U.S. Department of Transportation
Federal Highway Administration

Maintenance Monitoring Program

1. Purpose

DISCLAIMER: Except for the statutes and regulations cited, the contents of this document do not have the force and effect of law and are not meant to bind the States or the public in any way. This document is intended only to provide information regarding existing requirements under the law or agency policies.

The purpose of a Maintenance Monitoring Program is to assist the FHWA Division Offices to establish and maintain a consistent approach to identify, assess, and prioritize the State DOT's Maintenance Program threats and opportunities to improve the Federal-aid Highway Program and meet FHWA's strategic goals and objectives. The Maintenance Monitoring Program provides an oversight framework for executing a risk-based monitoring approach to ensure maintenance of highway systems.

The Maintenance Monitoring Program provides a framework to Division Offices that supplements FHWA's Risk-based Stewardship & Oversight (RBSO) policies and procedures. The Maintenance Monitoring Program outlines FHWA's Maintenance Program oversight methodology and clarifies the oversight role and expectations of Division Offices in assessing the maintenance of Federal-aid Highway Program projects by State Departments of Transportation (DOTs) and other direct recipients[1].

Division Offices may choose to adopt this Program, modify the Program to meet the needs of their State, or maintain their own processes for assessing Maintenance Program risks.

2. Definitions

a. *Core Elements*: the major components that comprise a program.
b. *Program Management*: The application of knowledge, skills, tools, and techniques to meet program requirements. A program is a group of related projects that are managed in a coordinated way to obtain benefits that are not available from managing them individually[2].
c. *Performance Indicator*: Key performance indicators (KPIs) refer to a set of quantifiable measurements used to gauge an organization's overall long-term performance. KPIs specifically help determine an organization's strategic, financial, and operational achievements, especially compared to those of other organizations within the same sector.
d. *Process Review*: A data driven exercise to evaluate an organization's processes and identify a way(s) in which they can be improved and made more effective and efficient. This exercise can provide insights into strengths and weakness, as well as areas for improvements.
e. *State DOT*: The State unit of government serving as the recipient of Title 23 funds.

3. Background

The Maintenance Monitoring Program, as outlined in this document, provides a guide for the framework by which Division Offices can execute a data-driven, performance-based approach to monitoring a State DOT Maintenance Program. Routine process reviews in different areas of maintenance can aid the

[1] 23 U.S.C. 116(b)
[2] Project Management Body of Knowledge, Project Management Institute 2021.

FHWA Division and the State DOT in identifying potential areas of improvement or areas where additional guidance or training might be needed to ensure compliance with 23 U.S.C. 116.

23 U.S.C. 116(b) clarifies that "[i]t shall be the duty of the State transportation department or other direct recipient to maintain, or cause to be maintained, any project constructed under the provisions of this chapter or constructed under the provisions of prior Acts." In 23 U.S.C. 116(d), the potential consequences of the State DOT or other direct recipient not properly maintaining projects are explained: "[i]f at any time the Secretary shall find that any project constructed under the provisions of this chapter, or constructed under the provisions of prior Acts, is not being properly maintained, he shall call such fact to the attention of the State transportation department or other direct recipient. If, within ninety days after receipt of such notice, such project has not been put in proper condition of maintenance, the Secretary shall withhold approval of further projects of all types in the State highway district, municipality, county, other political or administrative subdivision of the State, or the entire State in which such project is located, whichever the Secretary deems most appropriate, until such project shall have been put in proper condition of maintenance."

Division Offices can use the Maintenance Monitoring Program framework to ensure compliance with 23 U.S.C. 116(b) in a method consistent with 23 U.S.C. 116(d).

23 CFR 515.7(a) requires State DOTs to conduct "performance gap analysis to identify deficiencies hindering progress toward improving or preserving the NHS and achieving and sustaining the desired state of good repair" and to at least address targets and gaps for "asset condition of NHS pavements and bridges." Data for pavements and bridges can primarily be obtained through the State DOT's Transportation Asset Management Plan (TAMP). As far as monitoring other transportation assets, in accordance with 23 CFR 515.7(g), "the use of these or other management systems for other assets that the State DOT elects to include in the asset management plan is optional (e.g., Sign Management Systems, etc.)."

4. FHWA's Risk-Based Management Process

This Program is intended to follow and support the FHWA's RBSO policies and procedures, including:

- FHWA Division and State Stewardship and Oversight (S&O) Agreements, which document the extent to which a State assumes the responsibilities of FHWA under Title 23 in accordance with 23 U.S.C. 106(c) to carry out project responsibilities traditionally handled by FHWA, and describe FHWA oversight activities;
- Required project and program actions administered by FHWA, including project-level actions that FHWA determines cannot, or should not, be assumed by States;
- Risk-based project and program involvement, which is a FHWA response to elevated risks or meaningful opportunities to inform and improve programs and meet FHWA objectives; and
- Data-driven compliance assurance checks, through the Compliance Assessment Program, Validation Program, and the Financial Integrity Review and Evaluation Program, are used by FHWA to sample projects and inform program compliance.

Division Offices should refer to and follow these policies and procedures when establishing a Construction Monitoring Program.

The Maintenance Monitoring Program provides a framework for Division Offices to execute a data-driven, performance-based approach to monitor the Maintenance Program. A routine monitoring of the maintenance of Federal-aid highways by State DOTs and direct recipients assures FHWA that they are

meeting their maintenance obligations in accordance with the 23 U.S.C. 116(b). Routine maintenance reviews will aid Division Offices and State DOTs in identifying performance indicators, potential process improvements, and areas where additional guidance or training is needed to improve execution and consistency.

Effective management of the Federal-Aid Maintenance program can involve several additional activities on the part of the program manager. These activities can include but are not limited to:

- Engagement with the appropriate FHWA discipline(s) to maintain technical expertise,
- Attendance at State DOT Asset Management, TAMP, Pavement Management System (PMS), and Maintenance Management System (MMS) or other committees, and
- Review of asset management and maintenance management plans.

A. RISK-BASED PROJECT AND PROGRAM MONITORING

The Division Office should undertake the following activities to support the FHWA risk-based approach to project and program monitoring. It is expected that program monitoring will be for the purpose of determining if the State DOT is maintaining projects constructed with Federal funds.

- **Project Reviews:** A review of a specific project or projects to determine if all elements of the project(s) are being maintained in serviceable condition.
- **Core Element Reviews:** Each program has a limited number of major components or activities. The reviews ensure that the State DOT is following the processes and procedures that were approved by FHWA and deemed to be federally compliant. The reviews answer the questions, are the staff aware of the procedures and are they applying them correctly?
- **Special Emphasis Areas:** May be new innovations the State DOT is trying or contracting methods that are unique and complex. FHWA actions should be focused on helping the State DOT avoid or mitigate risk. Consider such activities as training, peer exchanges or focus process reviews, e.g. a review of guard rail installation procedures, to assist the State DOT with their maintenance efforts.

B. DATA-DRIVEN COMPLIANCE ASSURANCE

The execution of required actions and a risk-based management approach, at both the project and program level, provide an insight into how the program is functioning. It further ensures the program is compliant and is meeting performance expectations.

- **Internal Controls:** Internal controls are rules and procedures established by an organization to ensure business continuity, prevent fraud, and preserve the integrity and accuracy of financial reporting.

- **Program Indicators:** provide an overall health assessment of the program. They answer the question “Is the program moving in the right direction?”

5. Maintenance Program Monitoring Plan

Division Offices should develop a Maintenance Monitoring Plan (MMP) consisting of the activities planned for the current year and a summary of the previous year's actions. A copy of the MMP should be submitted to the Construction Team in the Office of Preconstruction, Construction and Pavement (HICP-20). Attachment A of this document contains an example of a MMP for informational purposes only.

6. Maintenance Program Components

A. Core Element Reviews

Some of the core elements that should comprise a Maintenance Monitoring Program are included in the table below. A suggested schedule for conducting a program review of each component of a core element on a multi-year cycle is suggested alongside the element. Sub-elements are provided as an aid in identifying potential areas for review. There are numerous sources of information within State DOTs, where inventory asset information can be found. Data sources such as Pavement Management Systems (PMS), Maintenance Management Systems (MMS), TAMP, and others are data sources that can be used to assess core element conditions.

Core Element	Sub-Element	Review Cycle	Remarks
Guardrail	End Terminals, Linear Segments, Bridge Approach Rail*, Bridge Pier Protection*	A	*Bridge sub-elements should follow the requirements set forth by the FHWA Office of Bridges
Pavement	Distress and Ride Condition, Pavement Markings, Shoulder Condition, Approaches to bridges	A	
Signs	Retroreflectivity, Bolt condition (rust or tightness), Breakaway support, Visibility (Obstructions blocking)	B	Interstate check of unauthorized signs or logos
Lighting	Light Function (working or not working), Base Condition, Crash Standard, Bolt Condition, Base Protection if any	B	
Traffic Signals	ADA features, Lamps	C	ADA if pedestrian crossing allowed
ITS Equipment	Road Weather Information System (RWIS), Cameras, Dynamic Message Signs (DMS)	C	
Pedestrian & Bike	ADA Ramps, Surface condition, Markings, and signage	C	
Fencing		D	On interstates confirm all access is controlled
Clear Zones		D	Any object inside the clear zone is protected
Culverts	Inlets, Outlets, Slopes, Headwalls	E	Clogged Perched Sloughing
Bridge	Deck, Railings	E	Bridge sub-elements should follow the requirements set forth by the FHWA Office of Bridges (see publication FHWA-HIF-18-022)

B. Maintenance Program Indicators

The use of indicators to track the performance of the program is essential. The indicators should provide insight into the health of the program. Indicators should be "leading" meaning they should indicate the direction of the program. Leading indicators can be difficult to identify, so lagging indicators can be used to reveal the performance. By identifying and tracking key indicators, Divisions can identify trends that may lead to increased program risk. This will allow the Division Offices to focus resources in areas needing additional attention. The table below provides illustrative examples of the program indicators. Divisions may opt for more or different indicators.

Indicator	Source	Submission	Remarks
Miles scheduled for crack seal/chip seal versus miles completed	Pavement Management (Mgt) System	Reported Annually	Verify all miles completed are within lifecycle window
Number and percent of signs not meeting retroreflectivity standards	Sign Management System, Asset Mgt System, Maintenance Mgt System	Reported Annually	Interstate as well as an NHS inventory of signs meeting the criteria vs. not meeting the criteria
Number of lane miles pavement markings not meeting retroreflectivity standards	Responsible Mgt System	Reported Annually	Interstate as well as an NHS inventory of markings meeting the criteria vs. not meeting the criteria
Average time from damaged to repaired for guardrail	Maintenance Mgt System	Reported Quarterly	Reporting by appropriate Maintenance management District would be useful
Average time to place temporary control devices by damaged end terminal	Maintenance Mgt System	Reported Quarterly	By appropriate Maintenance management District would be useful
Average time lighting out of service until repair	Maintenance Mgt System	Reported Annually	Report number of days before replacement
Total hours of traffic signals not operable or average time to return to service	Maintenance Mgt System	Reported Annually	
Bridge Decks sealed or overlayed versus planned	Bridge Mgt System	Reported as determined by State bridge management system guidance	Treatment completed at appropriate time in lifecycle

C. Internal Controls

The purpose of monitoring internal controls is to determine if there are controls in place and that they are adequately coordinated with the appropriate staff to handle the management of services that lead to properly detecting or preventing material errors or purposeful misstatement(s) in financial reports. Although control audits cannot completely detect all fraud, auditors can use this monitoring of internal controls to evaluate operational controls

of gaps, which can significantly reduce risk. This monitoring assists in identifying what situation(s) the organization is in:

- If controls are found to be effective, control risk is low.
- If controls are identified as vulnerable or ineffective, control risk is high. Monitoring may need to perform additional checks or take further actions, as specified by the relevant regulation or compliance standard.

There are several types of internal control checks, each one progressively more comprehensive:

- **Inquiry**—The Monitor(s) should ask managers and employees about the controls they are implementing. This is usually combined with more reliable checking methods—controls objectives or criteria should never rely only on an inquiry.
- **Observation**—The Monitor(s) should observe activities and operations to see how controls are implemented. This is useful in cases where there is no documentation on how to operate the control unit. For example, if there is no formal procedure to ensure silt fence is installed, the Monitor(s) can simply observe if silt fence is in place on the project or that the curing cover is placed on the material for the time required.
- **Examination or inspection**—The Monitor(s) should determine if controls are operational, using existing documentation and logs. For example, a check of controls can involve visiting a project and ensuring that the Buy America certifications match the heat numbers on the steel at the project or the Monitor(s) can examine change orders to ensure they are categorized correctly as Federal eligible or not.
- **Re-performance**—involves the Monitor(s) performing the control to see if it is effective. For example, the Monitor(s) can measure the layer thickness or guardrail height to verify, or manually perform a financial calculation to ensure it is correct.
- **Computer-aided audit tools (CAAT)**—Monitor(s) use technology to analyze large amounts of data automatically. A simple CAAT can be a spreadsheet, but there are specialized tools available that can test various types of internal controls. Most CAAT solutions are focused on export based, point in time sample testing across a complete inventory of all transactions.

When reviewing and approving manuals or procedures that are required to be submitted to FHWA by the State DOT, the Division Offices should ensure that the document(s) contains appropriate internal controls. The list below represents some of the most common types of internal controls:

- Physical control over vulnerable assets
- Establishment and review of performance measures and indicators
- Segregation of duties
- Proper execution of transactions
- Accurate and timely recording of transactions
- Appropriate documentation of transactions (Basis of Decision)

D. Special Emphasis Areas

Divisions should be aware of any new process or materials being utilized by the State DOT for maintenance that could pose a risk, threat or opportunity, where FHWA's expertise might be beneficial for mitigating the risk. Providing training for State DOT staff, before attempting construction, or conducting a peer review so State DOT staff can learn from others are risk mitigation strategies that can be considered.

Awareness of any Office of Inspector General (OIG), Government Accountability Office (GAO), State government, or other audit finding(s) could also trigger the need for an in-depth review of the materials or processes flagged.

7. Conclusion

Division Offices should submit the reviews conducted as part of the Maintenance Monitoring Program to the Program Review Library. This can help other Division Offices as they take steps to mature their Maintenance Monitoring Programs. In addition, Division Offices should consider sending their MMPs to the Construction Program Office (HICP-20) to help gather data to support nationwide risks and drive national activities.

Attachment A

Annual Maintenance Program Monitoring Plan

Example

Data presented has been fabricated for illustrative purposes

DIVISION: Best Division PERFORMANCE YEAR: 2022

PREVIOUS YEAR ACTIVITIES AND FINDINGS

For PY 2021 a Core Element Review was conducted on the condition of guardrail end terminals. Five NHS projects completed between 2008 and 2011 were selected for review. The five projects consisted of three interstate and two non-interstate projects. The five projects contained a total of 16 end terminals of differing types. The State maintains a guardrail inventory with a specific field for end terminals. Of the 16 end terminals, 13 were in working condition, 2 had been damaged but were scheduled for repair and had temporary barricades (barrels) marking the area and one was damaged and had yet to be flagged for repair or have additional traffic control devices place to alert drivers.

IMPROVEMENT AREAS

The establishment of a specific time-period for the placement of temporary barricades around damaged terminals.

1. Establish a target time frame for the maintenance forces to get temporary barricades up when a terminal is not serviceable.
2. Track crash standard each terminal has been tested for, so they may be updated if required when a project is scheduled on that segment.

End Terminal Condition	Number of Terminals	Number of Days to place temp devices
Serviceable	13	
Non-Functional w/temporary devices	2	Location #1 = 3 days Location #2 = 6 days
Non-Functional w/ no temporary devices	1	Location #3 = 22 days as of MM/DD/YYY

The Division also completed a Process Review on the Retroreflextivity monitoring performed by the State as required by the MUTCD current edition. The State works on a 5-year cycle to measure the retroreflextivity of signs on the State system. The readings for each sign are maintained in the sign inventory used as part of the larger asset management system.

The system flags signs with readings below the standard. Management then checks to determine if there is a project(s) in the STIP that will be replacing the signs. If there is no project(s) in the STIP for the roadway segment in question, then the maintenance district responsible is notified of the need for the sign to be replaced.

The Division Office has determined that the system fully complies with the MUTCD requirements and is functioning well to ensure that all signs are visible and properly erected.

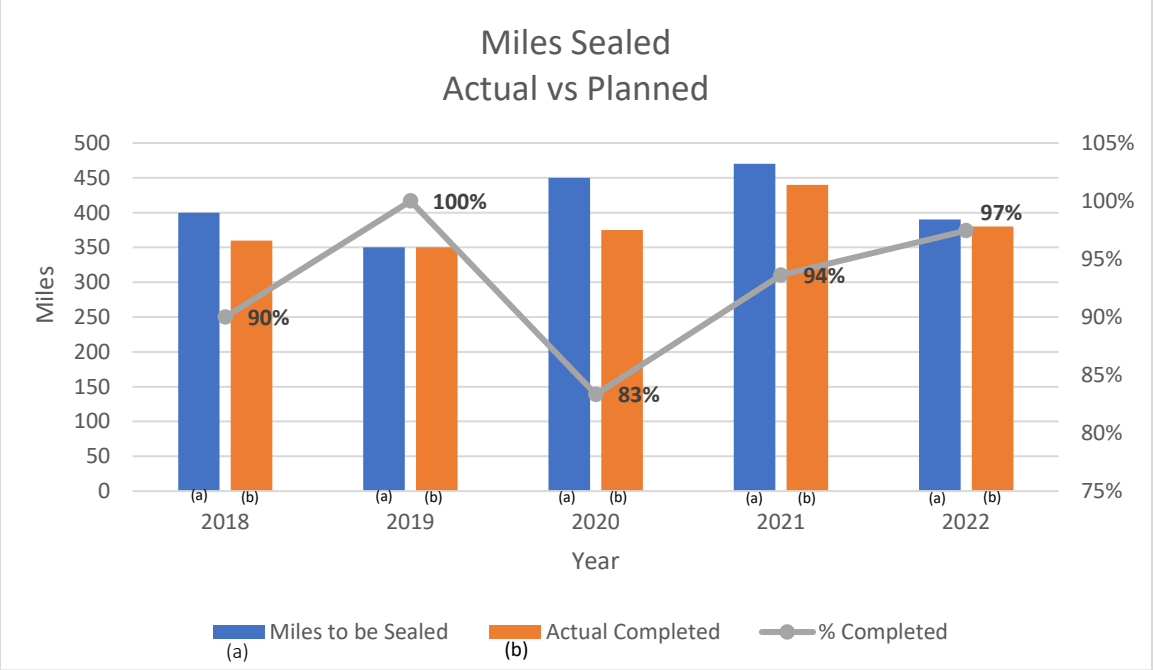
MONITORING ACTIVITIES FOR PERFORMANCE YEAR 2018-2022

The Core Element to be reviewed in the coming year will be Pavement Crack Sealing (and other areas as needed for ADA compliance). The review would focus on if the segments selected for crack sealing are within the lifecycle phase identified by the pavement management system or the maintenance management system and for projects between 2018-2022.

The Division will also review the maintenance of ADA ramps for a sample of projects completed in the 1999 to 2012 time frame.

Maintenance Program Indicators

Miles scheduled for crack seal/chip seal versus miles completed:



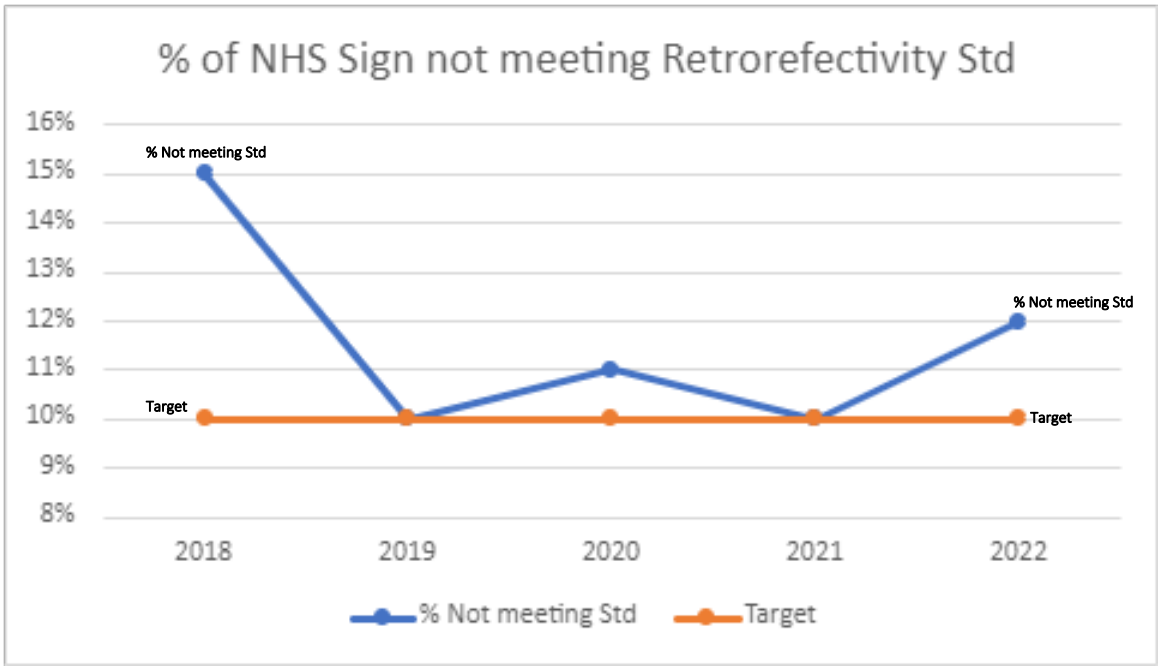
Over the past five years the State has sealed 90% or more of the miles identified in their State network for crack sealing. In 2020 the State did not achieve a rate above 90% because one of the

regional contractors went out of business. Because the contractor defaulted on the contract in the middle of the season the State did not have time to reassign the work.

NOTE: The State should provide information on how they are rectifying the issue.

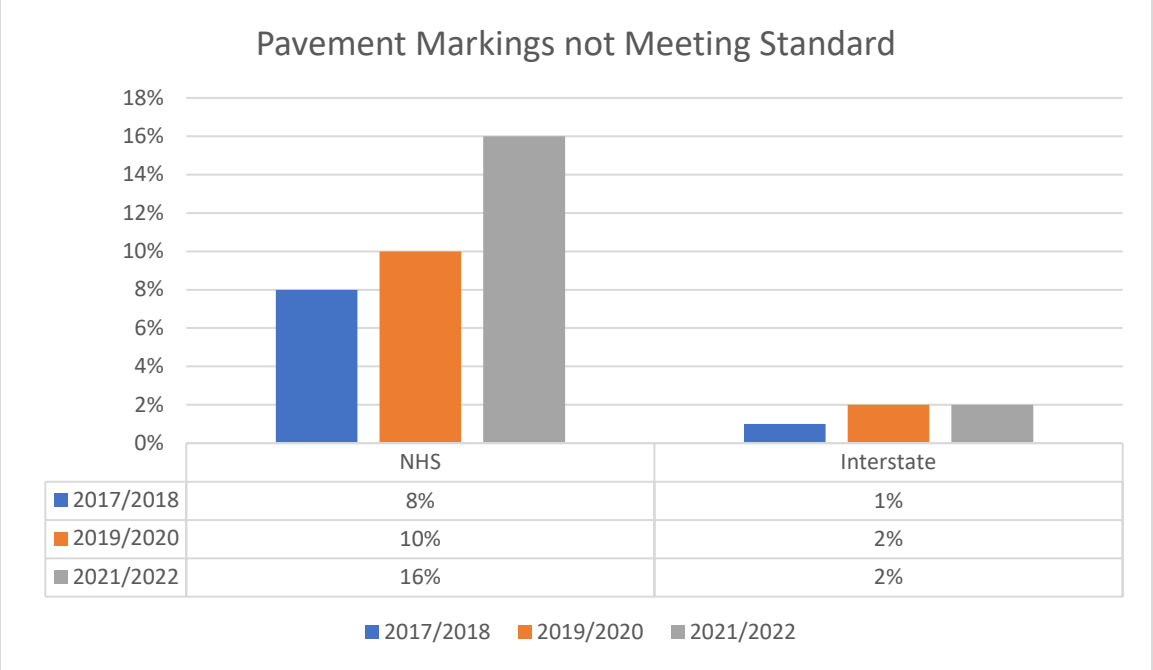
Number/% of signs not meeting retroreflectivity standard:

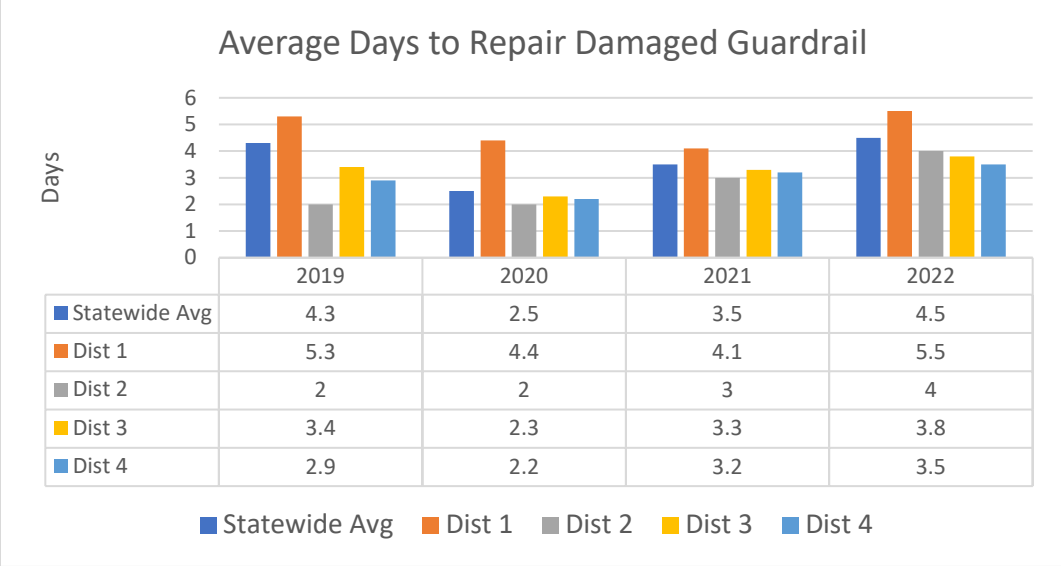
The State samples 20% of the NHS each year which means the system is completed on a 5-year cycle. Looking at the previous 5-year cycle (2018 to 2022), the State currently has 12% of signs on the NHS that don't meet retroreflectivity standards. Of the 12% of signs not meeting the standard, 8% of the signs are in locations that have a project programmed in the current STIP and will be corrected through the project. The remaining 4% of signs are to be addressed by District Maintenance forces.



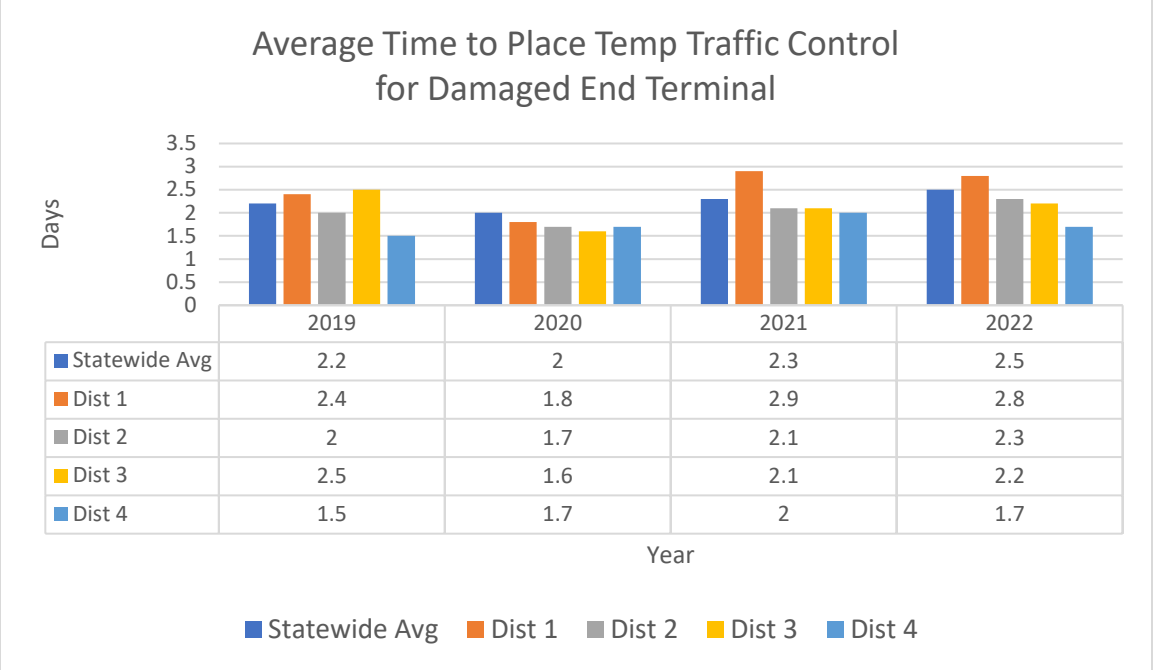
Miles or % of pavement markings not meeting Retroreflectivity standard

The State collects pavement inventory data every two years. When the State collects this data, it samples 50% of the NHS data each year. Looking at the previous 2-year cycle, 2021 to 2022, the State currently has 16% of the pavement markings (centerlines only) on the NHS that don't meet retroreflectivity standards. Note that only 2% of the Interstate markings failed to meet the standard. The State is currently seeking to contract out pavement marking on the interstate which will free up State maintenance forces to address the remainder of the NHS system.





Over the past four years the State has repaired damaged guardrail on average between 2.5 and 4.5 days. District 1 tends to take longer to repair damaged guardrail, but they are primarily urban and have more traffic. The repair times meet or exceed the State target of 5 business days to repair damaged rail.

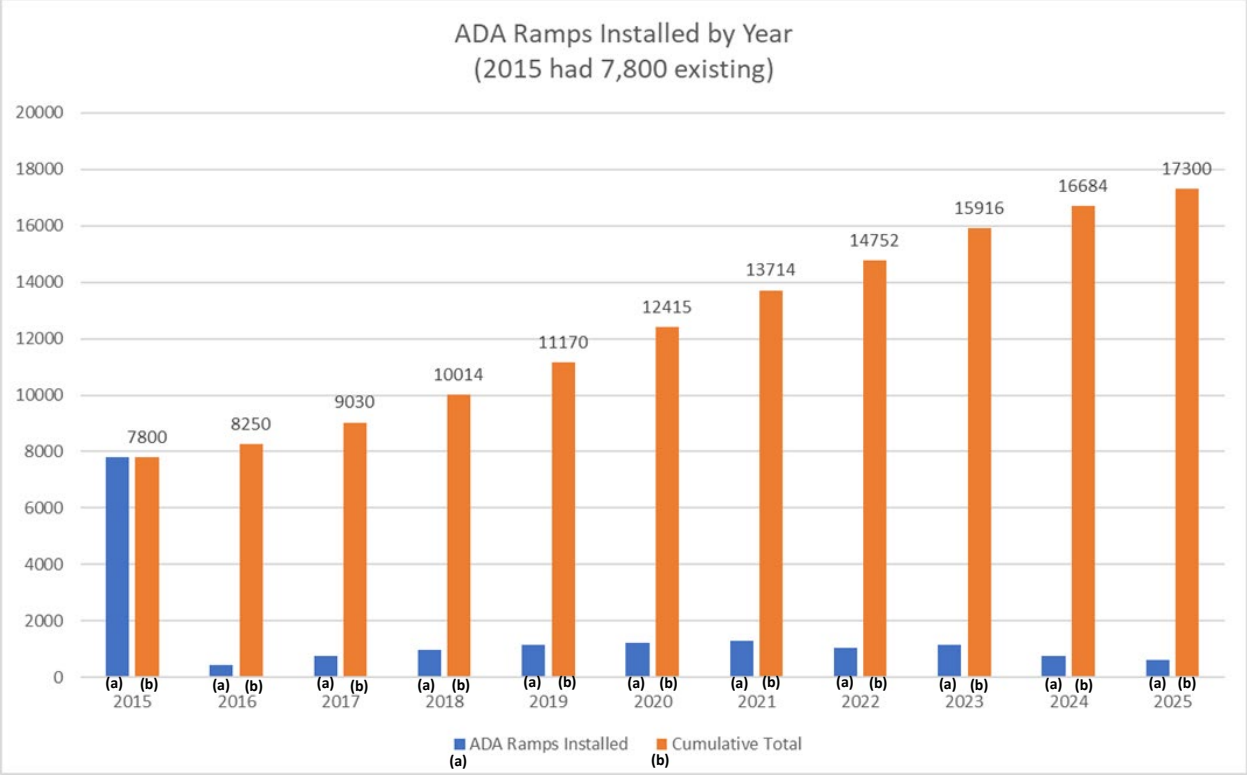


	2019	2020	2021	2022
Statewide Avg	2.2	2	2.3	2.5
Dist 1	2.4	1.8	2.9	2.8
Dist 2	2	1.7	2.1	2.3
Dist 3	2.5	1.6	2.1	2.2
Dist 4	1.5	1.7	2	1.7

The State has set a performance target of two days to get temporary traffic control devices placed in front of damaged end terminals. While they have only achieved this goal once in the past four years, they continue to be close to their goals and the annual reporting makes it a priority for Districts.

ADA Ramps installed versus transition plan

The State's ADA transition plan as accepted by FHWA in 2015 showed the State had 17,300 pedestrian crossings. Of which 7,800 had ramps meeting ADA standards. This left 9,500 locations to be upgraded. The transition plan assumed a 20-year period for completion of all upgrades. While the State has undertaken some standalone ADA upgrade projects, most of the improvements are being made as part of other larger projects. Based upon the data provided by the State, it appears the State will complete all upgrades required by the transition plan by or before the 20-year projected completion date.


ADA Ramps Installed by Year
(2015 had 7,800 existing)
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
0
7800
8250
9030
10014
11170
12415
13714
14752
15916
16684
17300
(a) (b)
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
ADA Ramps Installed (a)
Cumulative Total (b)