

2013 Transportation Asset Management Peer Exchange

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1 Overview

This report summarizes the proceedings of the 2013 Transportation Asset Management Peer Exchange hosted by the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO). The peer exchange was held in Burlington, Vermont on July 24th and 25th, 2013.

1.1 Peer Exchange Purpose

The purpose of this peer exchange was to provide participants from state Departments of Transportation (DOTs) an opportunity to share information on the best and current practices in asset management and maintenance and to discuss the Moving Ahead for Progress in the 21st Century Act (MAP-21) Transportation Asset Management Plan (TAMP) requirements. A particular focus of this peer exchange was the role of asset preservation and maintenance within a DOT's asset management program and in their TAMP. Workshop panels and facilitated discussions addressed a range of issues facing state DOTs within the domain of transportation asset management, including the following:

- How are maintenance and asset management integrated?
- How is maintenance being addressed in TAMPs?
- How is risk analyzed in the context of asset management?
- What is the relationship between a DOT's TAMP and financial plan?
- Which data issues are critical for effective transportation asset management?
- What are best practices for asset management of transportation assets other than pavements and bridges?

The peer exchange also provided an opportunity for discussion between state and federal transportation agency staff, as well as between private sector transportation professionals. Through a series of facilitated discussions and a round-table discussion, the participants discussed the following key topics:

- Defining risk and developing a risk assessment approach
- System resiliency
- Risk assessment in the TAMP
- Risk assessment training
- Financial planning processes
- Financial planning in the TAMP
- Life cycle cost analyses and funding assumptions
- Reporting on needs
- Establishing agency goals and targets
- Expanding the National Highway System (NHS)
- Data collection methods and funding
- Addressing transit in the TAMP
- Performance measurement
- Safety in relation to TAM

1.2 Peer Exchange Format

The peer exchange was held over two half days during the AASHTO Subcommittee on Maintenance (SCOM) and Subcommittee on Asset Management (SCOAM) conference. It consisted of two panels and three discussion sessions. The two panels on the first day focused on transportation asset management and maintenance. The second day focused on topics related to MAP-21 and TAM. This format was designed to balance structured presentations with open discussions, and to enhance opportunities for the exchange of practical information.

On the first day of the peer exchange, Carlos Braceras, Executive Director of Utah DOT, Butch Wlaschin, Director of FHWA's Office of Asset Management, Pavement, and Construction, and Matt Hardy, Program Director for Planning and Policy at AASHTO, provided opening remarks. The first set of presentations focused on the topic of state DOTs' efforts to integrate maintenance and asset management. Presenters included: Jon Wilcoxson, Kentucky Transportation Cabinet; Jennifer Bradenburg, North Carolina DOT; and Anita Bush, Nevada DOT. The second set of presentations focused on the topic of integrating maintenance into a TAMP. Steve Gaj of the FHWA introduced the session followed by presentations from Rod Sechrist, New York State DOT; Vince Latino and Jason Chapman, Louisiana Department of Transportation and Development (DOTD); and Martin Kidner, Wyoming DOT. Matt Hardy of AASHTO concluded the day by providing ideas to consider and an overview of the agenda for the second day.

The second day of the peer exchange consisted of the three discussion sessions. Scott Zainhofsky of North Dakota DOT began the discussions by providing a summary of the previous day's presentations and discussions. Mark Nelson of Minnesota DOT, Scott Richrath of Colorado DOT and Cory Pope of Utah DOT facilitated the three discussion sessions. The first session, Incorporating Risk into a TAMP, provided participants an opportunity to compare practices in an area where the state of the practice varies widely. The second discussion session, Financial Plans, built upon the previous panels and discussions in taking an in-depth look at an area of critical importance in developing a TAMP. The final session was an open discussion addressing issues of interest to the peer exchange participants. Following the discussion sessions Steve Gaj of FHWA offered a set of closing remarks.

Note that participation in the first day of the panel was open to all participants of the SCOM/SCOAM conference. Participants on the second day are listed in Section 1.4. The following section details the agenda of the peer exchange.

1.3 Peer Exchange Agenda

Wednesday, July 24, 2013

Integrating Maintenance and Asset Management

Introductions

1:00 - 1:30 Welcome, Opening Remarks
Carlos Braceras, Utah DOT
Butch Wlaschin, FHWA
Matt Hardy, AASHTO

Peer Exchange Overview and Objectives
Hyun-A Park, Spy Pond Partners, LLC

A. State DOT Examples of Integrating Maintenance and Asset Management

1:30 - 3:00 Kentucky Experience
Jon Wilcoxson, Kentucky Transportation Cabinet

North Carolina Experience
Jennifer Bradenburg, North Carolina DOT

Nevada Experience
Anita Bush, Nevada DOT

3:00 - 3:15 Break

B. Integrating Maintenance into a Transportation Asset Management Plan (TAMP)

3:15 – 4:45 Topic Introduction
Steve Gaj, FHWA

New York's TAMP
Rod Sechrist, New York State DOT

Louisiana's TAMP
Vince Latino and Jason Chapman, Louisiana DOTD

Wyoming's TAMP
Martin Kidner, Wyoming DOT

Day 1 Wrap Up

4:45 – 5:00 Summary of Day 1 Discussion, Ideas to Consider, Overview of Thursday's Agenda
Matt Hardy, AASHTO

TAMP Requirements in MAP-21

Day 2 Introduction

1:00 - 1:15 Recap Wednesday's Agenda and Overview of Wednesday's Agenda
Scott Zainhofsky, North Dakota DOT
Hyun-A Park, Spy Pond Partners, LLC

C. Incorporating Risk into a TAMP Discussion

1:15 – 2:15 *Mark Nelson, Minnesota DOT (facilitator)*

D. Financial Plans Discussion

2:15 – 3:15 *Scott Richrath, Colorado DOT (facilitator)*

3:15 - 3:30 Break

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.....

E. Round Table Discussion

3:30 – 4:45 *Cory Pope, Utah DOT (facilitator)*

Topics:

- NHS Routes Managed by Locals – Dealing with the Expanded NHS
 - TAM and Data Issues
 - What About Assets Other than Pavements and Bridges?
 - The TAMP and Meeting MAP-21 Performance Targets for Pavements and Bridges
 - How are States Dealing with Life-Cycle Costing at a System-Level?
-

Group Discussion and Peer Exchange Wrap-Up

4:45 – 5:00 Discussion of Priority Issues and Future Activities, Summary of Peer Exchange
Steve Gaj, FHWA

1.4 Peer Exchange Participants

The following is a list of Transportation Asset Management Peer Exchange participants recorded on July 25th, the second day of the peer exchange. The first day of the peer exchange was an open session and included additional participants also attending the 2013 AASHTO Subcommittee on Maintenance/Subcommittee on Asset Management conference.

State Participants (By State)

Name	State DOT
Kyle Lester	Colorado DOT
Scott Richrath	Colorado DOT
David Wieder	Colorado DOT
Colleen Kissane	Connecticut DOT
Jennifer Trio	Connecticut DOT
Tim Lattner	Florida DOT
Melany Reynolds	Georgia DOT
John Selmer	Iowa DOT
Bob Younie	Iowa DOT
Jon Wilcoxson	Kentucky Transportation Cabinet
Jason Chapman	Louisiana DOTD
Vince Latino	Louisiana DOTD
Jerry Casey	Maine DOT
Nate Moore	Maryland State Highway Administration
Mark Nelson	Minnesota DOT
Dave Solsrud	Minnesota DOT
Elizabeth Wright	Missouri DOT
Anita Bush	Nevada DOT

Name	State DOT
Glenn Davidson	New Hampshire DOT
Caleb Dobbins	New Hampshire DOT
Rod Sechrist	New York State DOT
Jennifer Bradenburg	North Carolina DOT
Scott Capps	North Carolina DOT
Lonnie Watkins	North Carolina DOT
Brad Darr	North Dakota DOT
Scott Zainhofsky	North Dakota DOT
Andrew Williams	Ohio DOT
Tim Gatz	Oklahoma DOT
Melissa Batula	Pennsylvania DOT
Joe Baker	Rhode Island DOT
Howard Holland	Texas DOT
Carlos Braceras	Utah DOT
Cory Pope	Utah DOT
Evan Brasseur	Vermont Agency of Transportation
Reid Kiniry	Vermont Agency of Transportation
Bruce Nyquist	Vermont Agency of Transportation
Jennifer Royer	Vermont Agency of Transportation
Kevin Viani	Vermont Agency of Transportation
Robert White	Vermont Agency of Transportation
Chris Christopher	Washington State DOT
Martin Kidner	Wyoming DOT

Name	State DOT
Joey Macaluso	Wyoming DOT

Other Participants (by Organization)

Name	Organization
Matt Hardy	AASHTO
Gummada Murthy	AASHTO
Jason Richins	AASHTO
David Peshkin	Applied Pavement Technology
Katie Zimmerman	Applied Pavement Technology
Travis Ritter	Bentley
Jonathan Fisher	Dye Management Group
Anwar Ahmad	FHWA
Steve Gaj	FHWA
Nelson Hoffman	FHWA
Karim Naji	FHWA
Butch Wlaschin	FHWA
James Tsai	Georgia Tech
Hyun-A Park	Spy Pond Partners, LLC
William Robert	Spy Pond Partners, LLC
Mike Harper	Volkert, Inc.
Lacy Love	Volkert, Inc.

2 Peer Exchange Introductions

2.1 Opening Remarks

Carlos Braceras, Executive Director of the Utah DOT and the chair of SCOM, welcomed the group to the peer exchange. He introduced the topic for the day, “Integrating Maintenance and Asset Management” and highlighted that the conference attendees represented both the maintenance and the asset management communities. He also acknowledged the contributions of FHWA in helping support the peer exchange.

Carlos discussed the importance and prevalence of asset management principles. Every member of a DOT has a responsibility to think like an asset manager when using public funds to make cost-effective decisions. Asset management is a tool that can be used to make better decisions and improve transparency. Given transportation agencies never have the money to do everything is needed, it is important to use asset management concepts to prioritize and make the most cost-effective decisions.

Carlos noted that maintenance is one area that has practiced asset management principles for some time. Ten years ago the AASHTO Subcommittee on Maintenance (SCOM) began discussing the use of performance measures and other asset management tools. Since that time, asset management concepts have become more widespread. Carlos described the example of the AASHTO Equipment Management Technical Services Program. This group established performance measures for state DOT equipment fleets, including measures of preventive maintenance compliance, retention, utilization, and availability. Equipment performance measures are not required under MAP-21, but this group took the lead in establishing measures for equipment that State DOTs can start using to better manage their equipment assets if they so desire. Finally, Carlos challenged conference participants to each take away at least one practice or concept that is shared during the peer exchange and use it to try something innovative in their state.

Butch Wlaschin, Director of the FHWA Office of Asset Management, Pavement, and Construction, welcomed participants and thanked Carlos, Jennifer Brandenburg of AASHTO SCOM and Ananth Prasad and Tim Henkel of the AASHTO Subcommittee on Asset Management for their contributions. Butch began by presenting an additional goal for the peer exchange: to discuss how to make the case for investing in maintenance in a different way. Maintenance is a crucial activity that maximizes the value of transportation investments, and ensures the continued performance of a DOT’s assets. Butch described his own experience in design, in which he realized the importance of maintaining an asset once it has been constructed, and of considering the longevity of a design.

Butch also expressed the need for members of the maintenance community to be more vocal in advocating for needed investments. It may often seem that maintenance is treated as an afterthought. However, maintenance is critical for asset preservation and stakeholders should be made aware of the long-term benefits of successful maintenance practices.

Matt Hardy, Program Director for Planning and Policy at the American Association of State Highway and Transportation Officials (AASHTO), thanked participants for attending the peer exchange on behalf of AASHTO and the AASHTO Subcommittee on Asset Management. He emphasized the Transportation Asset Management (TAM) Guide as an important resource, and noted that a PDF version of the Executive Guide is available for download at <http://www.fhwa.dot.gov/asset/pubs/hif13047.pdf>. He also encouraged peer exchange attendees to submit papers for and participate in the 2014 Transportation Research Board (TRB) Asset Management Conference.

Matt discussed the fact that the proposed rules stemming from MAP-21 related to asset management and performance management will be released soon (over the next six to eight months). The draft rule for safety performance measures will likely be released first. Draft asset management plan guidelines are expected to be released in the winter. A number of AASHTO committees are monitoring the rulemaking process, including the Standing Committee on Performance Management (SCOPM) and the Subcommittee on Asset Management, and that AASHTO is committed to working with state DOTs as they review and implement the new rules.

2.2 Peer Exchange Overview

Hyun-A Park of Spy Pond Partners, LLC, the peer exchange facilitator, welcomed the Peer Exchange participants and outlined the peer exchange agenda. She reviewed the presentations upcoming on the first day of the peer exchange, discussed the peer exchange format, and encouraged attendees to consider topics to discuss during the sessions on the second day of the peer exchange.

3 State DOT Examples of Integrating Maintenance and Asset Management

3.1 The Kentucky Experience

Jon Wilcoxson, from the Kentucky Transportation Cabinet’s Division of Maintenance, began the presentation by describing Kentucky’s historical approach to project development. The process was oriented around construction, following a linear progression from planning, to design, to construction, and, finally, to operations. Today, the project development process is a cyclical one. A diagram depicting the new cycle is pictured in **Figure 3.1.1**.

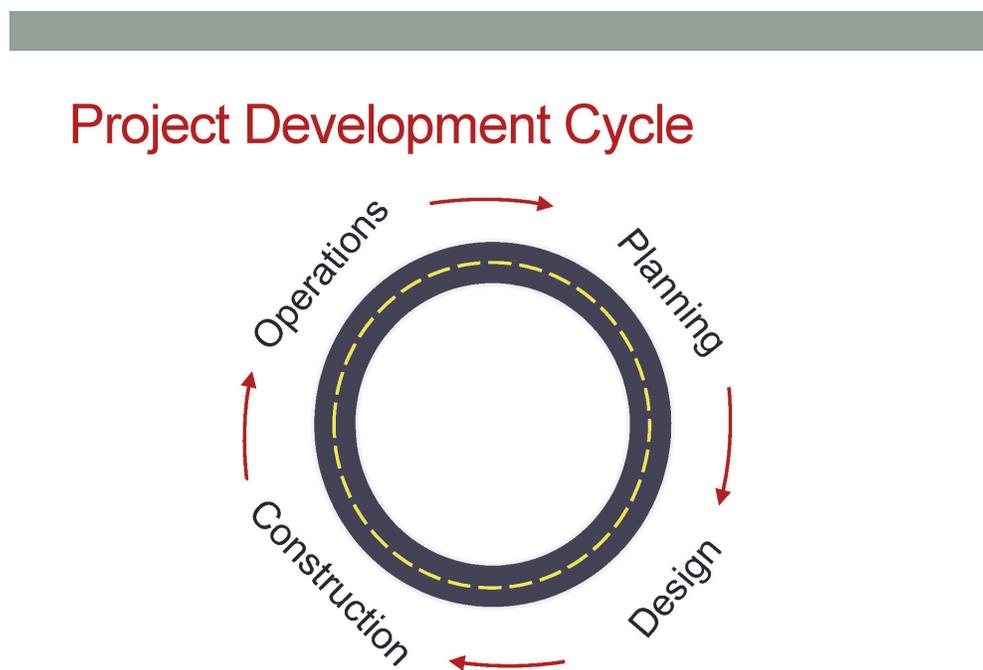


Figure 3.1.1 Kentucky Project Development Cycle

Jon then focused on part of the cycle depicted in the figure, the link between Operations and Planning. This process is characterized by three main elements:

- The use of quality data to define needs.
- The definition of objectives for prioritization (performance measures).
- The improvement of resource allocation decisions.

With respect to defining needs, Jon described KYTC's approach for defining needs for safety, pavement, bridge and other assets. For safety, KYTC considers the needs for a variety of different potential improvements. Three key improvement types are installation of high friction surfaces, installation of rumble strips, and addressing roadway departure corridors. Jon described the data required for evaluating each of these, such as geographic data, historical crash data, curve data, pavement condition, lane and shoulder widths, number of lanes, speed limit and functional class.

Jon next summarized KYTC's process for pavement management. KYTC performs the majority of its maintenance and asset management functions in-house, including data collection and prioritizing resurfacing actions. KYTC has developed an evaluation process that reviews visual ratings, International Roughness Index (IRI) data, rutting, and laser crack measurements to determine necessary work. Preservation treatments are handled by Operations, but Operations and Planning work together when a need is identified for rehabilitation or reconstruction - an example of the relationship between Operations and Planning. A similar process has been established for bridge management.

KYTC is working to develop management systems for other assets besides pavement and bridges. A sign management system, which was developed in-house, was recently adopted by the agency. Another system, also completed in-house, was created for pipe and culvert management. The agency is currently working towards completing management systems for additional assets such as guardrail, cable barriers, and striping.

Jon next discussed KYTC's performance measures for Safety, Pavements, and Bridge, and contrasted the KYTC measures to the MAP-21 national performance measures recommended for use by the AASHTO Standing Committee on Performance Management (SCOPM). KYTC's measures largely align with those recommended by SCOPM. In some cases KYTC uses additional performance measures and include assets beyond the National Highway System (NHS). **Figure 3.1.2** lists the KYTC measures, and indicates whether each is recommended by SCOPM or is a KYTC-specific measure.

KYTC Performance Measures

Area	Measure	SCOPM	KYTC
Safety	Number of Fatalities	☐	
	Fatality Rate	☐	
	Number of Serious Injuries	☐	
	Serious Injury Rate	☐	
Pavements	Interstate Roughness	☐	
	Non-Interstate NHS Roughness	☐	
	Non-NHS Roughness		☐
	Pavement Structural Health	☐	
Bridges	NHS Structurally Deficient Bridges	☐	
	NHS Bridges in Good or Fair Condition	☐	
	Non-NHS Structurally Deficient Bridges		☐
	Non-NHS Bridges in Good or Fair Condition		☐

Figure 3.1.2 KYTC Safety, Bridge and Pavement Performance Measures

In addition to measuring performance, Kentucky tracks unscheduled needs resulting from deferred maintenance. The list currently contains over 2,400 projects representing 6,300 miles of roadway and over \$60 billion in required funds. Information on unscheduled needs is considered by KYTC districts when they develop their district transportation plans. These are integrated into an agency-wide six-year plan. The plans require the state’s twelve districts to report on the Safety, Pavement, and Bridge performance measures. Other assets, system reliability, and CMAQ measures are also included in the plans.

Next steps for the agency include more fully developing the pavement and bridge management programs, and developing performance targets for these asset types. Also for these assets KYTC is working to develop performance and deterioration curves, as well as a methodology for incorporating risk. As the pavement and bridge programs are becoming more comprehensive, KYTC will also work to develop other asset management programs.

At the conclusion of the presentation, Butch Wlaschin, FHWA, asked if there was feedback from Planning incorporated into Operations, such as to avoid programming duplicate work. Jon responded that this relationship existed and the cyclic nature of the project development cycle implied a feedback loop between the two areas. An example of this is in the development of district plans. The relationship between Planning and Operations is also not unique within KYTC. Other divisions, such as Traffic and Maintenance, now coordinate using a similar model to encourage knowledge sharing practices across agency divisions.

Melany Reynolds of Georgia DOT inquired about the criteria that are used to set agency priorities. Jon replied that the criteria are based on consideration of what actions are most likely to be effective. He described KYTC's uses of measures such as cracking, rutting, and raveling in prioritizing. Melany noted that Georgia uses different measures, such as Average Daily Traffic (ADT), truck traffic, and population, and is interested in determining additional measures that could be useful for prioritization.

3.2 The North Carolina Experience

Jennifer Brandenburg, the State Maintenance Engineer for the North Carolina Department of Transportation, began her presentation by acknowledging the other NCDOT staff that contributed to the presentation, Lonnie Watkins and Scott Capps. She noted that a distinctive feature of NCDOT is that it maintains all county roads in the state, and thus has a very large network. This network is divided between 14 highway divisions and 40 districts.

An important component of NCDOT's asset management approach is its use of annual maintenance condition assessments (MCA) to establish system conditions for maintenance. These include assessments of a range of roadside features conducted annually for 23,000 tenth-mile samples. Collecting detailed data allows NCDOT to use the generated information to show system performance on multiple levels, namely:

- Statewide performance for interstate, primary, and secondary roads.
- Division-level performance for interstates.
- County-level performance for primary and secondary roads.

The data are published in a scorecard that records current performance for maintenance, pavement and bridges. The score card shows current conditions and agency targets in each area and overall. **Figure 3.2.1** shows an example of the maintenance scorecard with results for pavement, MCA, and bridge, as well an overall level of service (LOS) and a infrastructure health index. Work on the infrastructure health index is ongoing, particularly regarding determination of how to weight different factors in quantifying this index.

Reporting The Data (Infrastructure Health Index)

STATEWIDE – ALL SYSTEMS EXISTING INFRASTRUCTURE HEALTH WEIGHTED BY VMT (80% AND LM (20%))

SYSTEM	80%		WEIGHTED FACTOR	PAVEMENTS			MCA			BRIDGE HEALTH INDEX			TOTAL IHCS		
	VMT %	LANE MI		WEIGHT VALUE	40	OVERALL		WEIGHT VALUE	25	OVERALL		ALL	EXIST	OVERALL	EXISTING
					% GOOD	LMG	SCORE	SCORE	LMS	SCORE	# BRIDGES	CR>=6	BHCI	SCORE	LOS
INTERSTATE	45	5,038	36.59	84.9%	4.277	31.06	89.79	4.524	32.85	909	723	79.5%	29.10	B	84.2
PRIMARY	30	35,640	28.15	66.1%	23.558	18.61	86.41	30.797	24.32	4,199	2,796	66.6%	18.74	D	71.3
SECONDARY	25	131,074	35.26	67.5%	88.475	23.80	85.04	111.466	29.99	8,490	4,989	58.8%	20.72	D	68.8
TOTAL		171,752				73.47			87.17			62.6%	68.57		
COMPOSITE VALUES						29.4			21.8				24.0	C	75.2

Figure 3.2.1 North Carolina Reporting the Infrastructure Health Index Data

Data from the assessment process is used to identify areas of deficiency and develop work plans. NCDOT uses the AgileAssets Maintenance Management System (MMS) to support development of work plans and to track maintenance actions. Most divisions follow a process in which work plans are entered into the system by activity for maintenance features, e.g. shoulder maintenance, ditch maintenance. **Figure 3.2.2** shows a map of planned work illustrating the results of such an exercise. Jennifer noted that one of NCDOT’s divisions uses an alternative approach for work planning termed “sectional planning” in which plans are developed by section rather than activity, increasing the degree of coordination between groups.



Figure 3.2.2 North Carolina “Planning the Work”

The traditional maintenance management approach tends to focus on *outputs*, such as lane miles resurfaced or restriped. However, NCDOT also reports on its *outcomes*. NCDOT has established a web-based performance dashboard for reporting on project outcomes, such as improvements in infrastructure health over time, as shown in **Figure 3.2.3**.

At the end of the presentation, Jennifer reviewed the current NCDOT performance measure trends for roadside features, bridge health condition and overall pavement condition, showing improvement in all categories. Recently North Carolina passed a law creating the Strategic Mobility Formula, which will likely result in redirecting funds from paving unpaved roads to accelerating capital projects. The goal behind the formula is to encourage economic growth and utilize data to drive more effective decision-making. NCDOT is still reviewing the new law to determine how it will affect current practices.

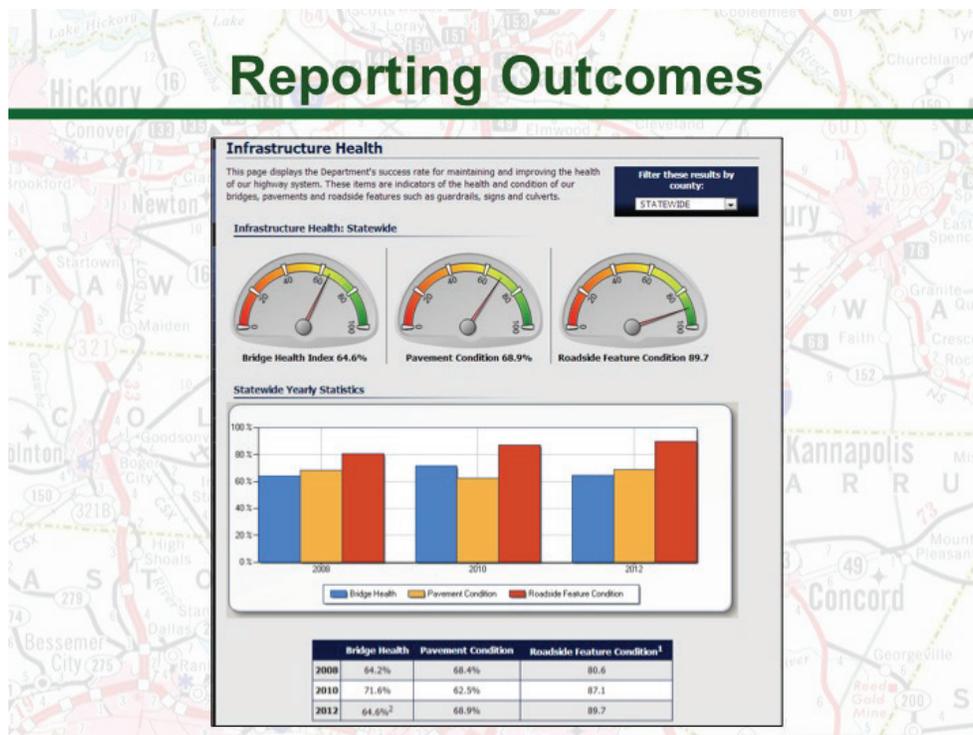


Figure 3.2.3 North Carolina “Reporting Outcomes” Dashboard

After opening the floor to questions, Hyun-A Park inquired about how NCDOT currently budgets. Jennifer responded that NCDOT currently budgets based on annual (fiscal year) budgets, but would like to move to longer programs for preservation. Tim Lattner of Florida DOT described the Florida practice of looking at the planned versus actual project data to help support budgeting. Jennifer noted that NCDOT is interested in doing this, but does not currently “close the loop” by comparing planned and actual performance.

Anwar Ahmad of FHWA asked whether the performance targets are state or division-level targets. Jennifer explained that North Carolina has established statewide targets set by committees that include division staff. Scott Richrath of Colorado DOT inquired further about the recent legislation to create the Strategic Mobility Formula, and whether this complements or contradicts existing agency practice. Jennifer responded that the DOT supports the approach of establishing a data-driven scoring approach for capital projects.

3.3 The Nevada Experience

Anita Bush, Chief Maintenance and Asset Management Engineer at the Nevada Department of Transportation, started the presentation by describing the unique aspects of the NDOT. The agency manages a large state, but a relatively sparse network with comparatively few bridges. Anita provided a breakdown of the annual maintenance costs by program, compared to the total department expenditures, shown in **Figure 3.3.1**.

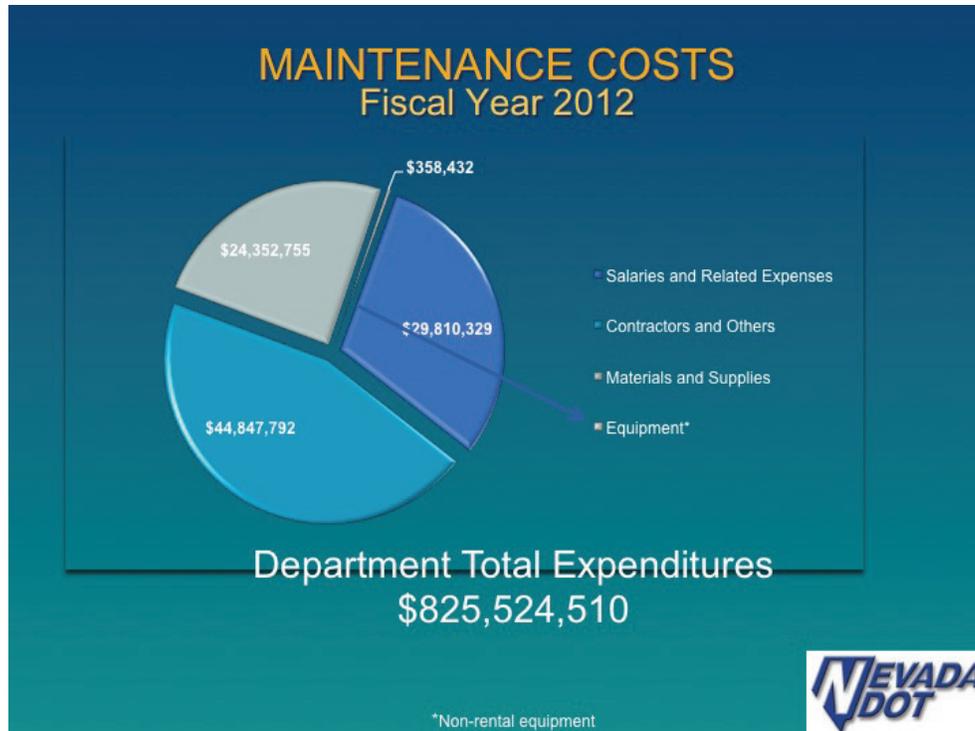


Figure 3.3.1 Nevada Maintenance Costs (FY2012)

In recent years Nevada DOT has focused on applying asset management concepts to its maintenance program. NDOT has had an MMS since the 1970's and for many years has performed condition surveys. Also, NDOT has a well-established preventive maintenance program responsible for treatments such as chip seals and micro-surfacing. In 2012 NDOT implemented a maintenance quality assurance program that uses data on the asset inventory and its conditions to predict maintenance performance. Also, NDOT is implementing systems for sign and facility management.

Regarding development of a TAMP, Nevada began its efforts in 2008 with formation of a Steering Committee and TAM Core Team. NDOT then conducted an asset management self-assessment, and held a regional workshop on transportation asset management practices. Through the self-assessment NDOT determined its biggest gaps were in data integration and the lack of a comprehensive prioritization process. NDOT then developed its TAM strategic and implementation plan, focusing on data needs and using data for improved decision-making.

To address the data integration gap, Nevada is developing a data warehouse using Oracle business intelligence tools. **Figure 3.3.2** illustrates the systems that will be integrated in the data warehouse.

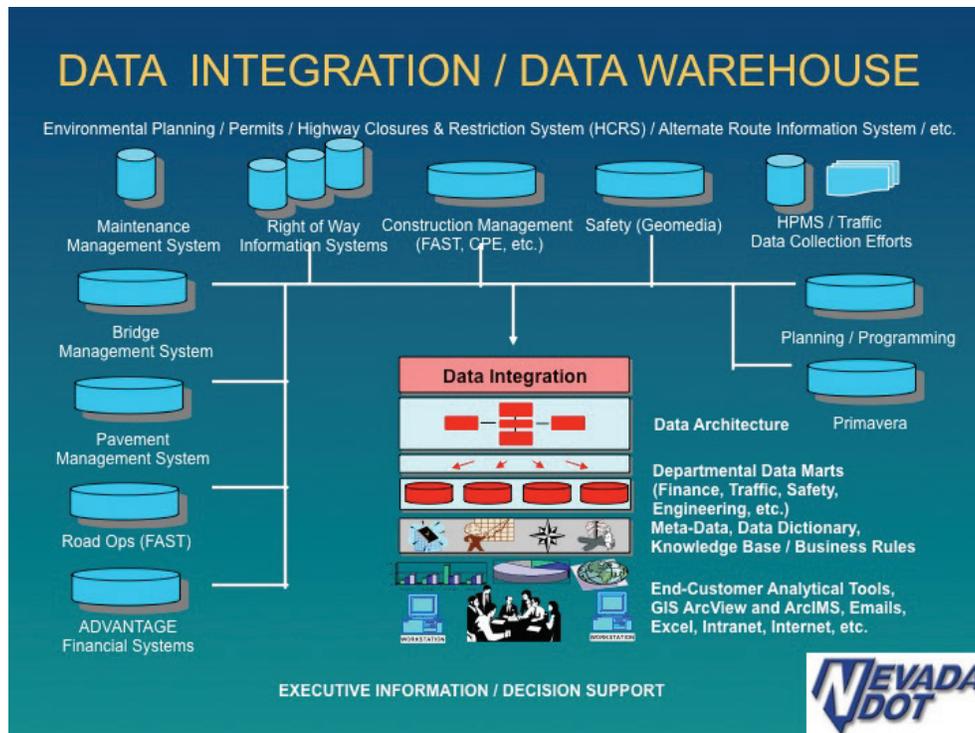


Figure 3.3.2 Nevada Data Integration and Data Warehouse Process

Following passage of MAP-21, NDOT renewed its efforts to develop a TAMP. NDOT has assigned two full time equivalent (FTE) staff members to Asset Management, attended the National Highway Institute (NHI) transportation asset management course, and held a data integration workshop. NDOT’s overall goal for applying asset management to maintenance is to systematically apply asset management principles to transform the maintenance program, making maintenance more proactive and less reactive, and over the longer term, shift towards a performance management approach.

Hyun-A Park asked about the process used for and challenges encountered in integrating data. Anita responded that data integration had proven to be a challenge, such as in efforts to show different asset types on a single map, and to resolve duplicate data. Jerry Casey of Maine DOT, noted that Maine has had success using Oracle’s business intelligence tools. Maine DOT formed a strategic data group seven years ago, using a model similar to Nevada’s. The focus was leveraging existing systems, and Oracle has helped that effort by bringing all necessary data into a single location. It helped departments coordinate by making data more accessible throughout the agency and driving data quality improvements. Now integrated data are being used to link system performance to investment decision-making. Maine DOT has an internal dashboard that shows the target levels of service, displayed on an A-F scale. The state legislature has also placed increased emphasis on establishing system condition goals, establishing a law that will require the state DOT to address assets with a condition rating below an established target.

Cory Pope of Utah DOT added that for Utah, integrating data from multiple systems has been a real challenge, as well. Often, there are proprietary issues that prevent data from being shared across systems with different vendors. Andrew Williams of Ohio DOT described Ohio's public-facing site, the Transportation Information Mapping System (TIMS). The website has been a helpful tool for improving communication by sharing data across geographic areas. Before TIMS could be successfully developed and deployed, Ohio had to focus on improving its internal data to resolve a series of issues regarding uses of systems from different vendors.

4 Integrating Maintenance into a Transportation Asset Management Plan (TAMP)

4.1 Introduction

Steve Gaj, Leader of the Asset Management Team for the FHWA Office of Asset Management, Pavement, and Construction, introduced the topic for the next set of presentations, integrating maintenance practices into a TAMP. Steve reiterated that the goal of the peer exchange was to share information. Participants should bring information back to their home states, starting a dialogue or implementing new ideas about how to approach asset management and maintenance.

Steve then added a few notes for participants to consider as the peer exchange progressed. First, he noted there are often issues between different groups in transportation agencies regarding how to define terms such as “maintenance” and “preservation.” Also, he suggested that as an industry, we need to have better information on how well different preservation treatments perform.

Moving forward, states will need to develop risk-based TAMPs in compliance with MAP-21. MAP-21’s definition of asset management emphasizes the importance of preservation, it states:

“Asset management is a strategic and systematic process of operating, maintaining, and improving physical assets, with a focus on engineering and economic analysis based upon quality information, to identify a structured sequence of maintenance, preservation, repair, rehabilitation, and replacement actions that will achieve and sustain a desired state of good repair over the lifecycle of the assets at minimum practicable cost”.

Ideally, maintenance staff should be involved in developing an agency’s TAMP. Steve detailed how asset management is defined in MAP-21, and noted that fundamentally, asset management helps to determine where an agency can best invest an additional dollar in its transportation assets.

Steve described FHWA’s ongoing project to work with a selected set of states to pilot development of TAMPs. MAP-21 requires that TAMPs address National Highways System (NHS) pavement and bridge assets. In the pilots some agencies are also addressing other assets, such as culverts, facilities, signs, and other non-NHS assets. Ideally an agency’s TAMP should include whatever information is needed to help support the budgeting and decision-making process. Basic elements that will need to be included in a TAMP based on the legislation include:

- Asset inventory data;
- Asset condition data;
- Agency goals and targets;
- Performance gaps;
- Lifecycle costs;
- Risk management; and

- Financial planning.

Finally Steve outlined the process for developing the rule for TAMP development. Based on information previously provided by FHWA, the current schedule is for release of a notice of proposed rulemaking (NRPM) in 2013 with a final ruling in April or May 2014. If this process remains on schedule, DOTs would be required to develop plans by October 2015, or during the second fiscal year after issuance of the rule.

4.2 New York's TAMP

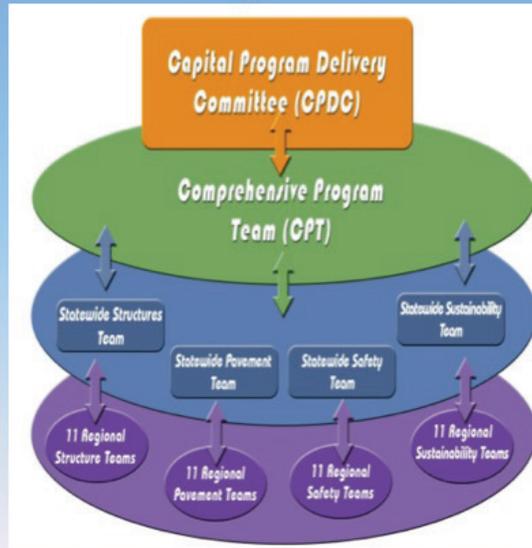
Rod Sechrist, Director of Comprehensive Asset Management and Capital Investment (CAM-CI) for the New York State Department of Transportation, began the presentation by providing an overview of the NYSDOT system and its wide range of assets. He next described NYSDOT's approach to implementing asset management, which emphasizes:

- An enterprise performance management framework,
- A robust inventory system,
- Comprehensive asset data collection,
- Developing a TAMP to comply with the MAP-21 mandate.

NYSDOT has attempted to use a practical approach that “cuts to the chase” as it implements asset management. The approach involves focusing on improving the quality of investment, leveraging existing data and tools, minimize initial investment and implementation time, working collaboratively across the agency, employing principles of TAM from the AASHTO TAM Guide, and following a systems approach.

Figure 4.2.1 illustrates NYSDOT organizational structure for implementing asset management. The effort is led by the Comprehensive Program Team (CPT), and is overseen by the Capital Program Delivery Committee (CPDC). A key aspect of the structure is the set of teams established for structures, pavement, safety, and sustainability. Each of the teams represents diverse areas of expertise and is responsible for identifying the highest priority areas for improvement to be incorporated into the TAMP. These teams work with staff in each of New York's eleven regions.

NYSDOT Asset Management Framework



5

Figure 4.2.1 NYSDOT Asset Management Organization

In implementing asset management concepts, NYSDOT was guided by a set of four basic principles, labeled the “Forward Four.” These are depicted in **Figure 4.2.2** and include:

- Preservation First: dedicating resources to maintaining assets over time.
- Maximize Return on Investment: ensuring that money is spent efficiently and effectively to make the most of limited funding.
- Make It Sustainable: making decisions that benefit the public, the economy, and the environment.
- System Not Projects: considering the entire system in the decision-making process.

In addition to these, the figure illustrates that safety is an integral concern, underlying all four principles.



Figure 4.2.2 NYSDOT Forward Four Guiding Principles

The asset management implementation effort resulted in a new approach to resource allocation within NYSDOT, increasing the consistency in approach between the different regions. Rod described the new approach as a “drastic departure” from NYSDOT’s previous approach to making investment decisions. With the new approach, regions are allocated preservation funds based on careful consideration of local needs. Each region is responsible for building a five-year program to show how funds will be further allocated to specific projects based on asset conditions. The majority of regional funds are dedicated to preservation, which is programmed using data-driven analysis of condition and functional data. Other funds are dedicated to statewide capital prioritization for system renewal and enhancement. The asset teams are responsible for providing a technical review of the regional plans, while the CPT works to find opportunities for collaboration across programs. In addition, 25% of preservation funds are placed in a statewide competition. These funds are budgeted based on regional submissions in four areas: bridge, pavement, safety, and sustainability.

A result of the new approach is that NYSDOT has been able to better balance its investments between different asset types, resulting in shifting of funds to pavement preservation. Also, the approach has helped NYSDOT “make the case” for obtaining increased funding. **Figure 4.2.3** illustrates projected outcomes for bridge and pavement condition based on the new approach compared to that projected using the previous approach.

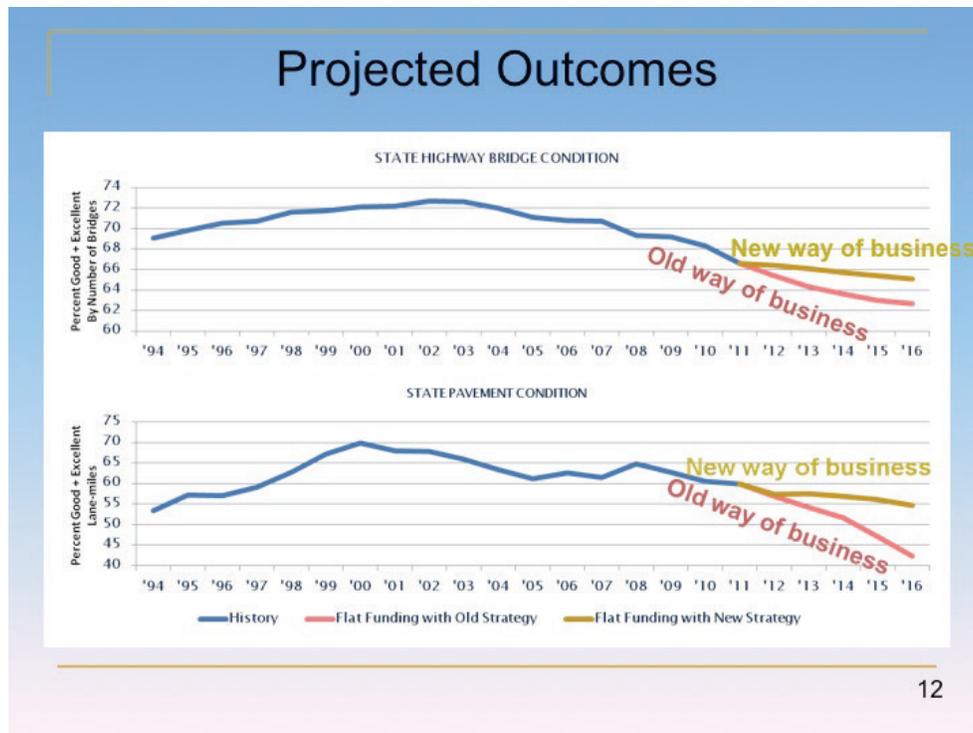


Figure 4.2.3 Projected Outcomes

Rod then described next steps for NYSDOT’s asset management implementation. These include implementation of the Agile Assets system as its Enterprise Asset Management Program (EAMP), and development of a TAMP. Regarding TAMP development, NYSDOT has formed a TAMP Working Group, which includes a project lead and project manager from the Office of Transportation Maintenance, as well as representatives from a variety of NYSDOT units, such as Pavement, Bridge, Planning, Multimodal, Finance, and the regions. External stakeholders on the working group include the New York’s Metropolitan Planning Organizations (MPOs), FHWA, and New York State Thruway Authority. The work plan for developing the TAMP was finalized in June, and in July NYSDOT held a risk management workshop to address the risks to be considered in the TAMP. A key challenge NYSDOT faces in developing the TAMP is that the TAMP should include all NHS assets, but NYSDOT owns only approximately two-thirds of NHS roadways in New York. Thus, it will be important to work closely with the MPOs and other external stakeholders in developing the TAMP.

Melany Reynolds asked about the risk management workshop that NYSDOT completed. Rod described the workshop, and noted that a valuable result was clarifying the difference and relationship between the annual risk exercise that the FHWA division conducts that is broader than TAM with the risk component of the TAMP. Carlos Braceras asked how NYSDOT determined the portion of regional budget that should be allocated to preservation (60%). Rod responded that the agency arrived at this allocation based on analysis of pavement and bridge preservation and capital needs: if the regions spend approximately 60% of their budgets on preservation this is expected to address approximately two-thirds of the pavement and bridge needs. Tim Lattner inquired about how NYSDOT achieves alignment between its maintenance

and capital programs. Rod noted that the capital program largely consists of preservation actions, so the two are relatively well aligned, but more work is needed in this area.

4.3 Louisiana's TAMP

Jason Chapman, Bridge Management Administrator and **Vince Latino**, Chief Maintenance Engineer for the Louisiana Department of Transportation and Development, detailed Louisiana's Transportation Asset Management Plan project. Jason first described the steps that led to development of the TAMP. The TAMP is being developed by the TAM Steering Committee formed in 2011. Michael Bridges, Undersecretary for the Office of Management and Finance, serves as the Executive Champion for the committee. The Chief Maintenance Engineer and Data and Systems Director are Co-Leads of the Committee. Once the committee was formed, LA DOTD executive staff and members of the TAM Committee participated in the NHI asset management course. Subsequently, LA DOTD requested that it be part of FHWA's TAMP pilot project. FHWA agreed, and meetings for the pilot project began in early 2013. Vince next described the current status of the effort. LA DOTD is using the basic work plan for TAMP development produced through the pilot project, though with an increased number of face-to-face meetings to facilitate TAMP development. LA DOTD's target is to complete a draft version of its TAMP by the end of 2013.

Jason then provided an overview of LA DOTD's existing asset data and management processes. LA DOTD has a well-defined approach for collecting pavement and bridge data, and for using its management systems to project needs and set targets. For pavement, the agency has measured conditions for the entire network biannually for almost twenty years, and uses Deighton's dTIMS Pavement Management System (PMS). For bridges, the agency conducts National Bridge Inventory (NBI) and element-level inspections, and uses the Pontis Bridge Management Systems (BMS). LA DOTD recently completed its second cycle of element-level inspections. LA DOTD has established performance measures and targets for both pavements and bridges, analyzes conditions and needs in its management systems, and reports on pavement and bridge conditions and needs and plans in documents such as the DOTD strategic plan, the Statewide Transportation Improvement Plan (STIP), and capital and operating plans.

Vince described DOTD's recent implementation of Agile Assets for maintenance management. LA DOTD has added inventory data for signals, sound walls, Intelligent Transportation Systems (ITS), and signs, and is identifying additional assets to be added into the system. However, these assets will not be included in the first version of the TAMP.

Next Jason described the tasks LA DOTD is performing to develop the TAMP. LA DOTD is using the work plan developed through the FHWA pilot project as a template. This document is available on the FHWA web site, <http://www.fhwa.dot.gov/asset/tamp/>. Jason next showed a section of the TAMP task list, showing specific action items, responsibilities, and due dates.

One task that is underway is the quantification of risks. LA DOTD staff met to develop a risk register for agency risks that lists risks by area, potential causes, existing controls or responses, and a risk rating based on the consequence and likelihood of each risk identified. **Figure 4.3.1** shows a sample from the risk register. The example shows agency risk - work is still underway to itemize

program and project risks. In developing the register LA DOTD reviewed examples from Minnesota and VicRoads (Victoria, Australia).

Vince concluded the presentation with a discussion of challenges that the agency has faced in developing the TAMP. Developing the risk register was a challenge in and of itself, and entailed extensive discussion about different potential risks, as well as distinguishing between risks and causes. A second challenge has been determining how the TAMP relates to LA DOTD's existing thirty-year financial plan, which incorporates investment strategies and financial assumptions also required in the TAMP. LA DOTD's hope is that the TAMP can be developed parallel to this existing document to prevent the agency from duplicating or revising past efforts.

Vince further described the challenges in quantifying life cycle costs. Basic concepts of life cycle cost analysis are well established. LA DOTD would like to be able to characterize the cost of preserving a roadway type in a certain condition over time. In the future, these analyses will help the agency to determine how to balance the budget between operating dollars and capital dollars. For instance, once cable barriers are installed, they cost approximately \$6,000 per mile per year to maintain. Ideally this cost should be considered when making a decision to install this asset. However, in practice, the agency does not currently have accurate cost data for all of the associated operating, maintenance and replacement costs for its assets.

A final challenge is developing an understanding of how the TAMP is to be integrated with LA DOTD's policies and plans. For example, is development of the TAMP ultimately a responsibility of Operations or Planning? Also, is it primarily an investment plan, or more of a guideline concerning how LA DOTD maintains its assets? Further work is needed to resolve these questions.

AGENCY RISK REGISTER

Risk Description	Key Risk Area	Potential Cause	Existing Risk Controls, management actions and management tools	Risk Assessment with existing controls		
				Consequence	Likelihood	Risk Rating
Negative public opinion	Reputation	loss of buying power (funding), trust, fraud, incident (bridge failure), poor employee customer service, system deterioration,	Public relations, executive management, performance,	Moderate	Possible	Medium
lack of operating funding	Financial	inflation, flat revenue stream, negative economic conditions, other budget demands, alternative fuels/fuel efficiency,	education of elected officials, strategic thinking, continuous improvement/efficiency, eliminate services, reduce staffing	Major	Almost Certain	Critical
cut in federal funding	Financial	federal highway trust fund insolvency	alternate priority program, statewide longrange plan, sell GARVEE bonds	Major	Possible	High
insufficient match for federal funds	Financial	increase in fed funds, decrease in state funds, increase shift to other parts of state budget, increased operating costs, disaster, federal legislation, change in match ratio,	restructure state highway program, cut port and flood control programs, cut parish trans fund, cut operating budget, use toll credits as match, apply for GO bonds, apply for state general funds, reduce level of service	Major	Likely	High
loss of staff	Business Performance and Quality	continual downsizing, aging population, reduced benefits for workers, funding, emphasis on privatization	succession planning, recruiting, overhire, cross training, workforce development program, structured training, outsourcing	Major	Almost Certain	Critical
weather events due to environmental changes	environmental	climate change, hurricane, subsidence, sea level rise, coastal erosion, flood events, drought,	design standards, emergency preparedness, support for levee districts, flood control program, infrastructure hardening, improved data (elevations), disaster recovery plan (COOP),	Moderate	Almost Certain	High
terrorist/criminal acts	security	terrorism, criminal activity, permit violators. ineffective	rest area security, cameras, fund weight enforcement and traffic control, access to as-built plans, building security, pre-employment drug screen, critical safety positions random screening, fund weight enforcement, issue permits, focus on infrastructure preservation.	Catastrophic	Rare	Low

Figure 4.3.1 Louisiana DOTD Agency Risk Register

At the conclusion of the presentation, Butch Wlaschin spoke further about the FHWA TAMP pilot project. He noted there is no “one-size-fits-all” approach to developing a TAMP, but that some elements of the process followed by LA DOTD and the other pilots may be applicable for other states.

4.4 Wyoming’s TAMP

Martin Kidner, State Planning Engineer for the Wyoming Department of Transportation, began the presentation by stating “silos are good,” and explaining that this phrase is meant to underscore the value of groups of experts on a particular asset type or topic, for the purpose of leveraging the knowledge base within an agency. He next outlined the contents of the TAMP that WYDOT is developing. The TAMP sections will include:

- NHS pavement and bridge inventory data;
- NHS pavement and bridge condition data;
- Performance objectives and measures;
- Performance gap identification;
- Lifecycle cost analysis;
- Risk management analysis;
- Financial plan; and
- Investment strategies.

One issue for WYDOT is determining how the TAMP relates to WYDOT’s planning cycle. **Figure 4.4.1** depicts WYDOT’s planning cycle, showing how the Long Range Transportation (LRTP) is used to develop corridor plans, identify needs, and support asset management decisions. This work informs the Statewide Transportation Improvement Plan (STIP), the results of which are measured using performance monitoring and updated to produce the strategic plan and a new LTRP. Along the way, these programs are improved through the use of programming and performance adjustments.

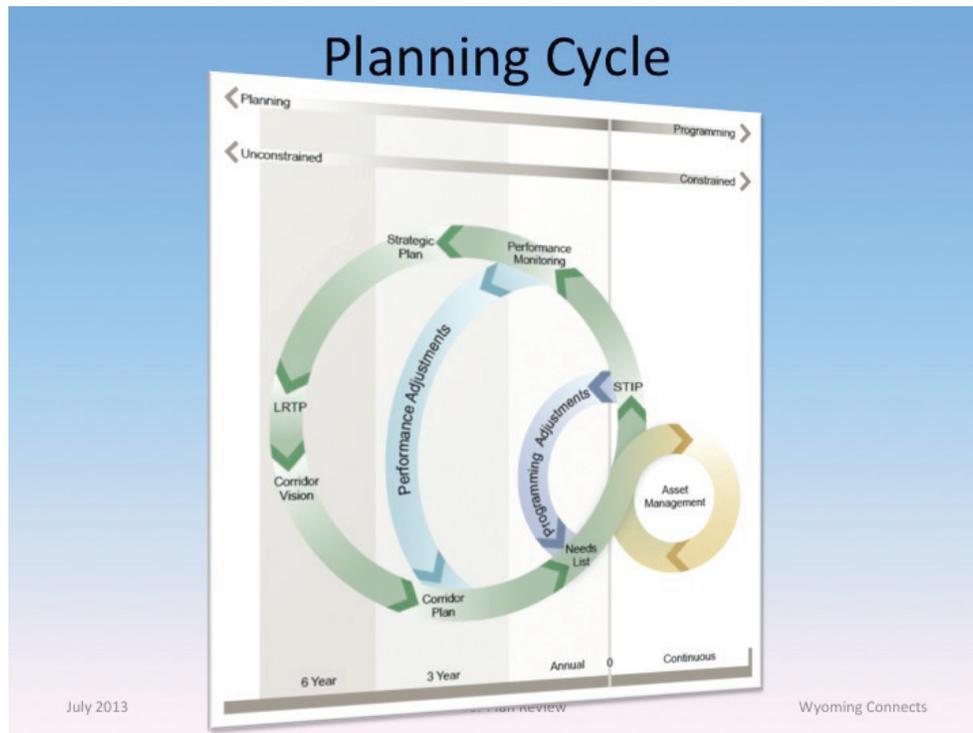


Figure 4.4.1 Wyoming DOT Planning Cycle

Martin next discussed the fact that WYDOT has developed much of the information needed for its TAMP. An important aspect of WYDOT’s approach is the development of corridor plans, which are used to best reflect the user experience of traveling between major nodes. Every year WYDOT performs “road tours” to assess conditions by corridor. Data on conditions are entered into Excel and imported into an Oracle database. **Figure 4.4.2** shows an example of preservation-related conditions for a corridor, with qualitative descriptions of the conditions for preservation categories by segment along the corridor.

Martin next described WYDOT’s approach to budgeting and programming pavement projects. Given a budget, WYDOT determines the funding available for Interstate, NHS, and non-NHS roadways. Projects are then further split based on WYDOT funding allocated to specific network strategies. A list of recommended projects is developed for each sub-category and district input is used to determine a draft program. He showed graphs depicting projected conditions for different budget strategies.

for innovation through exchanging new ideas and adopting relevant practices developed by other states. Matt also discussed the concept of “silos” or “cylinders of excellence.” Clearly states have a need to foster expertise in different areas, such as in maintenance, pavement management, and bridge management. This expertise is needed to develop a TAMP, but at the same time, it is important to integrate data and results from different groups in developing an agency’s TAMP, as this requires input across multiple divisions and can have outcome that affect the entire agency.

5 Facilitated Discussion

5.1 Introduction

Scott Zainhofsky, Planning & Programming Engineer for the North Dakota Department of Transportation, began the second day of the peer exchange with a summary of the previous day's key themes. He emphasized that the purpose of asset management is to maximize the result of investments and that asset management is a cyclical process. He also noted that, in asset management, there is no “one-size-fits-all” and there are a variety of solutions to every problem. Scott then reviewed some of the major themes from the presentations, including:

- Carlos Braceras of Utah DOT discussed the importance of using asset management to help prioritizing investments when they do not have sufficient funds to do everything that is needed.
- Jon Wilcoxson of KYTC discussed how the agency changed its project development process, as well as the benefits of having Planning and Maintenance working together to improve asset management.
- Jennifer Brandenburg of NCDOT presented the concept of an overall health index that combined data on conditions for multiple assets. Another important theme from the presentation was the concept of system-wide performance. It can be easy for asset managers to concentrate on their own assets, but this can happen at the expense of the system as a whole. If one asset type performs well and exceeds targets, is it more beneficial to increase targets in that area or divert funds to other assets that may be under-performing to increase the utility of the entire system?
- Anita Bush of NDOT discussed how her agency is now beginning to leverage maintenance data that had been collected over time, and the challenges in successfully integrating and using existing data.
- Jerry Casey of Maine DOT described his agency's approach of establishing letter grades by road and asset class, which could be used to determine an overall score for the system.
- Steve Gaj of FHWA discussed the use of asset management as a tool for maximizing investment strategies. He also expressed FHWA's hope that developing TAMP will be a beneficial process for agencies, providing an opportunity to illustrate current practices and consider places for improvement.
- Rod Sechrist of NYSDOT discussed how his agency had focused on the whole picture, optimizing the system as a whole rather than concentrating on individual projects. Adopting this way of thinking allowed NYSDOT to develop the “Forward Four,” providing clear objectives for the entire agency and incorporating teams into a cyclical decision-making process.
- Jason Chapman and Vince Latino of Louisiana LA DOTD described how their agency has form a multi-disciplinary team to develop their TAMP, and highlighted the importance of incorporating data from a number of different documents in an agency's asset management plan.

- Martin Kidner of WYDOT, described the importance of building expertise within “silos,” and discussed how experts in different groups at WYDOT work together to improve system-wide performance.
- Matt Hardy of AASHTO concluded the day by discussing the diversity of asset management practices and approaches to TAMP development across states, and how this should be viewed as an opportunity for innovation. This would allow states to learn from each other to find the approach that works best for their agency.

5.2 Incorporating Risk into a TAMP Discussion

The risk and TAMP discussion was facilitated by **Mark Nelson** of Minnesota DOT (MnDOT). Mark initiated the discussion by summarizing MnDOT’s risk management approach. MnDOT defines risk as “the effect of uncertainty on objectives.” There are a number of processes for calculating risk, but it is crucial to examine both the likelihood of an event occurring and the resulting impact. MnDOT developed an agency risk framework that includes methods for determining strategic risks, business line risks and project level risks. Some of the risks included in the framework are relevant to and will be included in the asset management plan, including programmatic risk and climate risks. Mark encouraged participants to review the complete risk framework on the MnDOT website.

Approaches to Risk Assessment

Melissa Batula of Pennsylvania DOT (PennDOT) shared PennDOT’s risk management approach, which thus far has focused on bridges. The process characterizes the consequences of an event, the likelihood of occurrence, and an overall risk score combining likelihood and consequence. The agency uses the risk score as a factor in prioritizing bridge projects. This process will be adapted for inclusion in the agency TAMP.

Jerry Casey, Maine DOT, discussed Maine’s grading system for assets. For the purpose of the grading, pavement segments are treated as assets. Each segment is assigned a grade from A through F based on a comprehensive list of criteria. While risk is a factor that is considered in the grading process, the agency also has a separate risk assessment process. Scott Zainhofsky of North Dakota DOT, noted that North Dakota has adopted a process similar to that of Maine, in terms of how it assesses asset conditions, but has not yet incorporated risk in the assessment.

Nate Moore of the Maryland State Highway Administration described his agency’s approach to assessing the risk of wet-weather accidents through combining data on crash rates with traffic data. Tim Lattner of Florida DOT discussed the challenges Florida has encountered in assessing risk. They are now trying to quantify the risks of not performing planned work (e.g., due to changes in fuel costs, lower revenue, and the impacts of posting or closing bridges). Another issue is determining how the agency would adjust its plan if it faced a situation in which revenues are less than planned.

Steve Gaj of FHWA, noted that one topic states may want to address in assessing risk is that of system resiliency. Martin Kidner of WYDOT expressed concern about measuring resiliency as part of a risk assessment. It may be more appropriate to consider resiliency in a separate assessment that examines what parallel routes exist for key corridors, for example. Steve

responded that resiliency could be a factor in situations such as analyzing coastal areas with a history of flooding. Rod Sechrist of NYSDOT added that for NYSDOT it would be difficult to consider existence of parallel roads in a risk analysis. Other factors, such as reducing scour risk or addressing roadway elevation, would be directly applicable to assessing risk.

Andrew Williams of Ohio DOT described the approach Ohio DOT is following for assessing risk. The agency developed a risk matrix to categorize the necessary data for determining risk, considering Tier I through Tier III data needs. Ohio DOT would like to collect the data needed to developing Markov models to determine the effects of various treatments, and treatment longevity. The goal is to factor this probabilistic analysis into the decision-making process. Initially this methodology will be utilized for pavement, with the assumption it will eventually be adapted for other assets.

Rod Sechrist discussed the risk workshop in which NYSDOT staff recently participated. One topic discussed at the workshop was that of absolute versus relative risks. He offered that the TAMP should address risks with the highest likelihood and/or risks with the most severe consequences. The TAMP should also be used to document the processes in place, or planned processes, for addressing risk. Program development guidance should address the risk approach, as well.

Vince Latino of LA DOTD noted the similarities in the process LA DOTD is following to that of NYSDOT. Historically, LA DOTD assessed risk at a project level. As described in the prior session, LA DOTD recently conducted a workshop, identifying between twelve and fifteen most significant agency-level risks that needed to be addressed. During the workshop, the participants found that it could be difficult to distinguish cause from risk. Vince agreed that risk is a broader issue though: it is not only relevant to the TAMP but applies to factors throughout the agency.

Risk Tolerance

Next Rod Sechrist raised the issue of risk tolerance. He noted that when risks are addressed at the project level, there is a tendency for designers to attempt to address every risk they find, even low likelihood/low consequence risks. There is a need to build more risk tolerance into project development in an effort to properly align with a risk-based approach. For NYSDOT a next initiative is to work on identifying program and project level risks.

Scott Richrath of Colorado DOT discussed an example in Colorado. In one town in the southwest corner of the states, there is a single route in and out of the town, and mudslides which result in closing the road are a frequent occurrence. As a result, on an annual basis Colorado DOT hauls approximately 700,000 pounds of mud to keep the road open. When considering how to best maintain this section of highway, it is important to consider a number of factors, including the resources required to perform the needed work following each mudslide, the costs of improving the road to reduce the risk of mudslides, and the potential consequences of a mud slides. Regional staff members have created flow charts to consider all of the possible actions for the highway, possible outcomes, and risks associated with each. This has allowed staff to better understand the effects of decisions, raise flags at critical points, and bring major issues to senior

management for review. DOTs make many such decisions regularly, but often do not make conscious decisions to accept, mitigate, transfer risks, for lack of formal analysis and process.

Risk Assessment and the TAMP

The discussion next shifted to the information on risk that should be included in the TAMP, and the structure for the final TAMP document. Andrew Williams asked how the kind of information described by Scott can be incorporated in a TAMP. Scott discussed the different approaches to addressing risk and asset management processes in the TAMP. Colorado is likely to have separate sections addressing risk and asset management processes. Rod Sechrist elaborated on the rationale for creating a process chapter in the TAMP, stating that it is beneficial to record the procedures to improve consistency. Mark Nelson agreed that process documentation is an important part of the TAMP.

Cory Pope of Utah DOT gave an example of the importance of process documentation. Previously UDOT allocated the majority of its federal funds to bridge and pavement assets. At that time, roads were categorized as Interstate, Level 1, and Level 2 based on average daily traffic and truck volume. Utah later decided to change their process by allocating the majority of the budget to Interstate and Level 1 projects, while dedicating the majority of Level 2 funds to maintenance. Although this example does not apply to assessing risk, UDOT found that changing the underlying decision-making processes allowed the agency to focus funds where they were needed. After Utah successfully met its targets for pavement and bridge performance, the DOT was able to lower the threshold for roads that constitute Level 1, allowing funds to be more widely distributed across the system.

Kevin Viani of the Vermont Agency of Transportation (VTTrans) inquired about the risks that will be addressed in the TAMP. Scott Richrath replied that the Colorado will most likely identify between thirty and fifty risks, developed through a series of agency workshops. The list will be reviewed by agency management before documenting individual risks for inclusion in the TAMP. An example of a fully developed risk assessment in Colorado is the rockfall program. Top corridors at risk for rockfall have been identified based on a hazard index developed by the agency. Steve Gaj suggested that agencies may want to focus on the methods for assessing and addressing risk, rather than the specific risks that will be included.

Risk Analysis

Mark Nelson posed the question to the peer exchange participants about the major hurdles and benefits they encountered in conducting a risk analysis. In Minnesota, the agency has experienced some issues with data quality. For pavement and bridge assets, MnDOT has the appropriate data to conduct a risk analysis, but lacks data on ancillary assets. Eventually, MnDOT plans to include some ancillary structures in the TAMP, but this will require additional data collection.

Melissa Batula agreed that data gaps are a common hurdle. In some cases, for example, when assessing geotechnical risks, Pennsylvania has developed different approaches and methodologies for different districts based on their available data and resources.

Andrew Williams described two potential issues: attempting to put too much into the TAMP, and not knowing how the document will be used. Jon Wilcoxson of KYTC suggested that another

challenge is in comparing different types of risks for different assets with different potential consequences.

Mark Nelson noted that the discussion thus far has assumed that agencies have a central decision-making process. He asked if agencies should be concerned if this is not the case, especially in the case of developing a TAMP or assessing risks. He expressed some concern that the documents would become too prescriptive, providing a detailed approach for managing assets on a daily basis. Rather, there should be a balance between developing a flexible program and a program that provides a simple, transparent approach. Caleb Dobbins of New Hampshire DOT added that it can be problematic to release risk-related data. Identifying, but not mitigating, a risk can leave the agency vulnerable to lawsuits.

Nate Moore identified coordination as another possible hurdle to the risk assessment process. Because risk requires involvement across divisions, it can often be difficult to initiate and garner support for the program. Nate and Scott Zainhofsky agreed that this is particularly difficult for risk, as it is not typically a high priority for most agencies and involvement is rarely required. At the same time, not all agencies will require in-depth risk management approaches. Scott speculated that the grading approach described by Jerry Casey for Maine DOT on page 33, may be sufficient for many states, and would be easier to implement than some of the other more detailed approaches others have implemented.

Risk Assessment Training

Mark Nelson asked if there was a need for risk assessment training. Rod Sechrist suggested that it may be possible to address this through adding discussion of risk assessment principles as part of agency risk workshops, rather than having a separate course. Steve Gaj discussed resources available for agencies wanting to learn more about risk assessment. FHWA has developed a number of reports on risk, in addition to a NHI training course that has been adapted to have an increased asset management focus. There are also webinars available online that address risk, although they do not include information on incorporating risk into a TAMP. FHWA hopes to make more resources available in the future that will discuss the role of risk in transportation asset management plans.

Hyun-A Park added that a number of projects are taking place to address the topic of risk, but the information has yet to be compiled and translated into a useful form for agencies. Steve noted the example of Scotland's risk assessment approach, detailed on the FHWA website. This example shows that there is no one approach to risk assessment; and some risks require more detail than others. Scott added that there should be other examples available.

Joe Baker of Rhode Island DOT noted there is large number of potential risks, from operational risks to political risks. Additional guidance may be needed to determine how to combine consideration of different types of risks. Vince Latino stated that guides are beneficial, but LA DOTD had only a vague notion of the process until staff met and began to list risks. Taking a hands-on approach proved to be successful for the agency.

Uses of Risk Assessment

Andrew Williams asked how Colorado is incorporating maintenance aspects of an asset's life cycle into its risk assessment, as sometimes agencies have a tendency to forgo maintenance. Scott Richrath agreed that this must be addressed, although it may have to be dealt with as part of the financial plan section of the TAMP rather than as a factor in the risk assessment. The TAMP financial plan for Colorado DOT will incorporate nine assets types. One important type to include is ITS. Colorado DOT has \$90 million in ITS equipment. Given the useful life is 15 years for most pieces of ITS equipment, one might expect that CDOT would spend approximately \$6 million per year on ITS equipment maintenance. Although the agency has added ITS assets in the past, it previously did not have the capacity or the resources to perform ITS maintenance, and did not budget for it.

Participants then raised additional questions and concerns about how risk assessments might be developed and used. John Selmer of Iowa DOT raised the question of whether risk assessment is fundamental to the decision making process, or is an "appendage." For instance, if risk is fundamental, one might prioritizing decisions considering a risk score, and consider different scenarios. He also noted that it may be difficult to find the appropriate balance between being too reckless and being too risk-averse. Anita Bush of NDOT agreed it is important to consider how a risk assessment will be used.

Rod Sechrist responded that the fundamental issue is that developing a risk based plan documents how decisions are made concerning risk, providing a framework for making the best use of funds to minimize risk. Steve Gaj agreed with Rod's point, reiterating that the basic idea is to document the process for decision-making incorporating risk. Mark Nelson also agreed, noting that documenting the process is not meant to make the agency more risk averse, but instead should to standardize risk assessment procedures.

Andrew Williams suggested that if one of the risks included in the analysis is funding risk, perhaps the risk assessment should include different funding scenarios. Rod concluded the discussion noting that the process of documenting an agency's risk assessment procedures should help show constituents that money is being spent efficiently to gain public trust (and thus serve as a tool to help mitigate funding risk).

5.3 Financial Plans Discussion

The financial plans and TAMPs discussion was facilitated by **Scott Richrath**, Performance and Policy Analysis Manager for the Colorado Department of Transportation. Scott began the discussion by introducing the topic of financial planning. The key concepts for transportation are similar to those for general financial planning, including calculating the risk on return, the time horizon for analysis, and key assumptions. In the case of transportation, making the proper assumptions and documenting them is particularly crucial, as there are no certainties. It can be helpful to create different funding scenarios to test various funding assumptions.

Financial Planning Approaches

Andrew Williams, Ohio DOT, explained how Ohio created a committee for financial planning, comprised of staff from the majority of DOT business units and the Chief Financial Officer (CFO). The committee is responsible for performing a five-year projection of revenue, cost of construction, capital costs, and maintenance allocation. The funds are considered based on their sources and restrictions, i.e. federal, gas tax. Funds are further allocated by the agency, which has established a number of dedicated budgets including a discretionary maintenance budget. The group meets on a quarterly basis to adjust the financial plan. Having a single group, reflecting a number of important divisions throughout the agency, has helped to formalize the financial planning process.

Vince Latino described how LA DOTD will incorporate its financial plan into its TAMP. The TAMP champion is the CFO and thus, is well positioned to design the financial plan for inclusion in the TAMP. It is still unclear if the TAMP will inform the statewide transportation improvement program (STIP) or vice versa, although once the process for developing the TAMP has been finalized, it is likely it will change the current processes in some areas. One of the advantages of the TAMP is that it will contain input from all major divisions in a single document. The plan will likely cover the next five- to ten-year period. Budget assumptions from the existing thirty-year plan will be used to inform the TAMP.

Scott Richrath elaborated on the topic of coordinating existing plans. He added that Colorado had developed a statewide plan with a projection for asset management, and the data from that document will be used to inform the TAMP.

Mark Nelson discussed the fiscally constrained twenty-year plan developed by MnDOT that contains all projections for funding. This includes funds allocated to NHS pavement and bridges. One challenge that the agency has faced is that historically, operations and maintenance (O&M) planning has been short-term, typically on a two-year cycle. Having a long-term financial plan is causing a shift in the financial planning approach, requiring staff to consider O&M spending over a longer period. Steve Gaj stated that it is not desirable that agencies redo or duplicate materials in their LRTP when developing their TAMP. In the future when STIPs and LRTPs are developed along with the TAMP, the TAMP should feed into these documents. However, all of these documents will embody an asset management approach.

Dave Solsrud, Minnesota DOT, asked how life-cycle cost analysis could be incorporated into the financial planning process. Steve Gaj responded that ideally the asset management approach that is defined for an asset considers the costs over its entire life cycle (whole life cost).

Rod Sechrist asked Scott Richrath about future funding assumptions in the TAMP, and if any guidance will be provided for future budgets. Scott noted that the current law in Colorado calls for the agency to receive a funding increase when economic conditions are met. However, CDOT has decided to make an assumption that there will be flat funding, for the sake of consistency in their long-term planning. Vince Latino added that in its TAMP LA DOTD will present different funding scenarios to account for a range of possible budgets.

Butch Wlaschin of FHWA offered that the TAMPs may be useful in helping clarify funding requirements for maintaining assets over time, but hopefully should not require states to rehash or revise projections already included in their LRTP. Melissa Batula noted that it may be important to discuss in the TAMP the impact of federal versus state dollars. Both are important sources of funding and it is beneficial to connect specific spending programs with the funds that were used.

Reporting on Needs

Scott noted that Colorado is required to produce an annual report on the agency need versus revenue (called the Deficient Report) for pavement and bridge. He asked whether agencies had the necessary data to complete such a report, and suggested that most agencies would likely have the data to complete pavement and bridge, but it was unclear if it would be feasible to generate such a report for other assets.

Howard Holland of Texas DOT (TxDOT) described that TxDOT estimates maintenance needs based on sample data, and does have the ability to calculate the deficiency of needed maintenance funds. The state has also produces a thirty-year plan focused on maintaining current levels of condition. In the future TxDOT may need to project future system performance based on planned revenue.

Joe Baker added that Rhode Island would be capable of preparing needs and revenue numbers for pavement and bridge. The state is also developing a plan for equipment purchases. Cory Pope described a presentation made in Utah outlining the components of the UDOT's plan. This emphasized that the financial picture may change, so it is crucial to have a process in place for determining how the funds will be spent.

Rod Sechrist described that in New York the Governor created a task force, the New York Works Task Force, responsible for all capital investments in the state. Each agency was responsible for compiling a 10-year plan to maintain the current level of service while maintaining assets in a state of good repair. As part of the results of this program, NYSDOT received additional transportation funding. This story highlighted the importance of demonstrating need. In addition to showing how assets would be maintained over time, the New York plan emphasized creating new jobs. Regarding the assumptions for the TAMP, Rod noted NYSDOT will use data from its STIP, while making an assumption about the degree to which the STIP may be over-programmed.

Scott Richrath described the funding process in Colorado and noted that the working assumption in Colorado is that transportation is well-funded, while other agencies have significant unmet needs. Anita Bush raised the question of whether purchases of right-of-way for large projects should be incorporated into an agency's TAMP, such as for projects involving a public-private partnerships.

Funding Cuts

The group next discussed what components of an agency's program would be maintained and what programs would have to be reduced in a worst case scenario. Melissa Batula and Anita Bush agreed that maintenance funding would be likely to drop in their agencies' worst case scenarios. Caleb Dobbins of New Hampshire DOT described the "long sine wave of erosion" that tends to occur, as funding gradually erodes over time. One possible reason for this decrease is that

legislators, as well as the public, have a short-term memory regarding transportation system conditions. When conditions are sufficiently bad, funds are increase, but as the conditions get better, funding gradually decreases.

David Wieder of Colorado DOT observed a similar dynamic regarding maintenance funding in Colorado, where the maintenance budget was held flat as costs were increasing. He noted the importance of small incremental increases in funding, and explained that CDOT was able to go to its Transportation Commission to obtain needed maintenance funds, rather than approach the legislature.

Tim Lattner explained that unlike other states, Florida funds maintenance projects first, and this is written into the law. Martin Kidner of Wyoming DOT described that in Wyoming, at one point, construction costs increased 25% and the number of miles being treated on the road network dropped significantly. During this time, the financial plan shifted to a preservation-first strategy. Glenn Davidson of New Hampshire DOT discussed the lack of incentives for DOTs to try to save money. In New Hampshire, one year the DOT found itself unable to shift funds from its snow and ice budget after it had a light winter.

Agency Goals and Targets

Scott Richrath asked the group if their financial plans would include the results of not maintaining the current condition. Most states replied that they already cannot maintain current conditions. Martin Kidner and Cory Pope elaborated, saying they can maintain their current conditions, but that is because they have made agency-wide decisions on the assets that should be maintained. Cory noted that in Utah, they have not assessed all of their asset conditions, such as signs and signals.

Rod Sechrist explained that overall conditions are declining for pavement and bridge, but the percent of Vehicle Miles Traveled (VMT) on good/excellent pavement is improving, as the DOT focus has shifted to roads with higher traffic volume. Nate Moore added that the selection of performance measures is important in “telling the story.”

Tim Lattner described the Florida process for developing targets. He explained that the state initially set high targets with the goal of improving system performance, and over time they have begun to reach their goals.

Nate Moore discussed that conditions can be defined in many ways. For example, it is possible to use a number of different condition measures, such as cracking or friction for pavement. While states have the ability to tailor these measures to best fit the local conditions, there is a need to think nationally about these measures and the process for comparing them. What measures are important to compare across states? How should they be weighted to compare between states? By VMT? By mileage? Butch Wlaschin agreed these are important questions, while noting that the rules for federal reporting of conditions remain to be determined.

Scott Zainhofsky added that system connectivity is an important factor, and low volume roads are often necessary to promote connectivity. Butch Wlaschin encouraged states to comment on FHWA’s proposed rules once they have been published to discuss some of these issues. Scott replied that even with the comment period, different measures might have to be established for

national versus state-level reporting. While national measures will be important for comparing the entire road network, state will likely require additional measures to perform and prioritize system preservation tasks. Anita Bush used Nevada as an example, explaining that 80% of the state system is low volume roads. There is a lot of value in these roads and that should be reflected in the national measures reported by the state. In this situation, reporting conditions based on mileage rather than VMT would be a better reflection of performance.

5.4 Round Table Discussion

Cory Pope, Director of Systems Planning and Programming for the Utah Department of Transportation, facilitated the open discussion session at the end of the peer exchange. Cory began the round table with a discussion of the expanded national highway system (NHS) and its impact on TAMP development. A basic challenge for many DOTs is that they are required to report on all NHS roads in their TAMP. However, the NHS, and particularly the expanded NHS created by MAP-21, includes locally-owned roads for which states typically have less detailed data. The new system definition will most likely impact data collection processes and the required level of detail, particularly for assets other than pavement and bridge. In the previous discussions about developing a TAMP, participants discussed state processes for establishing performance targets for pavement and bridge and considering life cycle costs at a system level. Cory noted that these topics had not yet been approached from the perspective of the expanded NHS and any subsequent changes to state approaches towards system performance.

The Expanded National Highway System

Rod Sechrist discussed the challenges faced by NYSDOT. Approximately two-thirds of the NHS in New York State is owned and operated by the DOT, while the remainder is operated by independent authorities, counties, cities, and other agencies. While this is not a problem for bridges, which are all maintained in the state BMS, pavement is more difficult to monitor across organizations. It is a huge effort to collect and centralize the necessary data to run pavement models and determine the best method for maintaining the system. New York has yet to figure out how to address this problem. Melissa Batula noted that Pennsylvania faces the same basic issues as New York.

Andrew Williams discussed the fact that portions of the NHS that have no connectivity. He refers to these as “danglers.” Ohio DOT debated changing the functional class on some of these roads. The agency went through the process of examining how roads are classified. Doing this actually resulted in adding mileage to the system, pending FHWA approval.

Cory Pope asked whether states had considered using federal funds for off-system data collection. Scott Zainhofsky responded that North Dakota had considered doing this. Also, his state was about to go through the processes of reclassifying roads described by other states. North Dakota was considering creating a different asset class for urban NHS versus rural NHS, as it functions differently and has different requirements.

Steve Gaj added work is underway updating the memo describing use of funds for off-system data collection. The group discussed that it is unclear whether states would use federal funds for this purpose, given federal funds were capped.

Tim Lattner discussed the situation in Florida. In his state there are 500 miles of locally maintained roads on the NHS, as well as NHS bridges for which local agencies are responsible.

The group next discussed the issue of coordination with local agency. Andrew Williams expressed concern that local agencies rarely have incentives to maintain bridges. Rod Sechrist noted it would be useful to have minimum maintenance standards. In New York the intent is to develop condition targets for NHS assets which MPOs will be able to review. Tim Lattner expressed concerns that MPOs may set different targets for NHS assets than the state. Melissa offered that MPOs should set targets based on the state TAMP, though there may not be a device for ensuring this occurs. Butch Wlaschin reiterated that states will need to carefully review the proposed rules to determine whether they adequately address these issues.

Mark Nelson described that in Minnesota approximately 1% of NHS roads are locally owned. The DOT already assists counties with data collection. Going forward local agencies will not be able to obtain state aid for data collection, but may be eligible for National Highway Performance Program (NHPP) funds.

Rod Sechrist noted that in New York local agencies pay only 5% of project costs because the states will match funds. The best motivator is the state's ability to withhold matches. Melissa Batula countered that there has been a discussion in Pennsylvania of withholding locals' liquid fuel funds if the necessary bridge repairs have not been completed, but the risk is that locals may prefer this, as having the funds withheld would make PennDOT responsible for performing needed maintenance.

Data Collection

The conversation then transitioned to data collection practices. Joe Baker described that in Rhode Island the DOT formed a group to review data collection practices and discovered numerous instances of duplication of effort. While there was a clear need to establish protocols that prevent duplicative data collection practices, there are still questions, such as whether to collect drainage details.

The question was posed to the group if manual data collection practices were used for pavement. Participants reported that in most cases they used automated data collection practices were used, although several noted the practice of performing manual reviews of the data to calculate certain measures. Cory Pope asked if the private sector had sufficient capacity for all the automated data collection. Most expressed confidence that this was not an issue, stating if the demand was there the service would be available.

Nate Moore discussed a different problem: that vendors in Maryland often use different approaches for data collection, including varying file formats. This approach makes it extremely difficult to switch vendors without setting data standards for the area, which all vendors would be required to adhere to. The state is currently procuring a new vehicle but it may need to reinvent data collection processes depending on the vehicle that is chosen. Cory Pope added that this is not a new problem, and described issues encountered in Utah handling of pavement data from different vendors. Matt Hardy reported that AASHTO is aware of this problem. To combat these issues, AASHTO has been working to establish seven core data principles. These will address concepts such as: data as an asset, open data, accessibility, etc. The goal is to address

these issues on a higher level so that agencies can begin to think about their data collection and data storage practices.

Other agencies expressed similar discontent with the ease of data integration, including Joe Baker, who noted issues with integrating data, such as GPS transmitters in trucks. David Wieder, worked directly with vendors in an effort to pull data from trucks for snow control. In his experience, the industry was willing to collaborate. Currently five vendors are working with Colorado DOT to develop a standard data protocol. Andrew Williams agreed that the Colorado example was the ideal and could be a viable approach in the future by showing how states can work to convince vendors to collaborate on projects, ultimately creating a useable product.

Cory Pope added that standardizing data practices could create a bigger market for vendors. Andrew Williams described a NCDOT effort to encourage vendors to open up their systems. Recognizing that many states have begun to develop efforts in this category, he wondered if there was a forum for sharing information and current efforts to improve data sharing. Matt Hardy responded that AASHTO has tried to do perform this function using community forums. He also noted that the topics discussed can be sensitive and group or personal email chain might be a more effective way to exchange information, rather than publishing on an open forum. Dave Solsrud of Minnesota DOT described a Listerv that has been used for this type of coordination. Katie Zimmerman further added that there will be a project to establish an asset management information portal for this sort of coordination. Data integration could be a potential topic for this new interface. James Tsai of Georgia Tech concurred with the need for coordination on data sharing, particularly given the emergence of new technologies, such as 3D visualization. Vendors use their own formats and they are difficult to share.

The next level of sharing would be in coordinating approaches for procedures, such as crack identification. Steve Gaj noted the lists of state and federal asset management contacts on the FHWA Asset Management web site at <http://www.fhwa.dot.gov/infrastructure/asstmgmt/amcontacts.cfm>. He personally maintains this information and this could be a source for people attempting to coordinate future efforts at communicating data integration practices.

Transit

The round table then addressed transit practices and how they will be addressed in MAP-21. Butch Wlaschin noted that in some instances, DOTs might be responsible for rural operators. In most cases, though, the transit asset management plans will follow different procedures from the TAMP. There is a separate MAP-21 rulemaking process for transit asset management. This means that some transportation agencies will be responsible for establishing two plans for NHS and transit assets. Matt Hardy asked the group how many agencies were active in transit, and most raised their hand to indicate they had been coordinating with their transit component since the ruling of MAP-21. Butch explained that with transit, there will be an advanced notice of proposed rulemaking requesting comment, allowing DOTs the opportunity to participate in the legislation. Steve Gaj addressed concerns that even though the MAP-21 requirements will be different from transportation, certain components of asset management will be the same. This will allow DOTs to apply some of the principles established in the TAMP, modified for transit.

Next, the group addressed some general concerns with the transit and transportation AM plans. Matt Hardy noted that the rules might be onerous for small agencies. Scott Zainhofsky explained that there exists some multi-state, multi-FTA region MPOs in North Dakota responsible for transit agencies. These agencies might have trouble coordinating across the necessary agencies to develop a cohesive asset management plan.

Life Cycle Costs and Performance Measurement

The topic of conversation then shifted to life cycle costing and performance measurement. Cory Pope posed a question about how agencies are addressing life cycle costing on a system-level. Scott Richrath began the discussion by relaying changes that have occurred in Colorado. The Executive Director, who was previously concerned with the remaining service life (RSL) of assets, is now focused on drivability. This has resulted in a change in the measures used to calculate system performance, shifting the focus to IRI. Melissa Batula responded with an example from Pennsylvania, where the state has been getting decent IRI numbers but a more careful review of the collected data shows that light treatments are occurring more often, therefore the treatments are not lasting as long. Andrew Williams agreed that this same issue had appeared in Ohio. To deal with the problem, the agency created a category called “poor performing pavement,” which monitors if the road was fixed appropriately during the last treatment. Depending on the answer, the expected deterioration is adjusted accordingly. In order to establish this protocol, the central office had to coordinate with districts to create plans for pavements that had not received optimal treatments in the past.

Rod Sechrist presented a different technique for determining performance, describing the New York State process for developing a different deterioration curve for every segment. Similar to Ohio, this provides a solution for distinguishing underperforming segments and adjusting treatment practices accordingly. Currently, the preferred treatment is cold-in-place recycling, which extends the life of the pavement segment.

Scott Zainhofsky also did work to develop additional models, although not for every segment. The state found that breaking out models by type and making them more specific did help the agency to make better decisions. In response to other state examples, Andrew Williams pointed out that the strategy for approaching these situations depends on the availability of data and the agency’s capabilities. Cory Pope noted that the availability of data is not only a problem in life cycle costing but also in other areas. Multiple participants agreed about the importance of data issues.

In conjunction with data integration practices, Wyoming inquired about state’s use of geographic information systems (GIS). Joey Macalase of Wyoming DOT asked whether GIS could be used as an integration tool for agencies, as most transportation asset data is location specific. Matt Hardy discussed the example of Utah’s UPlan. Cory Pope elaborated on the tool, which allows users to visualize data across business areas on a single platform. The tool has proved to be beneficial as it facilitates communication throughout the agency.

Andrew Williams discussed the risk analysis performed by the agency, after struggling internally to determine what information should be included in its TIMS. For every piece of data collected, there

is a geospatial component. This makes GIS a successful integration tool for multiple types of data, as well an effective way of communicating.

Cory Pope encouraged participants to review the website of the AASHTO Technology Implementation Group (TIG), which details projects of 12 states. Jerry Casey emphasized the importance of using a common linear referencing approach when using GIS as a data integration tool.

Safety and TAM

Finally, the round table participants addressed the topic of safety. Tim Lattner asked if safety was included in any of the FHWA TAM pilot plans. Mark Nelson responded that Minnesota is focused on the condition of current assets. Safety becomes relevant when the agency is performing a risk assessment.

Glenn Davidson of New Hampshire DOT, presented a different perspective. In New Hampshire safety is treated as an asset. In Utah, Cory Pope explained, the state is interested in overlaying facilities with traffic and safety features. Glenn then returned to the topic of data governance, and cited Maine as a successful example.

Rod Sechrist noted the recent Department of Justice (DOJ) guidance on Americans with Disability Act (ADA) compliance and the implications that will have to be addressed based on new standards. Jennifer Brandenburg of North Carolina DOT assured the group that SCOM is putting forward a resolution on this topic.

5.5 Conclusions

Steve Gaj thanked the peer exchange participants for attending the event. He thanked the FHWA Office of Asset Management, the Office of Planning, the AASHTO Planning and Capacity Building Initiative, and the AASHTO Subcommittees on on Asset Management and Maintenance.

Steve listed some of the priority issues that the participants should consider as they return to their home states. The first topic for consideration was the notice of proposed rulemaking (NPRM) for MAP-21. It will be important for states to review the NPRM. Steve also highlighted the FHWA asset management webinar series, which will continue to address the information covered in the peer exchange. He suggested that the group check the FHWA and AASHTO websites for more information, dates, and specific topics. Finally, Steve reiterated Carlos' comments from earlier in the peer exchange. *What did you learn that you're going to change?* He urged the participants to return back to their individual agencies with ideas for how they can improve their processes.