Mobility Performance Management (or at least Measurement)

Peter Rafferty

Great Lakes Regional Transportation Operations Coalition (GLRTOC)

September 2016

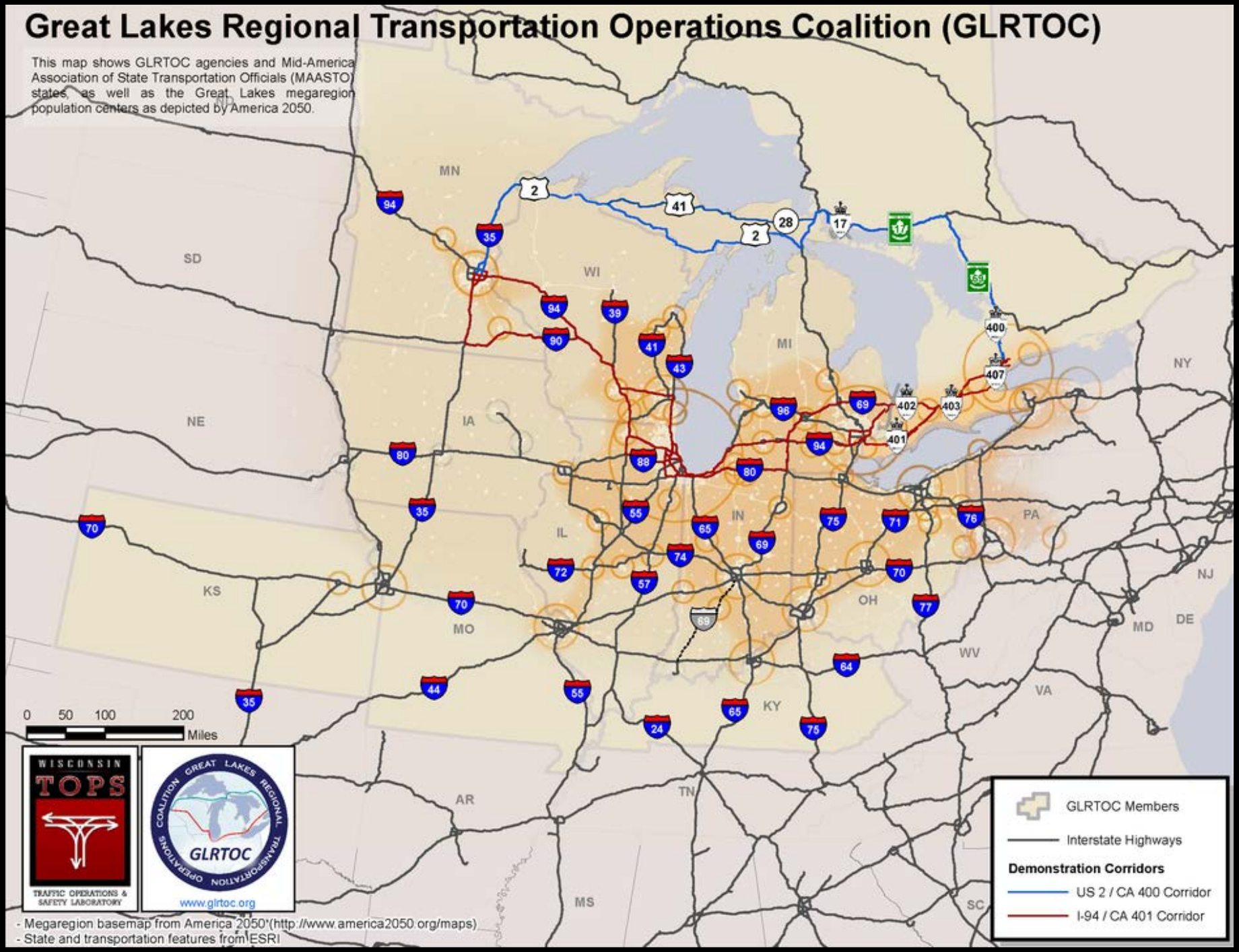
WISCONSIN TOPS

Wisconsin Traffic Operations and Safety Laboratory

WISCONSIN
UNIVERSITY OF WISCONSIN–MADISON

Great Lakes Regional Transportation Operations Coalition (GLRTOC)

This map shows GLRTOC agencies and Mid-America Association of State Transportation Officials (MAASTO) states, as well as the Great Lakes megaregion population centers as depicted by America 2050.



WISCONSIN TOPS
TRAFFIC OPERATIONS & SAFETY LABORATORY

GREAT LAKES REGIONAL TRANSPORTATION OPERATIONS COALITION
GLRTOC
www.glrtoc.org

- Megaregion basemap from America 2050*(http://www.america2050.org/maps)
- State and transportation features from ESRI

Source: Cape Chamber of Commerce

Measuring/Managing…

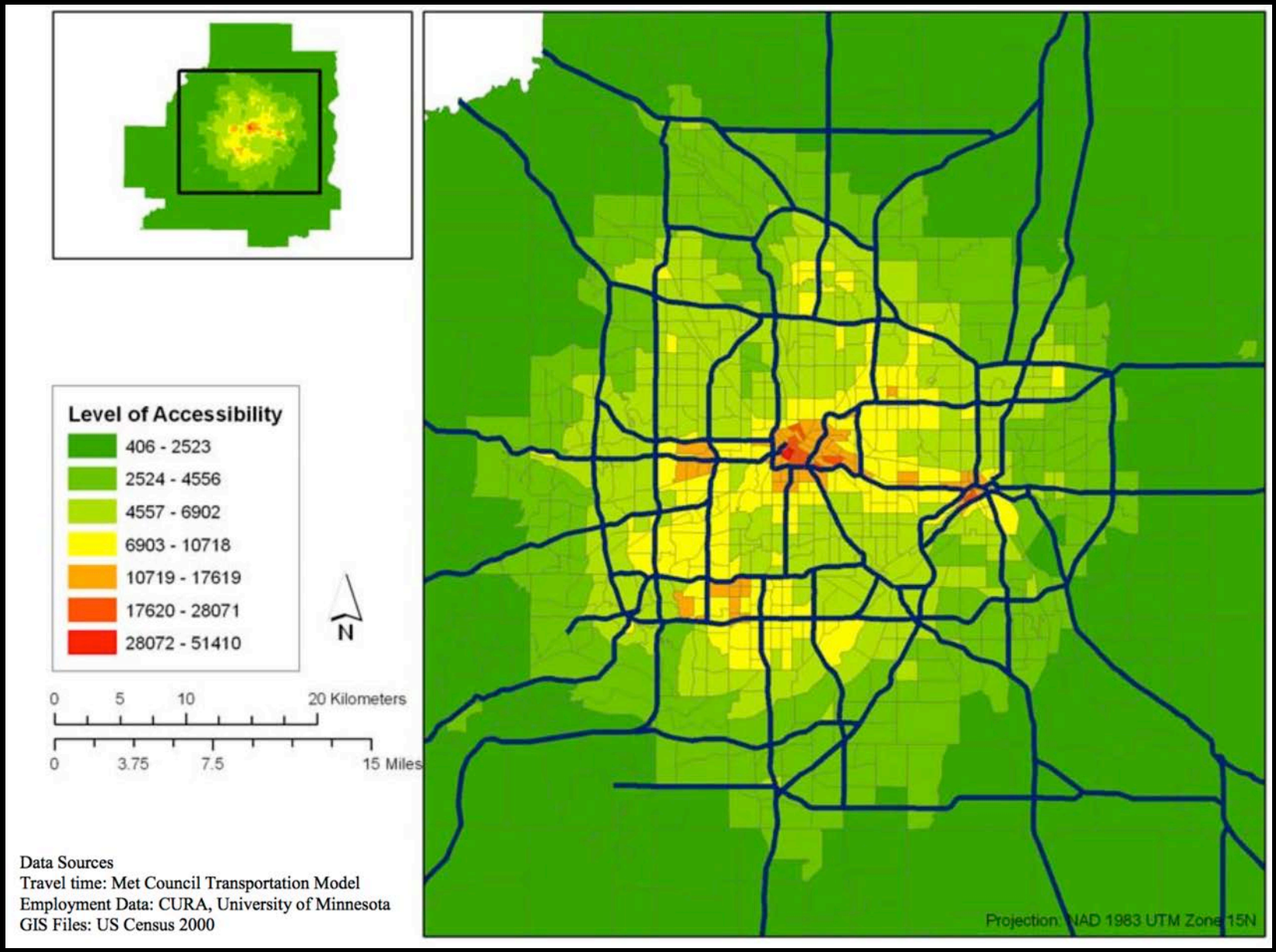
- Delay
  - freight, passenger
  - work zone
  - signal
- Reliability
  - which metric?
- Transit Accessibility
- Transit Productivity
- Bicycle and Pedestrian
  - mode share
  - activity and safety
  - level of service
- Carbon Intensity
- Emissions
- Fuel Consumption
- VMT
  - per capita
  - per lane mile
- Mixed Land Uses
- Transportation Affordability
- Benefits by Income Group
- Land Consumption
- Average Vehicle Occupancy
- On-Time Performance
- Person Throughput
- Incident Response
- Calls / Visits
- Crashes
  - severity
  - frequency
  - rate
  - secondary
- Fluidity
- And so on
- And on
- Etc.
- Etc.

What About…

- Access
- Equity
- Efficiency
- Agility
- Social Costs

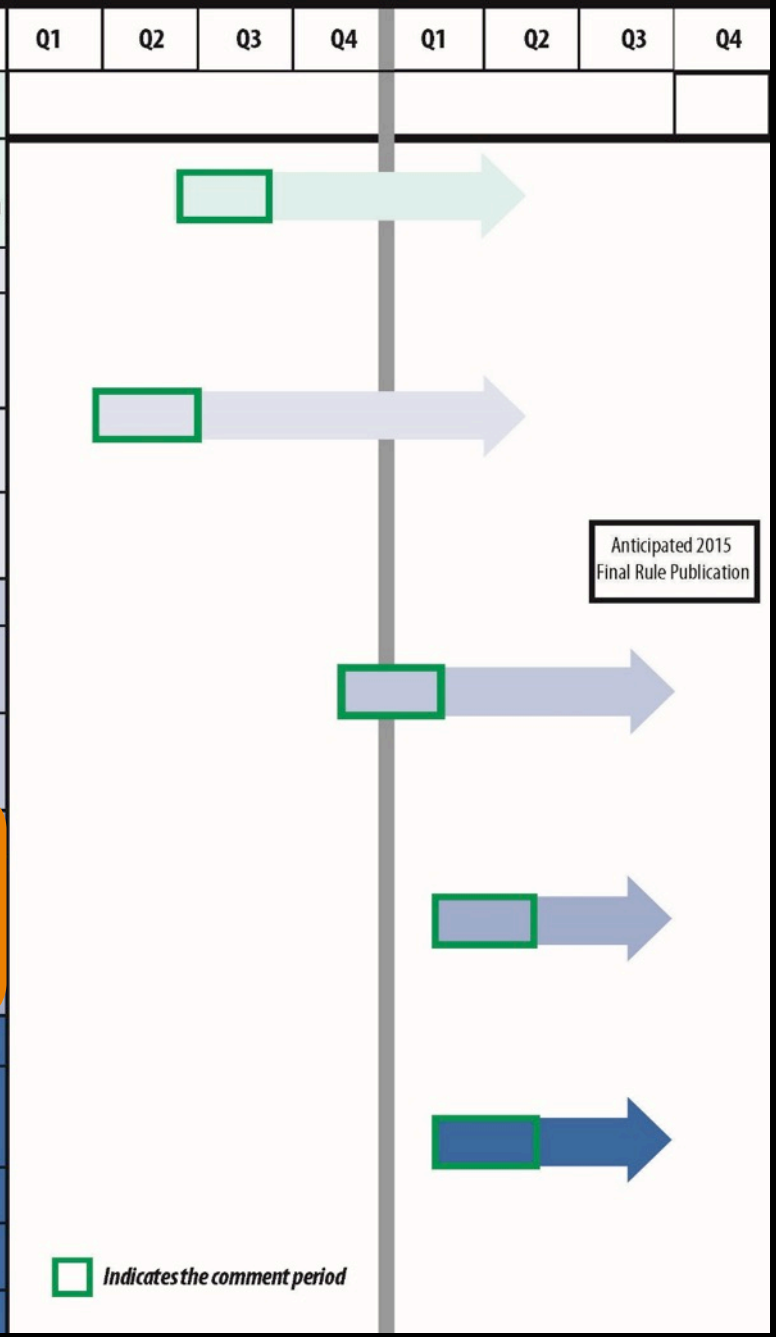
- Output vs Outcomes
  - vs consumption
- Management, not just Measurement

Access to Destinations

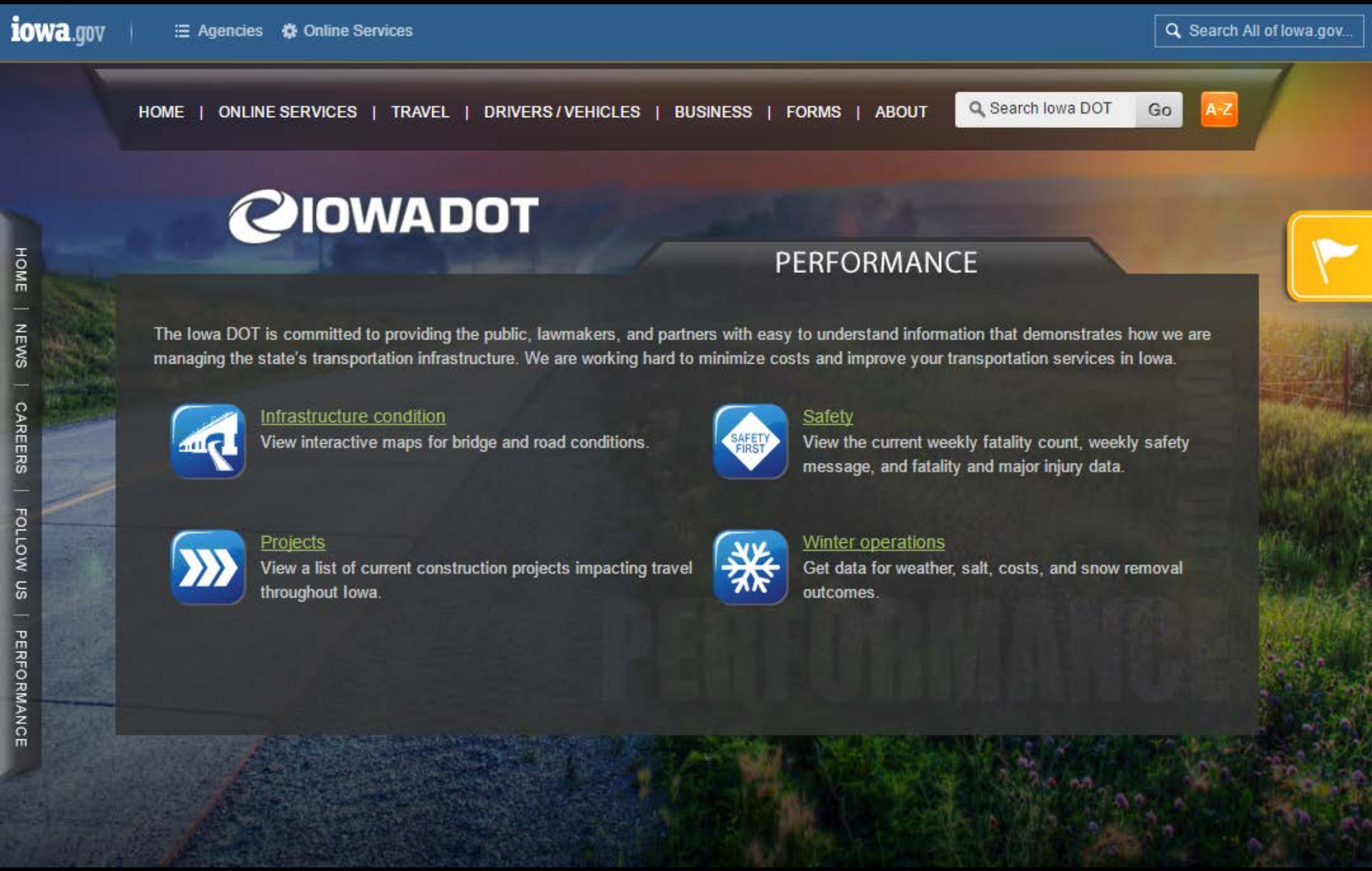


Source: U of MN / CTS / David Levinson / NEXUS Research Group

USDOT Implementation of MAP-21 Performance Provisions: Ten Interrelated Rules



Planning	
Metropolitan and Statewide Planning Rule	• Establish a performance-based planning process at metropolitan and state level. • Define coordination in the selection of targets, linking planning and programming to performance targets.
Highway Safety	
Safety Performance Measure Rule	• Propose and define fatalities and serious injuries measures, along with target establishment, progress assessment and reporting requirements. • Discuss the implementation of MAP-21 performance requirements.
Highway Safety Improvement Program (HSIP) Rule	• Integration of performance measures, targets, and reporting requirements into the HSIP. • Strategic Highway Safety Plan updates.
Highway Safety Program Grants Rule * * Interim Final Rule issued by NHTSA in January 2013.	• State target establishment and reporting requirements. • Highway safety plan content, reporting requirements, and approval.
Highway Conditions	
Pavement and Bridge Performance Measure Rule	• Propose and define pavement and bridge condition measures, along with minimum condition standards, target establishment, progress assessment and reporting requirements.
Asset Management Plan Rule	• Contents and development process for asset management plan. • Minimum standards for pavement and bridge management systems.
Congestion/System Performance	
System Performance Measure Rule	• Define performance of the interstate system, non-interstate national highway system, and freight movement on the interstate system. • Finalize interpretation of scope of CMAQ performance requirements, including congestion and on-road mobile source emissions . • Summarize MAP-21 highway performance measure rules
Transit Performance	
Transit Asset Management Rule	• Define state of good repair and establish state of good repair performance measures • Require transit providers to set targets and report on progress • Transit asset management plans
National Transit Safety Program Rule	• Define transit safety criteria and standards • Include definition of state of good repair
Transit Agency Safety Plan Rule	• Transit safety plan content and reporting requirements • Target setting requirements for transit agencies and States



http://www.iowadot.gov/index.html#/performance

Minnesota Department of Transportation

511

Search General Contacts MnDOT A to Z

Performance Measures

Performance Measures Home Contacts

MnDOT transportation performance reporting and management

Annual reports

2014 Annual Minnesota Transportation Performance Report

- Full report (PDF 8 MB)
- Scorecard (PDF)

2014 report cover

re set. For more

ices and priorities. We
stments and

2014 Minnesota Transportation Results Scorecard

Target · Good · Needs Improvement · Poor · MnDOT Primarily Responsible

Measure	Target	Result	Score	Multi-Year Trend	Analysis
Accountability, Transparency & Communication					
Public Trust: Share of survey respondents agreeing with the statement "MnDOT can be relied upon to deliver Minnesota's transportation system"	≥ 80%	84% (2014)		Stable ('10-'14): 85 (2010), 84, 88, 86, 84 (2014)	The majority of Minnesotans trust MnDOT's ability to deliver the transportation system. This result has been stable over the last six years.
Traveler Safety					
Fatalities: Total number of fatalities resulting from crashes involving a motor vehicle	< 300 by 2020	361 (2014)		Improving ('10-'14): 411 (2010), 388, 395, 387, 361 (2014)	Fatalities resulting from vehicle crashes decreased to a historic low in 2014, almost reaching the Toward Zero Deaths target of 350 by 2014. Traffic fatalities in 2014 are 6.7 percent below the previous year and 44.9 percent below 2003 when the TZD program began.
Serious Injuries: Total number of serious injuries resulting from crashes involving a motor vehicle	< 850 by 2020	1,044 (2014)		Improving ('10-'14): 1191 (2010), 1159, 1268, 1215, 1044 (2014)	Serious injuries resulting from vehicle crashes also decreased to a historic low in 2014, dropping over 14 percent from the previous year. Since 2004, the number of serious injuries on Minnesota roadways has fallen by almost 57 percent.
State Highway Asset Management					
Interstate Ride Quality: Share of Interstate system with poor ride quality in the travel lane	≤ 2%	1.9% (2014)		Short-term improvement followed by decline ('11-'18): 4.9 (2011), 2.4, 2.4, 1.9 (2014), 4.2 (2018)	Ride quality improved across all state highways in 2014. Overall, there were 170 fewer miles of highway with poor ride quality in 2014 than in 2013. This enabled MnDOT to meet its ride quality targets on the Interstate system, the non-Interstate National Highway System, and the non-NHS state highways.
NHS Ride Quality: Share of non-Interstate NHS with poor ride quality in the travel lane	≤ 4%	3.0% (2014)		Short-term improvement followed by decline ('11-'18): 5.1 (2011), 4.3, 2.9, 3.0 (2014), 5.3 (2018)	Average remaining service life has risen slightly over the last five years. This is because additional funding allowed MnDOT to construct more long-life fixes.
Non-NHS Ride Quality: Share of non-NHS state highways with poor ride quality in the travel lane	≤ 10%	4.4% (2014)		Short-term improvement followed by decline ('11-'18): 8.6 (2011), 7.5, 6.8, 4.4 (2014), 10.3 (2018)	**Outlook** — The positive pavement condition performance is a temporary result of a series of one-time increases in funding for asset preservation. Assuming current levels of sustained funding, MnDOT expects state highway pavement condition to resume a long-term decline by the end of the decade. Pavement conditions on all three highway systems will likely decline to or beyond target levels by 2018. By 2024, Interstate and NHS pavement conditions will be significantly worse than the targets.
Remaining Service Life: Average remaining service life (the number of years until major repair or replacement is needed)	Tracking indicator	9.7 (2014)	TBD	Improving ('11-'18): 8.6 (2011), 9.1, 9.4, 9.7 (2014), 8.8 (2018)	
NHS Bridge Condition: Share of NHS bridges in poor condition as a percent of total bridge deck area	≤ 2%	4.5% (2014)		Stable and near target ('11-'17): 4.8 (2011), 4.7, 4.3, 4.5 (2014), 4.3 (2017)	NHS bridges in poor condition rose in 2014 compared to 2013. This spike occurred when a condition was temporarily noted on the Blatnik Bridge connecting Duluth and Superior, which has a very large deck area. This condition has since been addressed. After adjustment, the share of NHS bridges in poor condition is 3.1%. The share of non-NHS bridges in poor condition remains well below the state target.
Non-NHS Bridge Condition: Share of non-NHS state highway bridges in poor condition as a percent of total bridge deck area	≤ 8%	1.3% (2014)		Improving and meeting target ('11-'17): 2.0 (2011), 2.1, 3.1, 1.3 (2014), 1.0 (2017)	**Outlook** — The share of NHS bridge deck area in poor condition is expected to remain at or near an acceptable level through 2024.

Measure	Target	Result	Score	Multi-Year Trend	Analysis
Critical Connections					
Twin Cities Freeway Congestion: % of metro-area freeway miles below 45 mph in AM or PM peak	Tracking indicator	21.1% (2014)		Stable ('10-'14): 21.5 (2010), 21.0, 21.4, 19.9, 21.1 (2014)	Congestion returned to its stable five-year level in 2014 after decreasing slightly in 2013. **Outlook** — Congestion is expected to increase as economic activity increases and the region continues to grow.
Interregional Corridor Travel Speed: Percent of system miles operating at more than 2 mph below corridor level speed target	≤ 5%	2% (2013)		Stable and meeting target ('09-'13): 2.0 (2009), 2.0, 2.0, 2.0, 2.0 (2013)	98 percent of IRC system miles have performed at or above target speed in each of the last 10 years. **Outlook** — This measure is expected to remain stable through 2023.
Snow and Ice Control: Frequency of achieving bare lanes within targeted number of hours after a winter weather event	≥ 70%	87% (2014-15)		Stable and meeting target ('11-'15): 79 ('10-'11), 88, 82, 79, 87 ('14-'15)	MnDOT has achieved its statewide snow and ice control target in nine of the last 10 seasons.
Freight Mode Share (by weight and distance): Total domestic shipments to, from or between Minnesota locations in ton-miles	Tracking indicator	322 billion (2012)	N/A	311 (2002), 296 (2007), 323 (2012)	Truck-only trips remain the primary means of shipping goods by value, but the share moved by other modes is increasing. Shipments by ton-miles have shifted from water to rail, truck and pipeline. Trucks tend to carry more valuable freight and make last-mile trips, while long-distance shipments of heavier, less valuable goods tend to be made by other modes.
Freight Mode Share (by value): Total domestic shipments to, from or between Minnesota locations in 2007 dollars	Tracking indicator	$451 billion (2012)	N/A	$388 (2002), $434 (2007), $451 (2012); Truck, Rail, Water, Multiple modes, Pipeline, Other	
Air Transportation: Number of available seat miles (ASM) offered on scheduled flights from MSP Airport	Tracking indicator	20.4 billion (2014)	N/A	Improving ('10-'14): 19.4 (2010), 19.4, 19.1, 19.8, 20.4 (2014)	Available seat miles increased in 2013 and 2014, reversing an 8-year declining trend caused by economic and airline industry conditions. **Outlook** — Moderate growth in ASM is expected to continue.
Twin Cities Transit Ridership: Boardings recorded by public transit providers serving metro-area counties	145-150 million by 2030	97.6 million (2014)		Improving and meeting target ('10-'14): 91.0 (2010), 93.9, 93.9, 94.3, 97.6 (2014)	Metro-area transit ridership increased by 3.5 percent in 2014 and is on track to meet its goal of doubling 2003 ridership by 2030. **Outlook** — Ridership growth is expected to accelerate as development occurs along key transitways and transit services improve.
Greater Minnesota Transit Ridership: Boardings recorded by public transit providers serving Greater Minnesota	15 million by 2015	12.1 million (2014)		Not meeting target ('10-'14): 11.1 (2010), 11.5, 11.6, 11.9, 12.1 (2014)	Transit ridership in Greater Minnesota grew to record highs of 12.1 million boardings in 2014, but ridership continues to fall behind legislative targets. **Outlook** — Continued ridership growth is expected, but at a rate that is insufficient to achieve the legislative targets of meeting 80% of needs by 2015 and 90% by 2025.
Bicycling: % of survey respondents who bicycled at least once a week during the bicycling season (April - October)	Tracking indicator	18% (2014)	N/A	Declining ('10-'14): 21 (2010), 21, 20, 25, 18 (2014)	The percentage of Minnesotans riding a bicycle at least weekly dropped by 28% from last year's historical high, driven primarily by fewer Minnesotans riding once per week. Daily bicycle riding levels have remained steady between 3% and 4% since 2006.
Pedestrian Accessibility: State highway sidewalk miles that are not compliant with ADA requirements	Tracking indicator	54% (2014)	N/A	336 sidewalk miles (54%) non-compliant (only one year of data available)	MnDOT completed a condition and ADA compliance assessment of sidewalks along its right of way in 2013. Of 620 miles of sidewalk, 54% were non-compliant due to narrow width, steep cross slope, barriers, or poor condition.
Transportation in Context					
Fuel Use: Total gallons of fuel sold for transportation (indicator of vehicle emissions)	Tracking indicator	3.10 billion (2014)	N/A	Stable ('10-'14): 3.08 (2010), 3.04, 3.07, 3.05, 3.10 (2014)	Fuel use increased slightly in 2014 and has remained generally stable since peaking in 2004. Improving vehicle fuel efficiency and changing travel behavior have offset increases in population and economic activity to result in a stable five-year trend.

http://www.dot.state.mn.us/measures/

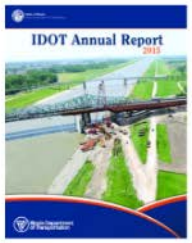
Performance

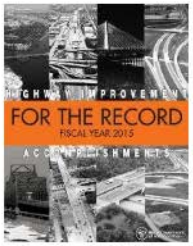
IDOT is committed to being accountable to the public for our work, and being transparent and open to scrutiny in the ways we go about doing that work. At IDOT, we represent and try to meet the best interests of all Illinois citizens, while providing efficient and effective travel options for businesses, industry, tourists, and individual travelers of every description.

Through the work we do, we strive to serve as an advocate and trusted adviser to state, local, and federal governments and other community agencies and partners involved in providing transportation access and services for all of Illinois. We invite you to visit the Reports section as well as the Awards and Recognition section below to see the work IDOT is doing and some direct results of that work.

Awards & Recognition | Reports

Reports





http://www.idot.illinois.gov/about-idot/our-story/performance/index

Kansas Department of Transportation

PERFORMANCE MEASURES

Show navigation

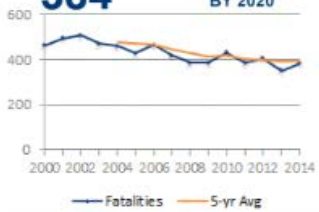
Safety

Fatalities | Injuries | Seat Belts

Annual number of fatalities:

2014: **384**

TARGET: **CUT IN HALF BY 2020**



More details

KDOT Safety Home

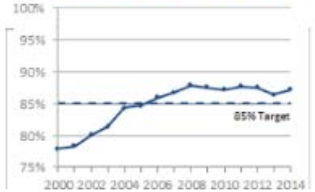
Bridges

Bridges

Percent of bridges in good condition

2014: **87.2%**

TARGET **85%**



More details

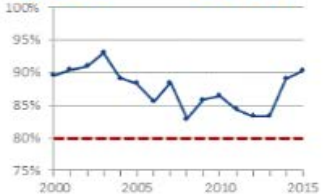
Pavement

Non-Interstates | Interstates

Percent of pavement in good condition

2015: **90.3**

Minimum Performance Threshold **80%**



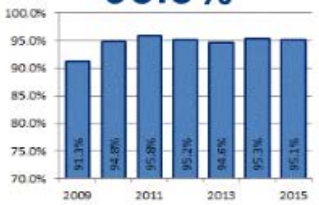
More details

Program Delivery

On-Time | On-Budget

Percent of highway construction projects completed early or on-time

2015: **95.3%**

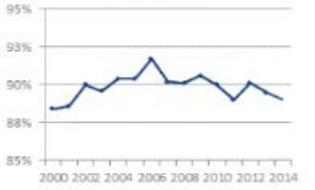


Operations

MQA

The MQA program measures the level of service of KDOT's maintenace efforts.

2014 **89%**



Modes

Modes

Number of counties with public transit:

2015: **83**

Perecent of short-line track that can accommodate 286,000-lb cars

2015: **65%**

https://kdotapp.ksdot.org/perfmeasures/

MDOT Michigan Department of Transportation

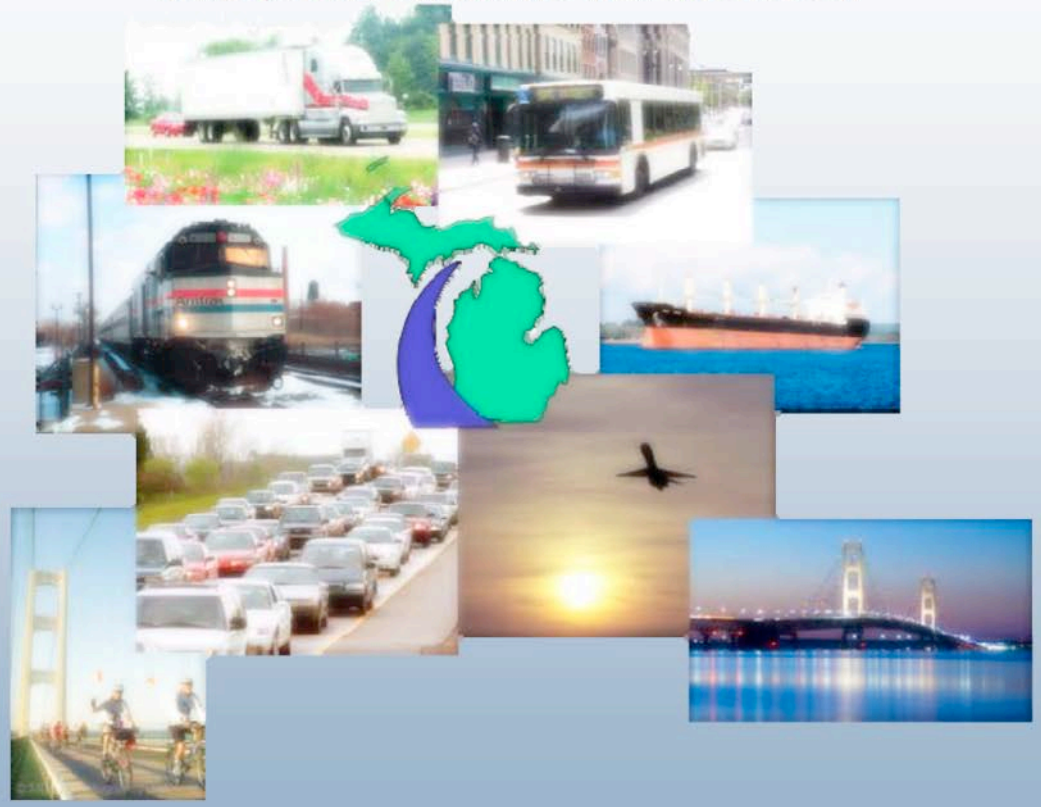
Transportation System Performance Measures

Last Updated 06/01/2016

Home Back Zoom

- Overview »
- Condition Trends »
- Measures by Goal Area »

2016 System Performance Measures Report



The purpose of this report is to provide data on the condition and performance of Michigan's publicly-owned* transportation system.

Full Screen On/Off Send Feedback

*All performance measures in this report refer to assets owned, maintained, or financed (in whole or in part) by the Michigan Department of Transportation.

http://www.michigan.gov/mdot/0,4616,7-151-9622_11045_25024_75677---,00.html

Mobility: July 2016

- MAPSS Performance Improvement program
- Mobility
- Accountability
- Preservation
- Safety
- Service
- Additional measures
- Archives
- Lean government initiative
- Contacts
- Budget
- Open Book

Wisconsin Department of Transportation
MAPSS Performance Scorecard

✓ Goal has been met ↑ Performance is trending in a favorable direction ↔ Trend is holding ↓ Performance is trending in an unfavorable direction

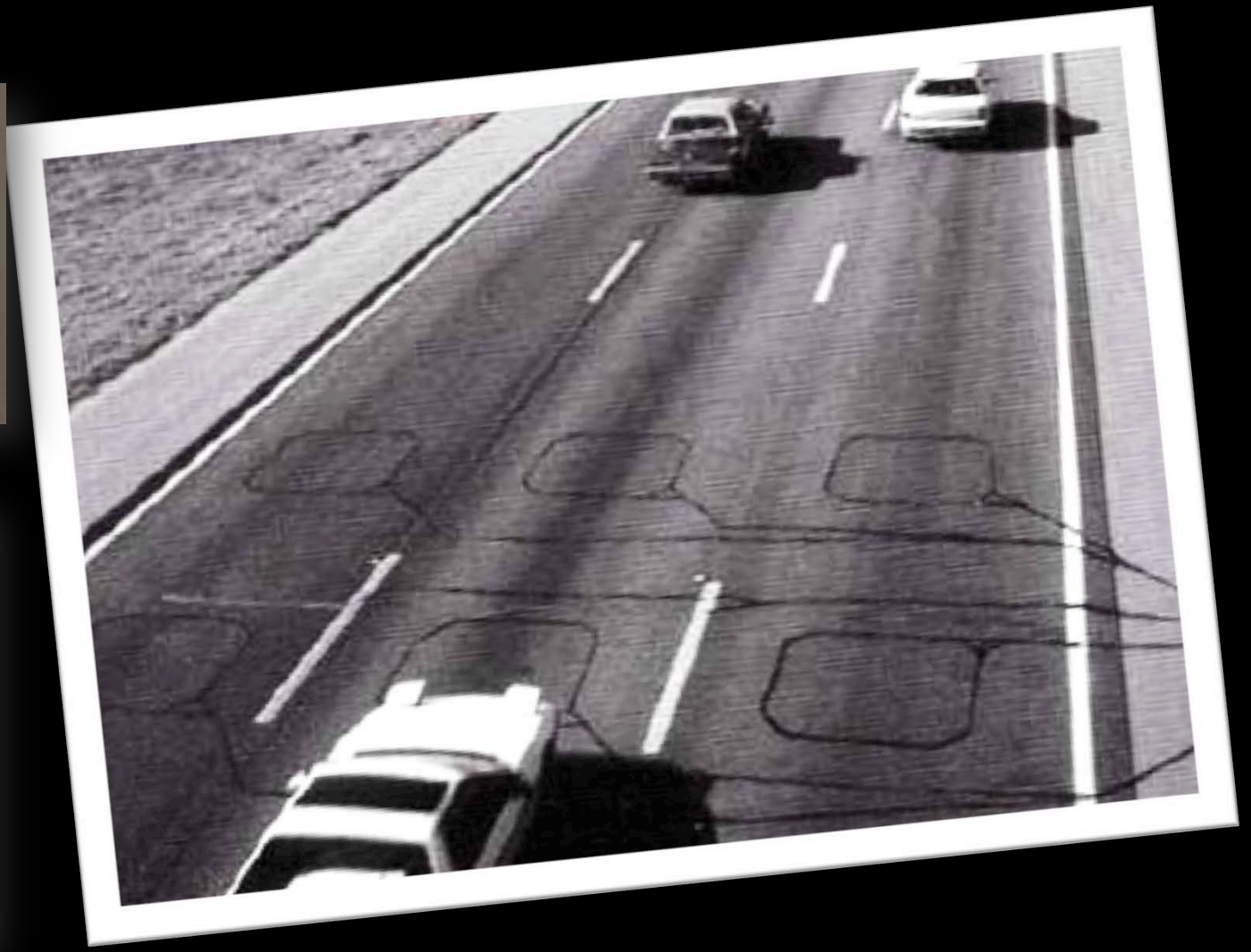
Performance measure	How we measure it	Current report period	Goal	Goal met	Trend	Comments
Mobility: Delivering transportation choices that result in efficient trips and no unexpected delays.						
Delay (hours of vehicle delay) Seasonal quarter Spring 2016	Number of hours spent in interstate traffic below posted speed	4,324,630 hrs.	1,464,331 hrs.		↓	Vehicle delay increased compared to spring 2015. The change in speed limit from 65 to 70 mph and the inclusion of 132 miles of I-41 appear to be the major contributing factors (a lower number is better).
Reliability(planning time index) Seasonal quarter Spring 2016	Index based on extreme travel time in a period	1.18	1.10		↓	The planning time index increased this spring quarter with all corridors seeing an increase in their planning time index (a lower number is better).
Transit availability Calendar year 2015	Percent of population served by transit	53.0	55.0		↓	There was a one percent decrease from 2014 to 2015. This decrease is largely the result of

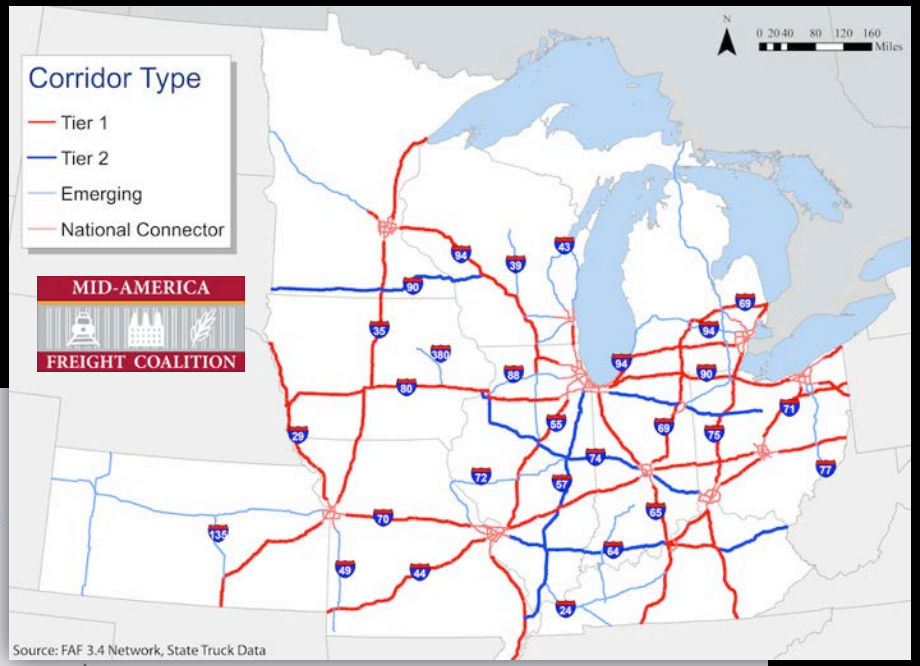
http://wisconsindot.gov/Pages/about-wisdot/performance/mapss/

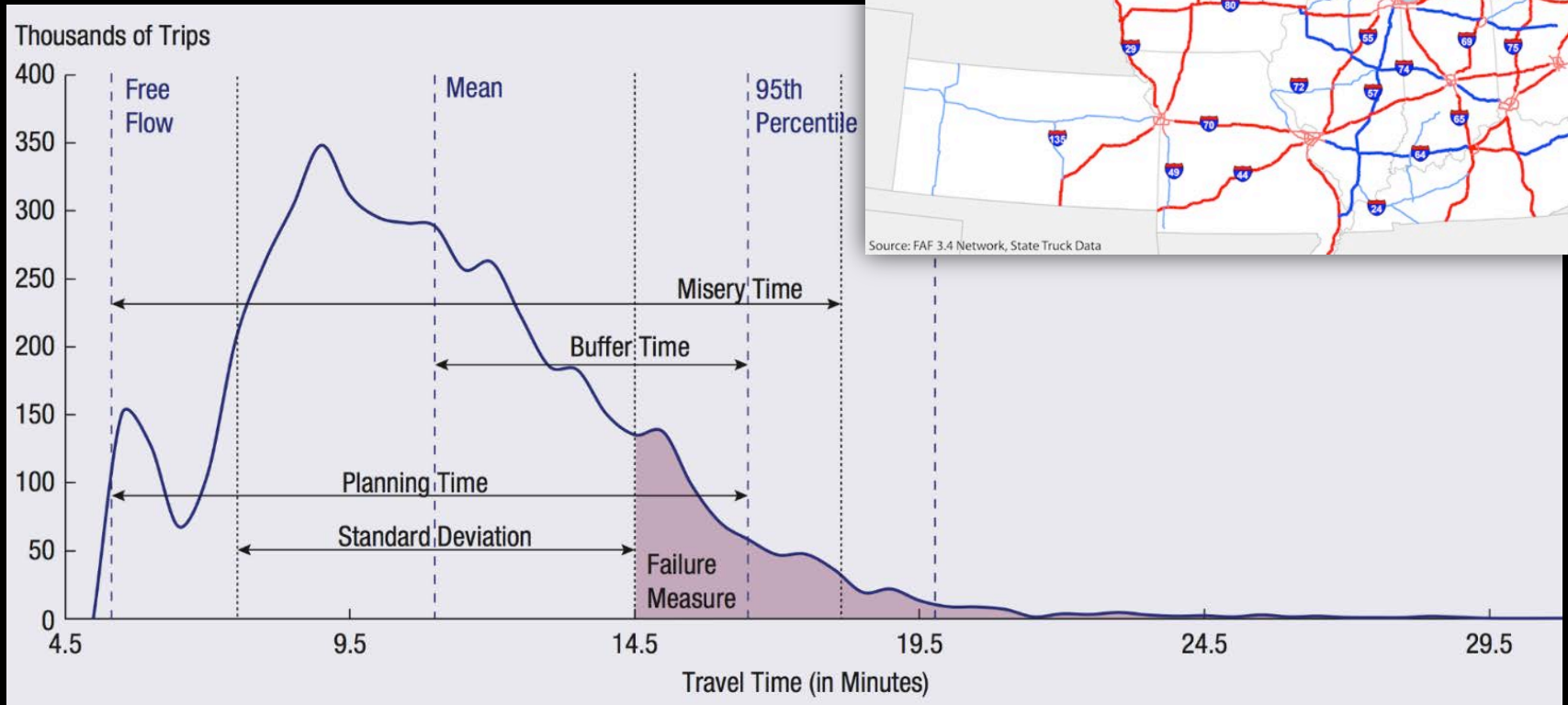
Fortran

AUTOMATIC CODING SYSTEM

FOR THE IBM 704

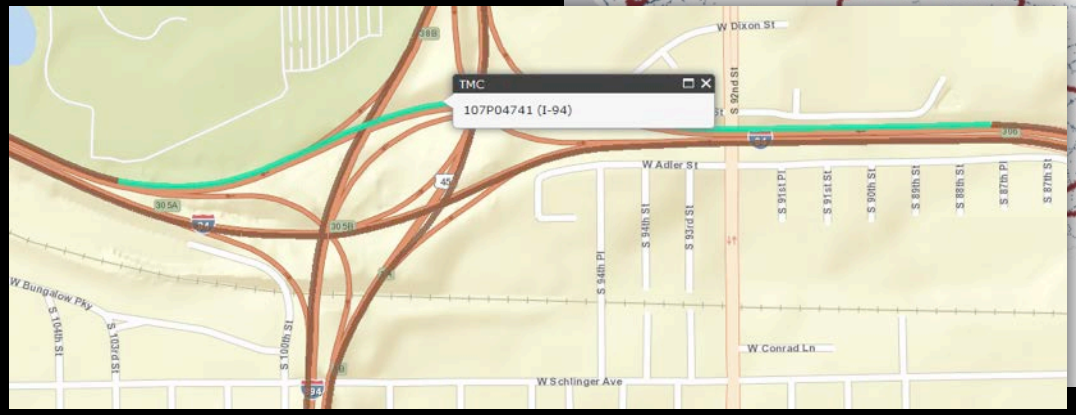


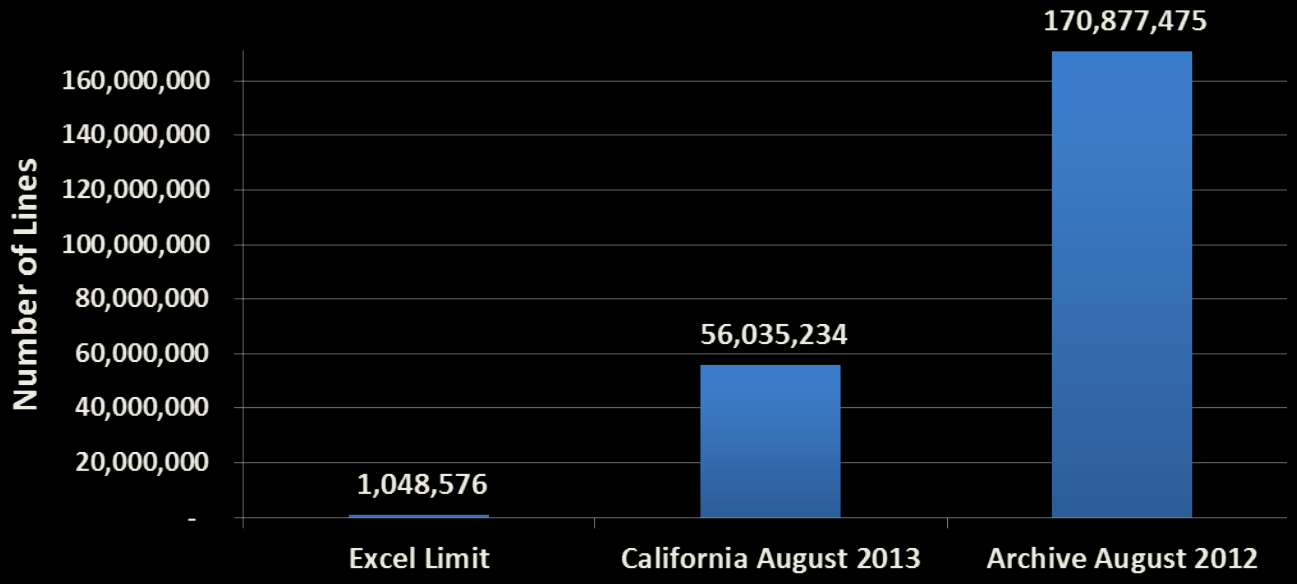




MEASURE	CALCULATION	DESCRIPTION
Planning Time Index* (PTI)	$\frac{95th\ Percentile\ of\ TT}{Free\ Flow\ TT}$	The extra time required to arrive at a destination "on time" 95 percent of the time. Can be calculated for trips, corridors, or segments. **The PTI is the recommended measure because it gives intuitive and consistent results.**


Vancouver
Seattle
Portland
Minneapolis
Lake Superior
Lake Huron
Ottawa
Montreal
Detroit
Denver
Washington
Monterrey
Gulf of Mexico
Miami


TMC
107P04741 (I-94)
W Dixon St
W Adler St
W Conrad Ln
W Schlinger Ave
W Bungalow Pky
S 92nd St
S 91st Pl
S 91st St
S 90th St
S 89th St
S 88th St
S 87th Pl
S 87th St
S 94th Pl
S 94th St
S 93rd St
S 104th St
S 100th St
45
30SA
30SB
94


Excel Limit Compared to One Month of Travel Times
Number of Lines
160,000,000
140,000,000
120,000,000
100,000,000
80,000,000
60,000,000
40,000,000
20,000,000
-
1,048,576
56,035,234
170,877,475
Excel Limit
California August 2013
Archive August 2012

Map Online at
www.glrtoc.org/operations/performance

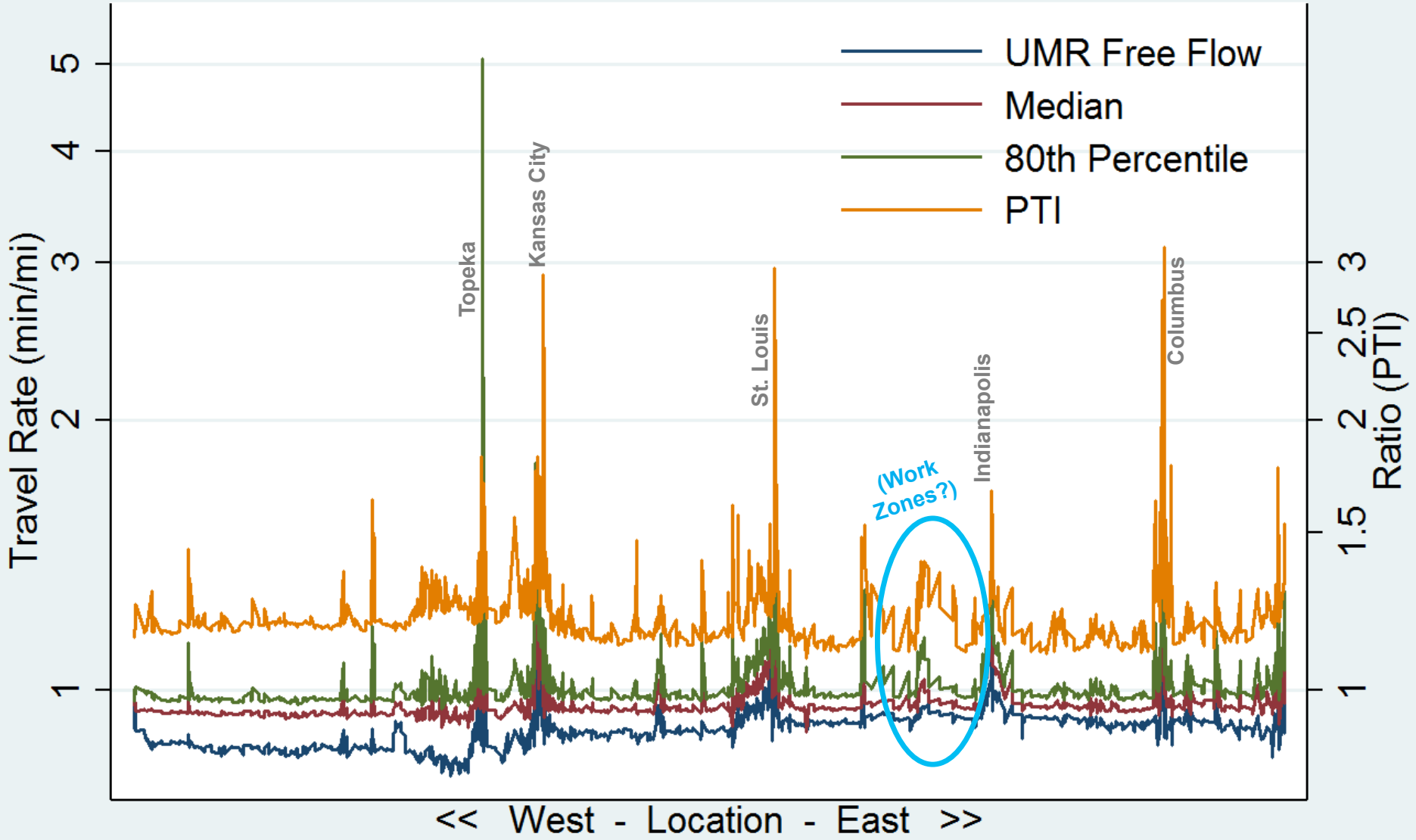
Freight Mobility Performance

I-70: Mobility Threshold (45 MPH)

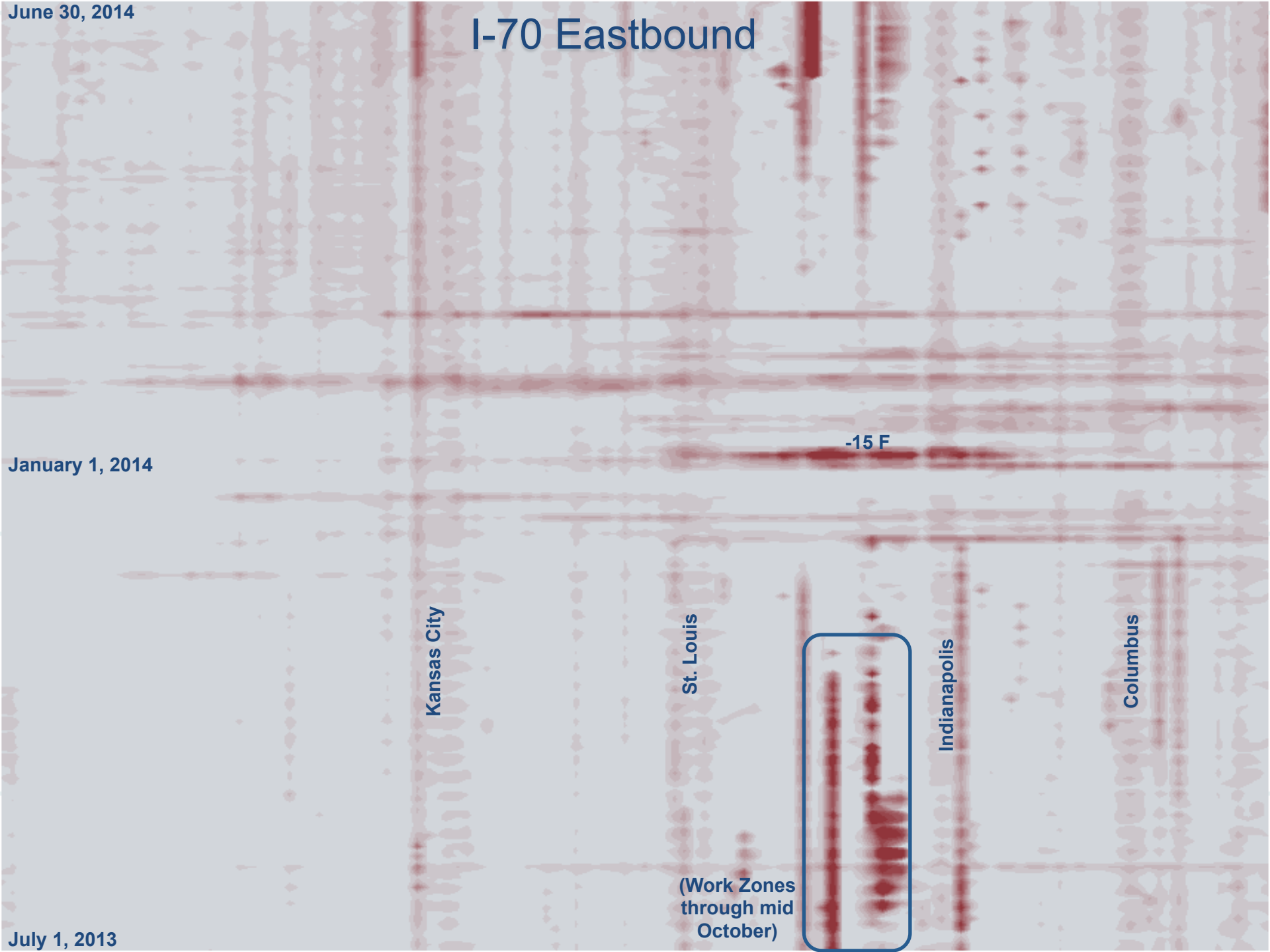
Source: NPMRDS, weekday non-holiday peak periods, ten-state Mid-America region

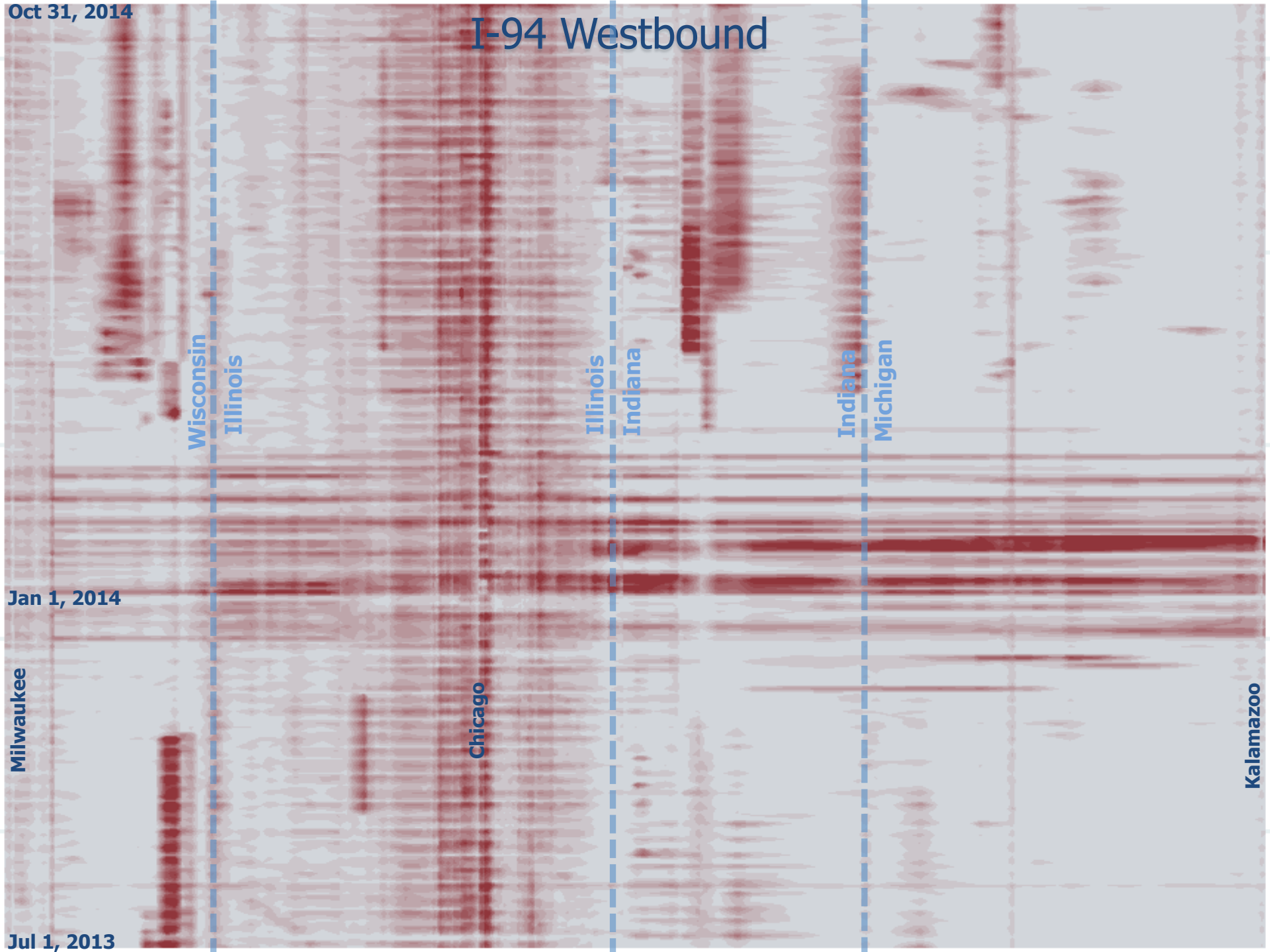
I-70 Mobility Measures

Kansas - Missouri - Illinois - Indiana - Ohio

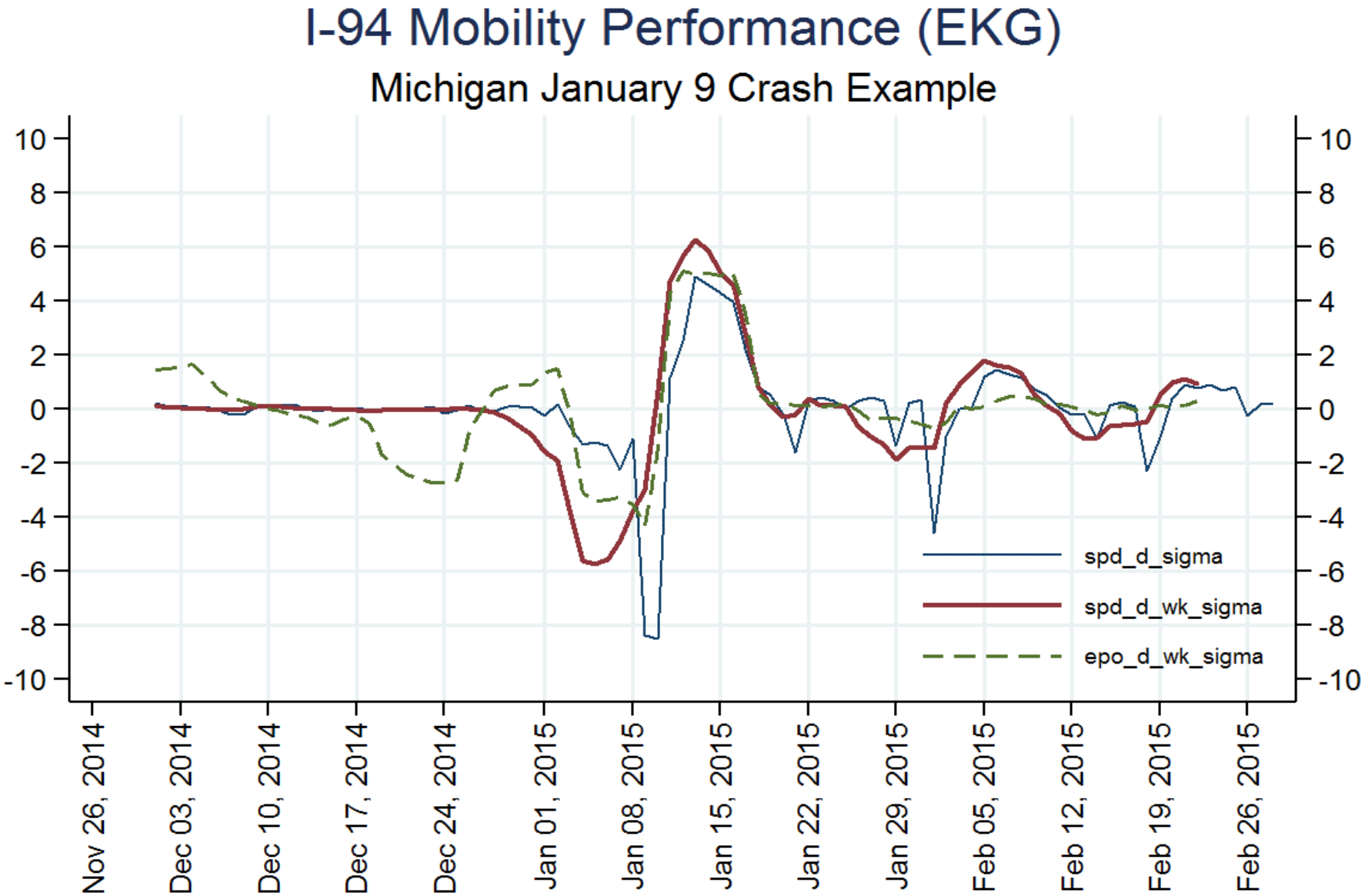


Source: NPMRDS 7/1/13-6/30/14 (~1200 miles)

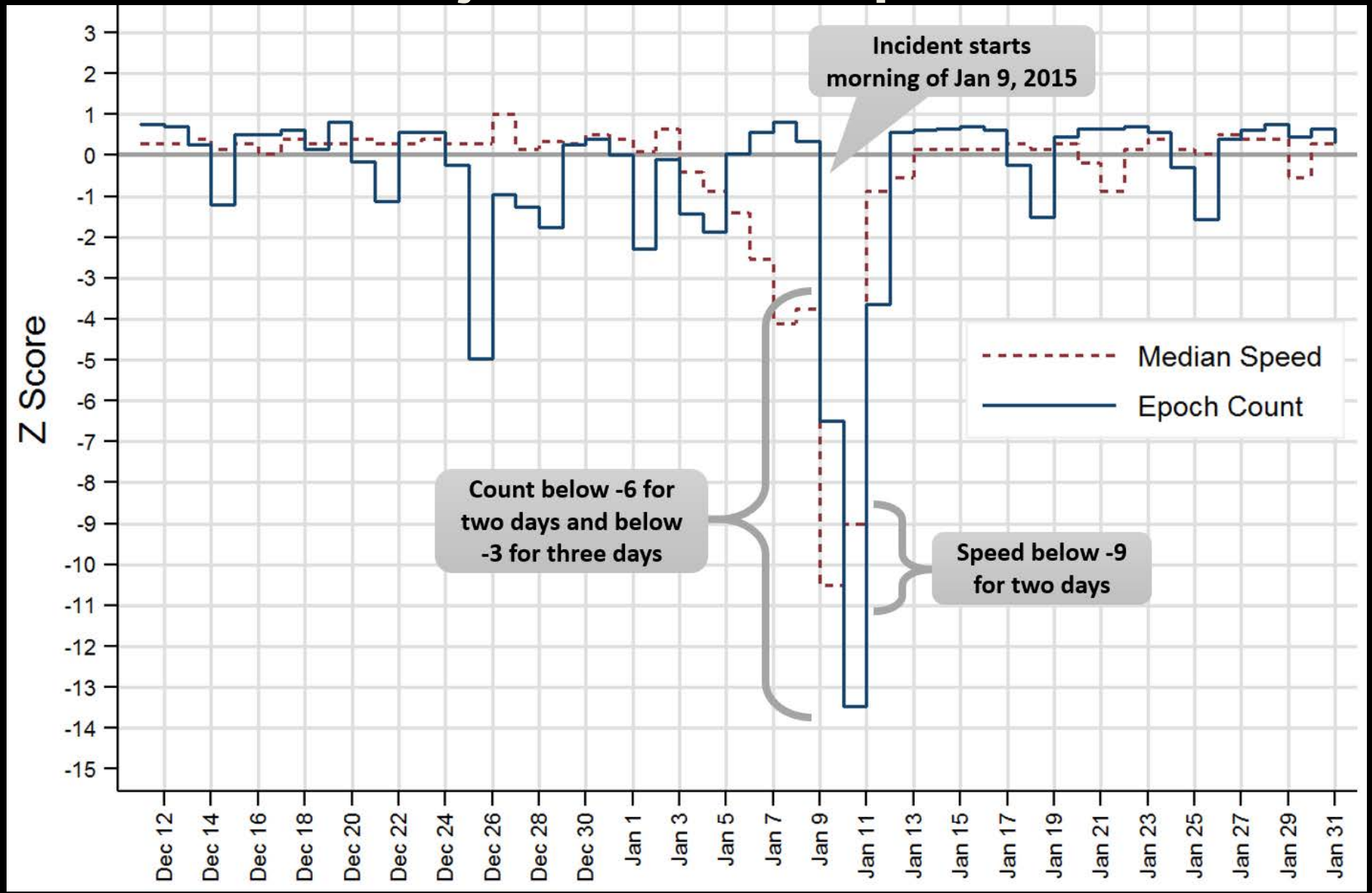

June 30, 2014
I-70 Eastbound
January 1, 2014
-15 F
Kansas City
St. Louis
Indianapolis
Columbus
(Work Zones through mid October)
July 1, 2013


I-94 Westbound
Oct 31, 2014
Jan 1, 2014
Jul 1, 2013
Milwaukee
Wisconsin
Illinois
Chicago
Illinois
Indiana
Indiana
Michigan
Kalamazoo

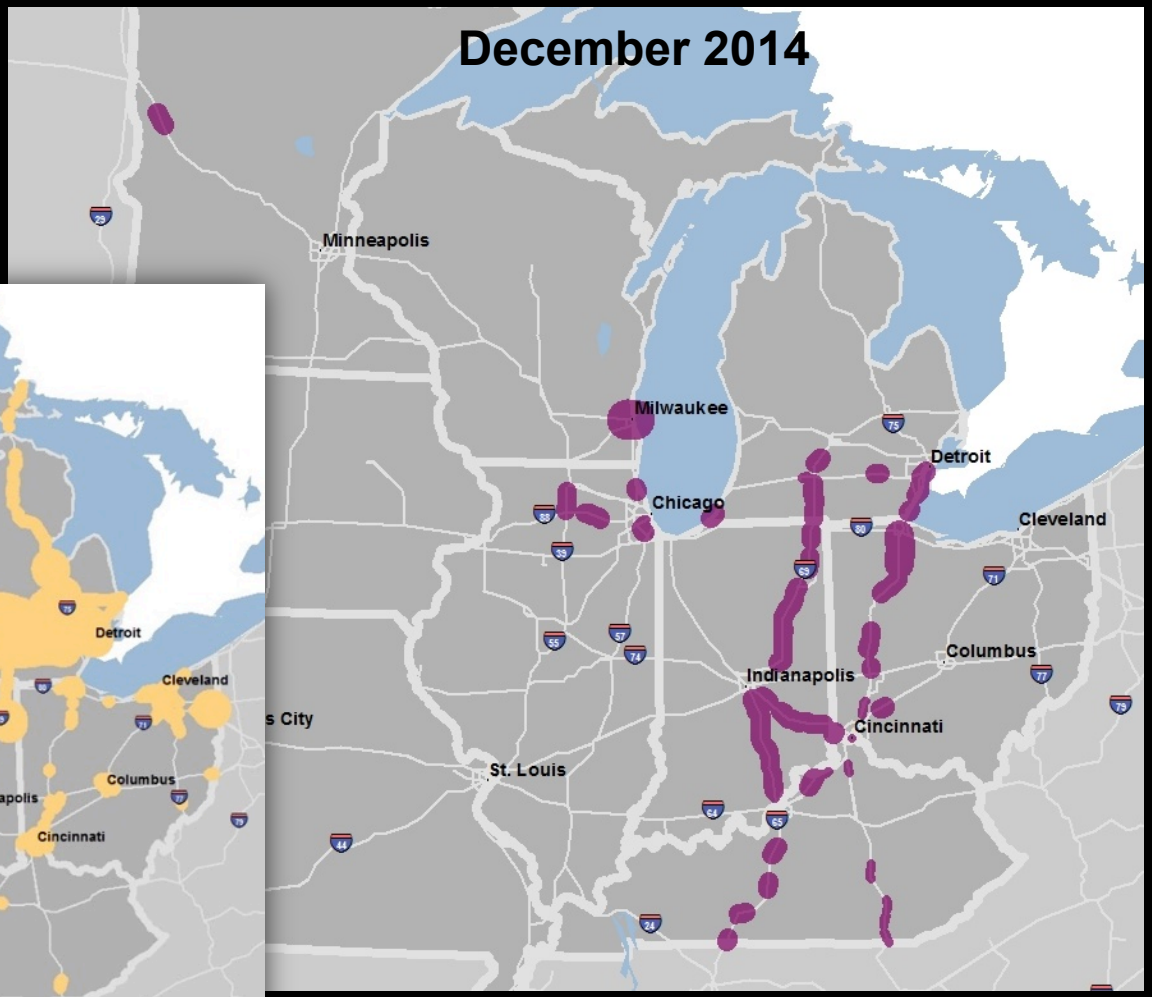
Mobility Scanner
Major Incident Example

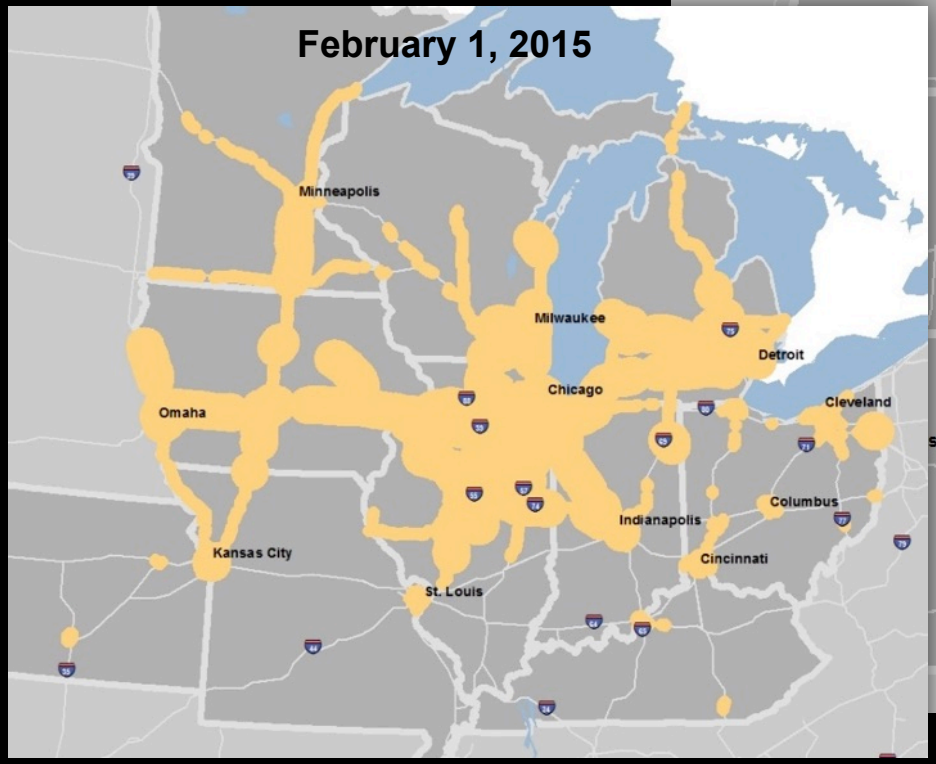


Mobility Scanner
Major Incident Example



Mobility Scanner
Monthly Performance Reporting





MAPSS Performance Improvement

Summary | By Corridor | User Delay Cost | Corridors

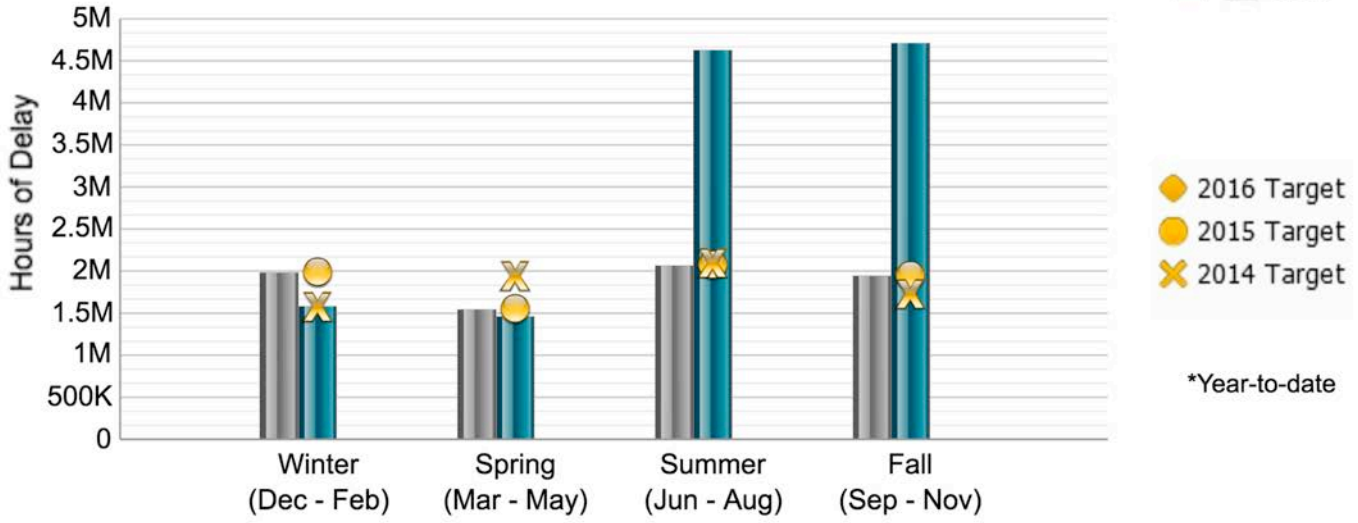
Congestion in Downtown Milwaukee

511 Wisconsin Travel Info www.511wi.gov

www.511wi.gov

Hours of Vehicle Delay

Statewide



*Year-to-date

2015 Total Hours of Delay = 12,385,773 hours (Total User Delay Cost Statewide is $386,973,051)
2014 Total Hours of Delay = 7,544,332 hours (Total User Delay Cost Statewide is $233,838,266)

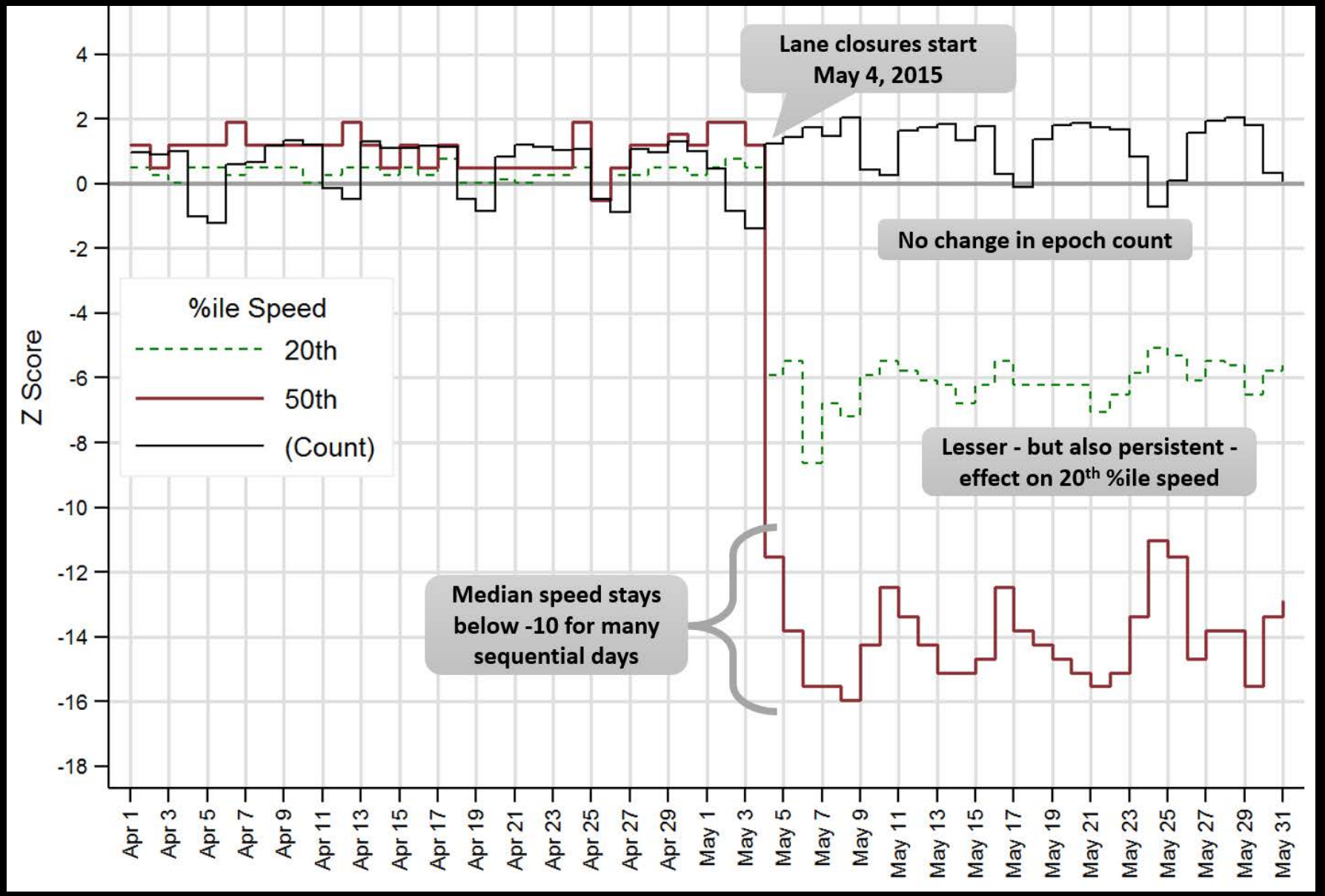
**The sharp increase in user delay was primarily caused by adding I-41 and increasing the speed limit from 65 to 70 mph in June 2015.

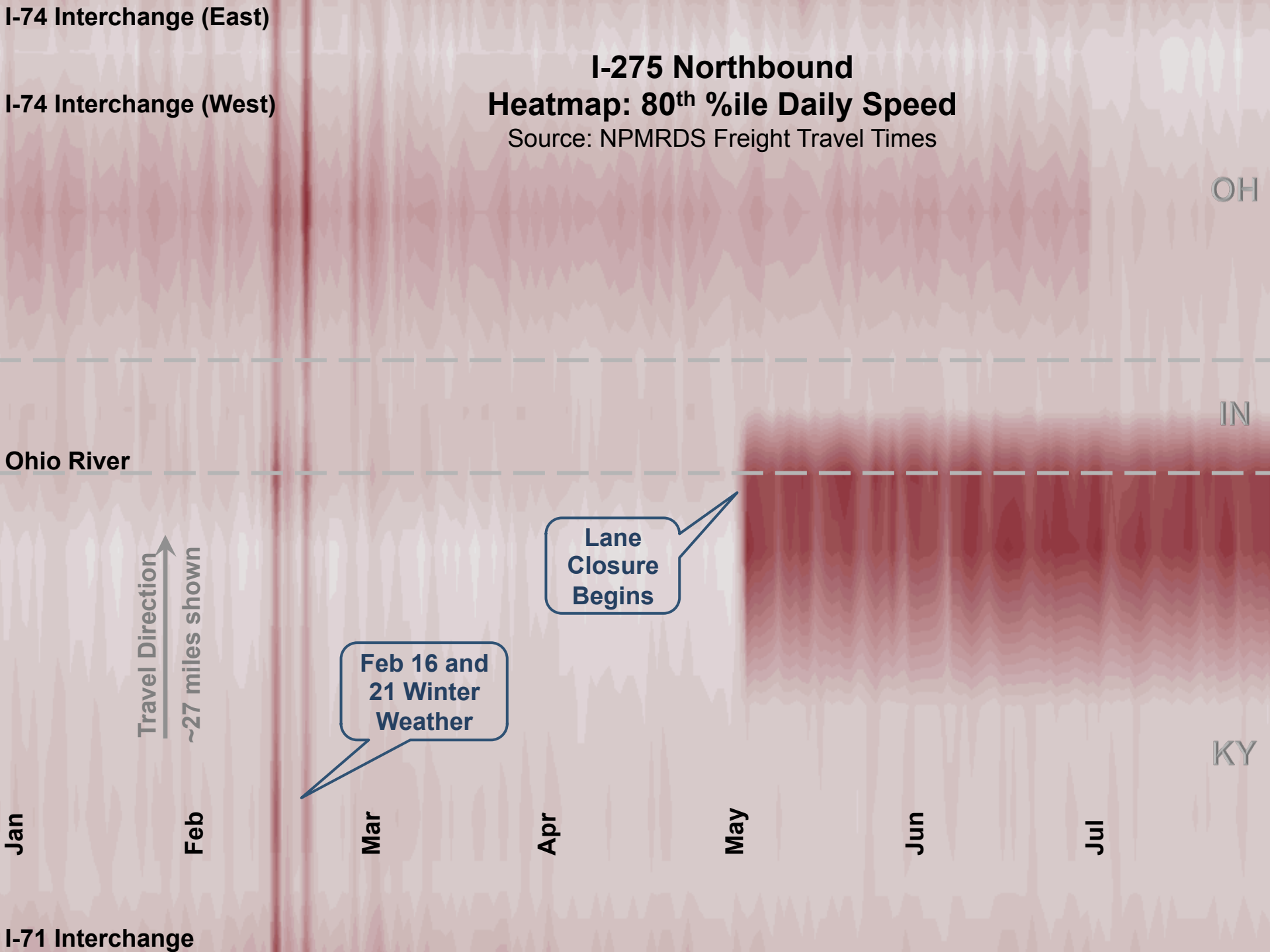
I-275 Carroll Cropper Bridge Across Ohio River

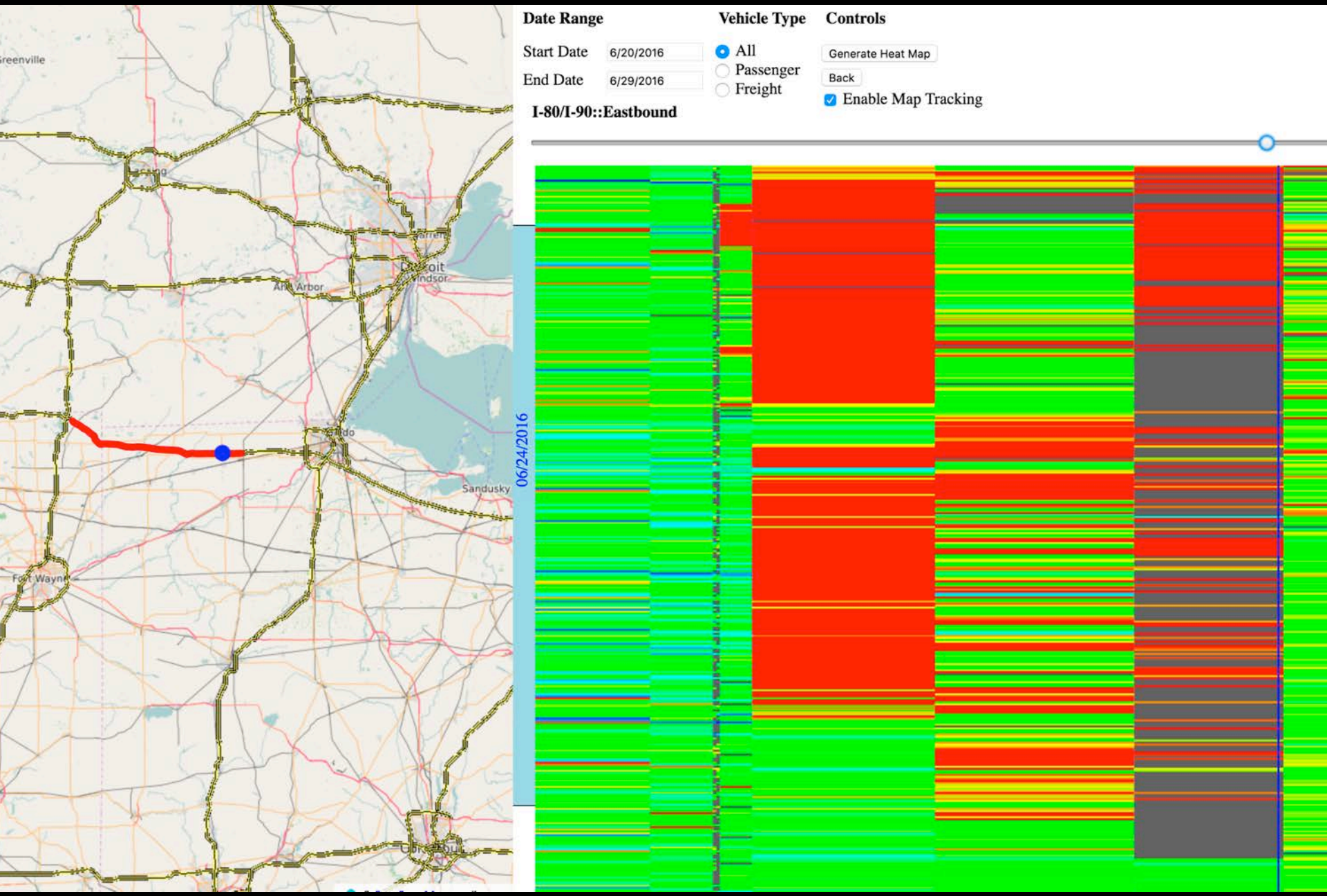
33 thousand AADT, 6-month work zone lane reduction

I-275 Carroll Cropper Bridge Across Ohio River

The Mid-America “scanner” reports the major anomaly from probe data through a process control chart algorithm




I-74 Interchange (East)
I-74 Interchange (West)
I-275 Northbound
Heatmap: 80th %ile Daily Speed
Source: NPMRDS Freight Travel Times
OH
IN
KY
Ohio River
Lane Closure Begins
Feb 16 and 21 Winter Weather
Travel Direction
~27 miles shown
Jan
Feb
Mar
Apr
May
Jun
Jul
I-71 Interchange



http://transportal.cee.wisc.edu/gis/webmaps/npmrds-heatmap

MAP-21 System Performance NPRM

April 22, 2016

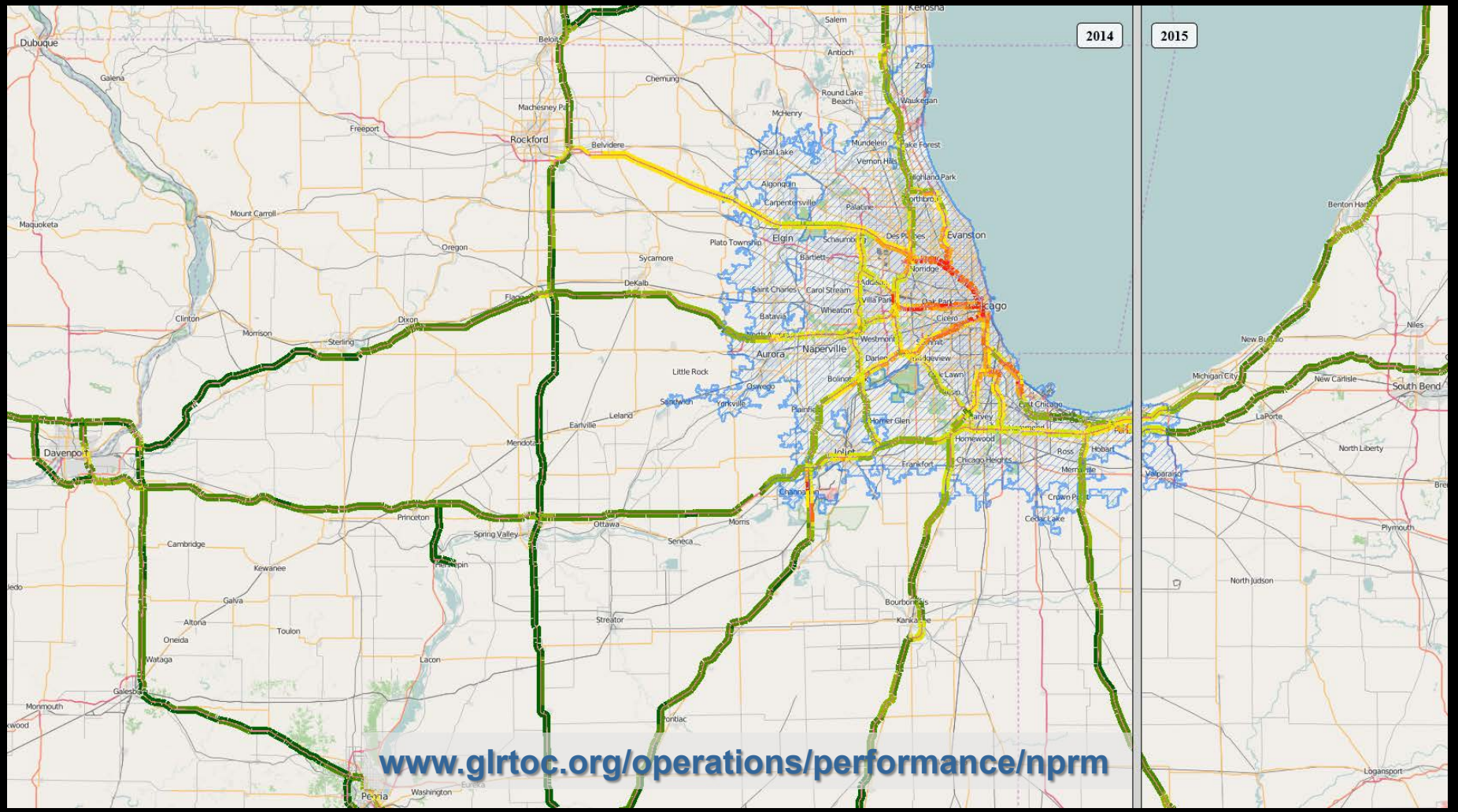
New annual, travel time based, performance measures

Metric	Measure	Interstate	Other NHS
Travel Time Reliability	% of Mileage Reliable (80th %ile)	Statewide	Statewide
Peak Hour Travel Time Ratio	% of Mileage Meeting Expectations	Metro*	Metro*
Truck Travel Time Reliability	% of Mileage Reliable (95th %ile)	Statewide	n/a
Average Truck Speed	% of Mileage Uncongested (50 mph)	Statewide	n/a
Total Excessive Delay	Hours of Delay per Capita	All NHS in Metros* in Nonattainment or Maintenance, e.g., St. Louis	

* Only applies to Urbanized Areas with population greater than one million, e.g., Kansas City, St. Louis, Oklahoma City

Great Lakes Regional
Transportation Operations Coalition

Results and Interactive Map Explorer



Mobility Performance Management

www.glrtoc.org/operations/performance

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