



ASSET MANAGEMENT INVESTMENT FOLIO

# Roadside Infrastructure Condition

**Roadside Infrastructure Condition** is one of the ten investment categories in MnSHIP. MnSHIP is a fiscally constrained plan, meaning that it must balance the needs and risks of this category against those of the other investment categories. Each investment category has its own folio describing the trade-offs of different investment levels. Please see page 4 for a list of additional folios.

## What is Roadside Infrastructure Condition?

Roadside Infrastructure Condition represents an array of assets found on Minnesota’s state highway system that support the safe, informed, comfortable, and efficient movement of people and goods throughout the state.

### Roadside Infrastructure Condition elements include:

- Drainage and culverts;
- Guardrails, including attenuators, cable-median barriers, fencing;
- Traffic Signals, lighting, Intelligent Transportation Systems (ITS);
- Overhead and other structures, such as noise walls, retaining walls and concrete barriers;
- Rest areas (43 Class I, 24 Class II and 13 Class III rest areas);
- Signage, including traffic and directional signs; and
- Pavement markings.

Roadside Infrastructure investment typically involves the repair, rehabilitation or replacement of previously existing elements. Traveler Safety projects may address similar elements (i.e. cable median barrier, rural intersection lighting, pavement markings) however such Traveler Safety investment is typically intended to expand the roadside infrastructure system.

*A variety of elements comprise Roadside Infrastructure elements - all contribute to a functioning highway network.*



cable barriers deflect vehicles if they swerve past shoulders. Culverts and drainage systems prevent flooding on the roadways during heavy rains and settle out pollutants that could damage rivers, creeks, and wetlands. Lighting, signs and signals help drivers find their way safely while rest areas provide travelers convenient spots to take a break.

## How does Roadside Infrastructure Condition support the Minnesota GO Vision + Statewide Multimodal Transportation Plan?

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

- Strategically fix the system;
- Integrate safety; and
- Ensure accessibility to key resources and amenities throughout communities.

Building upon these principles, investment in Roadside Infrastructure Condition strengthens multiple strategies identified in the Statewide Multimodal Transportation Plan (SMTP), notably:

- Ensure that safety, operations, and maintenance needs are considered and addressed in transportation planning and programming;
- Implement strategic and sustainable engineering solutions to improve traveler safety;
- Work with transportation partners to implement a transparent and collaborative approach to corridor investment along the state highway system; and
- Work together to improve accessibility and safety for everyone traveling on, along, and across roads.

## How does MnDOT typically invest in Roadside Infrastructure Condition?

MnDOT often repairs, replaces, or rehabilitates Roadside Infrastructure Condition features as a part of a larger pavement or intersection safety improvement. Examples of this include installation of cable median barriers as part of a safety improvement project or the striping of roadways as a part of a

paving project. On a typical pavement project, approximately 12% is spent on Roadside Infrastructure elements.

Sometimes, MnDOT carries out corridor-wide 'stand-alone' projects in a single Roadside Infrastructure element such as culverts, signs, or lights, as it is determined to be the most

cost-effective approach to needed improvements. Roadside Infrastructure features damaged from weather or crashes are usually repaired as part of routine annual maintenance funded through the operations and maintenance budget.

### Tips for Using This Table

#### Performance Levels

- **Performance Level 0 (or PL 0)** represents a strategy in which Roadside Infrastructure would receive less than current funding. PL 0 corresponds to the most extreme risk level MnDOT would potentially consider.
- Costs and benefits increase while risks decrease from left to right.
- MnDOT's current spending in Roadside Infrastructure Condition corresponds to **PL 1**.
- PL 3 is the amount it would cost to mitigate most identified risks and fund most of the identified needs.
- PLs for Roadside Infrastructure Condition are independent of other performance categories.
- All PLs assume current funding for Pavement Condition (PL 1).

#### Investment Level

- The **pie charts** represent the distribution of MnSHIP's total planned investment (\$14.3 billion) at each PL.
- **Minimum Category Investment** is the amount required to invest at PL 0 in every other category and PL 1 (current) for Pavement Condition.
- **Discretionary Category Investment** is the remaining revenue available for additional investment beyond the Minimum Category Investment for all categories in MnSHIP.

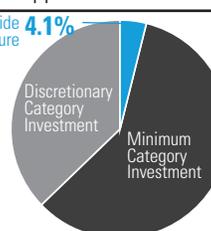
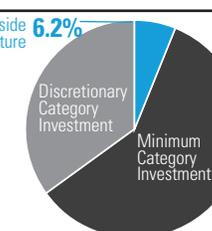
#### Performance Measures

- MnDOT has established measures for signs + rest areas, based on inventories of condition assets.
- MnDOT is developing a measure for signals, lighting, ITS maintenance, pavement markings and drainage condition.

## PERFORMANCE LEVEL OPTIONS

# Roadside Infrastructure Condition

**Overarching Goal:** To manage the assets associated with non-pavement and non-bridge infrastructure systems that are critical to the safe movement of people and freight along state highways.

	<b>Performance Level 0</b> <i>Lowest cost, greatest risk</i>	<b>Performance Level 1</b> <i>Lower cost, higher risk</i>
<b>Investment Approach</b> <i>See Scenario Planning Folio</i>	PL does not correspond with an Investment Approach	<b>Approach B (Approximate)</b> <b>Approach C</b>
<b>Investment Level</b> <i>Total</i> <i>Years 5-10 (2017-2022)</i> <i>Years 11-20 (2023-2032)</i>	Roadside Infrastructure <b>4.1%</b> Total \$582 M \$33 M/yr \$39 M/yr 	Roadside Infrastructure <b>6.2%</b> Total \$892 M \$48 M/yr \$61 M/yr 
<b>Investment Description</b>	<ul style="list-style-type: none"> <li>• Rely upon Pavement investment to fund much of the Roadside Infrastructure work</li> <li>• Minimal stand-alone work initiated to maintain standards</li> </ul>	<ul style="list-style-type: none"> <li>• Maintain current funding</li> <li>• Focus on Principal Arterials (reduced investment on non-Principal Arterials)</li> <li>• Rely upon Pavement investment as well as stand-alone work</li> </ul>
<b>Outcomes</b> <i>To what extent will MnDOT meet system and performance targets for this category?</i>	<ul style="list-style-type: none"> <li>- Repairs + replacement made reactively to issues</li> <li>- Rapidly growing # of unaddressed poor/very poor condition (# 4 + 3) culverts</li> <li>- Growing # of illegible signs</li> <li>- Increase in poor-quality pavement markings</li> <li>- Over half of rest areas closed</li> <li>- Increasing # of damaged guardrail, attenuators, + fence locations</li> </ul> <p><b>- Decline in standards</b> <b>= Current standards</b> <b>+ Improved standards</b></p>	<ul style="list-style-type: none"> <li>= Growing # of unaddressed very poor condition (#4) culverts</li> <li>= Non-PAs less reliable/deteriorating</li> <li>- Interstate highway rest areas maintained to ADA standards, approximately 15-20 other rest areas close (30-45% of Class I rest areas)</li> <li>= Some signs + pavement markings below retroreflectivity standards</li> <li>= Guardrail, attenuator, + fence standards unable to be upgraded; systems repaired as needed</li> </ul>
<b>Risks</b> <b>H = High Risk</b> <b>M = Medium Risk</b> <b>L = Low Risk</b>	<ul style="list-style-type: none"> <li>(M) Replace/repair burden shifts from capital to maintenance budget</li> <li>(H) Compromised facilities --&gt; decreased system reliability</li> <li>(M) Reactive, less cost-effective investment</li> <li>(H) Non-compliance with safety + accessibility standards</li> </ul> <p>MR * RR</p>	<ul style="list-style-type: none"> <li>(M) Replace/repair burden shifts from capital to maintenance budget</li> <li>(M) Compromised facilities --&gt; decreased system reliability</li> <li>(M) Reactive, less cost-effective investment</li> <li>(M) Non-compliance with safety + accessibility standards</li> </ul> <p>MR * RR</p>
<b>Risk Management Strategies</b> <i>What strategies would MnDOT use to manage risk?</i>	<ul style="list-style-type: none"> <li>• Rely on maintenance budget to keep system in good repair</li> <li>• Respond to non-functional or very poor condition elements only</li> </ul>	<ul style="list-style-type: none"> <li>• Repair + replace infrastructure on strategic and reactive basis</li> <li>• Prioritize work on high volume roads</li> <li>• Replace assets with greatest exposure to traveling public</li> </ul>

## How should we invest in Roadside Infrastructure Condition?

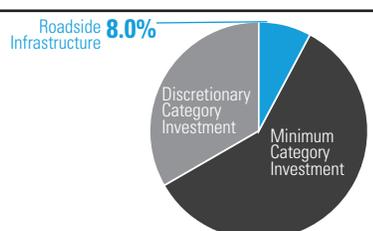
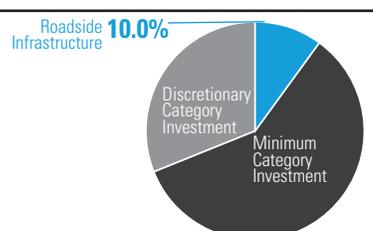
In consideration of the state's fiscal constraints, MnDOT has established four possible alternatives, called Performance Levels (PLs), to guide investment in Roadside Infrastructure Condition between 2017 and 2032. Performance Levels 0 through

3 represent a range of options to help guide stakeholders and decision-makers in balancing the state's Roadside Infrastructure Condition needs with those of other investment categories. The table on pages 2 and 3 illustrates the portion of the sixteen-year investment that would be dedicated to Roadside Infrastructure Condition, the outcomes, and the managed and accepted risks at

### PERFORMANCE LEVEL OPTIONS

## Roadside Infrastructure Condition

**Performance Objectives:** Install, maintain, replace and upgrade critical infrastructure elements such as drainage/culverts, traffic signals, lighting, Intelligent Transportation Systems (ITS), signage, guardrail, pavement markings, overhead structures and safety rest areas to achieve a safe, accessible, and reliable roadway system.

	<b>Performance Level 2</b> <i>Greater cost, lower risk</i>	<b>Performance Level 3</b> <i>Greatest cost, lowest risk</i>
<b>Investment Approach</b> <i>See Scenario Planning Folio</i>	<b>Approach A</b>	PL does not correspond with an Investment Approach
<b>Investment Level</b>  <i>Total</i> <i>Years 5-10 (2017-2022)</i> <i>Years 11-20 (2023-2032)</i>	\$1.14 B \$60 M/yr \$79 M/yr  	\$1.44 B \$74 M/yr \$100 M/yr  
<b>Investment Description</b>	<ul style="list-style-type: none"> <li>Continue improvements through Pavement investments</li> <li>Increase stand-alone investment by investing at 110% of current level</li> </ul>	<ul style="list-style-type: none"> <li>Continue improvements through Pavement investments</li> <li>Allocate a sizable amount of funding to strategic stand-alone Roadside Infrastructure investments</li> </ul>
<b>Outcomes</b> <i>To what extent will MnDOT meet system and performance targets for this category?</i>  <b>- Decline in standards</b> <b>= Current standards</b> <b>+ Improved standards</b>	<ul style="list-style-type: none"> <li>= Amount of unaddressed very poor condition (#4) culverts/yr remains steady or slowly declines</li> <li>= Most rest areas remain open and maintained to current ADA standards</li> <li>+ System upgrades are applied strategically and approach alignment with life cycle costs</li> <li>+ Retroreflectivity standards of signs + pavement markings are met on most highways</li> <li>+ As part of repair procedures, new standards are implemented for guardrail, attenuator, + fence systems that have become damaged</li> </ul>	<ul style="list-style-type: none"> <li>+ Majority of very poor condition (#4) culverts addressed each year</li> <li>+ Roadside Infrastructure assets replaced with optimal lifecycle fixes</li> <li>+ All rest areas remain open and maintained to current ADA standards</li> <li>+ Retroreflectivity standards on signs + pavement markings are met on all highways</li> <li>+ Guardrail attenuator, + fence systems are replaced within their life cycle</li> </ul>
<b>Risks</b> <b>H = High Risk</b> <b>M = Medium Risk</b> <b>L = Low Risk</b>  <b>MR = Managed Risk</b> <b>RR = Remaining Risk</b>	<ul style="list-style-type: none"> <li>(L) Replace/repair burden shifts from capital to maintenance budget</li> <li>(M) Compromised facilities --&gt; decreased system reliability</li> <li>(L) Reactive, less cost-effective investment</li> <li>(L) Non-compliance with safety + accessibility standards</li> </ul> <div style="text-align: center;"> <span style="background-color: #90EE90; padding: 2px;">MR</span> * <span style="background-color: #FF6347; padding: 2px;">RR</span> </div>	<ul style="list-style-type: none"> <li>(L) Replace/repair burden shifts from capital to maintenance budget</li> <li>(L) Compromised facilities --&gt; decreased system reliability</li> <li>(L) Reactive, less cost-effective investment</li> <li>(L) Non-compliance with safety + accessibility standards</li> </ul> <div style="text-align: center;"> <span style="background-color: #90EE90; padding: 2px;">MR</span> * <span style="background-color: #FF6347; padding: 2px;">RR</span> </div>
<b>Risk Management Strategies</b> <i>What strategies would MnDOT use to manage risk?</i>	<ul style="list-style-type: none"> <li>Repair failed infrastructure as needed</li> <li>Replace infrastructure that is functional but damaged/outdated</li> <li>Invest in preventive repairs to avoid future higher replacement costs</li> <li>Repair rest areas with ADA and other code deficiencies</li> </ul>	<ul style="list-style-type: none"> <li>Investments made through optimal life-cycle inventory analysis</li> <li>Invest in long-term replacements when appropriate</li> <li>Swift response to damaged or non-functional elements</li> </ul>

each PL. At each PL, it is projected that Roadside Infrastructure Condition preservation will be achieved through a combination of reactive projects specific to incidents or needs, investment through pavement projects, and stand-alone projects.

### Where are we headed?

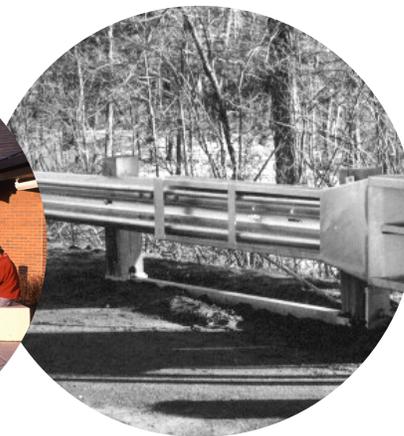
MnDOT is projected to spend an average of \$56 million annually on Roadside Infrastructure Condition for the next 20 years based on our current investment levels. At this rate, 30-45% of the MnDOT's Class I rest areas (large, with many amenities, open 24 hours/day) are projected to close, the number of unaddressed very poor condition (#4) culverts will increase, some signs and pavement markings will fall below retroreflectivity standards, and guardrail, attenuator, and fence standards will be repaired as needed, but are unable to be upgraded to new system standards.

### What are the risks to be addressed with the Roadside Infrastructure Condition investment?

Generally, the more MnDOT invests in Roadside Infrastructure Condition, the more we are able to reduce these key risks for automobile users, transit users, passengers, freight, and other system users:

- Increased safety concerns due to degraded visibility or lack of appropriate signage, pavement markings, and lighting;
- Lower capital investment levels shift repair, replacement and rehabilitation responsibilities to operations and maintenance budget;
- Closing or declining conditions of rest areas along the state highway system increases the potential for driver fatigue;

*Rest areas provide services and amenities for travelers on the state highway system.*



*Guardrails protect vehicles from road departures at hazardous locations.*

- Liability concerns due to non-compliance with safety and ADA-standards; and
- Reduced proactive strategic investment leads to reactive, inefficient future project investments.

### How are we optimizing resources?

The size and condition of some of the assets in Roadside Infrastructure Condition are not comprehensively tracked, it can be difficult to make strategic investment decisions on all elements of the system. However, MnDOT aims to preserve the amount of Roadside Infrastructure Condition in good condition and manage risks using the following strategies:

- **Low-cost maintenance and repairs** - seek to find and invest in the lowest cost approach to meeting the most critical (highest risk) performance issues related to the asset - for example, replace or repair guard rails along sharp curves; and
- **Coordinate investments with other projects** - repair or replace roadside assets as part of larger projects where economies of scale reduces unit costs. For example, replace edgeline pavement markings and rumble strips as part of pavement improvements.

Achieving Roadside Infrastructure Condition improvements concurrently with Pavement Condition or Traveler Safety projects can often reduce mobilization costs and duration of system disruption, and optimize investment funds. This

strategy may involve coordination to coincide with a project or replacing infrastructure that has not yet reached the end of its lifecycle.

### Look for these additional folios!

#### Overview + Background

- What is MnSHIP?

#### Investment Category Folios

- Pavement Condition
- Bridge Condition
- Traveler Safety
- Twin Cities Mobility
- Interregional Corridor Mobility
- Bicycle Infrastructure
- Accessible Pedestrian Infrastructure
- Regional + Community Improvement Priorities
- Project Support

#### Scenario Planning

- MnSHIP Investment Approaches

### For more information contact:

Ryan Wilson, P.E., AICP  
 Project Manager, 20-Year State Highway Investment Plan  
 Office of Capital Programs & Performance Measures  
 Minnesota Department of Transportation  
 395 John Ireland Boulevard, MS 440  
 St. Paul, MN 55155-1899  
 651.366.3537  
 ryan.wilson@state.mn.us

