# 2025 Transportation Asset Management Peer Exchange

# Communicating Asset Management Information and Outcomes

**August 25, 2025**
**Hilton Chicago, 720 S Michigan Ave, Chicago, IL**

AASHTO

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# 1 Overview

This report summarizes the proceedings of the 2025 Transportation Asset Management Peer Exchange hosted by the American Association of State Highway and Transportation Officials (AASHTO). The peer exchange was held at Hilton Chicago in Chicago, Illinois on August 25, 2025.

All of the videos created for this peer exchange and referenced in this report can be found using this link: https://www.youtube.com/playlist?list=PL3SleghBC1AVqhHt7aypo1zssMjoklOAG.

## 1.1 Peer Exchange Purpose

The 2025 American Association of State Highway and Transportation Officials Transportation Asset Management (TAM) Peer Exchange explored how effective communication and visualization of asset information can strengthen TAM programs in transportation agencies. As transportation agencies face increasing pressures, from system resiliency needs, safety goals and efficiency mandates to limited funding and performance requirements, the need to clearly convey asset-related information to both internal and external stakeholders has never been greater. Good TAM practice requires telling a compelling story with data to justify decisions and build alignment across the organization.

This year's peer exchange focused on sharing innovative practices, tools, and communication strategies that improve transparency, support informed choices, and promote trust. Sessions featured presentations from practitioners, followed by interactive discussions to exchange experiences and lessons learned. Topics included elements of good visualization, approaches to communicating asset inventory data as well as risk, and explaining investment decisions. A small-group exercise session was also held to encourage attendees to apply these data visualization strategies to real visuals used in existing state Transportation Asset Management Plans (TAMPs). Key objectives for the peer exchange included:

- Sharing lessons learned across transportation agencies to advance the state of TAM practice
- Identifying key elements of effective communication of TAM information
- Exploring tools, strategies, and visualization techniques that improve transparency and objectivity
- Envisioning the future of TAM-informed communications for better decision-making
- Providing insights and recommendations for upcoming TAM initiatives

The event concluded with a collaborative dialogue on how to bring all these elements together—highlighting needs for further research, new tools, and organizational strategies to support the TAM community nationwide.

## 1.2 Peer Exchange Summary

The one-day peer exchange consisted of a short introduction, four topic sessions, a small group exercise, and a concluding group-wide discussion. Sixteen volunteers from various state departments of transportation shared data visualization practices from their agencies, through five-to-ten-minute

video presentations that were prepared before the event. The conference was led by Michael "Mike" Johnson, the AASHTO Subcommittee on Asset Management Chair and California Department of Transportation (Caltrans) State Asset Management Engineer with support from Hyun-A Park of Spy Pond Partners, LLC.

To begin the event, Mike Johnson (Caltrans) welcomed participants and acknowledged the support of AASHTO, FHWA, and the AASHTO Committee on Performance-Based Management Technical Service Program (TSP) for the peer exchange. Following this, Tashia Clemons, Senior Transportation Specialist at FHWA, welcomed participants to the peer exchange and highlighted the organization's important challenges: being more transparent and building trust despite a recent reduction in staff. Next, Hyun-A Park (SPP) welcomed the participating agencies introduce themselves.

In "Session A. Elements of Good Visualizations and Communication," the central topic of data visualization was introduced with a video that highlighted good and bad data visualization practices, provided historical context on the concepts, and shared examples of how to effectively convey narratives visually through data. The video included statisticians and respected data scientists who have helped bring data visualization to the forefront of the professional world and developed the key principles that leverage how people process visual information, regardless of the industry or topic. Mike Johnson (Caltrans) then shared how connected these data visualization principles are to the transportation industry and TAMP practice. This presentation included examples of data visualization practices from TAM documentation, including state TAMPs. The session concluded with highlights from a video from the Colorado Department of Transportation Asset Management Program Director, Toby Manthey. The video, "Visualization in CDOT's Asset Management Program," highlighted key communication techniques used by the agency to effectively communicate TAM information.

The following session, "Session B. Communicating Asset Inventory and Condition Information," was organized using videos that participating states had prepared. The kicked off with a video highlighting state DOT data visualization practice focused on visualizing asset inventory and condition data. This video included highlights from:

- Mike Johnson of Caltrans
- Regina Colson and Rolando Valdes of Florida DOT
- Michael Cremin of Minnesota DOT
- Nicholas Alexander of New Hampshire DOT
- Amy Code of Ohio DOT
- Gehan Elsayed of West Virginia DOT

Following the video, a facilitated group discussion was held where the state practitioners featured in the video responded to questions and shared further insights about how their data visualization practices are being improved to better communicate asset inventory and condition data.

For the next session, "Session C. Communicating Asset Risks," the format was repeated with a video which featured highlights of practice from:

- Alicia Howard, Jamie Kavelak, and Deirdre Wallace of Delaware DOT

- Brad Sharlow of Michigan DOT

Following the presentation, a facilitated a group-wide discussion was held where highlights of the challenges of visually communicating information around risks, despite growing concerns in the industry around weather events, hazards, and asset deterioration.

In the final topic session titled "Session D. Explaining Investment Decisions." A video was shared featuring highlights from data visualization presentations from:

- Michael Weakley of Ohio DOT
- Alma Mujkanovic of Georgia DOT
- Walter Moy of Nebraska DOT
- Shaker Rabban of Minnesota DOT

A facilitated group discussion was held where attendees shared further insights into the challenges and strategies relating to conveying investment decisions through visual data storytelling.

Next, in "Session E. Good Communications Exercise", an interactive exercise was conducted. This small group exercise was intended to help participants put communication strategies into practice. Each group was given a series of data visuals from existing TAM documents. Group members were then asked to improve the existing visuals with messages, visuals, and talking points for different audiences and then share their approaches for communicating this information better with all peer exchange participants. The session concluded with a group wide discussion highlighting the key themes and insights revealed through the exercise.

Finally, "Session F. What Did We Learn?" included a summary of the lessons learned from the peer exchange by Mike Johnson (Caltrans). He also encouraged attendees to supplement this summary with additional insights and reflection gained through the small group exercise. He then shared the next steps for continuing the development of data visualization in TAM practices. This included discussion of a data visualization guide currently in development, and the need to improve data visualization practices relating to communicating risks and investment decisions through AASHTO and Transportation Research Board (TRB) committees. Hyun-A Park (SPP) concluded the peer exchange by thanking Mike Johnson (Caltrans) for his work on the event and acknowledging AASHTO for sponsoring it.

Figure 1-1. Peer Exchange Kickoff

## 1.3 Peer Exchange Agenda

**8:30 – 9:30 AM | Introductions**

- AASHTO Welcome: Mike Johnson (Caltrans, AASHTO Subcommittee on Asset Management Chair)
- FHWA: Tashia Clemons
- Participant Introductions: Sharing expectations for the day

**9:00 – 10:00 AM | Session A. Elements of Good Visualizations & Communications**

This session will highlight what makes visual communication effective in transportation asset management. Through videos and real-world examples, participants will learn how design principles and storytelling with data can improve clarity, engagement, and decision-making.

- Mike Johnson, Caltrans
- Toby Manthey & William Johnson, Colorado DOT

**10:00 – 10:45 AM | Session B. Communicating Asset Inventory & Condition Information**

In this session, state DOTs will showcase dashboards, websites, and reports that make asset inventory and condition data accessible and meaningful. Participants will see how these tools enhance transparency, support decision-making, and connect with diverse audiences.

- Caltrans – Mike Johnson
- Florida DOT – Regina Colson & Rolando Valdes
- Minnesota DOT – Michael Cremin
- New Hampshire DOT – Nicholas Alexander
- Ohio DOT – Amy Code
- West Virginia DOT – Gehan Elsayed

**10:45 – 11:15 AM | Break**

**11:15 AM – 12:00 PM | Session C. Communicating Asset Risks**

Transportation agencies face growing risks from weather events, hazards, and asset deterioration. This session will demonstrate how agencies are visualizing and explaining these risks to build understanding, prioritize resources, and inform planning across stakeholders.

- Delaware DOT – Alicia Howard, Jamie Kavelak, & Deirdre Wallace
- Michigan DOT – Brad Sharlow

**12:00 – 1:00 PM | Lunch**

**1:00 – 2:00 PM | Session D. Explaining Investment Decisions**

Making tough choices about limited resources is central to TAM. This session will showcase strategies and visuals that communicate trade-offs in investment decisions, helping agencies convey impacts clearly to leadership, policymakers, and the public.

- Ohio DOT – Michael Weakley
- Georgia DOT – Alma Mujkanovic
- Nebraska DOT – Walter Moy
- Minnesota DOT – Shaker Rabban

**2:00 – 3:30 PM | Session E. Good Communications Exercise (Small Groups)**

This interactive exercise will allow participants to put communication strategies into practice. Working in small groups, attendees will craft messages, visuals, and talking points for different audiences, then present their approaches for group discussion and feedback.

- Small group work and 5-minute presentations

**3:30 – 4:00 PM | Session F. What Did We Learn?**

Participant reflections and key takeaways.

**4:00 – 4:30 PM | Wrap Up & Next Steps**

Discussion of future TAM communication initiatives and summary of the exchange.

## 1.4 Peer Exchange Attendees

The following is a list of peer exchange attendees.

### Table 1-1. State DOT Participants (by organization)

| Count | Attendee Name | Agency Name | Email Address |
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| 13 | Maureen Kelley | Delaware Department of Transportation | maureen.kelley@delaware.gov |
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# 2 Peer Exchange Introduction

## 2.1 Welcome, Opening Remarks, & Introductions

Mike Johnson, the AASHTO Subcommittee on Asset Management Chair and Caltrans State Asset Management Engineer, kicked off the meeting by welcoming the participants and acknowledging the support of AASHTO, FHWA, and the AASHTO Committee on Performance-Based Management TSP for supporting the peer exchange. He emphasized the need for a new state DOT to replace Iowa DOT as the leader of the pooled fund that supports TAM conferences.

Next, Tashia Clemons, the Senior Transportation Specialist at FHWA, welcomed the participants to the peer exchange. She shared that FHWA had lost much of its workforce through recent retirements and highlighted that the biggest challenge for the organization is to accomplish more with fewer staff members. Tashia Clemons also stated FHWA's top priorities are being more transparent while building trust. She concluded her announcement by emphasizing that despite reductions in staff, FHWA is still engaged with TAM and is committed to continuing to move the industry forward.

Participants of the peer exchange were invited to introduce themselves. Mike Johnson (Caltrans) introduced Omar Smadi, the Director of the Center for Transportation Research and Education at Iowa State University, who helped organize the peer Exchange. He also acknowledged Matt Haubrich of HDR, who supported the meeting and previously led the AASHTO TAM Subcommittee while working at Iowa DOT.

# 3 Session A. Elements of Good Visualizations & Communications

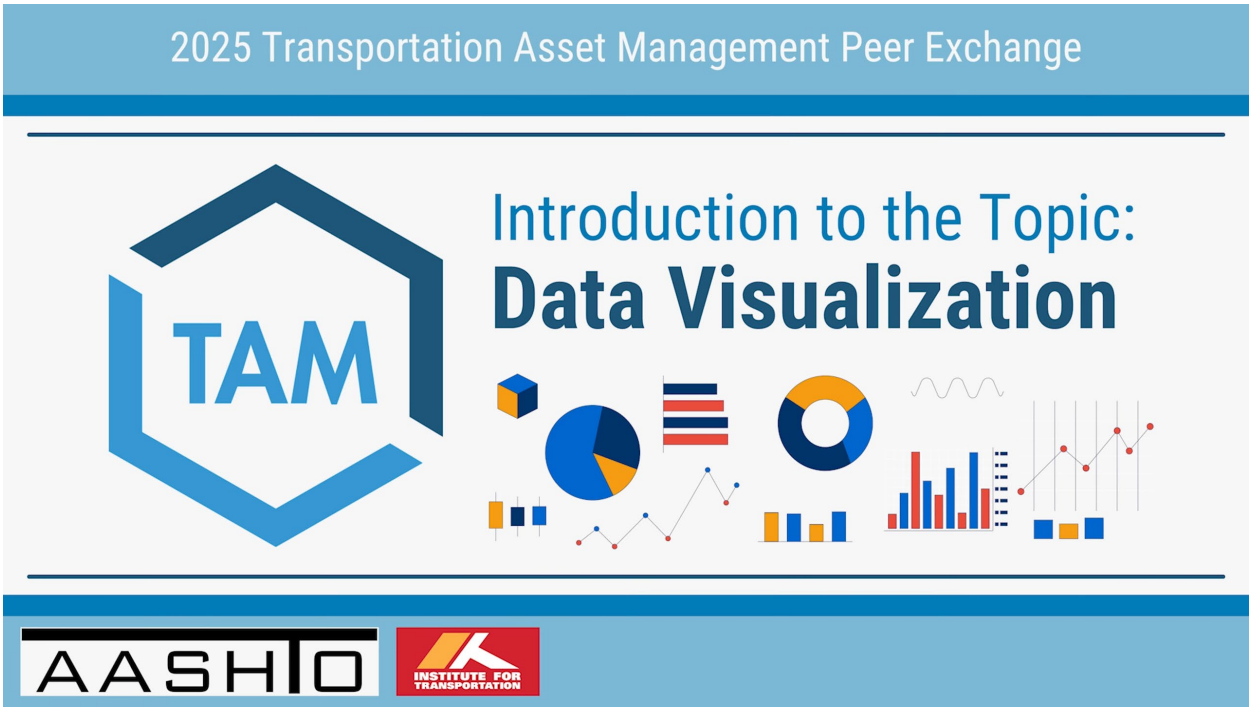
The first session of the peer exchange began with a video titled "Introduction to Data Visualization | 2025 TAM Peer Exchange" (https://youtu.be/H3sY6HHd044?list=PL3SleghBC1AVqhHt7aypo1zssMjoklOAG) introduced data visualization as a concept to the audience at a high level, not limited to the transportation industry. The video was comprised of clips, including anecdotes about the history of data visualization from influential authors in space, and summaries of good data visualization practices. Table 3-1 summarizes the video clips used in the compilation with accompanying descriptions of the content shown in the introductory video.

Table 3-1. Data Visualization Introduction Video Contents

| Title | Source | Data Visualization Insights |
|---|---|---|
| *The Art of Data Visualization* | Produced by PBSoffbook: https://youtu.be/AdSZJzb-aX8 | **Philosophical Foundations and History:** This section discusses the fundamental principles of data visualization, emphasizing that every visual element should directly convey content and that style should not overshadow truth. It traces the history of visualization from ancient cartography to modern science, highlighting that data |

| Title | Source | Data Visualization Insights |
|---|---|---|
| | | visualization is a linear decision-making process guided by the designer's intent, the reader's context, and the data's inherent truth. |
| *The Value of Data Visualization: The Power of Visual Storytelling* | Produced by Column Five: https://youtu.be/xekEXM0Vonc | **Pre-attentive Attributes and Rapid Comprehension:** This segment demonstrates how the human brain rapidly processes "pre-attentive attributes" such as color, size, and orientation within milliseconds. Designers can leverage these natural pattern recognition abilities to communicate complex information quickly and effectively, whether for data, processes, hierarchy, or chronology. |
| *Using Design Techniques for Clear and Appealing Data Visualization* | Produced by nullQueries: https://youtu.be/0Smgm2UTUSo | **Practical Design Concepts for Professional Visuals:** This part delves into actionable design concepts to create professional and attention-grabbing data visuals, including using balance (like alignment and contrast), providing ample white space, maintaining consistency in color patterns and chart types, and optimizing text usage. It also stresses selecting the right visual type, such as bar charts over pie charts, for clearer information processing. |
| *Data Visualization Crash Course: Consulting Best Practices* | Produced by Analyst Academy: https://youtu.be/ZUeWXNK-9yA | **Clarity of Message and Decluttering:** The final section emphasizes that effective data visualization is crucial for a message's impact, outlining two key best practices. These are ensuring the message is undeniably clear through elements like explicit titles and highlighting, and removing any clutter from the chart so the audience can focus solely on the pertinent data. |

Figure 3-1. Screenshot from the Data Visualization Topic Introduction Video




Next, Mike Johnson (Caltrans) shared a presentation intended to explore the concepts shared in the video and connect these design principles to the transportation industry. A copy of the presentation materials are attached in Appendix A. Mike began the presentation with six key takeaways from the introduction video that are most relevant to TAM data visualization practices:

- Data visualization is all about story telling
- Emphasize the message you are trying to communicate
- Create a narrative from the data
- Use visual cues effectively
- Present information clearly
- Select the proper graphic formats

## 3.1 Data Visualization is All About Storytelling

Mike continued the presentation by clarifying that data visualization is not about graphs and charts, it's about communicating a narrative. He defined a good visual as one that can connect data to decisions, making priorities, tradeoffs, and risks clear from a glance. The presentation continued with several themes for how to effectively tell a story through data visualizations.

### Tailor Your Message to the Audience

He stated that the first step of this process is tailoring the message behind the visualization to the audience viewing it. He demonstrated the importance of this step by showing two answers to the question: Why does the sky appear to be blue?

- Mike tailored the first answer to an educated adult audience. He stated that the blue color is a result of Rayleigh scattering. He elaborated that sunlight contains all colors of visible light, but as it passes through Earth's atmosphere, molecules and tiny particles scatter shorter wavelengths which humans perceive as blue and violet. Longer wavelengths, perceived as red and orange, are not as affected by the particles. Mike concluded the explanation by stating that while the violet light waves are scattered even more than the blue, human eyes are more sensitive to the blue color, hence the characteristic color of a daytime sky.
- To contrast to the adult-tailored response, he then shared an answer intended for a young child. This explanation simplified the scientific explanation to "the sky looks blue because the air takes sunlight and spreads out the blue part of it."
- Finally, Mike shared a visual answer to the question which showed a cartoon-styled rainbow light ray hitting Earth's atmosphere with the red, yellow, and orange portions continuing to the planet's surface, while the blue and violet colors were shown to scatter through the sky.

Mike juxtaposed the three responses, while also emphasizing that all three are effective for different audience groups. He concluded the example by asking participants to account for the background of their data visualization viewers. He asked them to consider if their intended audiences are technical or executive, internal to the agency or external, and highlighted the importance of intentionally choosing the right level of detail to effectively convey a message.

He then shared a series of visualizations from a collection of documents in the transportation industry. For each visual, he asked attendees to reflect on what message was being conveyed, who the target audience was, and if the visual was clear or overly cluttered. A summary of the visuals displayed, and subsequent group discussion is shown in Table 3-2.

### Table 3-2. Example Visuals from the Transportation Industry

| Visualization Description | Group Analysis Comments |
|---|---|
| Illustrated infographic showing the relationship between pavement condition and the types of pavement maintenance treatments. It is intended for the public to instruct them on when to report asset needs. It communicates that the longer you wait to report, the more disruption and cost the fix will be. | Participants felt this visual was intended for only external audiences. |
| Sankey diagram of funding flows from an anonymized DOT. The diagram is intended to tell the story of where revenue comes from (left side), where it is used (right side), and the middle section reveals how the money is budgeted. | Attendees offered that the core message could be that funding is complicated due to the different colors of money included.<br>• Mike Johnson (Caltrans) suggested this is an appropriate graphic for a Transportation Asset Management Plan (TAMP) or external audience. |
| Time-distance diagram where the vertical axis represents time (from the start to the end of the project) and the horizontal axis represents | The group thought that the complex and information-dense style indicated the visual was for a technical construction team. In this context, they stated it was |

| Visualization Description | Group Analysis Comments |
|---|---|
| distance along the highway alignment. Project activities—such as clearing, paving, or earthmoving—are plotted as sloped lines or shapes that reflect both their location and duration. | effective because it visually connects when and where work occurs, the rate of progress, and it highlights any conflicts, overlaps, or gaps in scheduling. |
| Bar and line chart infographic shows three different investment scenarios and the impact they will have on asset conditions. Investment levels are shown as columns and pavement conditions are shown in lines. | Participants correctly assumed the diagram was intended to convey condition data for three investment scenarios. However, they viewed the infographic as overly complicated, with unnecessary visual distractions such as green circles denoting values on the pavement condition lines. |
| Diagram summarizing the asset management strategy for a municipality. The visual relates decision-making to the considerations and balancing needed across the services the city provides and the considerations of risk, needs, and priorities. | Attendees viewed the graphic as overly complicated, deeming it a poor decision to put a small logo at the bottom of the funnel where it is obscured.<br>• One participant noted that it appears that decisions are least important as they're the smallest.<br>• Another participant speculated that it appears that decisions are the bottleneck in the process. |

### Emphasize the Message You Are Trying to Communicate

Mike then moved to the second lesson for creating effective data visualizations: highlighting only what matters most for communicating the intended narrative. He emphasized that clarity comes from a focus on the relevant information, not overwhelming the viewer with as much detail as possible. When crafted simply, visuals can be powerful tools that enable decision makers to cut through the noise and distractions created by information overload.

For this lesson, he started by sharing an unedited chart from an asset condition report that included data for bridges as well as bike and pedestrian system assets. He asked the group to analyze the messages conveyed by the visual, before showing several iterations of the same graphic that reduced the level of data shown. For each version, he asked attendees to reflect on how the varying levels of detail affected the core message. A summary of the versions shown and group comments are shown in Table 3-3.

### Table 3-3. Levels of Data in an Asset Condition Report

| Information Included | Messages Communicated to Participants |
|---|---|
| **Original Version Includes:**<br>• Asset Class/Asset, Inventory Status, Replacement Value, Current Value, Data Confidence, Condition (% good, fair, poor) | • One attendee noted the core message was about replacement value due to there being two columns displaying this information.<br>• Another audience member suggested sorting the information by data confidence as a more logical layout.<br>• Mike Johnson (Caltrans) suggested this visualization attempts to communicate too many messages at once. |

| Information Included | Messages Communicated to Participants |
|---|---|
| **Version 2 Includes:**<br>• Asset Class/Asset, Inventory Status, Replacement Value, Condition (% good, fair, poor) | Participants determined this version was worse for communicating data confidence, but better if the core message is about showing asset quantity. |
| **Version 3 Includes:**<br>• Asset Class/Asset, Condition (% good, fair, poor) | Attendees stated this simplified version of the graphic would only be effective for communicating asset condition. |

Figure 3-2. Mike Johnson Presenting


## Create a Narrative from the Data

The third lesson in Mike Johnson's presentation focused on the importance of using data to build a narrative through visualizations. To demonstrate the significance of this step, he shared a collection of charts and graphs and asked participants to comment on the message being communicated through the data. Key themes from these examples are summarized below:

- When too little data is provided or insufficiently labeled, visualizations can communicate unintended messages to the audience.
- When a visualization includes too much data in one element, the core message gets lost in the noise. The main takeaway becomes a subjective decision made by the viewer, rather than the author.
- Unnecessary data analysis can distract from the intended message. For example, a bell curve on a graph can pull a viewer's eye away from the more important information.

- When background data is included for context in a visual, if it is presented too prominently, it can compete for the viewer's attention with the data conveying the core message.

### Use Visual Cues Effectively & Select the Proper Graphic Formats

Next, Mike highlighted the importance of design elements and visual cues when communicating data. He highlighted how the smallest details like color and shape can help a viewer find what to look at, what to compare, and what parts of a visualization are prioritized. He also emphasized the importance of selecting the best graphic tool to present the data in. While a range of charts or graphs may work with a data set, the chosen format can change the messaging communicated to an audience. Key takeaways from the examples shown and subsequent discussions are summarized below:

- Clarity and focus matter. Visuals that simplified information through sparklines, fewer data labels, and clearer scales were preferred over more complex or cluttered versions.
- Color use is critical. Too many colors were seen as confusing, while effective use of contrasting colors helped communicate differences.
- Context helps. Diagrams that showed how a piece fit into the larger process, or maps with mileposts, added transparency and improved communication.
- Format choices influence comprehension. Pie charts were flagged as less effective because participants struggled to interpret quantities; line and bar formats were suggested as stronger alternatives.
- Audience preferences vary. For some graphics comparisons shown by Mike Johnson, participants had different favorites. This confirmed the importance of tailoring visuals depending on the audience.
- Application to different uses. Dashboards were highlighted as especially useful for executive summaries, while graphics comparing NHS vs. non-NHS assets were more effective in communicating specific messages.

### Concluding Summary & Future Developments

Mike Johnson began the final portion of the presentation by showing examples of data visualizations he made using Julius AI (https://julius.ai/), a generative artificial intelligence (AI) tool specializing in representing data visually. He emphasized how many of the design principles covered by his presentation were used by the software to produce strong visuals. Mike suggested that these tools will continue to improve and, given their speed and ease of use. He also recommended attendees explore these software solutions to help improve their own TAM data visualizations.

Finally, Mike summarized four of the key approaches for creating effective data visualizations. These included:

- Audiences react to the design or aesthetic of a visualization as much as they do the content.
- One should always emphasize the core message they are trying to communicate to the audience.

- When possible, present the minimum amount of information necessary to understand the message of the visual.
- Don't forget the importance of good techniques for color, contrast, fonts, and graphic formats.

For the final presentation in this session, a video created by Toby Manthey from the Colorado Department of Transportation (CDOT), describes how data visualization is integrated into their TAM program for internal stakeholders. It includes an illustration of 12 asset classes describing the program's scope, simplified budget allocation graphics that highlight the proportional spend on major assets, and performance curves demonstrating the impact of different investment levels on network conditions. The 2022 TAMP extensively uses infographics, photos, Sankey diagrams to link funding programs to national performance measures, and step-by-step visuals for project selection processes. Key data visualization topics highlighted are the critical importance of simplification to effectively convey core messages, the need to adjust visualization complexity for different audiences, and the challenge of visually communicating budget impacts and program interconnections. CDOT is also exploring the future potential of AI for generating complex and efficient illustrations for their TAMP. The link to this video is: https://www.youtube.com/watch?v=Hef6BuzhSzQ&list=PL3SleghBC1AVqhHt7aypo1zssMjoklOAG&index=7

# 4. Session B. Communicating Asset Inventory and Condition Information

## 4.1 Video Presentation Introducing Session B

The second session of the peer exchange began with a compilation /(https://youtu.be/Mq0Gb9-bYXI) of data visualization presentations recorded by state DOTs. Six presentations were selected for this session for their insights on how agencies communicate asset inventory and condition through data visualizations. Table 4-1 below lists the participating agencies in the video, the presenters who helped create them, and a quick summary of their content.

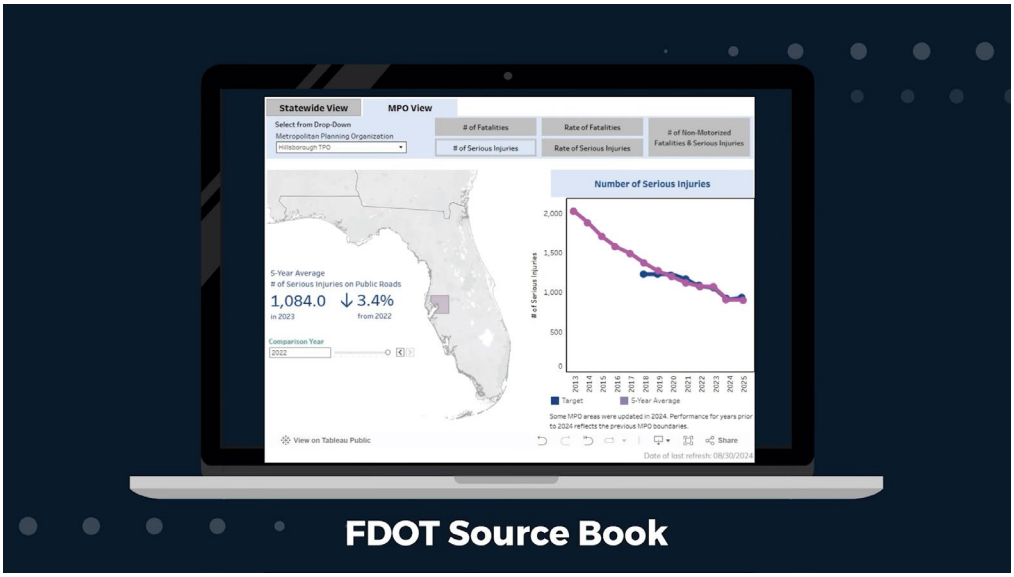
Table 4-1. Agency Presentations Shown in Session B Introduction Video

| Agency | Presenter(s) | Summary of Content Shared |
|---|---|---|
| Caltrans | Mike Johnson | Caltrans presented a public-facing dashboard that defines projects in data form, promoting transparency. This dashboard enables users to search for projects using a map or keywords, view project descriptions, status, and contact information. It also allows users to download resulting project lists into Excel spreadsheets, promoting communication and acceptance of their asset management. https://www.youtube.com/watch?v=Bkyt3bFRjLM&list=PL3SleghBC1AVqhHt7aypo1zssMjoklOAG&index=6 |

| Agency | Presenter(s) | Summary of Content Shared |
|---|---|---|
| Minnesota DOT | Michael Cremin | MnDOT showcased GeoRilla, which visualizes results from their Mobile LiDAR project and roadside barriers using GIS symbology. This system labels specific asset IDs and ties them to the TAMS database for additional data, such as work orders and condition data. MnDOT also developed a dashboard to show costs of work orders on signs and uses an ArcGIS online landing page, continuously updating the overall inventory project by project using conflated data from LiDAR. https://www.youtube.com/watch?v=Y9k6iAePDJE&list=PL3SleghBC1AVqhHt7aypo1zssMjoklOAG&index=12 |
| New Hampshire DOT | Nicholas Alexander | New Hampshire DOT has implemented an AssetWorks enterprise solution for asset management, where repair work orders are created and managed, and field maintenance forces conduct weekly and monthly inspections of fuel sites using an iPad app. Data from these work orders, inspections, and fuel systems are organized into master data sets for a Tableau dashboard, which spatially shows fuel sites, work order information, and monitors key performance indicators like fuel consumption for winter operations. Another dashboard tracks visual monthly inspection data, and users can subscribe to receive data and visualizations via email. https://www.youtube.com/watch?v=WwYKoJd-1_0&list=PL3SleghBC1AVqhHt7aypo1zssMjoklOAG&index=14 |
| Ohio DOT | Amy Code | ODOT highlighted web maps as a key data visualization tool, using GIS to manage data, store attributes, and provide visual references for asset condition and location at multiple scales. Their TIMSS app facilitates robust data collection on major assets like bridges, culverts, and pavement, providing extensive inventory and condition information to internal and external users. They also use a specialized work plan tool that filters this information to display deficient assets and already programmed projects, allowing asset managers to isolate necessary details and identify assets not yet addressed. https://www.youtube.com/watch?v=KJEMYGm502o&list=PL3SleghBC1AVqhHt7aypo1zssMjoklOAG&index=15 |
| West Virginia DOT | Gehan Elsayed | WVDOT presented a bridge management tool that provides comprehensive information for each bridge, sorted by district, including details like bar number, deck area, status, Average Daily Traffic, and a summary of bridge condition from MBIS data. The tool offers links to inspection reports and explanations of proposed treatments from the Bridge Management System (BMS), with districts having the opportunity to vet and choose alternative treatments. It also features reporting capabilities for management, providing an overview for each district in a simple report format. https://www.youtube.com/watch?v=9xg4BhMm4Rc&list=PL3SleghBC1AVqhHt7aypo1zssMjoklOAG&index=18 |
| Florida DOT | Regina Colson & Rolando Valdes | FDOT showcased their agency Sourcebook, an interactive dashboard within their Performance Data Integration space, which serves as a central hub for curated information to support data-driven transportation planning decisions. The Sourcebook provides key performance metrics reflecting Florida's transportation system health and efficiency, organized into four categories: Mobility, Infrastructure, Safety, and Federal Performance measures. It offers statewide, multimodal data visualized through dynamic dashboards and static PDF reports tailored to each Metropolitan Planning Organization, serving as the primary platform for delivering consistent, accessible, and efficient data to partners for target setting and enhancing informed decision-making. |

| Agency | Presenter(s) | Summary of Content Shared |
|---|---|---|
| | | https://www.youtube.com/watch?v=XvBaiSKOohM&list=PL3SleghBC1AVqhHt7aypo1zssMjoklOAG&index=9 |

Figure 4-1. Screenshot from the Session B Introduction Video




## 4.2 Session B. Facilitated Discussion with Agency Presenters

Following the compilation video, a facilitated questions and answers session was held with the agency presenters. The questions centered on exploring the data visualization practices being used to communicate asset inventory and condition.

**Question 1: What are you the most proud of or believed to be most notable from your presentation?**

- Michael Cremin (MnDOT) stated that providing access to data through links and publicly accessible apps were a big step forward.
- Nick Alexander (NHDOT) responded with narrowing visuals down to what is actionable and most important.
- Rolando Valdes (FDOT) explained that making data accessible to metropolitan planning organizations (MPOs), and the ability to tailor resources for different counties.
- Amy Code (ODOT) highlighted that the last map shown in the video demonstrates some of the concepts discussed in Session A of the peer exchange, such as thinking through what data elements are shown to improve clarity.
- Gehan Elsayed (WVDOT) responded with the vetting tool demonstrated in the video that's used for internal review. A challenge for WVDOT has been staff turnover. The tool helps communicate results on a single platform to internal decision-makers.
- Mike Johnson (Caltrans) mentioned two systems: The Asset Management Tool and SHOPP Dashboard. It took seven or eight years to develop these. Before these tools were

available Caltrans characterized projects based on anchor assets. They encouraged including multiple assets on a project but did not have an approach for showing this. Once the tools were developed it helped demonstrate where the money was going, and the different assets being worked on. The SHOPP Dashboard has helped improve public transparency in Caltrans' program. It has been well received in the state.

**Question 2: What will your agency do in the future to improve data visualization?**

- Gehan Elsayed (WVDOT) stated that increasing tool capabilities and improving visuals was a priority.
- Amy Code (ODOT) highlighted interest in extending the development of refined maps to other areas, such as safety, and noted that she was also interested in creating additional dashboards.
- Rolando Valdes (FDOT) explained that incorporating forecasted average daily traffic (ADT) into predictions of asset needs, along with segment-level bridge visualizations, would be valuable.
- Nick Alexander (NHDOT) emphasized that much of the work to develop effective visualizations involved improving the underlying data. He noted that much of NHDOT's effort had been focused on this area and particularly liked breaking out stacked bar diagrams when the portions were small (e.g., small portions of poor conditions).
- Michael Cremin (MnDOT) responded with the idea of establishing a clear home base or portal with key messages, which could be useful for both program delivery staff and the public.
- Mike Johnson (Caltrans) mentioned that he saw many inspirational examples from other state TAMPs that he would like to adapt for Caltrans.

**Question 3: What level of effort might be required to implement what your agency has already completed?**

- Mike Johnson (Caltrans) stated that about sixty people across headquarters, programs, and districts worked on TAM in some capacity. He emphasized the importance of ensuring that efforts to improve visualizations, data, or data quality clearly supported funding decisions.
- Nick Alexander (NHDOT) explained that one developer created all the dashboards shown for the agency, requiring extensive meetings with data owners and target audiences, along with trial-and-error to test different approaches. He noted that every dashboard was essentially a journey.
- Rolando Valdes (FDOT) described the significant effort required to improve the data sources supporting the tool demonstrated and noted the challenge of staying relevant as technology and data sources evolved.
- Amy Code (ODOT) emphasized the need to communicate with asset owners when developing tools, echoing Nick's point, and highlighted the importance of promoting their use.
- Gehan Elsayed (WVDOT) noted that two people were required to develop the tool demonstrated.

**Question 4: What level of involvement did each presenter have with their executive leadership in developing visualization tools?**

- Gehan Elsayed (WVDOT) emphasized the importance of securing initial buy-in from executives. Amy Code (ODOT) agreed with this point.
- Nick Alexander (NHDOT) noted that executive interest depended on the tool. Executives were very engaged with some dashboards but less so with others, and he added that wording could be sensitive in certain cases.
- Michael Cremin (MnDOT) explained that with input from Trisha Stefanski, Asset Management Project Manager at MnDOT, it was clarified that early buy-in was particularly important for some tools, as it was critical not to blindside executive leadership.
- Mike Johnson (Caltrans) stated that he sat on the Executive Board and met with the group regularly. He noted that executives generally liked dashboards, and many were being developed. However, he cautioned that many dashboards were based on static data and stressed the importance of knowing the data's origins and management. He also acknowledged pressures that sometimes arose to mask transparency or avoid publishing unfavorable data but emphasized maintaining transparency and keeping dashboards public-facing.

**Question 5: When agencies developed these visualization tools first internally and when was it necessary to engage professionals for help?**

- Mike Johnson (Caltrans) stated that much of the work was homegrown given the effort required to contract with consultants.
- Nick Alexander (NHDOT) explained that some public-facing dashboards had been developed by consultants, while most internal dashboards were developed in-house.
- Rolando Valdes (FDOT) noted that consultants had been used to help develop dashboards and to encourage the use of plain language.
- Amy Code (ODOT) stated that consultants were used for statewide communications, while at the district level most work was internal, and the audience was primarily in-house.
- Gehan Elsayed (WVDOT) explained that consultants handled some statewide plans, while other efforts were performed internally.

**Question 6: What is the time frame required to develop dashboards?**

- Mike Johnson (Caltrans) stated that Caltrans had about twenty dashboards, many of which were for internal use only. He noted that it typically took about a week to develop a dashboard.
- Rolando Valdes (FDOT) explained that while developing a dashboard did not take long, scheduling time with people to review it often caused delays.
- Other presenters noted that the time required to develop a new dashboard varied depending on factors such as the data source, review process, and other considerations.

# 5. Session C. Communicating Asset Risks

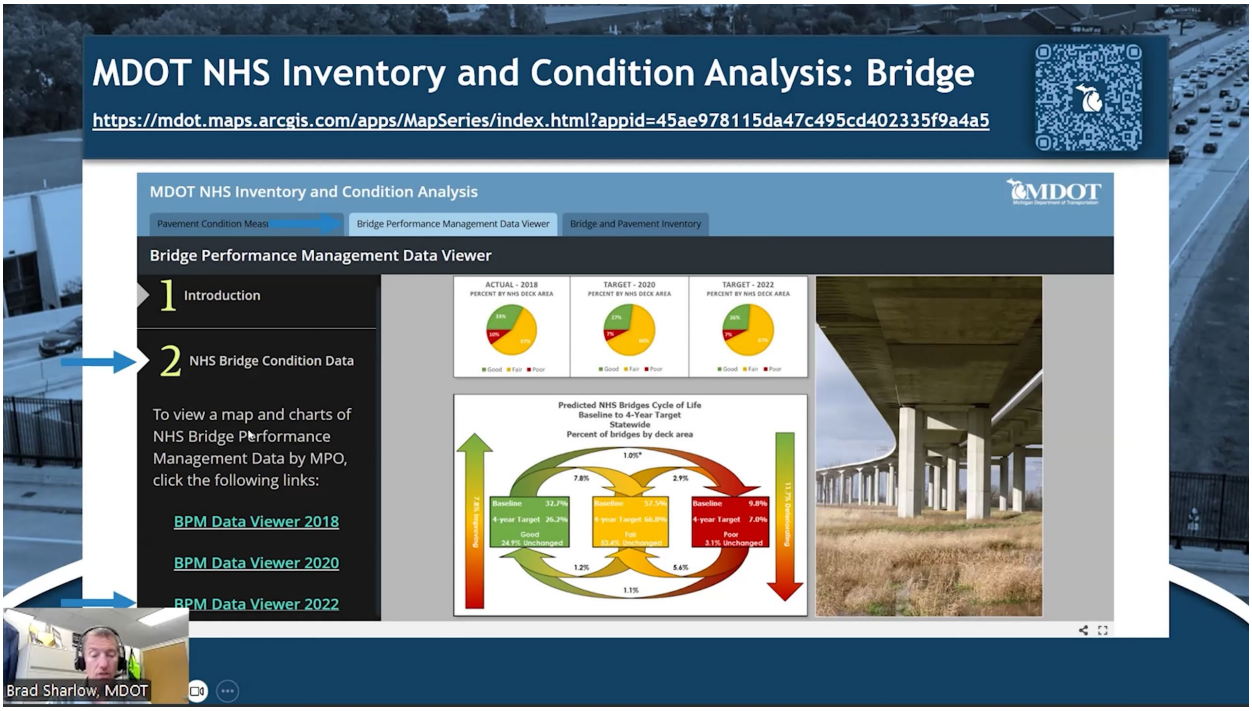
## 5.1 Video Presentation Introducing Session C

The third session of the peer exchange began with another compilation (https://youtu.be/kOwHOhMeRgU) of data visualization presentations recorded by TAM workers at state DOTs. Clips from two data visualization presentations were included for their discussion on how agencies communicate asset risks through data visualizations. Table 5-1 lists the participating agencies in the video, the presenters who helped create the presentations, and a quick summary of their contents.

### Table 5-1. Agency Presentations Shown in Session C Introduction Video

| Agency | Presenter(s) | Summary of Content Shared |
|---|---|---|
| Delaware DOT | Alicia Howard, Jamie Kavelak, & Deirdre Wallace | DelDOT is developing an Asset Management Digital Platform designed for transparency, strategic planning, and public understanding of how they manage transportation assets. This platform will feature downloadable two-page summary sheets for various asset types, detailing budgets, value, condition targets, and risk analyses. It also includes interactive maps for assets like pavements and stormwater best management practices, allowing users to filter data and visualize performance projections based on funding scenarios. Internally, DelDOT is building a trade-off analysis tool to help staff compare impacts across asset classes, simulate funding changes, and calculate cost-benefit ratios to inform funding decisions. https://www.youtube.com/watch?v=NB3fBSqa6YA&list=PL3SleghBC1AVqhHt7aypo1zssMjoklOAG&index=8 |
| Michigan DOT | Brad Sharlow | MDOT is focused on integrating asset management practices into everyday operations, promoting enterprise asset management. They utilize public-facing tools like the MDOT Open Data Portal and the National Highway System inventory and condition analysis to share data on bridges and pavements, showing conditions and performance measures. For internal use, MDOT has the Ancillary Structures Viewer, which provides condition and inventory data for assets like sign supports and noise walls, and the MDOT GIS Explorer, which pulls data from various IT systems into a single viewer for assets such as culverts and pump stations. MDOT aims to reduce its numerous independent IT systems to move towards a true enterprise asset management system in the long term. https://www.youtube.com/watch?v=G-O7inrlP14&list=PL3SleghBC1AVqhHt7aypo1zssMjoklOAG&index=11 |

Figure 5-1. Screenshot from the Session C Introduction Video




## 5.2 Session C. Facilitated Discussion with Agency Presenters

After showing the compilation video, Mike Johnson (Caltrans) noted that there were limited examples of approaches for visualizing risk besides the examples covered in the compilation. He then conducted a brief survey, asking attendees to give a show of hands for how many agencies quantify certain types of risk in their Transportation Asset Management Plans (TAMPs). The results of this survey are shown in Table 5-2.

Table 5-2. Survey of Agencies Quantifying Risks in their TAMPs

| Risks | Approximate Show of Hands from the Attendees |
|---|---|
| Funding Risk | 12 |
| Organizational Risk | 10 |
| Coastal Issues | 4 |
| Riverine Flooding | 2 |
| Geotechnical Risk | 6 |
| Bridge Seismic Vulnerabilities | 5 |
| Bridge Scour | 8 |

Based on the low survey responses, Mike Johnson concluded that the entire TAM community is struggling to quantify risk and include that information in their state TAMPs. He invited attendees to comment on what state DOTs are doing to address this challenge.

- Stephanie Johnson (DelDOT) stated that flooding was the biggest threat to infrastructure. She noted that DelDOT worked with maintenance staff to identify frequently flooded segments and used PROTECT funding to help address them.
- Richard Wollenbecker (Hawaii DOT) explained that most of the risks identified by Mike were also considered in Hawaii, with quantification largely done through a risk matrix. He highlighted flooding concerns for the large number of single-access communities, noting that on Oahu about 20 percent of roads were vulnerable to 1 meter of sea level rise. He added that the cost of relocating roads had been quantified and was significant.
- Brad Sharlow (Michigan DOT) described specific analyses performed on issues such as flooding of depressed freeways, failures of dams owned by other parties, and flood-prone corridors. He reported that last year Michigan DOT developed a statewide Resilience Improvement Plan (RIP) and was now working to better integrate it into the TAMP.
- Shaker Rabban (MnDOT) explained that MnDOT's work initially focused on asset-specific risk but had since expanded to consider cross-asset risks, examining how many different risk categories a single risk might impact.
- Matt Versdahl (WSDOT) reported that Washington State DOT had examined data needs and conducted several vulnerability studies.

Mike Johnson then described the challenge of balancing different types of risk. He noted that a recent concern was vessel impacts on bridges, raised in response to the collapse of the Francis Scott Key Bridge in Maryland. However, he emphasized that many other risks also needed attention. Mike asked whether any agencies had approaches for addressing this balance.

- William Johnson (Colorado DOT) highlighted that NCHRP Project 23-32 was underway and would produce a guide to help address resilience needs, including tools such as fragility curves that show the likelihood of damage from different risks. He added that this type of analysis could incorporate condition, allowing condition and risk to be examined together in a lifecycle plan.

# 6. Session D. Explaining Investment Decisions

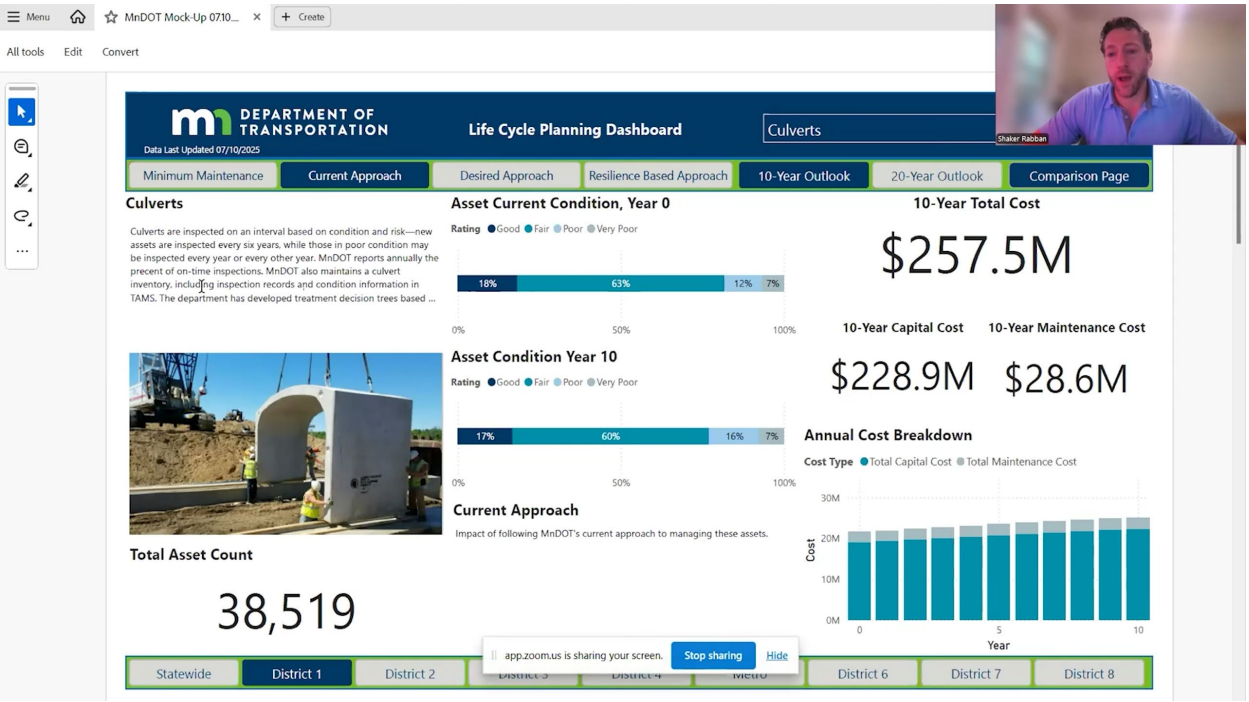
## 6.1 Video Presentation Introducing Session D

The fourth session of the peer exchange opened with the final compilation (https://youtu.be/BAIyjNEchmM) of data visualization presentations recorded by TAM workers at state DOTs. The video included clips from four agencies, selected because of their insights on how DOTs communicate and justify investment decisions through data visualizations. Table 6-1 lists the participating agencies in the video, the presenters who helped create them, and a quick summary of their contents.

## Table 6-1. Agency Presentations Shown in Session D Introduction Video

| Agency | Presenter(s) | Summary of Content Shared |
|---|---|---|
| Ohio DOT | Michael Weakley | ODOT presented a critical success dashboard that tracks asset preservation goals, using a green, yellow, and red status to show district performance. Users can drill down into data for poor-condition bridges, helping districts plan work and demonstrating to leadership that assets are being addressed. Additionally, ODOT utilizes a TAM Tier One Summary Report, which provides detailed inventory, inspection, condition, and maintenance data for various assets, and these are automatically emailed to the chief engineer monthly to facilitate discussions and future planning. https://www.youtube.com/watch?v=YqG45yAMXQo&list=PL3SleghBC1AVqhHt7aypo1zssMjoklOAG&index=16 |
| Georgia DOT | Alma Mujkanovic | GDOT publishes an annual Accountability and Investment Report (AIR), a transparent, public-facing document that provides an overview of the department's activities, expenditures, and accomplishments. The AIR shares inventory and condition data for Georgia's pavements and bridges, detailing how maintenance dollars are spent on state and off-system assets. This report has been circulated to the Georgia General Assembly since 2008, reinforcing the department's commitment to performance and accountability. https://www.youtube.com/watch?v=QjTExmTFpuk&list=PL3SleghBC1AVqhHt7aypo1zssMjoklOAG&index=10 |
| Nebraska DOT | Walter Moy | NDOT is mandated to produce an annual needs assessment report, which has evolved significantly since 1988 from a highly technical, voluminous document to a more concise report with meaningful tables and charts. The latest 2024 report categorizes needs into asset preservation, system modernization and operation, and capital improvements, utilizing prominent graphics like pavement condition graphs to emphasize the importance of timely asset preservation. While capital improvement details have largely moved to other reports, the needs assessment still provides a high-level summary of these areas. https://www.youtube.com/watch?v=MEOCJHltaXA&list=PL3SleghBC1AVqhHt7aypo1zssMjoklOAG&index=17 |
| Minnesota DOT | Shaker Rabban | MnDOT is developing Power BI-based dashboards to support internal lifecycle planning for various assets within their TAMP. These dashboards, built from Excel-based matrices, allow staff to explore different investment scenarios (e.g., minimum maintenance, desired, resilience-based) for asset classes like culverts. They display current and projected asset conditions, total financial obligations over ten years, and offer a slider bar to help users determine optimal investment levels to achieve desired asset states. https://www.youtube.com/watch?v=K_wb9KeDqoc&list=PL3SleghBC1AVqhHt7aypo1zssMjoklOAG&index=13 |

Figure 6-1. Screenshot from the Session D Introduction Video




## 6.2 Session D. Facilitated Discussion with Agency Presenters

Following the compilation video, Hyun-A Park (SPP) and Mike Johnson (Caltrans) facilitated a discussion with the agency presenters. The questions centered on exploring the data visualization practices being used to communicate investment decisions.

**Question 1: For the Ohio examples, how the information was being used to help make decisions?**

- Michael Weakley (ODOT) stated that the tool was useful for communication, but in many cases districts relied on other data beyond what was shown in the dashboard. He added that funding decisions were based on factors other than existing condition.
- Jon Keller (ODOT) explained that condition data did help support funding decisions for bridges. However, for pavements, average daily traffic (ADT) was also a factor, meaning condition dashboards alone did not provide all the information needed to guide funding decisions.

**Question 2: Is condition data is driving funding decisions at other state agencies?**

- A Michigan DOT representative and Matt Versdahl (WSDOT) stated that funding and distribution between districts varied based on condition at their respective agencies.
- Carl (Illinois DOT) explained that condition, population, vehicle registration, and other variables were all considered in pavement funding decisions.
- Anne Rearick (Indiana DOT) described that Indiana used dTIMS to make bridge funding decisions, incorporating condition as a factor.
- Jon Keller (Ohio DOT) added that asset dashboards supported resource allocation by showing what assets were on the system and their extent.

- Mike Johnson (Caltrans) highlighted the challenge of balancing funding to improve conditions without inadvertently rewarding poor performance. He noted that current conditions largely reflected past project decisions and emphasized the need to consider future outcomes under different funding levels. He cautioned against creating a self-perpetuating cycle where districts with poor conditions received more funding but failed to deliver the right projects, potentially worsening conditions further.

**Question 3: Can you share insights into how the tools and visualization approaches they shared support funding decisions?**

- Shaker Rabban (MnDOT) responded that without the additional information, there would have been less foresight in the decision-making process.
- Matt Haubrich (HDR) noted that when he was at Iowa DOT, communicating condition data helped secure increased TAM funding.
- Jon Keller (Ohio DOT) cautioned that it was important to be careful about what was measured. For example, he explained that using a weighted average condition level versus good/fair/poor categories could produce very different results. He observed that it was possible to maintain a constant average condition while the share of poor conditions still increased.

**Question 4: How challenging is it to keep data updated across various dashboards?**

- Michael (Ohio DOT) described the protocols in place for keeping data up to date in a data warehouse, noting that if data became static or outdated, people quickly lost trust in it.
- Trisha Stefanski (MnDOT) agreed on the importance of maintaining a data warehouse. She emphasized the value of building in data interoperability as part of the process.

**Question 5: What are approaches for communicating investment decisions where there is overlap between TAM and safety or other areas?**

- Mike Johnson (Caltrans) explained that in theory transportation performance management (TPM) metrics were intended to support investment decisions. In practice, however, funding was traditionally structured in silos, making it difficult to shift investments between assets or districts. He noted that agencies following best practices in asset management should adjust funding based on condition but acknowledged that this could be a hard sell. At Caltrans, investment decisions were revisited every two years, and the process had been revised to allow for greater flexibility. Each district received one overall budget and a set of performance targets, then decided how to fund projects to achieve those targets. He summarized the approach by stating, "The strategy we adopted was to stop talking about the money and start talking about performance."
- Laura Heckel (Illinois DOT) described Illinois DOT as highly decentralized, with each district receiving its own budget. She explained that she was training bridge maintenance engineers to become bridge management engineers and pavement maintenance engineers to become pavement management engineers. She also showed districts how to view conditions across assets and districts to encourage competition and improve performance.
- Jim Poorbaugh (Mississippi DOT) emphasized the importance of stewardship and being good stewards of taxpayers' money, while also balancing this responsibility with project decisions that were sometimes driven by worst-first considerations.

**Question 6: Can you share other examples of communication approaches used at your agencies?**

- Matt Versdahl (WSDOT) summarized Washington State DOT's Gray Notebook, which reports performance in each area. He noted that it had evolved over time, becoming more streamlined while continuing to present a well-rounded set of measures across different areas.
- Andrew Williams (ODOT) posed the question of what management truly wanted. He emphasized that asset managers needed visualizations that addressed management's concerns and made the case for what was needed, remarking, "You have to know those folks' love language to get them to respond."

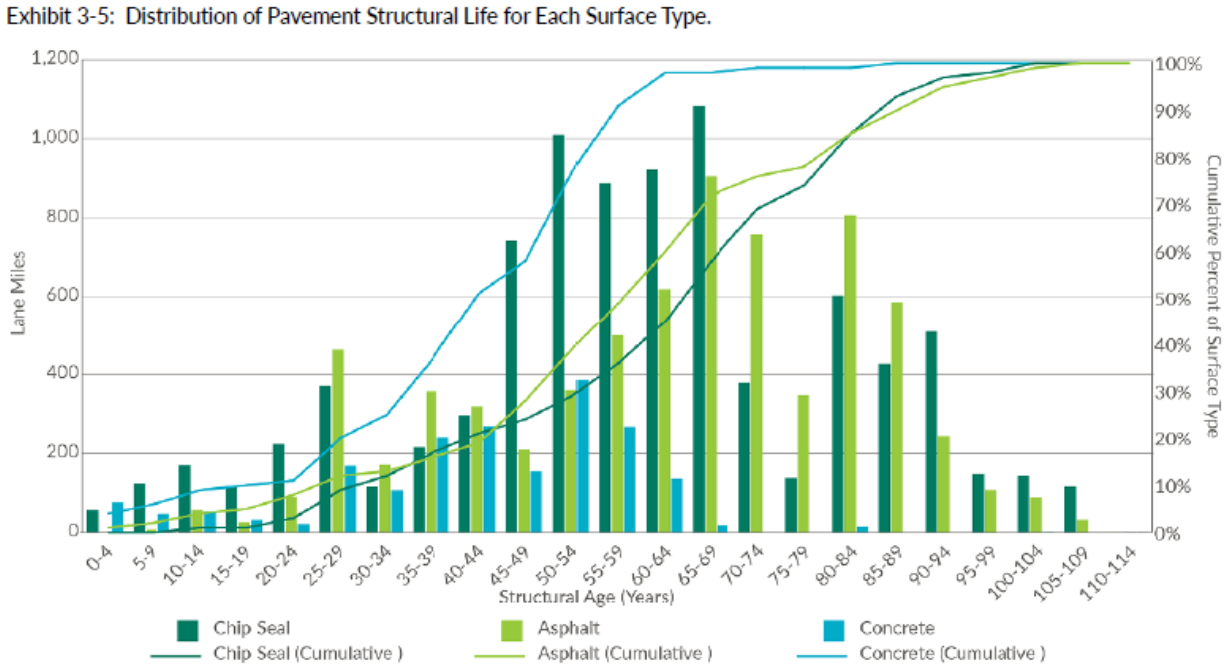
# 7. Session E. Good Communications Exercise

The fifth session was centered around a small group exercise meant to give participants the opportunity to apply the data visualization principles highlighted throughout the peer exchange. During the exercise, each table was given information from a published TAMP and worked collaboratively to develop key talking points, suggest ways the presentation of information could be improved, and recommend alternative graphics where appropriate. Afterward, each table selected a spokesperson to present their results.

## 7.1 Breakout Group Visuals & Analysis

### Group A Analysis & Design Recommendations

Figure 7-1. Group A Original Visual



The group members stated the primary message of the visual was to show lane miles by age for different pavement types. They inferred the audience for the visual was legislators looking to get information on the average age of pavement. They believed Figure 7-1 was too complicated and recommended several design improvements to make the narrative of the data clearer.

- The graph shouldn't have two y-axes. They recommended excluding the cumulative lane miles data.
- The number of x-axis categories should be reduced for visual clarity. The group recommended changing to increments of five to ten years for the pavement age.
- Group A members also highlighted how the visual should ideally show condition data instead of age. The visual does not indicate if any treatments could reset the asset age.
- The presenters highlighted that a Pareto chart can be an effective visual format, but not for this data where the x-axis is organized chronologically, rather than from largest to smallest.

### Figure 7-2. Group A Revised Visual

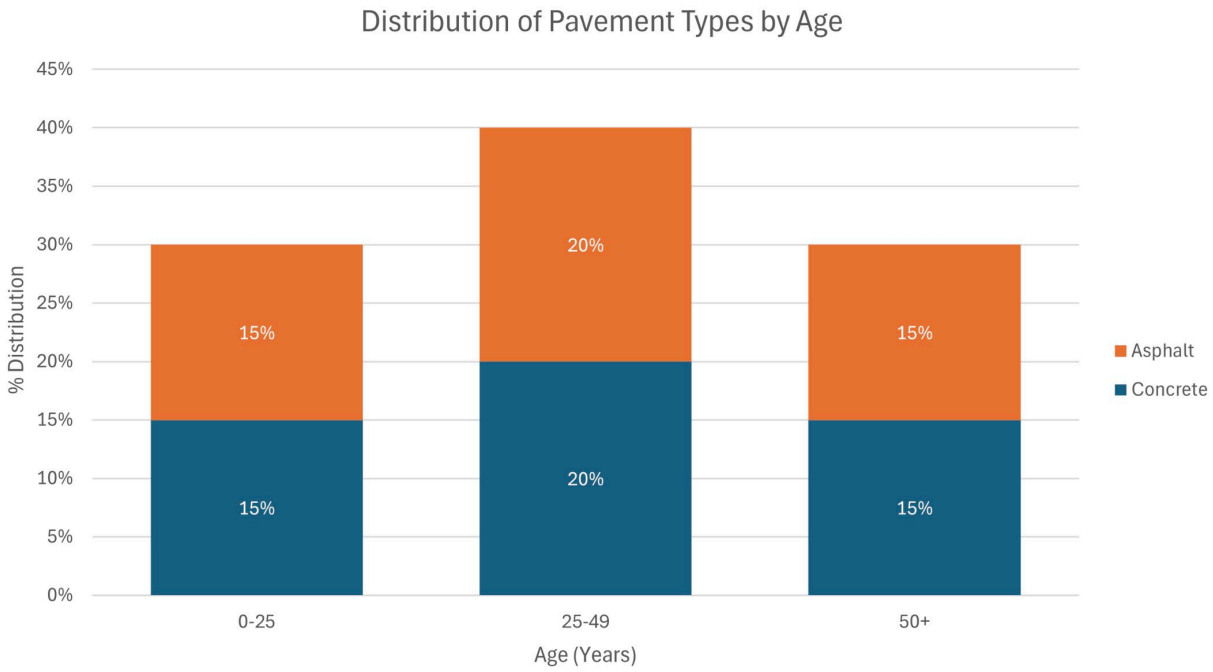



Figure 7-2 shows the redesign of the visual that addresses Group A's recommendations. The graph still shows the percentage of pavement by age, but with a clearer message. The figure includes fewer pavement types and age categories.

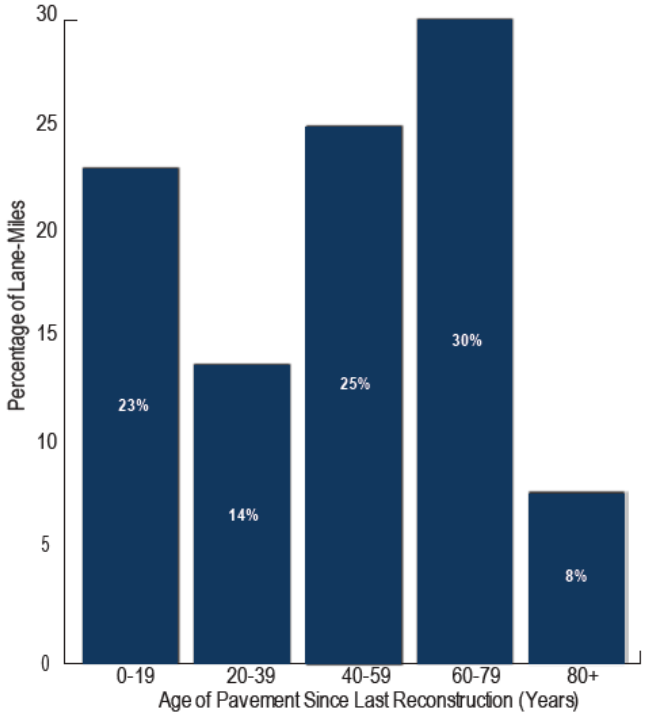
## Group B Analysis & Design Recommendations

### Figure 7-3. Group B Original Visual

| SYSTEM / FUNCTIONAL CLASSIFICATION | FLEXIBLE ROADWAY MILES | RIGID ROADWAY MILES | TOTAL ROADWAY MILES | TOTAL LANE-MILES | REPLACEMENT VALUE |
|---|---|---|---|---|---|
| Interstate | 925 | 896 | 1,821 | 4,036 | $4.04 billion |
| Other NHS | 4,660 | 1,114 | 5,774 | 11,759 | $11.76 billion |
| Non-NHS | 6,569 | 167 | 6,736 | 13,567 | $13.57 billion |
| **TOTAL** | **12,154** | **2,177** | **14,331** | **29,362** | **$29.36 billion** |

Note: Interstate and Other NHS do not include locally owned NHS roadways (see Figure 2-8). Replacement Value based on $1 million per lane-mile. Current value is based on Road Quality Index of pavements. See Figure 4-2 for current asset valuation.

Figure 4-7: Pavement Age Profile Since Last Reconstruction (by lane-mile)




Note: Age is calculated as the length of time from initial construction or reconstruction.

Group B highlighted the good design elements of their TAMP visual shown in Figure 7-3. They mentioned the strategic use of color, fonts, and percentages in the bar charts made the visual cohesive. However, the group believed the inclusion of the roadway photo was distracting and added unnecessary clutter.

Figure 7-4. Group B Revised Visual

**PAVEMENT INVENTORY SUMMARY**

| On/Off NHS | | Lane Miles | % Flexible | % Rigid |
|---|---|---|---|---|
| On | Interstate | 4,036.0 | 51% | 49% |
| | Non-Interstate NHS | 11,759.0 | 81% | 19% |
| | *Subtotal, NHS* | *15,795.0* | *74%* | *26%* |
| Off | *Subtotal, Non-NHS* | *13,567.0* | *98%* | *2%* |
| **Total** | | **29,362.0** | **85%** | **15%** |

**AGE DISTRIBUTION**

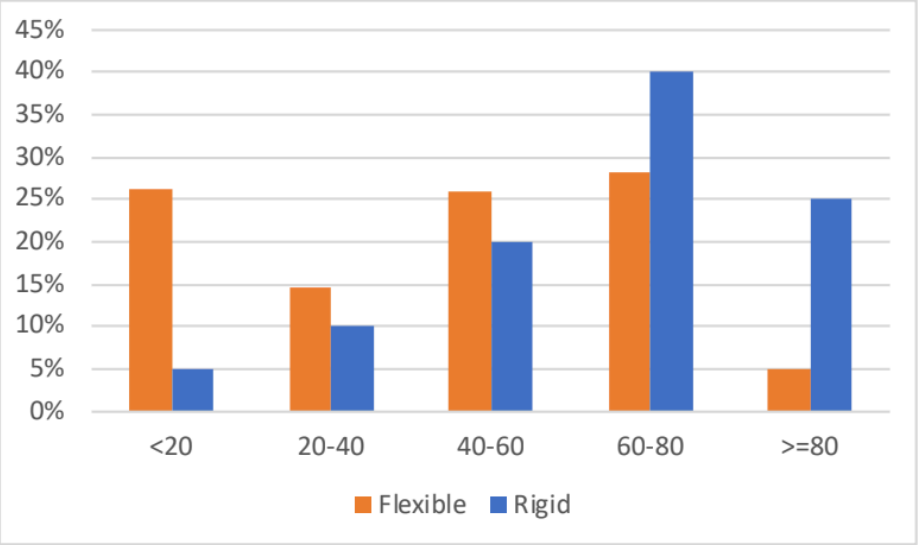
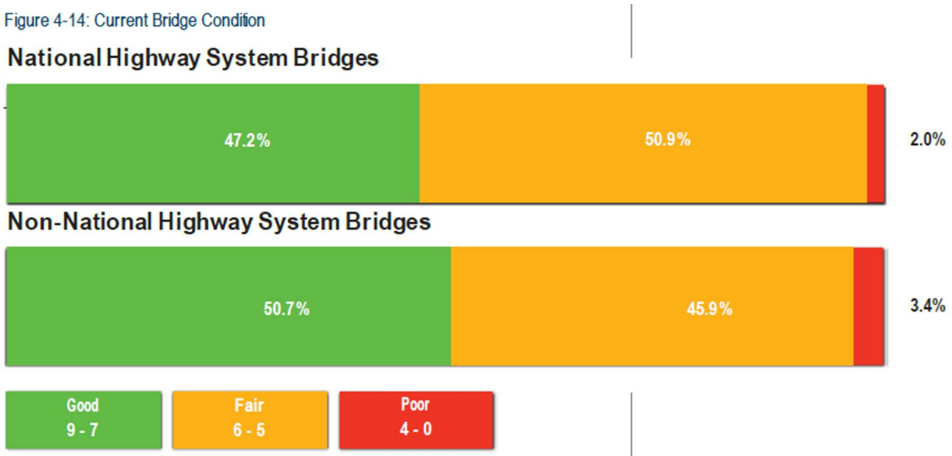



Figure 7-4 shows the reformatted graphic developed by Group B. This revised version includes a simplified summary of NHS assets overall and shows the age distribution of rigid and flexible pavement types.

## Group C Analysis & Design Recommendations

### Figure 7-5. Group C Original Visual

Figure 4-14: Current Bridge Condition




Note: Figure 4-14 reports condition by deck area of bridge structures 10' and greater and does not include bridge culverts or locally-owned NHS bridges (see Figure 2-10)

Figure 4-15: Bridge Current Condition, Targets, and Investment to Achieve Targets in 2027 Based on State Performance Measures

| SYSTEM | 2017 CONDITION (% POOR) | TARGETS (% POOR) | INVESTMENT REQUIRED TO ACHIEVE TARGETS |
|---|---|---|---|
| NHS | 2% | ≤ 2% | $1.1 billion |
| Non-NHS | 3.4% | ≤ 8% | $446 million |
| **TOTAL** | **2.4%** | **NA** | **$1.5 billion** |

Figure 4-16: Bridge Current Condition, Targets, and Investment to Achieve Targets in 2027 Based on Federal Performance Measures

| SYSTEM | 2017 CONDITION (% GOOD) | 2017 CONDITION (% POOR) | 2-YEAR TARGETS (2020) (% GOOD) | 2-YEAR TARGETS (2020) (% POOR) | 4-YEAR TARGETS (2022) (% GOOD) | 4-YEAR TARGETS (2022) (% POOR) | INVESTMENT REQUIRED TO ACHIEVE TARGETS |
|---|---|---|---|---|---|---|---|
| NHS | 48% | 1.9% | 50% | 4% | 50% | 4% | $316 million |

Note: Figure 4-16 reports condition by deck area of all NHS bridge structures 20' and greater regardless of ownership.

Group C stated the TAMP visual did a good job with design details like color and legibility. However, they criticized the visual for not having a clear message related to funding. They also found the format of the second table to be confusing, and suggested that accompanying text would be needed to explain its message to viewers.

## Group D Analysis & Design Recommendations

### Figure 7-6. Group D Original Visual

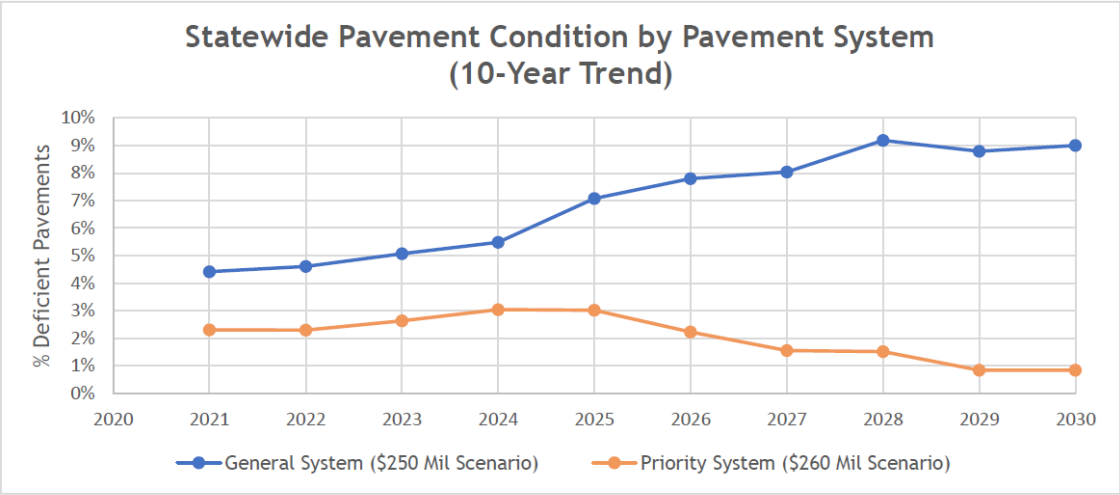
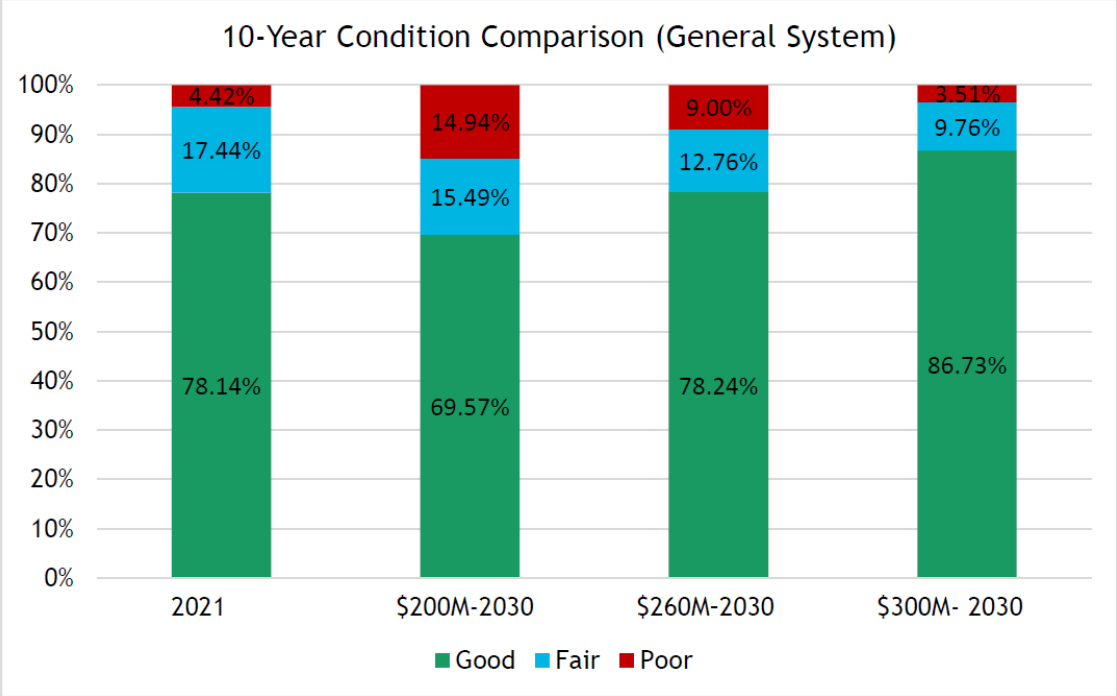


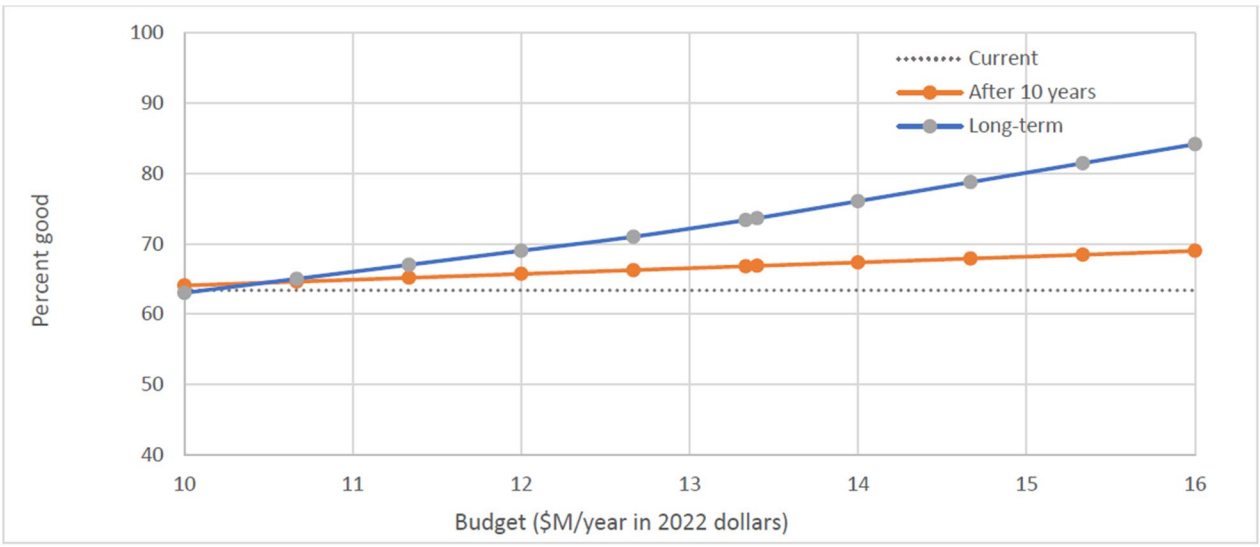

*Table 28 - 10-Year Statewide Pavement Deficient Percentage Condition by Pavement System*




Group D noted that the labeling of their visual was confusing and suggested moving contextual details into the title. They also found the use of color unclear and said including 2020 in the upper graph was unnecessary since the data began in 2021. For the bottom chart, they recommended a single trend line and clearer labeling.

## Group E Analysis & Design Recommendations

### Figure 7-7. Group E Original Visual




Group E emphasized that their visual shown in Figure 7-7 was effective in showing both short- and long-term outcomes and clearly illustrating how investments affect conditions. They explained how it highlighted the direct link between budget and condition, provided a useful baseline of current conditions for comparing future scenarios, and focused on an incremental budget range that aligned with realistic funding decisions. However, Group E also criticized the TAMP visual, stating how the budget range was limited and that the reference to the long term was unclear. They also observed that visual overlap in year ten made comparisons difficult and suggested adjusting the y-axis increments to improve clarity.

The group stated that the narrative communicated through the visual centered on bridge improvements being a long-term investment, with sustained higher funding required to achieve meaningful condition improvements across the network.

Figure 7-8. Group E Revised Simple Visual

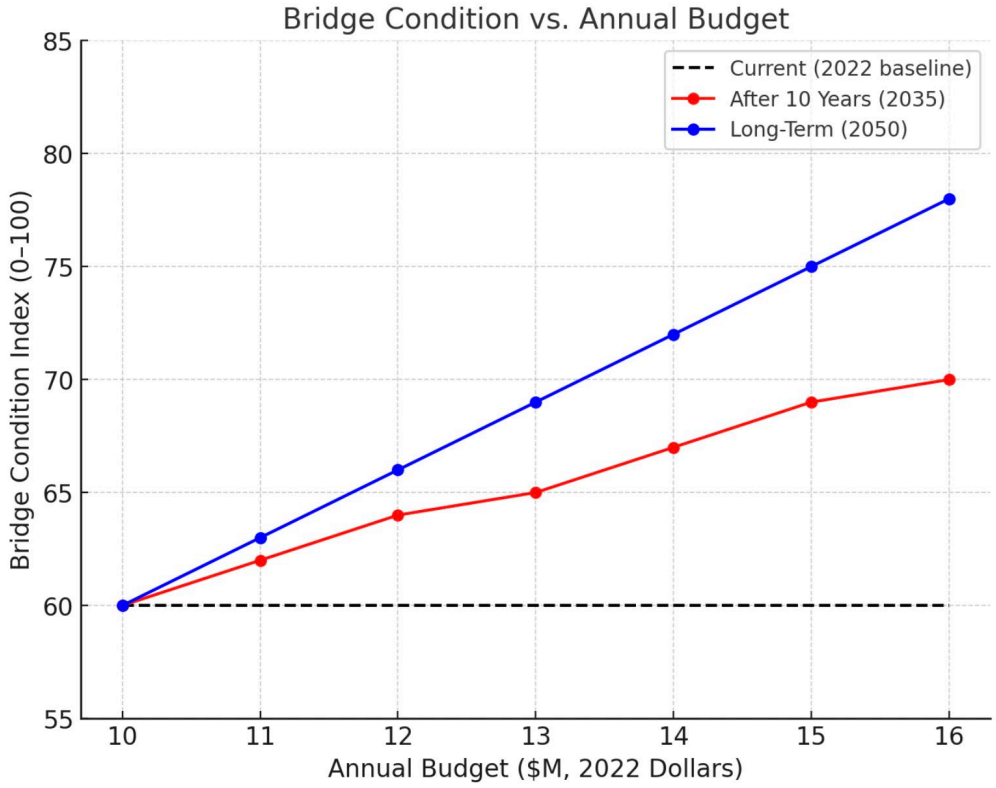
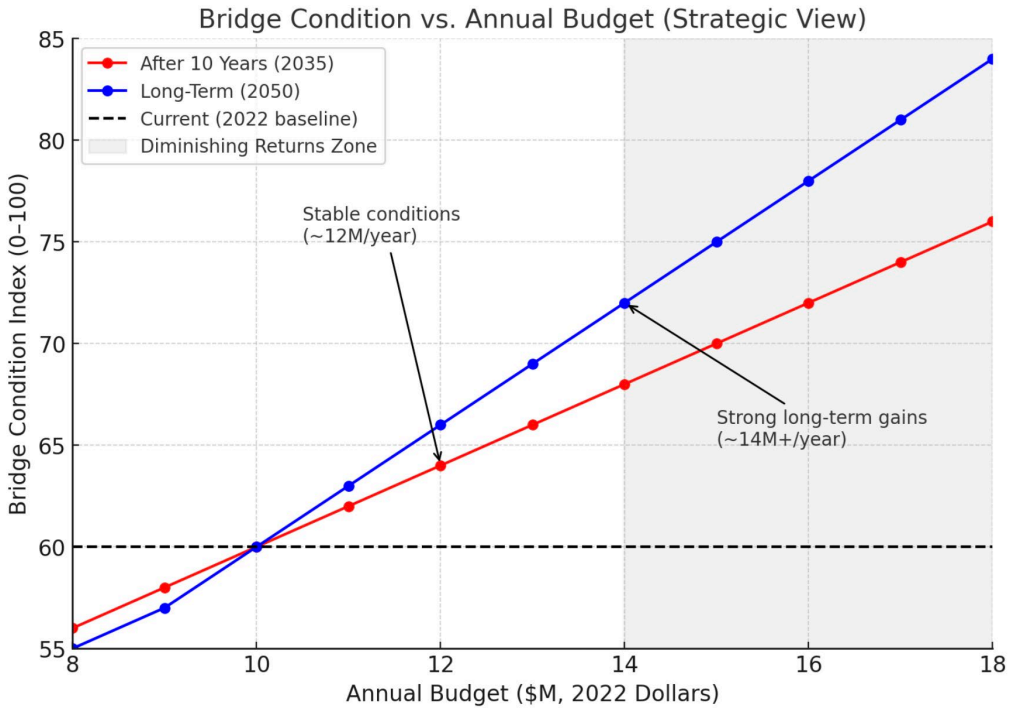


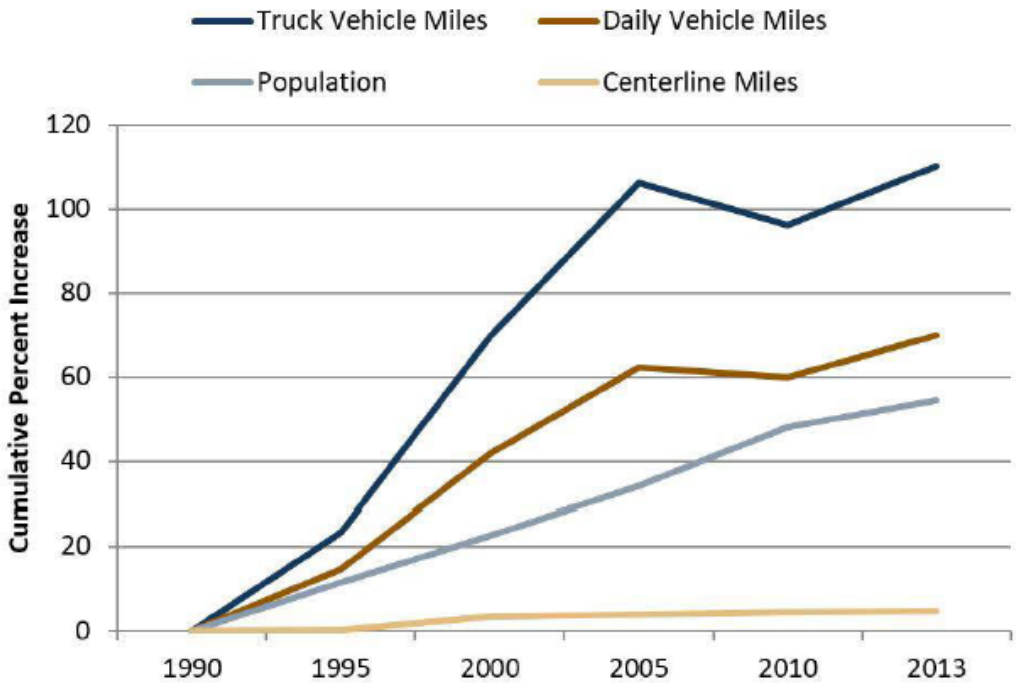

Figure 7-9. Group E Revised Strategic Visual



For each of their redesigned visuals, Group E focused on defining a better timeline, expanding the budget axis, and visually distinguishing key thresholds in the data. They produced two versions of the graphic, tailored for different audiences and aspects of the narrative. Figure 7-8 shows a simplified version of the original graphic. Figure 7-9 is a more detailed alternative meant to highlight the long-term effects of budgeting decisions with additional data.

### Group F Analysis & Design Recommendations

Figure 7-10. Group F Original Visual




| Fiscal Year | Percent of Very Good Lane Miles | Percent of Good Lane Miles | Percent of Fair Lane Miles | Percent of Poor Lane Miles | Percent of Very Poor Lane Miles |
|---|---|---|---|---|---|
| 2007 | 78.53 | 7.66 | 4.75 | 4.37 | 4.68 |
| 2008 | 78.25 | 7.07 | 4.88 | 4.66 | 5.14 |
| 2009 | 78.76 | 6.86 | 4.92 | 4.74 | 4.73 |
| 2010 | 78.63 | 6.84 | 5.06 | 4.87 | 4.59 |
| 2011 | 78.42 | 7.18 | 5.07 | 4.89 | 4.44 |
| 2012 | 80.28 | 6.61 | 5.00 | 4.48 | 3.63 |
| 2013 | 76.70 | 9.20 | 5.34 | 4.51 | 4.24 |
| 2014 | 76.75 | 9.19 | 5.20 | 4.52 | 4.34 |
| 2015 | 77.69 | 8.81 | 4.74 | 4.25 | 4.52 |
| 2016 | 66.37 | 16.20 | 8.12 | 4.36 | 4.94 |
| 2017 | 68.49 | 15.66 | 7.44 | 3.58 | 4.83 |

Group F suggested that the chart and table should use the same years for consistency. They recommended removing centerline miles and population from the graph and focusing only on vehicle miles traveled (VMT), which would eliminate the need to show percent increase that the group found confusing. The group also advised separating the graph and table unless the intent was to directly compare them and noted that bar charts might be more effective than line charts or a table.

## Group G Analysis & Design Recommendations

### Figure 7-11. Group G Original Visual

Scenario 1: No Bridge Preservation

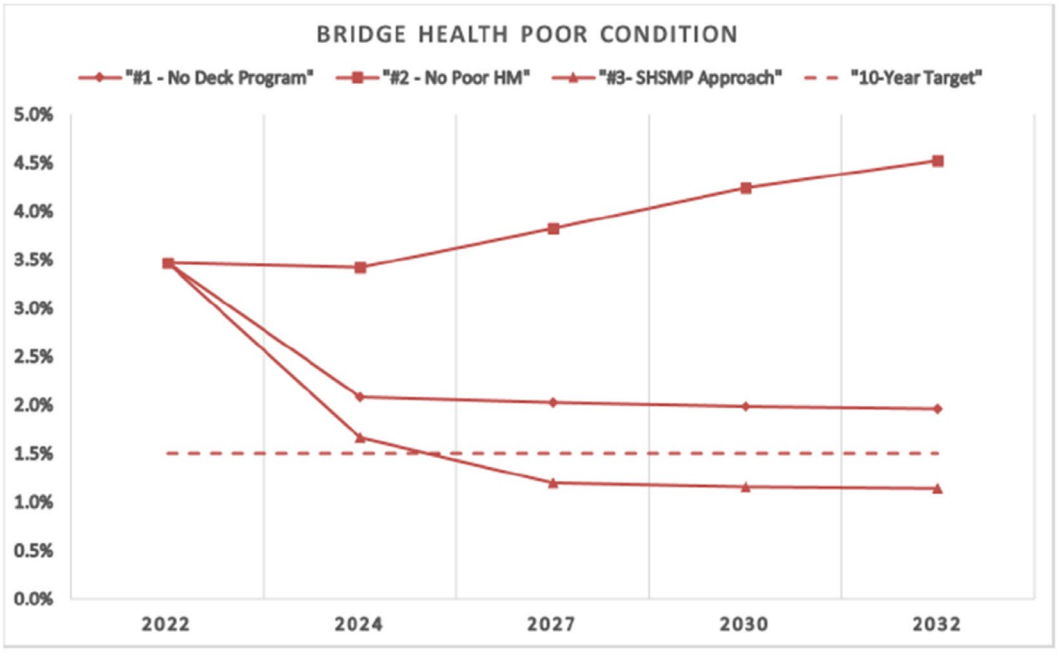
This scenario assumes that all work to improve condition of bridges is through the rehabilitation program with no investment in bridge maintenance or preservation activities. The LCP analysis includes deterioration rates and statewide average unit costs from the 2021 Plan and the amount of work predicted to be accomplished annually for the life span of the asset. Total estimated investment: $ 5.7 Billion.

Scenario 2: Historical Approach

This scenario was based on historical strategies to improve bridge condition including historical deterioration rates, and statewide average unit costs based on a mix of preservation, rehabilitation and replacement work to fix fair and poor bridges, and the amount of work predicted to be accomplished annually for the life span of the asset. Total estimated investment: $ 6.5 Billion.

Scenario 3: (Implemented Strategy)

The scenario includes additional bridge deck preservation work for two years of the 10-year plan, deterioration rates from the 2021 Plan, and statewide average unit costs that are a mix of preservation, rehabilitation, and replacement work to fix fair and poor bridges including additional bridge decks, and the amount of work predicted to be accomplished annually for the life span of the asset. Total estimated investment: $ 6.8 Billion.




Bridge LCP Scenarios

Group G observed that the chart and scenario explanations shown in Figure 7-11 did not align and said it would be helpful to show funding levels directly on the chart, rather than only in the text. They found the assumptions for Scenario #2 to be unclear and suggested using a different color for the target. The group also noted that the axes were not labeled and recommended showing fair and good condition in addition to poor condition.

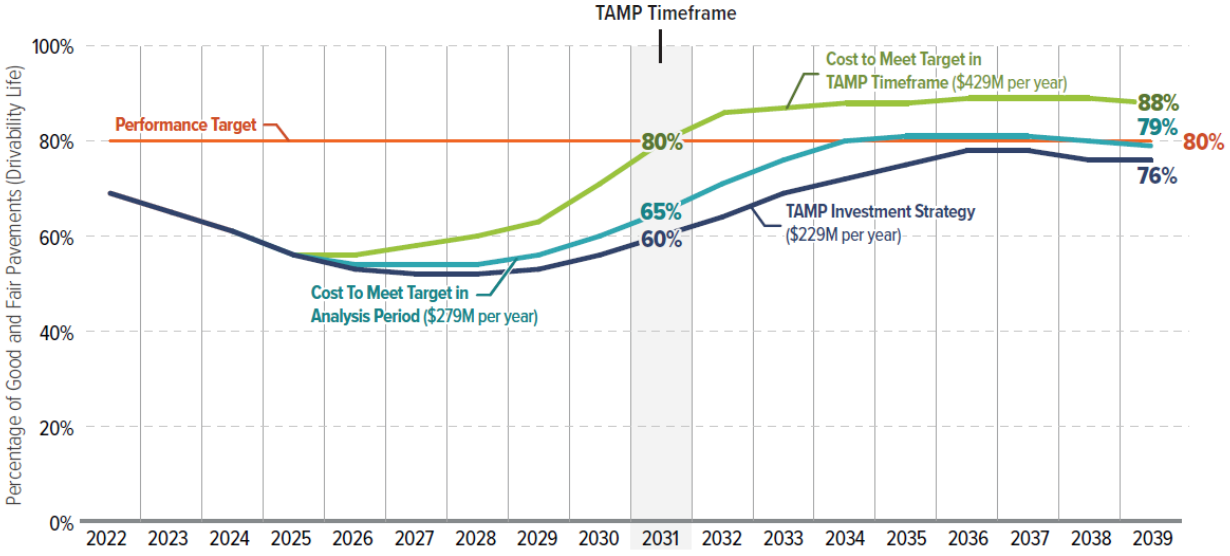
## Group H Analysis & Design Recommendations

### Figure 7-12. Group H Original Visual

**Table 19** *Pavement Investment Strategy FY 2022–31 (in Millions)*

| Work Type | FY 22 | FY 23 | FY 24 | FY 25 | FY 26 | FY 27 | FY 28 | FY 29 | FY 30 | FY 31 |
|---|---|---|---|---|---|---|---|---|---|---|
| Maintenance* | $40.4 | $41.6 | $40.7 | $41.9 | $43.2 | $44.5 | $45.8 | $47.2 | $48.6 | $50.1 |
| Preservation | $6.94 | $28.99 | $14.09 | $7.30 | $33.02 | $27.44 | $32.15 | $24.51 | $22.29 | $22.29 |
| Rehabilitation | $216.36 | $195.62 | $208.85 | $221.70 | $195.98 | $201.56 | $196.85 | $204.49 | $206.71 | $206.71 |
| Reconstruction | N/A | N/A | $2.67 | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Initial Construction | $118.7 | $118.7 | $118.7 | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| TOTAL | $382.4 | $384.91 | $385.01 | $270.9 | $272.2 | $273.5 | $274.8 | $276.2 | $277.6 | $279.1 |

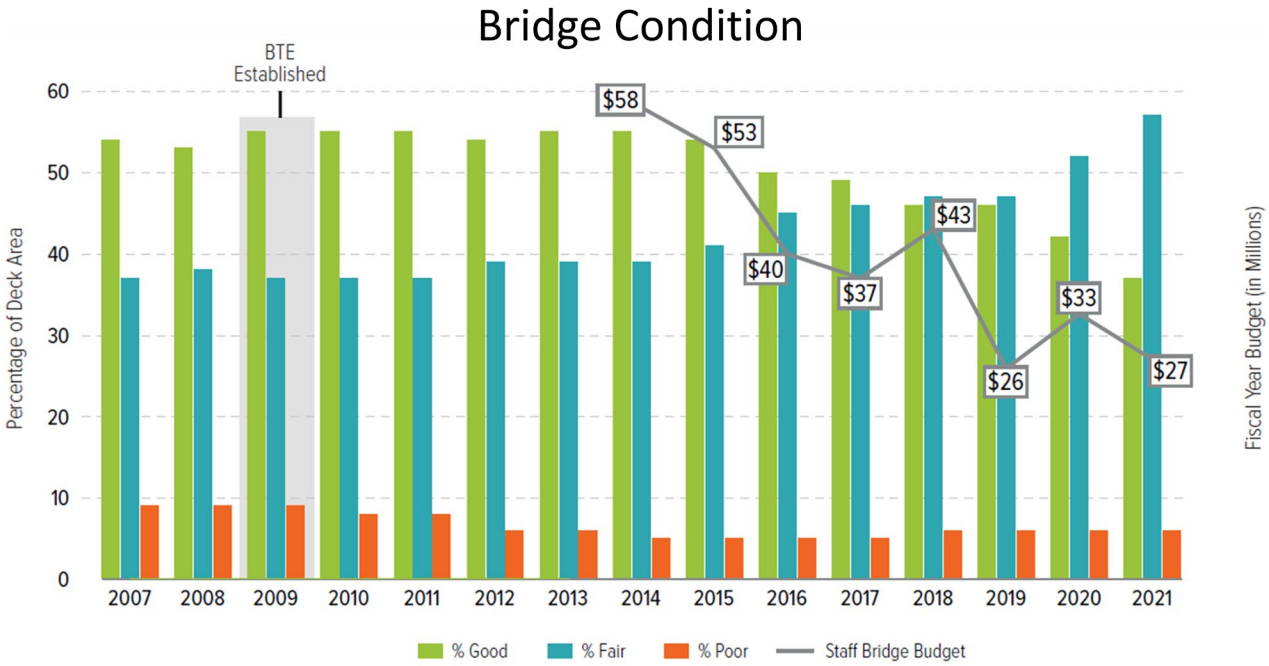
** Maintenance expenditure is from maintenance levels of service budget.*
*FY30 and FY31 data for preservation and rehabilitation work types are averages.*




Group H noted that the connection between the table and graph was difficult to follow because of differing time ranges and unclear funding assumptions. They suggested collapsing rows in the table to reduce the number of distracting "N/A" cells, truncating the range of the graph to remove excess white space, and adding a legend to improve the legibility.

## Group J Analysis & Design Recommendations

### Figure 7-13. Group J Original Visual




Group J remarked that it would be helpful to see the initial versions of the graphs, as they often start clear but become cluttered after adding extra information. They noted that showing fifteen years of data was unnecessary, especially since the budget was only presented from 2014 onward. Group J also pointed out that the staff bridge budget was not explained. The group felt the intended story was that conditions worsen with reduced funding, but said this was difficult to see because the increase in poor condition was not clear. They suggested using a different visualization, such as a stacked bar chart, to better highlight condition changes.

Figure 7-14. Presenting Small Group Exercise Results

## 7.2 Observations & Reflections from the Group Exercise

Following the final small group presentation, the attendees discussed the general observations and takeaways gained from the exercise. Comments from the participants included:

- William Johnson (Colorado DOT) noted that while ideally visualizations should stand alone, in reality most TAMPs included narratives to guide readers through them. He emphasized the importance of deciding where to focus improvement efforts in TAMPs—whether on visuals or other aspects of the document. He also addressed accessibility, describing Colorado DOT's partnership with the Blind Institute of Technology, and the importance of designing visuals with accessibility in mind. On the broader use of visuals, he acknowledged that taking them out of context always carried risks, but observed that when stakeholders truly wanted the data, they would ask for additional details. He concluded that there was often apathy until an issue gained attention and stressed that asset managers needed to be ready with data when that time came.
- A Michigan DOT representative observed that it was important to think about how visuals were actually being used. Often, graphs were pulled out of a TAMP and repurposed in a presentation, which could change their context.
- Blake Holub (DDOT) cautioned that third parties were likely to reinterpret graphs in ways that could skew results. He suggested that agencies could shape the narrative as much as possible by providing explanatory snippets and context. He added, however, that the growing use of maps and dynamic displays further complicated this challenge.
- Quinten Arsenault (Connecticut DOT) highlighted the need to ensure visualizations were accessible to everyone. He stressed the importance of selecting colors and fonts that met accessibility standards so the graphics could be used widely and equitably.

- A Wyoming DOT representative emphasized the importance of storytelling, noting that the exercise devoted significant time to considering the story each visualization was meant to convey. Another attendee added that even when a TAMP included a supporting narrative, agencies needed to recognize that some readers would look only at the visual and skip the accompanying text.

## 8. Session F. Summary - What Did We Learn?

Mike Johnson (Caltrans) facilitated the final session of the peer exchange. He began by summarizing the lessons he learned through the meeting. Mike highlighted that it had been helpful to see concrete examples of how to improve visualizations. One example from the Session E small group exercise came from a Caltrans TAMP, which staff internally acknowledged could have been stronger when it was published. Reviewing this example, and observing how others responded to it, provided useful insight into how similar materials could be improved in the future.

Another key lesson from the exchange for Mike was the importance of tailoring the message to the audience. He emphasized that there is no single visualization that works for everyone; rather, visualization should be viewed as a tool for telling a story, with the message adapted depending on who is receiving it. Improving the clarity of the message in turn improves the ability to tell that story effectively.

Lastly, Mike also pointed to specific techniques—such as using color, transparency, and highlighting—as strategies to direct the reader's attention to the most important points. The leading purpose of the peer exchange had been to give participants time to reflect on these ideas and consider ways to strengthen their own approaches going forward, and he felt that was accomplished through the video and slide presentations, as well as the small group exercise.

The speaker then opened the discussion to participants, asking them to reflect on the peer exchange.

- Matt Haubrich (HDR) noted that work is underway through NCHRP to develop a guide for effective visualization, which was expected to be released in about a year.
- Meredith Hill (Maryland DOT SHA) described how the agency maintained a key message archive to share with leadership, recognizing that key messages changed over time. She emphasized that the messages behind a TAMP and its visuals were often more important than the document itself.
- Alma Mujkanovic (Georgia DOT) observed that while asset management tools had not changed significantly in recent years, the challenge of how best to tell an asset management story through visuals remained.

## Closing Remarks

Mike Johnson (Caltrans) closed the peer exchange with some final thanks. He highlighted the work performed by Spy Pond Partners to develop the opening video. He also thanked the agency

participants for recording videos ahead of time, and the audience for their attention and engagement.

Finally, Hyun-A Park (SPP) thanked Mike Johnson for his work preparing for and leading the peer exchange, while also acknowledging AASHTO for sponsoring the event.

## Next Steps for Improving Data Visualization in TAM

Mike Johnson reminded the attendees that a data visualization guide is currently under development. He noted a key challenge for the future is developing strategies for visualizing risk and investment decisions. Transportation agencies are better at visualizing asset inventory and condition, and to some extent financial data associated with TAM. Mike acknowledged NCHRP Project 23-32 that William Johnson (Colorado DOT) referred to in Session C. He stated that while this effort will be helpful for improving tools for quantifying risk, it will still require further work to integrate TAM data with investment decision-making. He emphasized that there may still be other strategies the TAM community should consider through various Transportation Research Board (TRB) and AASHTO committees.

# Appendix A. Presentation Slides

2025 Transportation Asset Management Peer Exchange

# Communicating Asset Management Information and Outcomes

Chicago, Illinois - August 25, 2025

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## Agenda

- Introductions
- Session A — Elements of Good Visualizations and Communications
- Session B — Communicating Asset Inventory and Condition Information
- Session C — Communicating Asset Risks
- Session D — Explaining Investment Decisions
- Session E — Good Communications Exercise (Small Groups)
- Session F — What Did We Learn?
- Wrap Up and Next Steps

2



2

# AASHTO Welcome

Mike Johnson
(Caltrans, AASHTO Subcommittee on Asset Management Chair)



# FHWA Welcome

Tashia Clemons (FHWA, TAM Lead)

# Participant Introductions



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2025 Transportation Asset Management Peer Exchange
Communicating Asset Management Information and Outcomes

# Session A — Elements of Good Visualizations and Communications

AASHTO



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2025 Transportation Asset Management Peer Exchange
Communicating Asset Management Information and Outcomes

Topic Introduction

# Applying Visualization Tips to Transportation

**Michael Johnson**
State Asset Management Engineer

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## What Did We Learn?

- **Data visualization is all about story telling**
- **Emphasize the message you are trying to communicate**
- **Create a narrative from the data**
- **Use visual ques effectively**
- **Present information clearly**
- **Select the proper graphic formats**

8



8

# Data Visualization is All About Story Telling



"Data visualization is not just about charts and graphs—it's about telling a story. In transportation asset management, good visuals connect the data to decisions, making risks, tradeoffs, and priorities clear at a glance."

# Tailor Your Message

**Why is the Sky Blue?**

- The sky appears blue because of Rayleigh scattering.
- Sunlight contains all colors of visible light, but as it passes through Earth's atmosphere, gas molecules and tiny particles scatter shorter wavelengths (blue and violet) more effectively than longer wavelengths (red and orange).
- Although violet light is actually scattered even more than blue, our eyes are less sensitive to violet, and much of it is absorbed by the upper atmosphere.
- As a result, the scattered light we predominantly see from all directions is blue, giving the sky its characteristic color during the day.

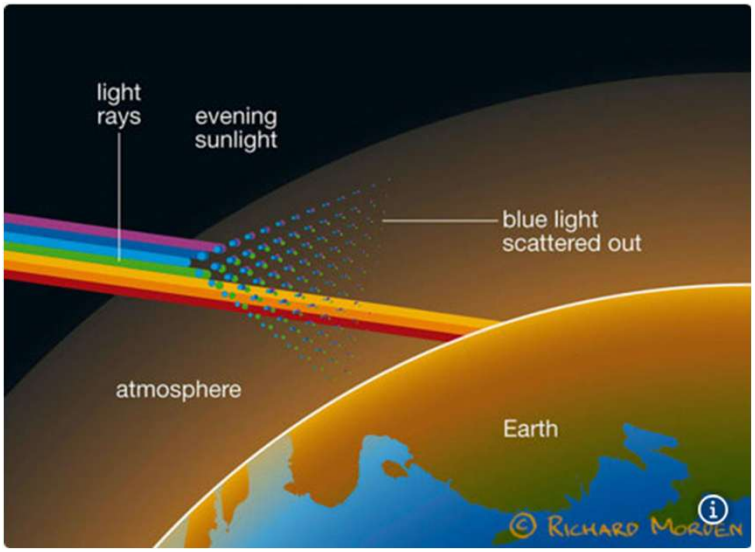


# Tailor Your Message

**Why is the Sky Blue?**

- The sky looks blue because the air takes sunlight and spreads out the blue part of it.

# Visualization of Blue Sky Answer




13



13

# Tailor Your Message

- All examples answer the same blue sky question in different ways.
- When developing asset management visualizations or communicating in general it is important to consider your audience
  - What is the background of my audience?
  - Is my target audience technical or executive?
  - Is my target audience internal or external to my agency?
  - How much detail should I provide?
  - What is the best format to convey my message?

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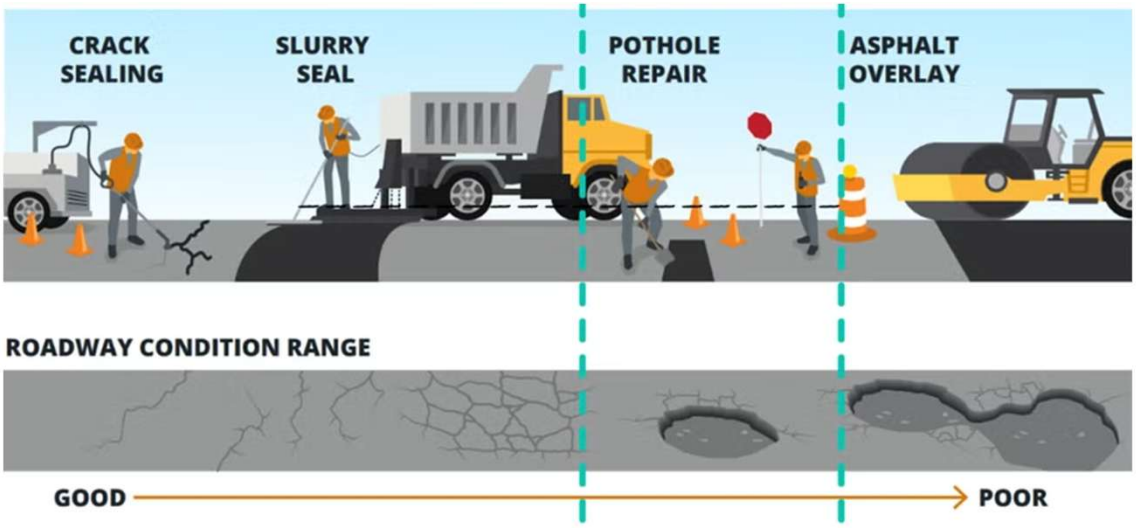
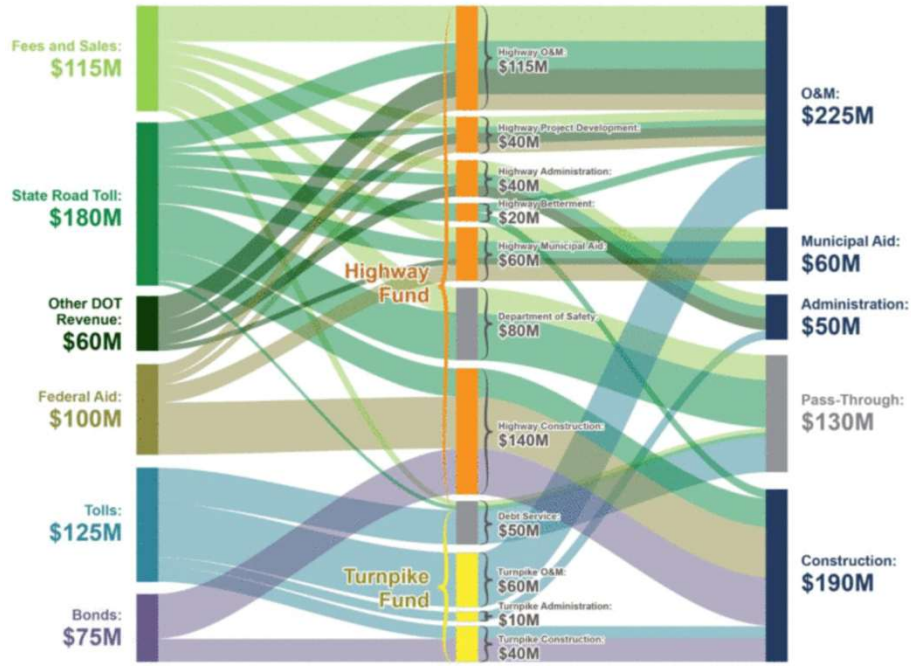
# Let's Look at Some Transportation Examples



# When to Report Asset Need



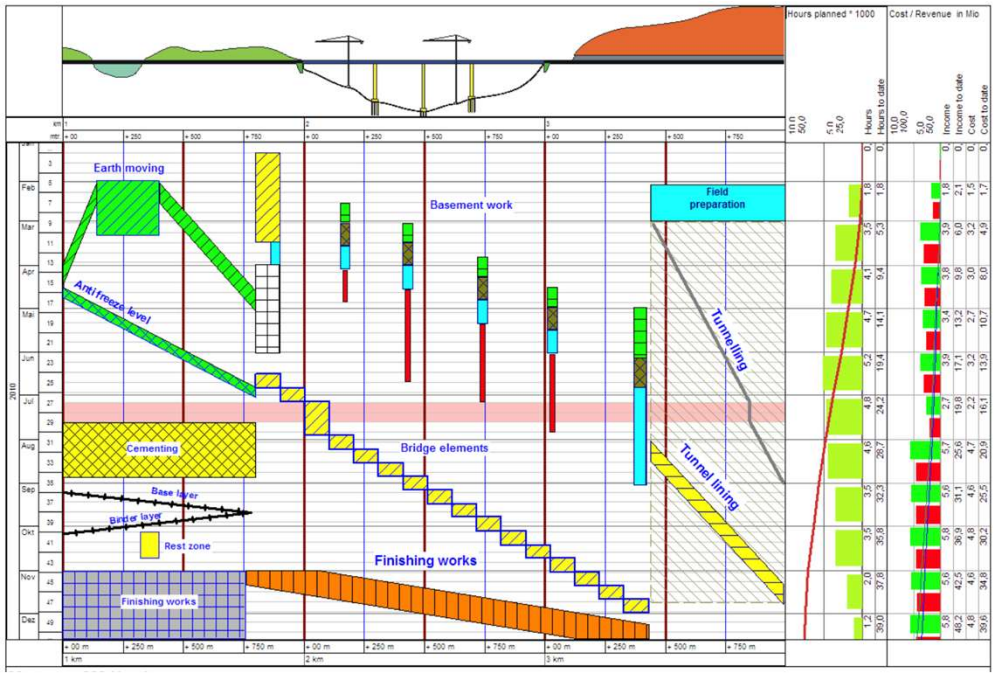



# Sankey Diagram of Funding Flow



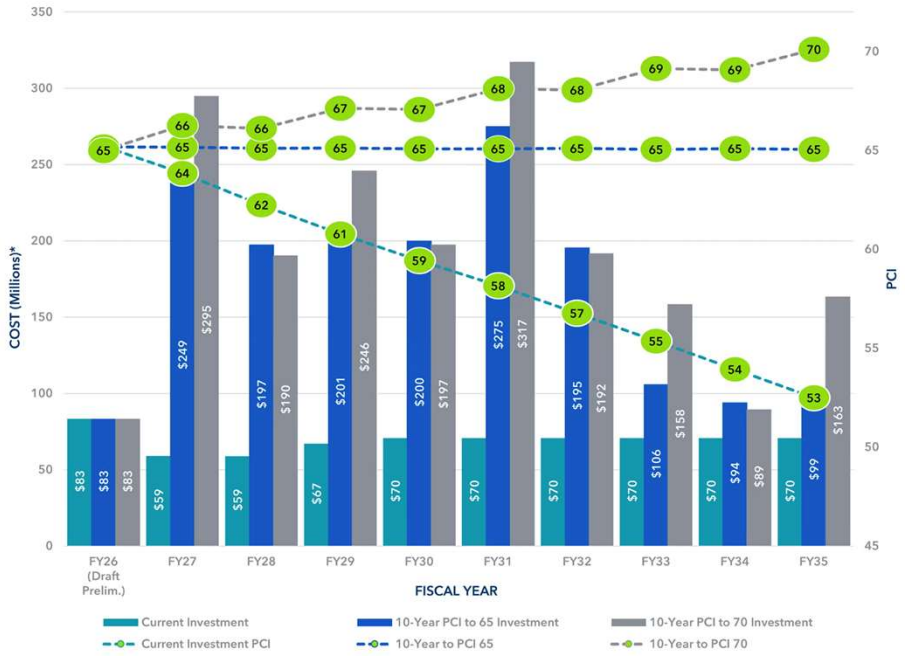







# Time-Distance Diagram

# Pavement Investment Scenarios

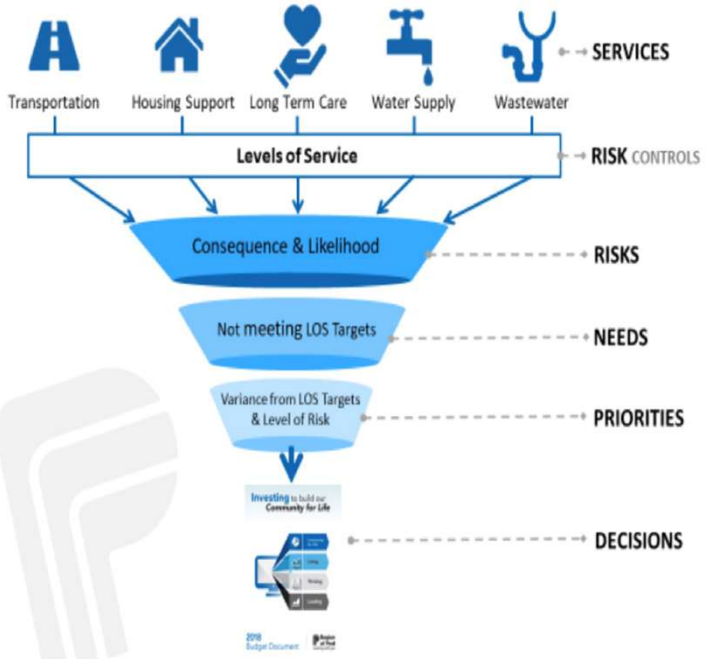









# Asset Management Strategy for a Municipality



# Emphasize the Message You are Trying to Communicate



"The best visualization doesn't show everything—it highlights what matters most. Clarity comes from focus, not complexity."

"Clarity in visualization comes from focus. Emphasizing the central message helps decision-makers cut through the noise."



# Asset Condition Reporting

| Asset Class/Asset | Inventory Status | Replacement Value ($M) | Current Value ($M) | Data Confidence | Condition: Good | Fair | Poor | Unk. |
|---|---|---|---|---|---|---|---|---|
| **BIKE & PEDESTRIAN SYSTEM** | | **$9,684.0** | | | | | | |
| Bicycle Facilities | 141.5 miles | $71.8 | | Medium | | | | |
| Bicycle Racks | 3,953 | $2.4 | $1.8 | Med-High | 86.2% | 1.0% | 0.4% | 12.3% |
| Kiosk | 150 (e) | $1.3 | $0.7 | Low | | | | 100% |
| Marked Crosswalks | 5,649 | $3.7 | $2.5 | Med-High | 72.4% | 11.7% | 13.8% | 2.1% |
| Sidewalks | 34,425 blocks | $9,404.4 | $5.6 | High | ** | ** | ** | ** |
| Stairways | 497 | $73.3 | $51.7 | High | 70.1% | 28.6% | 1.3% | |
| Street Furnishings | 1,039 | $3.0 | $1.5 | Medium | | | | 100% |
| Trails | 47 lane miles | $124.1 | $62.0 | Medium | | | | 100% |
| **BRIDGES & STRUCTURES** | | **$8,710.4** | | | | | | |
| Air Raid Siren Tower | 1 | $0.5 | $0.3 | High | | 100% | | N/A |
| Areaway Street Walls | 236 | $194.4 | $119.6 | Medium | ** | ** | ** | ** |
| Bridges | 122 | $7,143.5 | $3,580.4 | High | ** | ** | ** | ** |
| Bridge Hydrant Vaults | 18 | $5.2 | $4.1 | Medium | 17.1% | 53.1% | 29.8% | |
| Elevator | 2 | $3.0 | $2.4 | High | 100% | | | |
| Retaining Walls | 606 | $1,361.2 | $855.1 | Medium | ** | ** | ** | ** |
| Tunnel | 1 | $2.6 | $1.3 | High | | 100% | | |

# Better or Worse?

| Asset Class/Asset | Inventory Status | Replacement Value ($M) | Condition: Good | Fair | Poor |
|---|---|---|---|---|---|
| **BIKE & PEDESTRIAN SYSTEM** | | **$9,684.0** | | | |
| Bicycle Facilities | 141.5 miles | $71.8 | | | |
| Bicycle Racks | 3,953 | $2.4 | 86.2% | 1.0% | 0.4% |
| Kiosk | 150 (e) | $1.3 | | | |
| Marked Crosswalks | 5,649 | $3.7 | 72.4% | 11.7% | 13.8% |
| Sidewalks | 34,425 blocks | $9,404.4 | ** | ** | ** |
| Stairways | 497 | $73.3 | 70.1% | 28.6% | 1.3% |
| Street Furnishings | 1,039 | $3.0 | | | |
| Trails | 47 lane miles | $124.1 | | | |
| **BRIDGES & STRUCTURES** | | **$8,710.4** | | | |
| Air Raid Siren Tower | 1 | $0.5 | | 100% | |
| Areaway Street Walls | 236 | $194.4 | ** | ** | ** |
| Bridges | 122 | $7,143.5 | ** | ** | ** |
| Bridge Hydrant Vaults | 18 | $5.2 | 17.1% | 53.1% | 29.8% |
| Elevator | 2 | $3.0 | 100% | | |
| Retaining Walls | 606 | $1,361.2 | ** | ** | ** |
| Tunnel | 1 | $2.6 | | 100% | |



# Better or Worse?

| Asset Class/Asset | Condition: Good | Fair | Poor |
|---|---|---|---|
| **BIKE & PEDESTRIAN SYSTEM** | | | |
| Bicycle Facilities | | | |
| Bicycle Racks | 86.2% | 1.0% | 0.4% |
| Kiosk | | | |
| Marked Crosswalks | 72.4% | 11.7% | 13.8% |
| Sidewalks | ** | ** | ** |
| Stairways | 70.1% | 28.6% | 1.3% |
| Street Furnishings | | | |
| Trails | | | |
| **BRIDGES & STRUCTURES** | | | |
| Air Raid Siren Tower | | 100% | |
| Areaway Street Walls | ** | ** | ** |
| Bridges | ** | ** | ** |
| Bridge Hydrant Vaults | 17.1% | 53.1% | 29.8% |
| Elevator | 100% | | |
| Retaining Walls | ** | ** | ** |
| Tunnel | | 100% | |

# Better or Worse?

| Asset Class/Asset | Condition: Good | Fair | Poor |
|---|---|---|---|
| **BIKE & PEDESTRIAN SYSTEM** | | | |
| Bicycle Racks | 86.2% | 1.0% | 0.4% |
| Marked Crosswalks | 72.4% | 11.7% | 13.8% |
| Sidewalks | ** | ** | ** |
| Stairways | 70.1% | 28.6% | 1.3% |
| **BRIDGES & STRUCTURES** | | | |
| Air Raid Siren Tower | | 100% | |
| Bridge Hydrant Vaults | 17.1% | 53.1% | 29.8% |
| Elevator | 100% | | |
| Tunnel | | 100% | |



# Create a Narrative from the Data

“Data becomes powerful when arranged into a story. A clear narrative turns disconnected facts into insights that drive action.”



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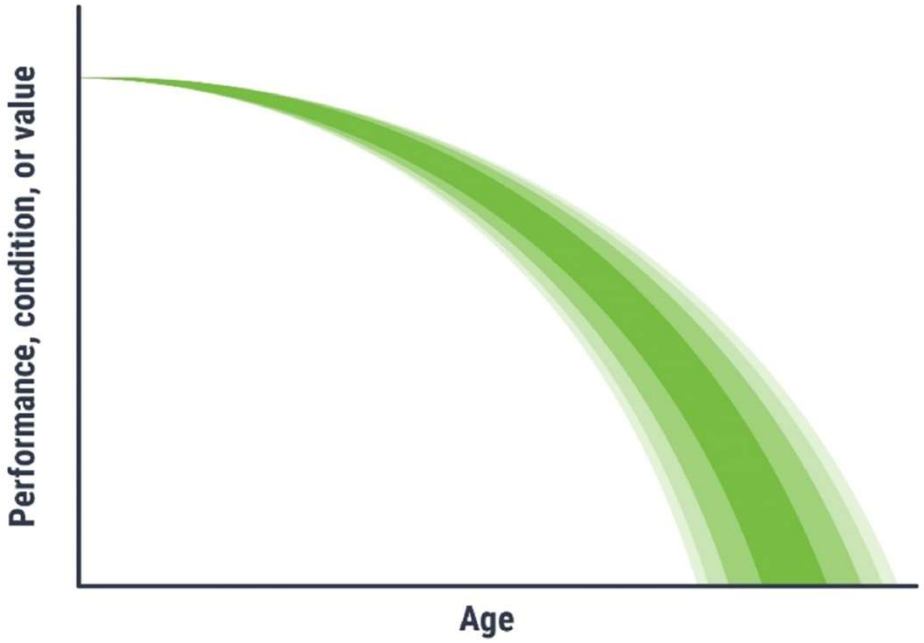
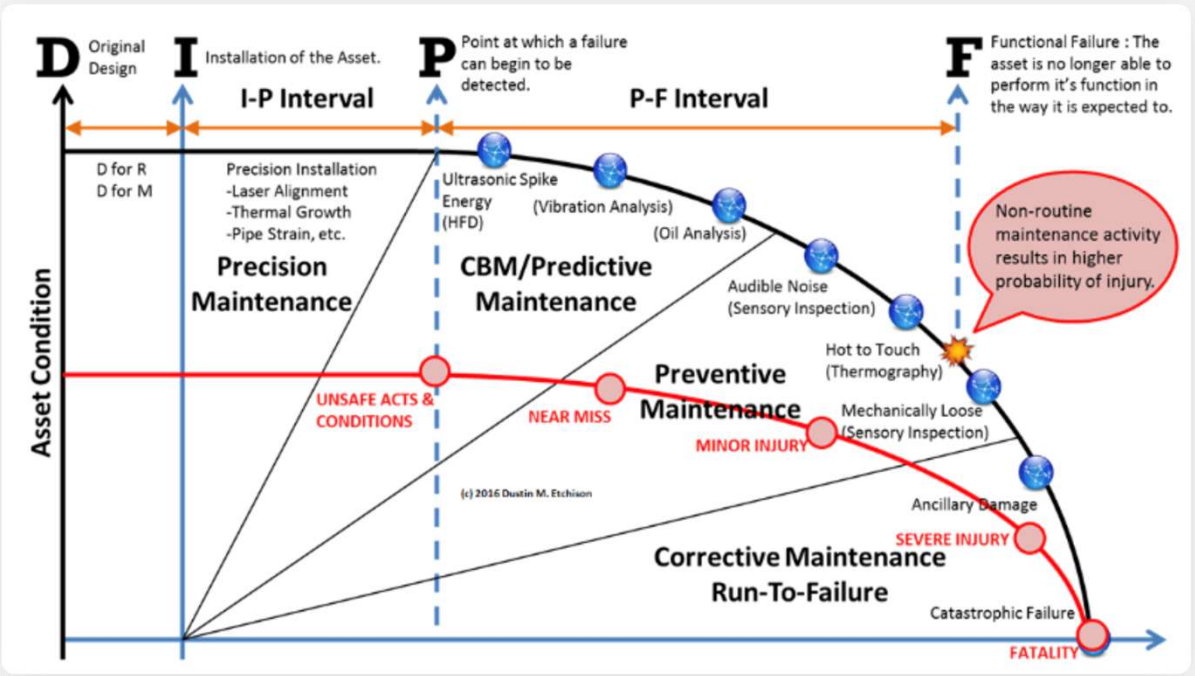
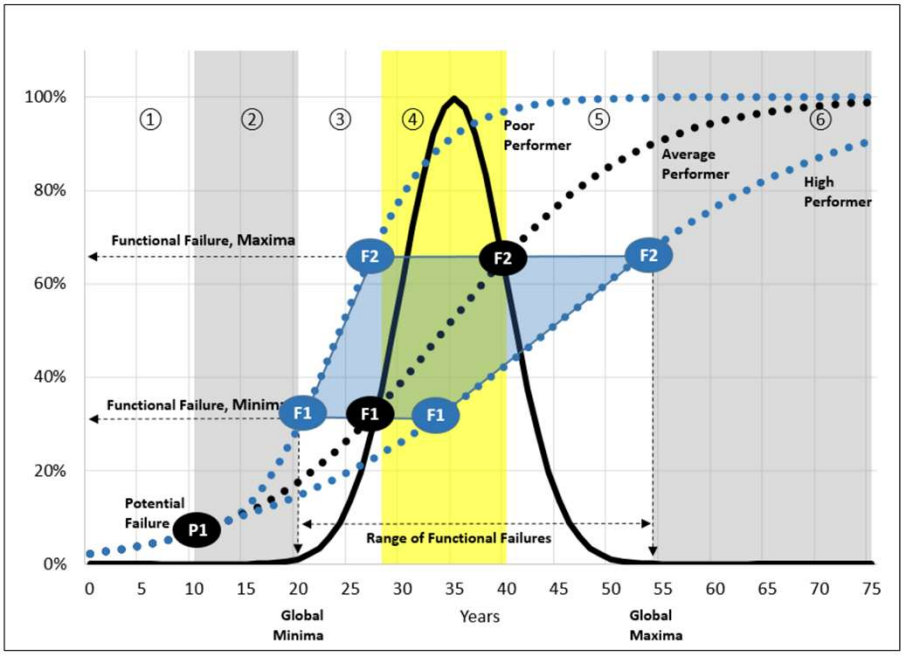


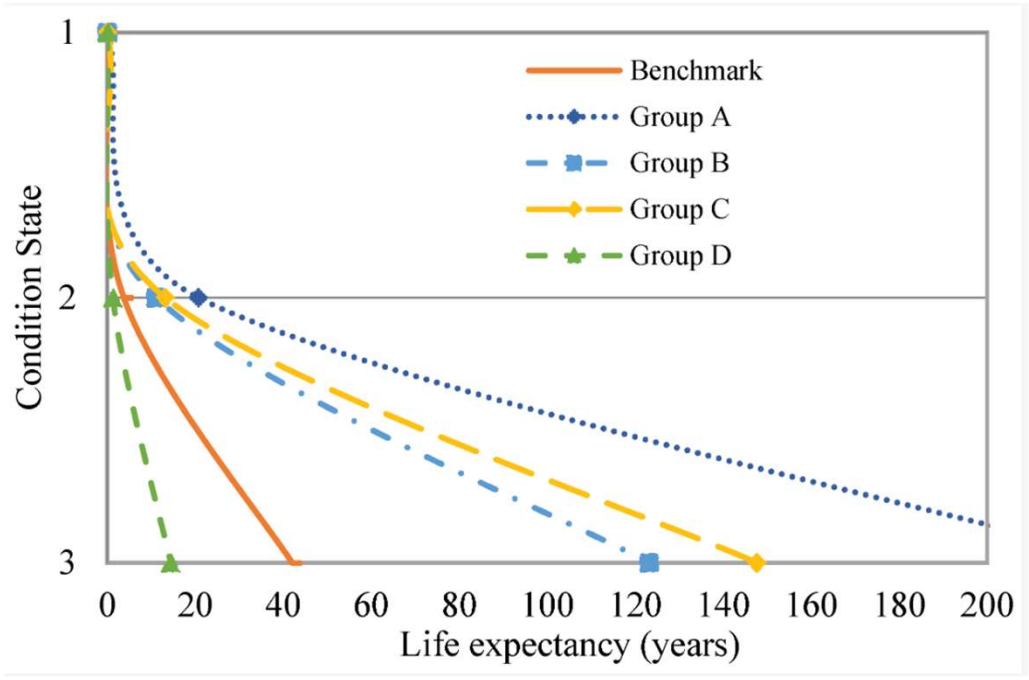



30


D
Original Design
I
Installation of the Asset.
P
Point at which a failure can begin to be detected.
F
Functional Failure : The asset is no longer able to perform it's function in the way it is expected to.
I-P Interval
P-F Interval
Asset Condition
D for R
D for M
Precision Installation
-Laser Alignment
-Thermal Growth
-Pipe Strain, etc.
Precision Maintenance
Ultrasonic Spike Energy (HFD)
(Vibration Analysis)
(Oil Analysis)
CBM/Predictive Maintenance
Audible Noise (Sensory Inspection)
Hot to Touch (Thermography)
Non-routine maintenance activity results in higher probability of injury.
UNSAFE ACTS & CONDITIONS
NEAR MISS
Preventive Maintenance
Mechanically Loose (Sensory Inspection)
MINOR INJURY
(c) 2016 Dustin M. Etchison
Ancillary Damage
SEVERE INJURY
Corrective Maintenance
Run-To-Failure
Catastrophic Failure
FATALITY



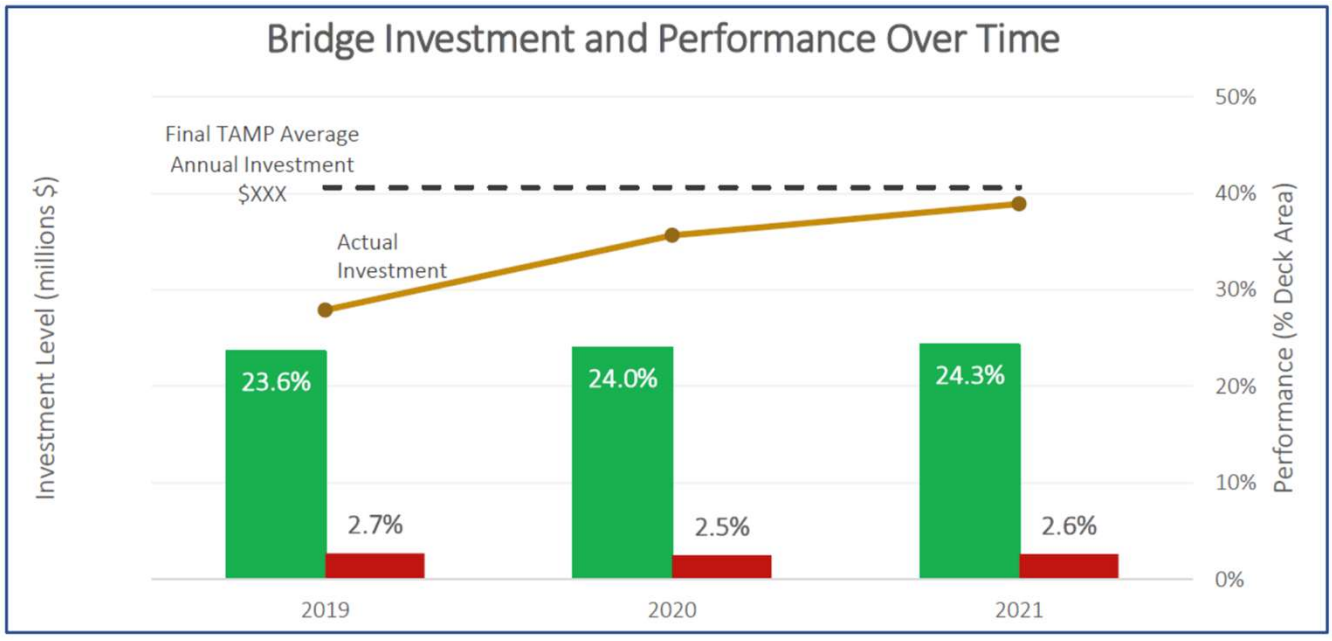

100%
80%
60%
40%
20%
0%
① ② ③ ④ ⑤ ⑥
Poor Performer
Average Performer
High Performer
Functional Failure, Maxima
Functional Failure, Minima
F2
F1
Potential Failure
P1
Range of Functional Failures
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
Years
Global Minima
Global Maxima


1
2
3
Condition State
Benchmark
Group A
Group B
Group C
Group D
0
20
40
60
80
100
120
140
160
180
200
Life expectancy (years)

33



33


Bridge Investment and Performance Over Time
Final TAMP Average Annual Investment
$XXX
Actual Investment
Investment Level (millions $)
Performance (% Deck Area)
50%
40%
30%
20%
10%
0%
23.6%
2.7%
24.0%
2.5%
24.3%
2.6%
2019
2020
2021

34

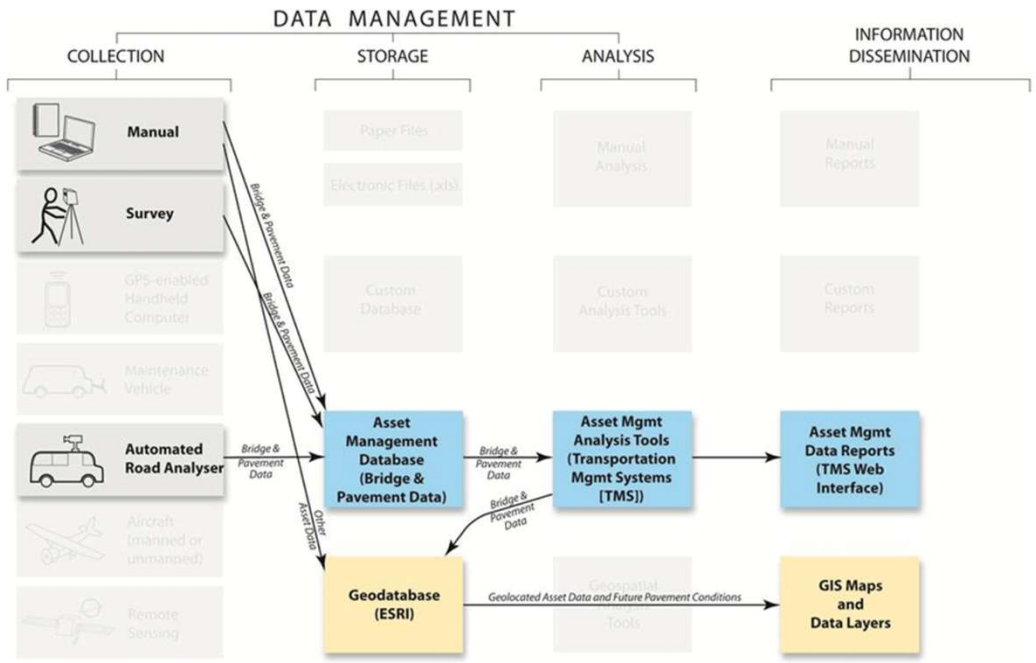


34

# Use Visual Ques Effectively



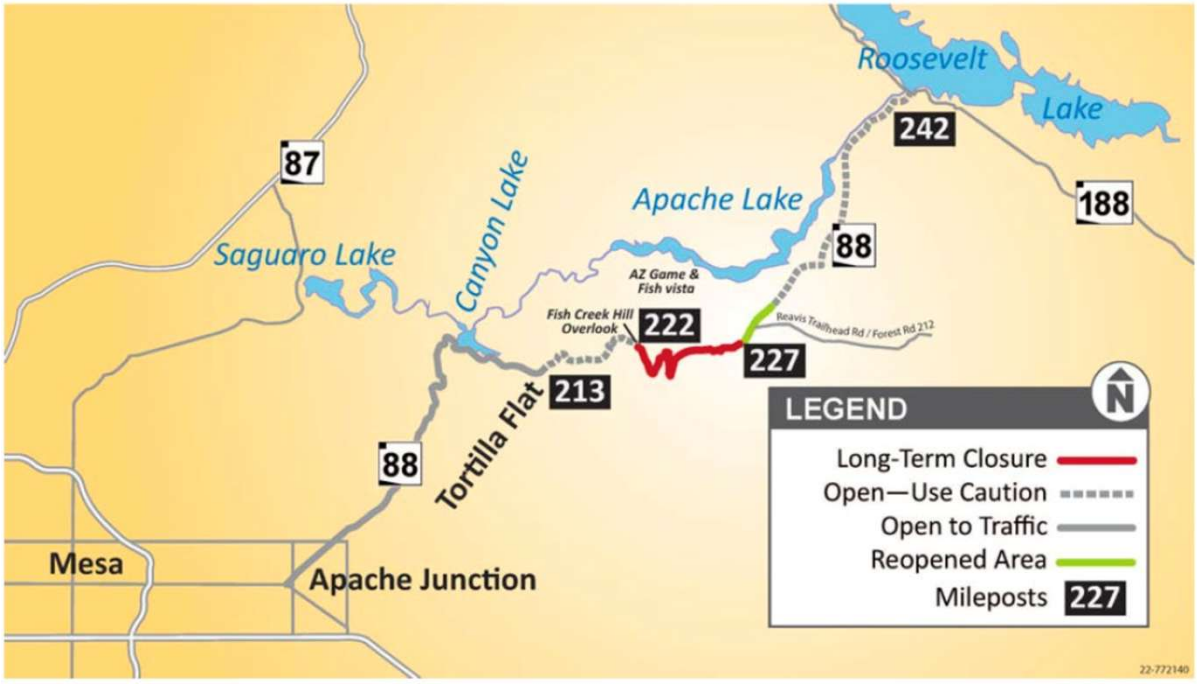
"The right visual cues make complex data intuitive. They show viewers where to look, what to compare, and what matters most."


DATA MANAGEMENT
COLLECTION
STORAGE
ANALYSIS
INFORMATION DISSEMINATION
Manual
Survey
GPS-enabled Handheld Computer
Maintenance Vehicle
Automated Road Analyser
Aircraft (manned or unmanned)
Remote Sensing
Paper Files
Electronic Files (.xls)
Custom Database
Manual Analysis
Custom Analysis Tools
Manual Reports
Custom Reports
Bridge & Pavement Data
Other Asset Data
Asset Management Database (Bridge & Pavement Data)
Asset Mgmt Analysis Tools (Transportation Mgmt Systems [TMS])
Asset Mgmt Data Reports (TMS Web Interface)
Geodatabase (ESRI)
Geolocated Asset Data and Future Pavement Conditions
GIS Maps and Data Layers

37



37


Roosevelt Lake
87
242
188
Apache Lake
Canyon Lake
Saguaro Lake
88
AZ Game & Fish vista
Fish Creek Hill Overlook
222
227
Reavis Trailhead Rd / Forest Rd 212
213
Tortilla Flat
88
Mesa
Apache Junction
LEGEND
Long-Term Closure
Open—Use Caution
Open to Traffic
Reopened Area
Mileposts 227
N
22-772140

38



38



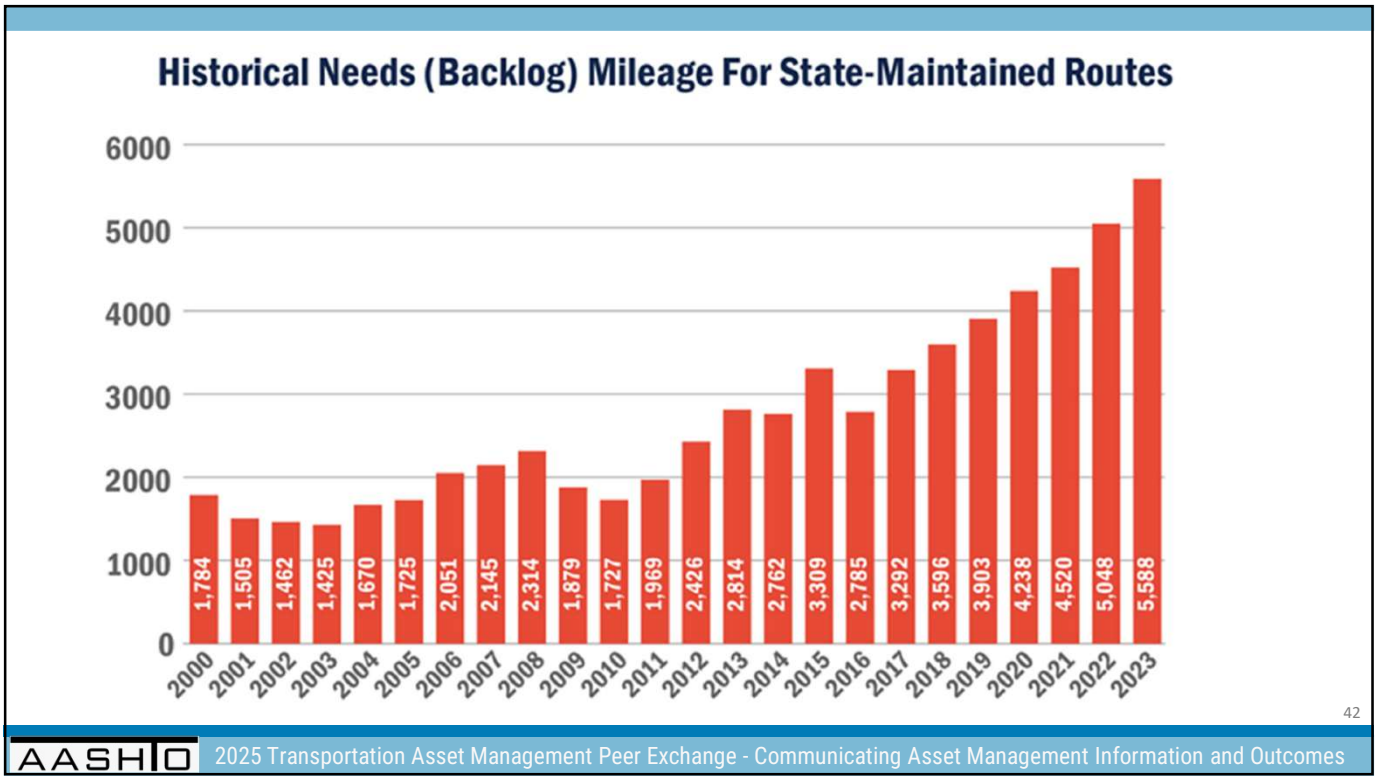

# Present Information Clearly

"Clear visuals reduce complexity. When the presentation is straightforward, decision-makers can focus on meaning, not mechanics."

41



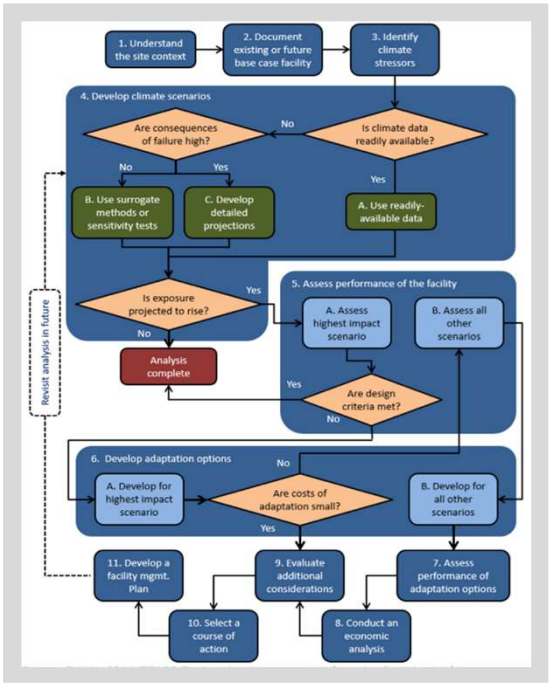
41

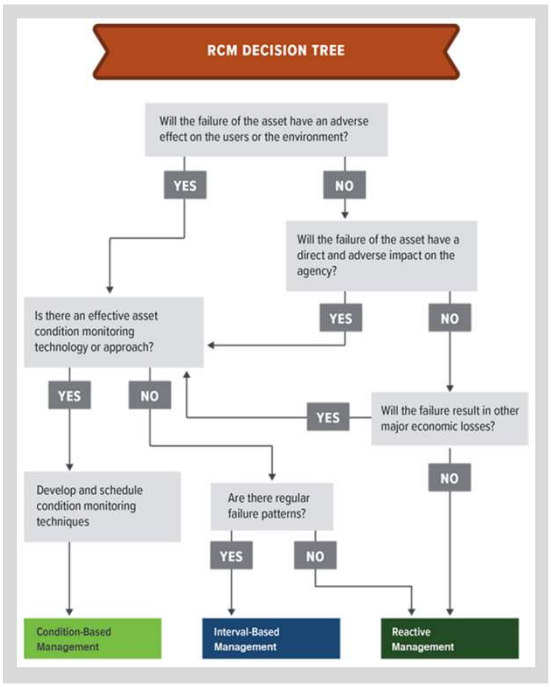



42

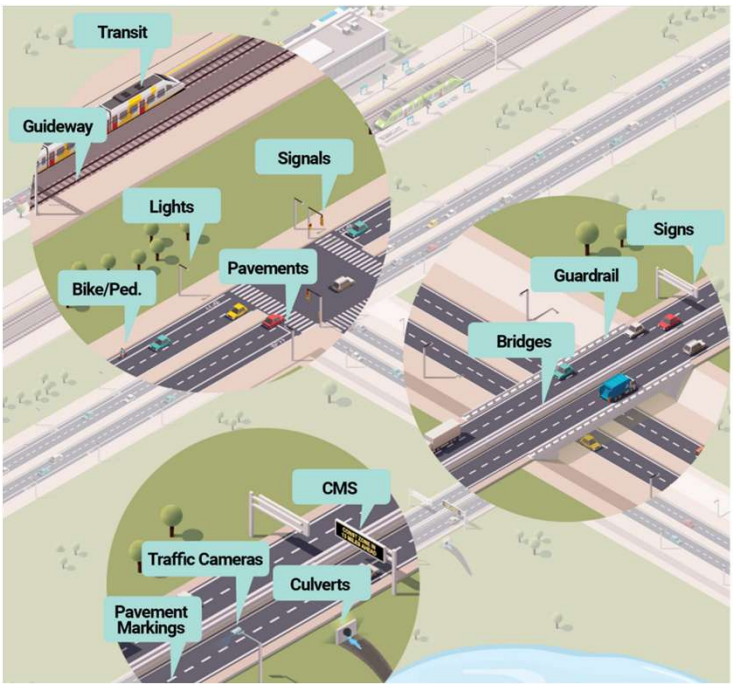


42


1. Understand the site context
2. Document existing or future base case facility
3. Identify climate stressors
4. Develop climate scenarios
Are consequences of failure high?
No
Is climate data readily available?
No
Yes
Yes
B. Use surrogate methods or sensitivity tests
C. Develop detailed projections
A. Use readily-available data
Is exposure projected to rise?
Yes
No
5. Assess performance of the facility
A. Assess highest impact scenario
B. Assess all other scenarios
Analysis complete
Yes
Are design criteria met?
No
Revisit analysis in future
6. Develop adaptation options
No
A. Develop for highest impact scenario
Are costs of adaptation small?
B. Develop for all other scenarios
Yes
11. Develop a facility mgmt. Plan
9. Evaluate additional considerations
7. Assess performance of adaptation options
10. Select a course of action
8. Conduct an economic analysis


RCM DECISION TREE
Will the failure of the asset have an adverse effect on the users or the environment?
YES
NO
Will the failure of the asset have a direct and adverse impact on the agency?
YES
NO
Is there an effective asset condition monitoring technology or approach?
YES
NO
YES
Will the failure result in other major economic losses?
NO
Develop and schedule condition monitoring techniques
Are there regular failure patterns?
YES
NO
Condition-Based Management
Interval-Based Management
Reactive Management

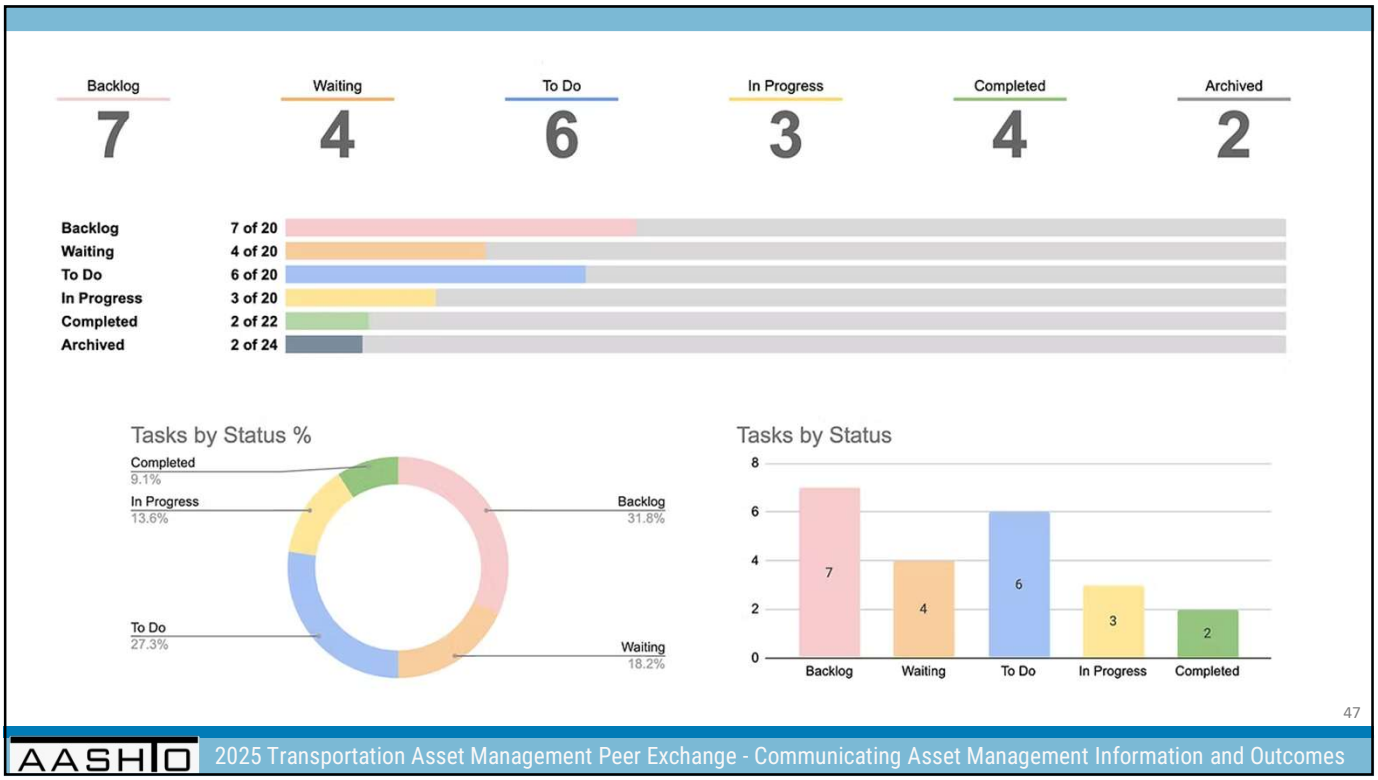



Transit
Guideway
Signals
Lights
Pavements
Bike/Ped.
Signs
Guardrail
Bridges
CMS
Traffic Cameras
Culverts
Pavement Markings

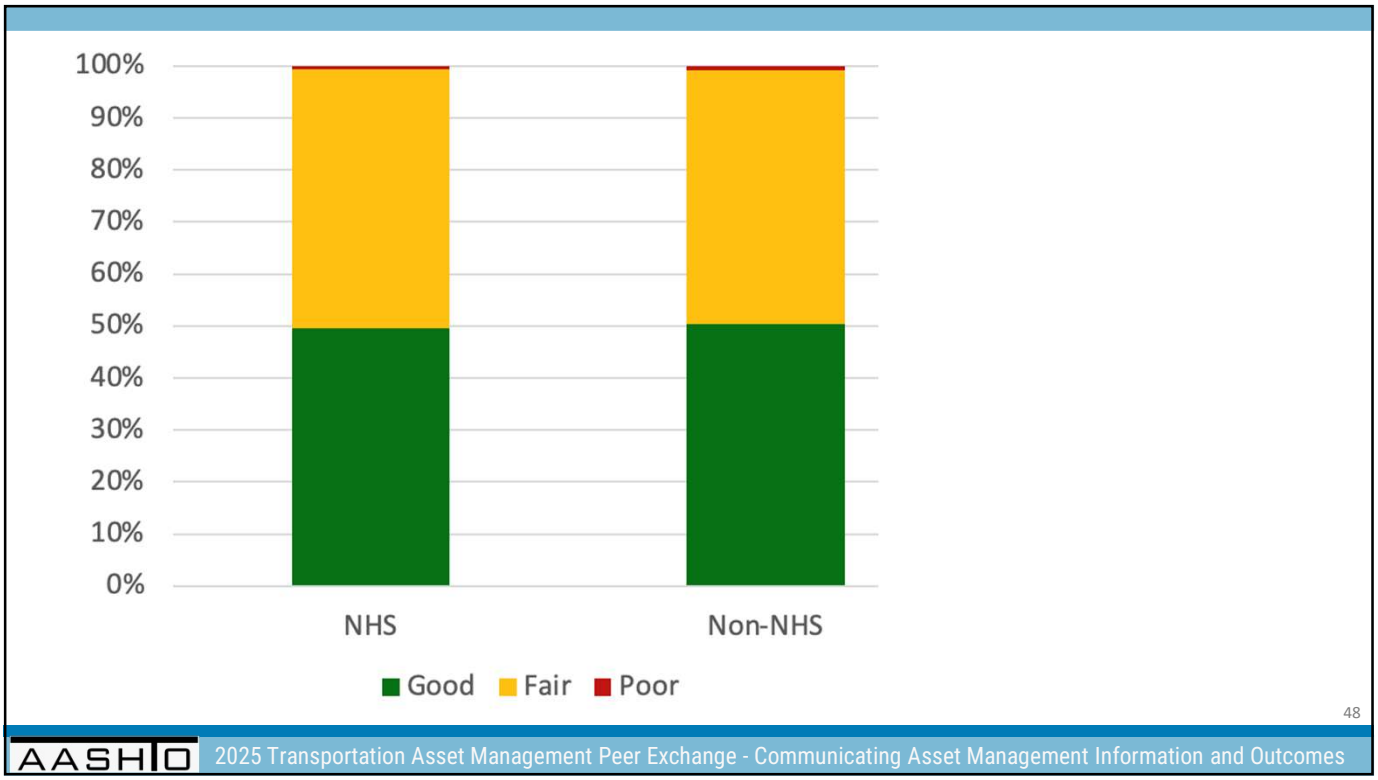
# Select the Proper Graphic Formats



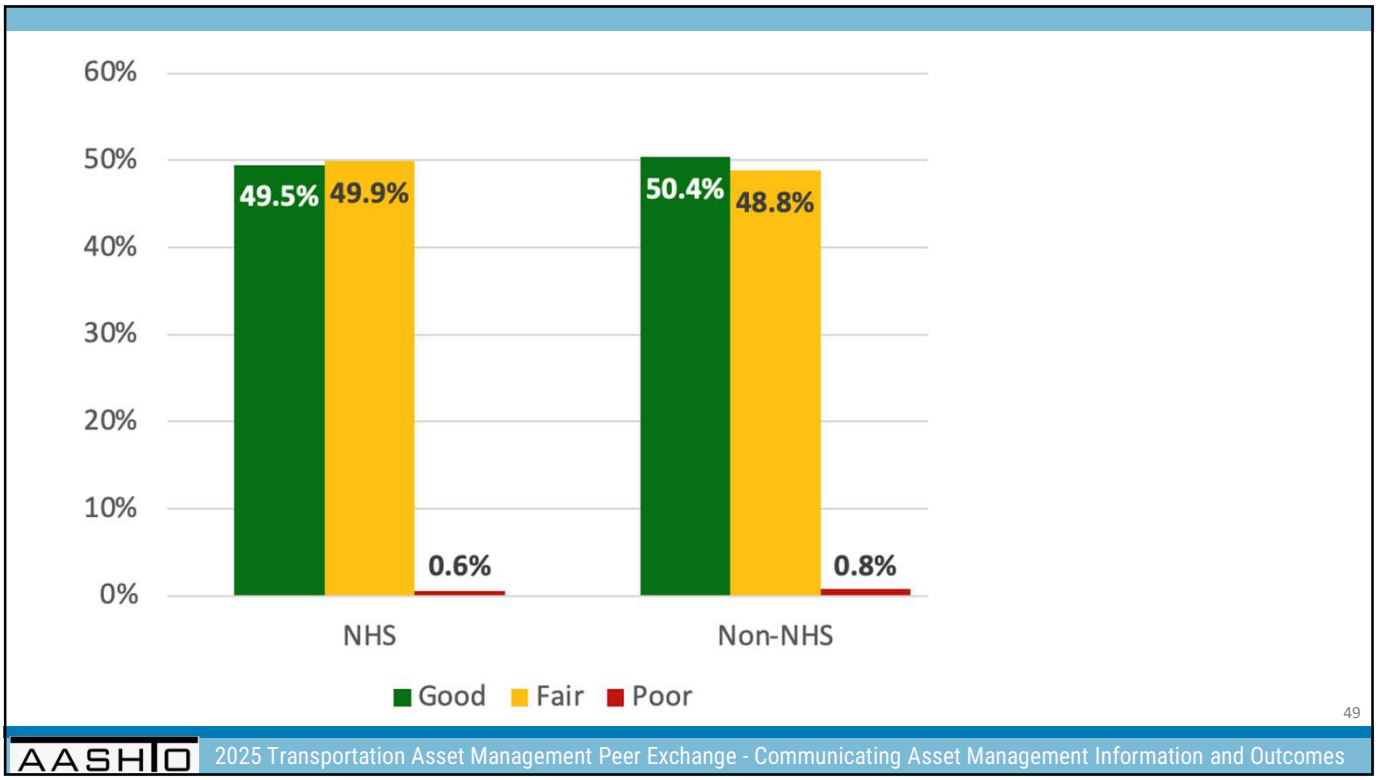
"Choosing the proper format is as important as the data itself. The wrong graphic confuses; the right one clarifies."


Backlog
7
Waiting
4
To Do
6
In Progress
3
Completed
4
Archived
2
Backlog 7 of 20
Waiting 4 of 20
To Do 6 of 20
In Progress 3 of 20
Completed 2 of 22
Archived 2 of 24
Tasks by Status %
Completed 9.1%
In Progress 13.6%
To Do 27.3%
Backlog 31.8%
Waiting 18.2%
Tasks by Status
8
6
4
2
0
7
4
6
3
2
Backlog
Waiting
To Do
In Progress
Completed
47
AASHTO
2025 Transportation Asset Management Peer Exchange - Communicating Asset Management Information and Outcomes

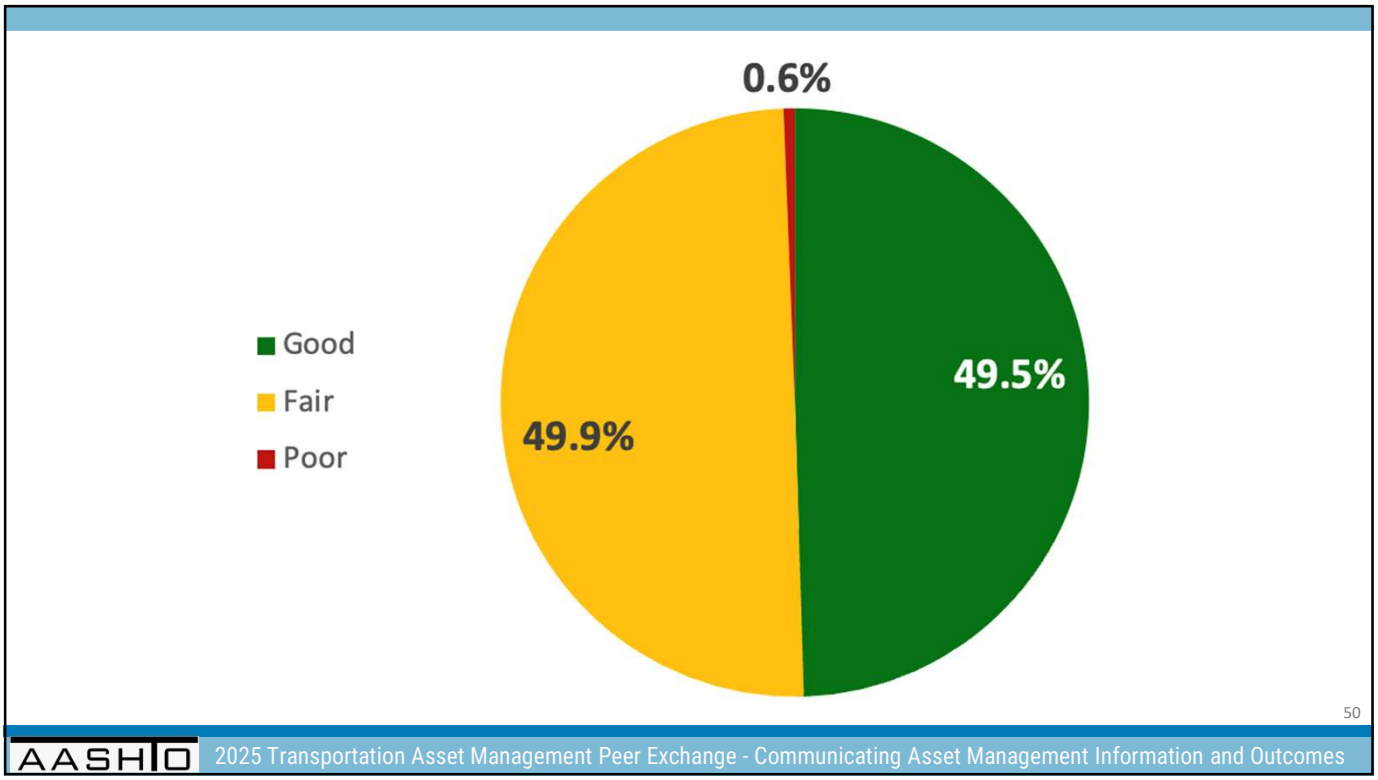
47


100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
NHS
Non-NHS
Good
Fair
Poor
48
AASHTO
2025 Transportation Asset Management Peer Exchange - Communicating Asset Management Information and Outcomes

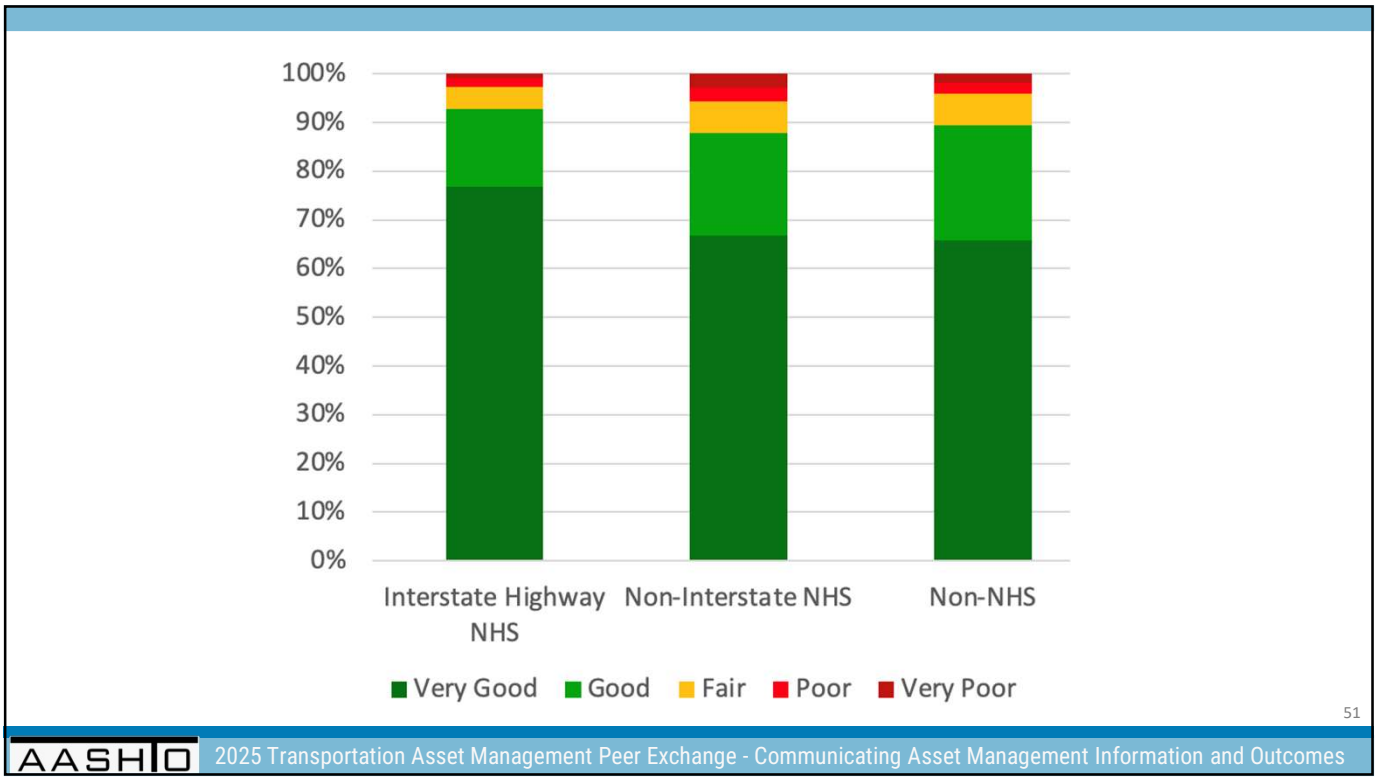
48


60%
50%
40%
30%
20%
10%
0%
49.5%
49.9%
0.6%
50.4%
48.8%
0.8%
NHS
Non-NHS
Good
Fair
Poor
49
AASHTO
2025 Transportation Asset Management Peer Exchange - Communicating Asset Management Information and Outcomes

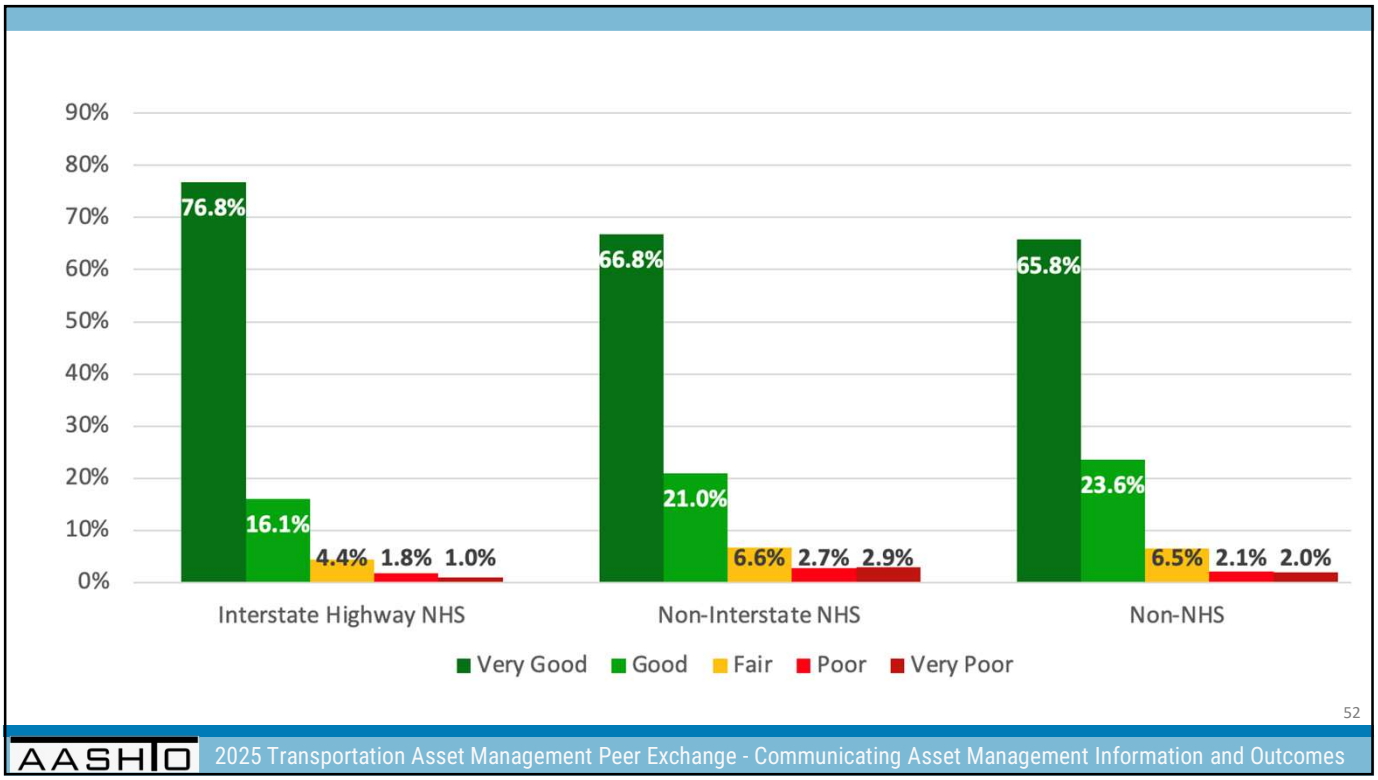
49


0.6%
Good
Fair
Poor
49.5%
49.9%
50
AASHTO
2025 Transportation Asset Management Peer Exchange - Communicating Asset Management Information and Outcomes

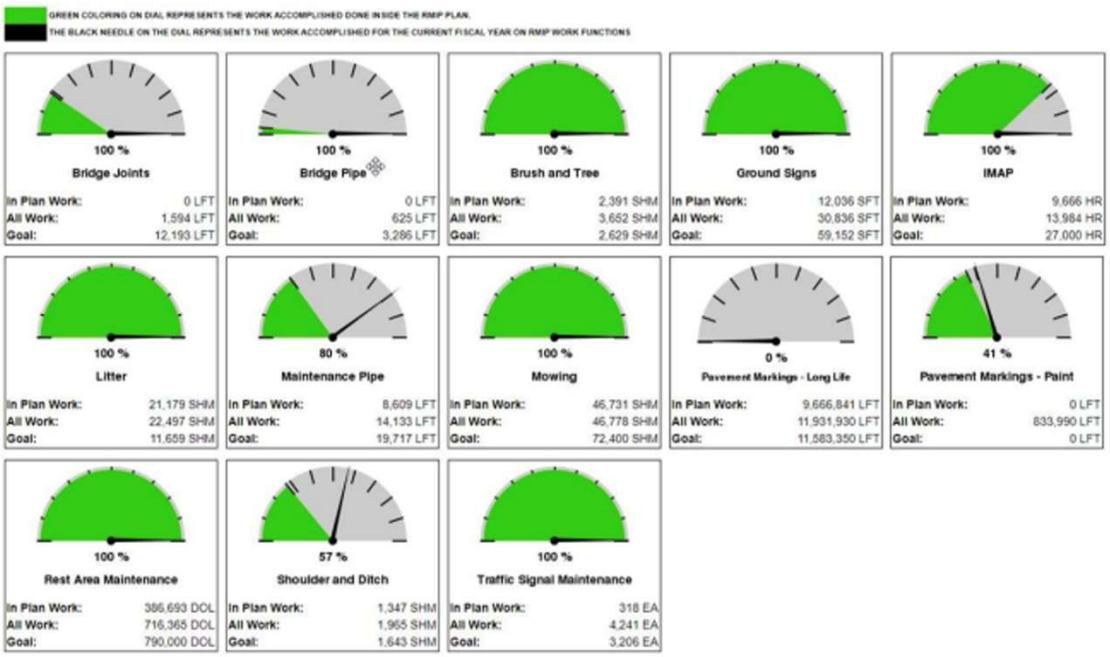
50


100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Interstate Highway NHS
Non-Interstate NHS
Non-NHS
Very Good
Good
Fair
Poor
Very Poor
51
AASHTO
2025 Transportation Asset Management Peer Exchange - Communicating Asset Management Information and Outcomes

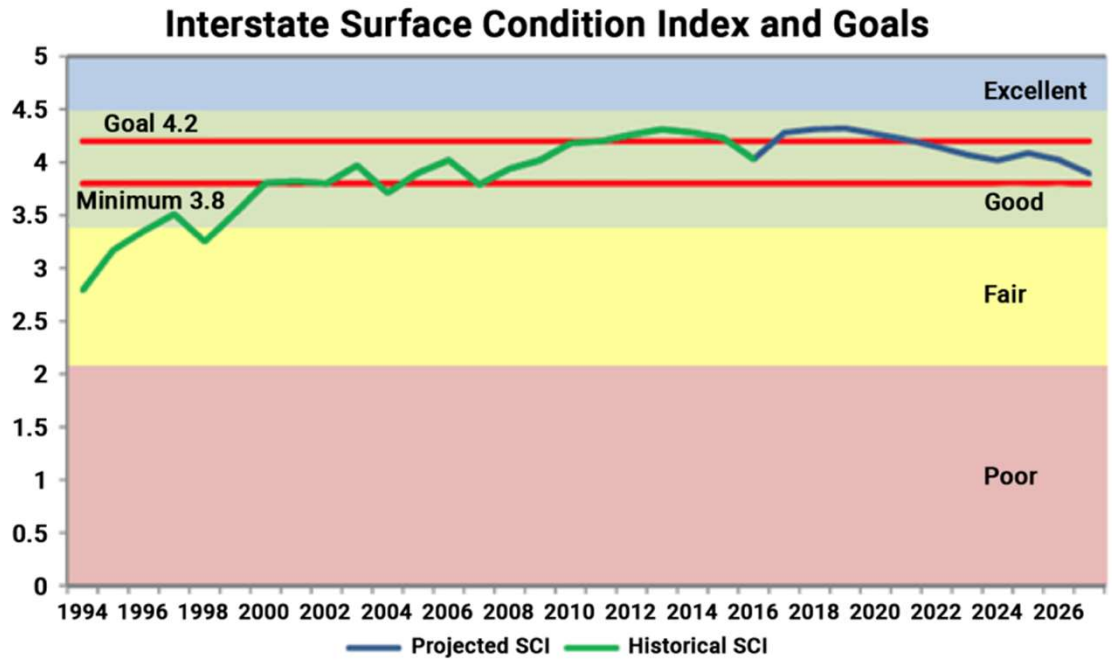
51


90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
76.8%
16.1%
4.4%
1.8%
1.0%
66.8%
21.0%
6.6%
2.7%
2.9%
65.8%
23.6%
6.5%
2.1%
2.0%
Interstate Highway NHS
Non-Interstate NHS
Non-NHS
Very Good
Good
Fair
Poor
Very Poor
52
AASHTO
2025 Transportation Asset Management Peer Exchange - Communicating Asset Management Information and Outcomes

52


GREEN COLORING ON DIAL REPRESENTS THE WORK ACCOMPLISHED DONE INSIDE THE RMP PLAN.
THE BLACK NEEDLE ON THE DIAL REPRESENTS THE WORK ACCOMPLISHED FOR THE CURRENT FISCAL YEAR ON RMP WORK FUNCTIONS
100 %
Bridge Joints
In Plan Work: 0 LFT
All Work: 1,594 LFT
Goal: 12,193 LFT
100 %
Bridge Pipe
In Plan Work: 0 LFT
All Work: 625 LFT
Goal: 3,286 LFT
100 %
Brush and Tree
In Plan Work: 2,391 SHM
All Work: 3,652 SHM
Goal: 2,629 SHM
100 %
Ground Signs
In Plan Work: 12,036 SFT
All Work: 30,836 SFT
Goal: 59,152 SFT
100 %
IMAP
In Plan Work: 9,666 HR
All Work: 13,984 HR
Goal: 27,000 HR
100 %
Litter
In Plan Work: 21,179 SHM
All Work: 22,497 SHM
Goal: 11,659 SHM
80 %
Maintenance Pipe
In Plan Work: 8,609 LFT
All Work: 14,133 LFT
Goal: 19,717 LFT
100 %
Mowing
In Plan Work: 45,731 SHM
All Work: 46,778 SHM
Goal: 72,400 SHM
0 %
Pavement Markings - Long Life
In Plan Work: 9,666,841 LFT
All Work: 11,931,930 LFT
Goal: 11,583,350 LFT
41 %
Pavement Markings - Paint
In Plan Work: 0 LFT
All Work: 833,990 LFT
Goal: 0 LFT
100 %
Rest Area Maintenance
In Plan Work: 386,693 DOL
All Work: 716,365 DOL
Goal: 790,000 DOL
57 %
Shoulder and Ditch
In Plan Work: 1,347 SHM
All Work: 1,965 SHM
Goal: 1,643 SHM
100 %
Traffic Signal Maintenance
In Plan Work: 318 EA
All Work: 4,241 EA
Goal: 3,206 EA

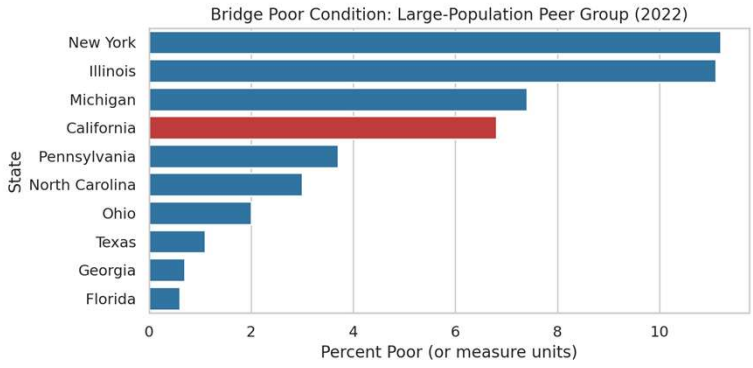


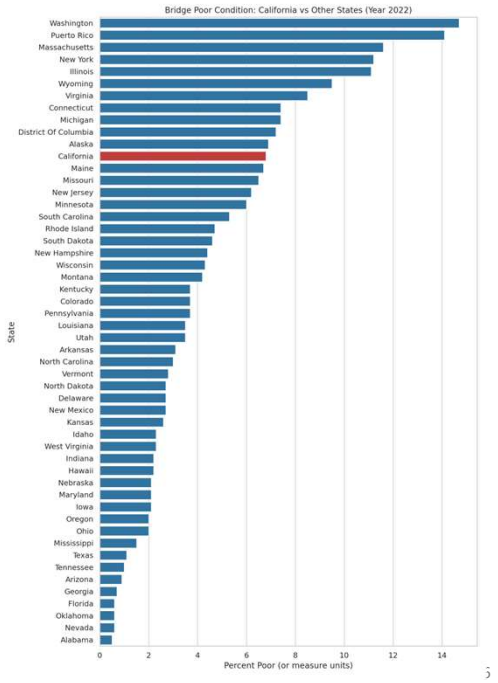

Interstate Surface Condition Index and Goals
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Goal 4.2
Minimum 3.8
Excellent
Good
Fair
Poor
1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024 2026
Projected SCI
Historical SCI

# “Artificial Intelligence Tools Can Help”



# AI Generated Visualizations



# Closing

We react to the design or aesthetic of a visualization as much as we do the content

Emphasize the message we are trying to communicate to our audience

We present the minimum amount of information necessary to understand the message

Use good techniques for color, contrast, fonts and format

**We will be able to create effective visualizations**





# Session A – Elements of Good Visualizations and Communications

## Colorado Video

# Session B — Communicating Asset Inventory and Condition Information



2025 Transportation Asset Management Peer Exchange
Communicating Asset Management Information and Outcomes

**Session B — Communicating Asset Inventory and Condition Information**

- Caltrans – Mike Johnson
- Florida DOT – Regina Colson & Rolando Valdes
- Minnesota DOT – Michael Cremin
- New Hampshire DOT – Nicholas Alexander
- Ohio DOT – Amy Code
- West Virginia DOT – Gehan Elsayed

# Session C — Communicating Asset Risks



2025 Transportation Asset Management Peer Exchange
Communicating Asset Management Information and Outcomes

## Session C — Communicating Asset Risks

- Delaware DOT – Alicia Howard, Jamie Kavelak & Deirdre Wallace
- Michigan DOT – Brad Sharlow

# Session D — Explaining Investment Decisions



2025 Transportation Asset Management Peer Exchange
Communicating Asset Management Information and Outcomes

**Session D — Explaining Investment Decisions**

- Ohio DOT – Michael Weakley
- Georgia DOT – Alma Mujkanovic
- Nebraska DOT – Walter Moy
- Minnesota DOT – Shaker Raban

# Session E — Good Communications Exercise (Small Groups)





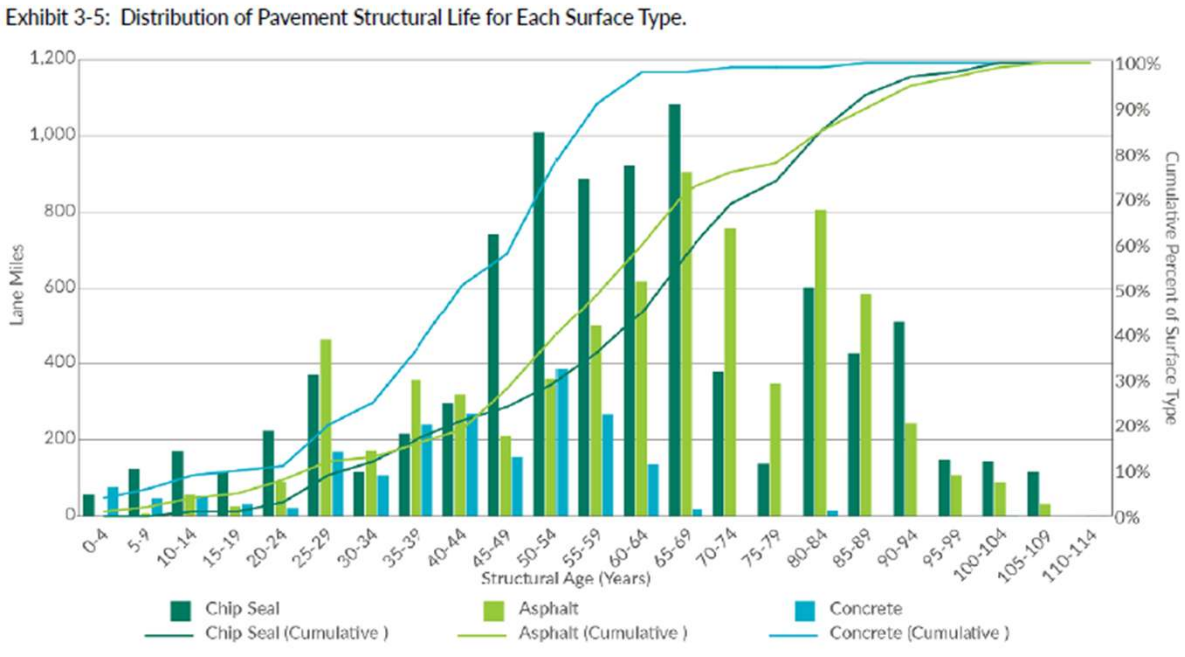
## Exercise Instructions

1. Each table will be given some information from a published TAMP to use for the exercise
2. Working together you are to develop key talking points
3. Provide suggestions of how the presentation of information could be improved
4. Suggest alternative graphics to better convey the message if appropriate
5. Each table will be given 5 minutes to report out on their results with the broader group… be thinking about your table spokesperson

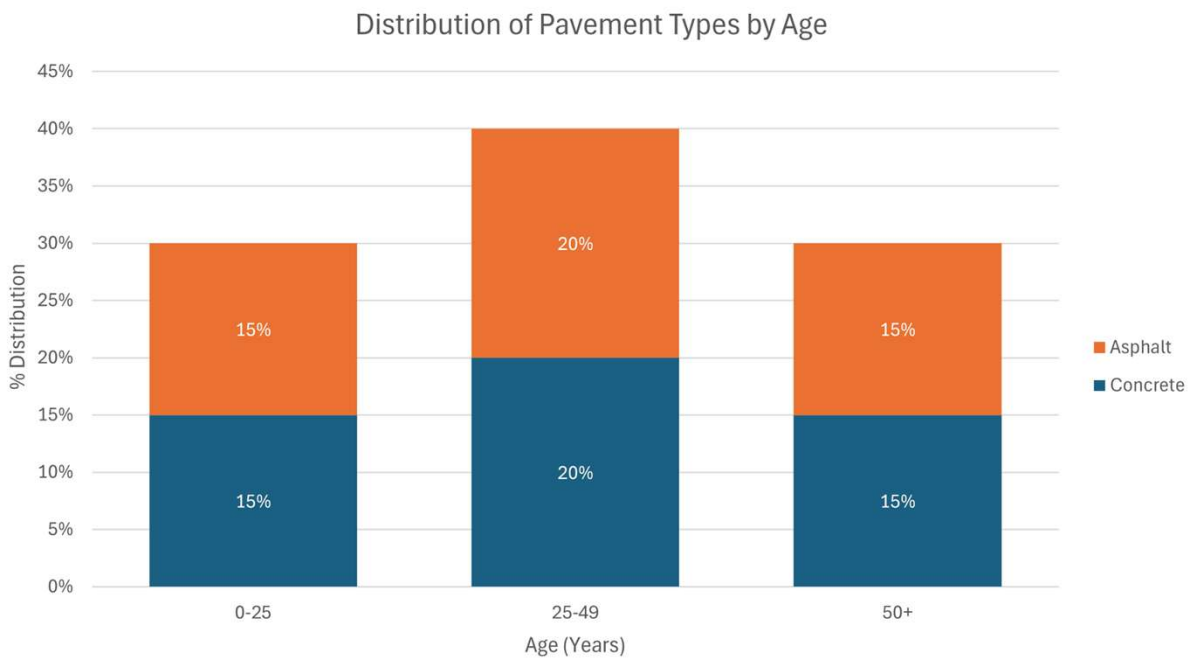
# Each group must start with the visual label that matches their group label.



A



A




69



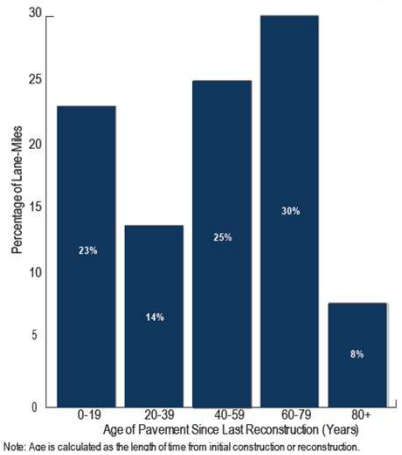
69

B

| SYSTEM / FUNCTIONAL CLASSIFICATION | FLEXIBLE ROADWAY MILES | RIGID ROADWAY MILES | TOTAL ROADWAY MILES | TOTAL LANE-MILES | REPLACEMENT VALUE |
|---|---|---|---|---|---|
| Interstate | 925 | 896 | 1,821 | 4,036 | $4.04 billion |
| Other NHS | 4,660 | 1,114 | 5,774 | 11,759 | $11.76 billion |
| Non-NHS | 6,569 | 167 | 6,736 | 13,567 | $13.57 billion |
| **TOTAL** | **12,154** | **2,177** | **14,331** | **29,362** | **$29.36 billion** |

Note: Interstate and Other NHS do not include locally owned NHS roadways (see Figure 2-8). Replacement Value based on $1 million per lane-mile. Current value is based on Road Quality Index of pavements. See Figure 4-2 for current asset valuation.

Figure 4-7: Pavement Age Profile Since Last Reconstruction (by lane-mile)




Note: Age is calculated as the length of time from initial construction or reconstruction.

70



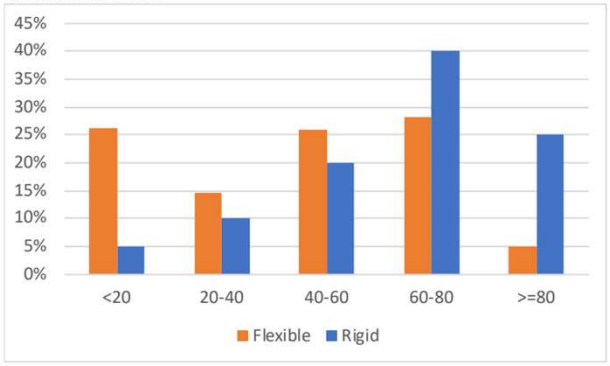
70

B

PAVEMENT INVENTORY SUMMARY

| On/Off NHS | | Lane Miles | % Flexible | % Rigid |
|---|---|---|---|---|
| On | Interstate | 4,036.0 | 51% | 49% |
| | Non-Interstate NHS | 11,759.0 | 81% | 19% |
| | *Subtotal, NHS* | *15,795.0* | *74%* | *26%* |
| Off | *Subtotal, Non-NHS* | *13,567.0* | *98%* | *2%* |
| **Total** | | **29,362.0** | **85%** | **15%** |

AGE DISTRIBUTION




71



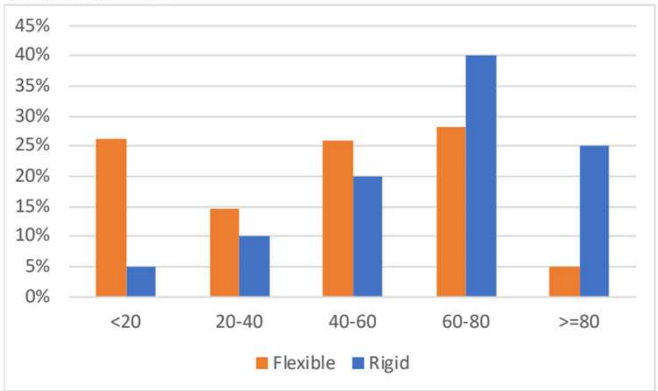
71

B

PAVEMENT INVENTORY SUMMARY

| On/Off NHS | | Lane Miles | % Flexible | % Rigid |
|---|---|---|---|---|
| On | Interstate | 4,036.0 | 51% | 49% |
| | Non-Interstate NHS | 11,759.0 | 81% | 19% |
| | *Subtotal, NHS* | *15,795.0* | *74%* | *26%* |
| Off | *Subtotal, Non-NHS* | *13,567.0* | *98%* | *2%* |
| **Total** | | **29,362.0** | **85%** | **15%** |

AGE DISTRIBUTION



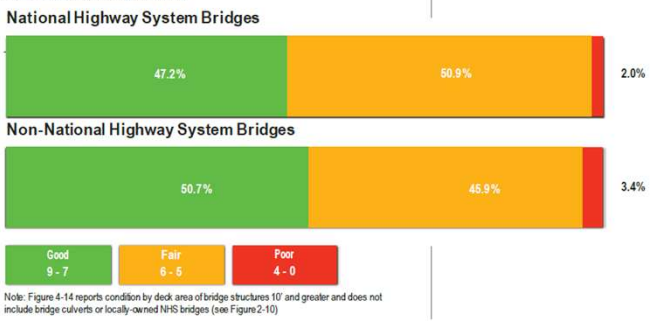

72



72

C

Figure 4-14: Current Bridge Condition




Note: Figure 4-14 reports condition by deck area of bridge structures 10' and greater and does not include bridge culverts or locally-owned NHS bridges (see Figure 2-10)

Figure 4-15: Bridge Current Condition, Targets, and Investment to Achieve Targets in 2027 Based on State Performance Measures

| SYSTEM | 2017 CONDITION (% POOR) | TARGETS (% POOR) | INVESTMENT REQUIRED TO ACHIEVE TARGETS |
|---|---|---|---|
| NHS | 2% | ≤ 2% | $1.1 billion |
| Non-NHS | 3.4% | ≤ 8% | $446 million |
| **TOTAL** | **2.4%** | **NA** | **$1.5 billion** |

Figure 4-16: Bridge Current Condition, Targets, and Investment to Achieve Targets in 2027 Based on Federal Performance Measures

| SYSTEM | 2017 CONDITION (% GOOD) | 2017 CONDITION (% POOR) | 2-YEAR TARGETS (2020) (% GOOD) | 2-YEAR TARGETS (2020) (% POOR) | 4-YEAR TARGETS (2022) (% GOOD) | 4-YEAR TARGETS (2022) (% POOR) | INVESTMENT REQUIRED TO ACHIEVE TARGETS |
|---|---|---|---|---|---|---|---|
| NHS | 48% | 1.9% | 50% | 4% | 50% | 4% | $316 million |

Note: Figure 4-16 reports condition by deck area of all NHS bridge structures 20' and greater regardless of ownership.





73

D

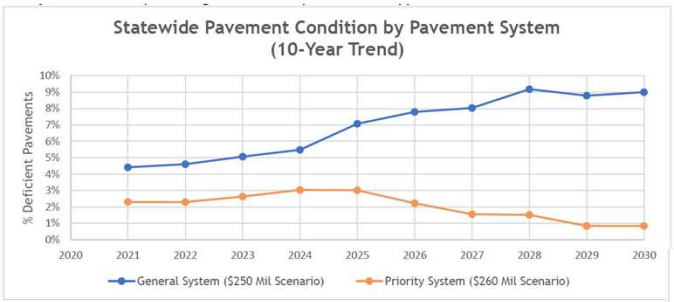
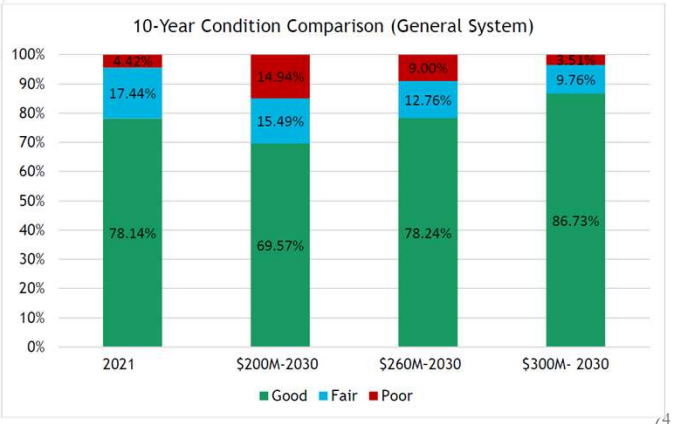



*Table 28 - 10-Year Statewide Pavement Deficient Percentage Condition by Pavement System*



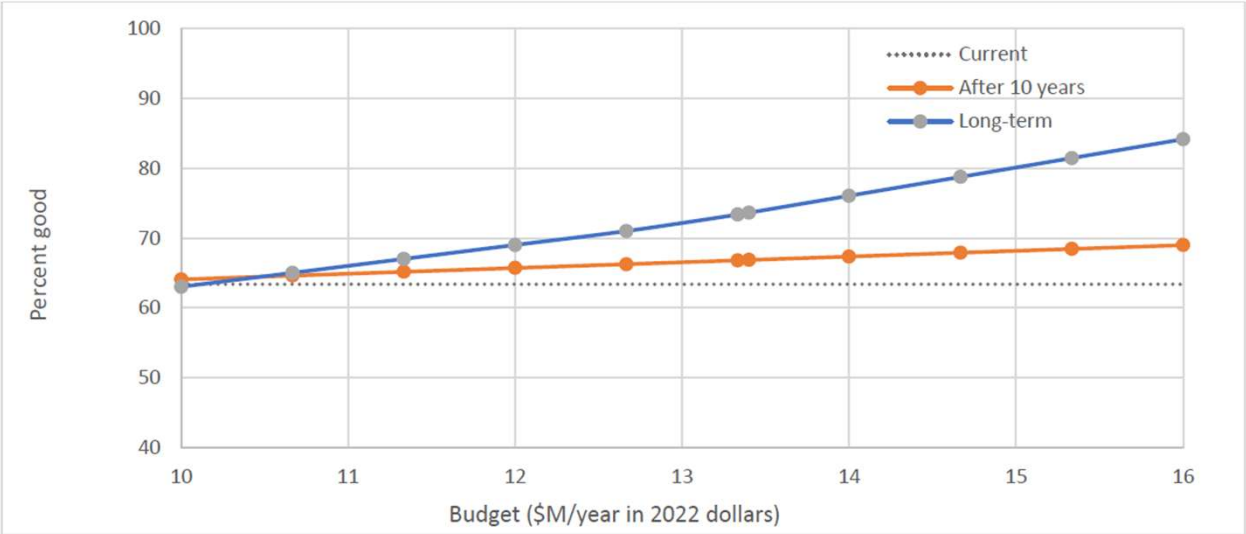





74

E

## Bridge Condition




75



75

E

## Strengths:

- Shows both short and long term outcomes (helps visualize how investments impact conditions)
- Direct relationship between budget and condition
- Baseline for “current” provides context for future scenarios
- The incremental budge range focuses on a practical range that aligns with realistic funding decisions

76



76

E

## Weaknesses:

- Limited budget range
- Unclear what long term is reference to
- Visual overlap:  at year 10 (at the start of the comparison) can't really determine it.  Change the increments on the y-axis

77



E

## Key Points:

- Current bridge conditions show that about 65% of bridges are in good condition.
- With flat funding at ~$10M/year, bridge conditions will remain stagnant both in the next 10 years and long term.
- Increasing funding to ~$16M/year yields only modest improvement in the 10-year horizon (~72% good), but produces significant long-term benefits, with conditions improving to about 85% good.
- This analysis highlights that bridge improvements are a long-term investment, and sustained higher funding is required to achieve meaningful gains in overall network condition.

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# Explore Improvements:

E

- Clear/Effective:
  - Define timeline better
  - Expand the budget axis
  - Call out key thresholds
- Alternate Graphs: Based on a picture inserted into ChatGPT from a cell phone pic, therefore, information may not be true to the example. (Or, low-bid contractor!)

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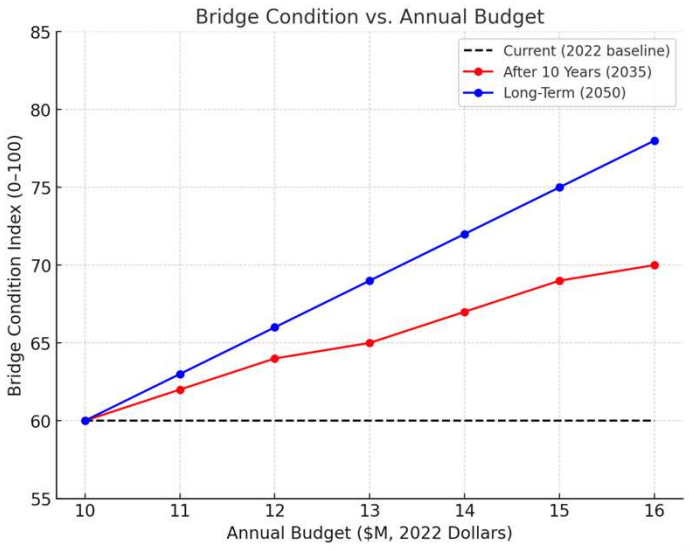
# Explore Improvements:

E

- Simple, but more clear:

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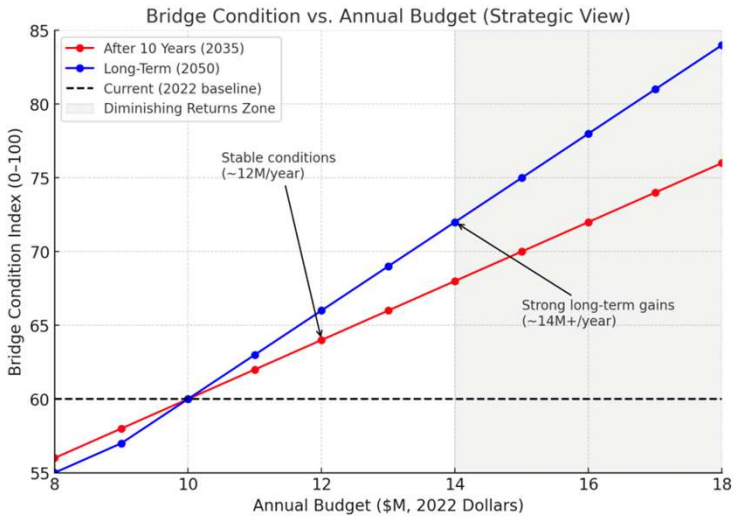
# Explore Improvements:

E

- More strategic:

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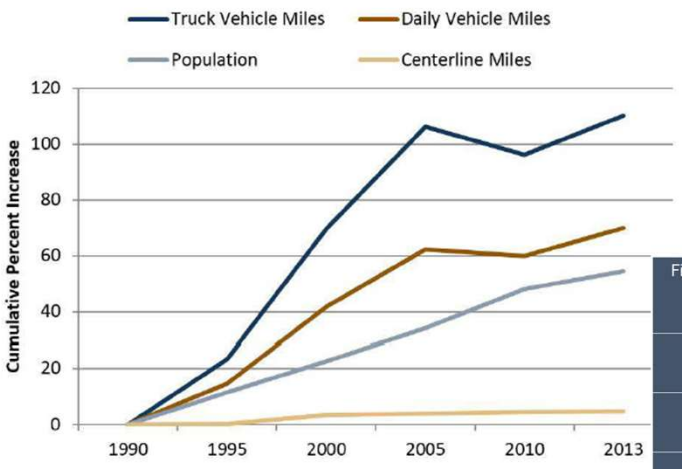


| Fiscal Year | Percent of Very Good Lane Miles | Percent of Good Lane Miles | Percent of Fair Lane Miles | Percent of Poor Lane Miles | Percent of Very Poor Lane Miles |
|---|---|---|---|---|---|
| 2007 | 78.53 | 7.66 | 4.75 | 4.37 | 4.68 |
| 2008 | 78.25 | 7.07 | 4.88 | 4.66 | 5.14 |
| 2009 | 78.76 | 6.86 | 4.92 | 4.74 | 4.73 |
| 2010 | 78.63 | 6.84 | 5.06 | 4.87 | 4.59 |
| 2011 | 78.42 | 7.18 | 5.07 | 4.89 | 4.44 |
| 2012 | 80.28 | 6.61 | 5.00 | 4.48 | 3.63 |
| 2013 | 76.70 | 9.20 | 5.34 | 4.51 | 4.24 |
| 2014 | 76.75 | 9.19 | 5.20 | 4.52 | 4.34 |
| 2015 | 77.69 | 8.81 | 4.74 | 4.25 | 4.52 |
| 2016 | 66.37 | 16.20 | 8.12 | 4.36 | 4.94 |
| 2017 | 68.49 | 15.66 | 7.44 | 3.58 | 4.83 |

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Scenario 1: No Bridge Preservation

This scenario assumes that all work to improve condition of bridges is through the rehabilitation program with no investment in bridge maintenance or preservation activities. The LCP analysis includes deterioration rates and statewide average unit costs from the 2021 Plan and the amount of work predicted to be accomplished annually for the life span of the asset. Total estimated investment: $ 5.7 Billion.

Scenario 2: Historical Approach

This scenario was based on historical strategies to improve bridge condition including historical deterioration rates, and statewide average unit costs based on a mix of preservation, rehabilitation and replacement work to fix fair and poor bridges, and the amount of work predicted to be accomplished annually for the life span of the asset. Total estimated investment: $ 6.5 Billion.

Scenario 3: (Implemented Strategy)

The scenario includes additional bridge deck preservation work for two years of the 10-year plan, deterioration rates from the 2021 Plan, and statewide average unit costs that are a mix of preservation, rehabilitation, and replacement work to fix fair and poor bridges including additional bridge decks, and the amount of work predicted to be accomplished annually for the life span of the asset. Total estimated investment: $ 6.8 Billion.

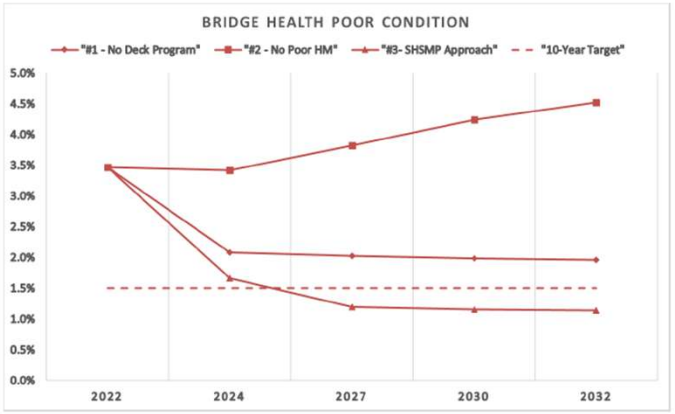


Figure 4-7. Bridge LCP Scenarios



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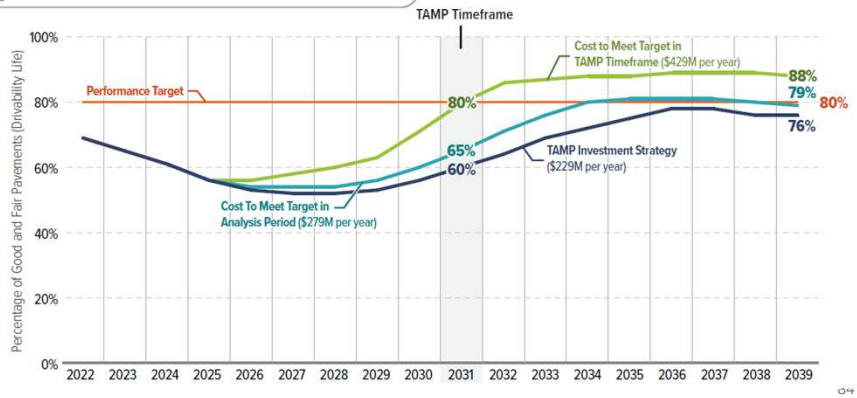
**Table 19** *Pavement Investment Strategy FY 2022–31 (in Millions)*

| Work Type | FY 22 | FY 23 | FY 24 | FY 25 | FY 26 | FY 27 | FY 28 | FY 29 | FY 30 | FY 31 |
|---|---|---|---|---|---|---|---|---|---|---|
| Maintenance* | $40.4 | $41.6 | $40.7 | $41.9 | $43.2 | $44.5 | $45.8 | $47.2 | $48.6 | $50.1 |
| Preservation | $6.94 | $28.99 | $14.09 | $7.30 | $33.02 | $27.44 | $32.15 | $24.51 | $22.29 | $22.29 |
| Rehabilitation | $216.36 | $195.62 | $208.85 | $221.70 | $195.98 | $201.56 | $196.85 | $204.49 | $206.71 | $206.71 |
| Reconstruction | N/A | N/A | $2.67 | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Initial Construction | $118.7 | $118.7 | $118.7 | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| TOTAL | $382.4 | $384.91 | $385.01 | $270.9 | $272.2 | $273.5 | $274.8 | $276.2 | $277.6 | $279.1 |

** Maintenance expenditure is from maintenance levels of service budget.*
*FY30 and FY31 data for preservation and rehabilitation work types are averages.*



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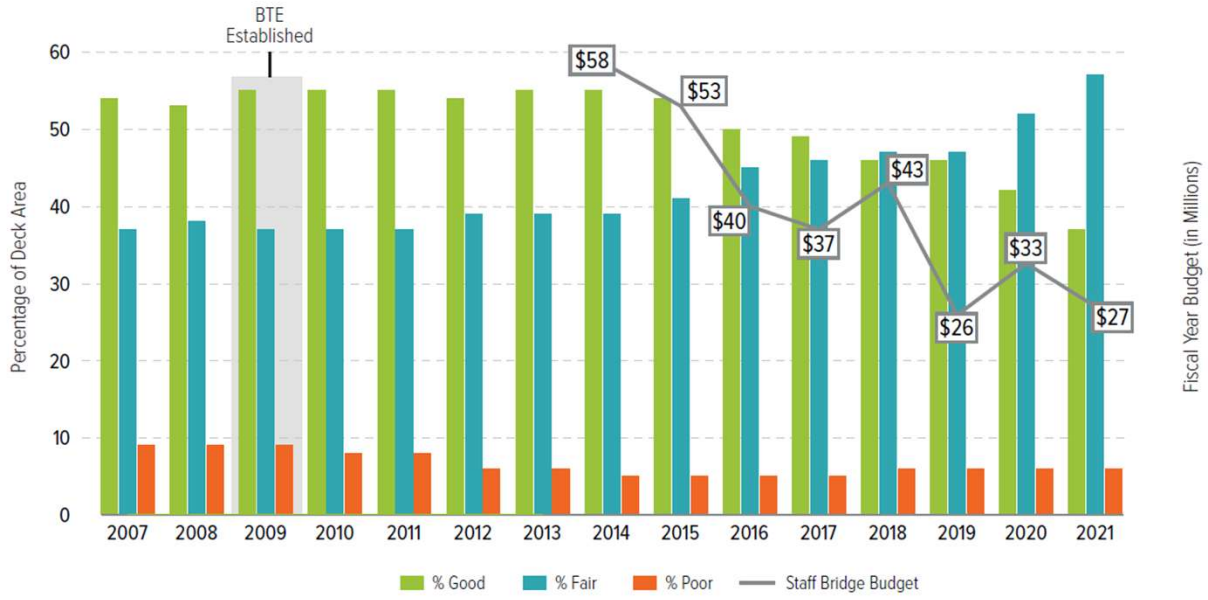
## Bridge Condition

J



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2025 Transportation Asset Management Peer Exchange
Communicating Asset Management Information and Outcomes

# Group Report Outs



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# Session F — What Did We Learn?





# Wrap Up and Next Steps

# Thank You!!!

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