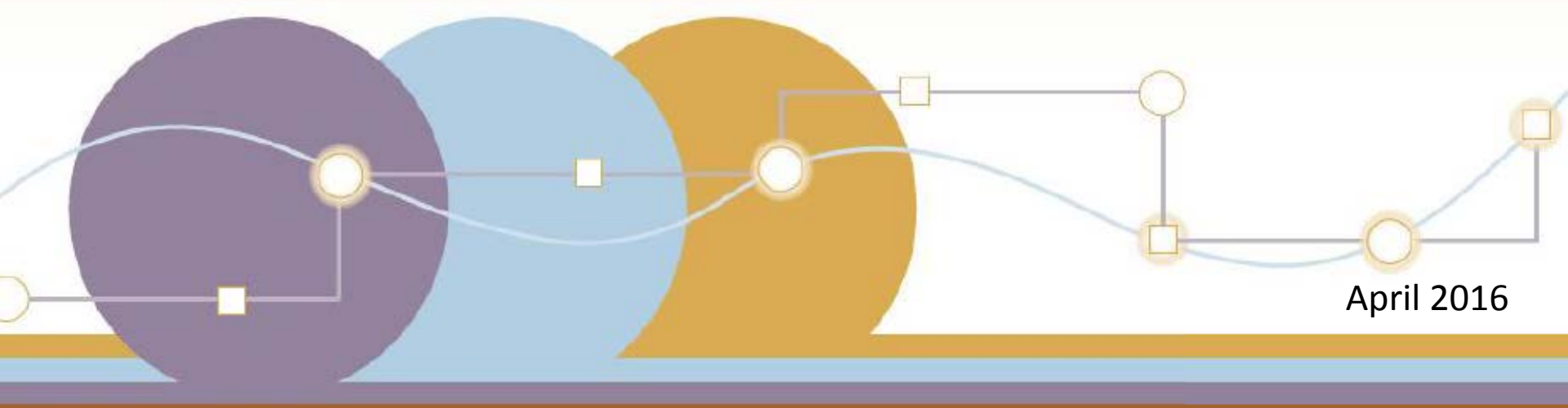
National Performance Management Measures NPRM

Assessing Performance of the National Highway System, Freight Movement on the Interstate System, and the Congestion Mitigation and Air Quality Improvement Program

Subpart E:
Measures to Assess Performance of the NHS



April 2016

Opening Comments and Introductions

Jeffrey Lindley

Associate Administrator

Office of Operations

Today's Webinar

Part 1

Introduction to Transportation Performance Management

Francine Shaw Whitson, *Office of Infrastructure*

Part 2

Proposed Performance Measures and Concepts

Rich Taylor, *Office of Operations*

Part 3

Calculating the Proposed Performance Measures

Rich Taylor, *Office of Operations*

Part 4

Target Establishment, Reporting, Significant Progress, and RIA

Francine Shaw Whitson, *Office of Infrastructure*

Nat Coley, *Office of Infrastructure*

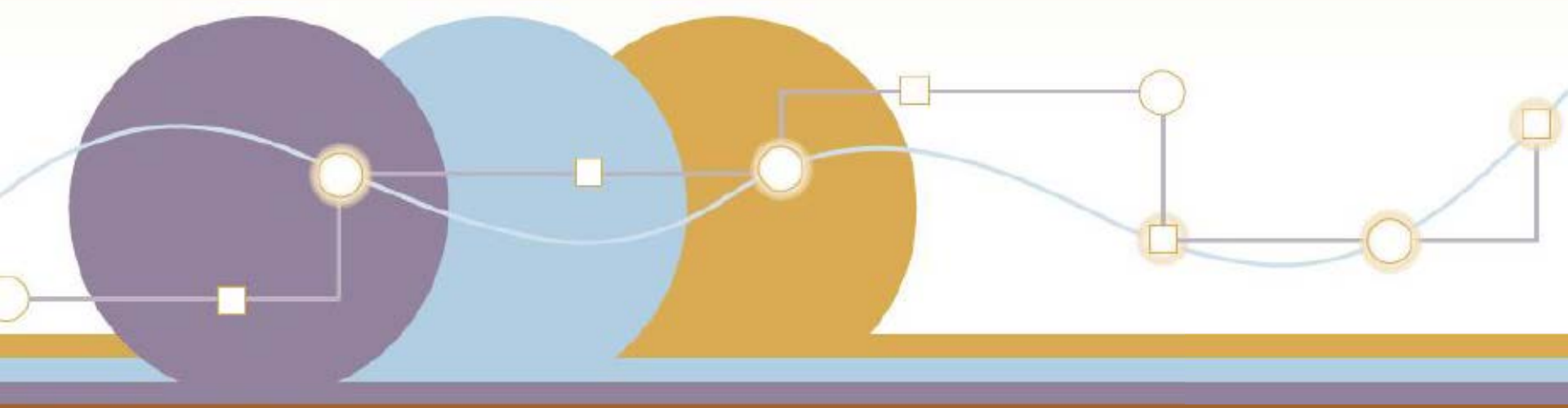
Part 5

Summary and Q&A

Francine Shaw Whitson, *Office of Infrastructure*

Part 1

Introduction to Transportation Performance Management



Why Are We Doing Performance Management?

- To transform the Federal-aid Highway Program and to provide a means to the **most efficient investment** of Federal transportation funds
- To refocus on **national transportation goals**
- To increase the **accountability and transparency** of the Federal-aid Highway Program
- To **improve decision-making** through performance-based planning and programming

FHWA TPM Rulemaking Schedule

Performance Area	NPRM	Comments Due	Final Rule
Safety Performance Measures	March 11, 2014	Closed June 30, 2014	Published March 15, 2016
Highway Safety Improvement Program	March 28, 2014	Closed June 30, 2014	Published March 15, 2016
Statewide and Metro Planning; Non-Metro Planning	June 2, 2014	Closed October 2, 2014	Anticipated May 2016
Pavement and Bridge Performance Measures	January 5, 2015	Closed May 8, 2015	Anticipated October 2016
Highway Asset Management Plan	February 20, 2015	Closed May 29, 2015	Anticipated October 2016
Performance of the NHS, Freight, and CMAQ Measures	April 22, 2016	Open until August 2016 120 days	TBD

Summary of Proposed New 23 CFR Part 490

Subpart A: **General Information, Target Establishment, Reporting, and NHPP and NHFP Significant Progress Determination**

Subpart B: Measures to Assess the Highway Safety Improvement Program (HSIP)

Subpart C: Measures to Assess Pavement Condition

Subpart D: Measures to Assess Bridge Condition

Subpart E: **Measures to Assess Performance of the National Highway System (NHS)**

Subpart F: Measures to Assess Freight Movement on the Interstate System

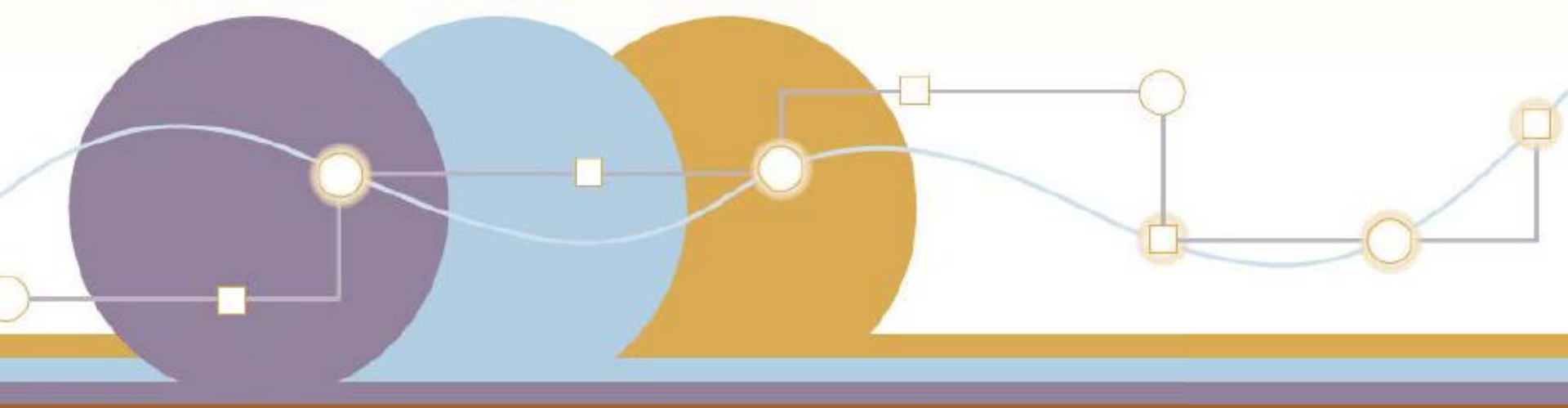
Subpart G: Measure to Assess the CMAQ Program – Traffic Congestion

Subpart H: Measures to Assess the CMAQ Program – On-Road Mobile Source Emissions

Part 2

Proposed Performance Measures and Concepts

Key Concepts, Performance Measure Data Requirements, and Applicability



Subpart E: Measures for Assessing Performance of the National Highway System (NHS)

	Interstate System	Non-Interstate NHS
Travel Time Reliability	1 Percent of the Interstate System providing for reliable travel times	2 Percent of the non-Interstate NHS providing for reliable travel times
Peak Hour Travel Time	3 Percent of the Interstate System in urbanized areas over 1M in population where peak hour travel times meet expectations	4 Percent of the non-Interstate NHS in urbanized areas over 1M in population where peak hour travel times meet expectations

Metrics, Thresholds, and Measures

	Each Reporting Segment		Entire Applicable Network
	METRIC **A quantifiable indicator of performance or condition**	**THRESHOLD** **The level of performance for a specific reporting segment that would determine its inclusion in the measure**	**MEASURE** **An expression based on a metric, used to establish targets and to assess progress towards achieving the established target**
Example	Average truck speed = **52.30 mph**	Uncongested = **Avg truck speed > 50.00 mph**	2,510 uncongested miles 3,000 total miles = **83.7% uncongested**

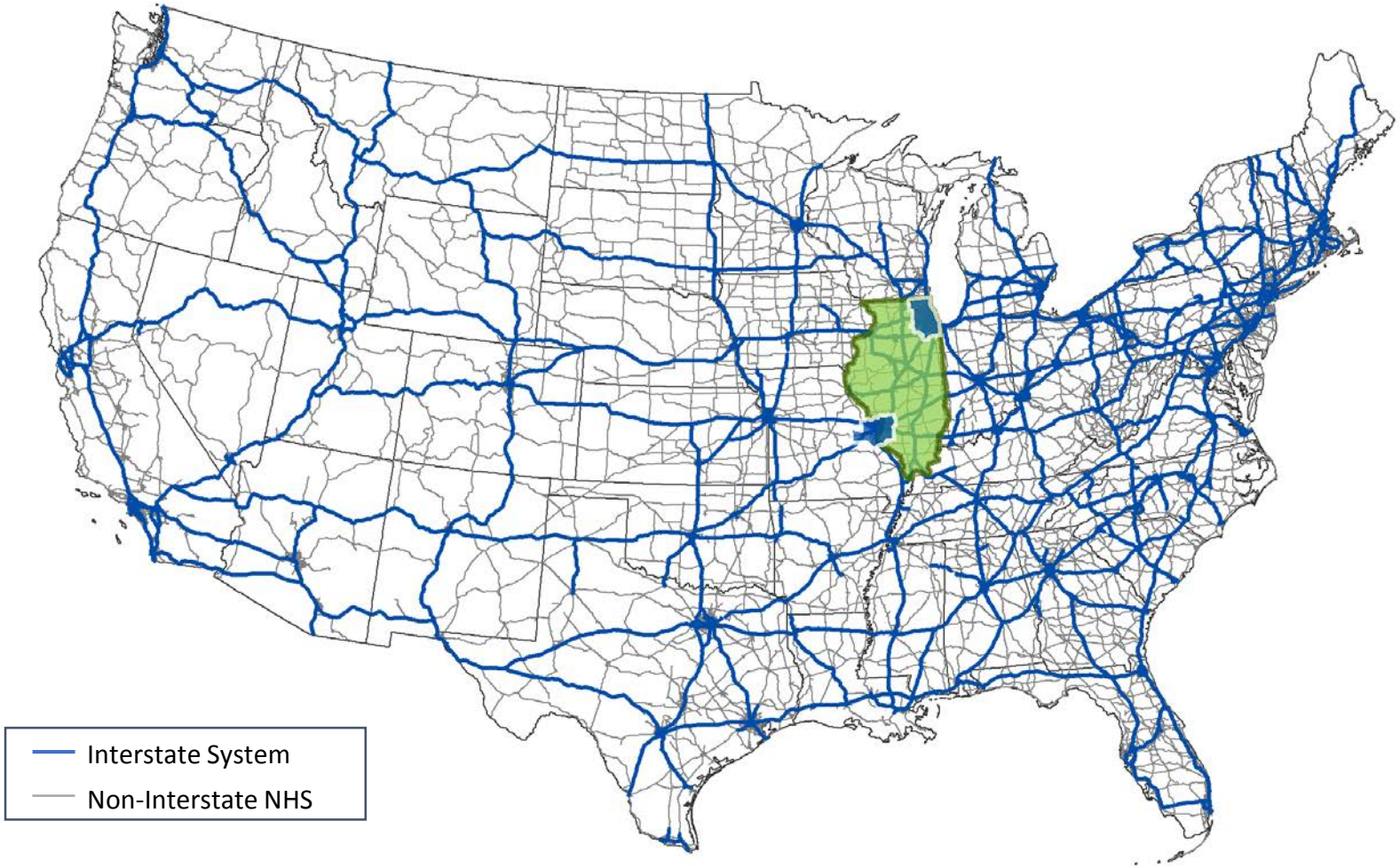
Measures vs. Targets

Entire Applicable Network

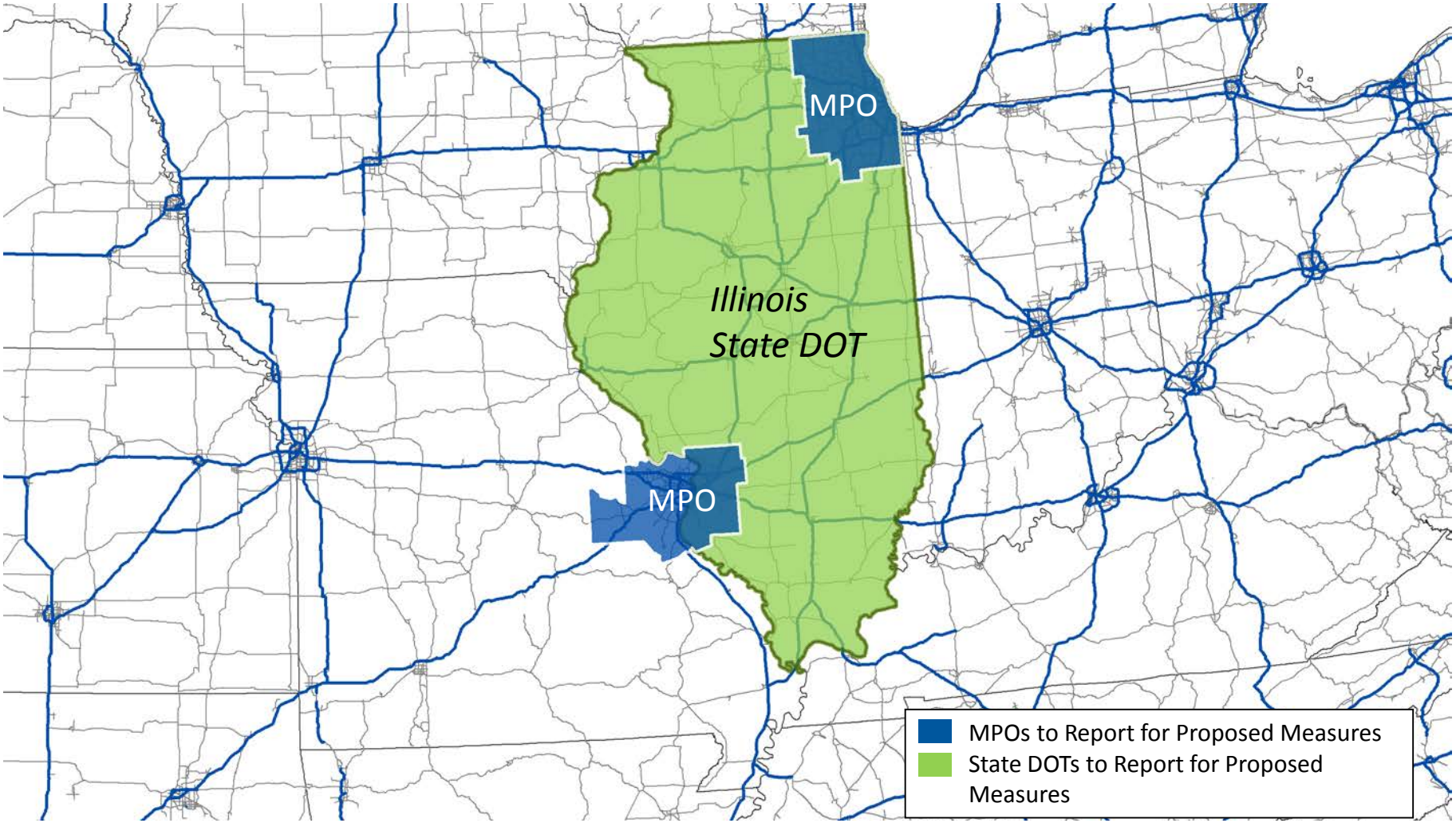
	MEASURE	TARGET
	An expression based on a metric, used to establish targets and to assess progress towards achieving the established target	**A quantifiable level of performance or condition, as a value for a measure, to be achieved within a time period required by FHWA**
Example	**83.7% total Interstate miles uncongested**	Target: 80.0% uncongested Actual: 83.7% uncongested ✓ **Target Achieved**

Geographic Areas used by Proposed Measures

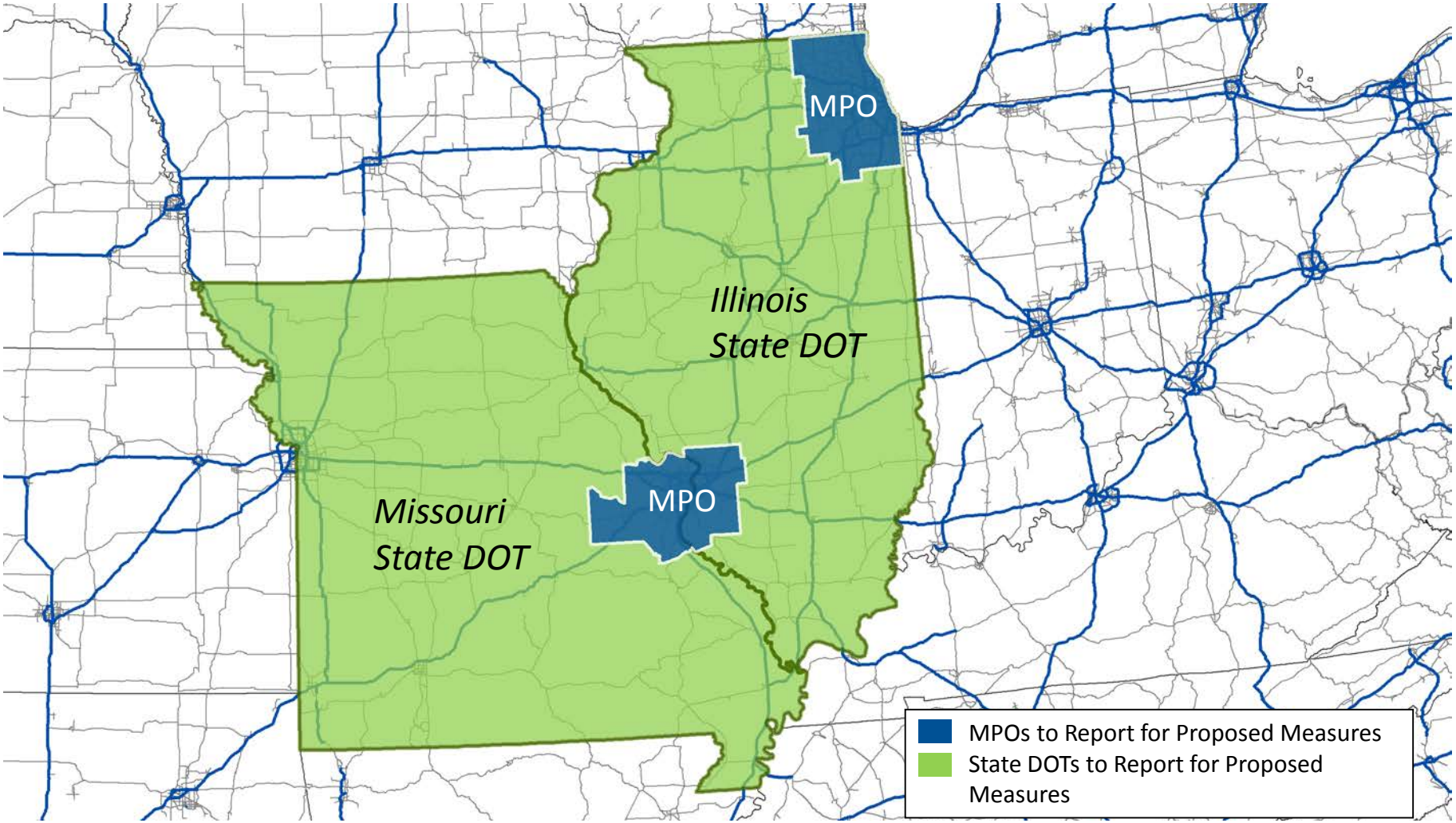
Geographic Areas used by Proposed Measures



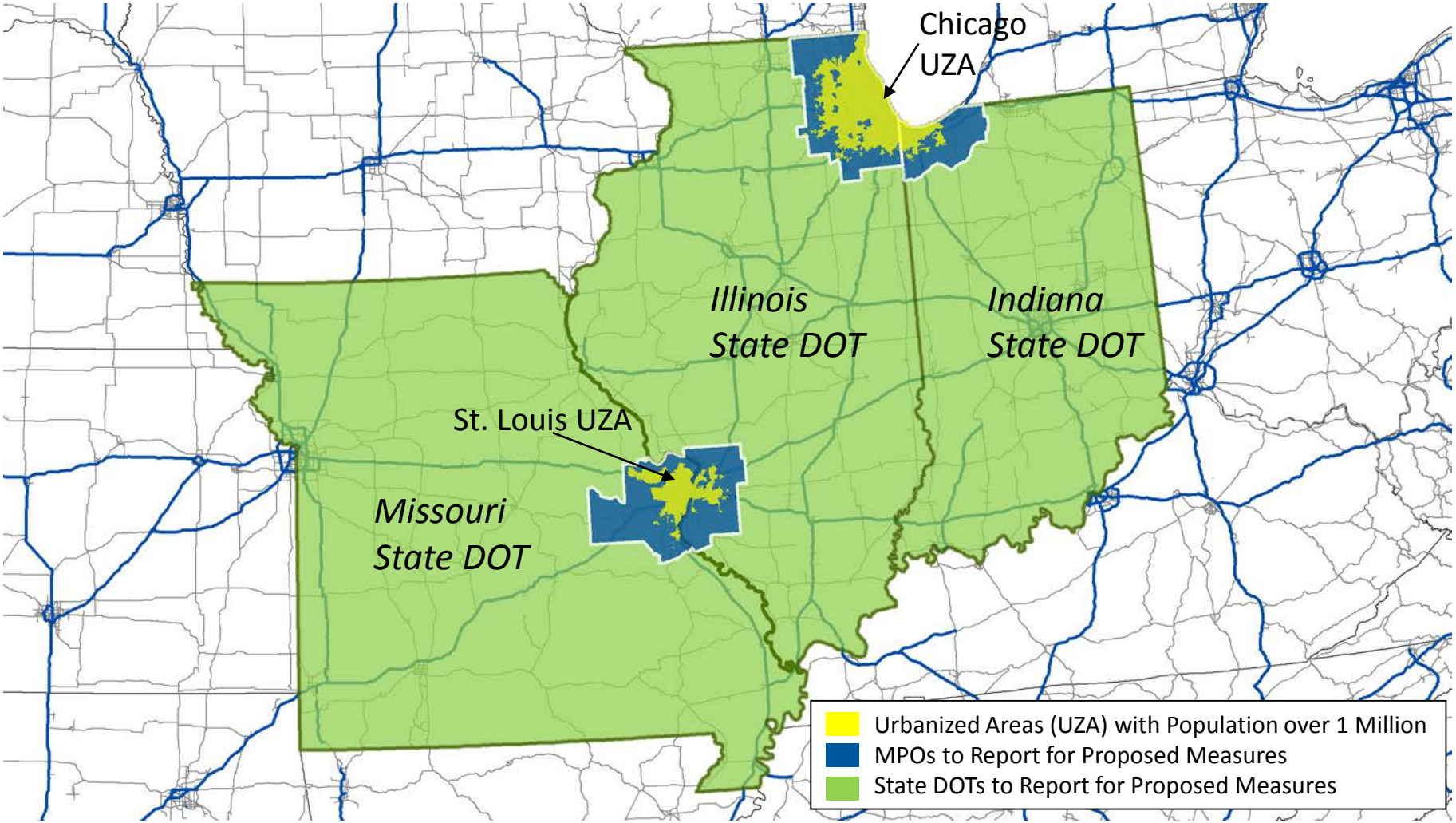
Geographic Areas used by Proposed Measures



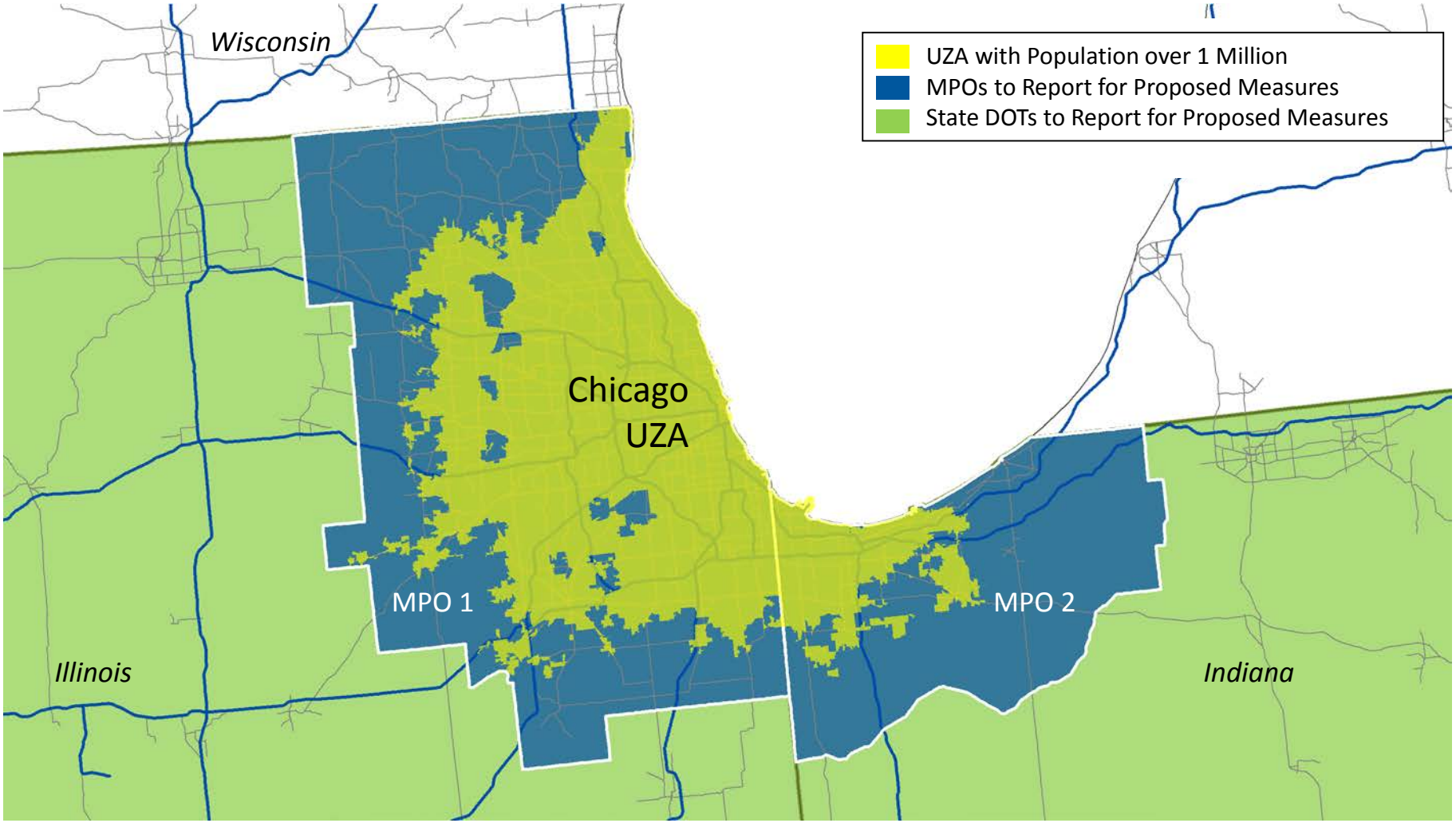
Geographic Areas used by Proposed Measures



Geographic Areas used by Proposed Measures



Geographic Areas used by Proposed Measures



Data Sources for Proposed Performance Measures

Data Sources	Applicable Measure(s)	Relevant Data
National Performance Management Research Data Set (NPMRDS) or equivalent data set	• Travel Time Reliability • Peak Hour Travel Time	• Travel times • NHS travel time segments
US Decennial Census	• Peak Hour Travel Time	• Urbanized area populations
Highway Performance Monitoring System (HPMS)	• Travel Time Reliability • Peak Hour Travel Time	• Urbanized area boundaries • AADT/volumes

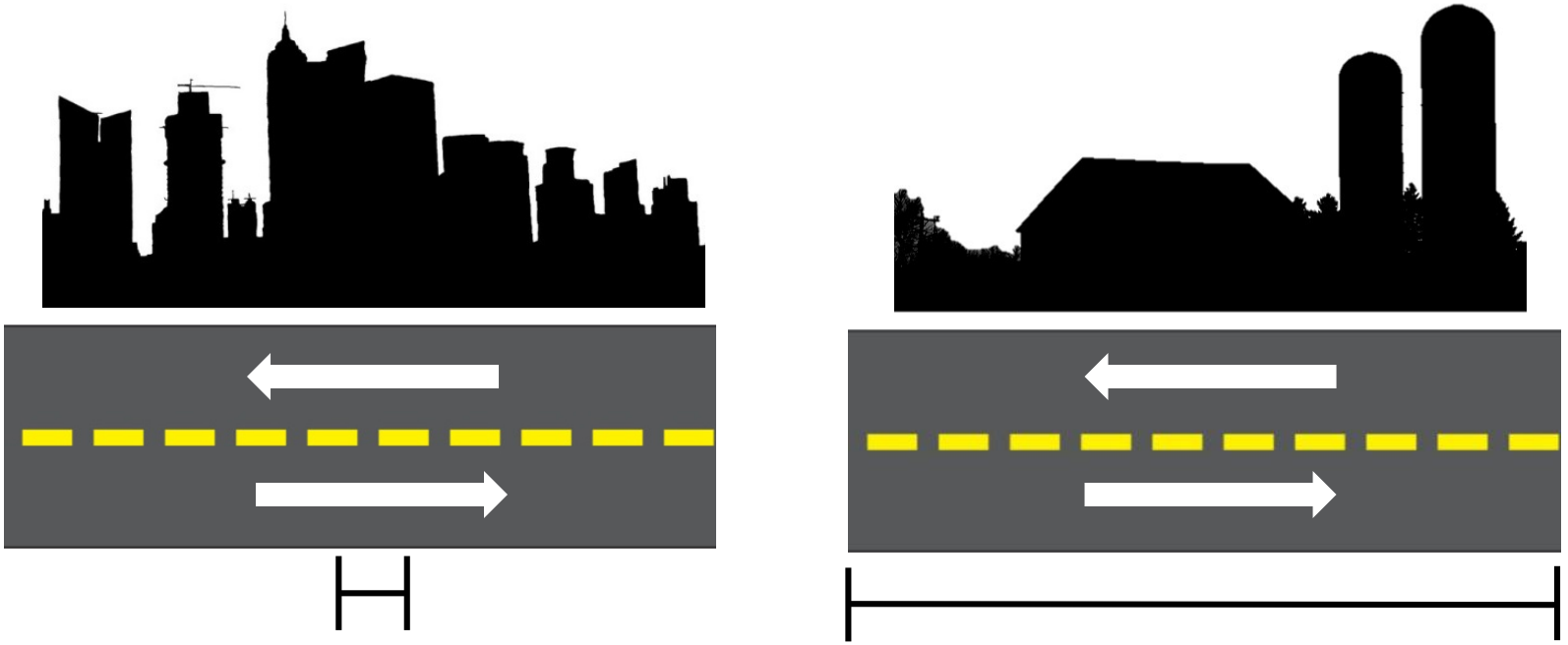
What is the National Performance Management Research Data Set (NPMRDS)?

- Is a data set provided by FHWA **monthly to State DOTs and MPOs**
- Includes **travel times derived from all traffic using the highway system**, in 5-minute bins
- Includes a breakdown of travel times of **freight vehicles** and **all traffic (freight and passenger vehicles)**
- Uses travel times that are reported via vehicle probes on **contiguous segments of roadway** covering the entire mainline NHS
- **Uses vehicle probes** that could include mobile phones, vehicle transponders, and portable navigation devices

Equivalent Data Set Requirements

- Include contiguous segments that cover the full NHS, as defined in 23 U.S.C. 103, within the State boundary and/or MPA
- Include average travel times for at least the same number of 5-minute intervals and the same locations that would be available in the NPMRDS
- Be populated with actual measured vehicle travel times and shall not be populated with travel times derived from imputed methods (historic travel times or other estimates)
- For each segment at 5-minute intervals throughout a full day (24 hours) for each day of the year, include the average travel time, recorded to the nearest second, representative of at least one of the following:
  - All traffic on each segment of the NHS (freight and passenger)
  - Freight vehicle traffic on each segment of the Interstate System

Reporting Segments – Mainline NHS



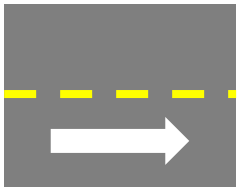
Maximum Urban Length ½ mile*

Maximum Rural Length 10 miles*

**Unless an individual Travel Time Segment is longer*

Example of NPMRDS Travel Times

Single Road Segment (eastbound travel)



All 5-min bins in a 24-hour period

Full Year (Jan 1-Dec 31)

5-minute bins (105,120 per year)		Avg Travel Time (EB) All Traffic (sec)
Feb 3	6:00 – 6:05am	47
Feb 3	6:05 – 6:10am	55
Feb 3	6:10 – 6:15am	--
Feb 3	6:15 – 6:20am	53
Feb 3	6:20 – 6:25am	52
Nov 7	6:25 – 6:30pm	51
Nov 7	6:30 – 6:35pm	53
Nov 7	6:35 – 6:40pm	54
Nov 7	6:40 – 6:45pm	50
Nov 7	6:45 – 6:50pm	57

Data Requirements for the Measures

Travel Time Reliability:

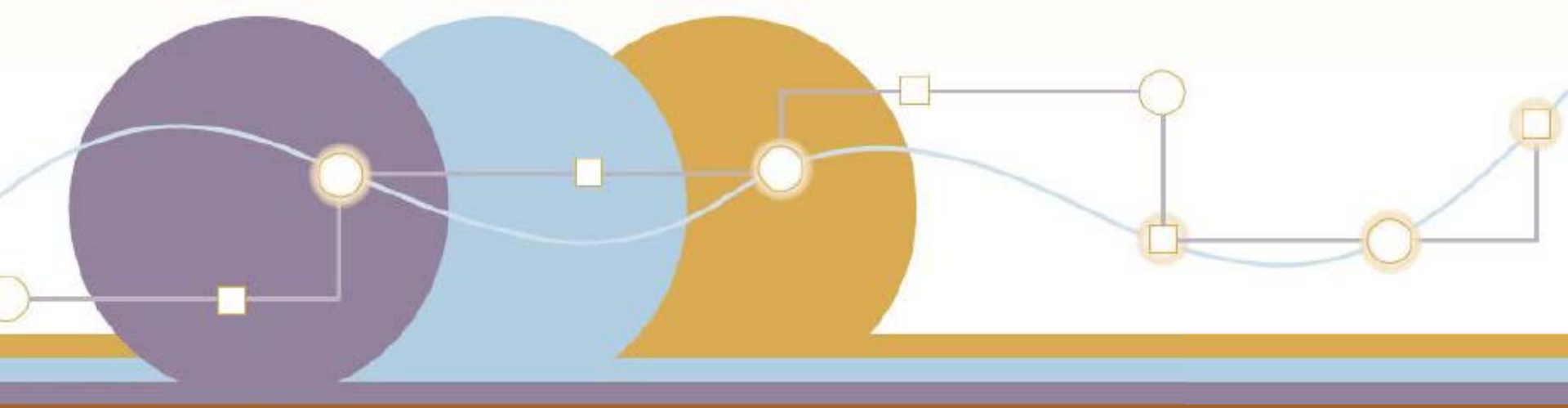
Weekdays (Mon – Fri)	Weekends
6 – 10am	6am – 8pm
10am – 4pm	
4 – 8pm	

Peak Hour Travel Time:

Weekdays (Mon – Fri, non-Holiday)	Weekends
6 – 7am	
7 – 8am	
8 – 9am	
4 – 5pm	
5 – 6pm	
6 – 7pm	

Part 3

Calculating the Proposed Performance Measures



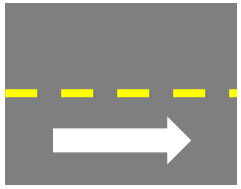
Measures to Assess Performance of the NHS – Travel Time Reliability

	Each Reporting Segment		Entire Applicable Network
	METRICS **Level of Travel Time Reliability (LOTTR) of each time period of each reporting segment for the full extent:** **1. Interstate System** **2. Non-Interstate NHS**	**THRESHOLD** **LOTTR < 1.50 for the reporting segment = reliable**	**MEASURES** **Percent of system providing for reliable travel times.** **1. Interstate System** **2. Non-Interstate NHS**
Interstate Example	30 sec (80th percentile)/ 15 sec (50th percentile) **LOTTR = 2.00**	2.00 > 1.50 = **Not Reliable**	8,125 reliable miles/ 10,000 total Interstate miles = **81.3% reliable**

Calculating Level of Travel Time Reliability Metrics

Assemble travel times in 5-minute bins, for each segment and each period, for the full year

0.500 mi. segment (eastbound travel)



All 5-min bins, 4 time periods

- 6-10am
- 10am – 4pm
- 4-8pm

6am - 8pm

Full Year (Jan 1-Dec 31)

5-minute bins (up to 61,488 per year)		Avg Travel Time (EB) All Traffic (sec)
Feb 3	6:00 – 6:05am	26
Feb 3	6:05 – 6:10am	28
Feb 3	6:10 – 6:15am	36
Feb 3	6:15 – 6:20am	37
Feb 3	6:20 – 6:25am	36
Nov 7	6:25 – 6:30pm	27
Nov 7	6:30 – 6:35pm	--
Nov 7	6:35 – 6:40pm	26
Nov 7	6:40 – 6:45pm	25
Nov 7	6:45 – 6:50pm	26

Calculating Level of Travel Time Reliability Metrics

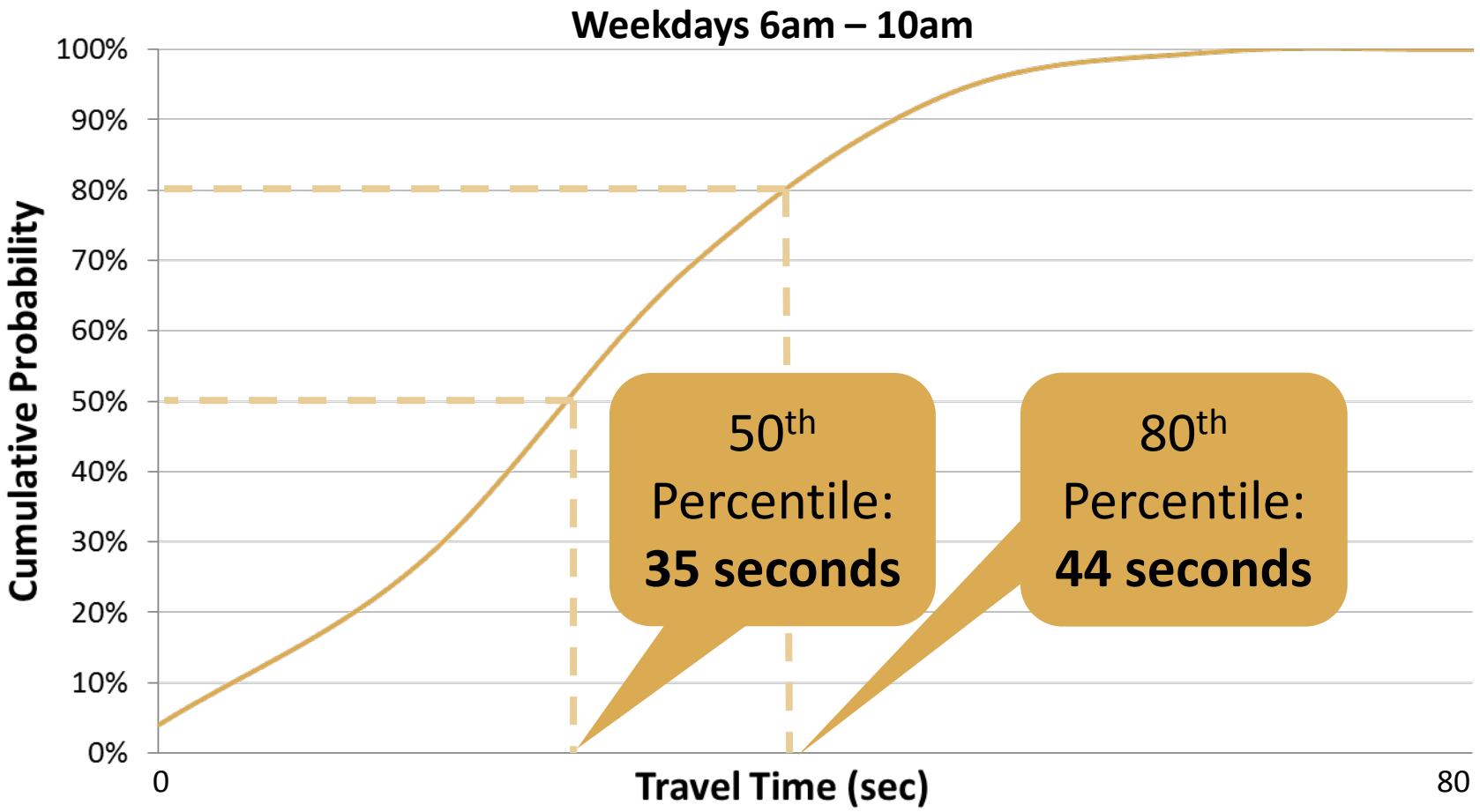
Replace blank values with the travel time at posted speed limit.

5-minute bins (up to 61,488 per year)		Avg Travel Time (EB) All Traffic (sec)
Feb 3	6:00 – 6:05am	26
Feb 3	6:05 – 6:10am	28
Feb 3	6:10 – 6:15am	36
Feb 3	6:15 – 6:20am	37
Feb 3	6:20 – 6:25am	36
Nov 7	6:25 – 6:30pm	27
		26
Nov 7	6:35 – 6:40pm	26
Nov 7	6:40 – 6:45pm	25
Nov 7	6:45 – 6:50pm	26

Blank times indicate that no vehicle probes reported data during this time period. Convert these to travel time at the posted speed limit (TT@PSL).

Calculating Level of Travel Time Reliability Metrics

Note the normal (50th percentile) and longer (80th percentile) travel times



Calculating Level of Travel Time Reliability Metrics

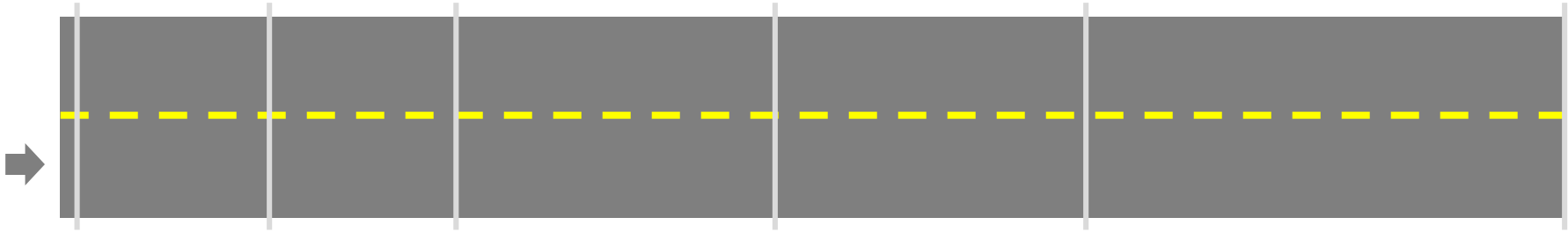
Determine the LOTTR Metric for each time period

- $\frac{\text{Longer Travel Time (80th)}}{\text{Normal Travel Time (50th)}} = \frac{\text{\# seconds}}{\text{\# seconds}} = \text{Level of Travel Time Reliability Ratio}$

Level of Travel Time Reliability (LOTTR) *(Single Segment, Interstate Highway System)*		
Monday – Friday	6am – 10am	$\text{LOTTR} = \frac{44 \text{ sec}}{35 \text{ sec}} = 1.26$
	10am – 4pm	LOTTR = 1.39
	4pm – 8pm	LOTTR = 1.54
Weekends	6am – 8pm	LOTTR = 1.31
Must exhibit LOTTR below 1.50 during **all** of the time periods		**Segment does not provide for reliable travel times**

Calculating Travel Time Reliability Measure

Calculate the percentage of all reporting segments providing for reliable travel times



Length	0.500 mi.	0.500 mi.	1.000 mi.	1.000 mi.	5.000 mi.
6am-10am					
10am-4pm					
4pm-8pm					
Weekend					
Reliability	✗	✓	✗	✓	✓

$$\frac{6.500 \text{ reliable miles}}{8.000 \text{ total miles}} = \textbf{81.3\% Reliable}$$

Measure vs. Target

Entire Applicable Network

MEASURES

Percent of system providing for reliable travel times. Threshold: < 1.50

1. **Interstate System**
2. **Non-Interstate NHS**

TARGETS

1. **% of Interstate System provides reliable travel times;**
2. **% of non-Interstate NHS provides reliable travel times**

Interstate Example

81.3%

Interstate miles providing for reliable travel times

Target: 80.0 %

Actual: 81.3 %

✓ **Target Achieved**

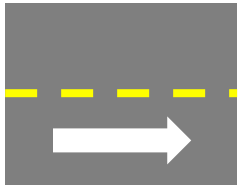
Measures to Assess Performance of the NHS – Peak Hour Travel Time

	Each Reporting Segment		Entire Applicable Network
	METRICS **Peak Hour Travel Time Ratio (PHTTR) of each reporting segment for the full extent in urbanized areas of > 1 million:** **1. Interstate NHS** **2. Non-Interstate NHS**	**THRESHOLD** **PHTTR < 1.50 for the reporting segment = reliable**	**MEASURES** **Percent of each system in urbanized areas where peak hour travel times meet expectations**
Interstate Example	30 sec (longest)/ 25 sec (desired) **PHTTR = 1.20**	1.20 < 1.50 = **Met Expectations**	800 miles met expectations/ 1,000 total miles = **80.0%**

Calculating Peak Hour Travel Time Ratio Metric

Gather travel times in 5-minute bins, for each segment and each period, for the full year

0.500 mi. segment (eastbound travel)



All 5-min bins, **6 time periods**

Full Year (Jan 1-Dec 31)

5-minute bins (up to 61,488 per year)		Avg Travel Time (EB) All Traffic (sec)
Feb 3	6:00 – 6:05am	26
Feb 3	6:05 – 6:10am	28
Feb 3	6:10 – 6:15am	36
Feb 3	6:15 – 6:20am	37
Feb 3	6:20 – 6:25am	36
Nov 7	6:25 – 6:30pm	27
Nov 7	6:30 – 6:35pm	15
Nov 7	6:35 – 6:40pm	--
Nov 7	6:40 – 6:45pm	25
Nov 7	6:45 – 6:50pm	26

Calculating Peak Hour Travel Time Ratio Metric

Gather travel times in 5-minute bins, for each segment and each period, for the full year

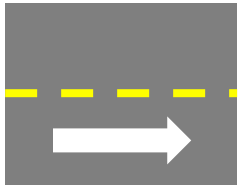
5-minute bins		Avg Travel Time (EB)
		All Traffic (sec)
Feb 3	6:00 – 6:05am	26
Feb 3	6:05 – 6:10am	28
Feb 3	6:10 – 6:15am	36
Feb 3	6:15 – 6:20am	37
Feb 3	6:20 – 6:25am	36
Nov 7	6:25 – 6:30pm	27
	6:30 – 6:35pm	~~15~~
Nov 7	6:35 – 6:40pm	--
Nov 7	6:40 – 6:45pm	25
Nov 7	6:45 – 6:50pm	26

Travel times equating to **speeds less than 2 mph or greater than 100 mph**, **as well as blank times**, should be removed from the calculation of averages.

Calculating Peak Hour Travel Time Reliability Metric

Calculate annual average travel times

0.500 mi. segment
(eastbound travel)



Single Time Period

Mon – Fri
6 – 7 am

Full Year (Jan 1 – Dec 31)

5-minute bins		Avg Travel Time (EB) All Traffic (sec)
Feb 3	6:00 – 6:05am	26
Feb 3	6:05 – 6:10am	28
Feb 3	6:10 – 6:15am	36
Feb 3	6:15 – 6:20am	37
Feb 3	6:20 – 6:25am	36
Dec 30	6:25 – 6:30pm	27
Avg. Annual Travel Time	**6am – 7am Weekdays**	**= 36 sec***

** Removed travel times are not included in the average*

Calculating Peak Hour Travel Time Ratio Metric

Identify longest peak hour travel time

Peak Hour Period	Average Annual Travel Time (sec)	
	Segment A	Segment D
	0.500 mi.	0.250 mi.
6:00 – 7:00am	37	21
7:00 – 8:00am	39	22
8:00 – 9:00am	42	20
4:00 – 5:00pm		23
5:00 – 6:00pm		
6:00 – 7:00pm		
Longest Peak Hour Travel Time	**42**	**23**

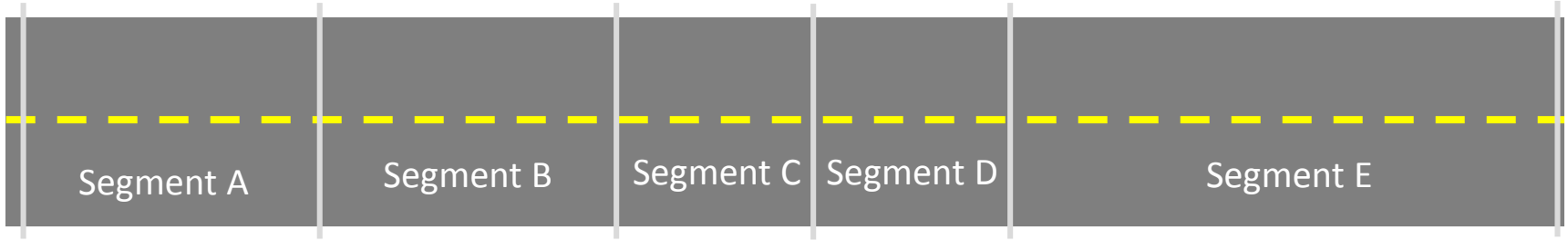
AM Peak Hours

PM Peak Hours

Calculating Peak Hour Travel Time Ratio Metric

Define desired peak period travel times

Full Extent: 2.5 mi.



	Segment A	Segment B	Segment C	Segment D	Segment E
Length	0.500 mi.	0.500 mi.	0.250 mi.	0.250 mi.	1.000 mi.
Desired Peak Period Speed (AM/PM)	50 mph (AM)	50 mph (AM)	50 mph (AM)	50 mph (AM)	50 mph (AM)

$$\text{Travel Time (sec)} = \frac{\text{Length}}{(\text{Speed} \div 60 \div 60)}$$

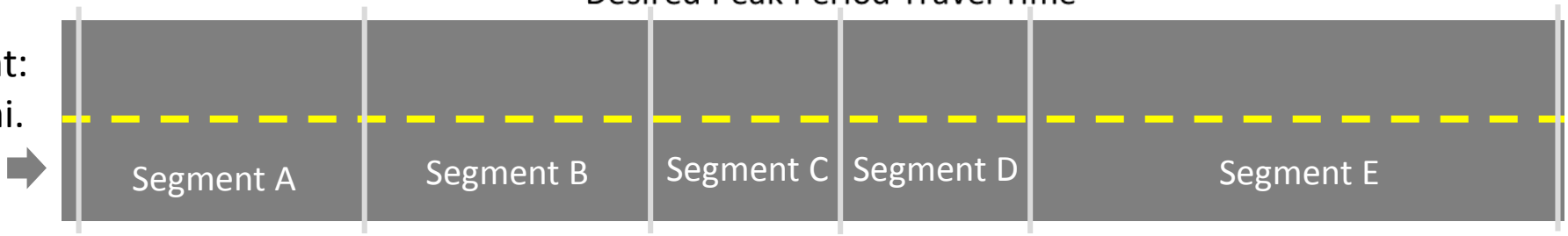
Desired Peak Period Travel Time (AM/PM)	**36 sec** (AM)	**36 sec** (AM)	**18 sec** (AM)	**18 sec** (AM)	**72 sec** (AM)

Calculating Peak Hour Travel Time Ratio Metric

Calculate the Peak Hour Travel Time Ratio (PHTTR)

$$PHTTR = \frac{\text{Peak Hour Travel Time}}{\text{Desired Peak Period Travel Time}}$$

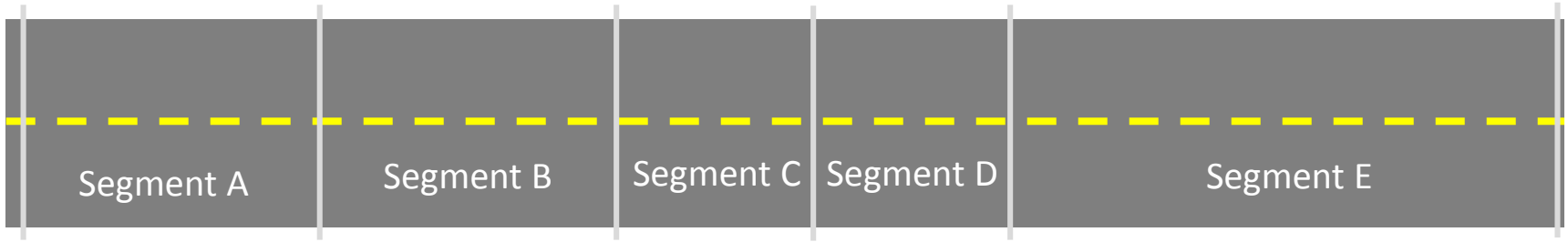
Full Extent: 2.5 mi.



	Segment A	Segment B	Segment C	Segment D	Segment E
Length	0.500 mi.	0.500 mi.	0.250 mi.	0.250 mi.	1.000 mi.
Longest Peak T	42 sec	46 sec	27 sec	30 sec	100 sec
Desired Peak T	36 sec	36 sec	18 sec	18 sec	72 sec
PHTTR	**1.17**	**1.28**	**1.50**	**1.67**	**1.39**

Calculating Peak Hour Travel Time Measure

Full Extent: 2.5 mi.



	Segment A	Segment B	Segment C	Segment D	Segment E
Length	0.500 mi.	0.500 mi.	0.250 mi.	0.250 mi.	1.000 mi.
PHTTR	1.17	1.28	1.50	1.67	1.39
Meets expectations?	✓	✓	✘	✘	✓

$$\frac{\text{2.000 miles met expectations}}{\text{2.500 total miles}} = \textbf{80.0\% Met Expectations}$$

Measure vs. Target

Entire Applicable Network

	MEASURES	TARGETS
	Percent of each system in urbanized areas where peak hour travel times meet expectations	**1. % of Interstate System in area that meets expectations** **2. % of non-Interstate NHS that meets expectations**
Interstate Example	**80.0 %** Interstate miles met expectations	Target: 80.0% Actual: 80.0% ✓ **Target Achieved**

Data Submittal Requirements

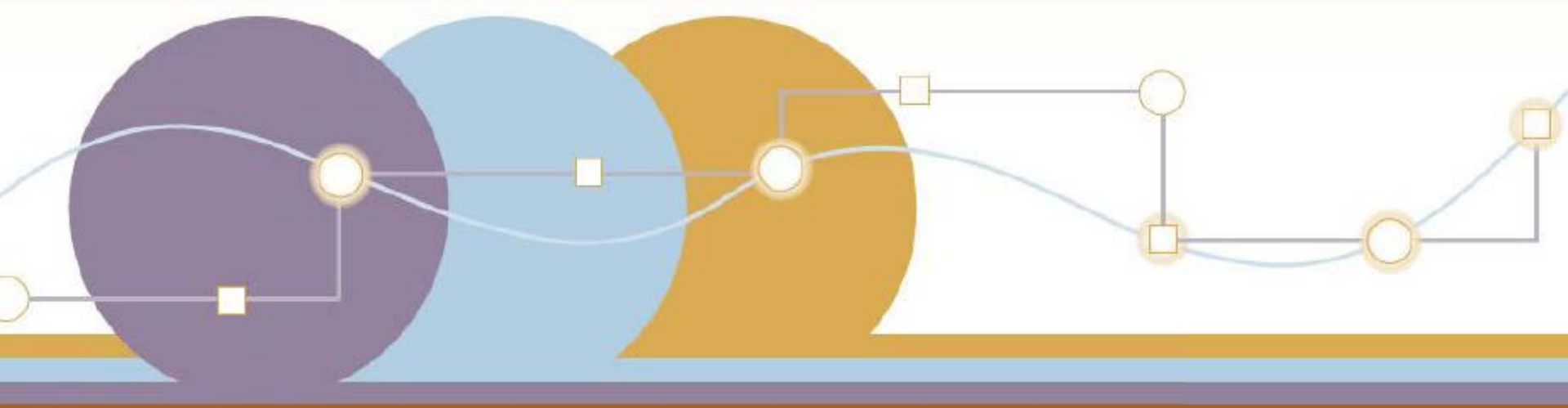
Data Submittal Requirements for Metric Calculations

Measure	Data	Submit Data to	Submission Deadline	Extraction Date
Both	• Reference NPMRDS TMC Codes or HPMS Location Referencing	HPMS	June 15*	August 15
	• NHS Reporting Segments	HPMS	November 1	--
Travel Time Reliability	• LOTTR (each reporting period) • 80th percentile travel time • 50th percentile travel time	HPMS	June 15*	August 15
Peak Hour Travel Time	• PHTTR • Peak hour travel time • Hour where peak travel time occurred	HPMS	June 15*	August 15
	• Desired peak period travel times • (AM and PM)	HPMS	November 1	--
	• Adjusted urbanized area boundaries • Urbanized area population	HPMS	First Baseline Report	--

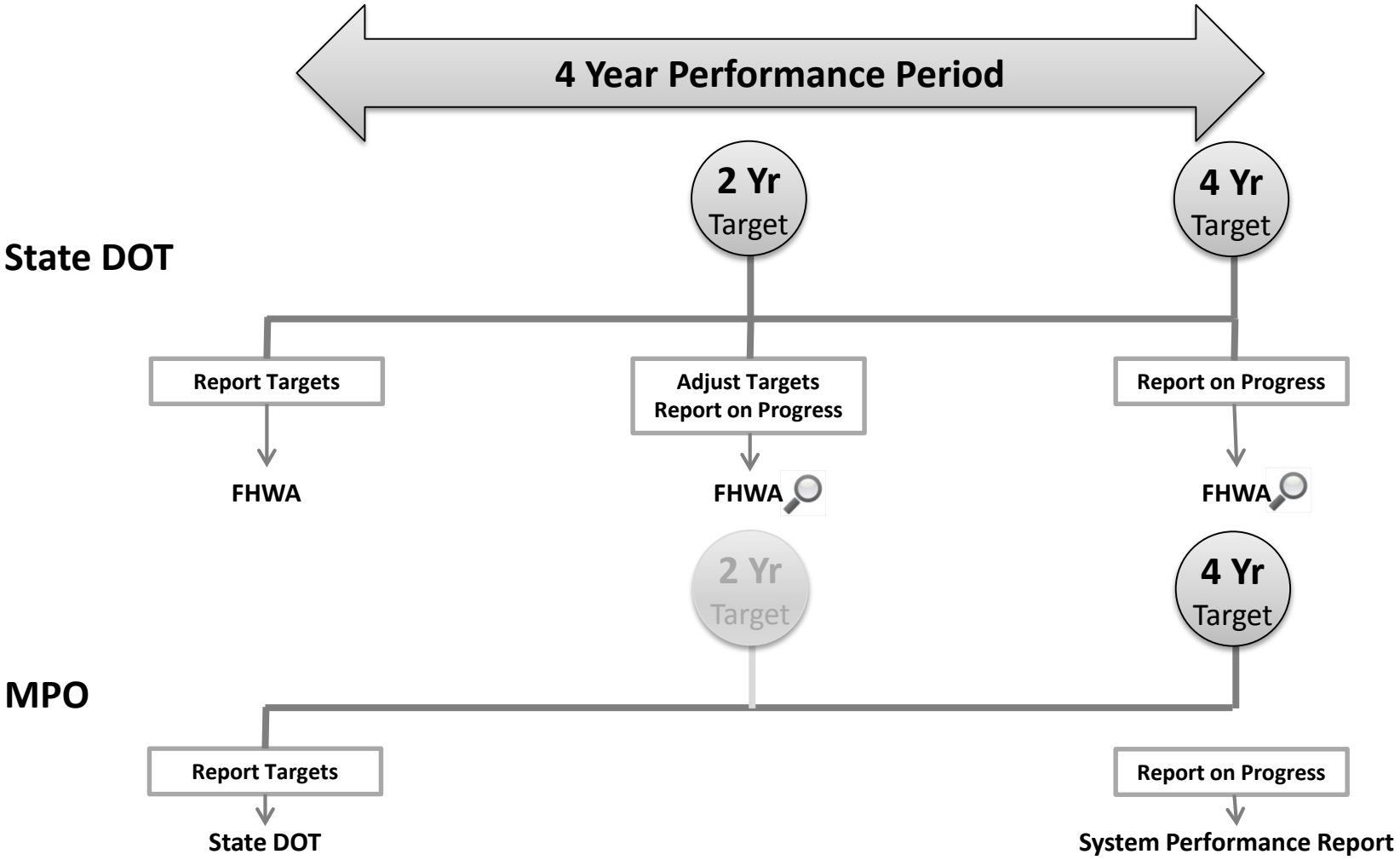
*Data would be submitted each year for the previous calendar year. For example, on June 15, 2019, data would be submitted for January 2018 – December 2018.

Part 4

Target Establishment, Reporting, NHPP & NHFP Significant Progress



Overview


4 Year Performance Period
State DOT
2 Yr Target
4 Yr Target
Report Targets
Adjust Targets
Report on Progress
Report on Progress
FHWA
FHWA
FHWA
MPO
2 Yr Target
4 Yr Target
Report Targets
Report on Progress
State DOT
System Performance Report

Proposed Establishment of Performance Targets

State DOTs

- Establish 2-year* and 4-year targets, as applicable
  - Within 1-year of the effective date of the final rule.
- Target adjustment of 4-year target allowed at the mid-point of target period
- Optional additional urbanized/non-urbanized targets

MPOs

- Establish 2-year and 4-year targets, as applicable, by either committing to support the State DOT target or establishing a quantifiable target
  - Within 180 days of the State DOT
- If State DOT adjusts target, any MPO adjustments must occur within 180 days

**Non-Interstate NHS Travel Time Reliability only: 2-year targets not required for 1st performance period*

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Performance of the NHS Target Establishment Summary

Proposed Measures	State DOT Targets	MPO Targets	Performance Period Start Date
Percent of the Interstate System providing for reliable travel times	2-year* & 4-year targets (Statewide)	4-year target only (MPA)	January 1, 2018
Percent of the non-Interstate NHS providing for reliable travel times			
Percent of the Interstate System in urbanized areas over 1M in population where peak hour travel times meet expectations	Single 2-year & 4-year targets for each urbanized area		January 1, 2018
Percent of the non-Interstate NHS in urbanized areas over 1M in population where peak hour travel times meet expectations			

**Non-Interstate NHS Travel Time Reliability only*: 2-year targets not required for 1st performance period*

Reporting

Initial State DOT Reporting

Initial State Performance Report (due October 1, 2016)

- Performance where data is available
- Effectiveness of asset management investment strategy for NHS
- Progress toward targets
- Activity to reduce freight bottlenecks

State DOT Reporting on Performance Targets

Baseline Performance Period Report

- NHS limits
- Adjusted urbanized area boundaries and population data
- Nonattainment and maintenance areas and MPOs' CMAQ Performance Plan*
- Baseline performance
- 2-year and 4-year targets
- Discussion of congestion at freight bottle necks.
- Relationship to other plans, including freight

Mid Performance Period Progress Report

- 2-year performance
- Progress discussion
- Investment strategy effectiveness
- Adjusted 4-year targets (optional)*
- Extenuating circumstances*
- Target achievement discussion*
- MPOs' CMAQ Performance Plans*

*Only include when applicable

Full Performance Period Progress Report

- Same content as Mid Performance Period Progress Report, except:
  - Reporting on 4-year performance
  - No option for adjusted targets

MPO Reporting on Performance Targets

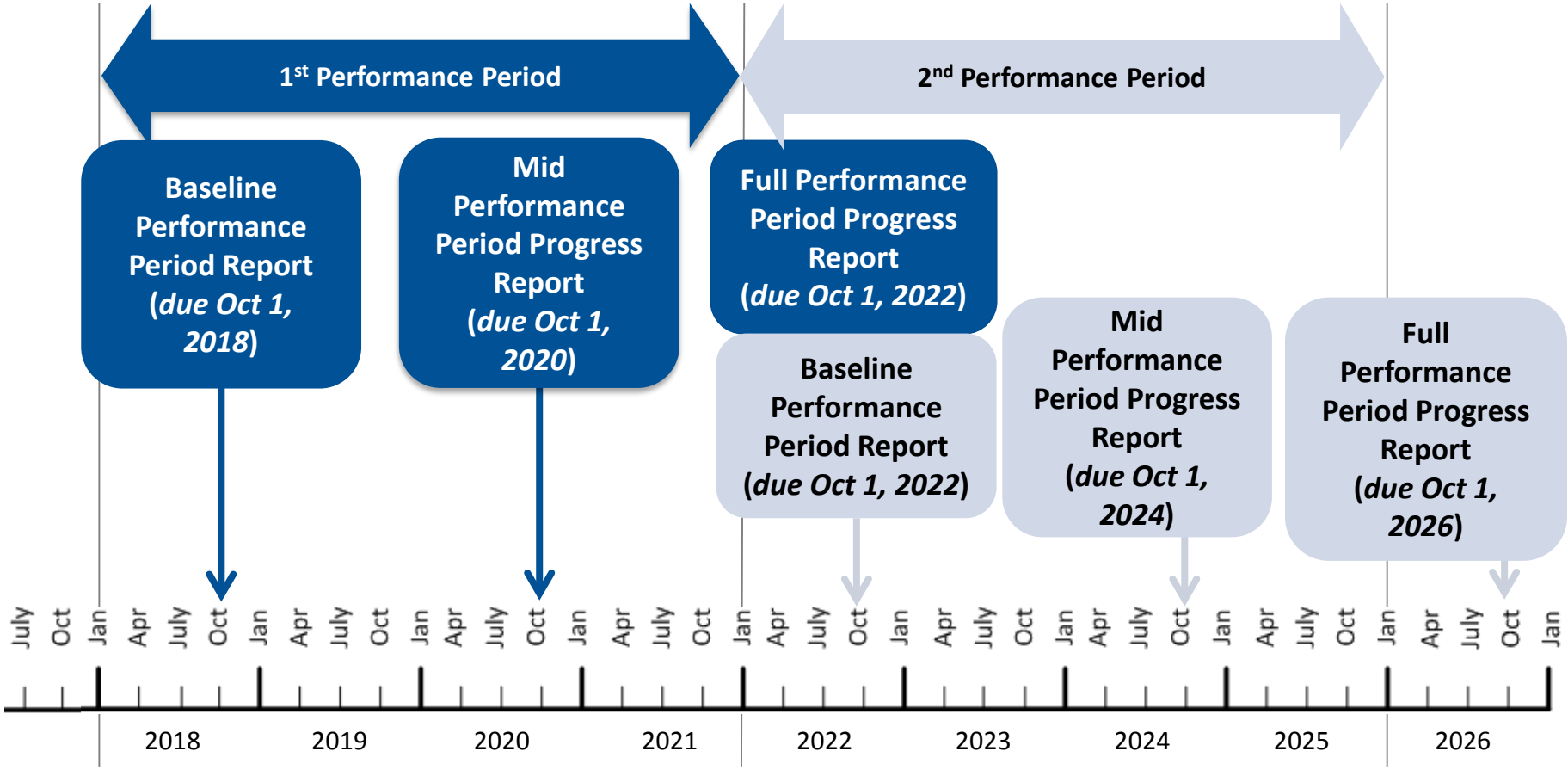
System Performance Report

- Part of MPO's Metropolitan Transportation Plan (MTP)
- Report baseline performance and progress toward achieving targets

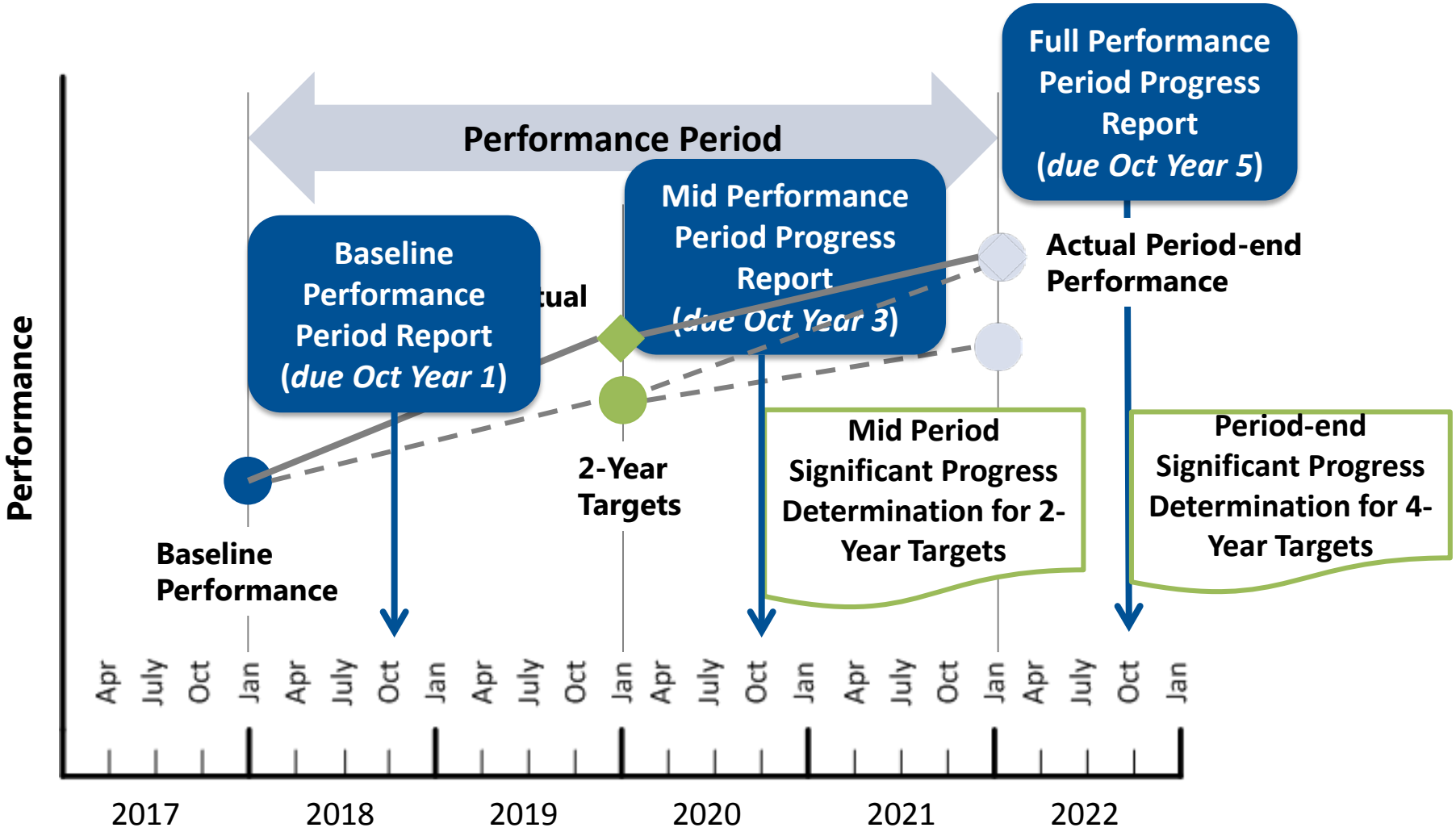
CMAQ Performance Plan

- Required for MPOs serving a TMA with a population over 1 million with ozone, CO, or PM nonattainment and maintenance areas

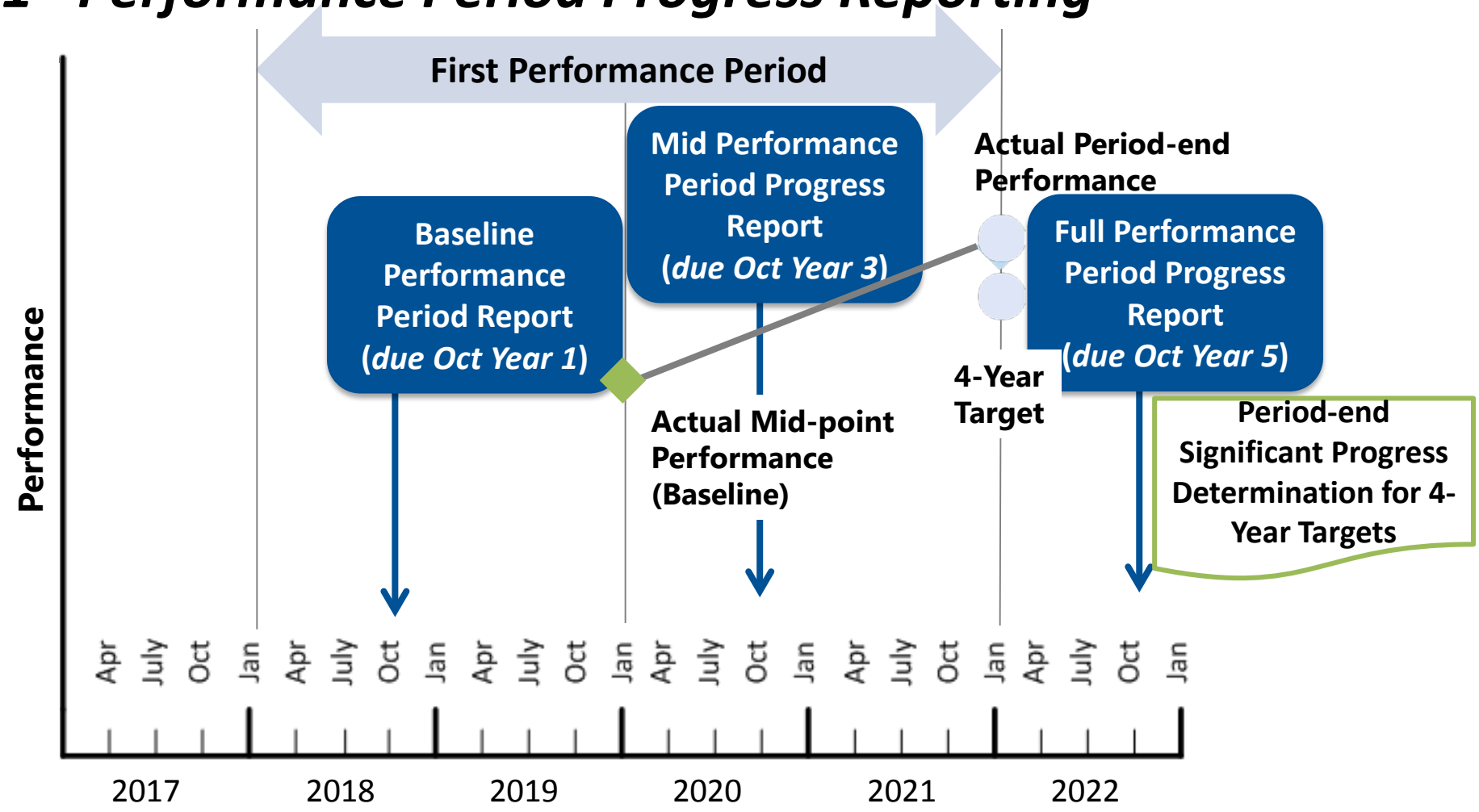
Timeline for Biennial Performance Reporting



Example Full Performance Period Progress Reporting



Non-Interstate NHS Travel Time Reliability: 1st Performance Period Progress Reporting



Significant Progress

Assessing Significant Progress Toward Achieving NHPP Targets

NPRM Subpart	Group	Proposed Measures	Sig. Progress
Subpart C - Pavement Condition	**Inter-state**	Percentage of pavements of the Interstate System in Good condition	NHPP
		Percentage of pavements of the Interstate System in Poor condition	
	non-Inter-state NHS	Percentage of pavements of the non-Interstate NHS in Good condition	
		Percentage of pavements of the non-Interstate NHS in Poor condition	
Subpart D - NHS Bridge Condition	**Bridge Cond.**	Percentage of NHS Bridges Classified as in Good Condition	NHPP
		Percentage of NHS Bridges Classified as in Poor Condition	
Subpart E - Performance of the National Highway System (NHS)	**Travel Time Reliability**	Percent of the Interstate System providing for Reliable Travel Times	NHPP
		Percent of the non-Interstate NHS providing for Reliable Travel Times	
	Peak Hour Travel Time	Percent of the Interstate System where Peak Hour Travel Times meet expectations	NHPP
		Percent of non-Interstate NHS where Peak Hour Travel Times meet expectations	

Assessing Significant Progress Toward Achieving NHPP Targets

NPRM Subpart	Group	Proposed Measures	Sig. Progress
Subpart E - Performance of the National Highway System (NHS)	**Travel Time Reliability**	Percent of the Interstate System providing for Reliable Travel Times	NHPP
		Percent of the non-Interstate NHS providing for Reliable Travel Times	
	Peak Hour Travel Time	Percent of the Interstate System where Peak Hour Travel Times meet expectations	NHPP
		Percent of non-Interstate NHS where Peak Hour Travel Times meet expectations	

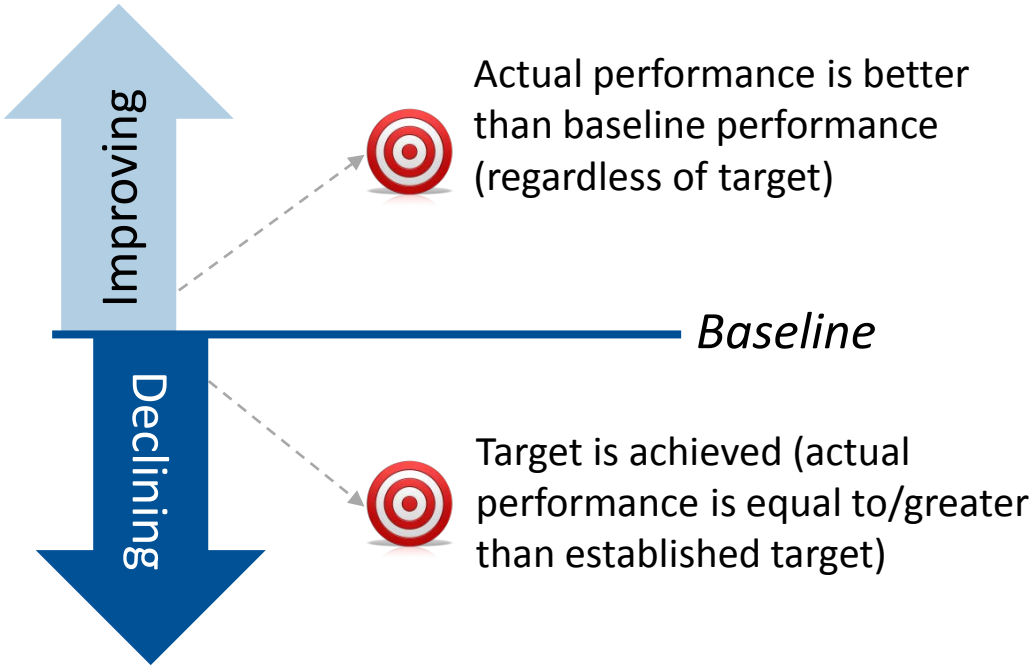
Assessing Significant Progress Toward Achieving NHPP Targets

Who	• FHWA determines if a State DOT has made significant progress
What	• Makes determination for each NHPP target individually
When	• Assesses significant progress every 2 years

Consequence: State DOTs are required to achieve or make significant progress toward their NHPP targets every biennial reporting period (every 2 years), and are to take additional reporting actions if FHWA determines significant progress is not made.

Assessing Significant Progress Toward Achieving NHPP Targets

Significant progress is made when either…



Regulatory Impact Analysis (RIA)

Regulatory Impact Analysis Estimate over 11 Years

Increased reliability of travel time across all NHS

+

Reduced commuter travel time spent in congestion

Change Needed to Make Costs Beneficial

Performance of the NHS (undiscounted)

Metric Calculation	$5.48 million
+	
Measure Calculation	$4.29 million

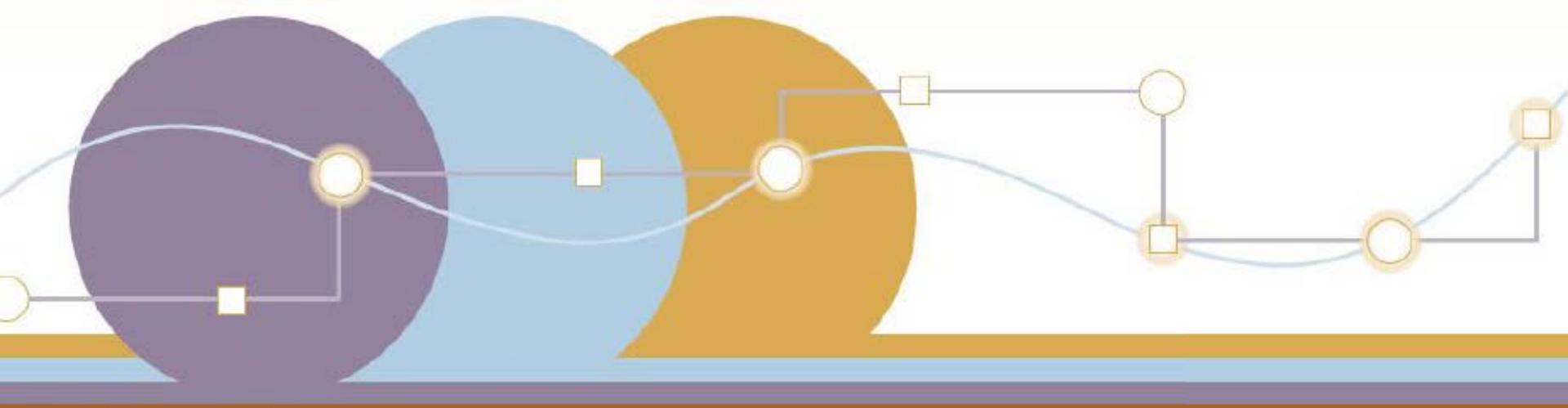
= $9.76 million*

Estimated Costs

**This NPRM contains a summary of the analysis of the change needed to make these costs beneficial. Refer to the document in the Docket for full analysis details.*

Part 5

Summary and Q&A



Rulemaking Resources

Office of TPM website: http://www.fhwa.dot.gov/tpm/

In-Depth Webinars on Proposed Measures

- 5/3: CMAQ – Traffic Congestion and On-Road Mobile Emissions (Subparts G and H)
- TBD: Freight Movement on the Interstate System (Subpart F) – Industry Overview

Fact sheets, published NRPMs, webinar registration, and related information at http://www.fhwa.dot.gov/tpm/rule/pm3_nprm.cfm

Submit comments to:

www.regulations.gov:

FHWA 2013-0054

For clarifying questions or more information, please contact:

Francine Shaw Whitson
FSWhitson@dot.gov
PerformanceMeasuresRulemaking@dot.gov

Thank you!