Transportation Performance Management Webinar Series

Highway Infrastructure Target Setting

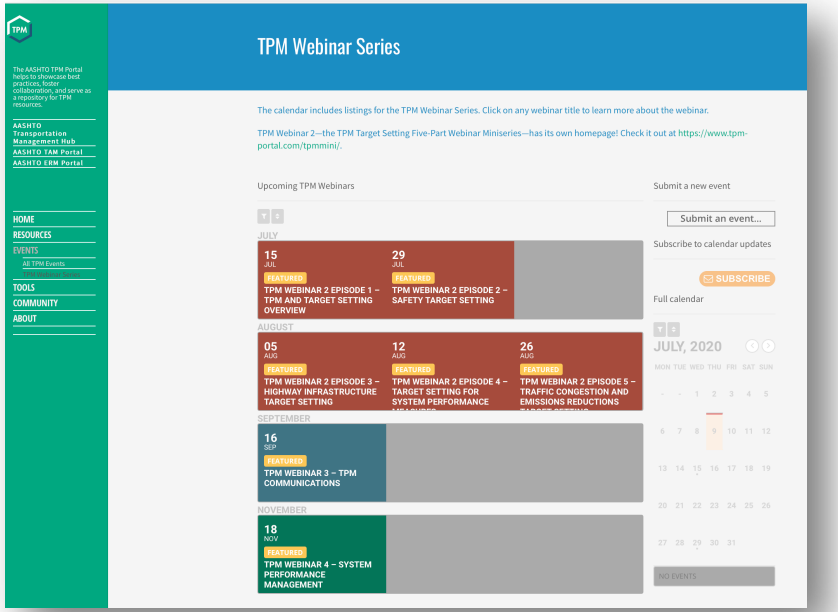
Sponsored by the TPM Pooled Fund
with Support from AASHTO CPBM Leadership and FHWA

August 5, 2020

TPM Target Setting Miniseries Webinar 3

Transportation Performance Management Webinar Series

- Our regular webinar series is held every two months, on topics such as communications, system performance management, data sources, and many more to come!
- Today is Episode 3 of a special, five-part Target Setting Webinar Miniseries that will run through August
- We welcome ideas for future webinar topics and presentations
- Use the webinar Q&A panel during the webinar
  - Submit questions for today's presenters
  - Submit ideas for future webinar topics



Welcome

The TPM Pooled Fund, the AASHTO Committee on Performance Based Management, and FHWA are pleased to sponsor this webinar series!

- Sharing knowledge is a critical component of advancing performance management practice

FHWA Introduction

Nelson Hoffman, FHWA

U.S. Department of Transportation
Federal Highway Administration

TPM
HOW WE GET THERE

Webinar Agenda

2:00 **Welcome and Introduction and TPM Pooled Fund Overview**
Christos Xenophontos (Rhode Island DOT) and Hyun-A Park (Spy Pond Partners, LLC)

2:10 **FHWA Target Setting Overview**
Nelson Hoffman (FHWA)

2:20 **Highway Infrastructure Target Setting: Experiences of a Small, Centralized, Rural State**
Chad Allen (Vermont Agency of Transportation)

2:35 **VDOT's Experience with Target Setting and Performance Management for Pavements and Bridges**
Tanveer Chowdhury and Adam Matteo (Virginia DOT)

2:50 **MDOT TPM Pavement Target Setting in Coordination with our MPO Partners**
Tim Lemon (Michigan DOT)

3:05 **Caltrans Target Setting for Pavements and Bridges**
Mike Johnson (California DOT)

3:20 **Q&A and Wrap Up**

VTrans Asset Management

Chad A. / ent Division

Highway Infrastructure Target Setting
Experiences of a Small, Centralized, Rural State

August 5, 2020

Highway Infrastructure Condition Targets
Pavements

NHS Performance Measures	Targets	2017 Data Baseline 10/1/2018	2018 Data	2019 Data MPP[1] 10/1/2020
Interstate in **Good** condition	**35.0%**	50.1%	56.9%	53.7%
Interstate in **Poor** condition	**4.9%**	1.6%	0.2%	0.5%
Non-Interstate in **Good** condition	**30.0%**	67.1%	47.3%	44.3%
Non-Interstate in **Poor** condition	**9.9%**	7.8%	7.0%	9.3%

[1] MPP = Mid-Performance Period



Highway Infrastructure Condition Targets

Bridges

NHS Performance Measures (by deck area)	Targets	2017 Data Baseline 10/1/2018	2018 Data	2019 Data MPP[1] 10/1/2020
Bridges in **Good** condition	**35.0%**	49.8%	49.2%	47.8%
Bridges in **Poor** condition	**6.0%**	1.8%	3.2%	3.3%



[1] MPP = Mid-Performance Period

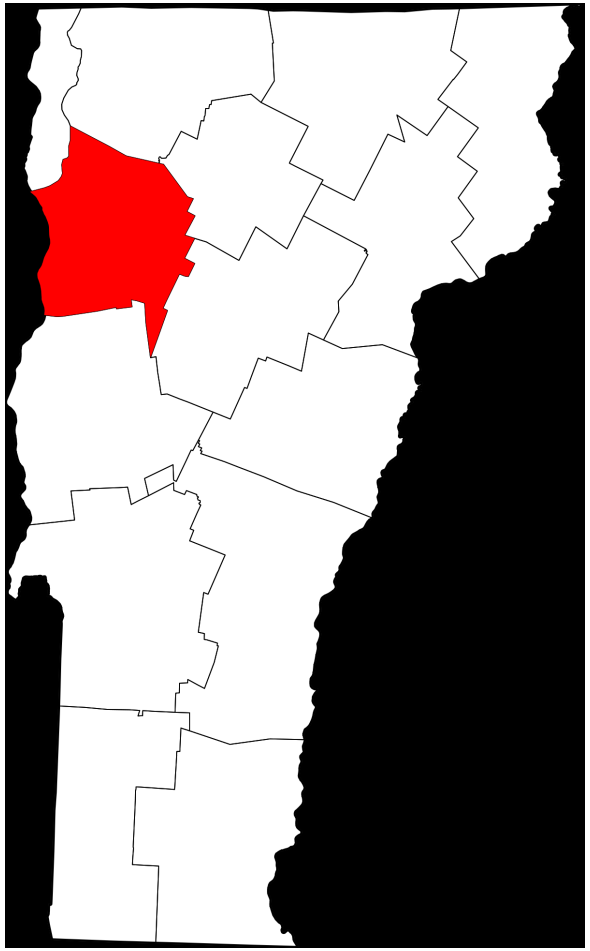
VTrans Working to Get You There
Vermont Agency of Transportation

Data Considerations

- Pavement condition is based on full distress (IRI, rutting, cracking)
- Began collecting pavement data on “proposed” NHS in 2018
- High baseline measurements for Non-NHS Interstate in “Good” condition seem high, likely related to being only based on IRI.

VTrans Working to Get You There
Vermont Agency of Transportation

MPO Collaboration & Coordination



Chittenden County Regional Planning Commission (CCRPC)

KEY STATISTICS

- 2010 Census population: **156,545**
- 2014 American Community Survey population: **158,686**
- 2014 Vermont Department of Labor employment: **99,768**
- Area: **620** m^2

VTrans Working to Get You There
Vermont Agency of Transportation

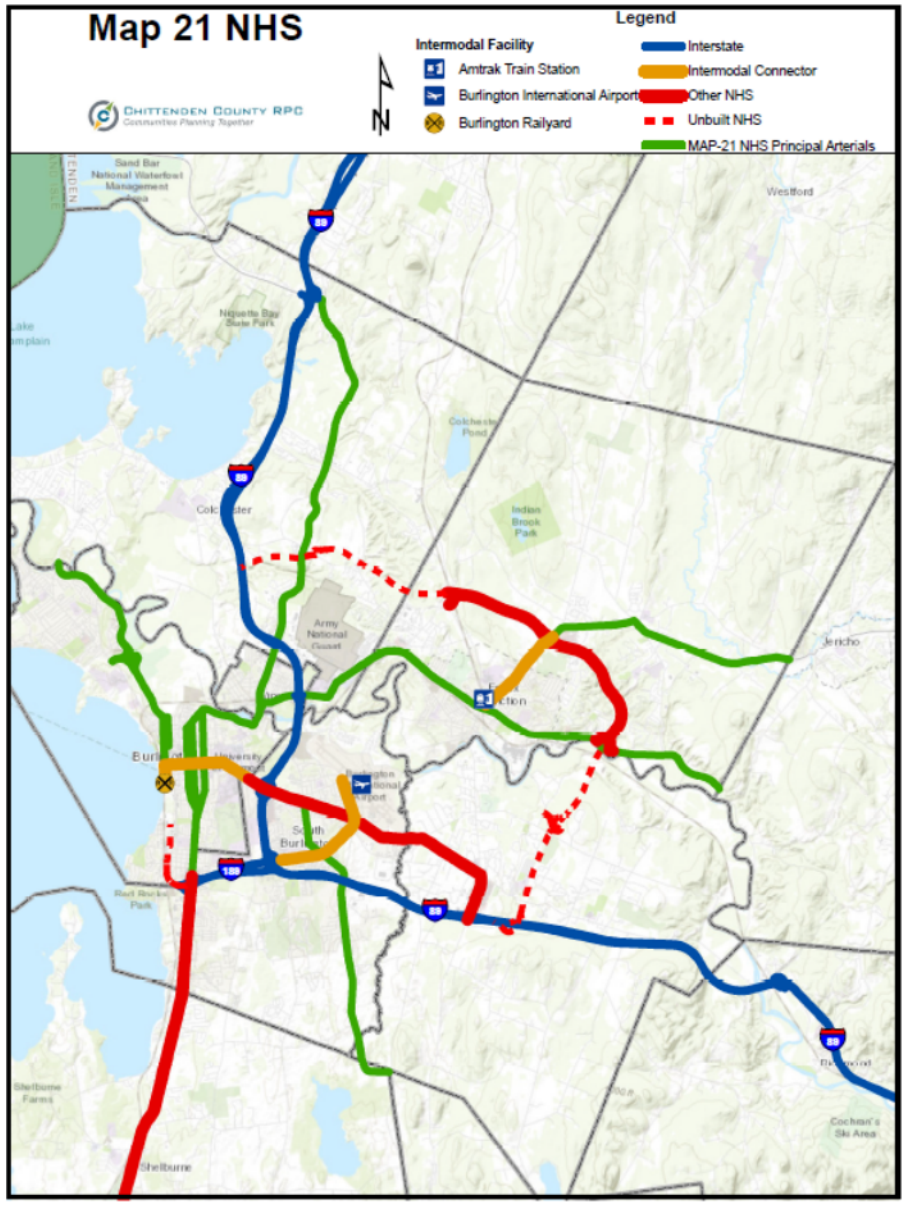
MPO Collaboration & Coordination

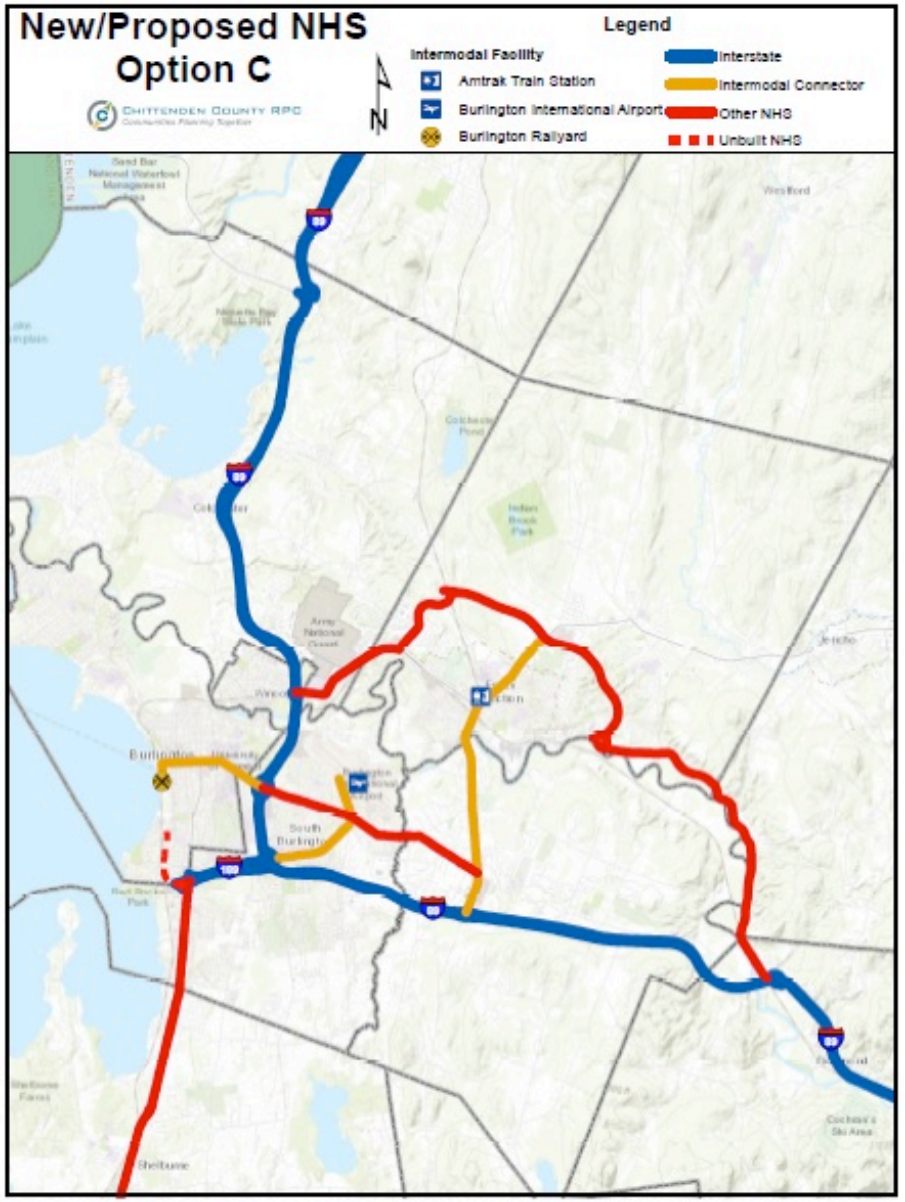
- 2012 – MAP-21 added mileage to the NHS
- 2014-2018 –Worked with local FHWA Division Office and MPO….What is a reasonable NHS?
  - ✓ MPO saw this as opportunity to funnel more pavement $ to their region
  - ✓ VTrans addressed this risk through series of trade-offs. Added 8.6 miles of “new NHS” but also removed 35.5 miles of MAP-21 added mileage and a few links that did not contribute to a contiguous NHS.

! Performance of Non-Interstate NHS is a measure that VTrans is closely monitoring as a future area of potential non-compliance.

VTrans Working to Get You There
Vermont Agency of Transportation

MPO Collaboration & Coordination





VTrans Working to Get You There
Vermont Agency of Transportation

MPO Collaboration & Coordination

- 2018 collaboration meeting with MPO to discuss VTrans TPM performance measures

  ✓Suggested that MPO consider acceptance of VTrans Infrastructure PMs

  ✓Within the 180 days, the MPO accepted VTrans measures for the MPO area. VTrans collects pavement (annually) and bridge (every 2 years) data on the NHS within the MPO region.

Aligning Performance (TPM) Projections with Agency Plan Goals

- 2040 Long Range Transportation Plan

  ✓Plan includes Federal Performance Targets for Pavement & Bridge Condition

- Strategic Plan

  ✓Goal #2: Grow Vermont's economy by providing a safe, reliable, and efficient transportation system in a state of good repair.

  ✓Updated Strategic Plan dated April 23, 2019 removed specific references to pavement and bridge condition.

Aligning Performance (TPM) Projections with Agency Plan Goals

- TAMP
  - ✓Plan is supports/reinforces Federal Performance Measures
  - ✓**Risk:** There is a “lag” between the dTIMS investment projections and the delivery of the Capital Program. Require better alignment of work types.
    - ✓**Mitigation:** Add check points in project selection and delivery processes to ensure better alignment with the Federal Consistency Determination and to better project future performance.
    - ✓**Mitigation:** Moving forward, use a “de-optimized” 10-yr Asset Plan rather than actual dTIMS projections.

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TPM Target Setting Miniseries Webinar 3 - Highway Infrastructure Target Setting Wednesday, August 5, 2020

Modeling Federal Pavement Performance Measure Using VDOT Pavement Condition Indices

Tanveer Chowdhury, PE

Assistant Division Administrator, Maintenance Division

Virginia Department of Transportation

VDOT – Performance Measurement & Monitoring

- VDOT has a long history of performance measurement and monitoring of core assets like pavements and bridges
- First public dashboard was established in 2004
- State legislative requirements for establishing performance targets, monitoring, reporting and budgeting
- VDOT has robust and matured pavement and bridge management systems

Pavement Inventory

- VDOT Maintained inventory *129,000* lane miles
  - Interstate – *5,600* lane miles
  - Primary – *22,000* lane miles
  - Secondary – *100,800* lane miles
  - Frontage – *600* lane miles

- Federal Focus - NHS
  - NHS Inventory *19,000* lane miles
    - All Interstates
    - Approx. half of all primaries
    - Few secondaries
  - NHS Inventory Maintenance
    - VDOT *16,000* lane miles
    - Locality *3,000* lane miles

Performance Measures: Federal & State

Detailed Distress Types
Asphalt -10
Jointed Concrete – 13
Continuously Reinforced Concrete – 8

VDOT

LDR, NDR, CCI

Excellent, Good, Fair
Poor, Very Poor

Measures: **% Sufficient** / **% Deficient**

Target:
- Interstate: % Sufficient > 82% (no sections with CCI <35)
- Primary: % Sufficient > 82% (AADT > 3,500), %Sufficient > 75% (AADT < 3500)
- Secondary: % Sufficient > 82% (AADT > 3500), %Sufficient > 60% (AADT < 3500)

FHWA

IRI, Cracking, Rutting, Faulting

Good, Fair, Poor

Measures:
%Good Interstates
% Poor Interstates
%Good Non-Interstate NHS
%Poor Non-Interstate NHS

Target:
% poor interstate < 5 %
% Good & % Poor Interstates
% Good & % Poor non-Interstate

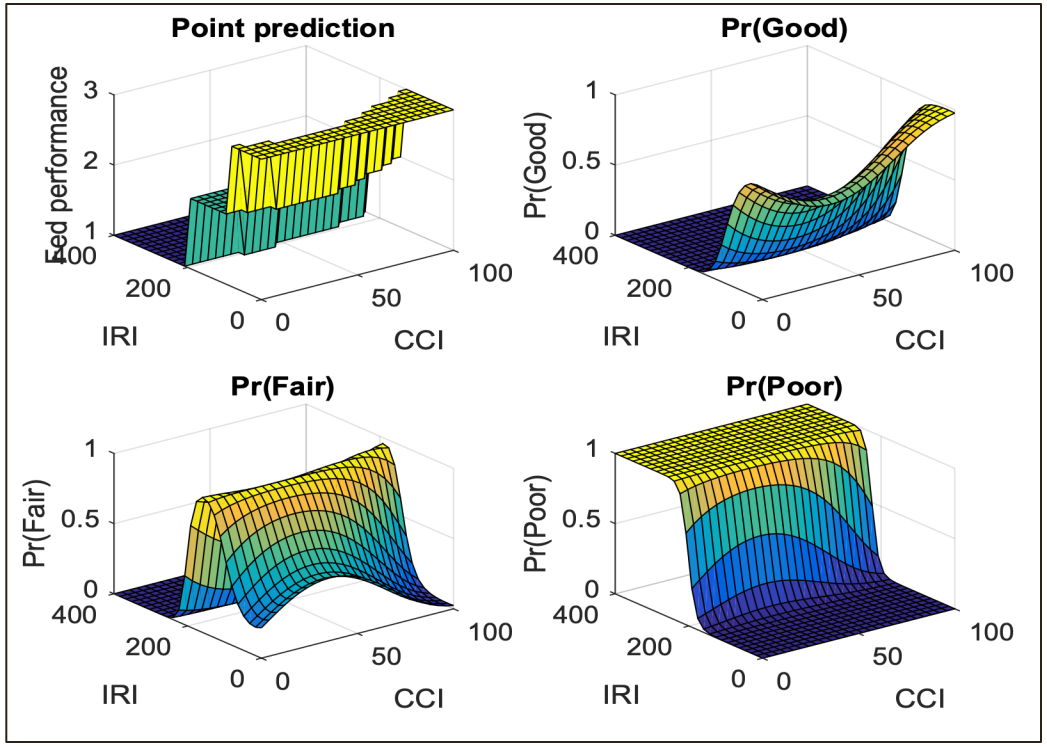
Federal Performance Measure Modeling

- VDOT's pavement management tools do not directly forecast based on Federal measures
- Correlation between VDOT pavement condition summary indices and Federal measures was developed
- Historical condition data (2013-2016) was used to develop the models and the results were applied to the most recent available data for validation and testing
- This approach allows use of existing PMS performance forecasting and investment optimization results to establish the required federal targets and performance goals

Federal & State Performance Measures Correlation

Ordered Logistic Regression Model to fit Federal measures to the State measures

$$y^* = \beta_1 \frac{CCI}{100} + \beta_2 \left(\frac{CCI}{100}\right)^2 + \beta_3 \frac{IRI}{100} + \beta_4 \left(\frac{IRI}{100}\right)^2$$



PMS Optimization Analysis Output

Predicted CCI and IRI

Predicted Federal Performance

Predicted % Good / Poor

TPM Webinar
VDOT's Experience with Target Setting & Performance Management for Bridges

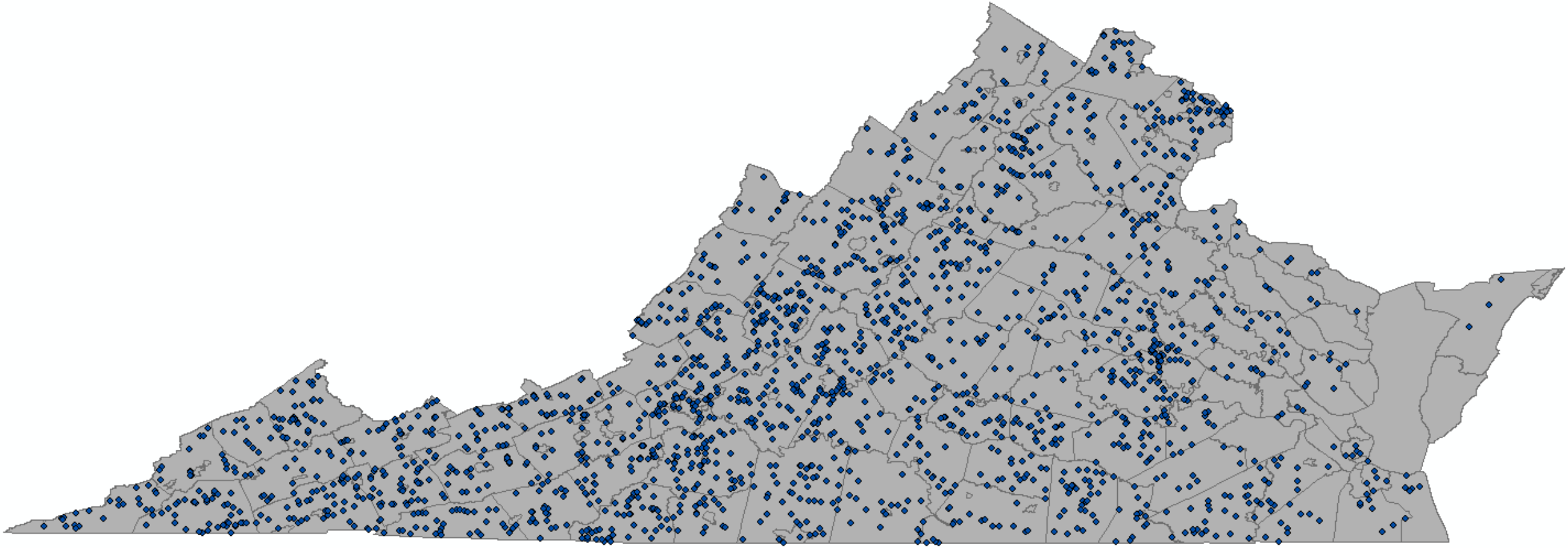
VDOT's 11 Year Bridge Performance Targets History

- Established a Dashboard with Public and Inside-facing Views: 2007
- Established First Performance Measure for Bridges in ~ 2009
  - Maximum Statewide Percentage of Structurally Deficient Bridges = 8%
- Added SD Performance Measures for Highway Systems ~ 2012
  - Interstate System Maximum % SD: 3%
  - Primary System Maximum % SD: 8%
  - Secondary System Maximum % SD: 11%
- Added Additional *Best Practice Goals* 2014
  - Eliminate 2% of Expansion Joints per District per Year
  - Address 2% of all Fair Bridges Annually (Minimum GCR = 6)
  - Address 2% of all Satisfactory Bridges Annually (Minimum GCR = 6)
  - Maintain 90% of Expansion Joints in Condition State 1
- Established Tighter Goals for SD Bridges & Expansion Joints: 2016
  - Interstate System Maximum % SD: 1%
  - Primary System Maximum % SD: 4%
  - Secondary System Maximum % SD: 6%
  - All Systems Combined Maximum % SD: 4.5%
  - Required Steady Improvement in Condition of Expansion Joints

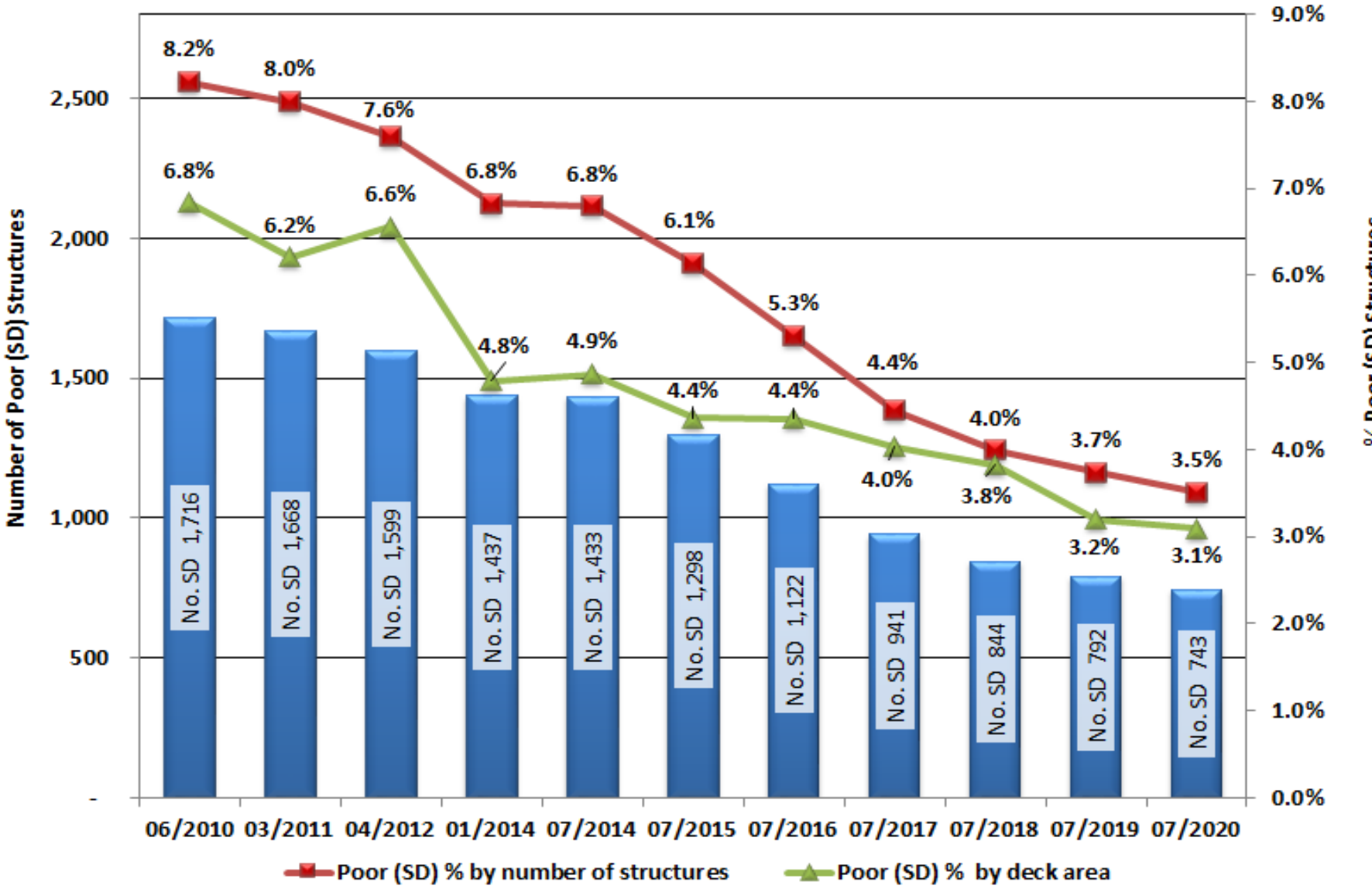
Focus On Structurally Deficient (SD) Structures Was Successful:

2,130 SD Structures Replaced or Improved Since 2010

Most Were Smaller Bridges, Many non-NBI

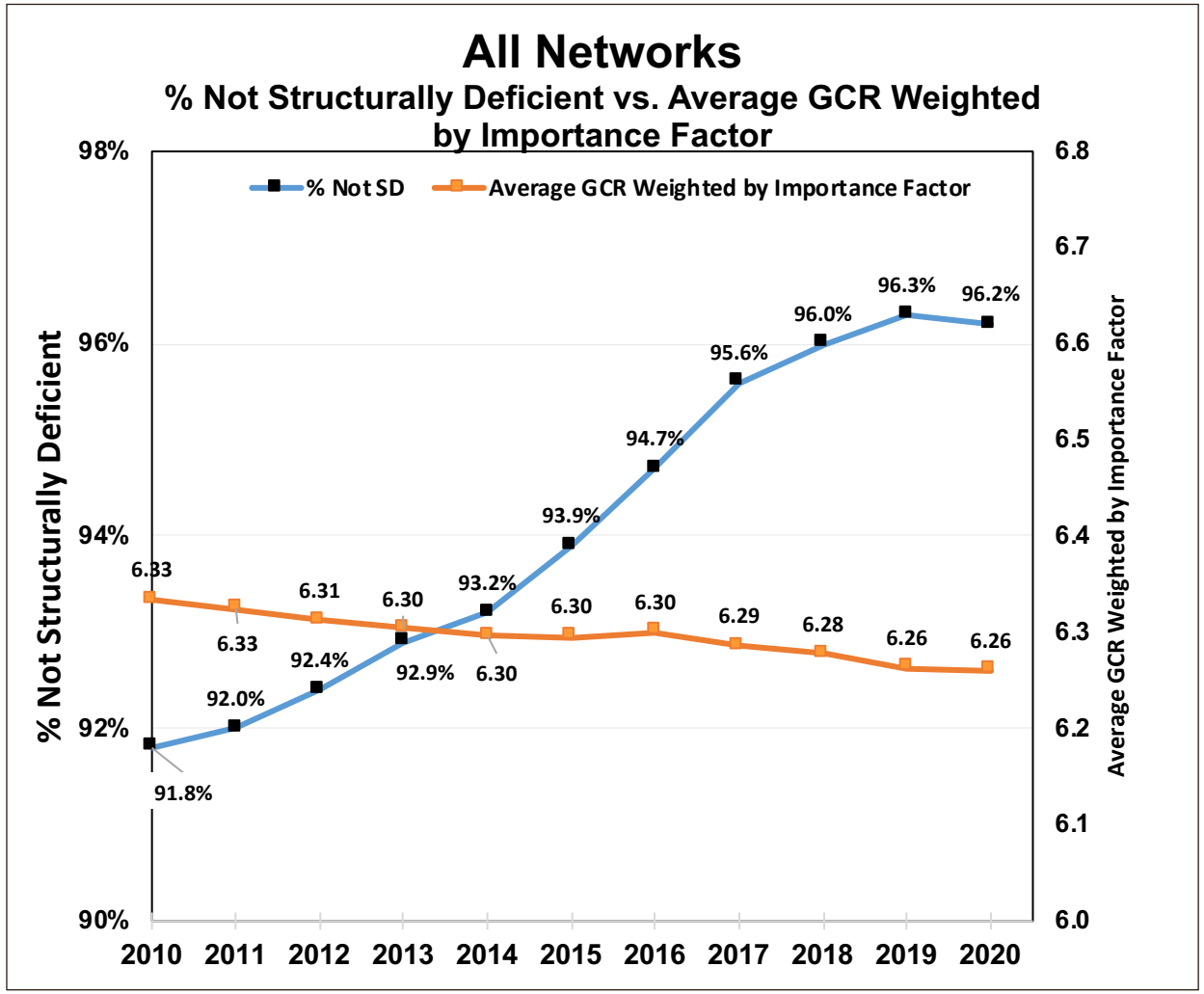


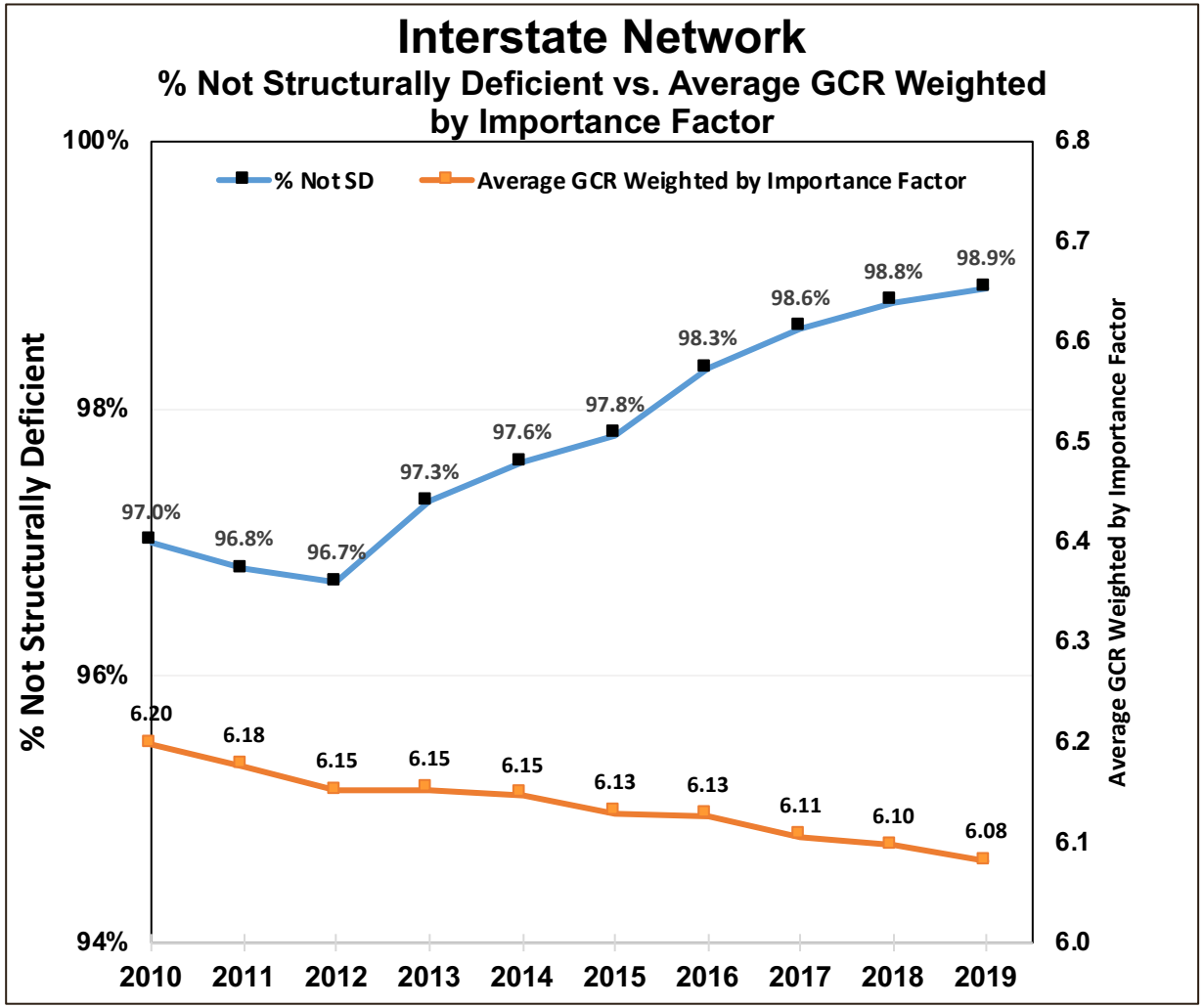
Despite Preservation *Goals*, Focus Was on SD Bridge *Requirement* ~75% of Total Funding to SDs



- Targets Exceeded
- 10 Year Drop in SDs was 927, but 2,130 Were Improved
- So 1,203 “Fell In” to SD Over 10 Years

Focus On SDs Came At a Price: Average GCRs Declining

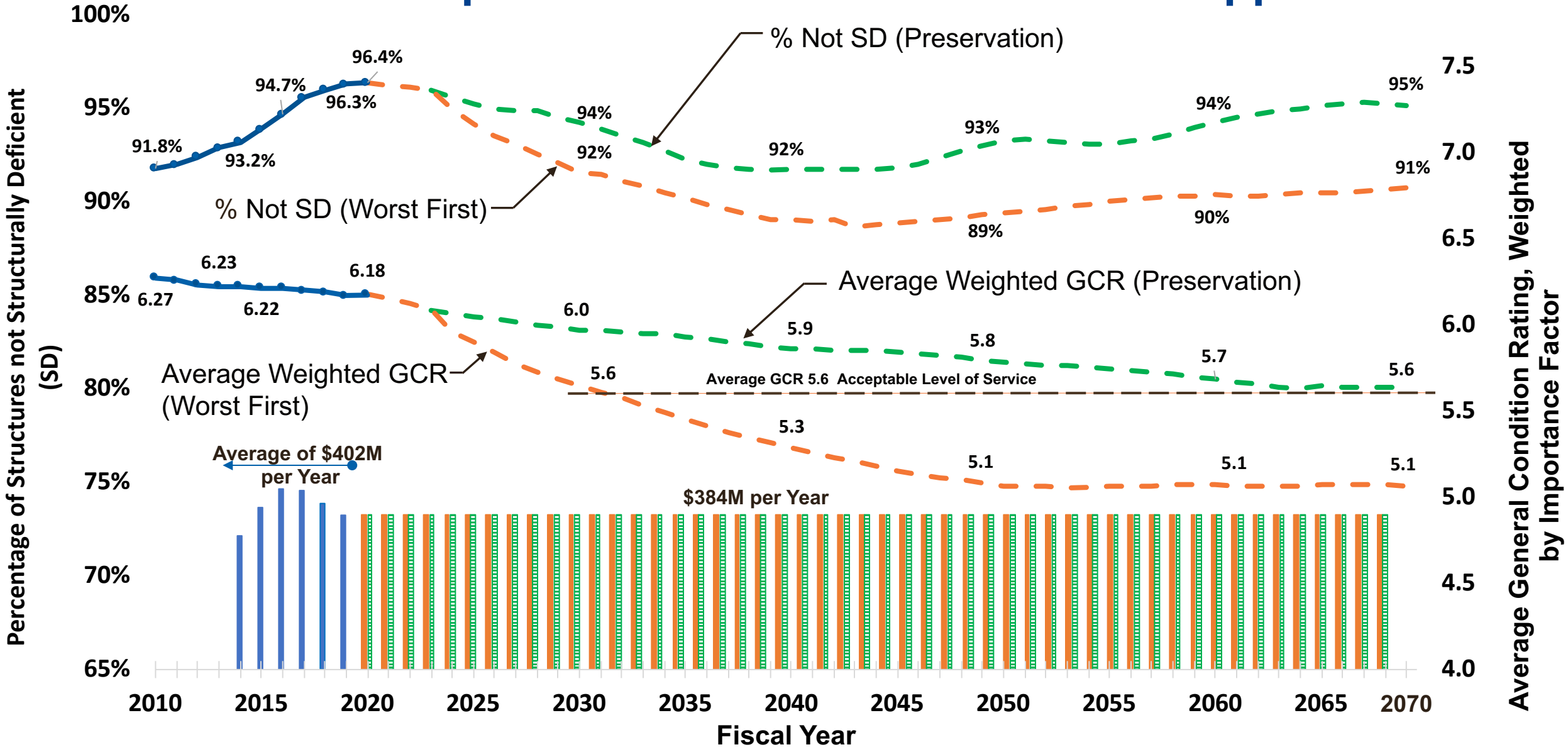




2019 Comprehensive Investment Strategy Review

- Goal Was To Perform a Long Term Review of Bridge Needs and Determine Ideal Investment Strategy
- How To Measure Performance. What is An “Acceptable Level of Service”?
- Establish Performance Measures and Targets
- Determine Total Amount of Funding Required for Existing Inventory
- Determine Appropriate Balance of Spending by Type of Intervention
- Determine Appropriate Balance of Spending by Highway System

50 Year Model Compared "Worst First" to Balanced Approach



Actual

Results w/ Current Approach

Results with Proposed Approach

- All Future Expenditures Are in 2019 Dollars
- Excludes Special Structures

Results of Comprehensive Investment Strategy Review

- **Existing Funding OK if We Rebalance Investment Breakdown**
  - 25% for Replacement, 75% for Preservation (Analysis undertaken to define a sustainable solution
  - 29% Each to Interstate & Secondary Systems, 42% to Primary System
- **Change Primary Performance Measure & Target**
  - Measure: Average General Condition Rating*Importance Factor
  - Target: 5.6 Average GCR*IF, but “stable” Preserved with Overlays, Coatings, Joint Eliminations
- **Relax Targets for % SD Bridges**
  - Interstate: 3% (No Postings)
  - Primary: 7%
  - Secondary 10%

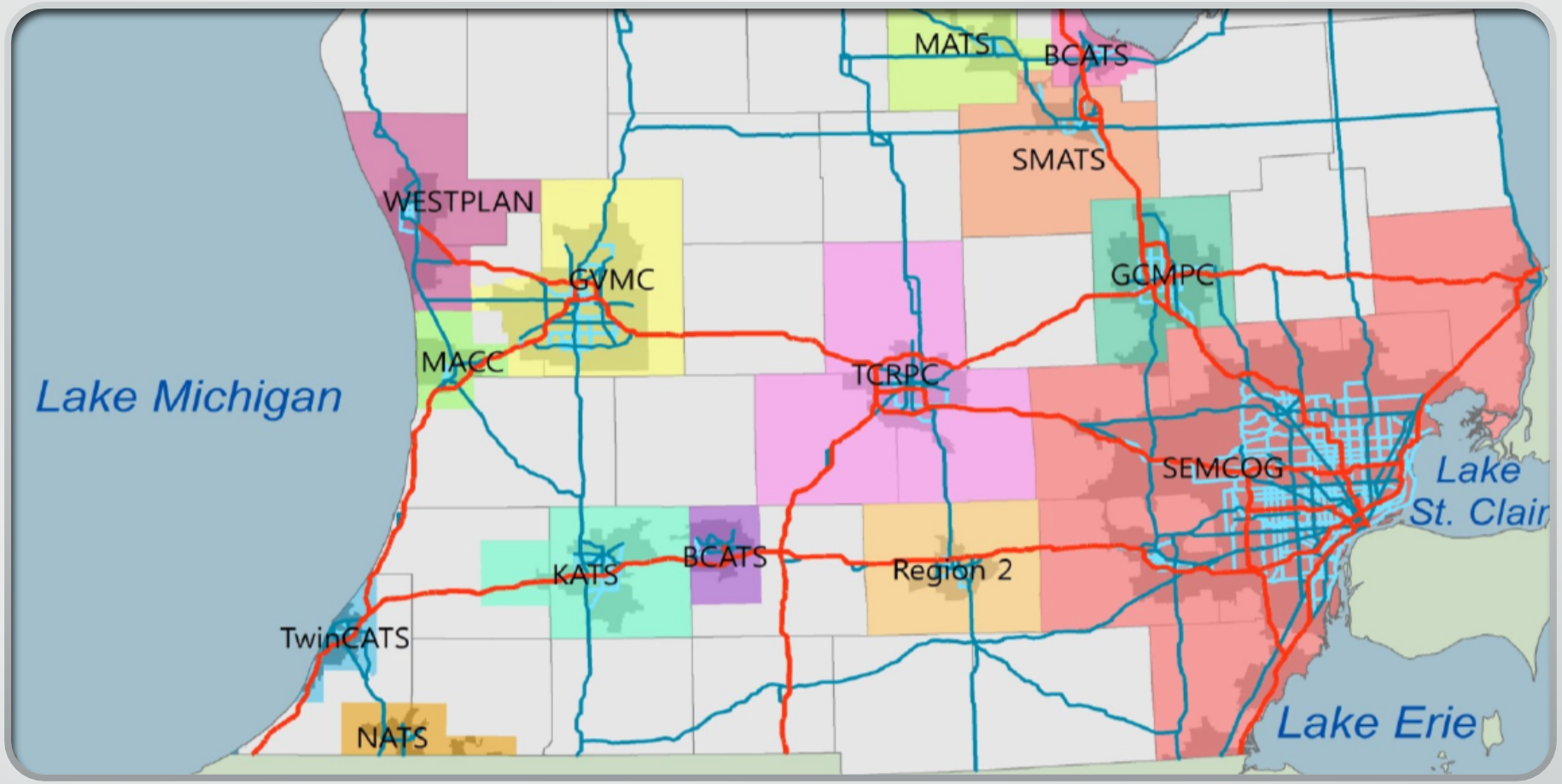
TPM Pavement Target Setting in Coordination with our MPO Partners

Tim Lemon

Transportation Planner

Statewide Transportation Planning Division

Michigan Department of Transportation



Michigan Metropolitan Planning Organizations

State of Michigan NHS Pavement Inventory		
Route Type	Lane Miles	Route Miles
Interstate (State)	6,078	1,251
Non-Interstate NHS	16,349	5,220
State Owned	12,081	4,005
Locally Owned	4,268	1,215

Michigan NHS Pavement Health Ratings

- State Trunkline: Remaining Service Life (RSL)
- Paved Federal Aid (PFA): Pavement Surface Evaluation and Rating (PASER)

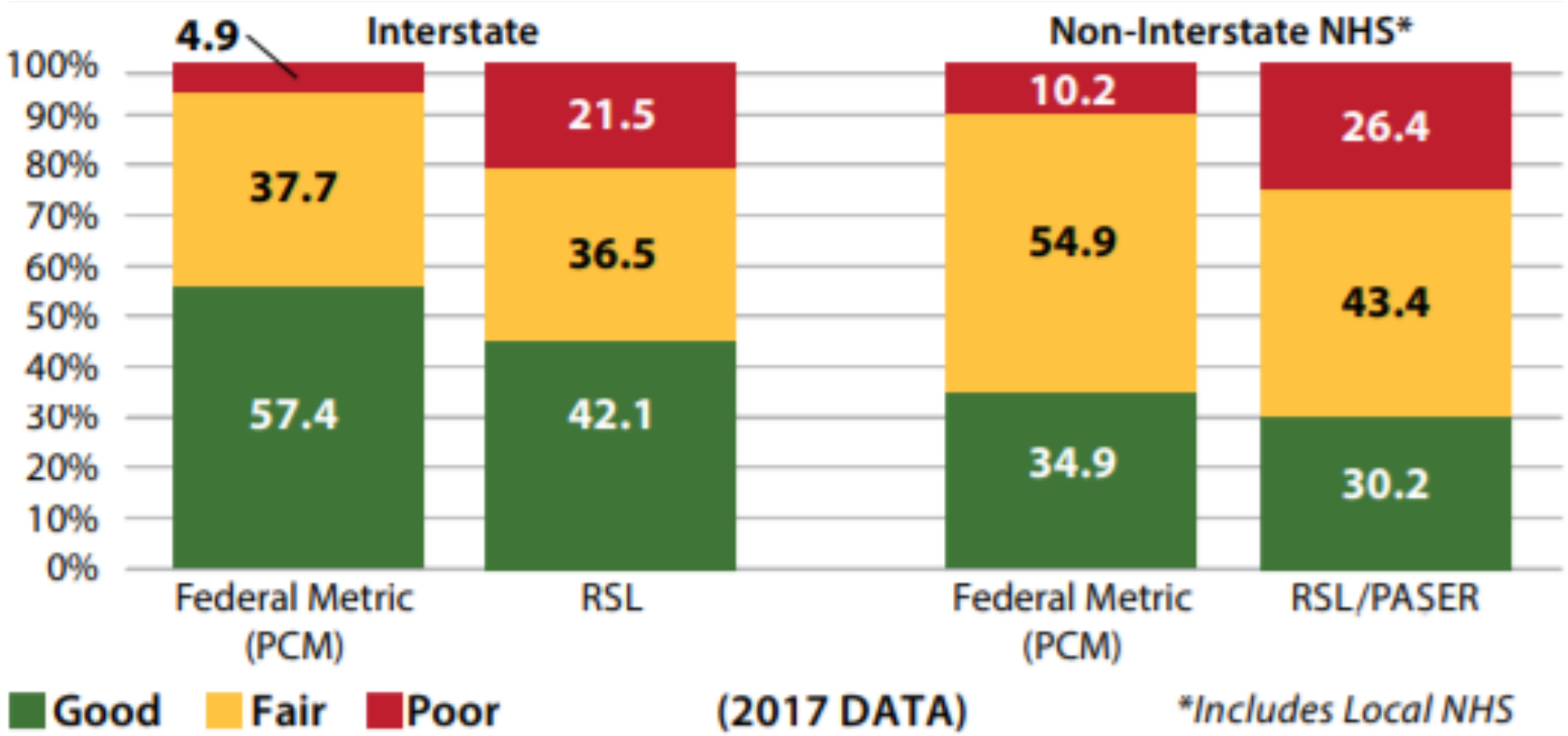
Michigan NHS Pavement Health Ratings		
Condition State	RSL (State)	PASER (PFA)
Good	8+ Years	8-10
Fair	2-7 Years	5-7
Poor	0-2 Years	1-4

Federal Pavement Condition Measure (PCM) Metrics:

- IRI (International Roughness Index)
- Cracking (Based on Pavement Type)
- Rutting (asphalt only)
- Faulting (jointed concrete only)

Three metrics combine to determine condition state

Performance Measure Comparison



TPM Pavement Team

- Includes representatives from MDOT planning, engineering and regional offices as well as representatives from the Grand Valley Metro Council and South East Michigan Council of Governments.
- Objectives:
  - Develop target setting and reporting practices
  - Create materials for MPO engagement in TPM process
  - Implement federal measure into MDOT's planning documents and procedures.
  - Conduct research to improve statewide use of federal measure

Target Establishment Methodology

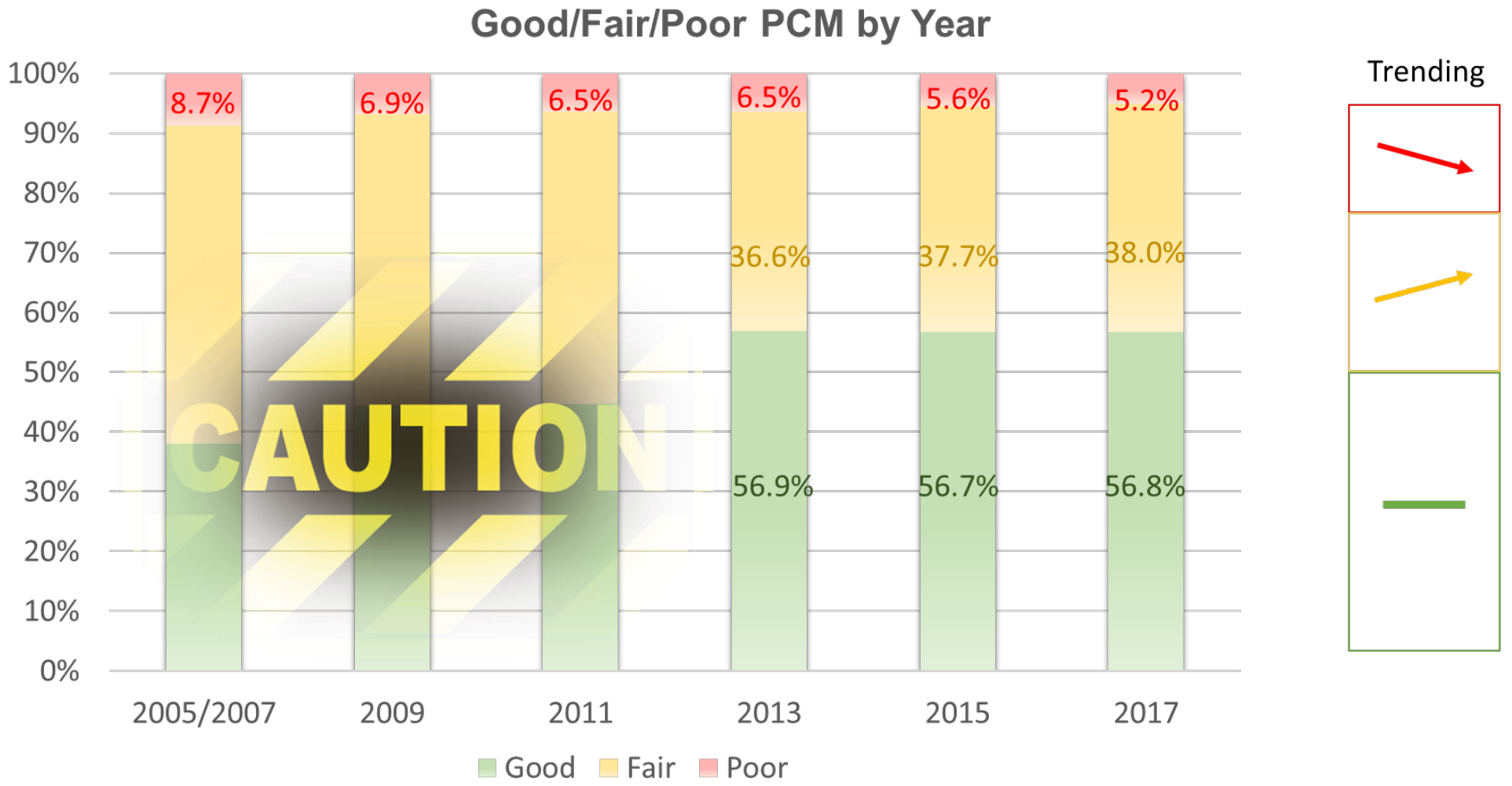
SHORT-TERM TREND ANALYSIS

RATING GROUP BUILD-UP ANALYSIS

UTILIZATION OF RSL AND PASER

RISK ASSESSMENT

Interstate Pavement Condition Measure (PCM)

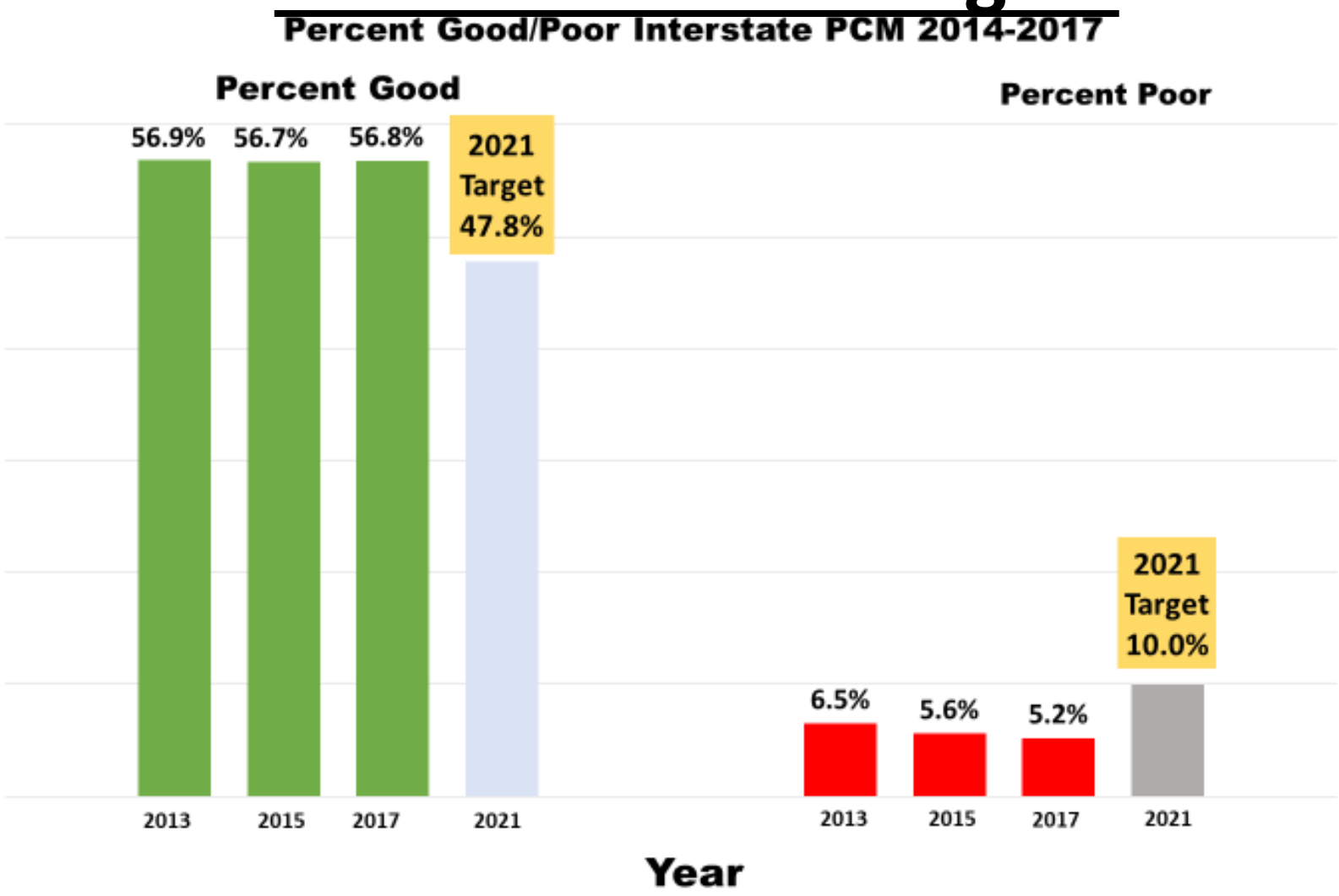


These figures are from pre-processed PCM data used for target setting purposes only and may not necessarily match exactly the data submitted in the baseline report.

Assessment of Factors

- Statewide RSL condition in consistent decline
- International Roughness Index distributed towards edge of good rating
- Cracking percent sample would increase from 30% to 100%
- Funding uncertainties surrounding state income tax redirect.

Interstate PCM Targets



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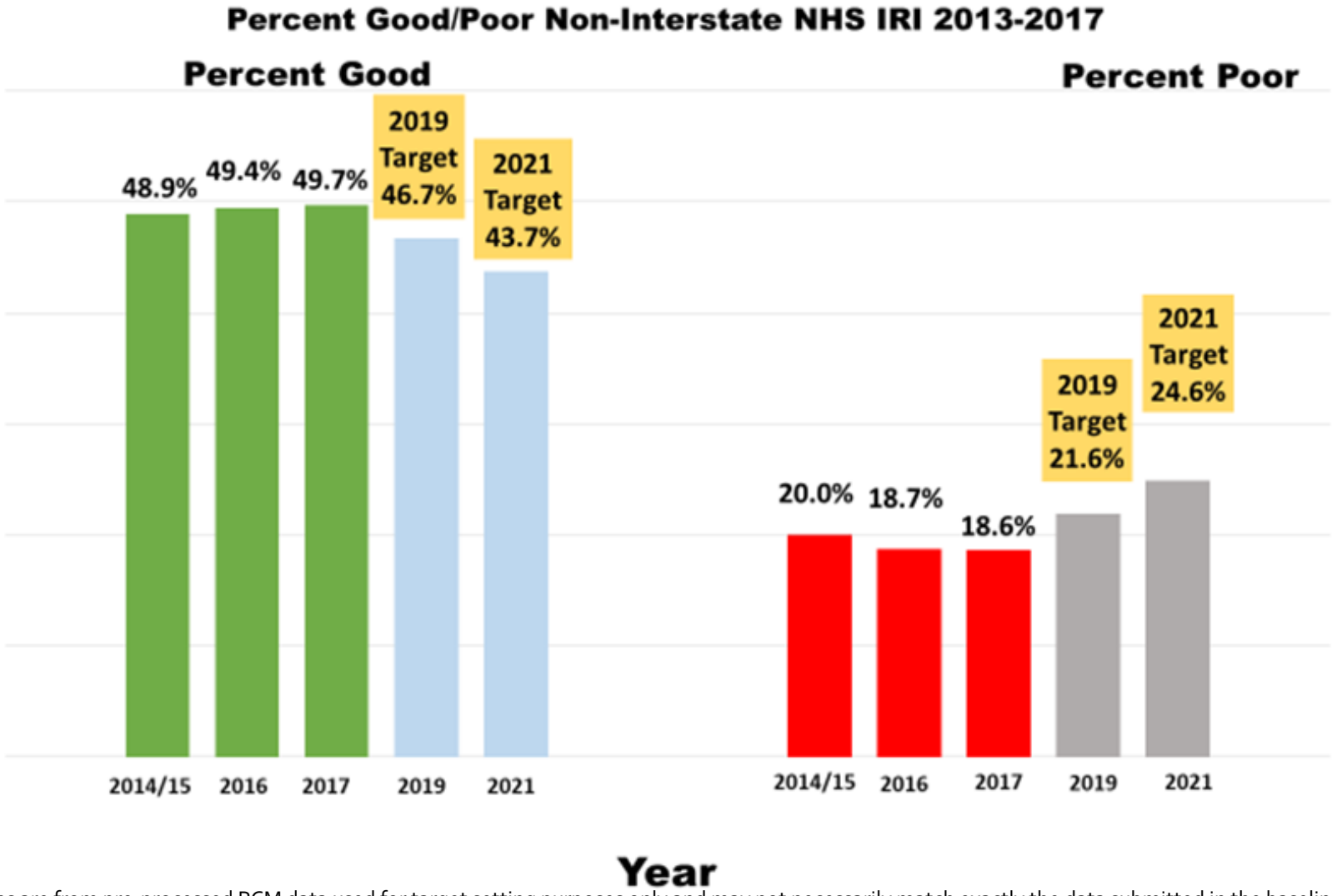
Non-Interstate IRI Targets



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MPO Coordination

- Create a TPM Pavement Newsletter
- Communicate directly with Michigan Transportation Planning Association
- Provide MPO Pavement Condition Report Cards

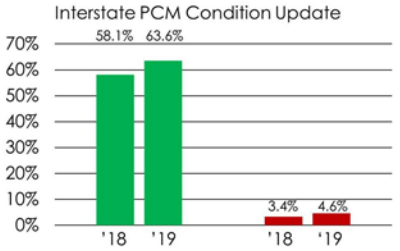
TRANSPORTATION PERFORMANCE MANAGEMENT

PAVEMENT PERFORMANCE MANAGEMENT

MID-PERFORMANCE PERIOD REPORT

The final pavement performance rule requires MDOT to report how previously established pavement targets compare to the actual measured condition of the NHS network. As interstate pavements did not require 2-year performance targets, this comparison will only be made against the 2-year non-interstate IRI targets. The state is also required to re-evaluate their 4-year targets based on the newly collected pavement data and adjust them if necessary.

National Goal



FHWA will annually assess the percent of Interstate pavement in poor condition to ensure compliance with a minimum condition level requirement **that no more than five percent of the Interstate System be in poor condition.** Per the Interstate Pavement Condition Measure data submitted to HPMS for the years 2018 and 2019, Michigan achieved the National Interstate Pavement Condition Goal, as no more than 5% of NHS pavements were in poor condition.

As a result, the federal pavement penalty for not achieving the national goal will not apply to MDOT. Regardless, MDOT acknowledges the risk posed by the interstate penalty and will continue to monitor both its interstate PCM condition and its interstate funding levels through strategic direction.

Significant Progress

Non-Interstate IRI Target Progress

Measure	Target	Outcome	Baseline	Significant Progress?
% Good	46.7%	48.5%	49.7%	Yes ✓
% Poor	21.9%	19.1%	18.6%	Yes ✓

As the non-interstate IRI data collected in 2019 indicates that the percentage of pavements in good condition is higher than the initially established 2-year target, and that the percentage of poor pavements is lower than it's respective 2-year target, the state has made significant progress towards the 2-year targets.

TARGET RE-EVALUATION

The TPM Pavement Team reviewed the previously established targets against the pavement new performance data gathered in 2018 and 2019. The data showed improvement in interstate PCM, and a relatively flat trend in non-interstate IRI, despite the measured and projected continuing decline in pavement condition as measured by MDOT's pavement measure Remaining Service Life.

The team decided that, with the additional risks presented by the COVID crisis, the targets remained reasonably conservative. It is anticipated that significant progress can be made towards these targets, despite the possible impacts of risks such as continuing low funding levels, funding uncertainty, as well as concerns surround quality and consistency of vendor data.

2019 Interstate Pavement Condition Measure (PCM) by MPO

MPO	Good	Fair	Poor	Interstate Thru Lane Miles**
Battle Creek Area Transportation Study	43.1%	50.8%	6.1%	64.4
Bay City Area Transportation Study	55.6%	36.0%	8.3%	89.8
Genesee County Metropolitan Planning Commission	67.5%	24.7%	7.8%	376.8
Grand Valley Metropolitan Council	58.2%	39.4%	2.4%	228.2
Jackson Area Comprehensive Transportation Study	49.1%	49.1%	1.8%	120.6
Kalamazoo Area Transportation Study	74.9%	18.7%	6.3%	155.7
Macatawa Area Coordinating Council	86.0%	14.0%	0.0%	75.2
Saginaw Metropolitan Area Transportation Study	67.6%	28.1%	4.3%	180.0
Southeast Michigan Council of Governments	57.3%	37.4%	5.3%	2,167.1
*St. Clair County Transportation Study**	79.3%	14.3%	6.4%	205.0
*Washtenaw Area Transportation Study**	60.7%	36.2%	3.1%	156.6
SEMCOG (Outside Specified Transportation Study Areas)	54.6%	40.1%	5.4%	1,805.5
Southwest Michigan Planning Commission	49.5%	39.8%	10.7%	161.1
*Twin Cities Area Transportation Study**	49.5%	39.8%	10.7%	161.1
Tri-County Regional Planning Commission	34.1%	53.3%	12.6%	401.0
West Michigan Metropolitan Transportation Planning Program	85.5%	14.5%	0.0%	47.4
Statewide Total (Includes Rural)	63.1%	32.0%	4.9%	5,833.6

*Study Area Subset ** Thru miles for NHS Interstate as of June 30, 2020 (Pavement collection on the interstate represents one bound)

Slight differences exist between the network-level values derived separately from the HPMS software and from MDOT MPO-distribution calculations. The differences are non-material for purposes of this data-sharing effort. The HPMS software values are those recognized by the FHWA.

Thank you!

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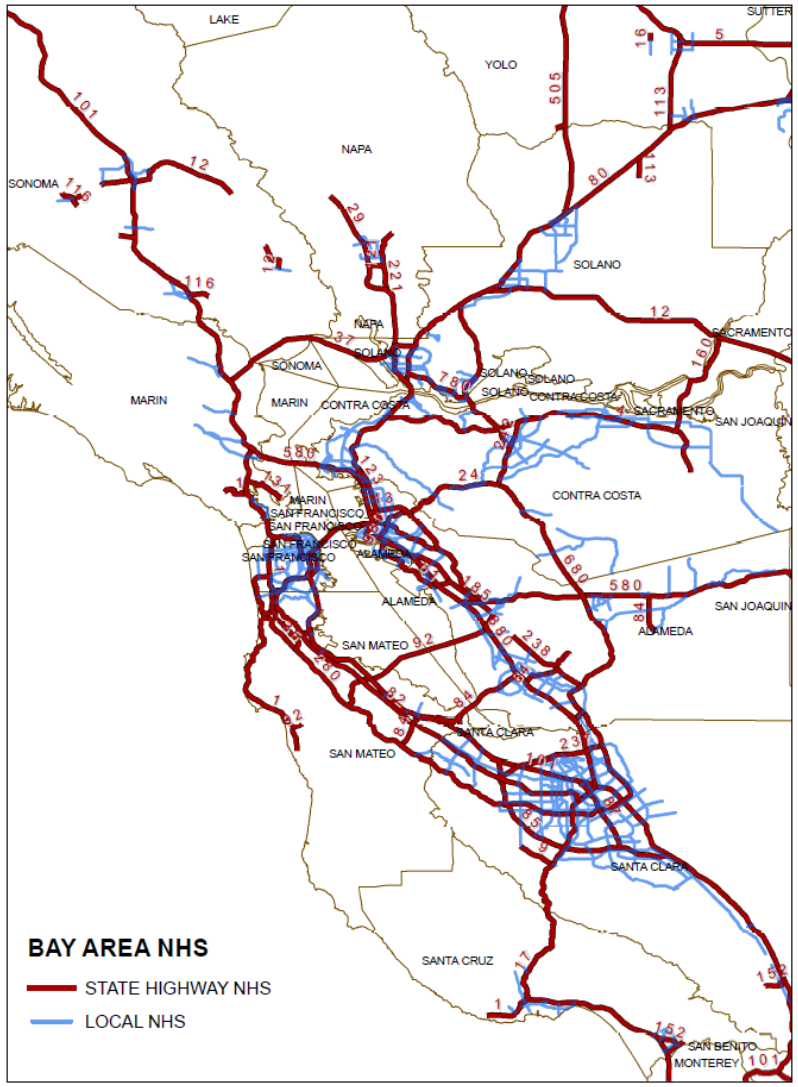
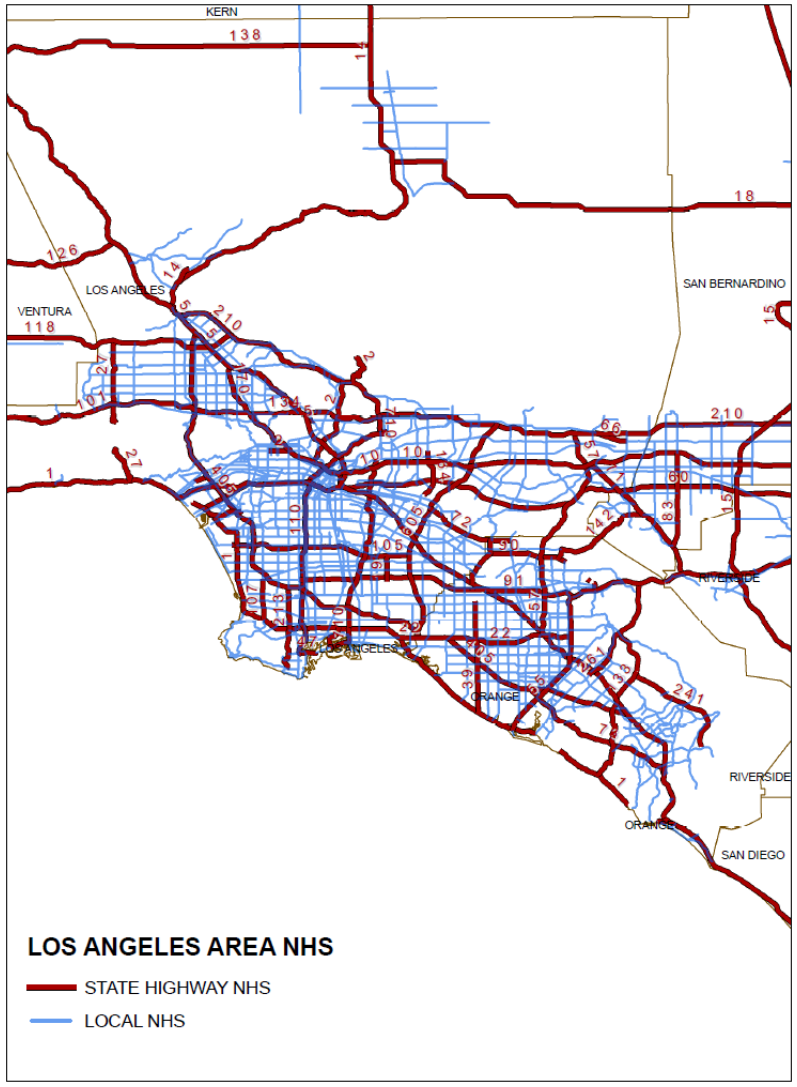
Asset Management Target Setting

Michael Johnson P.E.
State Asset Management Engineer
California Department of Transportation (Caltrans)

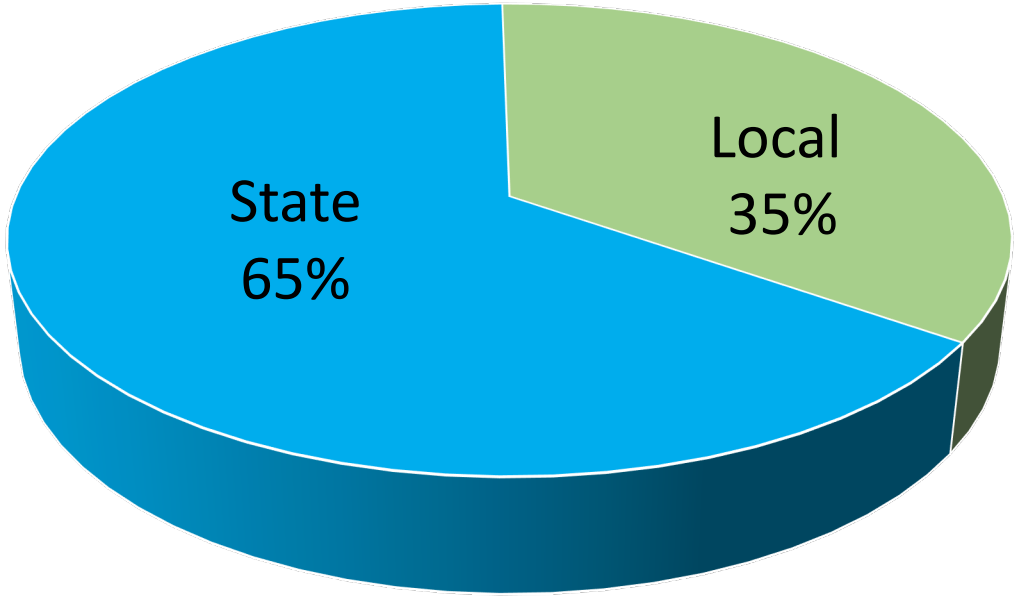
NHS – Bay Area & Los Angeles Area





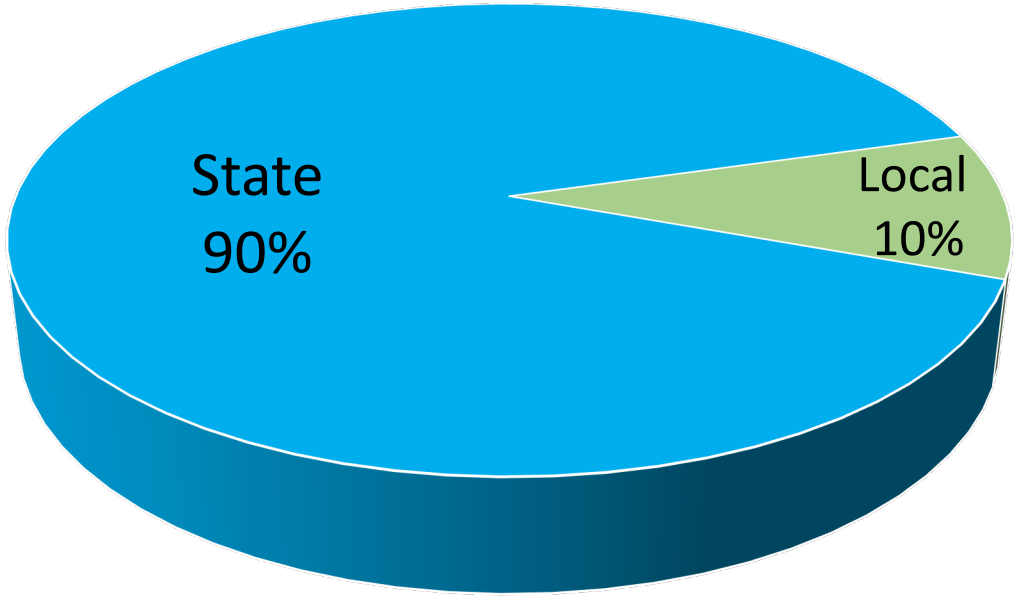
NHS Ownership in California

NHS Pavement Ownership



Lane Miles of NHS Pavement

NHS Bridge Ownership



Square Feet of NHS Bridge Area

Caltrans

California NHS Target Setting Methods

Options

1. Fixed target across all agencies
2. Determine an acceptable percentage improvement and apply to all agencies equally
3. Solicit each MPO/RTPA target and use a weighted roll up for the statewide target

Target Method – Fixed Target Across Agencies

- This approach determines a single target common to all agencies
- For Example: Poor Pavement ≤ 2% of all Lane Miles

Target Method – Weighted Fixed Improvement

Agency	Inventory (% of Total)	Existing Poor (%)	1% Reduction	Weigted
State DOT	90	3.50	2.5	2.25
MPO #1	0.6	7.40	6.4	0.04
MPO #2	5	12.00	11	0.55
MPO #3	2.5	4.90	3.9	0.10
MPO #4	1	6.90	5.9	0.06
MPO #5	0.9	10.50	9.5	0.09
	100			
		State Target	**3.08**	

Target Method- Weighted Agency Targets

Agency	Inventory (% of Total)	Poor Target (%)	Weigted Contribution
State DOT	90	1.50	1.35
MPO #1	0.6	8.00	0.048
MPO #2	5	6.50	0.325
MPO #3	2.5	2.00	0.05
MPO #4	1	6.50	0.065
MPO #5	0.9	12.00	0.108
	100		
		State Target	**1.946**

Conclusion

- Every agencies inventory, condition and funding is unique
- Allowing each agency to establish their own targets made sense
- Caltrans Targets were set by evaluating performance cost curves
- Statewide target is an inventory weighted roll-up of agencies targets
- This approach had the best MPO buy-in during our workshops

Questions

Questions?

Submit your questions using the Webinar's Q&A feature

Target Setting Miniseries Webinar 4: Target Setting for System Performance Measures

- This webinar covers transportation agency target setting for federal PM3 system performance and reliability, including policy, planning and performance considerations related to target setting.
- Topics will include data gaps, modeling and forecasting for system performance targets, and moving the needle on the national system.
- When: August 12, 2020 2:30 EDT

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Target Setting Webinar Miniseries: https://www.tpm-portal.com/tpmmini/

Save the Dates!

TPM Target Setting Webinar Miniseries

Wednesday, August 12, 2020 – 2:30 PM EDT
Target Setting for System Performance Measures

Wednesday, August 26, 2020 – 2:00 PM EDT
Traffic Congestion and Emissions Reductions Target Setting

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