PM3 & NPMRDS Analytics

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1

Presentation Outline

- Overview of the rule
- PM3 target setting & coordination
- PM3 metrics, measures, formulas and calculations
- PM3 Tool
- Methodology used to calculate targets –review each measures
- Summarize proposed statewide targets
- Data Challenges
- General Guidance
- Live Demo (maybe)

2

Performance Measures Focus Area PM3 Final Rule –Key Points

http://www.fhwa.dot.gov/tpm/

- Rule effective May 20, 2017
- Major changes from the NPRM:
  - Reduced seven vehicle travel time-based measures in the proposed rule to four
  - Addressed multimodal and person-focused concerns
  - Addressed concerns about the use of absolute thresholds
  - Added a congestion measure on non-SOV travel
  - Delayed a proposed rule for GHG; pending new NPRM

3

What measures are in the TPM 3 final rule?

Measure Focus Area	Performance Measures
Performance of the National Highway System (Subpart E)	**Interstate Travel Time Reliability Measure**: Percent of person-miles traveled on the Interstate that are reliable **Non-Interstate Travel Time Reliability Measure**: Percent of person-miles traveled on the non-Interstate NHS that are reliable
Freight Movement on the Interstate System (Subpart F)	**Freight Reliability Measure:** Truck Travel Time Reliability (TTTR) Index
Measures to Assess the CMAQ Program –Traffic Congestion(Subpart G)	**Peak Hour Excessive Delay (PHED) Measure:** Annual Hours of Peak Hour Excessive Delay (PHED) Per Capita **Non-Single Occupancy Vehicle Travel (SOV)Measure:** Percent of Non-Single Occupancy Vehicle (SOV)Travel
Measure to Assess the CMAQ Program –On-Road Mobile Source Emissions (Subpart H)	•**Emissions Measure:** Total Emissions Reduction

4

2017 & 2018 Key Dates

Dates	Responsible Parties	Performance of NHS, Freight, and CMAQ measures
May 20, 2017	FHWA, State DOTs & MPOs	Final rule effective date:
September 28, 2017	FHWA, State DOTs & MPOs	Greenhouse gas measure effective date
October 1, 2017 and every 4 years thereafter	FHWA	CMAQ measure applicability determination (PHED, Percent Non-SOV Travel, and Total Emissions Reduction measures) *
No later than October 1, 2017 and annually thereafter	State DOTs	The State DOT requests FHWA approval for the use of equivalent data source(s) for Travel Time based measures.
No later than May 20, 2018 (effective date + 1 year)	State DOTs	State DOTs establish targets for the first Performance Period

* Measures not applicable to LA until 2022, therefore, the rest of the dates for these measure aren't shown

5

2017 & 2018 Key Dates

Dates	Responsible Parties	Performance of NHS, Freight, and CMAQ measures
By June 15, 2018 and annually thereafter	State DOTs	Metric data for Travel-time based measures reported to HPMS:
By October 1, 2018, and every 4 years thereafter	State DOTs	State DOTs report targets for the performance period to FHWA in their Baseline Performance Period Report.
Not later than November 16, 2018	MPOs	MPOs establish 4 year targets… to the State DOT in a manner that is documented and mutually agreed upon by both parties.

6

2019 and Beyond Key Dates

Dates	Responsible Parties	Performance of NHS, Freight, and CMAQ measures
On or after May 20, 2019	State DOTs	Updates or amendments to LRSTP and STIP
On or after May 20, 2019	MPOs	Updates or amendments to MTP and TIP
October 1, 2019, and every 4 years thereafter	FHWA	CMAQ measure applicability re-assessment:
On August 16, 2020 and every 2 years thereafter	FHWA	FHWA data extraction of HPMS data for Travel Time Reliability and Freight reliability measures (significant progress determination)
By October 1, 2020, and every 4 years thereafter	State DOTs	State DOTs report their 2-year (midpoint performance period) progress and adjusted 4-year targets to FHWA in their Mid Performance Period Progress Report.
By October 1, 2022 and every 4 years thereafter	State DOTs	State DOTs report their 4-year (end of performance period) progress to FHWA in their Full Performance Period Progress Report.

* PHED, GHG, CMAQ dates aren't shown

7

§490.105 Establishing Targets – State DOTs

- Establish 2-year and 4-year targets for each performance period
  - First set of targets within 1 year of the effective date of the final rule: May 20, 2018 (23 USC150(d))
  - Targets must be reported to FHWA by October 1,2018.
  - For the 1st Performance Period Only -**2-year target is NOT required for non-Interstate NHS Travel Time Reliability measure–phase-in requirements**
- Establish a single, unified target (both 2-year and 4-year) for entire urbanized area for PHED and non-SOV Travel measures:
  - For the 1st Performance Period –applicable to State DOTs with NHS in the urbanized area with a population greater than 1 million containing any part of a nonattainment or maintenance area (For the 1st Performance Period Only –**2-year target is NOT required for PHED measure -phase-in requirements**)
  - **Beginning with the 2nd Performance Period and beyond –applicable to State DOTs with NHS in urbanized areas with populations greater than 200,000 that contain any part of a nonattainment or maintenance area**
- Adjustment of 4-year target allowed at the mid-point of performance period

8

§490.107 Reporting on Performance Targets - State DOTs

- **Baseline Performance Period Report**:
  - Baseline condition/performance;
  - 2-and 4-year targets;
  - Congestion at truck freight bottlenecks;
  - Data collection method for the Non-SOV Travel measure; etc.
- **Mid Performance Period Progress Report**:
  - 2-year condition/performance;
  - 2-year progress in achieving performance targets;
  - Adjusted 4-year targets(optional);
  - Congestion at truck freight bottlenecks; etc.
- **Full Performance Period Progress Report**:
  - 4-year condition/performance;
  - 4-year progress in achieving performance targets;
  - Congestion at truck freight bottlenecks; etc.

9

§490.107 Reporting on Performance Targets - MPOs

- **Reporting includes:**
  - Targets to respective State DOT(s) in a manner that is documented and mutually agreed upon by both parties;
  - Baseline level and progress toward targets in Metropolitan Transportation Plan; and
  - CMAQ Performance Report in State Biennial Performance Reports (for applicable MPOs only).

10

§490.109 Significant Progress Determination

- **Applies to statewide NHPP and NHFP targets only**
  - Interstate and non-Interstate NHS Travel Time Reliability measures, and Freight Reliability measure
- **FHWA assessment of State DOT target achievement(every 2years)**
  - The actual condition/performance level is better than the baseline, or
  - The actual condition/performance level is equal to or better than the established target
- **Consequences of not making significant progress**
  - NHPP –State DOT documents the actions it will take to achieve target
  - Freight Reliability measure –additional documentation requirement
- **Extenuating circumstances may be considered**

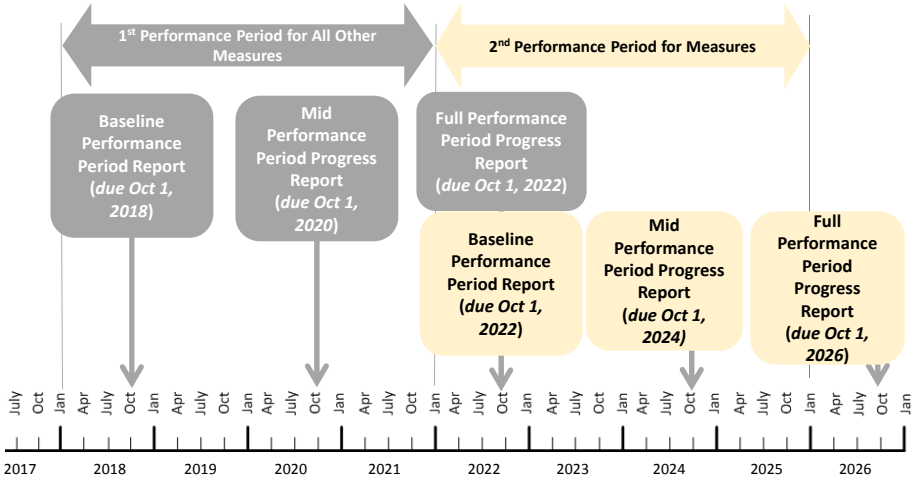
11

§490.105, 490.107 & 490.109 First Performance Period: Phase-In Requirements

- Applies to first performance period and two measures only
  - Non-Interstate NHS Travel Time Reliability Measure
  - PHED measure
- Reporting
  - **First Baseline Performance Period Report (due October 1, 2018)**
    - State DOTs establish and report their 4-year targets
    - State DOTs are not required to report baseline condition/performance
  - **First Mid Performance Period Progress Report (due October 1,2020)**
    - State DOTs report the 2-year condition/performance as the baseline condition/performance
    - State DOTs may adjust their 4-year targets
- Significant Progress Determination
  - In 2020, at the midpoint of the first performance period, FHWA will not make a determination of significant progress toward the achievement of 2-year targets for the non-Interstate NHS Travel Time Reliability measure

12

§490.105 & 490.107 Timeline for Performance Periods and State DOT Biennial Reporting



13

DOT/MPO PM3 Target Setting and Coordination

Past and Future

14

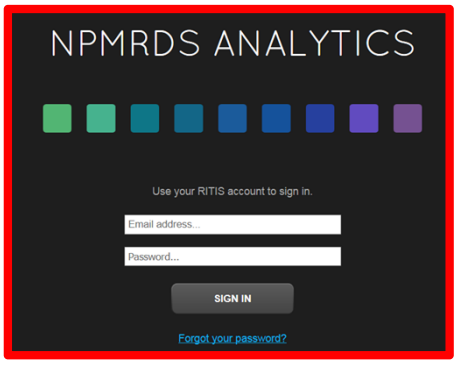
Who is involved?

- DOTD Working Group (Planning, Data Coll & Mgmt Systems, LTRC)
- Involved CATT lab from University of Maryland and their affiliates during multiple data and target setting insight discussions.
  - CATT lab is currently the NPMRDS data provider to the FHWA and RITIS tool provider to the AASHTO pool fund study –Task 4
- MPOs
- FHWA

15

In short, this must happen…

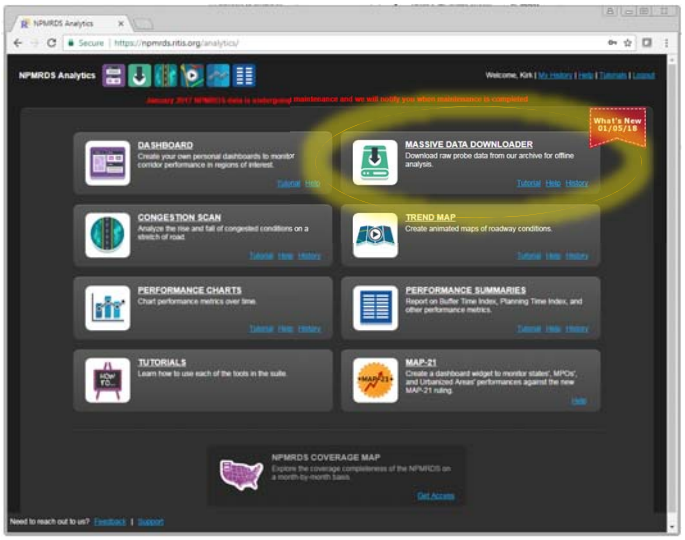
1. **Defining reporting segments**
2. **Conflation**
3. **Metric calculation**
4. **Measure calculation**
5. Target development & coordination
6. Develop report to meet federal requirement



16

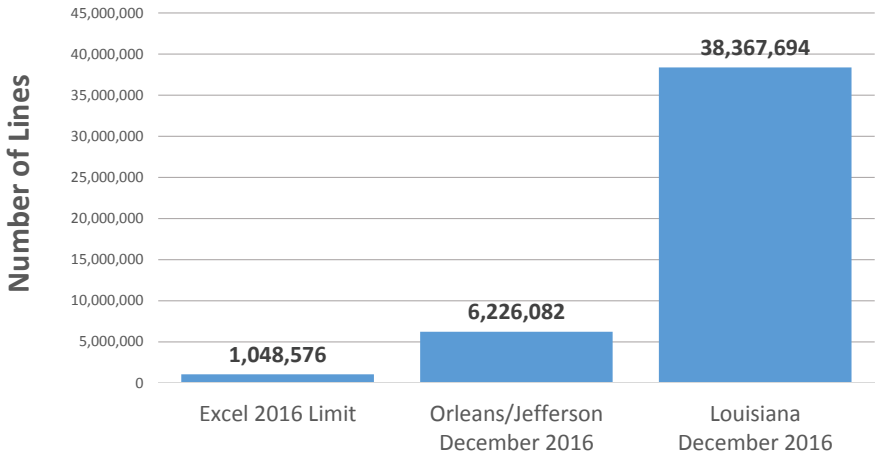
PM3 Target Setting Tools and Resources

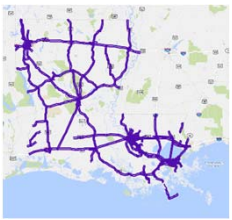
- RITIS provides state DOTs and MPOs "free" access to their "Massive Data Downloader" to download NPMRDS data (raw probe data)



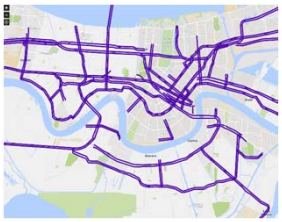
17

Why does that matter?





Louisiana: 14,511 TMCs



Orleans & Jefferson: 3100 TMCs

18

PM3 Target Setting Tools and Resources

- **DOTD joined the Transportation Performance Management Pooled Fund Study #TPF-5(326) at $790,000**
  - $135,000 / 5 years for a MAP-21 basic package
  - $55,000 for additional INRIX NPMRDS data (v2) from Jan 2016 to January 2017 to support target setting and trend analysis
  - $120,000/year (for 5 years) for RITIS NPRMDS deep-dive analytics and advanced visualizations
    - Congestion Scans, Animated Maps, Performance Charts and Summaries, MAP-21, Trend Map, Data Downloader
  - MPO's get all this too!
- **LTRC plans (tentative) to procure NPMRDS-type data (v2/Inrix) for the remainder of the network (non-NHS) at $35K/year** (MPO's would get all this too!)

19

Using NPMRDS Analytics for MAP-21 Interstate and Non-interstate NHS Travel Time Reliability Target Setting for Louisiana DOTD

20

PM3 System Performance Measures -System Reliability

Travel Time Reliability measures:

1. Percent of Person-Miles Traveled on the Interstate System That Are Reliable (the Interstate Travel Time Reliability measure)
2. Percent of Person-Miles Traveled on the Non-Interstate NHS That Are Reliable (the Non-Interstate NHS Travel Time Reliability measure)

Both of these measures assess Level of Travel Time Reliability (LOTTR):

- LOTTR is defined as the ratio of the 80th percentile travel time to a ''normal'' travel time (50th percentile). **LOTTR threshold level = 1.50**
- Data are derived from the travel time data set using either the National Performance Management Research Data Set (NPMRDS) or approved equivalent

21

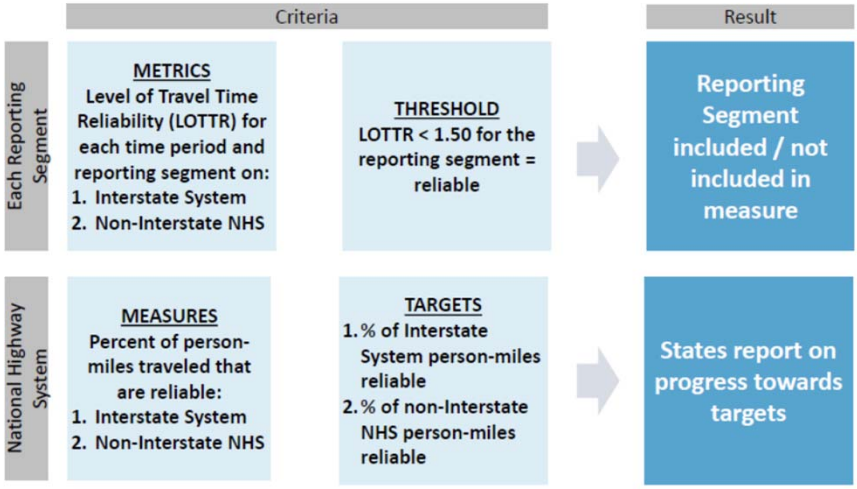
Things to keep in mind…

- TTTR, LOTTR
  - Reliable < 1.5
  - Not Reliable > 1.5

- Very Good < 1.25
- Good 1.25 – 1.40
- Barely Good 1.40 – 1.50
- Barely Bad 1.50 – 1.60
- Bad 1.60 – 1.75
- Very Bad > 1.75

22

Travel Time Reliability Measures:



23

Required Data:

Relevant Data	Data Source(s)
• Travel Times • NHS Travel Time Segments (TMCs)	• National Performance Management Research Data Set (NPMRDS), ***or*** • Equivalent data set
• Traffic volumes (AADT)	• Highway Performance Monitoring System (HPMS)
• Occupancy Factors	• Provided by FHWA, ***or*** • Other allowed data source

24

Example:

§ 490.511 Level of Travel Time Reliability (LOTTR) Metric (Example)

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

Level of Travel Time Reliability (LOTTR) *(Single Segment, Interstate Highway System)*		
Monday – Friday	6am – 10am	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 **is not** reliable

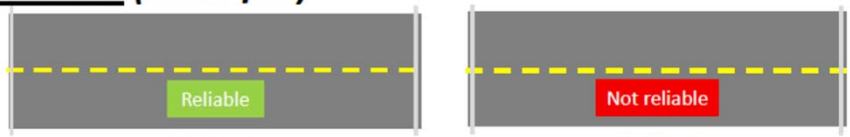
HPMS Submittal: *Starting in 2018, State DOTs report LOTTR metrics and the corresponding 80th and 50th percentile times for each time period and directional AADT for each reporting segment by June 15 of each year, for the previous year's measures*

U.S. Department of Transportation
Federal Highway Administration

21

25

§ 490.513 Calculating Travel Time Reliability Measures (Example)



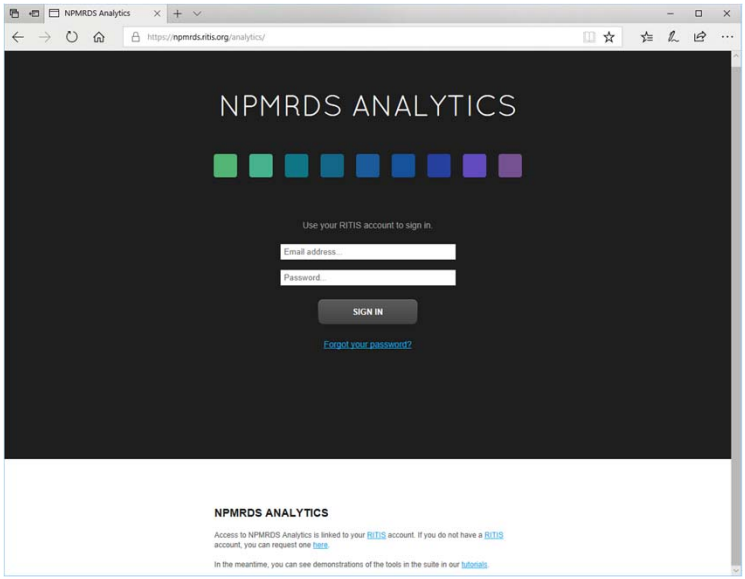
	Reliable	Not reliable
Length	1.000 mi.	0.750 mi.
	x	x
Annual Traffic Volume	2,000,000	3,500,000
	x	x
Occupancy Factor	1.3 persons/vehicle	1.7 persons/vehicle
Segment Total	**Reliable: 2,600,000 person-miles**	**Unreliable: 4,462,500 person-miles**

$$\frac{\Sigma \text{ (Reliable person-miles)}}{\Sigma \text{ (Total person-miles)}}$$

Measure: % of person-miles reliable, for full extent of the system

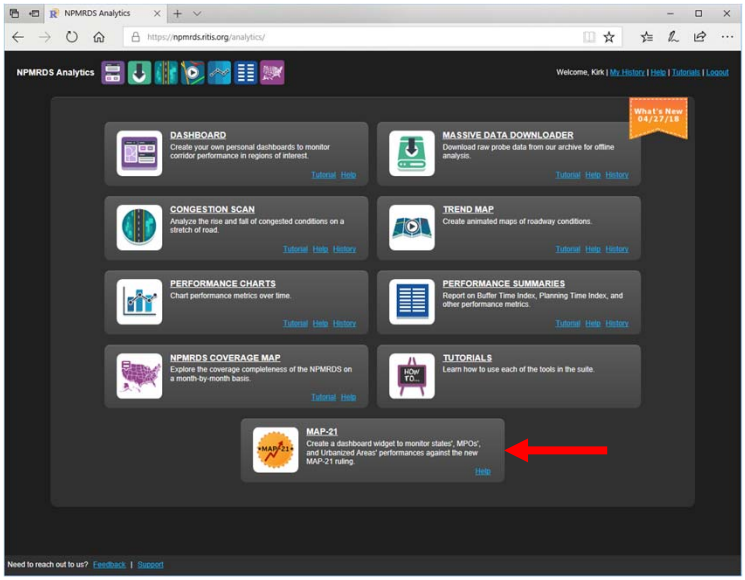
26

Log in Page: https://npmrds.ritis.org/analytics/



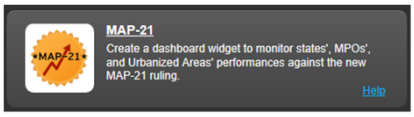
27

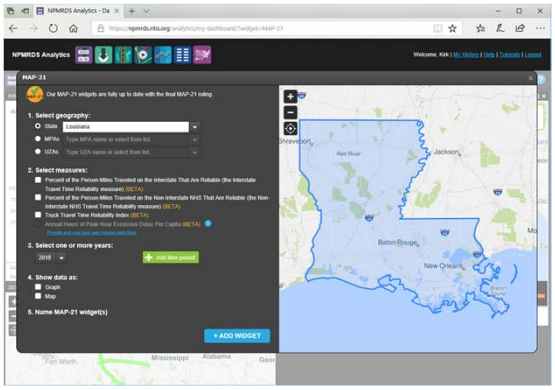
Log in Page: https://npmrds.ritis.org/analytics/



28

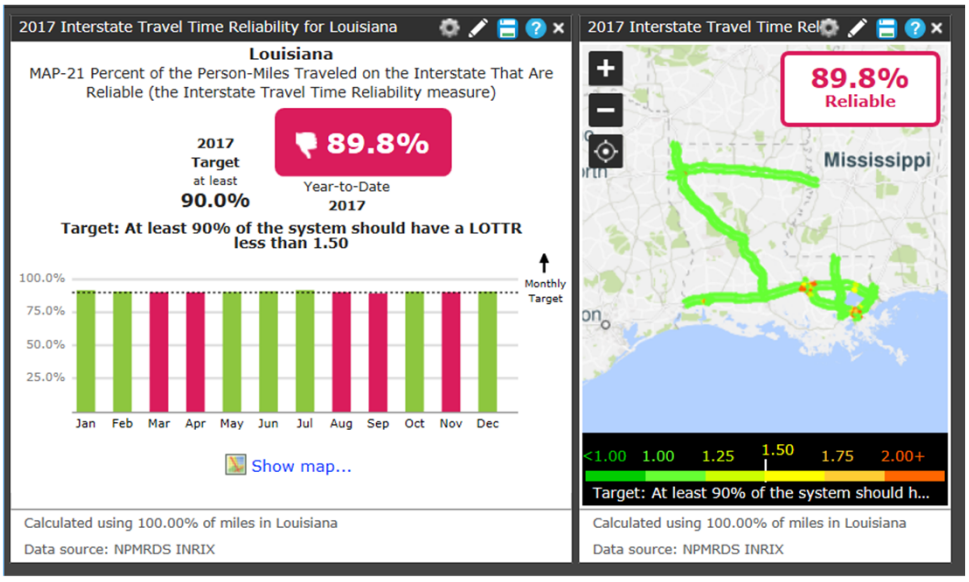
1. **Select geography:** State, MPA, or UZA
   - LA – Alexandria-Pineville MPO, Alexandria
   - LA – Capital Regional Planning Commission…
   - LA – Houma-Thibodaux MPO, Houma (HT-MPO)
   - LA - Imperial Calcasieu Regional Planning & …
   - LA – Lafayette Area MPO, Lafayette
   - LA – Northwest Louisiana COG, Shreveport…
   - LA – Ouachata Council of Governments…
   - LA – Regional Planning Commission, New…
   - LA – South Tangipahoa MPO, Hammond
2. **Select measures:**
   - % of Person-Miles Traveled on the Interstate That Are Reliable (the Interstate Travel Time Reliability measure): set target to at least 1 – 100%
   - % of Person-Miles Traveled on the Non-Interstate That Are Reliable (the Non-Interstate Travel Time Reliability measure): set target to at least 1 – 100%
3. **Select year(s):** 2011 – 2018
4. **Show data as:** Graph or Map
5. **Name MAP-21 Widget(s):** whatever you want





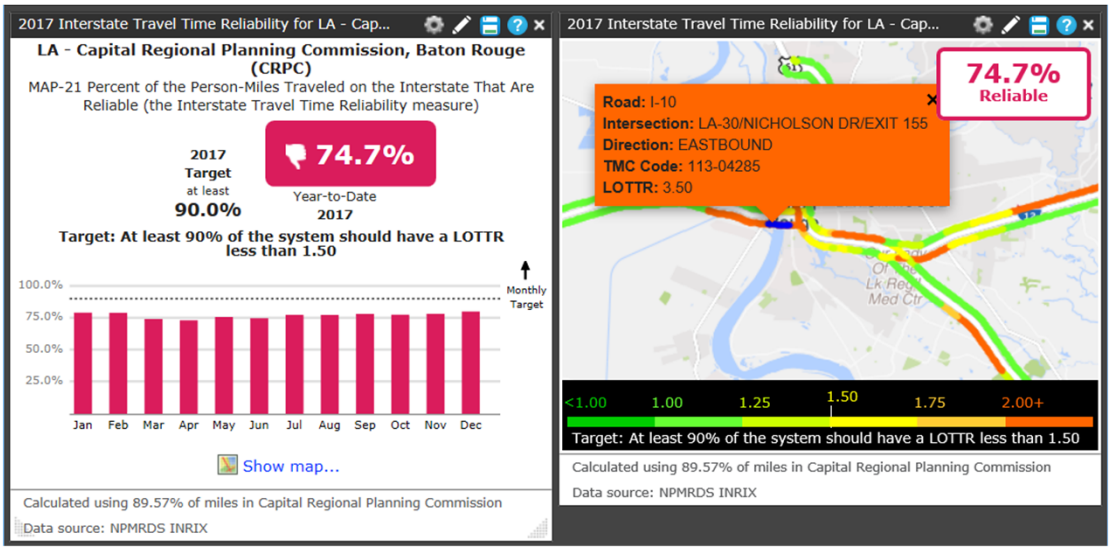
29

Example: Percent of Person-Miles Traveled That Are Reliable (Interstate)



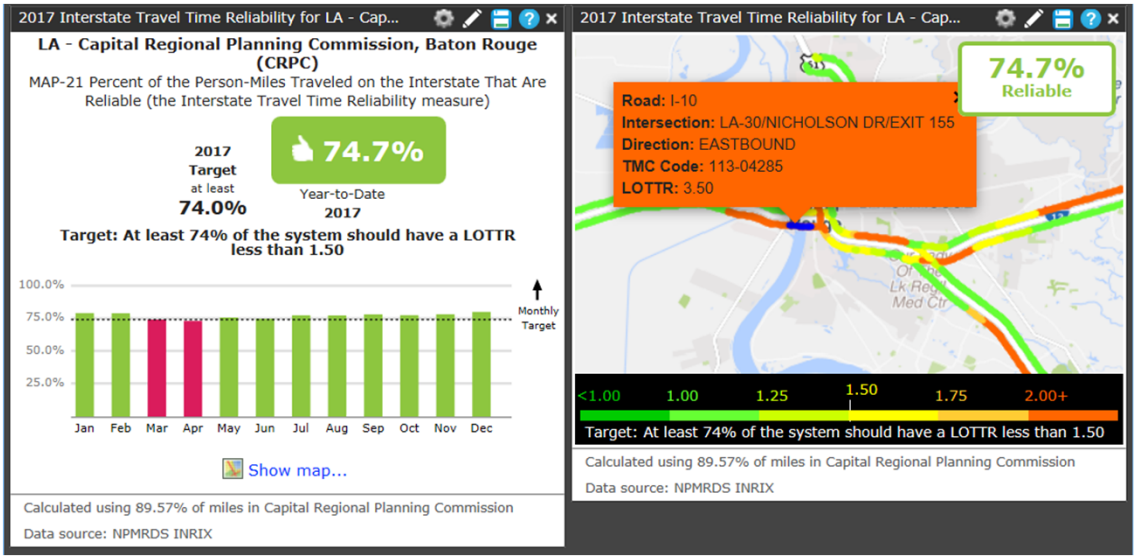
30

Example: Percent of Person-Miles Traveled That Are Reliable



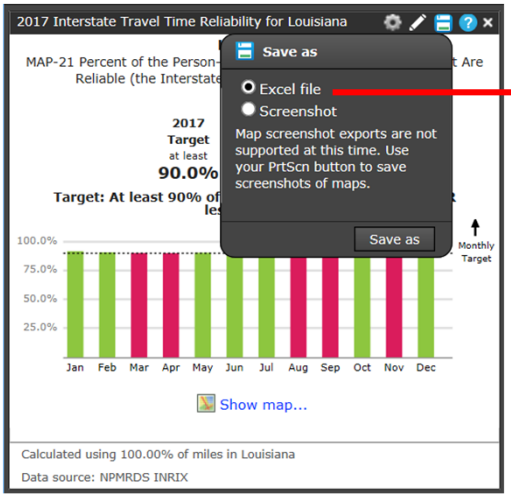
31

Example: Percent of Person-Miles Traveled That Are Reliable

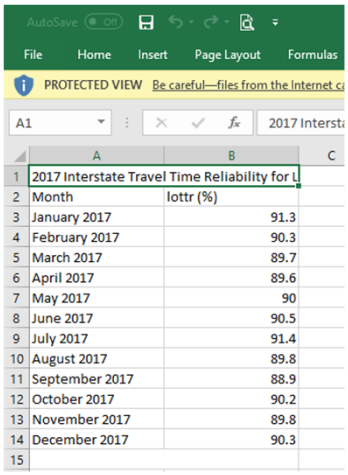


32

Graph Widget



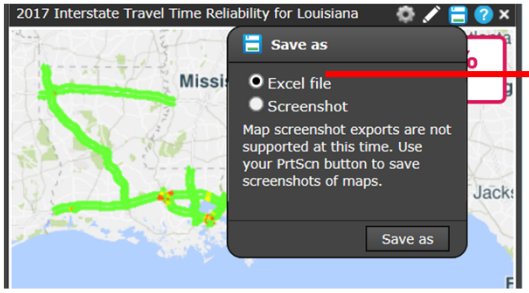
2017 Interstate Travel Time Rel .xml



	A	B	C
1	2017 Interstate Travel Time Reliability for L		
2	Month	lottr (%)	
3	January 2017	91.3	
4	February 2017	90.3	
5	March 2017	89.7	
6	April 2017	89.6	
7	May 2017	90	
8	June 2017	90.5	
9	July 2017	91.4	
10	August 2017	89.8	
11	September 2017	88.9	
12	October 2017	90.2	
13	November 2017	89.8	
14	December 2017	90.3	
15			

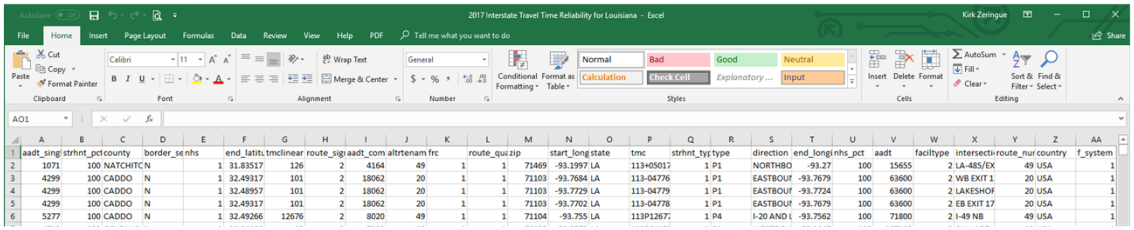
33

Map Widget



2017 Interstate Travel Time Reliability for Louisiana.csv

- 40 variables
- 1434 roadway segments



34

Reliability Measures Trend Analysis and Target Setting

	NPMRDS v1			NPMRDS v2	
Year	**2013**	**2014**	**2015**	**2016**	**2017**
Interstate	92.7	91.8	92.1	90.6	89.8
Non-Interstate NHS	70.4	69.8	69.4	88.6	89.7

	NPMRDS v1			NPMRDS v2
Year	**2013 - 2014**	**2014 - 2015**	**2013 – 2015***	**2016 - 2017**
Interstate	-1.0%	0.3%	**-0.3%**	-0.9%
Non-Interstate NHS	-0.9%	-0.6%	**-0.7%**	1.2%

*CAGR

	Projected Targets by Year				
Year	**2018**	**2019**	**2020**	**2021**	**2022**
Interstate	90	89	**89**	89	**88**
Non-Interstate NHS	89	88	88	87	**87**

35

% of Person-Miles Traveled That Are Reliable

Interstate

	NPMRDS v1			NPMRDS v2	
	2013	**2014**	**2015**	**2016**	**2017**
Statewide	92.7	91.8	92.1	90.6	89.8
Alex-Pinev.	100	100	100	100	100
CRPC	84.6	84.6	83.3	76.8	74.7
Houma-Thi.	No data available				
Imp. Calc.	100	100	100	98.9	95.8
Lafayette	100	100	100	100	100
NW Shreve.	98.4	97.4	96.6	97.5	97.5
Ouachita	100	100	100	100	100
NORPC	79.9	76.9	79.4	77.3	76.1
S. Tang.	100	100	100	100	100

Non-Interstate NHS

	NPMRDS v1			NPMRDS v2	
	2013	**2014**	**2015**	**2016**	**2017**
Statewide	70.4	69.8	69.4	88.6	89.7
Alex-Pinev.	84.0	83.4	82.4	98.6	98.6
CRPC	44.6	43.7	44.6	68.0	74.0
Houma-Thi.	62.8	56.0	62.6	88.3	86.8
Imp. Calc.	76.6	77.2	65.7	89.1	89.6
Lafayette	82.8	78.3	78.5	96.2	95.4
NW Shreve.	66.6	66.5	62.9	92.5	93.6
Ouachita	69.6	67.5	65.2	88.5	89.9
NORPC	59.6	59.1	58.6	87.0	86.9
S. Tang.	34.7	30.5	25.4	86.4	76.8

36

Using NPMRDS Analytics for MAP-21 Truck Travel Time Reliability Target Setting for Louisiana DOTD

37

§ 490.607 Freight Reliability Measure

	Criteria		Result
Each Reporting Segment	**METRIC** Truck Travel Time Reliability (TTTR) for each time period and each segment on the Interstate System	**NO THRESHOLD**	Maximum TTTR for each reporting segment
Interstate System	**MEASURE** TTTR Index: The sum of maximum TTTR for each segment, divided by total Interstate miles	**TARGET** TTTR Index for the Interstate System	States report on progress towards targets

38

§ 490.609 & 490.611 Data Requirements: Applicable Time Periods

Full Year (Jan 1-Dec 31)

Weekdays (Mon – Fri) | Weekends

- 6 – 10am
- 10am – 4pm
- 4 – 8pm
- 6am – 8pm (Weekends)
- Overnight (all days) 8pm – 6am

Five Total Time Periods

39

§ 490.611 Freight Reliability Metric (Example)

$$\frac{\text{Longer Truck Travel Time (95th)}}{\text{Normal Truck Travel Time (50th)}} = \frac{\text{\# seconds}}{\text{\# seconds}} = \text{Truck Travel Time Reliability (TTTR) Ratio}$$

Truck Travel Time Reliability (TTTR) (Single Segment, Interstate Highway System)		
Monday – Friday	6am – 10am	$TTTR = \frac{72\ sec}{50\ sec} = 1.44$
	10am – 4pm	TTTR = 1.39
	4pm – 8pm	TTTR = **1.49**
Weekends	6am – 8pm	TTTR = 1.31
Overnight	8pm – 6am	TTTR = 1.20
Maximum TTTR		**1.49**

40

§ 490.613 Calculating Freight Reliability Measure (Example)

$$\text{TTTR Index} = \frac{\sum \text{All segment length weighted TTTR}}{\sum \text{All segment lengths}}$$

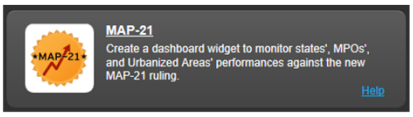
Segment length (mi.)	0.500	0.500	1.000	1.000	5.000
	x	x	x	x	x
MaxTTTR	1.49	1.59	1.50	1.41	1.36
	=	=	=	=	=
Length-weighted TTTR	0.75	0.80	1.50	1.41	6.80

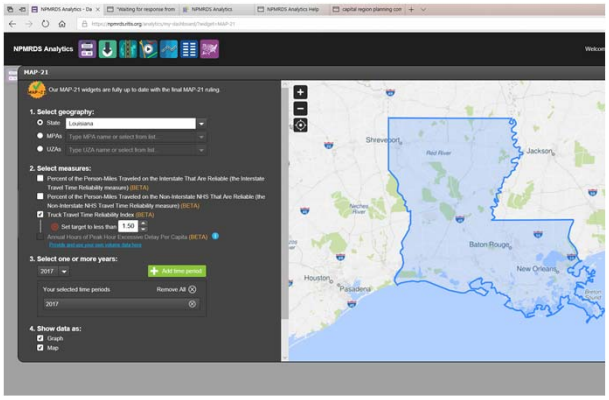
$$\text{TTTR Index} = \frac{11.25}{8.000 \text{ mi}} = 1.41$$

Measure: TTTR Index, full extent of the Interstate system

41

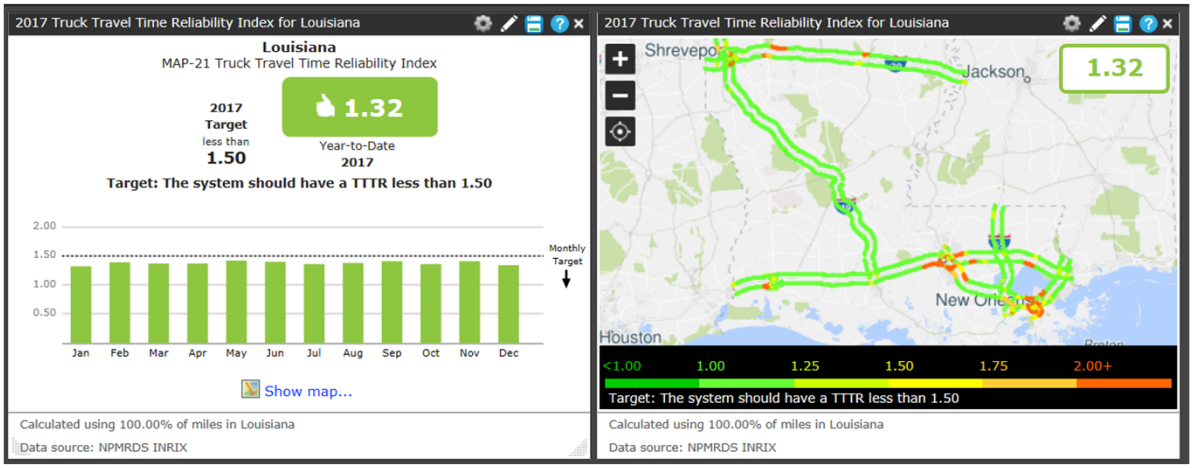
1. **Select geography:** State, MPA, or UZA
   - LA – Alexandria-Pineville MPO, Alexandria
   - LA – Capital Regional Planning Commission…
   - LA – Houma-Thibodaux MPO, Houma…
   - LA - Imperial Calcasieu Regional Planning…
   - LA – Lafayette Area MPO, Lafayette
   - LA – Northwest Louisiana COG, Shreveport…
   - LA – Ouachata Council of Governments…
   - LA – Regional Planning Commission, New…
   - LA – South Tangipahoa MPO, Hammond
2. **Select measure:**
   - Truck Travel Time Reliability Index: set target to any number (default is 1.5)
3. **Select year(s):** 2011 – 2018
4. **Show data as:** Graph or Map
5. **Name MAP-21 Widget(s):** whatever you want





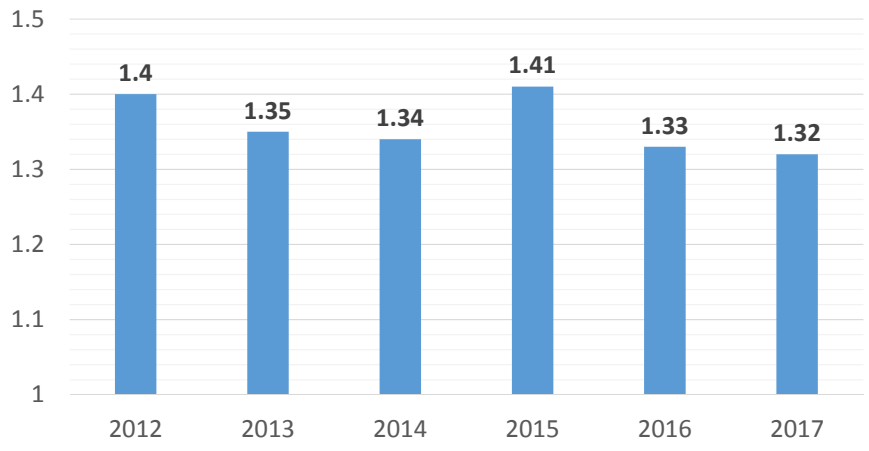
42

Example: Truck Travel Time Reliability Index



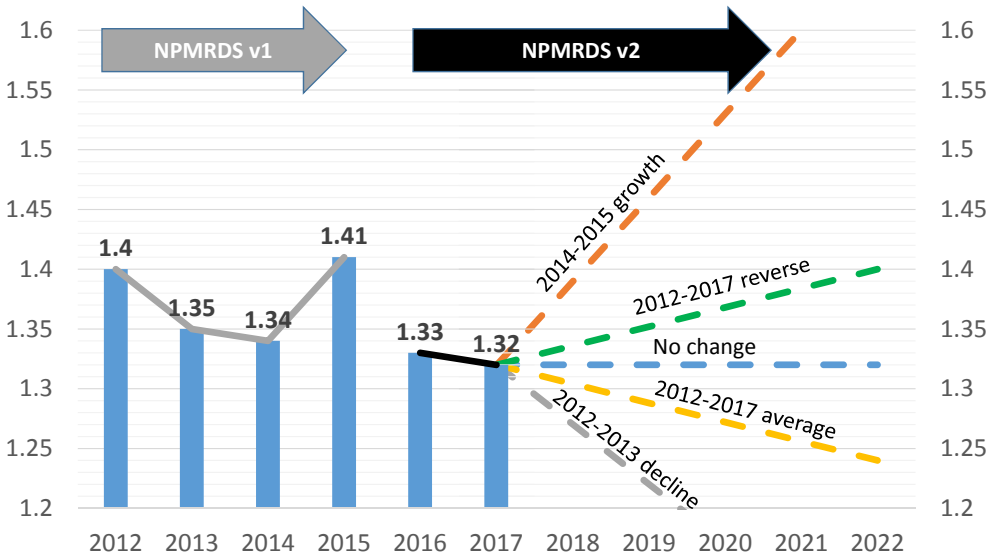
43

Truck Travel Time Reliability Index in LA



44

Truck Travel Time Reliability Index in LA



45

Trend Analysis and Target Setting

	Projections for 2018 - 2022				
	2018	**2019**	**2020**	**2021**	**2022**
Average Condition (-1.17%)	1.30	1.29	1.27	1.26	1.24
Worst Scenario (+5.0%)	1.39	1.46	1.53	1.60	1.67
Best Scenario (-3.7%)	1.27	1.22	1.17	1.12	1.07
Recommended (+1.17%)	**1.34**	**1.35**	**1.37**	**1.38**	**1.40**

For statewide TTTR index, recommend using **1.37** as **2020 target**, and **1.40** as **2022 target** .

46

TTTR Analysis Results by MPAs

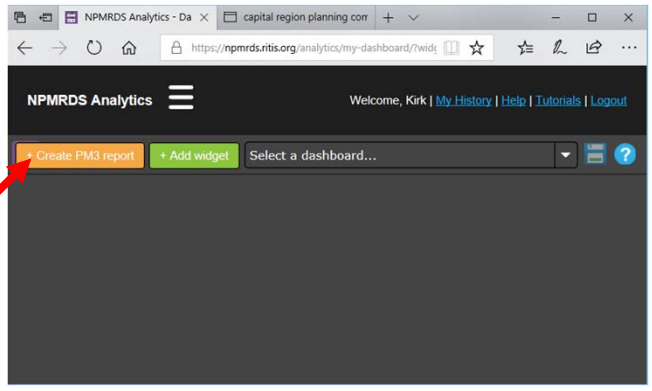
Truck Travel Time Reliability	2012	2013	2014	2015	2016	2017	2012-2017 Compound Annual Growth
A-P	1.12	1.11	1.11	1.09	1.09	1.09	-0.54%
CRPC	2.57	2.27	2.12	2.42	2.17	2.08	-4.14%
H-T	No data available						
IC	1.91	1.18	1.26	1.22	1.30	1.41	-5.89%
Laf.	1.14	1.15	1.16	1.15	1.12	1.13	-0.18%
NW	1.26	1.26	1.25	1.38	1.23	1.24	-0.32%
Ouach.	1.17	1.21	1.22	1.23	1.26	1.22	+0.84%
NORPC	1.79	1.84	1.96	2.11	1.76	1.67	-1.38%
S. Tang.	1.16	1.14	1.13	1.13	1.11	1.11	-0.88%

MPOs can support the statewide target, or establish a quantifiable 4-year target for their areas.

47

Report Baseline Metric Data

The PM3 Report Generation Tool (a.k.a. The Easy Button) is now available in the Dashboard. The Easy Button allows agencies to generate a PM3 metric report in the format specified by FHWA for the June 15th submittal



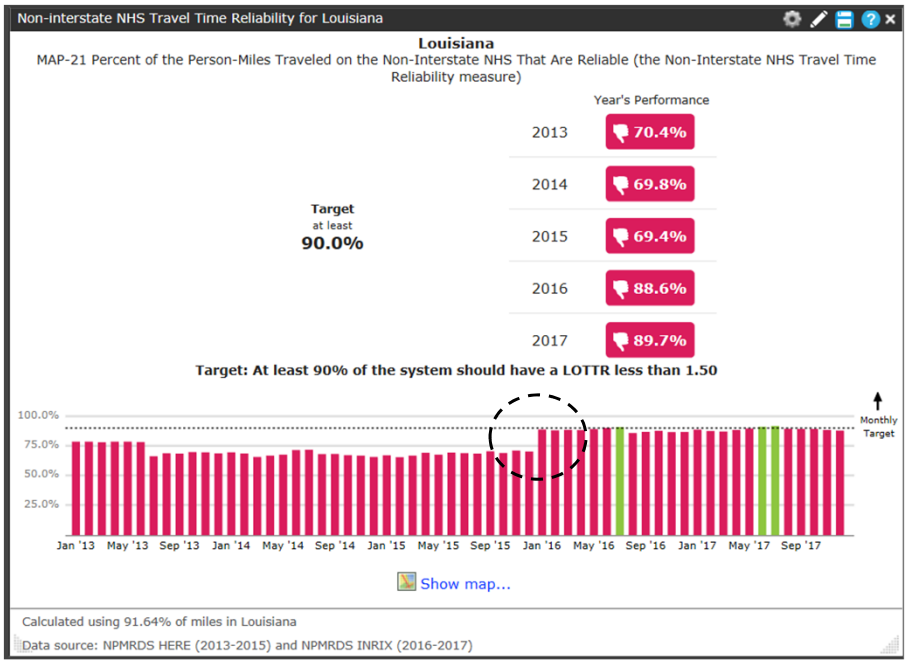
4853 segments, 40 data elements

48

Data Challenges and Discrepancies

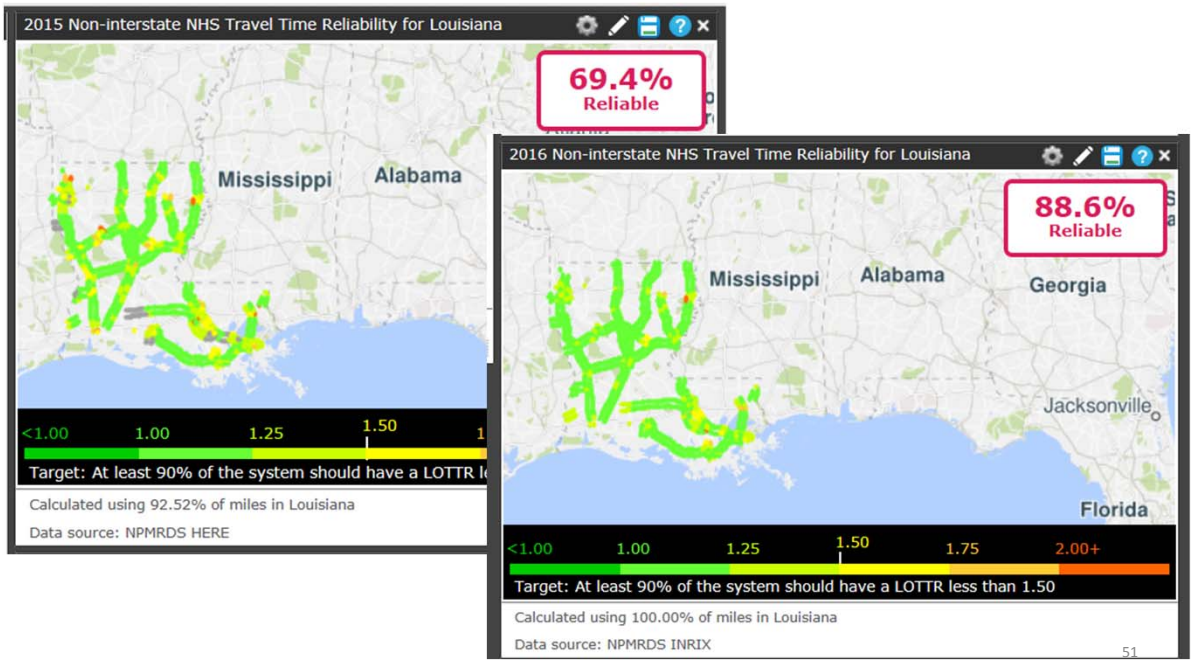
- 2012 to 2015 measures were calculated using NPMRDS version 1 data (HERE data)
- 2016 & 2017 measures were calculated using NPMRDS version 2 data (Inrix data)
- v1 and v2 data do not match and results are not always comparable
  - Speed filtering: v1 no filtering, v2 removed speeds less than 3 mph
  - Data collection: v1 collected as "pings" of instant speed, and v2 is collected as travel time between two points
  - Changes in traffic message channels (TMC): i.e. shorter segments used in v2
  - Network coverage: v1 < 100%, v2 ~ 100%
- FHWA guidance changes, as recent as April 27th, 2018

49



% of Person-Miles Traveled That Are Reliable (Non-Interstate NHS)

50



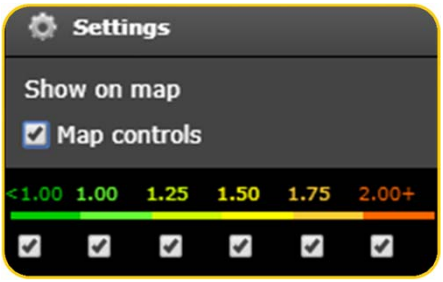
General Guidance

- **Do NOT be overly ambitious.**
  - FHWA isn't looking for aspiration targets akin to FHWA's zero-deaths goal.
  - Keep it realistic, know that the feds aren't going to ding you for missing the target, but they are going to look to see if you're moving in the right direction.
- **Look at your history.**
  - The RITIS NPMRDS tools allow you to see your performance over many years, and you should leverage the tools to see if you are already trending in a particular direction.

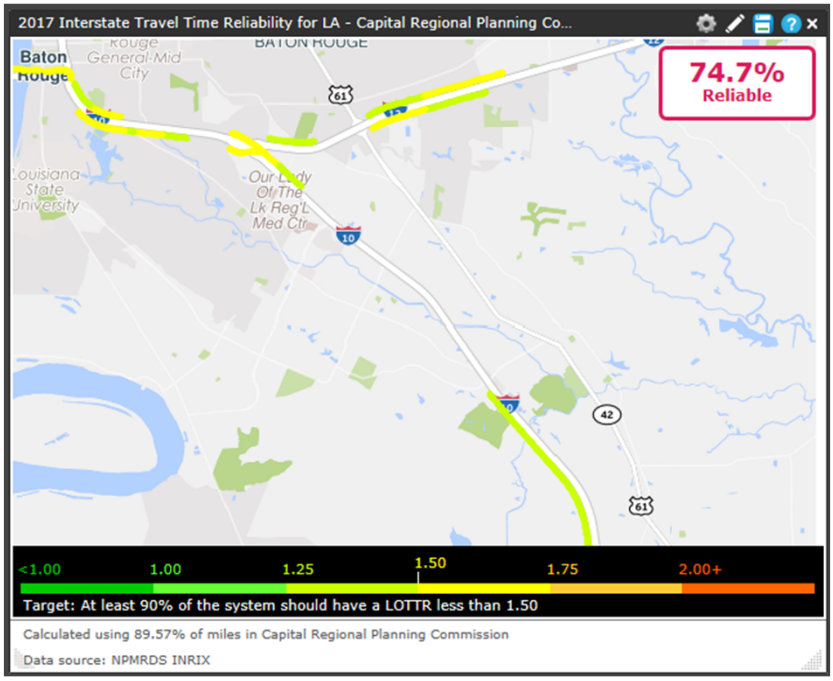
52

General Guidance

- **Consider what will/might change in the future**.
  - Do you already have construction or mitigation projects planned out for the next 5-years?
    - Where are they? Which segments will they impact? Which segments have been changing over the years, and in which direction?
    - Are those segments on the cusp of performing acceptably (or vice versa)?
- **Ignore extreme segments.**



53



54

55

Questions?

Live demo?

56

Shameless Plug…

LOUISIANA CTPP TRAINING OPPORTUNITY

May 15, 16, 2018 (Tuesday, Wednesday)

FREE Census Transportation Plannning Products Program (CTPP)

TTEC Transportation Training & Education Center

4099 Gourier Ave., Baton Rouge, LA 70808

Contact Kirk Zeringue LTRC Special Studies Research Administrator for site or registration questions Kirk.Zeringue@la.gov

Subjects Covered:

- Dealing with Data Issues
- Transportation Data and How to Get it
- What Kind of Data is Collected
- Census and CTPP Geography, Understanding It and Using It
- CTPP Data Access Software

Hands on training for MPO's or anyone working in long range planning, congestion management, travel forecast

AASHTO CTPP Census Transportation Planning Products

57