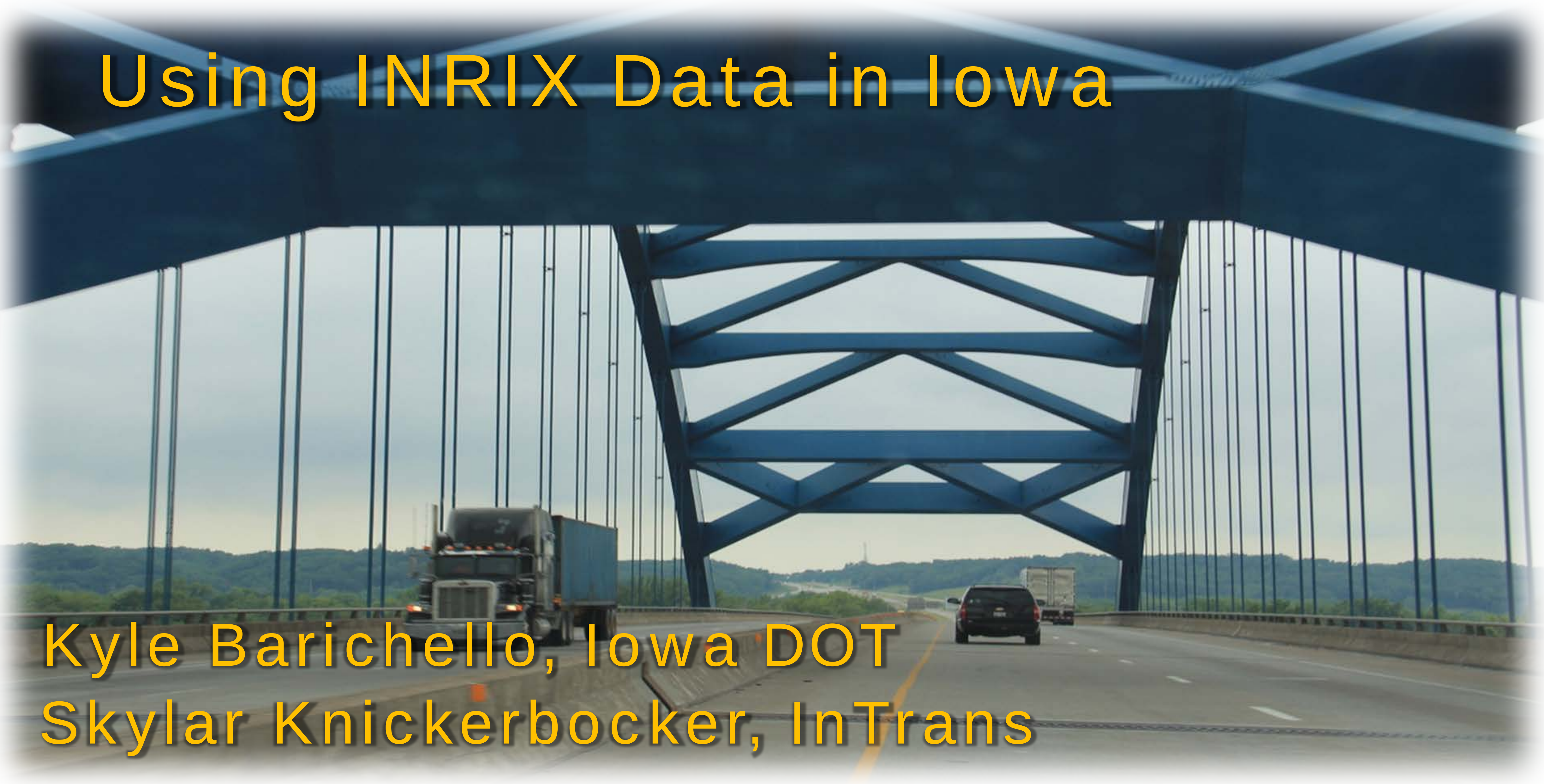
# Using INRIX Data in Iowa



Kyle Barichello, Iowa DOT
Skylar Knickerbocker, InTrans

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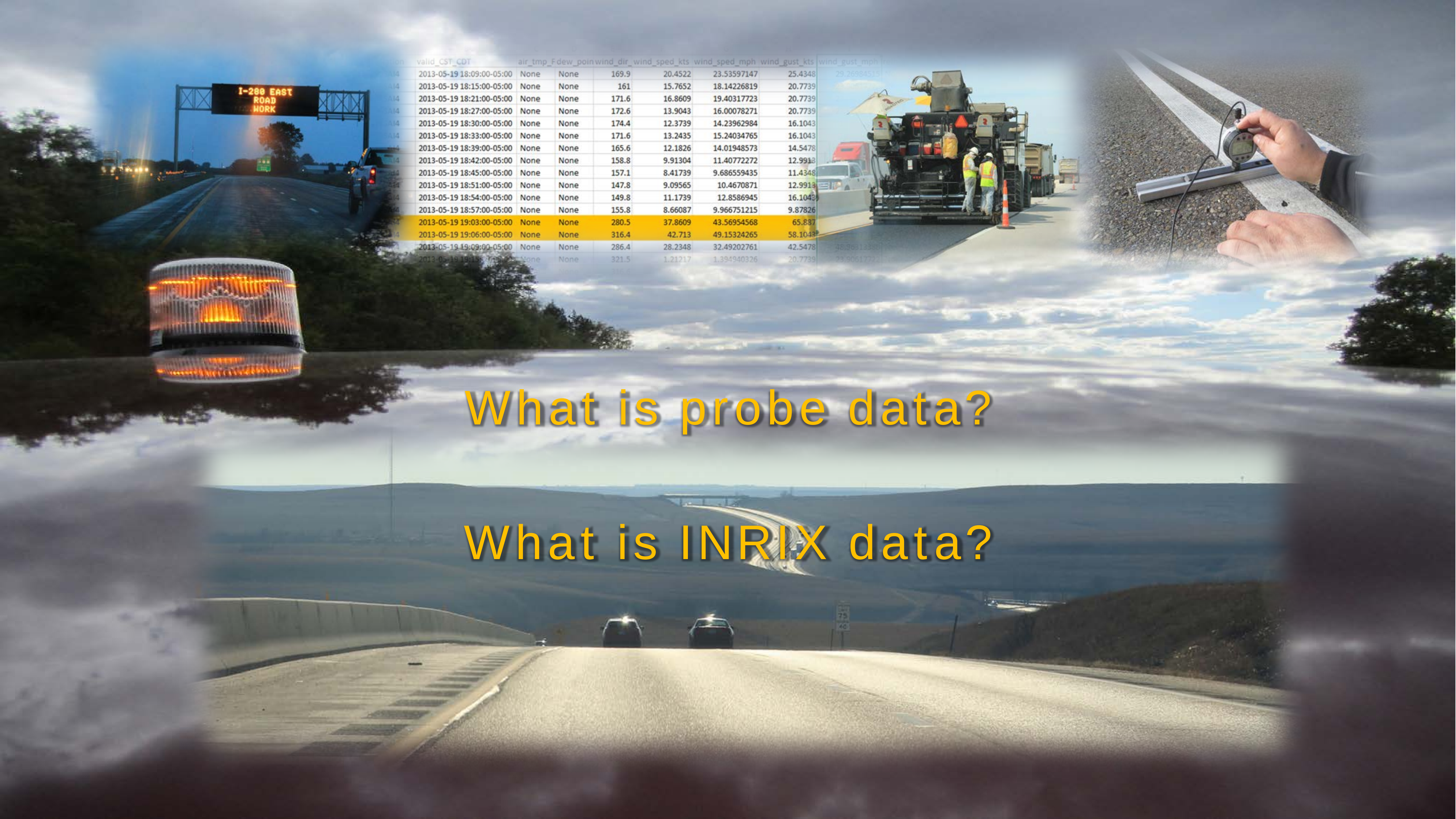
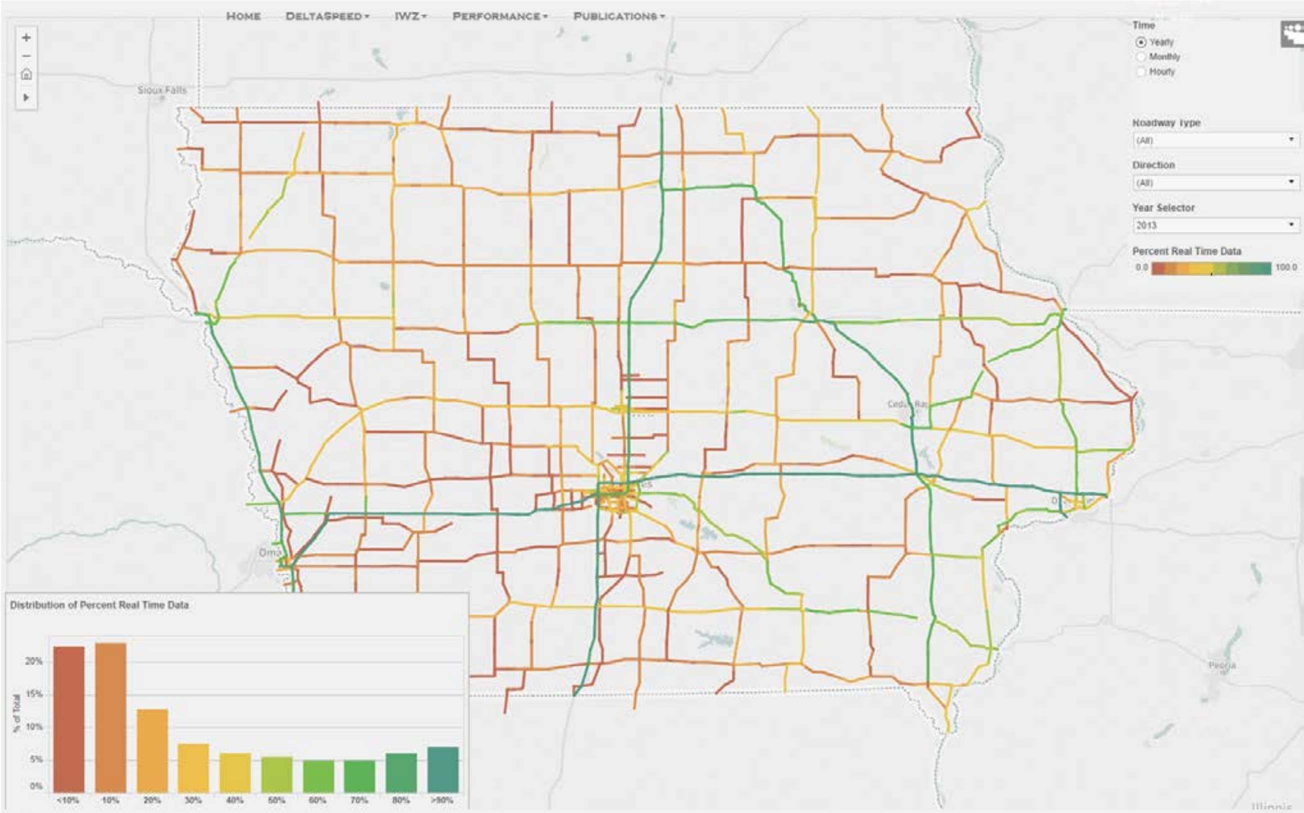

I-280 EAST
ROAD
WORK
valid_CST_CDT air_tmp_F dew_poin wind_dir_ wind_sped_kts wind_sped_mph wind_gust_kts
2013-05-19 18:09:00-05:00 None None 169.9 20.4522 23.53597147 25.4348
2013-05-19 18:15:00-05:00 None None 161 15.7652 18.14226819 20.7739
2013-05-19 18:21:00-05:00 None None 171.6 16.8609 19.40317723 20.7739
2013-05-19 18:27:00-05:00 None None 172.6 13.9043 16.00078271 20.7739
2013-05-19 18:30:00-05:00 None None 174.4 12.3739 14.23962984 16.1043
2013-05-19 18:33:00-05:00 None None 171.6 13.2435 15.24034765 16.1043
2013-05-19 18:39:00-05:00 None None 165.6 12.1826 14.01948573 14.5478
2013-05-19 18:42:00-05:00 None None 158.8 9.91304 11.40772272 12.9913
2013-05-19 18:45:00-05:00 None None 157.1 8.41739 9.686559435 11.4348
2013-05-19 18:51:00-05:00 None None 147.8 9.09565 10.4670871 12.9913
2013-05-19 18:54:00-05:00 None None 149.8 11.1739 12.8586945 16.1043
2013-05-19 18:57:00-05:00 None None 155.8 8.66087 9.966751215 9.87826
2013-05-19 19:03:00-05:00 None None 280.5 37.8609 43.56954568 65.887
2013-05-19 19:06:00-05:00 None None 316.4 42.713 49.15324265 58.1043
2013-05-19 19:09:00-05:00 None None 286.4 28.2348 32.49202761 42.5478
What is probe data?
What is INRIX data?

# INRIX Data Overview

- **Purchased traffic data**
- **Covers Interstates, State Highway, some local roads**
- **Speed and Travel Time data provided every 1 minute**
- **Data Analytics**



# TMC vs XD

- **TMC Data**
  - Industry standard road segmentation
  - Defined by a consortium
- Historical back to 2013 for Iowa DOT
- Issues
  - Long Segments
  - Gaps
  - Overlap

- **XD Segments**
  - Developed by INRIX
  - Covers all FRC 1-2-3 Roads
- Used for real-time analysis
  - Can also capture stream
- Typically 1-1.5miles
  - Breaks at intersection and interchanges

REACTOR Realtime Analytics of Transportation Data

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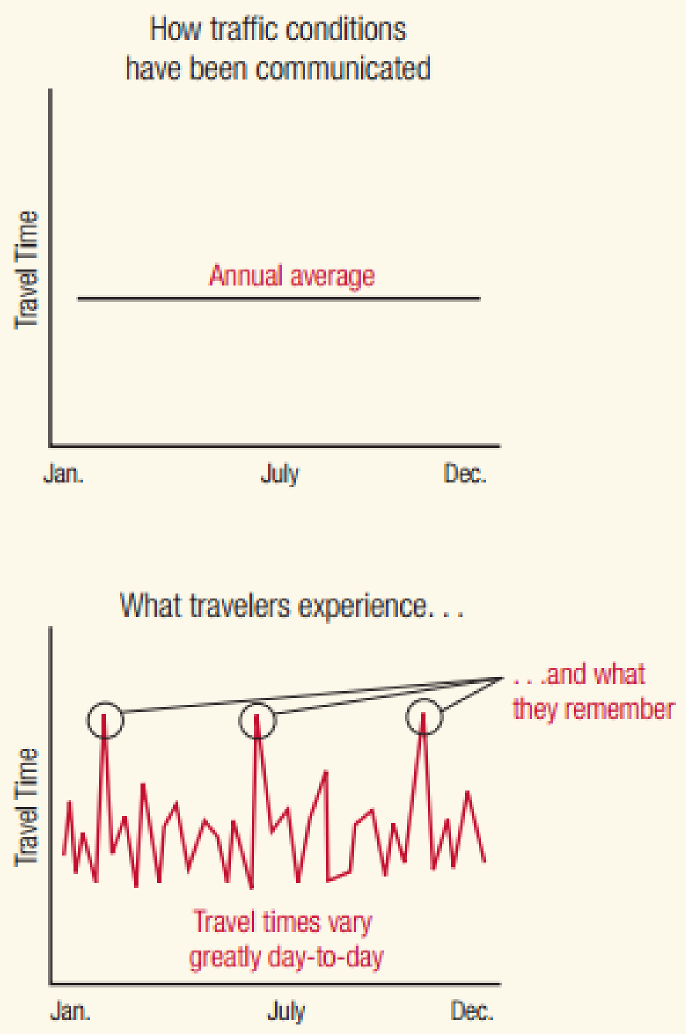
# Quick Explanation

- FHWA defines as:
  - *"Travel time reliability measures the extent of this unexpected delay."*
  - ***"the consistency or dependability in travel times, as measured from day-to-day and/or across different times of the day."***
- Expected vs. experienced
- Accounting for variability included planning trips for:
  - Time of day
  - Weather Events
  - Holidays and many others
- Important because it quantifies the benefits of traffic management & operations activities.

*Figure 1. Averages don't tell the full story*



# What do travelers care about?

- Selection of reliability and mobility measures includes an assessment on what travelers value the most
- **Summarizing congestion effects**
  - Duration
    - length of time congestion affects system
  - Extent
    - number of people or vehicles affected
  - Intensity
    - severity of congestion from travelers perspective
  - Variation
    - Recurring delay

# Traffic Data Services

- Vendors
  - INRIX, TomTom (Tele Atlas), & HERE (NokiaNavteq)
- FHWA - National Performance Management Research Data Set (NPMRDS)
  - Previously HERE now INRIX
- Iowa DOT – INRIX Contract
  - 1 year guaranteed – option to extend up to three more additional years

# Types of Reliability measures

## Measures of Typical Delay

- **Travel Time (TT)** = distance / speed
- **Travel Time Index (TTI)** = Average travel time / free-flow travel time

## Measures of Travel Time Reliability

- **Buffer Time (BT)** = 95th percentile Travel Time - Average Travel Time
- **Buffer Time Index (BTI)** = Buffer Time / Average Travel Time
    - i.e. Measure of trip reliability that expresses the amount of extra “buffer time” needed to be on time for 95% of the trips

## Combined Measures

- **Planning Time (PT)** = Average Travel Time + Buffer Time ($95^{th}$ percentile TT)
- **Planning Time Index (PTI)** = Planning Time / Free-flow Travel Time
    - i.e. If the PTI is 1.60, for a 15 minute trip in light traffic, the total time that should be planned for the trip is 24 minutes (15* 1.60 = 24 minutes).

# Getting clear on use of Probe data

- **Step 1 – Determine how measures will be used**
  - Quantify benefits
  - Compare alternative scenarios
- **Step 2 – Develop a plan based on users**
  - Travel modes, trips, times of day, peak periods, frequency, reliability calculations etc..
- **Step 3 – Collect and process data**
  - Using INRIX and ITS systems
  - Quality Assurance
- **Step 4 – Calculate reliability measures**
  - $95^{th}$ percentile travel Buffer times, Travel time index, planning time index
  - Congestion frequency
- **Step 5 – Communicate effectively**
  - How to communicate the data (ex. report, dashboard, etc..)
  - Graphics and relate to travelers experience

# INRIX at the Iowa DOT

# Iowa DOT Current Uses of INRIX

- Real-time data
  - Main users Traffic Operations
  - Incident detection alerts
  - Assist DOT Ops Center balancing traffic among diversion routes
  - Travel Times (rural and urban)
- Historic data
  - Traffic Management Systems and Operations (TSMO)
  - Value, Condition and Performance analysis (VCAP)
  - Yearly/Monthly corridor reports
- INRIX analytics dashboard
  - http://www.inrixtraffic.us/Analytics.aspx

| | A | B | C | D | E | F | G | H | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | TMC Code | Distance | Date_Time | Speed | Average Speed | Average Travel Time | Confidence Score | C Value | Fr Tr Ti |
| 06 | 118N04892 | 0.3386195 | 1/1/2013 16:00 | 66.77 | 65 | 0.3 | 28.67 | 83.63 | |
| 07 | 118N06499 | 0.643845 | 1/1/2013 16:00 | 65 | 65 | 0.01 | 20 | 0 | |
| 08 | 118N06500 | 0.6437891 | 1/1/2013 16:00 | 66.52 | 65 | 0.58 | 25.67 | 54 | |
| 09 | 118N06501 | 0.5873473 | 1/1/2013 16:00 | 64.73 | 65 | 0.54 | 22.67 | 25 | |
| 10 | 118N09882 | 0.6821419 | 1/1/2013 16:00 | 67.07 | 65 | 0.61 | 23.83 | 32.97 | |
| 11 | 118P04888 | 0.9250658 | 1/1/2013 16:00 | 65.25 | 65 | 0.85 | 23.67 | 35 | |
| 12 | 118P04890 | 0.6702793 | 1/1/2013 16:00 | 65.28 | 65 | 0.62 | 23.67 | 35 | |
| 13 | 118P04891 | 0.0580698 | 1/1/2013 16:00 | 65.25 | 65 | 0.05 | 22.5 | 23.33 | |
| 14 | 118P04892 | 0.3462254 | 1/1/2013 16:00 | 65.27 | 65 | 0.32 | 23.67 | 35 | |
| 15 | 118P06499 | 0.627962 | 1/1/2013 16:00 | 50 | 50 | 0.01 | 20 | 0 | |
| 16 | 118P06500 | 0.6237675 | 1/1/2013 16:00 | 64.97 | 65 | 0.58 | 23.33 | 33.25 | |
| 17 | 118P09882 | 0.6847828 | 1/1/2013 16:00 | 65.77 | 65 | 0.62 | 24.5 | 45 | |
| 18 | 118+04890 | 2.5024399 | 1/1/2013 17:00 | 65.67 | 65 | 2.29 | 23.83 | 38.07 | |
| 19 | 118+04891 | 1.6345989 | 1/1/2013 17:00 | 67 | 65 | 1.46 | 24.33 | 38.8 | |
| 20 | 118+04892 | 0.4182208 | 1/1/2013 17:00 | 65.47 | 64 | 0.38 | 24.33 | 42.8 | |
| 21 | 118+06500 | 5.8113204 | 1/1/2013 17:00 | 65.2 | 65 | 5.35 | 24.83 | 46.67 | |
| 22 | 118+06501 | 3.0014241 | 1/1/2013 17:00 | 65.28 | 65 | 2.76 | 24 | 40 | |
| 23 | 118+09877 | 4.4526355 | 1/1/2013 17:00 | 59.17 | 61 | 5.29 | 25.67 | 55 | |
| 24 | 118+09878 | 2.3663409 | | | | | | | |
| 25 | 118+09879 | 2.885533 | | | | | | | |
| 26 | 118+09880 | 1.0582442 | | | | | | | |
| 27 | 118+09881 | 6.2882635 | | | | | | | |
| 28 | 118+09882 | 6.6021327 | | | | | | | |
| 29 | 118+09883 | 3.7186067 | | | | | | | |
| 30 | 118+09884 | 5.4696125 | | | | | | | |
| 31 | 118+09885 | 2.1111568 | | | | | | | |
| 32 | 118+09887 | 4.8631696 | | | | | | | |
| 33 | 118+11350 | 0.6514012 | | | | | | | |
| 34 | 118+11351 | 4.7480553 | | | | | | | |
| 35 | 118+11352 | 6.8649911 | 1/1/2013 17:00 | 59.45 | 59 | 6.93 | 23.5 | 35 | |

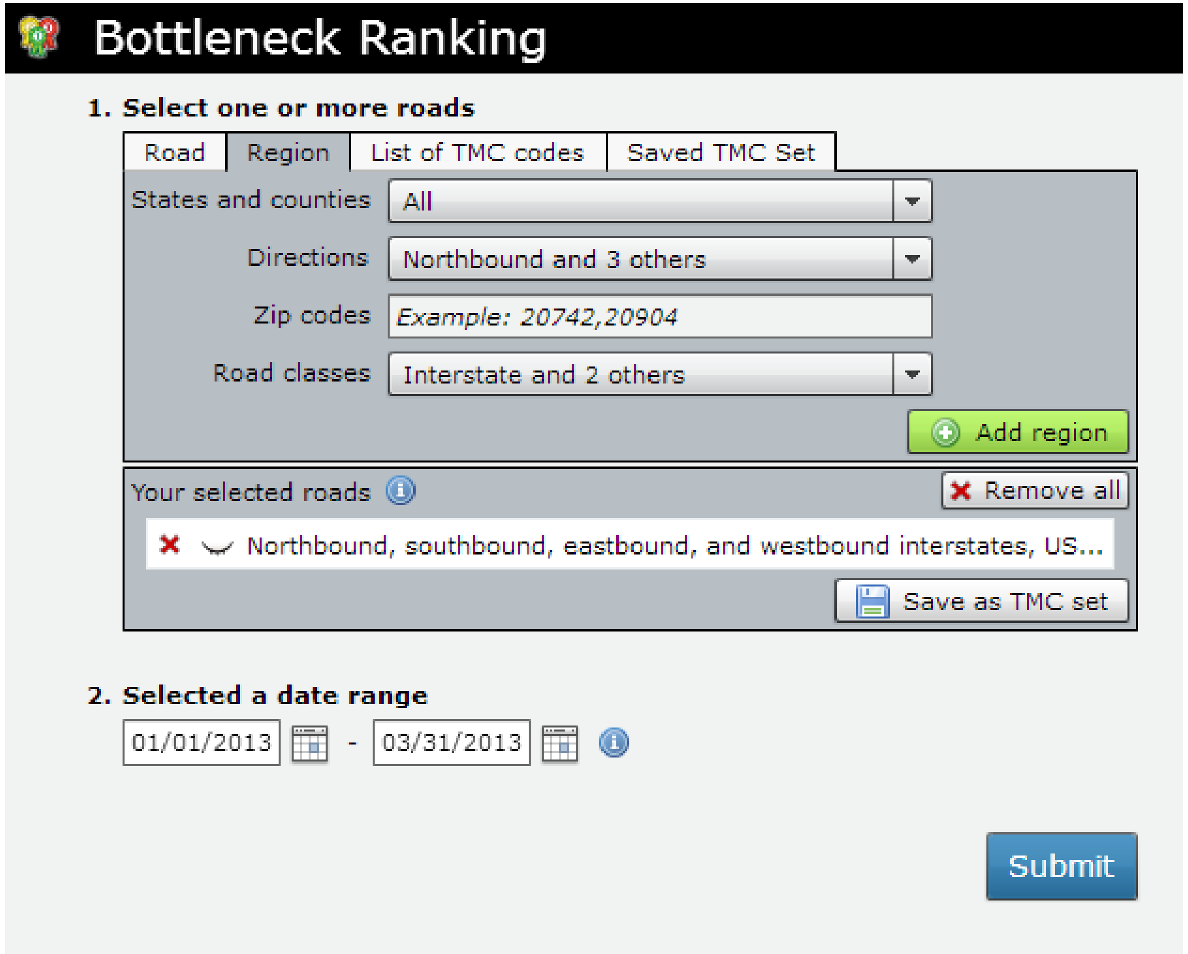
**Confidence score:** a simple confidence factor. The three possible values are:
30 – high confidence, based on real-time time data for that specific segment
20 – medium confidence, based on real-time data across multiple segments and/or based on a combination of expected and real-time data
10 – lower confidence, based primarily on historical data

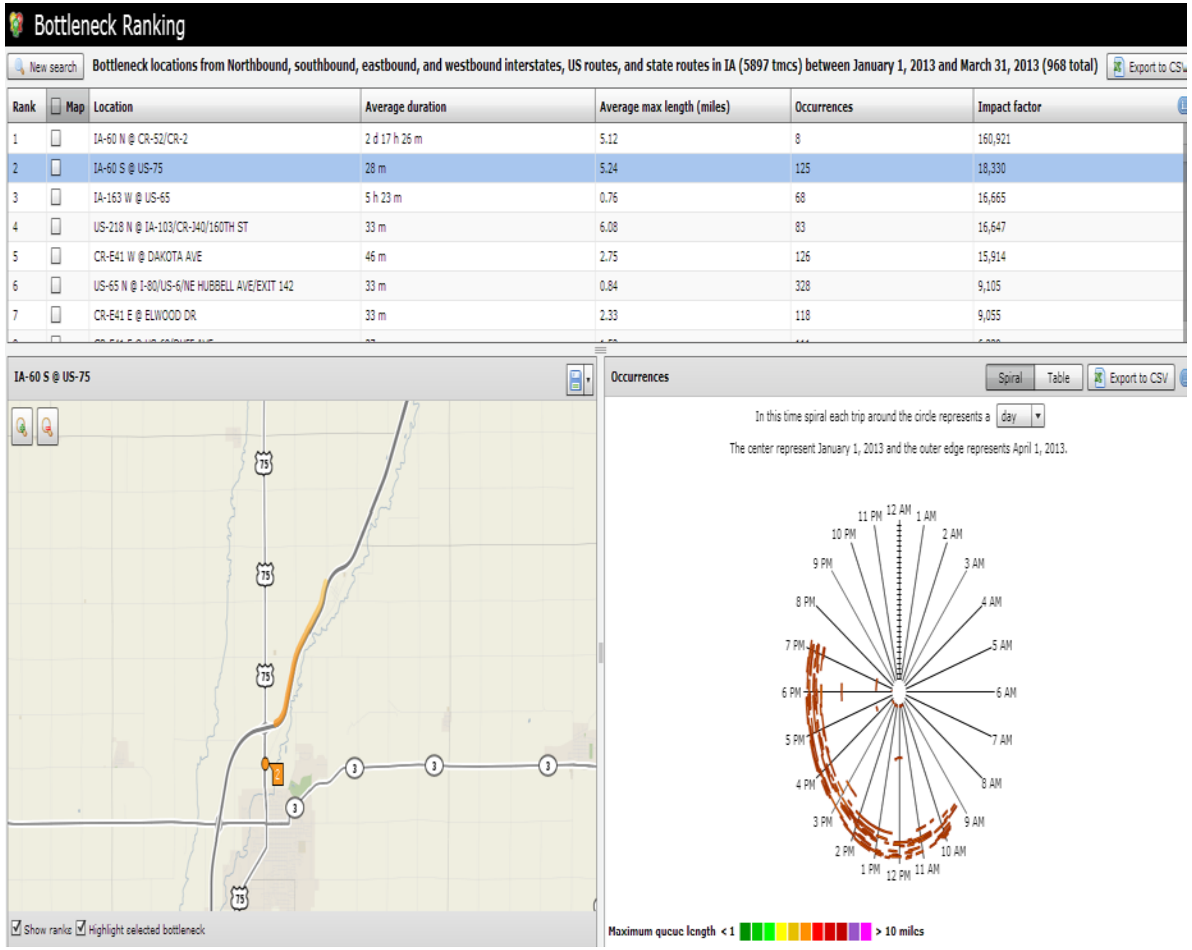
**C-Value:** Indicates the probability that the current probe reading represents the actual roadway conditions based on recent and historic trends. This value is only used when the confidence score is 30. (0 = low probability, 100 = high probability)

# Massive Raw Data Downloader

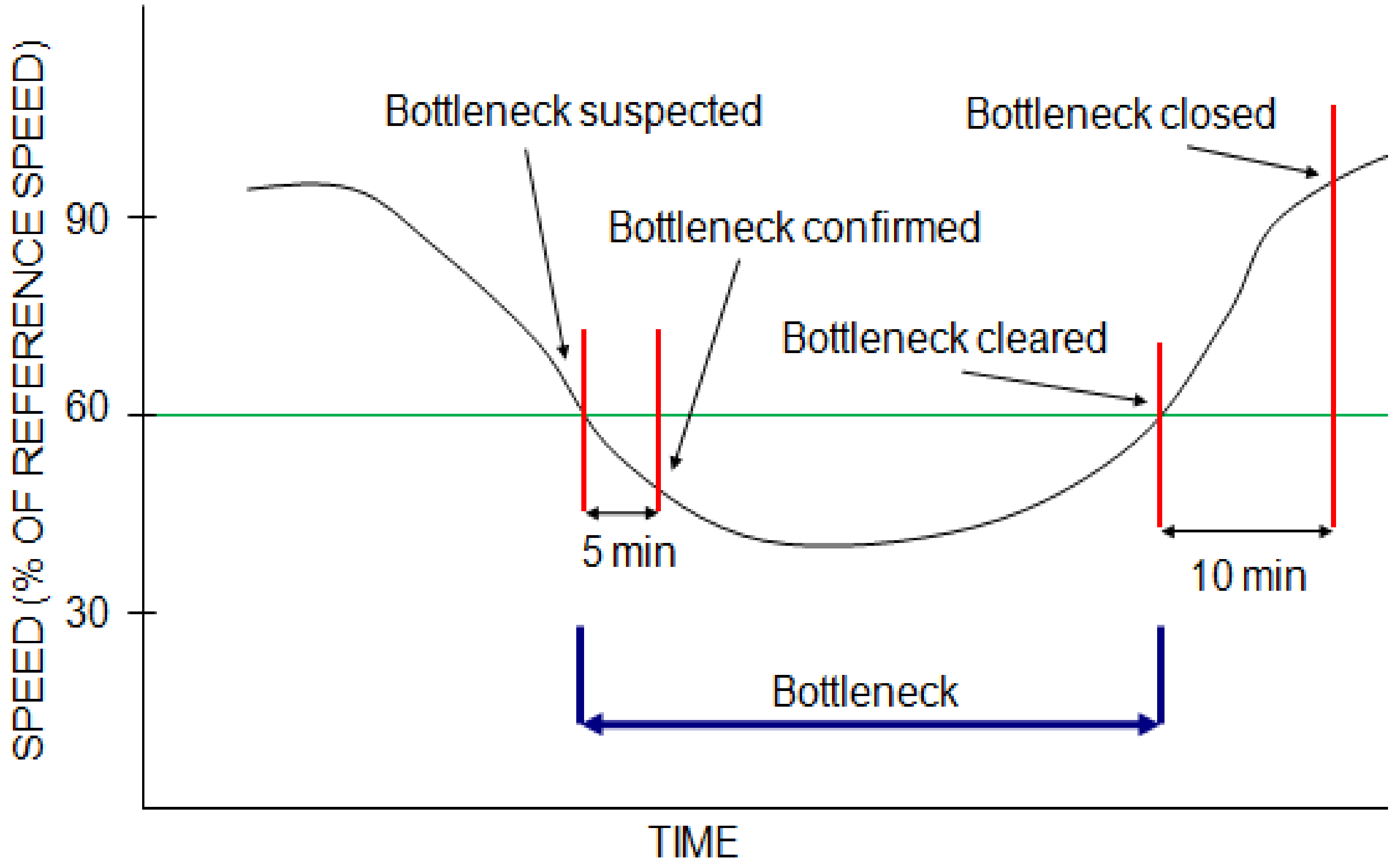
- Excel File with information tied to TMC Code shapefile
- Speed is estimated mean speed for the roadway
- Average Speed is the historical average mean speed for that segment
- To Map, Join by TMC Code Identifier

# Bottlenecks Analysis



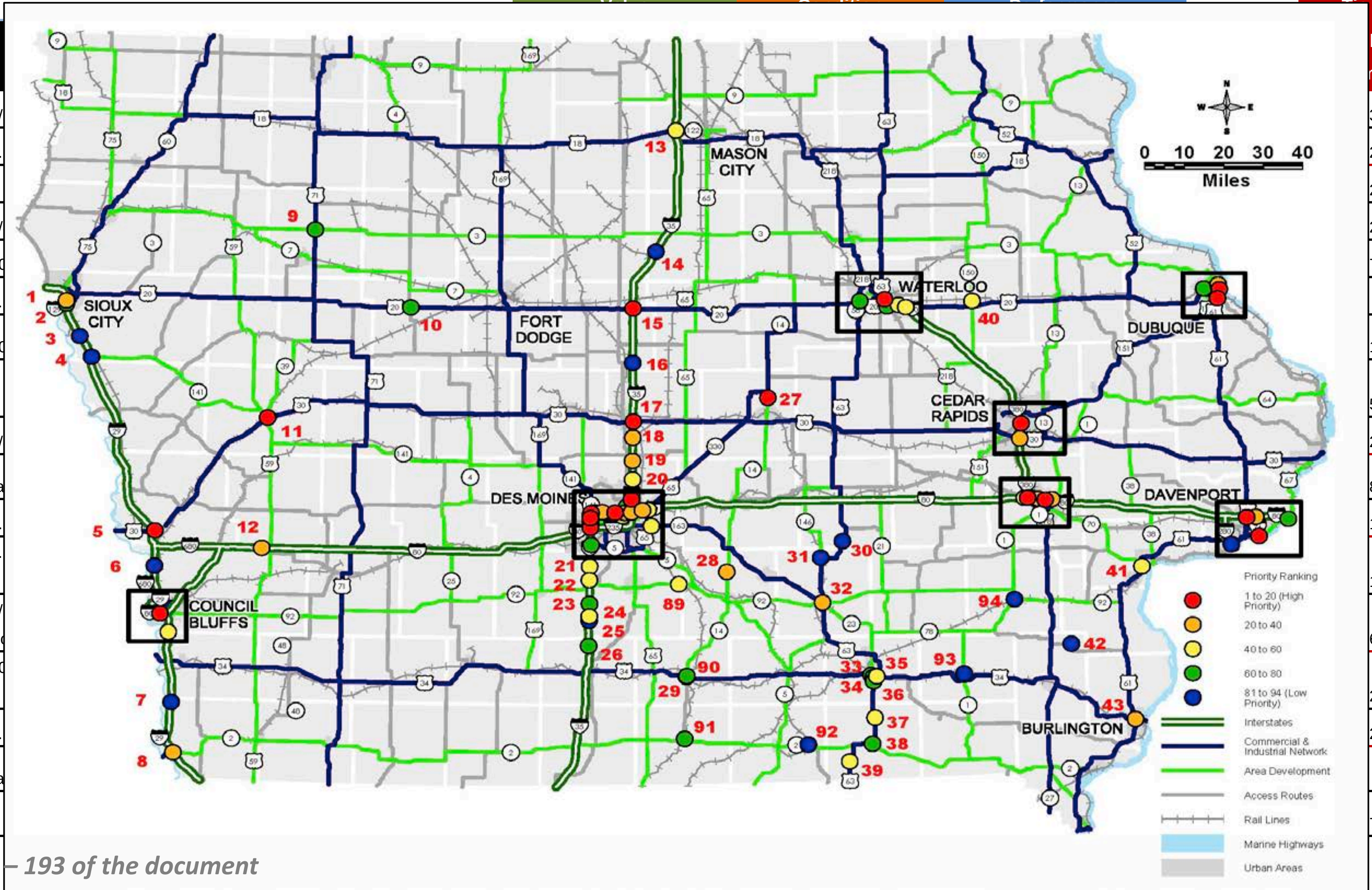
# Freight Bottlenecks



# Value, Condition, and Performance (VCAP analysis)

## Highway improvement candidates

| Map ID | | | Priority rank |
|---|---|---|---|
| 48 | I-80/ | 3579 | 1 |
| 47 | U.S. | 2115 | 2 |
| 87 | I-74 | 2908 | 3 |
| 57 | I-35/ | 2761 | 4 |
| 76 | I-38 | 7226 | 5 |
| 5 | U.S. | 993 | 6 |
| 79 | I-38 | 1161 | 7 |
| 15 | I-35 and | 5559 | 8 |
| 55 | I-35/ | 2884 | 9 |
| 6 | Iowa | 8331 | 10 |
| 11 | U.S. | 1377 | 11 |
| 84 | U.S. I-80 | 1230 | 12 |
| 51 | I-80/ @ s | 6870 | 13 |
| 71 | I-38 San | 2799 | 14 |
| 46 | U.S. | 2212 | 15 |
| 27 | Iowa | 542 | 16 |
| 17 | I-35 | 7633 | 17 |



# Traffic Systems Management and Operations (TSMO-ICE OPS)

| ID | Corridor Name | Length (mi) | All Bottlenecks per mile (10%) | Freight Bottlenecks per mile (10%) | Incident Frequency per mile (10%) | Crash Rate (15%) | Buffer Time Index (BTI) (10%) | Event Center buffer mileage (5%) | Weather Sensitive Corridor mileage (10%) | AADT (20%) | ICE rating (5%) | Composite Rating | Rank |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 395 | I-235 (jct of IA 28 to jct of US 69) | 5.7 | 1 | 10 | 4 | 1 | 5 | 1 | 10 | 1 | 5 | 38.5 | 1 |
| 463 | I-35/80 (west jct of I-35/80 to US 6) | 2.1 | 4 | 1 | 3 | 3 | 8 | 7 | 10 | 2 | 4 | 41.5 | 2 |
| 394 | I-235 (jct of I-35/80 to jct of IA 28) | 5.1 | 1 | 10 | 1 | 5 | 6 | 1 | 10 | 3 | 6 | 45.5 | 3 |
| 368 | I-80 (Nebraska border to jct of I-29) | 3.5 | 6 | 1 | 5 | 4 | 8 | 9 | 10 | 5 | 1 | 53.5 | 4 |
| 263 | I-29 (South Dakota border to jct of US 20/I-12 | 8.4 | 1 | 10 | 3 | 5 | 1 | 9 | 10 | 9 | 5 | 59 | 5 |
| 406 | I-35/I-80 (jct of IA 415 to jct of I-35) | 2.0 | 8 | 5 | 8 | 3 | 8 | 7 | 10 | 4 | 2 | 60 | 6 |
| 261 | I-129 (full route) | 0.3 | 1 | 10 | 6 | 1 | 4 | 10 | 10 | 9 | 5 | 61 | 7 |
| 407 | I-35/80 (jct of IA 141 to jct of IA 28) | 3.9 | 7 | 4 | 8 | 8 | 9 | 3 | 10 | 3 | 3 | 63 | 8 |
| 408 | I-35 (jct of I-80/I-235 to jct of IA 160) | 3.1 | 8 | 4 | 7 | 7 | 8 | 5 | 10 | 4 | 4 | 63.5 | 9 |
| 281 | I-235 (jct of US 69 to west jct of I-35/80) | 4.4 | 5 | 10 | 7 | 6 | 6 | 2 | 10 | 5 | 5 | 64 | 10 |
| 275 | I-74 (full route) | 5.2 | 1 | 10 | 7 | 5 | 1 | 10 | 10 | 8 | 7 | 64.5 | 11 |
| 462 | I-35/80 (from jct of IA 28 to IA 415) | 4.0 | 9 | 6 | 8 | 8 | 9 | 3 | 10 | 2 | 2 | 64.5 | 11 |
| 277 | I-35/80 (jct of US 6 to jct of IA 141) | 2.5 | 10 | 9 | 7 | 8 | 8 | 7 | 10 | 2 | 2 | 68 | 13 |
| 440 | I-380 (jct of US 20 to start of US 218) | 7.3 | 7 | 2 | 9 | 7 | 2 | 10 | 10 | 8 | 8 | 70 | 14 |
| 430 | I-35 (jct of IA 5 to jct of I-80/I-235) | 4.7 | 8 | 5 | 10 | 6 | 7 | 3 | 10 | 6 | 6 | 70.5 | 15 |
| 272 | I-80 (east jct of I-35/80 to jct of IA 14) | 28.5 | 10 | 8 | 9 | 8 | 8 | 1 | 4 | 7 | 5 | 72.5 | 16 |

# Buffer Time Index calculation

## Performance Summaries - Using INRIX data

Switch to...

New search

**12 tmcs**

**Selected time ranges**

**6:00 AM - 10:00 AM**

12:00 AM 6:00 AM 12:00 PM 6:00 PM 12:00 AM

6:00 AM 10:00 AM

Add another time range

Submit

**2016 Southbound** | 2016 Northbound

**Buffer time (minutes)**

| | 6:00 AM - 10:00 AM |
|---|---|
| Monday | 0.17 |
| Tuesday | 0.21 |
| Wednesday | 0.17 |
| Thursday | 0.15 |
| Friday | 0.19 |
| Saturday | 0.2 |
| Sunday | 0.18 |
| Weekends | 0.19 |
| Weekdays | 0.18 |
| All Days | 0.19 |

**Buffer index**

| | 6:00 AM - 10:00 AM |
|---|---|
| Monday | 0.06 |
| Tuesday | 0.08 |
| Wednesday | 0.06 |
| Thursday | 0.05 |
| Friday | 0.07 |
| Saturday | 0.07 |
| Sunday | 0.06 |
| Weekends | 0.07 |
| Weekdays | 0.07 |
| All Days | 0.07 |

**Planning time (minutes)**

| | 6:00 AM - 10:00 AM |
|---|---|
| Monday | 2.94 |
| Tuesday | 2.97 |
| Wednesday | 2.93 |
| Thursday | 2.92 |
| Friday | 2.97 |
| Saturday | 2.97 |
| Sunday | 2.97 |
| Weekends | 2.97 |
| Weekdays | 2.95 |
| All Days | 2.97 |

**Planning time index**

| | 6:00 AM - 10:00 AM |
|---|---|
| Monday | 1.06 |
| Tuesday | 1.08 |
| Wednesday | 1.06 |
| Thursday | 1.06 |
| Friday | 1.07 |
| Saturday | 1.08 |
| Sunday | 1.08 |
| Weekends | 1.08 |
| Weekdays | 1.07 |
| All Days | 1.08 |

**Speed (mph)**

| | 6:00 AM - 10:00 AM |
|---|---|
| Monday | 60.48 |
| Tuesday | 59.98 |
| Wednesday | 60.42 |
| Thursday | 60.57 |
| Friday | 60.39 |
| Saturday | 59.65 |
| Sunday | 59.05 |
| Weekends | 59.35 |
| Weekdays | 60.37 |
| All Days | 60.07 |

**Travel time (minutes)**

| | 6:00 AM - 10:00 AM |
|---|---|
| Monday | 2.77 |
| Tuesday | 2.79 |
| Wednesday | 2.77 |
| Thursday | 2.77 |
| Friday | 2.77 |
| Saturday | 2.81 |
| Sunday | 2.84 |
| Weekends | 2.82 |
| Weekdays | 2.78 |
| All Days | 2.79 |

# Other

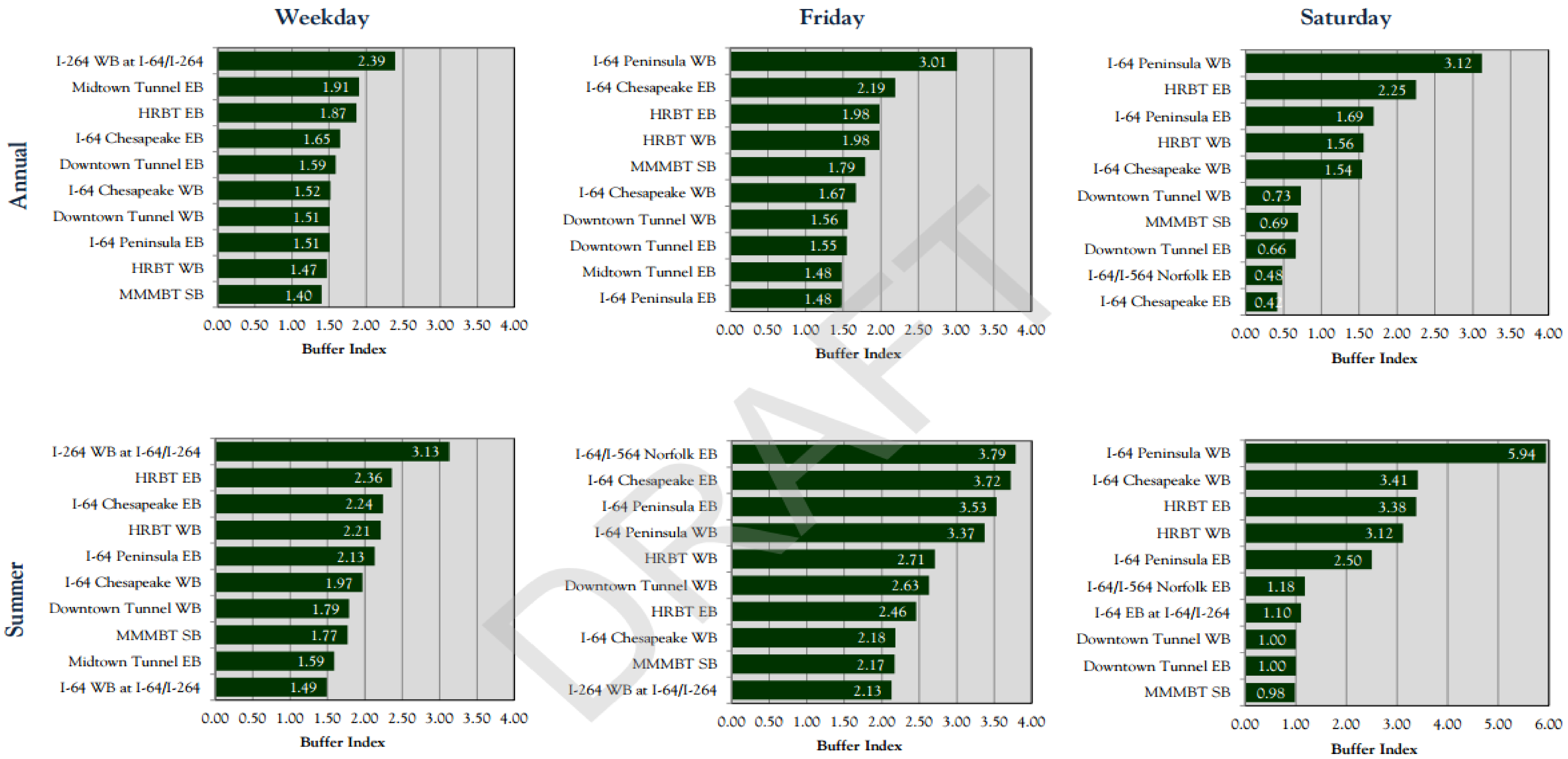
## Iowa DOT Interstate Corridor Analysis

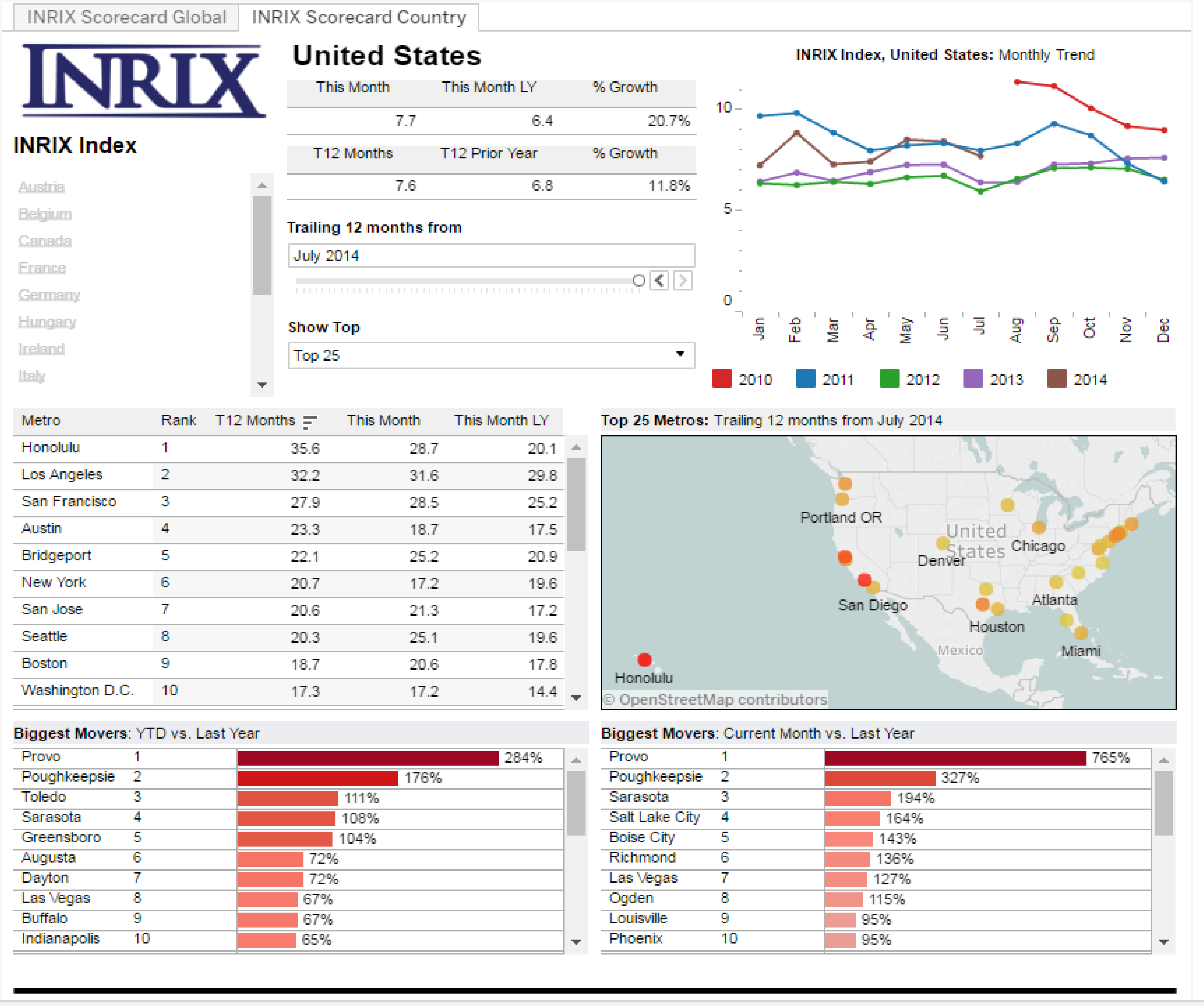
| I-80 Rural Corridor in Iowa County near Williamsburg | | | | |
|---|---|---|---|---|
| Spring | | | | |
| | | Avg_TT | PTI | PTI Avg_TT |
| PM | EB | 24.76 | 1.070 | 26.27 |
| | WB | 24.47 | 1.073 | 26.05 |
| AM | EB | 24.98 | 1.075 | 26.72 |
| | WB | 24.71 | 1.076 | 26.52 |
| Fall | | | | |
| | | Avg_TT | PTI | PTI Avg_TT |
| PM | EB | 24.77 | 1.103 | 26.55 |
| | WB | 25.20 | 1.098 | 27.62 |
| AM | EB | 25.01 | 1.084 | 26.94 |
| | WB | 24.74 | 1.094 | 26.80 |
| Winter | | | | |
| | | Avg_TT | PTI | PTI Avg_TT |
| PM | EB | 24.92 | 1.094 | 26.60 |
| | WB | 24.81 | 1.080 | 26.69 |
| AM | EB | 25.15 | 1.079 | 27.11 |
| | WB | 25.00 | 1.092 | 27.32 |
| Summer | | | | |
| | | Avg_TT | PTI | PTI Avg_TT |
| PM | EB | 24.76 | 1.070 | 26.27 |
| | WB | 24.47 | 1.073 | 26.05 |
| AM | EB | 24.84 | 1.071 | 26.42 |
| | WB | 24.54 | 1.068 | 26.15 |
| 2014 average | | | | |
| | | Avg_TT | PTI | PTI Avg_TT |
| PM | EB | 24.80 | 1.084 | 26.42 |
| | WB | 24.74 | 1.081 | 26.60 |
| AM | EB | 25.00 | 1.077 | 26.80 |
| | WB | 24.75 | 1.083 | 26.70 |

| I-380 from I-80 to US 30 | | | | |
|---|---|---|---|---|
| Spring | | | | |
| | | Avg_TT | PTI | PTI Avg_TT |
| PM | NB | 14.74 | 1.096 | 16.00 |
| | SB | 14.49 | 1.103 | 15.71 |
| AM | NB | 14.65 | 1.084 | 15.77 |
| | SB | 14.57 | 1.095 | 15.72 |
| Fall | | | | |
| | | Avg_TT | PTI | PTI Avg_TT |
| PM | NB | 14.72 | 1.103 | 16.09 |
| | SB | 14.84 | 1.117 | 16.44 |
| AM | NB | 14.49 | 1.096 | 15.70 |
| | SB | 14.66 | 1.108 | 16.06 |
| Winter | | | | |
| | | Avg_TT | PTI | PTI Avg_TT |
| PM | NB | 15.03 | 1.266 | 19.98 |
| | SB | 15.15 | 1.206 | 17.64 |
| AM | NB | 14.93 | 1.164 | 17.26 |
| | SB | 14.95 | 1.224 | 17.87 |
| Summer | | | | |
| | | Avg_TT | PTI | PTI Avg_TT |
| PM | NB | 14.78 | 1.049 | 15.77 |
| | SB | 14.61 | 1.084 | 15.74 |
| AM | NB | 14.35 | 1.078 | 15.33 |
| | SB | 14.27 | 1.080 | 15.28 |
| 2014 average | | | | |
| | | Avg_TT | PTI | PTI Avg_TT |
| PM | NB | 14.82 | 1.128 | 16.96 |
| | SB | 14.77 | 1.128 | 16.38 |
| AM | NB | 14.60 | 1.106 | 16.01 |
| | SB | 14.61 | 1.127 | 16.23 |

# Peak hour buffer index factors

## Hampton Roads MPO Study






# Possible Future Use

Dashboarding

- Monthly, hourly, peak AM/PM

# Case Study Example Washington DOT

Online trip planner to check current travel times

Washington State Department of Transportation

Traffic & Cameras | Projects | Business | Environment | Maps & Data

You are Here: Home › Traffic › Seattle › Travel Times › Best Time to Leave

## Best Time To Leave

Where are you starting from? Everett

Where are you going? Bellevue

What time do you need to get there? 8 : 00 AM

Submit

For your trip from Everett to Bellevue your 95% Reliable Travel Time is **84** minutes. For 19 out of 20 working days (95%) you would need to leave at **6:36 AM** to arrive by 8:00 AM.

These times are for highway travel only, please allow extra time to get to the highway and to reach your destination after exiting.

# Challenges & Questions

- How do we process and store all of this data?
- Expensive to maintain
- Which time frame of data do we use for analysis?
  - AM/PM Peak Hours
  - Weekly
- How can we combine ATR data and other sensor data with INRIX probe datasets?
- Non-broken out truck data in the INRIX dataset
- New NPMRDS Performance Measure requirement (Reliability measures on Interstates)
- Finding the proper way to use INRIX data across multiple platforms
- Accuracy issues off Interstate
- Few application studies out there

# Concluding Thoughts

- There have been successes using primarily cell phone probe data sources like INRIX
- Loop detectors and other sensors are most common for corridor studies
    - Adding a large amount of sensors is fiscally within reach
    - **Combination between the two is ideal for measuring reliability**
- Travel time systems must be operationally reliable to be used effectively
    - Accuracy is very important to the public for travel time messaging
- SHRP Researchers found reliability measures in transportation planning should
    - Be incorporated as a system wide goal
    - Be used as a tool to help prioritize roadway segments using Travel Time measures
- Data processing is the biggest concern – Who will address this?

# Using INRIX Data (Traffic Operations)

- **Mobility Reporting**
- **Performance Measures**
- **Real-time monitoring/alerting**
- **After-action review**



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Realtime Analytics of Transportation Data

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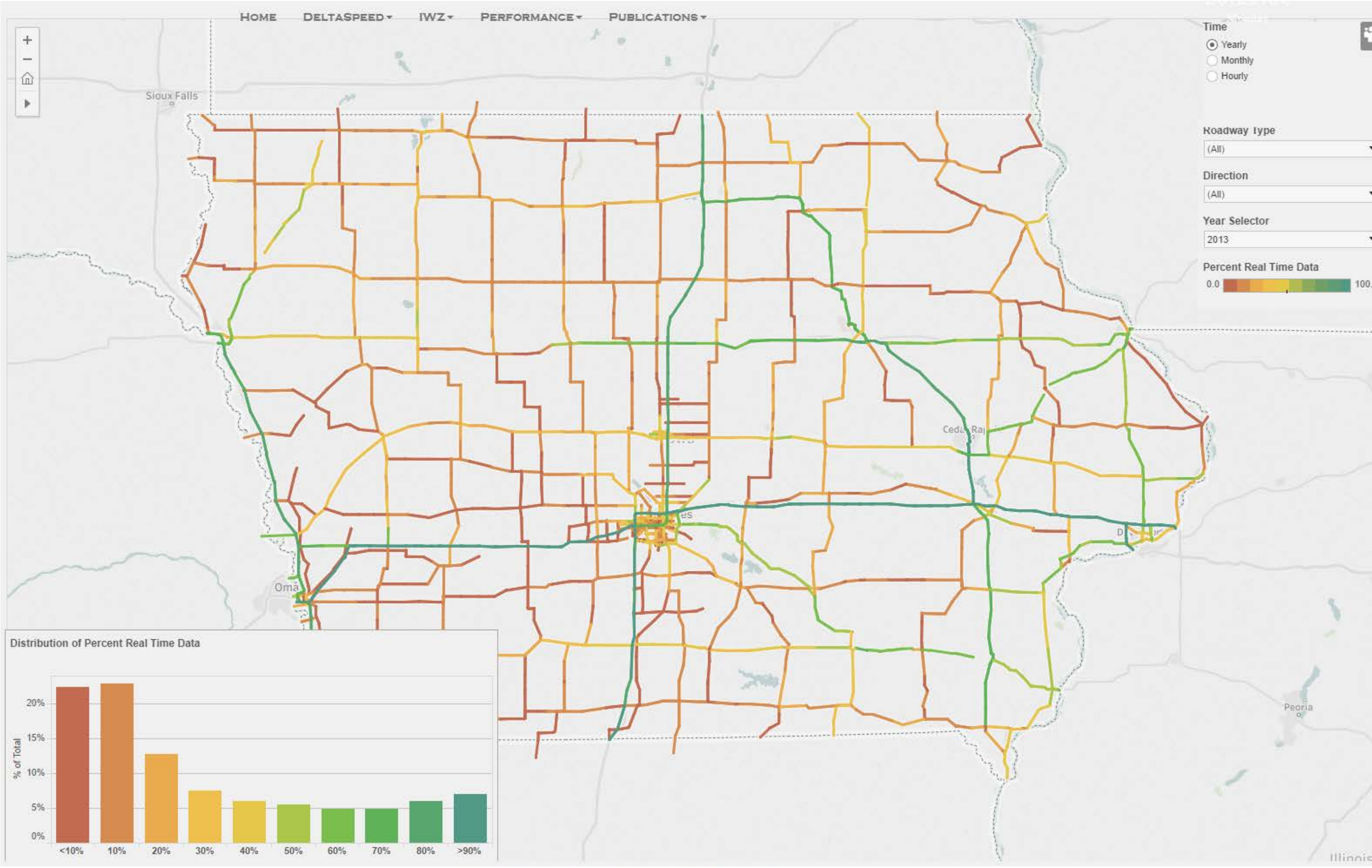
# Real-time Data

- **Understand where performance measures most accurate**
- **Monitoring in real-time**
  - Understand where latency may be higher

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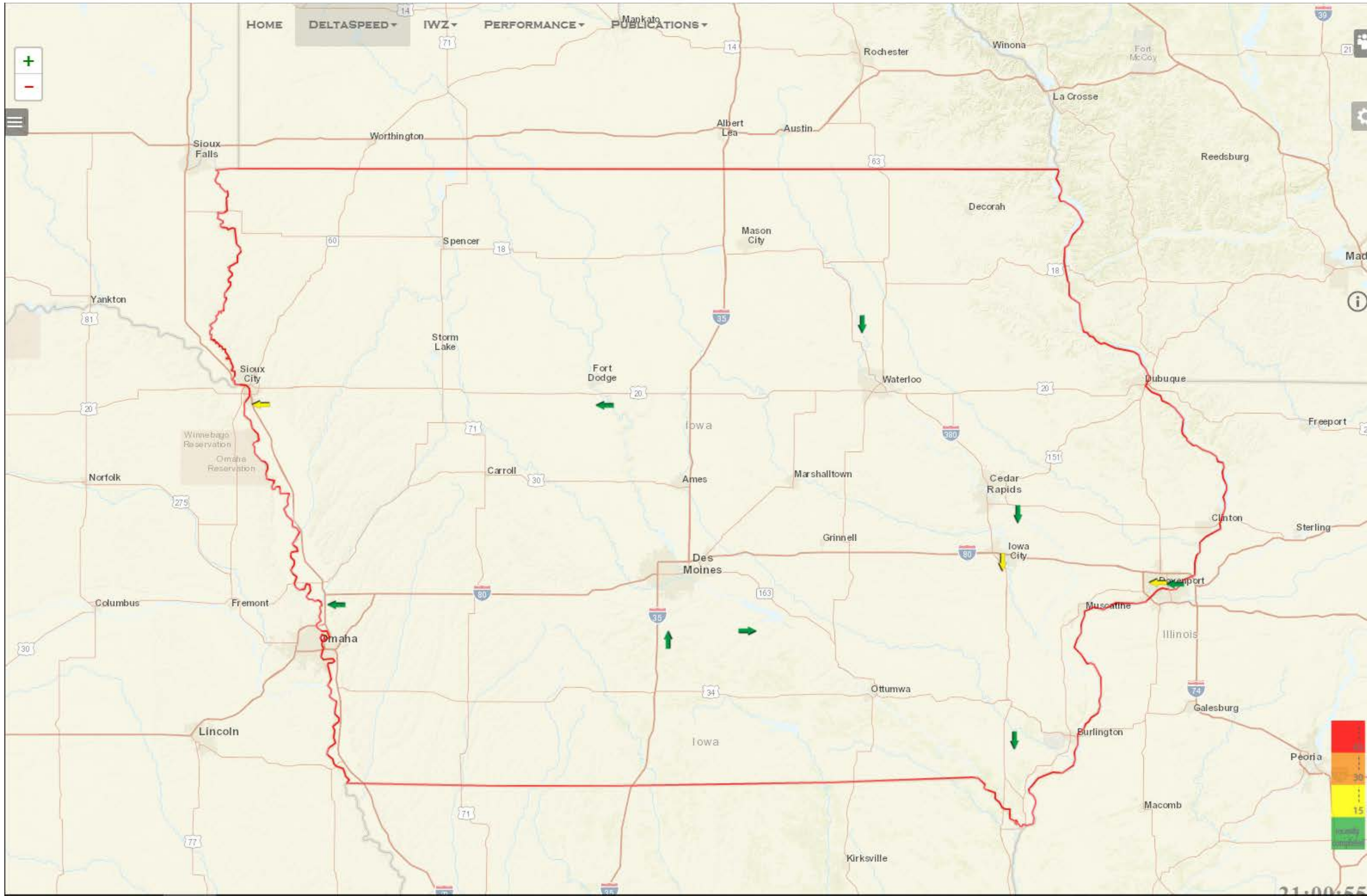
# Real-time Data

- **Delta Speed**
  - Difference in speed between segments to identify back of queue
- **Traffic anomaly detection**
  - Using outlier analysis to detect incidents

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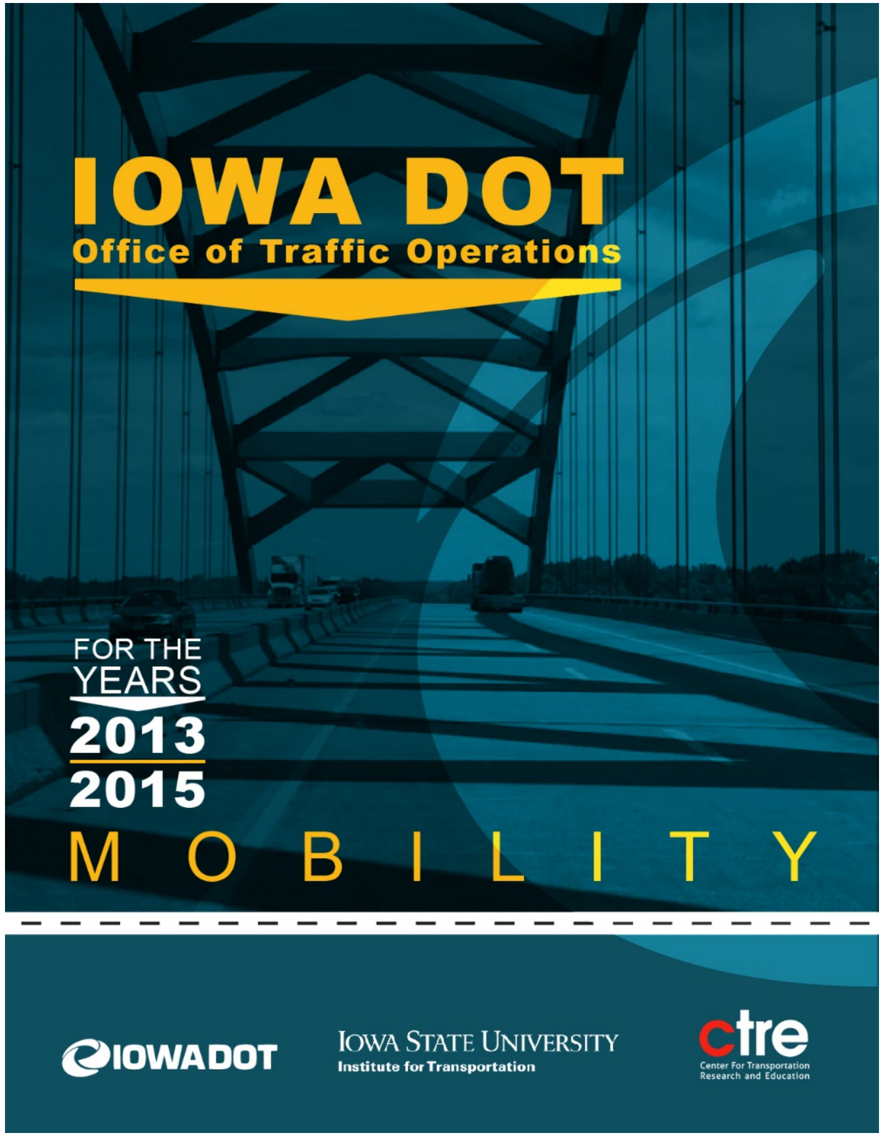


- Congested Hours
  - Top 10 most congested
  - Metro and Interstate comparison
  - Corridor congested hours
- Speed Percentage
- % increase in typical travel time (BTI)
  - Yearly
  - Daily

# Congested Hours

- Calculate hours of speed less than 45 mph

- Look at each minute of data
  - Congested if speed is less than 45 mph and real time score

- Summarized data by time of day, day of week and month

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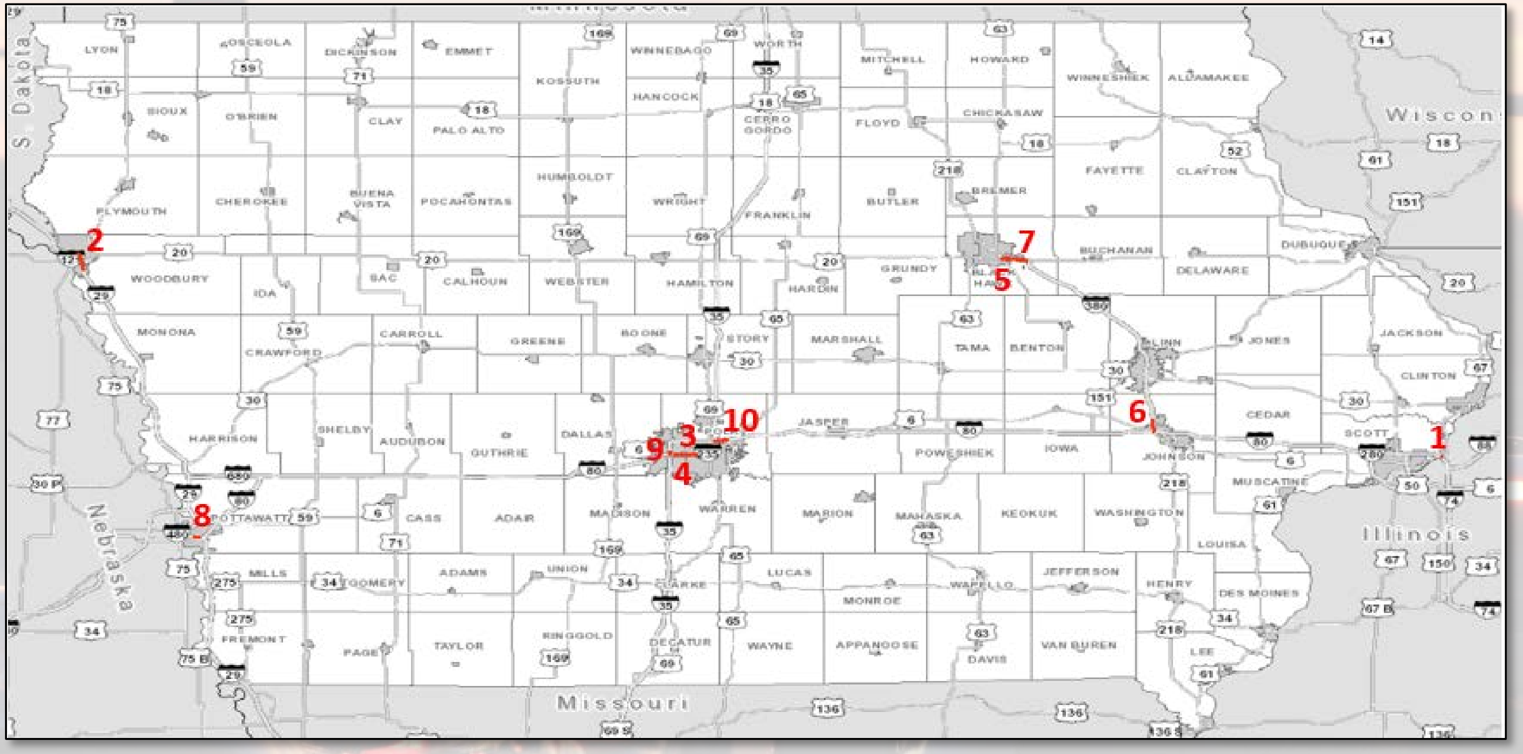
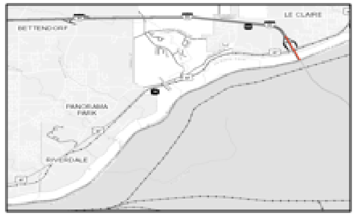
# Top 10 Most Congested - 2013



**Interstate 80 Westbound**

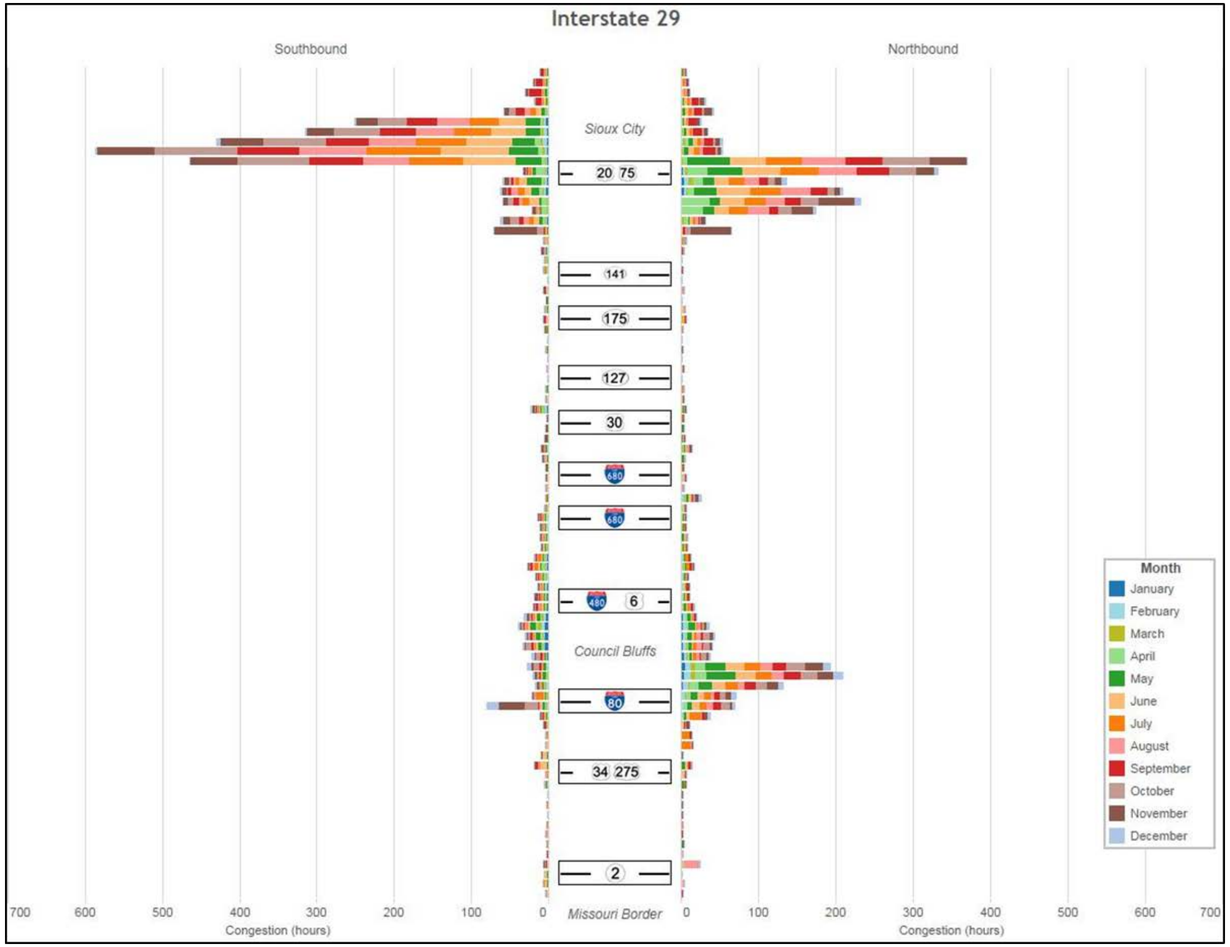
The top congested segment in Iowa was located in the Quad Cities on Interstate 80 westbound at the Illinois border. This half mile segment of road had 378.6 hours of congestion in 2013 which was primarily between June and November. Congested peaked with over 90 hours a month during both July and August. Construction on the Mississippi River bridge likely caused the congestion. Congestion primarily occurred between 9 am and 6pm with a majority during the PM Peak. .Friday was the peak of congestion while all other days had consistent congestion hours.

**Interstate 29 Northbound**

Up to 326.3 hours of congestion was experienced between Exit 141 (Sergeant Bluffs) and Exit 147A (Floyd Blvd) on I-29 northbound in Sioux City during 2013. This 5.8 miles of road had the most congestion between the months of August and October and 66.3 hours of congestion in September. The congestion was fairly consistent across the time of day and for all days of the week but was slightly higher between 9 am and 6 pm.

# 2013-2015 Mobility Report

## Construction

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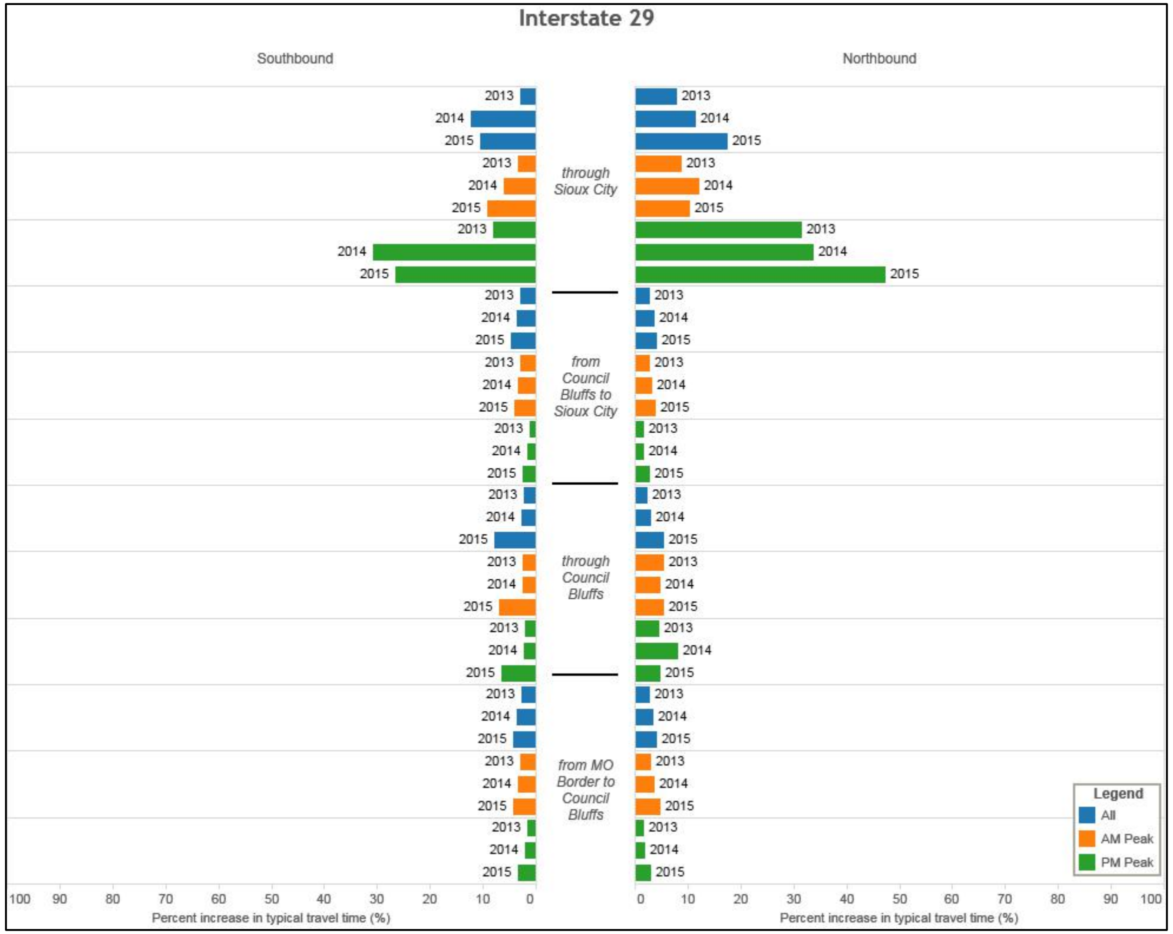
# Percentage increase in typical travel time

- Buffer time index

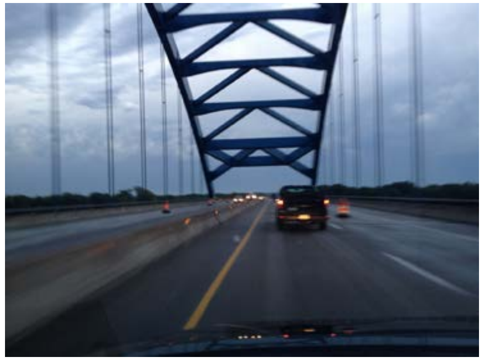
- Percentage increase in the typical travel time to arrive at destination with 95 percent confidence

- Calculated daily and yearly
  - All time periods
  - AM Peak
  - PM Peak

# Reliability





# Questions


Kyle Barichello
kyle.Barichello@iowadot.us

Skylar Knickerbocker
sknick@iastate.edu

IOWA DOT

ctre
Center for Transportation Research and Education

IOWA STATE UNIVERSITY
Institute for Transportation