Framework for ADOT Asset Management System

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November 14, 2013
Arizona Pavements/Materials Conference

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.

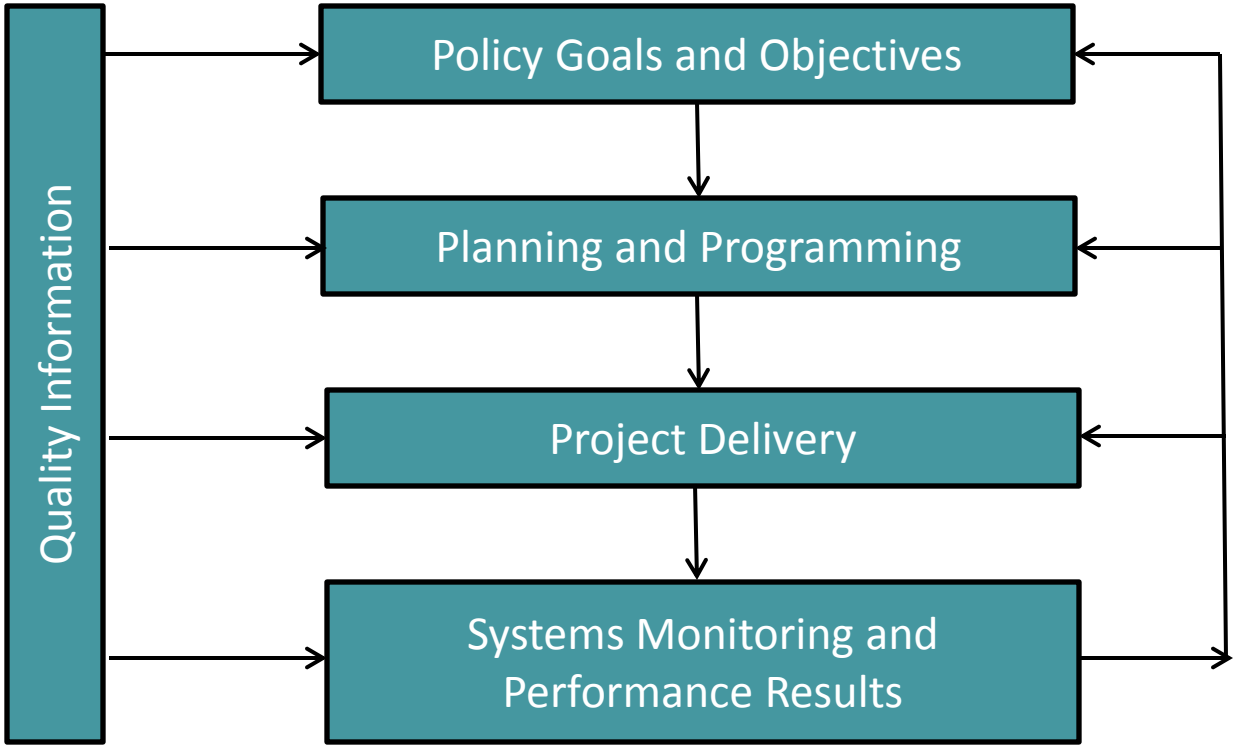
- **Performance-based**—Policy objectives are translated into system performance measures that are used for both day-to-day and strategic management.

- **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



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

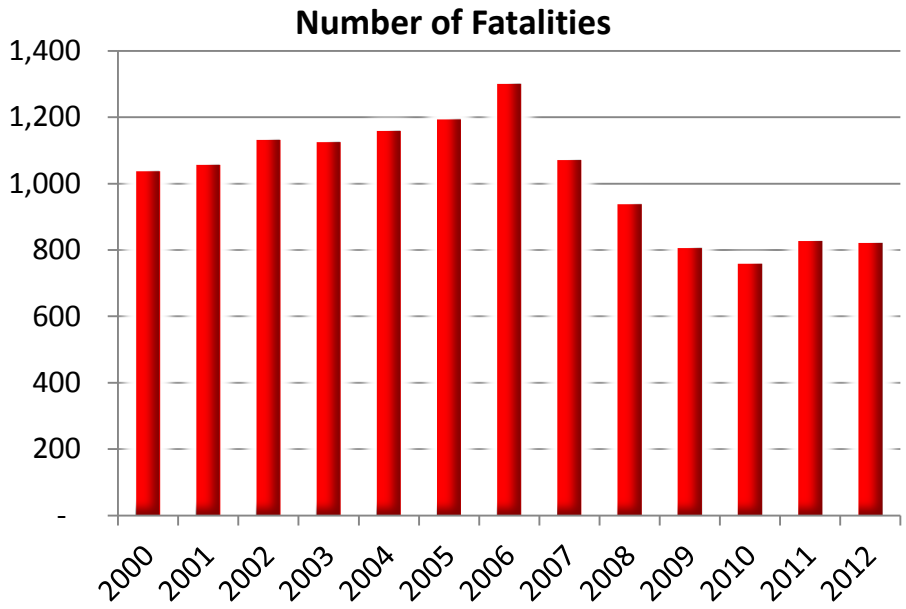
- Additionally, the bill contains the following minimum standards/targets:

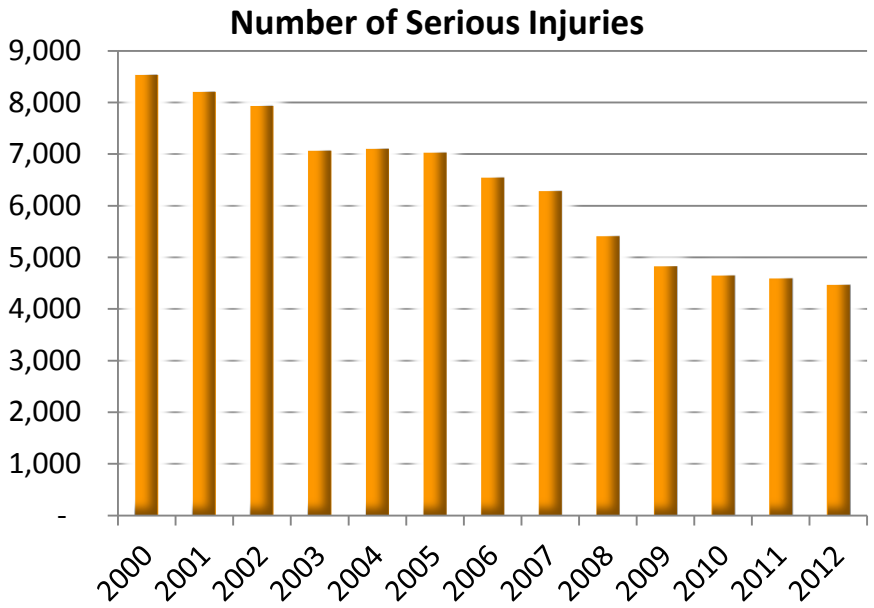
  Minimum standards for interstate pavement (USDOT is working on it)

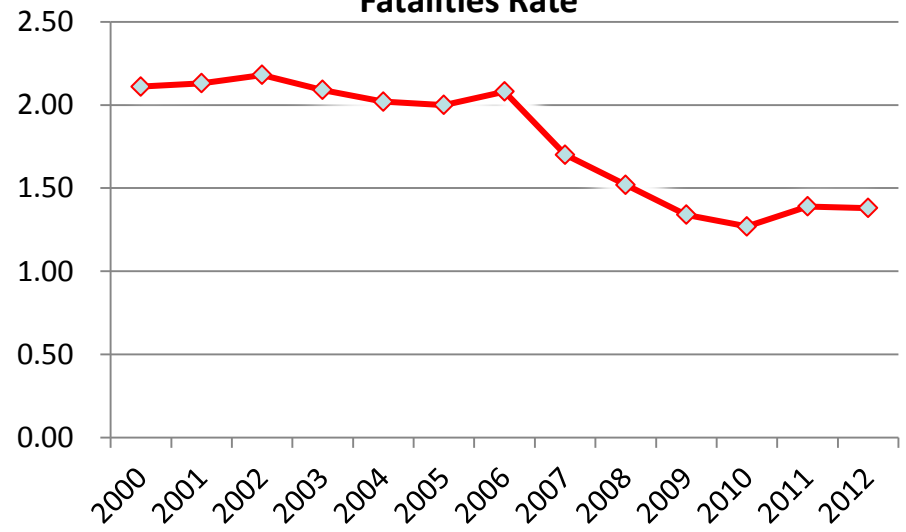
  NHS bridge conditions: No more than 10 percent of the total deck area of NHS bridges in a State is on structurally deficient bridges

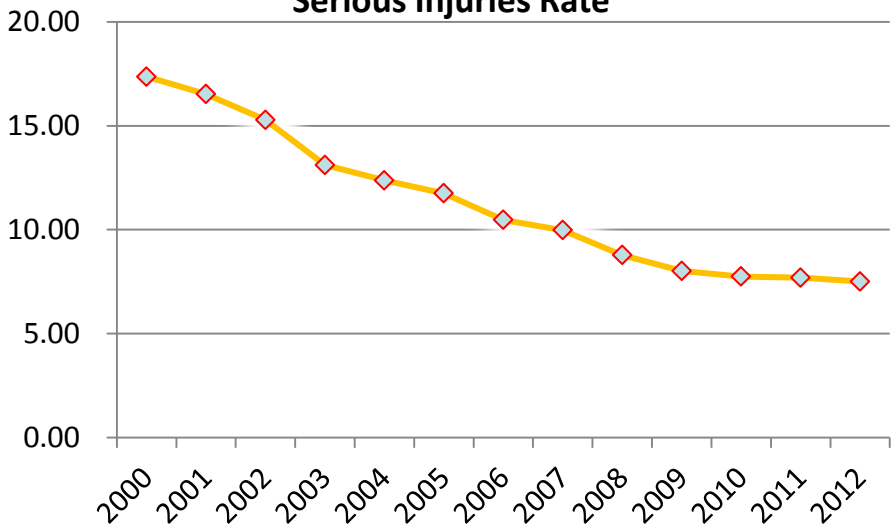
AASHTO Recommendation - Safety

- **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***


Number of Fatalities
1,400
1,200
1,000
800
600
400
200
-
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012


Number of Serious Injuries
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
-
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012


Fatalities Rate
2.50
2.00
1.50
1.00
0.50
0.00
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012


Serious Injuries Rate
20.00
15.00
10.00
5.00
0.00
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012

AASHTO Recommendation - Pavement

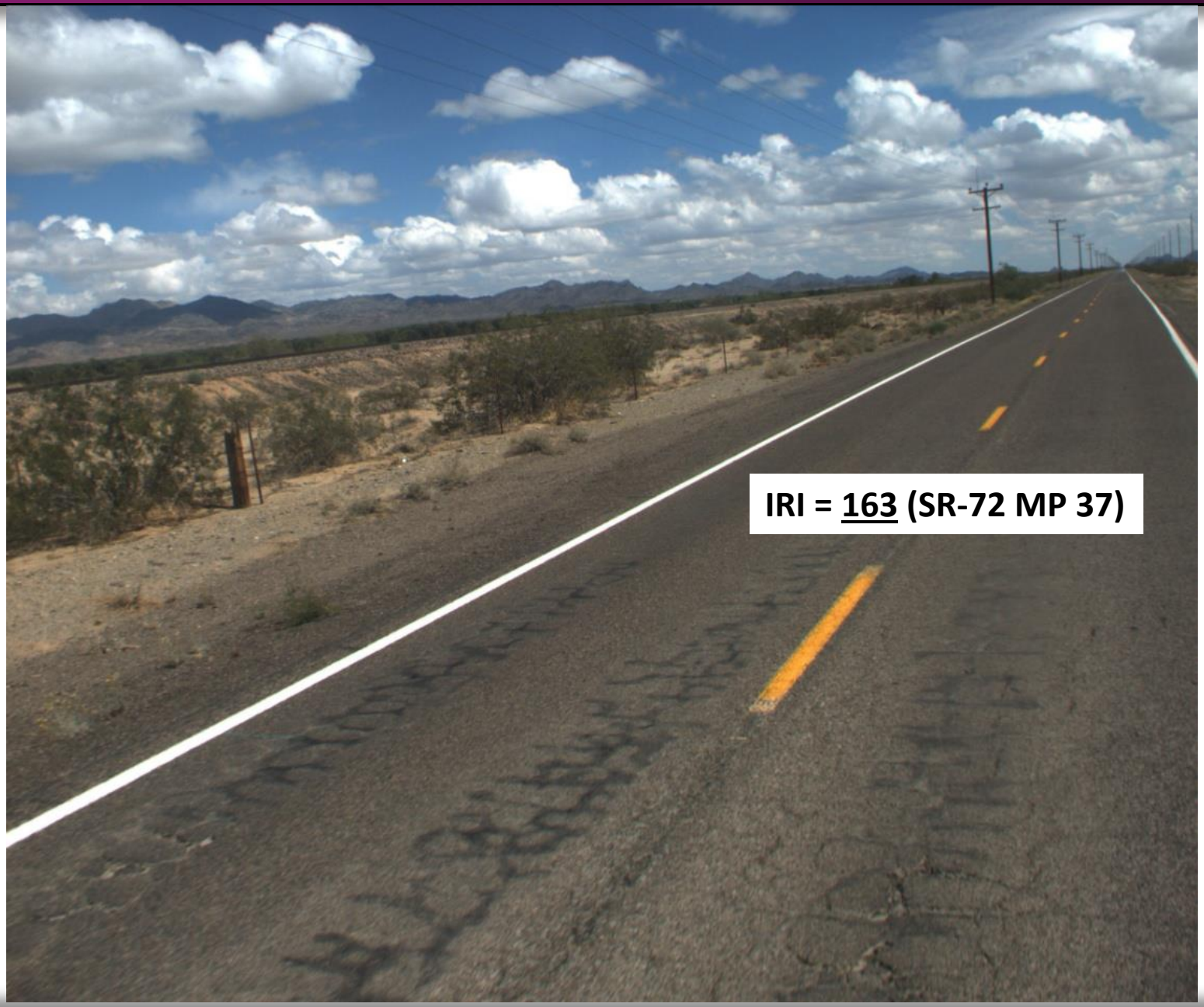
- **Pavement in Good, Fair and Poor Condition:** Percentage of 0.1 mile segments of Interstate pavement mileage in good, fair and poor condition based on the following criteria:

	AASHTO / FHWA	ADOT
Poor	IRI > 170	IRI > 117
Fair	95 < IRI < 170	95 < IRI < 117
Good	IRI < 95	IRI < 95

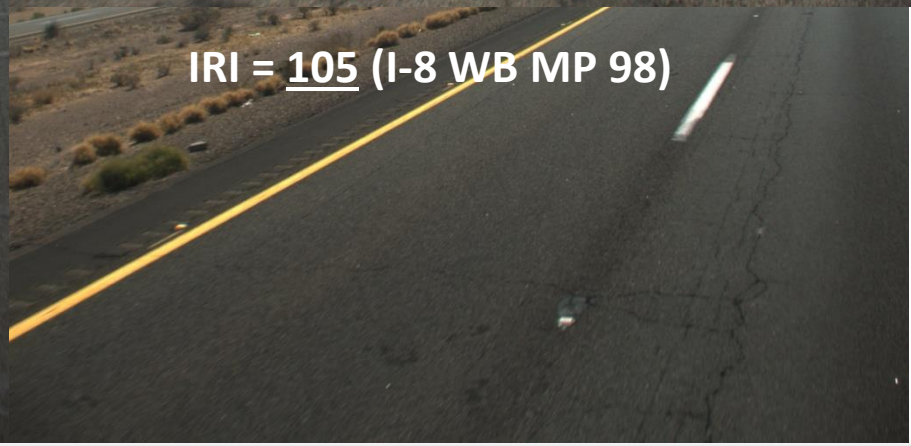
- **Pavement Structural Health Index—**Percentage of pavement which meet minimum criteria for pavement faulting, rutting and cracking.

ADOT currently does not have an aggregate health index

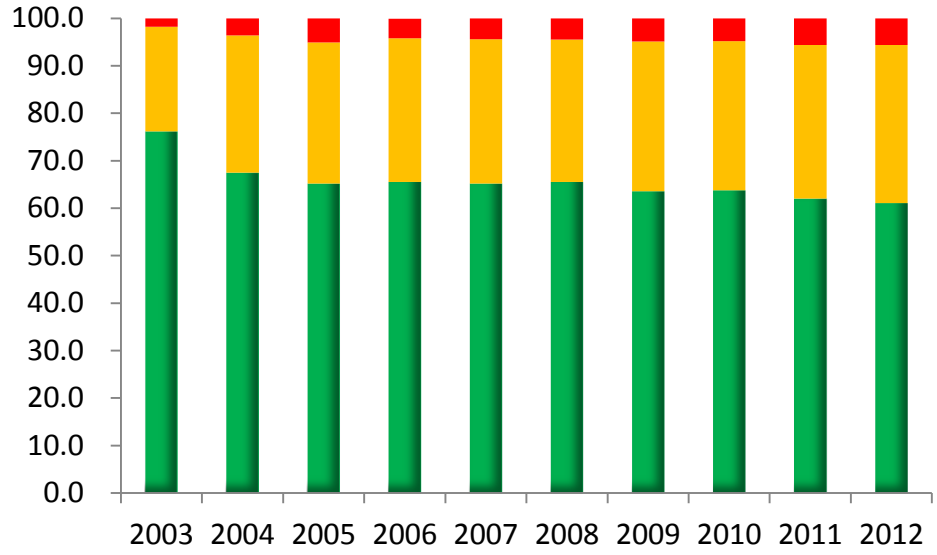

IRI = 144 (I-8 WB MP 61)


IRI = 163 (SR-72 MP 37)

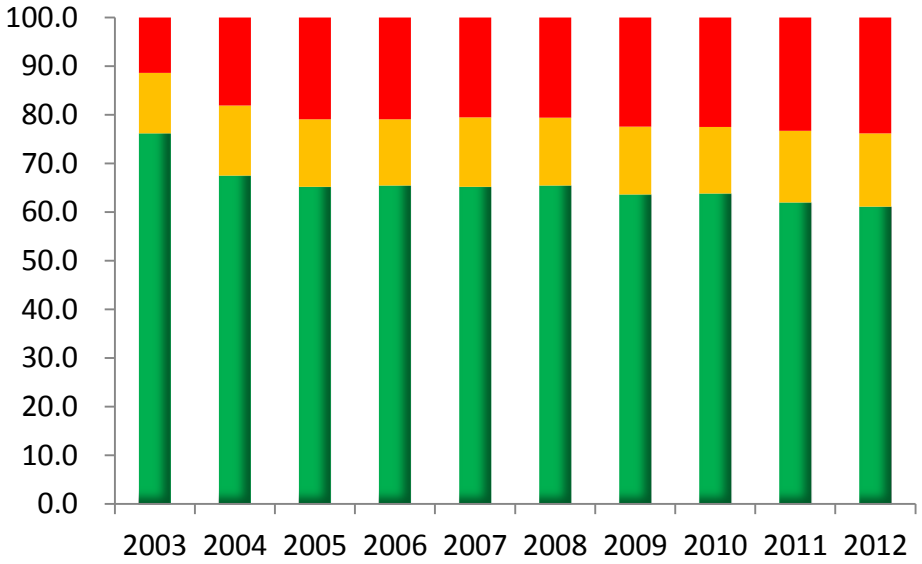
IRI Examples



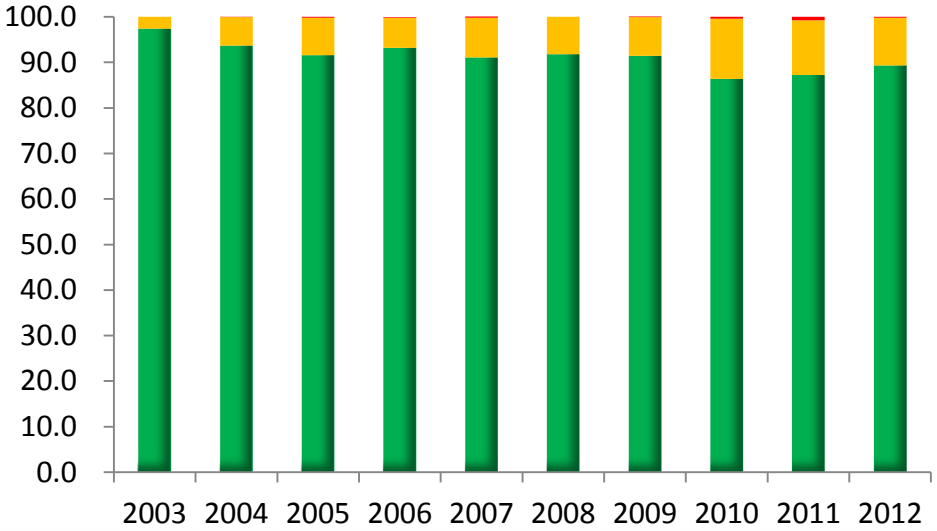
Non-Interstate Pavement Condition – AASHTO Definition



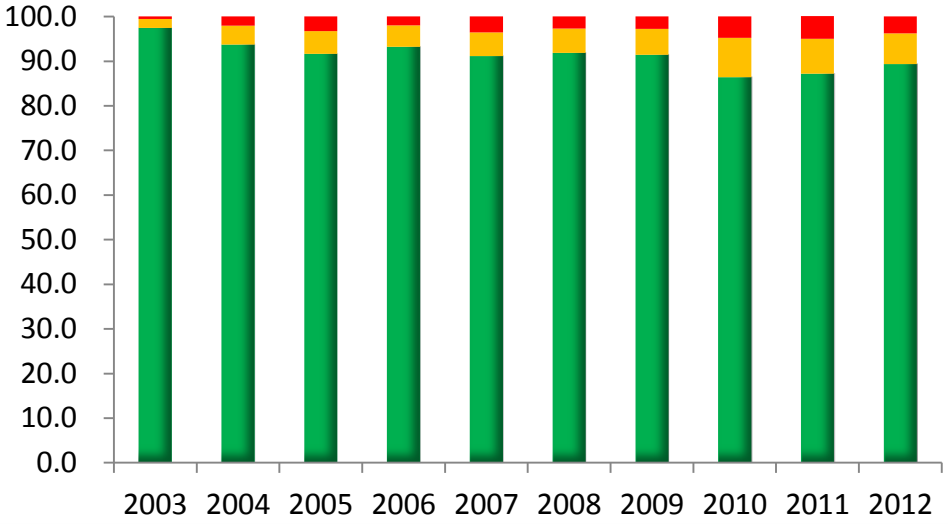
Non-Interstate Pavement Condition – ADOT Definition



Interstate Pavement Condition – AASHTO Definition



Interstate Pavement Condition – ADOT Definition



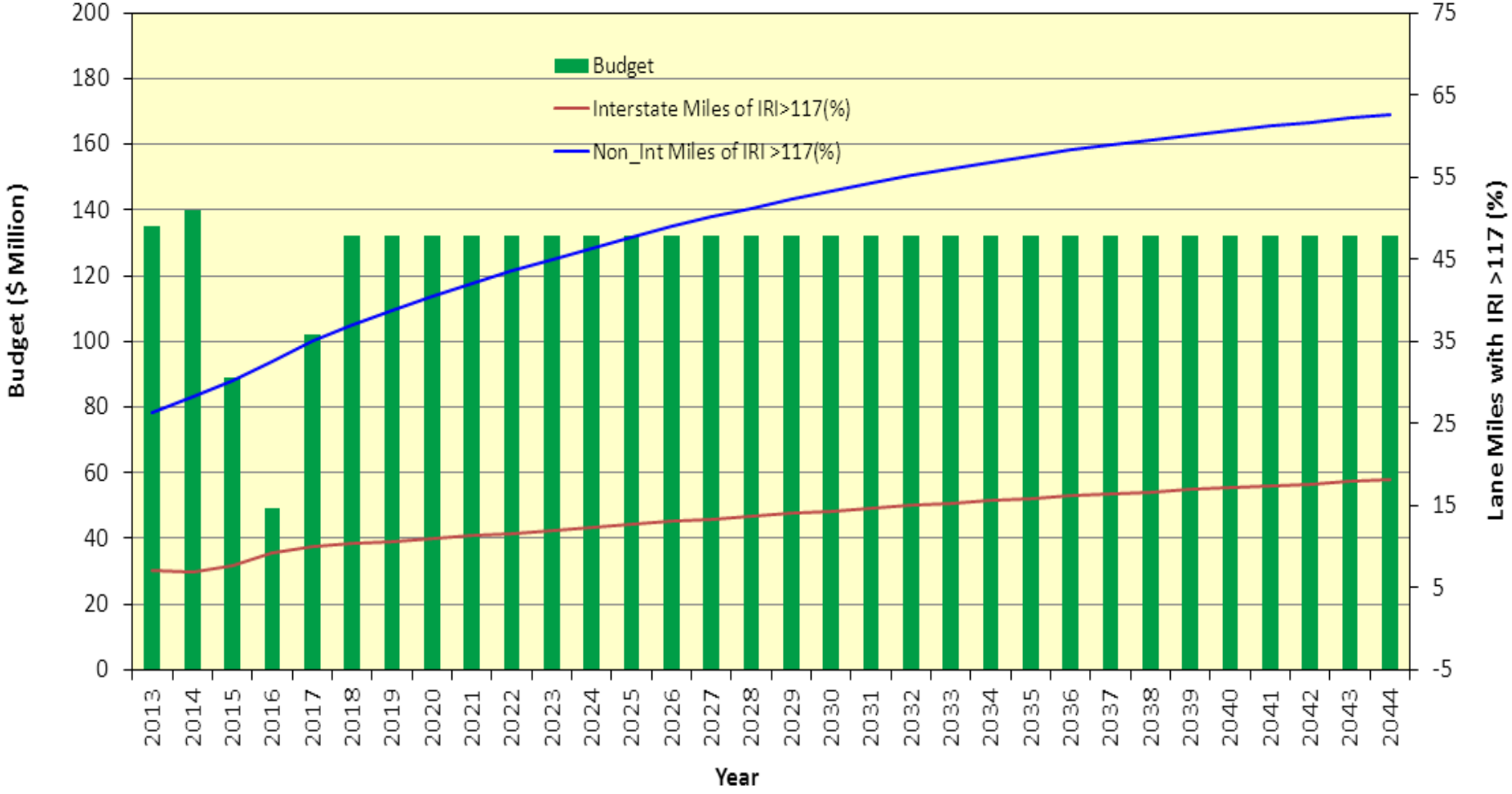
Scenario #2

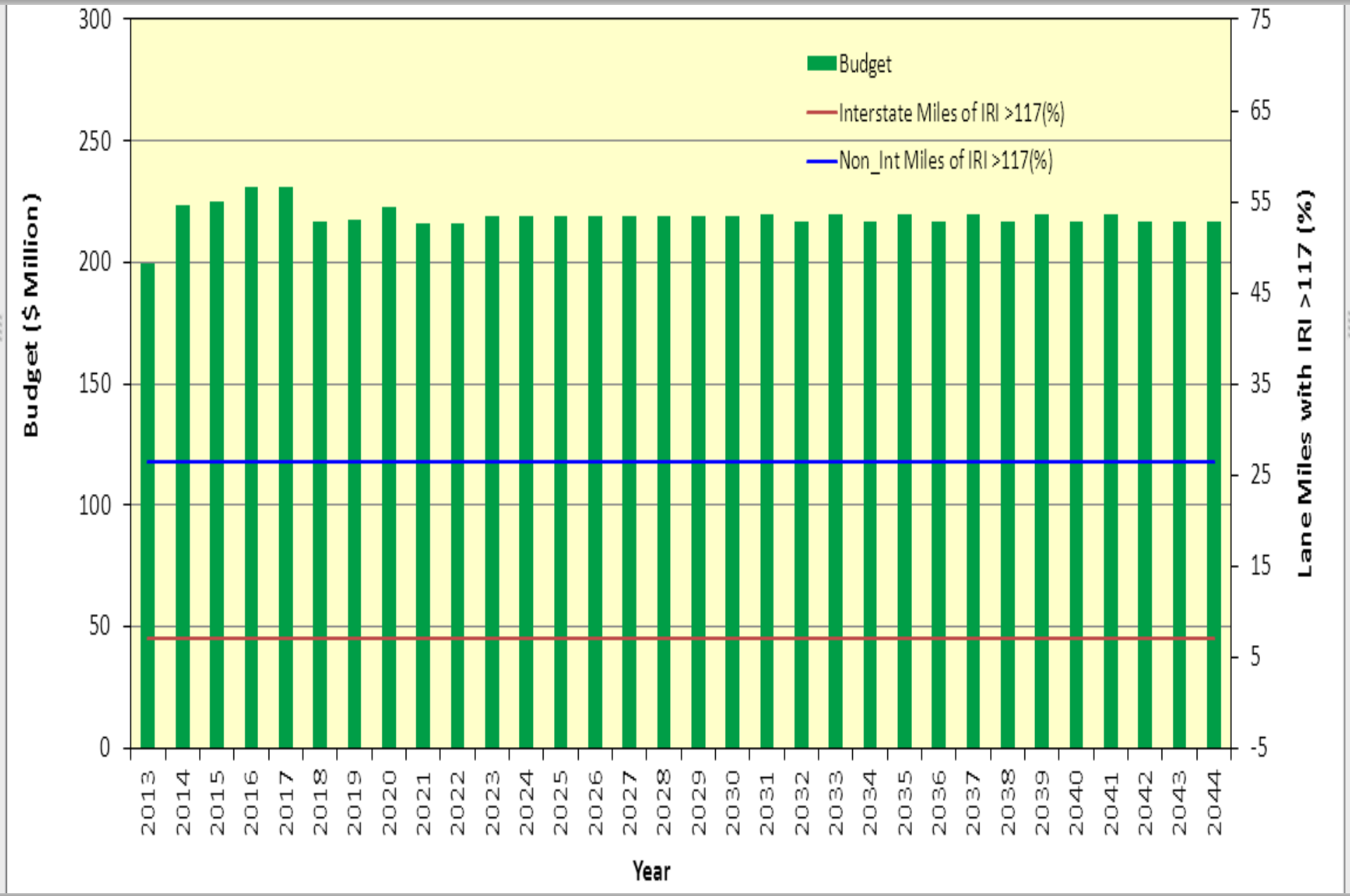
FY15 89 Million

FY16 49 Million

FY17 102 Million

FY18-42 132 Million




Budget
Interstate Miles of IRI >117(%)
Non_Int Miles of IRI >117(%)
Budget ($ Million)
Lane Miles with IRI >117 (%)
Year
300
250
200
150
100
50
0
75
65
55
45
35
25
15
5
-5
2013
2014
2015
2016
2017
2018
2019
2020
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2044

AASHTO Recommendation - Bridges

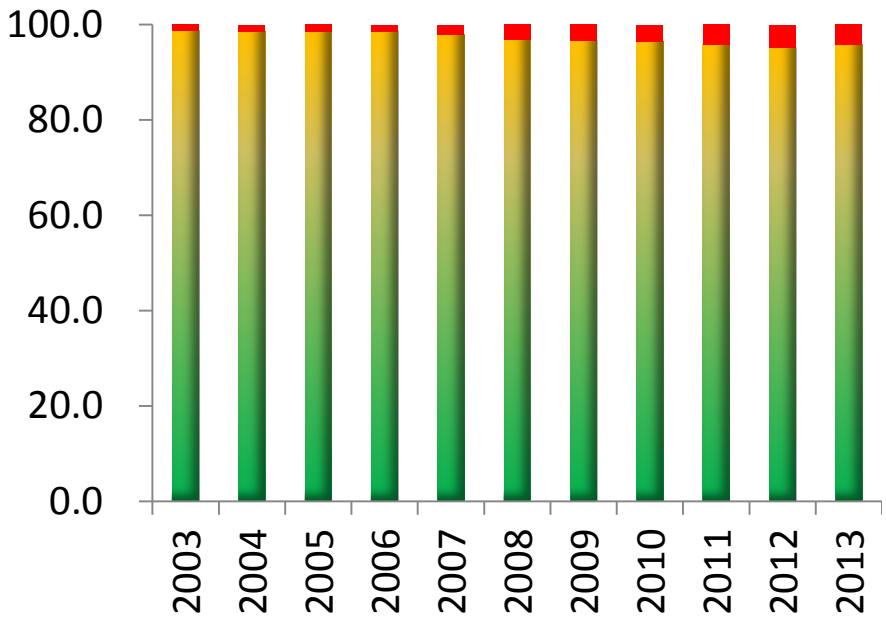
- **Percent of Deck Area on Structurally Deficient Bridges**—NHS bridge deck area on structurally deficient bridges as a percentage of total NHS bridge deck area.

- **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.

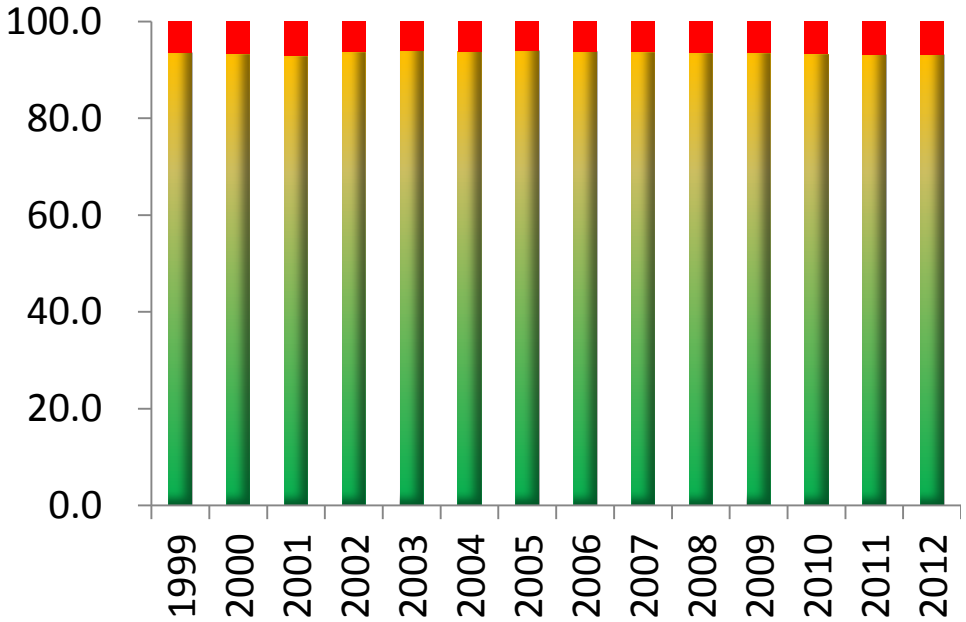
AASHTO and FHWA are working on defining Good, Fair, and Poor

ADOT has a Bridge Condition Rating Index: ***93.1 %*** *(2012)*

Bridge Condition (ADOT System) – % SD (Deck Area)



Bridge Condition Index (ADOT System) – ADOT Definition



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.

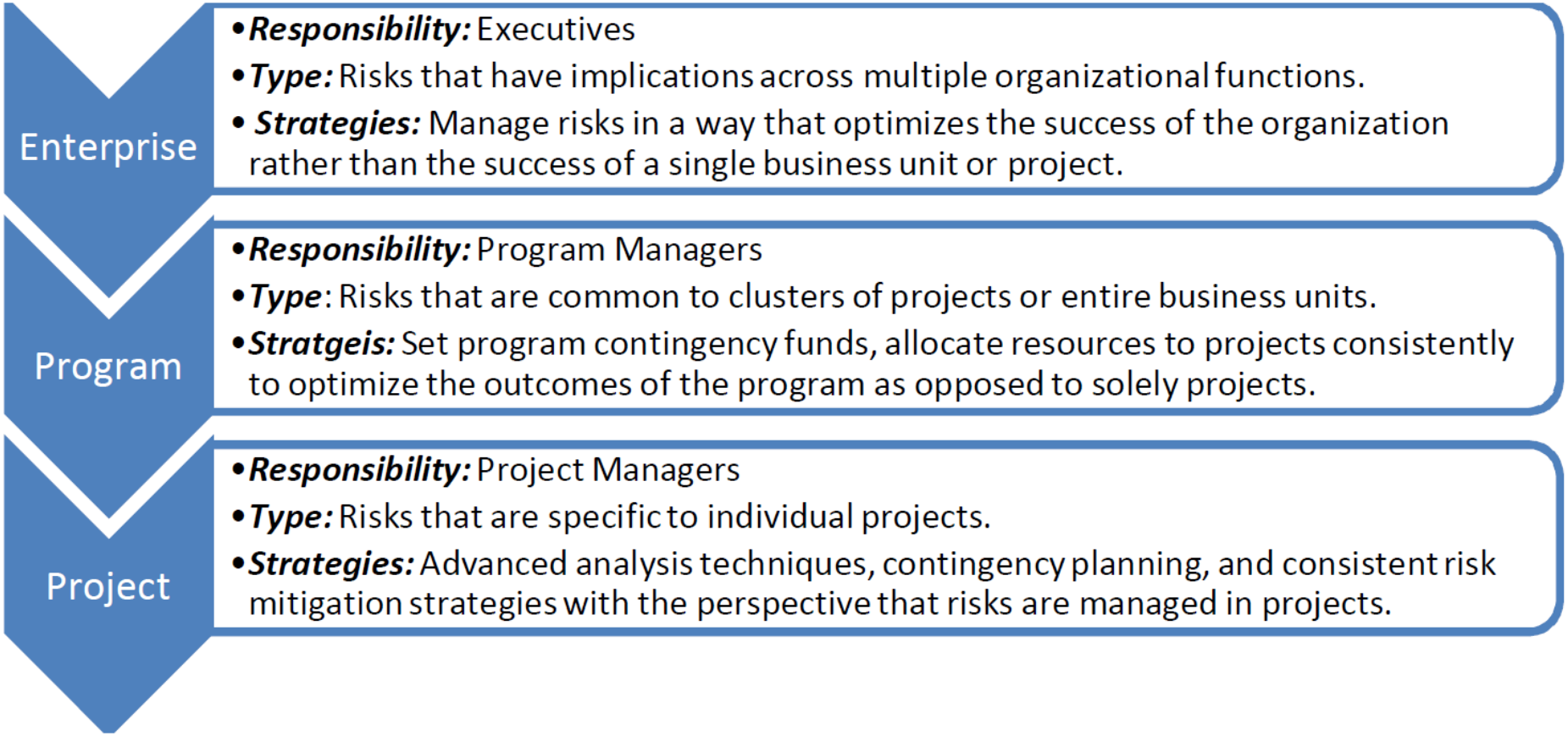
AASHTO Recommendation – CMAQ

- **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.

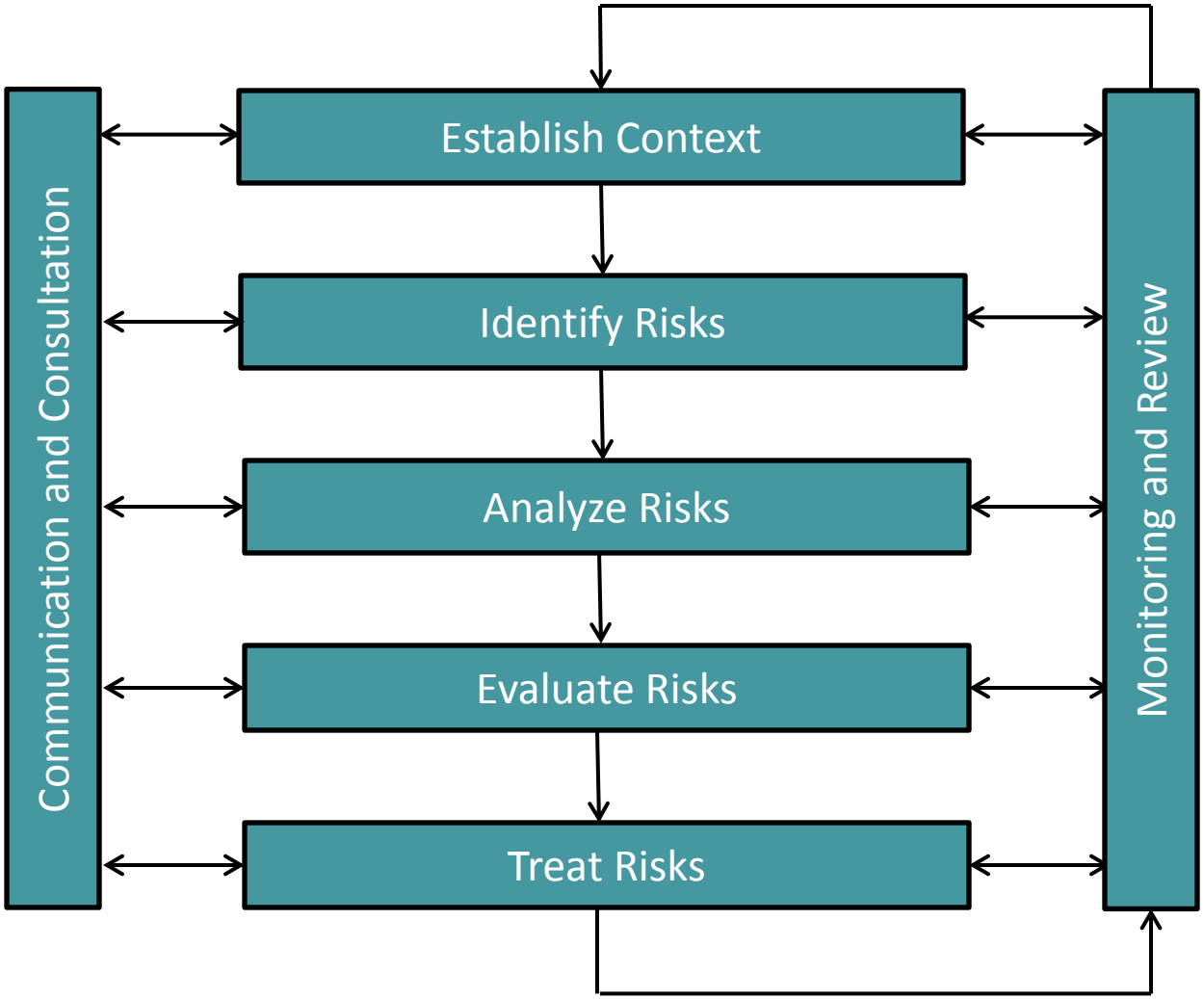
Incorporating Risk within Transportation Asset Management

The Various Levels of Risks



NCHRP 20-24

ISO's Risk Management Framework



Risk Matrix

	Consequence				
Likelihood	*Insignificant*	*Minor*	*Significant*	*Major*	*Catastrophic*
Very rare	Low	Low	Low	Moderate	High
Rare	Low	Low	Moderate	High	High
Seldom	Low	Moderate	Moderate	High	Extreme
Common	Moderate	Moderate	High	Extreme	Extreme
Frequent	Moderate	High	High	Extreme	Extreme

Risk Matrix - Landslides

	Consequence				
Likelihood	*Insignificant*	*Minor*	*Significant*	*Major*	*Catastrophic*
Very rare	Low	Low	Low	Moderate	High
Rare	Low	Low	Moderate	High	High
Seldom	Low	Moderate	Moderate	High	Extreme
Common	Moderate	Moderate	High	Extreme	Extreme
Frequent	Moderate	High	High	Extreme	Extreme

Risk Matrix - Landslides

	Consequence				
Likelihood	*Insignificant*	*Minor*	*Significant*	*Major*	*Catastrophic*
Very rare	Low	Low	Low	Moderate	High
Rare	Low	Low	Moderate	Landslides	Landslides
Seldom	Low	Moderate	Moderate	Landslides	Extreme
Common	Moderate	Moderate	High	Extreme	Extreme
Frequent	Moderate	High	High	Extreme	Extreme

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

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

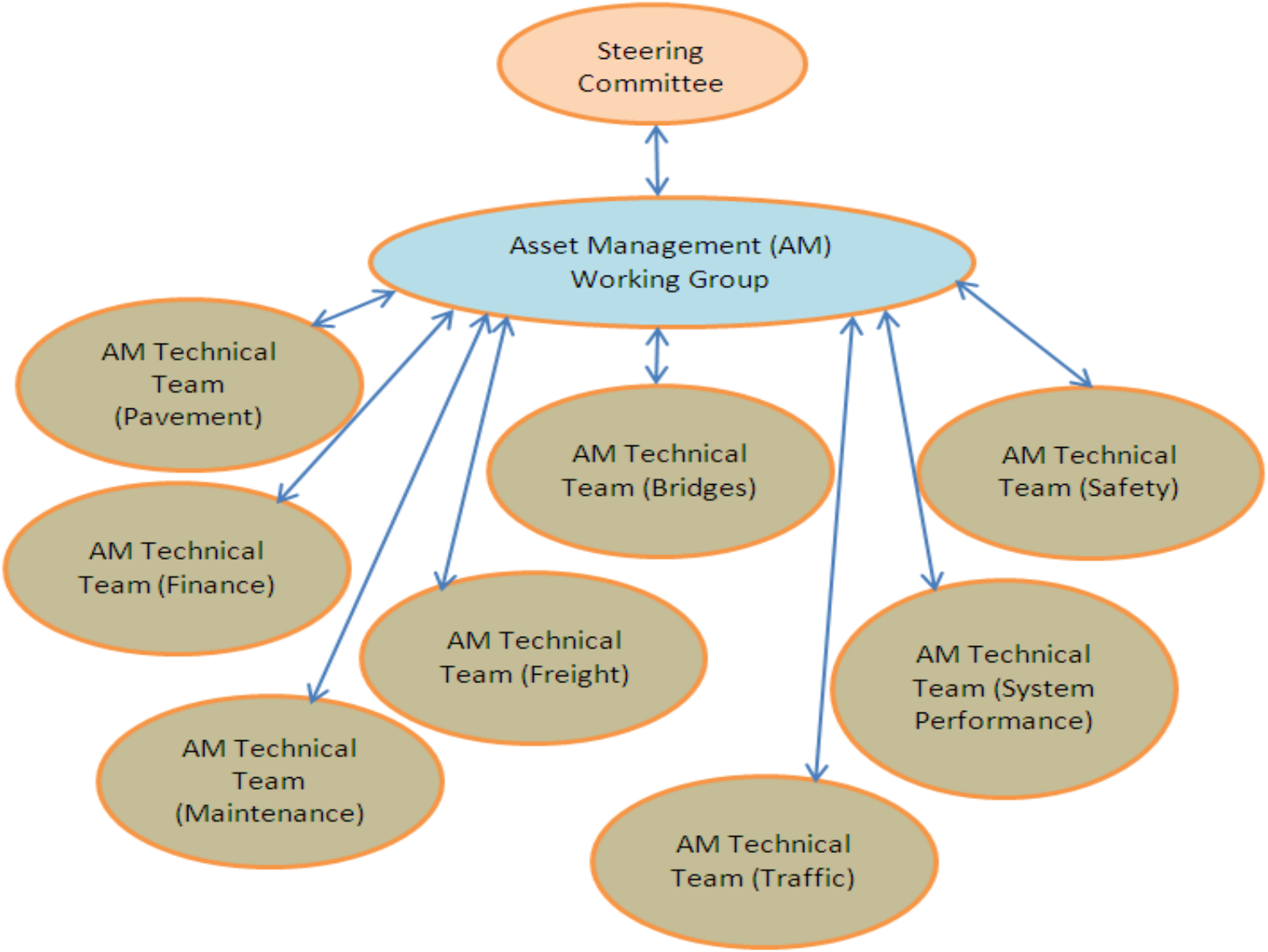
The steering committee will set the general direction for ADOT's TAMP and provide support to implement the plan. It will meet on a quarterly basis.

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.


Steering Committee
Asset Management (AM) Working Group
AM Technical Team (Pavement)
AM Technical Team (Bridges)
AM Technical Team (Safety)
AM Technical Team (Finance)
AM Technical Team (Freight)
AM Technical Team (System Performance)
AM Technical Team (Maintenance)
AM Technical Team (Traffic)

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

Dates	Milestone Activities (see Section 5 for item numbers)	Responsible Party
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)

Dates	Milestone Activities (see Section 5 for item numbers)	Responsible Party
March 2014	Performance Measures and Targets* (#5) *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.	All Technical Teams, Asset Management Working Group and Steering Committee
April 2014	Lifecycle Cost Considerations (#11, #12, #13, and #14)	Asset Management Working Group
May 2014	Risk Management Analysis (#15, #16, #17, and #18)	Asset Management Working Group and Steering Committee
May 2014	Complete the Financial Plan (#21, #22, and #23)	Finance Technical Team and Steering Committee
May 2014	Identify and Document Challenges (#9 and #10)	Asset Management Working Group

6. Implementation (cont'd)

Dates	Milestone Activities (see Section 5 for item numbers)	Responsible Party
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?