Welcome and Introductions

Michael Johnson
State Asset Management Engineer
California Department of Transportation (Caltrans)
Kome Ajise
Chief Deputy Director
California Department of Transportation
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Participants</th>
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</thead>
</table>
| 8:00 AM | Welcome and Introductions       | - Caltrans Welcome  
- California Transportation Commission  
- Federal Highway Administration |
| 8:35 AM | Setting the Context             | - California TAMP  
- Overview of the National Highway System (NHS)  
- Relationship between PM2 target setting and the TAMP |
| 9:00 AM | Understanding Bridge & Pavement Performance Measures | - MAP-21 Performance Measures for Pavements  
- MAP-21 Performance Measures for Bridges |
| 9:30 AM | BREAK                           |                                                                             |
| 9:45 AM | Target Setting Overview         | - Methodology for target setting                                             |
| 11:30 AM | Workshop Summary and Next Steps |                                                                             |
| 12:00 PM | LUNCH BREAK                    |                                                                             |
| 1:00 PM | PM3 Target Setting Workshop     |                                                                             |
Workshop Objectives

- Develop a common understanding of the Federal Highway Administration (FHWA) requirements for Bridge and Pavement Target Setting
- Share where we are in the process of developing the California Transportation Asset Management Plan (TAMP)
- Discuss results of the Initial Survey for the National Highway System Pavement and Bridges Owned by Local Agencies
- Present proposed statewide target setting approach
Thomas Van
Office of Asset Management
Federal Highway Administration
MAP-21/FAST Act
FHWA Overview:
Performance Management
Outline

• Legislation Background
• Transportation Performance Management Program
• Issues for States and MPOs
• Challenges and Opportunities
Legislative Background and Purpose

MAP-21 / FAST Act Legislation
• Planning
• Asset Management
• Performance Management

Focus in National Highway System
• Historical issues
• Funding Philosophy
Legislative Background and Purpose

Overall Expectations
• “Good State of Repair”
• Federal Goals / State Goals
• Sustainable Management
• Transparency
• Accountability
Transportation Performance Management

Requirements:

At a Statewide Level:
• Set Condition Targets and Report on Conditions
• Develop and Implement Asset Management Plan
• Implement Planning Rules
Transportation Performance Management

Pavement Performance Targets:
- Percent of Lane-miles in “Good” Condition
- Percent of Lane-miles in “Poor” Condition
- Separately for Interstate and Non-Interstate NHS

Bridge Performance Targets:
- Percent of Bridge Deck Area in “Good” Condition
- Percent of Bridge Deck Area in “Poor” Condition
- For the entire NHS
Transportation Performance Management

Asset Management Expectations:

- Program Sustainably
- Achieve “Good State of Repair”
- Meet National and State goals

Minimum: Pavements and Bridges; Other Assets Encouraged
Transportation Performance Management

Planning Expectations:

• Include targets in LRTP
• Include targets in STIP
• Two-way Communications with MPOs and other owners of NHS
Who Cares?

• Funding Flexibility, or Not
• One TAMP, One set of Targets per State
  • Issues:
    • Ownership of NHS
    • Unequal Conditions across Road Systems
    • Multi-State MPOs
    • Complexity of Planning / Management Processes
What else?

Penalties!!

Pavements:
No More than 5% of Interstate in Poor Condition

Bridge:
No more than 10% Deck Area of NHS in Poor Condition
Conclusions

Challenges:

Overlapping requirements
Data-driven requirements
Performance targets / Reporting
Strategic approach – State of Good Repair
Communications
Conclusions

Opportunities:

Flexibility in using federal-aid funds

Transparency
  • Good and Bad
  • Strategies

Communications
  • Link programs / $$$ / Planning / Management
Contacts

Performance Management:
Thomas Van
202-366-1341
thomas.van@dot.gov

Planning:
Harlan Miller
202-366-0847
harlan.miller@dot.gov
Setting the Context

Michael Johnson
State Asset Management Engineer
California Department of Transportation (Caltrans)
TAMP Development Roadmap

Phase 1 – Setting the Approach and Baseline
- Kick-Off Meeting
- Document Review
- Establish Analysis Scope
- Asset Inventory and Condition

Phase 2 – Setting the Strategic Direction
- Asset Performance Forecasts
- Goals and Objectives Workshop
- Risk Management Workshop
- Financial Plan and Investment Strategies Workshop

Phase 3 – Producing the TAMP
- Bridge and Pavement NHS Target Setting Workshop
- Draft TAMP Components
- TAMP Building Workshop
- Final TAMP
Why Asset Management?

**Legislative Drivers**
- MAP-21 requires performance-based budgeting and monitoring
- California Law (SB486) requires a robust asset management plan
- Legislative bodies throughout the country are seeking evidence of progress made with funding provided

**Maximize Available Funding**
- Having the information available to make good decisions
- Life-Cycle Planning
- Better coordinating efforts across business units
- Demonstrating asset need with quantitative information is compelling to decision-makers
- Accountability for public funds
Federal Regulation (MAP-21/FAST Act) requires the development of a TAMP with National Performance Measures for pavement and bridges

The TAMP requires the implementation of Performance Management which requires performance targets to be set using the National Measures

TAMP shall include the entire NHS

TAMP due to FHWA by April 30, 2018

Government Code requires a “robust asset management plan” that is consistent with Federal Law

Performance measures and targets are approved by the CTC

TAMP shall include the entire State Highway System (SHS)

Draft TAMP due to the CTC October 2017
# Overlapping Requirements

<table>
<thead>
<tr>
<th>Owner</th>
<th>System</th>
<th>Pavement</th>
<th>Bridges</th>
<th>Culverts</th>
<th>ITS</th>
<th>Supplemental Assets</th>
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<tbody>
<tr>
<td>Local</td>
<td>NHS</td>
<td></td>
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<td>State</td>
<td>NHS</td>
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<tr>
<td>State</td>
<td>Non-NHS</td>
<td></td>
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</table>
What is the NHS?

• The National Highway System (NHS) is the Interstate Highway System plus additional roads important to the nation’s economy, defense and mobility.

• MAP-21 expanded the NHS to include all roadways with functional classes of principal arterial or higher.

• In California the NHS is over 15,000 miles of roadway owned by the state and local agencies.

• The TAMP is required to include the entire NHS.
Transportation System included in the TAMP

State Highway System

NHS Asset Management Plan

Local Transportation System
The TAMP Requires the implementation of Performance Management which requires performance targets to be set using the National Measures.

FHWA defines Transportation Performance Management as a strategic approach that uses system information to make investment and policy decisions to achieve national performance goals (targets).

https://www.fhwa.dot.gov/map21/factsheets/pm.cfm
MAP-21 Performance Measures for Pavement

Tom Pyle
Chief, Office of Pavement Programming
California Department of Transportation (Caltrans)
California Pavement Inventory

2016 Total California Pavement Inventory

180,351 Road Miles (RM*)
402,466 Lane Miles (LM**) 

State
14,776 RM
49,682 LM

Local
165,574 RM
352,784 LM

State Non-NHS
6,319 RM
13,033 LM = 26% State

State NHS
8,458 RM
36,649 LM = 74% State

Local NHS
5,450 RM
19,427 LM = 6% Local

Local Non NHS
160,124 RM
333,357 LM = 94% Local

NHS Target Setting

Note:
*Road Miles (RM) is center lane miles
** Lane Miles (LM) represents the measures for the NHS
Source: 2016 HPMS Data
Current Performance Measures

Local vs State NHS Pavement

Local
Lane Miles (LM) of Pavement
35% of Total NHS

- Good: 891 (5%)
- Fair: 16,105 (83%)
- Poor: 2,431 (12%)

State
Lane Miles (LM) of Pavement
65% of Total NHS

- Good: 19,507 (53%)
- Fair: 16,140 (44%)
- Poor: 1,002 (3%)
Pavement Condition and Penalties

Minimum Condition Level: Percentage of lane-miles of Interstate System in Poor condition would not exceed 5.0%

FHWA is committed to reassessing the minimum condition level after completion of the first full performance period

Penalty: If minimum not met for two consecutive years, State must obligate NHPP & transfer STP funds
State:

- International Roughness Index (IRI) for all pavements
- Cracking (Alligator B for asphalt and 3rd stage for concrete pavements)
- Faulting for concrete pavements
- Rutting for all pavements

Locals:

- Pavement condition index (PCI)
State and Locals:

- International Roughness Index (IRI) for all pavements
- Cracking for all pavements
- Faulting for jointed plain concrete pavements
- Rutting for asphalt pavements
Cracking

Asphalt Pavement

Jointed Plain

Continuously Reinforced

Concrete Pavement
Rutting
How Data is Being Collected

- **Pathway 3D for Surface Imaging**
  - Rutting, Faulting & Automated Crack Detection

- **Roof-Mounted GPS Antenna**

- **360 Degree Camera**

- **Safety Lighting**
  - (front and back)

- **Super HD Roadway Imaging**
  - (2750 X 2200 per camera)

- **Laser Illumination**
  - to Remove Shadows

- **Macrotexture**

- **Onboard IMU for Grade, Cross Slope, Horizontal and Vertical Curvature**

- **DMI**

- **TTI-Certified Class I Profiler**

- **Single Interface, Voice Animated**
### MAP-21 Final Performance Measures

<table>
<thead>
<tr>
<th>Performance parameter</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRI (in/mi)</td>
<td>&lt;95</td>
<td>95-170</td>
<td>&gt;170</td>
</tr>
<tr>
<td>Cracking (percent)</td>
<td>&lt;5</td>
<td>5-10 (CRCP¹)</td>
<td>&gt;10 (CRPC¹)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5-15 (JPCP²)</td>
<td>&gt;15 (JPCP²)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5-20 (AP³)</td>
<td>&gt;20 (AP³)</td>
</tr>
<tr>
<td>Rutting⁴ (inch)</td>
<td>&lt;0.2</td>
<td>0.2-0.4</td>
<td>&gt;0.4</td>
</tr>
<tr>
<td>Faulting⁵ (inch)</td>
<td>&lt;0.10</td>
<td>0.10-0.15</td>
<td>&gt;0.15</td>
</tr>
</tbody>
</table>

**Notes:**
1. Continuously reinforced concrete pavement
2. Jointed plain concrete pavement
3. Asphalt pavement
4. Rutting is applicable to asphalt pavement only
5. Faulting is applicable to jointed plain concrete pavement only
Pavement Condition Measures

- **Where to Measure:**
  - Interstate System
  - National Highway System (State and Local)

- **How to Measure:**
  - **GOOD:** ALL metrics “good”
  - **POOR:** ONE metric “poor” for continuously reinforced concrete pavements and TWO metric “poor” for other pavements
  - **FAIR:** All other combinations OR 100% - GOOD – POOR

- **What to Measure:**
  - Percentage of pavements in “good” condition
  - Percentage of pavements in “poor” condition
Rural Asphalt Pavement Rating Example

IRI = 180 in/mile
- G: <95; F: 95-170; P: >170
  - Good
  - Fair
  - Poor

Cracking = 7.0%
- G: <5%; F: 5-10%; P: >10%
  - Good
  - Fair
  - Poor

Rutting = 0.3 in
- G: <0.2”; F:0.2” - 0.4”; P: >0.4”
  - Good
  - Fair
  - Poor

1 Poor rating and 2 Fair ratings

Overall Section Rating = Fair
MAP-21 Performance Measures for Bridges

Michael Johnson
State Asset Management Engineer
California Department of Transportation (Caltrans)
Source: National Bridge Inventory (NBI) bridges
Note: NHS Targets are required on NBI bridges, non-NBI bridges excluded
Note: There are over 250 Local Agency owners of NHS bridges of which 87% own less than 10 bridges
*Deck area in thousand square feet (KSF)
Bridge Condition Introduction

• Bridges are inspected typically every 2 years
• Caltrans performs bridge inspections in California for most local agency owned bridges
• Culverts that span more than 20 feet are considered bridges
• Conditions are assessed on all major components of the bridge using AASHTO and FHWA criteria
• A zero (low) to 9 (high) scale is used to assess condition of each major component
## Current Performance Measures
### All 2017 California NHS Bridges

<table>
<thead>
<tr>
<th>Lowest NBI Condition Rating</th>
<th>Asset Classification</th>
<th>Bridges</th>
<th>Deck Area (1000 SF)</th>
<th>% of Total deck Area</th>
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</thead>
<tbody>
<tr>
<td>9</td>
<td>Good</td>
<td>7,706</td>
<td>155,858</td>
<td>64%</td>
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<tr>
<td>8</td>
<td>Good</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Good</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Fair</td>
<td>2,681</td>
<td>67,209</td>
<td>31%</td>
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<td>5</td>
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<tr>
<td>4</td>
<td>Poor</td>
<td>438</td>
<td>11,218</td>
<td>5%</td>
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<td>3</td>
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<td>2</td>
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<td>1</td>
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<tr>
<td>0</td>
<td>Poor</td>
<td></td>
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</tbody>
</table>
Performance Measures

- NBI Bridge Condition Ratings Determined during Bridge Inspections
- Uses the Lowest of the 3 Condition Ratings or Culvert Rating
- Weighted by Deck Area

Example:

\[
\frac{\sum_{g} \text{GOOD} [\text{Deck Area}]}{\sum_{t} \text{TOTAL} [\text{Deck Area}]} \text{ Bridge } g \quad \text{Bridge } t
\]
Current Performance Measures

Local vs State NHS Bridges

Local
NBI Bridges Deck Area (SF)
10% of Total NHS

- Good: 9,586,733 (41%)
- Fair: 3,475,299 (15%)
- Poor: 10,449,077 (44%)

State
NBI Bridge Deck Area (SF)
90% of Total NHS

- Good: 146,271,637 (69%)
- Fair: 7,743,040 (4%)
- Poor: 56,760,097 (27%)

Legend: 
- Green: Good
- Yellow: Fair
- Red: Poor
Summary

- Bridges carrying NHS on the deck
- Based on Condition Ratings
- Weighted by Deck Area
- Current NHS Status
  - 64% Good/Deck Area
  - 31% Fair/Deck Area
  - 5% Poor/Deck Area
BREAK
Target Setting Overview
Methodology for Target Setting

Michael Johnson & Dawn Foster
Director’s Office of Asset Management
California Department of Transportation (Caltrans)
TAMP Target Setting

- The TAMP utilizes a 10 year period for all analysis and therefore needs 10 year target condition ending 2027/28
- The FHWA also require 2 & 4 year targets to measure progress toward the 10 year goal
- The California TAMP targets will need to reflect the varied starting condition levels
- Agencies have varied funding availability that influences accomplishments and resulting conditions
- Federal regulations allow MPO’s to adopt the state targets or set their own targets within 180 days
Options

1. Utilize analysis of available funding to establish reasonable targets
2. Solicit each MPO/RTPA target and use a weighted roll up for the statewide target
3. Determine an acceptable percentage improvement and apply to all agencies equally
4. Other ideas???
Initial Survey Results
NHS Pavements & Bridges Owned by Local Agencies

• July 2017 - Survey was sent to MPO and RTPAs that have NHS pavement and bridges within their region
• Over 70% response rate received from MPOs and RTPAs
• A select number of local cities/counties responded directly to Caltrans
Key questions asked…

• Have you estimated spending and investments on NHS pavement and bridges to maintain or bring conditions to a desired state of good repair over the next 10 years? Considering current funding and the addition of SB 1.

• Do you expect your conditions to improve, stay the same or get worse over the next 10 years?

• Have you set 10 year performance targets for NHS pavement and bridges?
General responses received…

• Several regional and local agencies provided current funding estimates on 10 year spending and investment for all local pavement and bridges

• Responses indicated prediction of pavement and bridge conditions would vary from region to region over the next 10 years, but generally at current funding levels pavement would become worse

• Some local agencies do not currently build 10 year forecasts for spending on pavement and bridges

• Multiple regions have not evaluated the impact of SB 1, but plan to do so

• Many MPOs used their current RTP process to estimate their spending and investments
Option #1 – Statewide Funding

- Every MPO and RTPA would have to provide budgets for NHS bridges and pavement
- Caltrans will establish target based on the sum of all funding being spent
- We will have a statewide deterioration rate and unit cost for this work
- This option requires every agency to develop their budgets and provide Caltrans supporting documentation for NHS bridge and pavement
Option #1 – Statewide Funding
Local NHS Pavement Investment Model

**General Parameters**
- **First Year**: 2017
- **Max % Work on Poor**: 40%
- **Annual Budget**: 600,000
- **Total Quantity**: 19,373

**Initial Conditions (2016 HPMS Data)**
- Good: 4.3%
- Fair: 83.1%
- Poor: 12.6%

**End of Period Conditions**
- Good: 57.1%
- Fair: 31.0%
- Poor: 11.9%

**Unit Costs (Class 2 Pavements)**
- Fair to Good: 290
- Poor to Good: 735

**Deterioration Probability**
- Good: 8.78%
- Fair: 3.37%

### Investment (X$1000)

<table>
<thead>
<tr>
<th>Initial Conditions from 2016 HPMS (Investment Unknown)</th>
<th>25% SB1 Funds Only</th>
<th>30% SB1 Funds Only</th>
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<tr>
<td><strong>Initial</strong></td>
<td><strong>$600,000</strong></td>
<td><strong>$780,000</strong></td>
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<td><strong>$600,000</strong></td>
<td>4.3%</td>
<td>12.6%</td>
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<td><strong>$780,000</strong></td>
<td>57.1%</td>
<td>11.9%</td>
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<tr>
<td></td>
<td>73.7%</td>
<td>22.0%</td>
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**Example Local NHS Pavement Investment Model**

- Good: 57.1%
- Fair: 31.0%
- Poor: 11.9%
Option #2 – Agency Roll Up

- Every MPO and RTPA would have to provide targets for NHS bridge and pavement
- Take targets and weight them relative to the amount of inventory they have
- Summarize across entire state to come up with a statewide number
- This option requires every agency to develop their targets and provide Caltrans supporting documentation for their NHS bridge and pavement targets
## CA 2016 Pavement Conditions (NHS)
### Target Calculator Tool

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>2016 Lane Miles (LM)</th>
<th>2016 Current Pavement Condition (%)</th>
<th>% Target (G)</th>
<th>% Target (F)</th>
<th>% Target (P)</th>
<th>% Impact to Statewide Lane Miles</th>
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<tr>
<td>State Interstate - NHS</td>
<td>14,159</td>
<td>47.9% 52.1% 3.1%</td>
<td>52.1%</td>
<td>3.1%</td>
<td>25.2%</td>
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<tr>
<td>Non Interstate - NHS</td>
<td>22,544</td>
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<td>54.0%</td>
<td>2.5%</td>
<td>40.2%</td>
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<td>Butte (BCAG)</td>
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<td>Fresno (FCOG)</td>
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<td>4.2%</td>
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<td>76.7%</td>
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<td>15.2%</td>
<td>0.2%</td>
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<td>Metropolitan (MTC)</td>
<td>2,995</td>
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<td>87.2%</td>
<td>11.1%</td>
<td>5.3%</td>
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<td>Monterey (AMBAG)</td>
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<td>83.9%</td>
<td>8.1%</td>
<td>0.4%</td>
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<td>Sacramento (SACOG)</td>
<td>1,149</td>
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<td>14.4%</td>
<td>2.0%</td>
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<td>San Diego (SANDAG)</td>
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<td>89.1%</td>
<td>8.8%</td>
<td>1.8%</td>
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<tr>
<td>San Joaquin (SJCOG)</td>
<td>545</td>
<td>13.9% 86.1% 5.8%</td>
<td>86.1%</td>
<td>5.8%</td>
<td>1.0%</td>
<td></td>
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<tr>
<td>San Luis Obispo (SLOCOG)</td>
<td>43</td>
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<td>77.9%</td>
<td>11.5%</td>
<td>0.1%</td>
<td></td>
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<td>Santa Barbara (SBCAG)</td>
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<td>88.2%</td>
<td>7.9%</td>
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<td>Southern California (SCAG)</td>
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<td>14.4%</td>
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<td>Shasta (SRTA)</td>
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<td>71.5%</td>
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<td>73.5%</td>
<td>13.2%</td>
<td>0.4%</td>
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<td>Tahoe (TMO)</td>
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### Options
- **Option #2 Pavement Agency Roll Up**

---

**Bridge and Pavement Target Setting Workshop | August 31, 2017 | Slide 63**
### CA 2017 NBI Bridge Conditions (NHS) as of 8-15-2017

#### Target Calculator Tool

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</table>
Option #3 – Fixed Percentage

• Caltrans/Commission will establish a fixed percentage improvement in condition
• The percentage improvement would be applied to each agency starting condition
• Summarize across entire state to come up with a statewide number
<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>2016 Lane Miles (LM)</th>
<th>2016 Pavement Condition (%)</th>
<th>% Improve (G)</th>
<th>% Improve (F)</th>
<th>% Impact to Statewide Lane Miles</th>
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<tr>
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<td>Non Interstate NHS</td>
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<tr>
<td>Butte (BCAG)</td>
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<td>7.5% 92.5% 0.0%</td>
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<tr>
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<tr>
<td>Glenn CTC</td>
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<td>Humboldt CAG</td>
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<td>0.1%</td>
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<td>686</td>
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<td>Kings (KCAG)</td>
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<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Merced (MCAG)</td>
<td>87</td>
<td>2.6% 82.2% 15.2%</td>
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</tr>
<tr>
<td>Metropolitan (MTC)</td>
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<tr>
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<tr>
<td>Sacramento (SACOG)</td>
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<tr>
<td>San Diego (SANDAG)</td>
<td>991</td>
<td>2.1% 89.1% 8.8%</td>
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<tr>
<td>San Joaquin (SJCOC)</td>
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Other Ideas?
Target Setting Discussion

- Timing is critical
  - Draft TAMP being presented to the Commission in October
- Given the target setting options presented what is the preferred option?
  - Options on next page
- Will MPOs adopt the statewide targets or set their own?
  - MPOs have 180 days to set their own targets
  - Requires submittal of methodology, 3-5 year prior and 10 year plan of funding and performance targets
- How do MPOs report targets to Caltrans?
  - Final federal rule requires a consistent format that is documented and mutually agreed upon
Vote on Target Setting Methods

Options

1. Utilize analysis of available funding to establish reasonable targets – STATEWIDE FUNDING
2. Solicit each MPO/RTPA target and use a weighted roll up for the statewide target – AGENCY ROLL-UP
3. Determine an acceptable percentage improvement and apply to all agencies equally – FIXED PERCENTAGE IMPROVEMENT
4. Other ideas???
Workshop Summary and Next Steps
Federal Regulations require California to produce a TAMP inclusive of pavement and bridges.

National pavement and bridge performance measures must be used for the entire NHS.

The TAMP must include targets for pavement and bridges conditions over a 10 year plan horizon.

The available NHS pavement and bridge funding for all local NHS owners in California is not know.

Several options exist for setting a single statewide target condition for pavements and bridges.

MPO’s have the authority to adopt the statewide target or adopt their own.

Failure to achieve the condition targets established will require the development of an improvement plan.
TAMP Next Steps

- August 2018 – TAMP workshop summaries open for public comment
- September 21, 2017 – Final TAMP workshop focusing on asset management improvement areas
- October 2017 – Draft TAMP open for CTC and stakeholder comments
- January 2018 – Final TAMP to CTC for approval
- April 30, 2018 – TAMP due to FHWA
Questions
Acknowledgements

Jennifer Duran
Dawn Foster
Kome Ajise
Tom Pyle

Melissa Thompson
Susan Bransen
Thomas Van
MIG Consulting

For more information:

http://www.dot.ca.gov/assetmgmt/index.html