or unresolved data is also excluded from the calculations and is not to exceed five percent of the system's mileage. The good and poor measures are determined by summing the total lane-miles of good or poor highway segments and dividing by the total lane-miles of all highway segments on the applicable system.

To develop targets in alignment with the FHWA definitions of good and poor, Iowa DOT's pavement management team reviewed historical condition data and used a pavement management tool to forecast the metrics. The tool can provide a recommended program of pavement projects based on condition information, treatment options and decision trees, benefits and costs, and projected budgets for pavement work. The tool also provides forecasted condition based on the FHWA good/fair/poor definitions. The forecasts were reviewed and the estimated performance for the 4-year period was used to set targets. Targets were adjusted up or down as appropriate to allow for a conservative approach, given the current uncertainty related to construction cost inflation and ongoing supply chain issues and how that may impact projects planned during the performance period. The 2- and 4-year targets were held constant, though the 4-year targets will be reviewed at the midpoint of the performance period and adjusted if appropriate.

Figure 1 shows the historical performance and proposed targets for the Interstate System, and Figure 2 shows the same information for the non-Interstate NHS. Note that there was not a 2-year target required for the Interstate condition measures in the prior performance period. Also, prior targets for the non-Interstate NHS are not shown because the first performance period allowed a phase-in where only the IRI rating was used to measure condition, thus prior targets are not comparable to the current data and targets. Table 2 summarizes Iowa DOT's PM2 pavement targets.

Figure 1: Interstate pavement historical condition, prior targets, and proposed targets

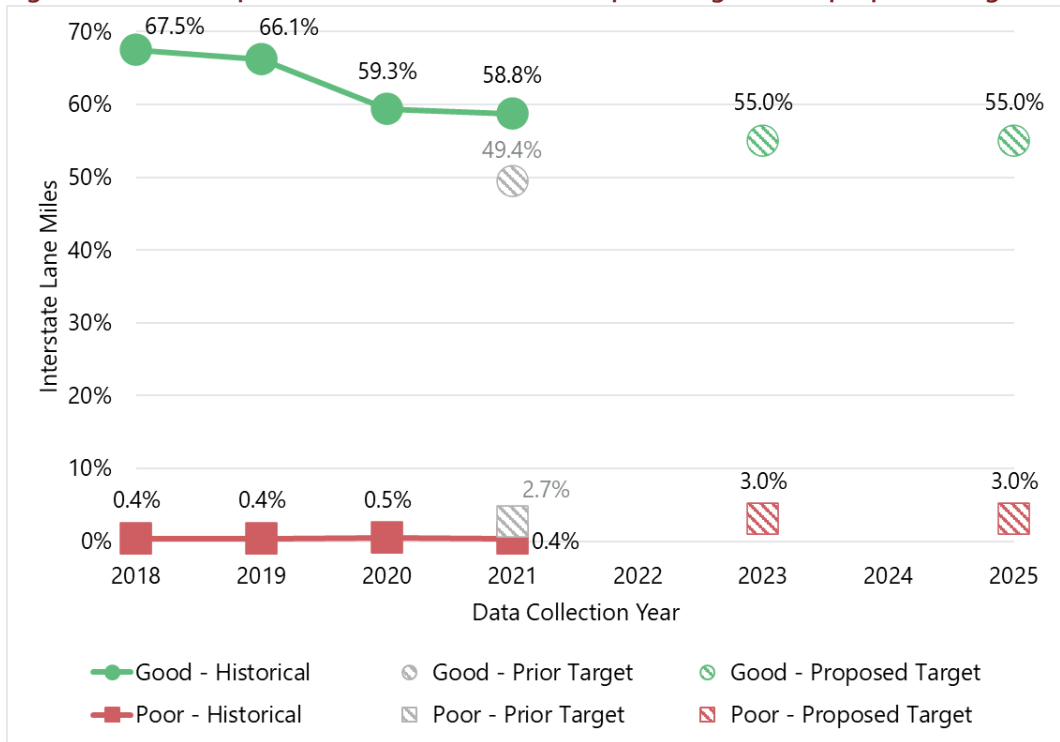


Figure 2: Non-Interstate NHS pavement historical condition and proposed targets

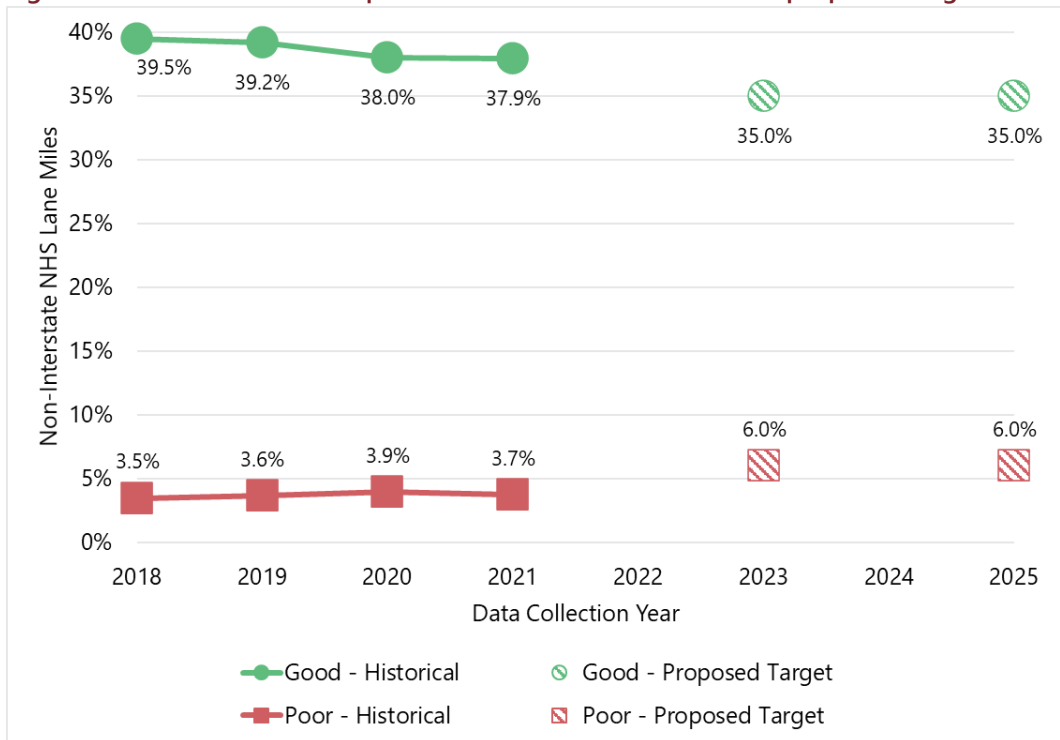


Table 2: Iowa DOT PM2 pavement targets for 2022-2025

Performance measure(s)	Baseline (CY 2021 data)	Proposed 2-year target (CY 2023 data)	Proposed 4-year target (CY 2025 data)
Percentage of pavements of the Interstate System in Good condition	58.8%	55.0%	55.0%
Percentage of pavements of the Interstate System in in Poor condition	0.4%	3.0%	3.0%
Percentage of pavements of the non-Interstate NHS in Good condition	37.9%	35.0%	35.0%
Percentage of pavements of the non-Interstate NHS in Poor condition	3.7%	6.0%	6.0%

Note: the years represent the calendar year in which data was collected. Data is reported through the Highway Performance Monitoring System (HPMS) the following year; e.g., the baseline data of CY 2021 was reported to the HPMS in CY 2022.

It is important to note that these targets are based on FHWA definitions of good and poor, which have been nationally defined to achieve a standard measurement across states. These definitions of good and poor may not be the same as other pavement condition metrics used by the Iowa DOT to evaluate system condition and may not be the best indicator of what a typical traveler considers to be good or poor pavement condition.

Minimum level for condition of Interstate pavements

In addition to establishing performance measures, MAP-21 also set a minimum condition level for Interstate pavements. Per 23 CFR 490.315, states are required to maintain Interstate pavements so that the percentage of the lane-miles of the Interstate System classified as poor condition does not exceed 5.0 percent. FHWA annually determines whether a state exceeds this threshold. If a state's percentage of poor condition Interstate lane-miles exceeds 5.0 percent, in the following year the state will be subject to funding penalties that require a certain amount of National Highway Performance Program (NHPP) and Surface Transportation Block Grant (STBG) funding to be used for eligible projects on the Interstate System. The percentage of Iowa's Interstate lane-miles in poor condition is currently below the 5.0 percent threshold and is forecast to remain below that threshold through the performance period.

Bridges

Iowa has more than 24,000 bridges across state, county, and municipal systems. Iowa DOT is responsible for maintaining 4,195 of these bridges, including bridges on Interstate System, the majority of the NHS, and other state highways. Local governments maintain the remaining bridges. Table 3 shows the number of bridges and deck area of NHS bridges in Iowa, which is the system that targets are being set for.

Table 3: NHS bridges in Iowa

Highway system	Number of bridges	Deck area (ft ²)
NHS – Iowa DOT owned	2,600	34,081,466
NHS – Locally owned	48	984,324
Total NHS	2,648	35,065,790

Bridge owners are required to inspect bridges at least every 24 months. Data from these inspections form the basis for determining condition levels and help owners determine bridge maintenance needs. More information about NHS bridges and how they are managed can be found in Iowa’s TAMP.

Target setting methodology

As part of the National Bridge Inventory (NBI) program, condition is rated for each bridge’s deck, superstructure, and substructure using a scale of zero to nine. Per FHWA’s definitions, a bridge is considered “poor” if one of these three ratings is less than or equal to four. A bridge is considered “good” if all the three ratings are greater than or equal to seven, and otherwise it is considered “fair.” The performance measures are calculated based on the deck area for all bridges carrying the NHS, including highway bridges on ramps connected to the NHS and bridges that cross state borders. Bridges on state borders count toward both states’ totals. The good and poor measures are determined by summing the total deck area of good or poor NHS bridges and dividing by the total deck area of the NHS.

Iowa DOT models bridge deterioration and projects future conditions using a tool called Asset Optimizer, developed by IDS Consulting. The Asset Optimizer predicts future condition of each bridge in the network, estimates the impact of bridge treatment alternatives, and prioritizes treatments subject to a budget constraint. Certain bridges are excluded from the Asset Optimizer analysis, and their needs are handled outside the system. These include locally owned NHS bridges as well as complex structures that are not easily modeled, including selected “big bridges” with unique design characteristics. There are 34 such big bridges, 18 of which are on the NHS. For each of these bridges, Iowa DOT establishes specific maintenance and preservation activities; these bridges are typically maintained in a higher condition due to their importance and expense. These bridges include large river bridges over Iowa’s eastern and western borders, which are managed through coordination with the neighboring states.

To develop targets, the Asset Optimizer was used to model future condition of Iowa DOT-owned bridges, excluding the big bridges mentioned previously. The output for the NHS portion of the future scenario was then combined with the condition of big bridges on the NHS and locally owned

NHS bridges to account for them not being in the forecast. The resulting targets are shown in Figure 3 and on Table 4.

Figure 3: NHS bridge historical condition, prior targets, and proposed targets

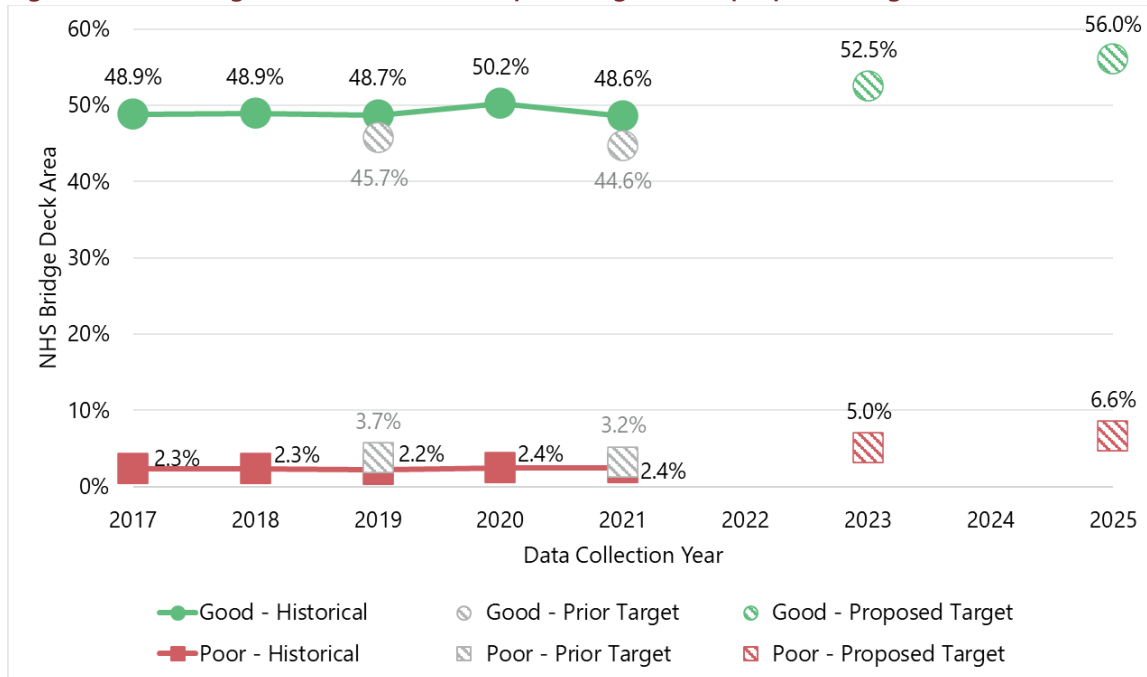


Table 4: Iowa DOT PM2 bridge targets for 2022-2025

Performance measure(s)	Baseline (CY 2021 data)	Proposed 2-year target (CY 2023 data)	Proposed 4-year target (CY 2025 data)
Percentage of NHS bridges classified as in Good condition	48.6%	52.5%	56.0%
Percentage of NHS bridges classified as in Poor condition	2.4%	5.0%	6.6%

Note: the years represent the calendar year in which data was collected. Data is reported through the NBI the following year; e.g., the baseline data for CY 2021 was reported to the NBI in CY 2022.

It is important to note that these targets are based on FHWA definitions of good and poor, which have been nationally defined to achieve a standard measurement across states. These definitions of good and poor may not be the same as other bridge condition metrics the Iowa DOT uses to evaluate system condition and may not be the best indicator of what a typical traveler considers to be good or poor bridge condition.

Minimum level for condition of NHS bridges

In addition to establishing performance measures, MAP-21 also set a minimum condition level for NHS bridges. Per 23 CFR 490.411, states are required to maintain NHS bridges so that the percentage of the deck area of bridges classified as structurally deficient (also referred to as “poor” for the performance measures and targets) does not exceed 10.0 percent. FHWA annually determines whether a state exceeds this threshold. If, for three consecutive years, a state’s percentage of NHS bridge deck area in poor condition exceeds 10.0 percent, in the following year the state will be subject to funding penalties that require a certain amount of NHPP funding to be used for eligible bridge projects on the NHS. The percentage of Iowa’s NHS bridges in poor condition is currently below the 10.0 percent threshold and is forecast to remain below that threshold through the performance period.