Framework for ADOT Asset Management System

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Arizona Department of Transportation

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Presentation Overview

- Brief Intro to Transportation Asset Management
- Performance- and Risk-based Transportation Program
  - MAP-21 Performance Measures and Targets
  - ADOT Performance Measures and Targets
  - Incorporating Risk within Transportation Asset Management
- Arizona Transportation Asset Management Work Plan
What is Asset Management?
MAP-21 Definition of Asset Management

“A strategic and systematic process of operating, maintaining, and improving physical assets, with a focus on both 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.”
Core Principles of Asset Management

- **Policy-driven**—Resource allocation decisions are based on a well-defined set of policy goals and objectives.

- **Performance-based**—Policy objectives are translated into system performance measures that are used for both day-to-day and strategic management.

- **Analysis of Options and Tradeoffs**—How will different allocations impact achievement of relevant policy objectives.

- **Decisions Based on Quality Information**—The merits of different options with respect to an agency’s policy goals are evaluated using credible and current data.

- **Monitoring Provides Clear Accountability and Feedback**—Performance results are monitored and reported for both impacts and effectiveness.
Asset Management - Illustration

- Policy Goals and Objectives
- Planning and Programming
- Project Delivery
- Systems Monitoring and Performance Results

Quality Information
MAP-21 Performance Measures Requirements

- USDOT to identify national-level performance measures for various performance management areas related to:
  - Safety
  - Pavement Condition
  - Bridge Condition
  - Freight System Performance (Delay and Reliability)
  - NHPP System Performance (Delay and Reliability)
  - CMAQ (Emissions and Traffic Congestion)

  - Targets for these measures will be developed by the States and MPOs and will be approved by FHWA
MAP-21 Specific Standards/Targets

- Additionally, the bill contains the following minimum standards/targets:
  - Minimum standards for interstate pavement (USDOT is working on it)
  - NHS bridge conditions: No more than 10 percent of the total deck area of NHS bridges in a State is on structurally deficient bridges
AASHTO Recommendation - Safety

- **Number of Fatalities**—Five-year moving average of the count of the number of fatalities on all public roads for a calendar year. *ADOT 2012: 821*

- **Fatality Rate**—Five-year moving average of the Number of Fatalities divided by the Vehicle Miles Traveled (VMT) for a calendar year. *ADOT 2012: 1.38*

- **Number of Serious Injuries**—Five-year moving average of the count of the number of serious injuries on all public roads for a calendar year. *ADOT 2012: 4,468*

- **Serious Injury Rate**—Five-year moving average of the Number of Serious Injuries divided by the Vehicle Miles Traveled (VMT) for a calendar year. *ADOT 2012: 7.51*
AASHTO Recommendation - Pavement

- **Pavement in Good, Fair and Poor Condition:** Percentage of 0.1 mile segments of Interstate pavement mileage in good, fair and poor condition based on the following criteria:

<table>
<thead>
<tr>
<th>Condition</th>
<th>AASHTO / FHWA</th>
<th>ADOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor</td>
<td>IRI &gt; 170</td>
<td>IRI &gt; 117</td>
</tr>
<tr>
<td>Fair</td>
<td>95 &lt; IRI &lt; 170</td>
<td>95 &lt; IRI &lt; 117</td>
</tr>
<tr>
<td>Good</td>
<td>IRI &lt; 95</td>
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- **Pavement Structural Health Index**—Percentage of pavement which meet minimum criteria for pavement faulting, rutting and cracking.

  \textit{ADOT \textcolor{red}{\textbf{currently does not have an aggregate health index}}}
IRI Examples

IRI = 144 (I-8 WB MP 61)

IRI = 105 (I-8 WB MP 98)

IRI = 163 (SR-72 MP 37)
Scenario #2
FY15  89 Million
FY16  49 Million
FY17  102 Million
FY18-42  132 Million

Budget ($ Million)

Interstate Miles of IRI > 117 (%)

Non-Int Miles of IRI > 117 (%)

Year

ADOT
AASHTO Recommendation - Bridges

- Percent of Deck Area on Structurally Deficient Bridges—NHS bridge deck area on structurally deficient bridges as a percentage of total NHS bridge deck area.

- NHS Bridges in Good, Fair and Poor Condition based on Deck Area—Percentage of National Highway System bridges in good, fair and poor condition, weighted by deck area.

AASHTO and FHWA are working on defining Good, Fair, and Poor

ADOT has a Bridge Condition Rating Index: **93.1 % (2012)**
AASHTO Recommendation - Freight

- **Annual Hours of Truck Delay (AHTD)**—Travel time above the congestion threshold in units of vehicle-hours for Trucks on the Interstate Highway System.

- **Truck Reliability Index (RI_{80})**—The RI is defined as the ratio of the total truck travel time needed to ensure on-time arrival to the agency-determined threshold travel time (e.g., observed travel time or preferred travel time).
AASHTO Recommendation – System Performance

- **Annual Hours of Delay (AHD)**—Travel time above a congestion threshold (defined by State DOTs and MPOs) in units of vehicle-hours of delay on Interstate and NHS corridors.

- **Reliability Index (RI$_{80}$)**—The Reliability Index is defined as the ratio of the 80th percentile travel time to the agency-determined threshold travel time.
AASHTO Recommendation – CMAQ

- **Criteria Pollutant Emissions**—Daily kilograms of on-road, mobile source criteria air pollutants (VOC, NOx, PM, CO) reduced by the latest annual program of CMAQ projects.

- **Annual Hours of Delay (AHD)**—Travel time above a congestion threshold (defined by State DOTs and MPOs) in units of vehicle-hours of delay reduced by the latest annual program of CMAQ projects.
Incorporating Risk within Transportation Asset Management
The Various Levels of Risks

**Enterprise**
- **Responsibility:** Executives
- **Type:** Risks that have implications across multiple organizational functions.
- **Strategies:** Manage risks in a way that optimizes the success of the organization rather than the success of a single business unit or project.

**Program**
- **Responsibility:** Program Managers
- **Type:** Risks that are common to clusters of projects or entire business units.
- **Strategies:** Set program contingency funds, allocate resources to projects consistently to optimize the outcomes of the program as opposed to solely projects.

**Project**
- **Responsibility:** Project Managers
- **Type:** Risks that are specific to individual projects.
- **Strategies:** Advanced analysis techniques, contingency planning, and consistent risk mitigation strategies with the perspective that risks are managed in projects.
ISO’s Risk Management Framework

- Establish Context
- Identify Risks
- Analyze Risks
- Evaluate Risks
- Treat Risks
- Monitoring and Review

Communication and Consultation
## Risk Matrix

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<tr>
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<tr>
<td><strong>Very rare</strong></td>
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Arizona Transportation Asset Management Work Plan
Major components that will be included in ADOT’s TAMP

- Documentation of ADOT’s procedures for allocating funds to build, operate, and preserve the transportation system.
- A process through which enhancements could be made to the TAMP including seamless additions of new asset types.
- Definition and documentation of ADOT’s transportation system performance measures.
- Definition and documentation of ADOT’s transportation system performance targets.
- Tools enabling trade-off analysis and project prioritization amongst asset types.
Table of Contents

1. Introduction
2. Purpose and Scope
3. Individuals and Teams Involved in Developing the TAMP
4. Outline
5. Information and Activities Needed to Develop the TAMP
6. Implementation
1. Introduction

At a minimum, the Arizona Transportation Asset Management Plan (TAMP) must include the following:

- A summary of pavement and bridge inventory and condition
- Asset management objectives and measures
- Performance gap identification
- Lifecycle cost and risk management analysis
- A financial plan
- Investment strategies
2. Purpose and Scope

2.1 ADOT TAMP Objectives

- Implement an asset management system that:
  - Links planning, programming, project development, construction, maintenance, and operation to the performance of the transportation system.
  - Incorporates asset worth, asset condition, and risk factors in decision making to optimize the use of funds in building, operating, and preserving the transportation system.

- Communicate current asset worth and their conditions.

- Comply with the requirements of MAP-21.
2. Purpose and Scope (cont’d)

2.2 Asset Types

- Initially the plan will cover:
  - Pavement on the State Highway System (SHS) in addition to the pavement on the expanded NHS
  - All bridges that are included in Arizona’s portion of the National Bridge Inventory (NBI)

2.3 Management and Timeframe of the TAMP Development

- Draft TAMP completed by December 2014
- Final January 2015
- TAMP development will be managed by the State Asset Management Engineer
3. Individuals and Teams Involved in Developing the TAMP

3.1 Asset Management Steering Committee
The steering committee will set the general direction for ADOT’s TAMP and provide support to implement the plan. It will meet on a quarterly basis.

3.2 Asset Management Working Group
This group will be responsible for developing performance measures and state targets that will be reviewed for approval by the steering committee. This group will meet on a monthly basis.

3.3 Asset Management Technical Teams
Each team will be responsible for documenting procedures and compiling needed data to produce performance measures and targets. These teams will meet as often as required.
4. TAMP Outline

ADOT TAMP will include the following Sections:

1. Executive Summary
2. Asset Management Objectives and Performance Measures and Targets
3. Performance Gap Assessment
4. Lifecycle Cost Considerations
5. Risk Management Analysis
6. Financial Plan
7. Investment Strategies
8. Asset Management Process Enhancement
9. Appendices
5. Required Information and Activities

A wide range of information and data is required, such as:

- Inventory data
- Condition data (current and future)
- Travel demand data (current and future)
- Data required to estimate the likelihood and consequences of external events for the system risk assessment
- Historic funding levels
- Projected funding levels
- Cost data

The work plan describes 29 activities that will be required to develop the TAMP
## 6. Implementation

<table>
<thead>
<tr>
<th>Dates</th>
<th>Milestone Activities (see Section 5 for item numbers)</th>
<th>Responsible Party</th>
</tr>
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| November 2013   | Asset Management Work Plan  
  • Conduct Asset Management Workshops (#27)  
  • Finalize the Asset Management Work Plan including the review of the milestones and their deadlines | State Asset Management Engineer           |
| December 2013   | Define High Level Objectives of the Asset Management System to Be Handed to the Asset Management Working Group for Final Documentation | Asset Management Steering Committee        |
| December 2013   | Data Collection and Quality Control and Assurance Procedures (#3, #4, and #6)                                         | Pavement and Bridge Technical Teams        |
| January 2014    | Asset Management Objectives and TAMP Governance  
  • Document the objectives of ADOT’s asset management program (#2)  
  • Develop the TAMP’s governance process (#26)  
  • Prioritize asset types to be added to the TAMP (#28) | Asset Management Working Group and Steering Committee |
| February 2014   | Funding Levels  
  • Historic funding levels for assets included in the TAMP (#19)  
  • Forecasting of funding levels for a ten-year horizon (#20) | Finance Technical Team                     |
### 6. Implementation (cont’d)

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<tr>
<td><strong>March 2014</strong></td>
<td>Performance Measures and Targets* (#5)</td>
<td>All Technical Teams, Asset Management Working Group and Steering Committee</td>
</tr>
<tr>
<td></td>
<td>*This milestone may require re-assessment due to the fact that FHWA final rule making relating to national performance measures is not expected to be complete until the end of 2014.</td>
<td></td>
</tr>
<tr>
<td><strong>April 2014</strong></td>
<td>Lifecycle Cost Considerations (#11, #12, #13, and #14)</td>
<td>Asset Management Working Group</td>
</tr>
<tr>
<td><strong>May 2014</strong></td>
<td>Risk Management Analysis (#15, #16, #17, and #18)</td>
<td>Asset Management Working Group and Steering Committee</td>
</tr>
<tr>
<td><strong>May 2014</strong></td>
<td>Complete the Financial Plan (#21, #22, and #23)</td>
<td>Finance Technical Team and Steering Committee</td>
</tr>
<tr>
<td><strong>May 2014</strong></td>
<td>Identify and Document Challenges (#9 and #10)</td>
<td>Asset Management Working Group</td>
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| July 2014       | Performance Gap Assessment  
• Illustrate the relationship between funding and asset condition (#7)  
• Document the methodology (#8) |
|                 | Pavement and Bridge Technical Teams                                                                                  |
| September 2014  | Investment Strategies (#24 and #25)                                                                                   | Pavement and Bridge Technical Teams|
| December 2014   | Final Draft ADOT TAMP  
• Executive summary (#1)  
• Appendices (#29)  
• Submit to FHWA for review |
|                 | State Asset Management Engineer                                                                                       |
| January 2015    | Final ADOT TAMP – First Edition                                                                                       | State Asset Management Engineer    |
Questions?