Leveraging New Data Sources to Strengthen the Transportation Planning Process

James McLane

NCTCOG Regional GIS Meeting

May 15, 2018

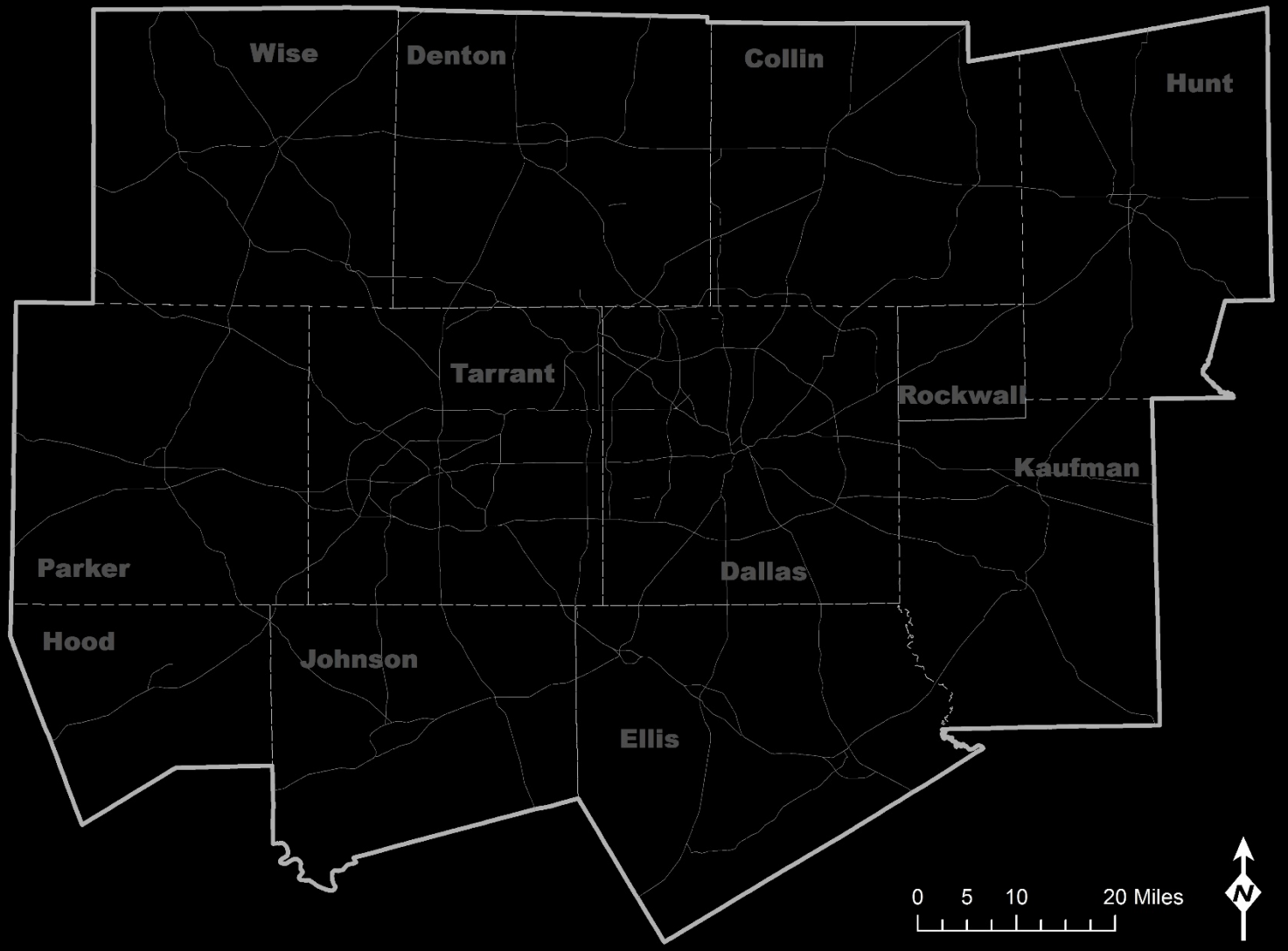
NCTCOG's Role in Transportation Planning

- As the region's MPO, NCTCOG is responsible for long-range and short range transportation planning in a 12-county region

- Long-range planning often driven by forecasts and predictions
  - Metropolitan Transportation Plan
- Short-range planning often driven by current conditions
  - Transportation Improvement Program
- Both informed by many observed data sources:
  - Traffic counts, household surveys, travel time datasets, etc.

Comprehensive Multi-Modal Planning Process

Metropolitan Planning Area



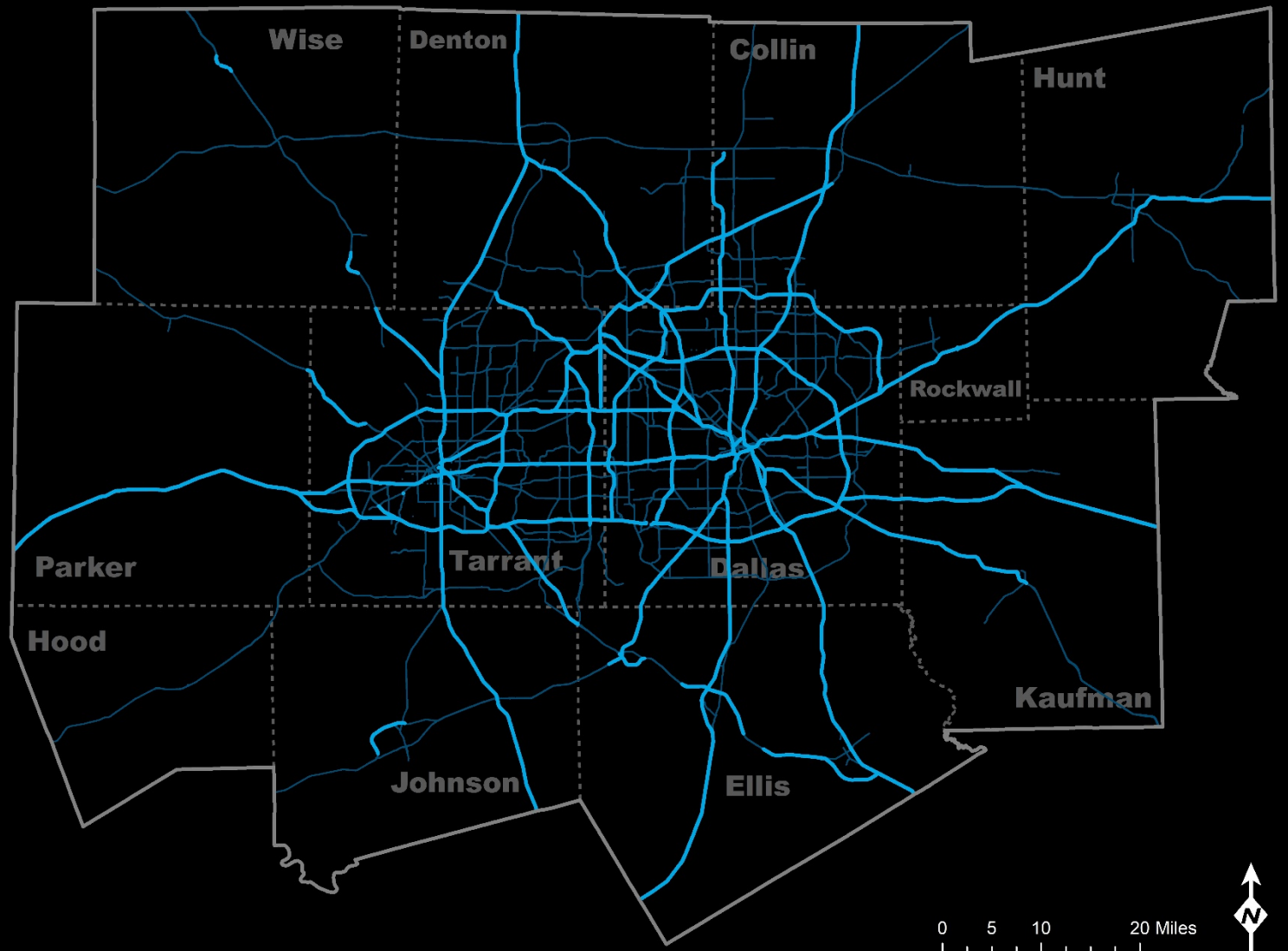
Performance Measurement

- Uses observed datasets to quantify and summarize the observed performance of the system
  - Can be used at both regional and corridor scales to evaluate projects or identify needs
- Becoming increasingly recognized as a useful tool to quantify changing performance over time
- New Federal requirements as a result of MAP-21/FAST Act require state DOTs and MPOs to report on the observed performance of the system relative to formally established targets
  - Specific measures and calculation procedures have been established to allow for comparison and aggregation
  - New datasets like the National Performance Management Research Dataset (NPMRDS) have been released to aid in calculation of some of these measures

NPMRDS

- An INRIX-derived travel time dataset provided freely to MPOs and state DOTs to enable calculation of some of the required measures
- Provides travel times on industry-standard TMC segments in five-minute intervals for each day
    - 288 time intervals/day * 31 days * 10,465 NHS TMCs in our planning area = up to 93 million records/month
- Has been available since mid-2013 – since January 2017 in a more complete form
- Travel time on a segment is the inverse of its speed

Extent


Wise
Denton
Collin
Hunt
Rockwall
Parker
Tarrant
Dallas
Hood
Kaufman
Johnson
Ellis
0 5 10 20 Miles
N

Federally Required Performance Measures

- Percentage of Person-miles of travel on the Interstate system that is reliable
- Percentage of Person-miles of travel on the Non-Interstate National Highway System (NHS) that is reliable
- Truck Travel Time Reliability Index
- Person-Hours of Peak-Hour Excessive Delay

- Procedures and guidance in flux despite specificity in rulemaking
- Many require a number of different data sources beyond NPMRDS

Federally Required Performance Measures

- Percentage of Person-miles of travel on the Interstate system that is reliable (2017)
  - 77.4%
- Percentage of Person-miles of travel on the Non-Interstate National Highway System (NHS) that is reliable (2017)
  - 71.2%
- Truck Travel Time Reliability Index (2017)
  - 1.74
- Person-Hours of Peak-Hour Excessive Delay (2017)
  - 14.5

Limitations of Requirements

- Required measures are only numbers with no spatial component
- We're still interested in a quantification of absolute congestion rather than just reliability
- Flaws in rulemaking's definition of reliability
- Difficult for different parties to get exact same result in calculations

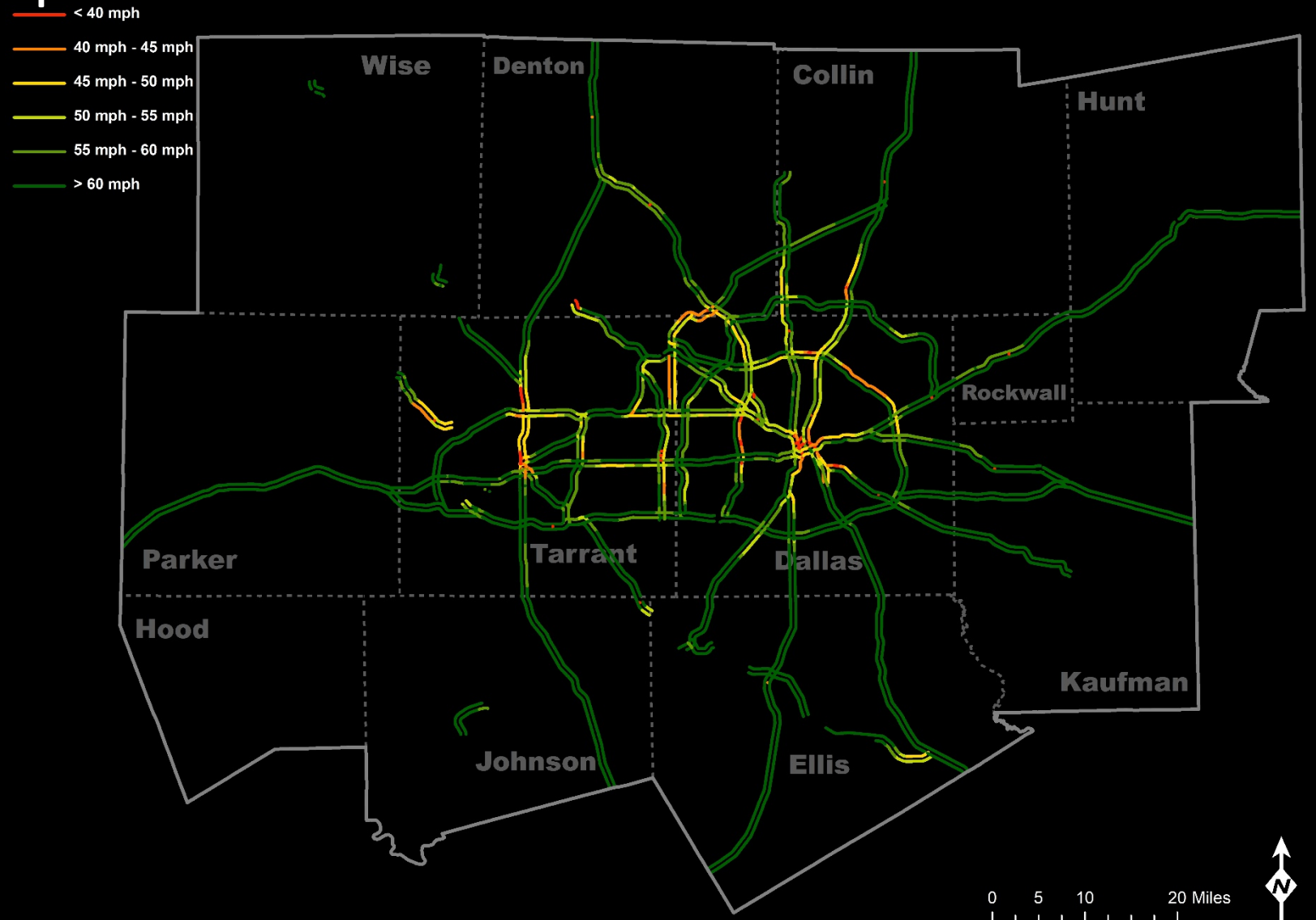
Quantifying Reliability

Additional Uses for NPMRDS

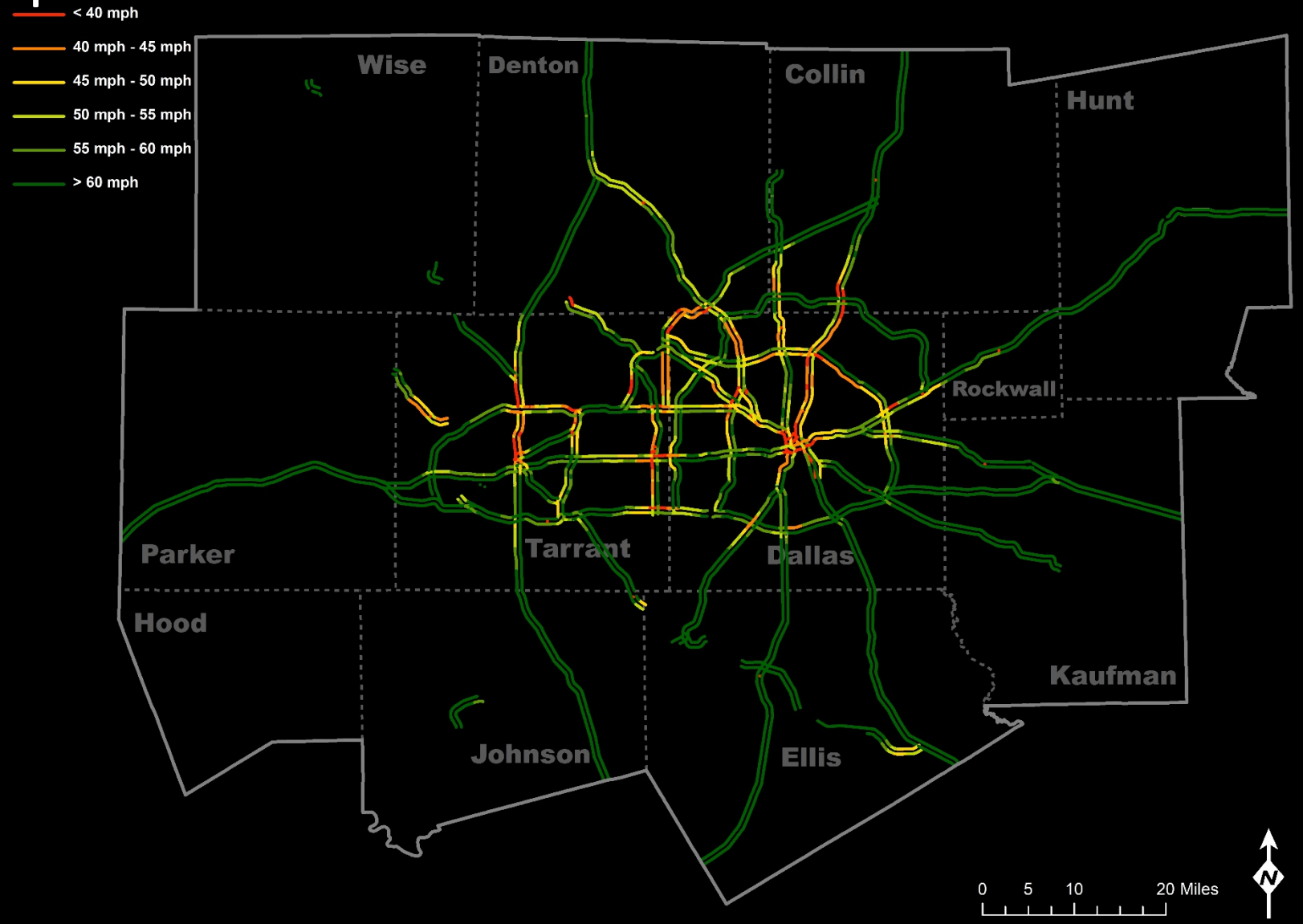
- Basic charts and maps
- Our own performance measures/metrics
  - Currently being integrated into upcoming MTP
- Evaluation of roadway projects and operational fixes
- Other special analyses

- NPMRDS is a powerful dataset that's capable of all of this and more

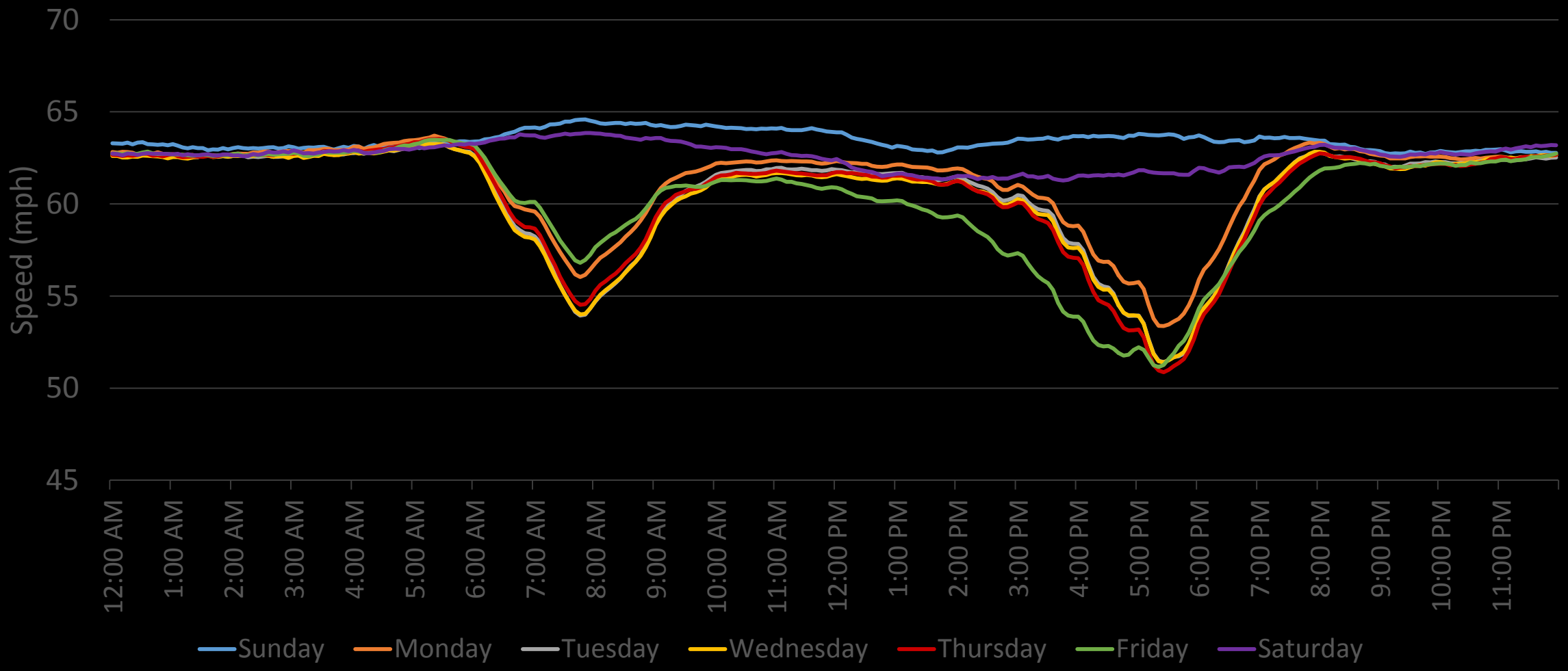
AM Speeds


< 40 mph
40 mph - 45 mph
45 mph - 50 mph
50 mph - 55 mph
55 mph - 60 mph
> 60 mph
Wise
Denton
Collin
Hunt
Rockwall
Parker
Tarrant
Dallas
Hood
Kaufman
Johnson
Ellis
0 5 10 20 Miles
N

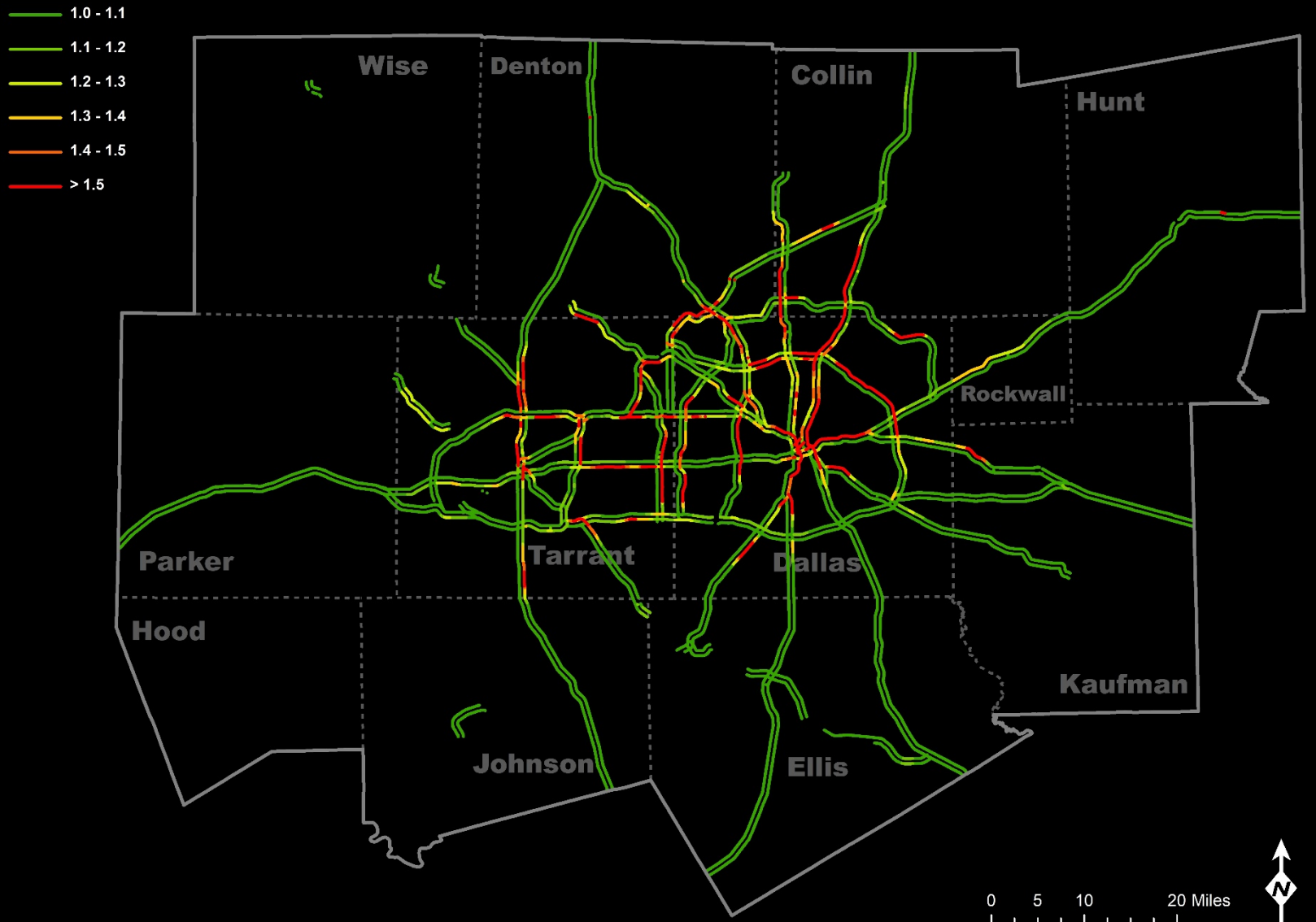
PM Speeds


< 40 mph
40 mph - 45 mph
45 mph - 50 mph
50 mph - 55 mph
55 mph - 60 mph
> 60 mph
Wise
Denton
Collin
Hunt
Rockwall
Parker
Tarrant
Dallas
Hood
Kaufman
Johnson
Ellis
0 5 10 20 Miles
N

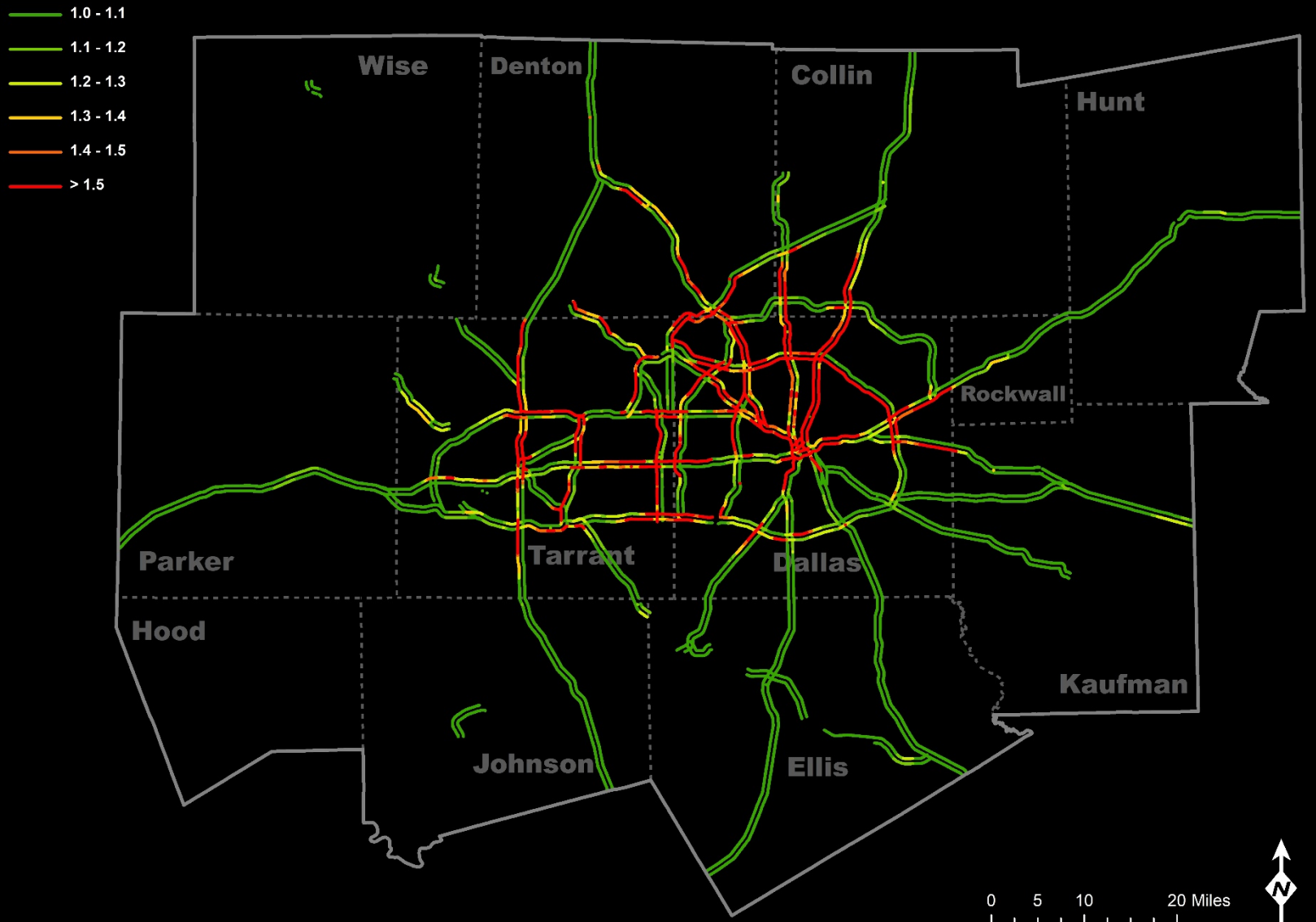
Speed by Time of Day



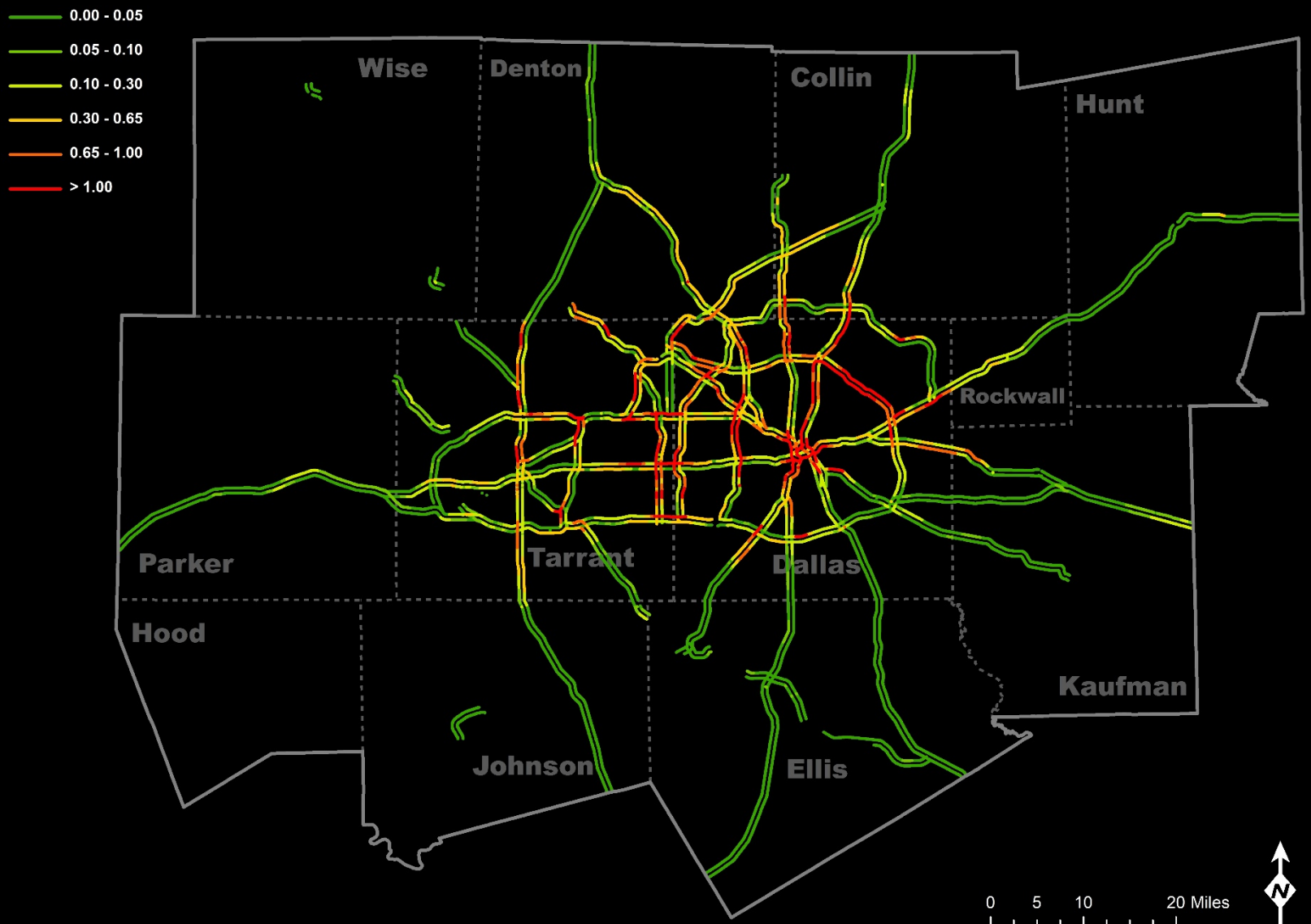
AM Travel Time Index



PM Travel Time Index



AM-PM TTI Difference



Individual Corridor Visualization

Speeds, mph, by time of day (15-minute interval) and day of May 2015

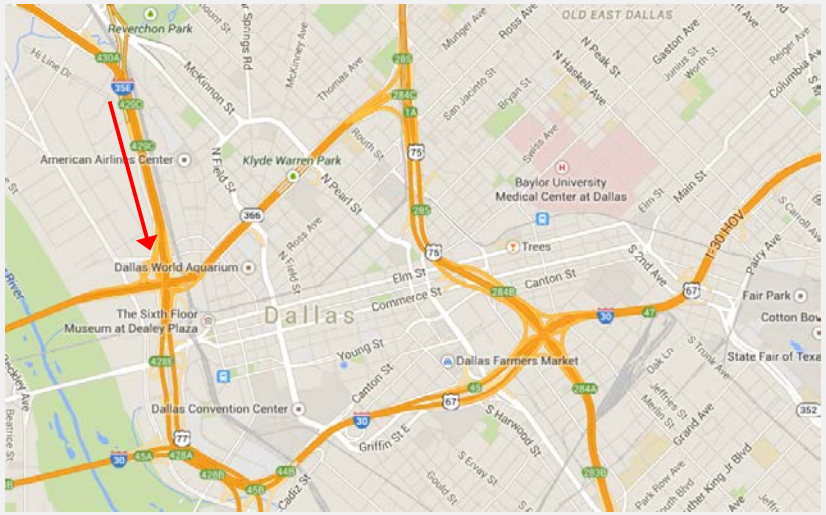
Worst Direction: Southbound

TIME OF THE DAY

Day	DOW	Early Morning Off-Peak	Morning Peak	Midday Off-Peak	Afternoon Peak	Night Off-Peak
May 1, 2015	Fri	56 56 56 56 56 56 56 56 56 50 50 60 60 65 65 56 56 60 65 33 60 60 65 56 65 56 53 53 60 45 53 53 53 35 38 26 31 30 27	22 27 18 12 12 18 25 24 22 22 16 26 27 31 22 10 20 20 16 14 9 12 12	13 8 9 6 9 8 7 5 9 13 13 16 14 14 16	15 18 16 24 40 30 14 15 33 22 60 65 53 53 50 56 60 53 53
May 4, 2015	Mon	60 53 53 56 56 56 56 56 53 50 50 53 53 53 47 47 47 47 65 56 60 71 60 60	60 56 56 60 56 42 50 45 53 30 40 42 47 38 53	56 53 42 50 33 56 50 45 27 38 56 53 35 47 38 35 50 38 25 20 20 15 19	24 21 17 15 13 9 10 11 8 9 16 21 28 56 53	56 56 60 53 60 56 56 60 53 60 56 65 53 60 60 50 60 56
May 5, 2015	Tue	53 53 53 60 56 65 60 56 60 60 50 60 60 60 56 60 56 53 56 65 65 65 56 56	60 42 53 53 56 47 38 30 53 35 56 40 30 29 26	23 50 53 40 56 50 60 53 38 42 60 60 53 60 56 45 35 31 31 31 21 17 17	15 16 16 14 10 10 11 9 9 12 10 12 16 20 24	38 50 53 60 53 53 56 53 45 47 53 65 56 56 56 56 56 50 56
May 6, 2015	Wed	56 53 60 60 56 65 56 56 53 53 50 53 50 50 56 60 47 65 56 47 65 56 60 60	53 56 60 65 47 42 33 33 23 42 37 42 38 50 24	37 50 56 47 53 42 56 45 53 45 29 29 35 53 38 45 38 53 30 31 30 30 26	21 13 14 15 15 11 11 10 10 12 12 12 16 27 38	56 60 60 56 50 47 47 47 53 65 60 53 60 56 53 60 60 56
May 7, 2015	Thu	60 56 53 60 53 53 71 65 56 60 60 60 60 65 60 60 56 60 65 65 60 65 65 53	65 60 65 60 50 45 34 35 38 30 26 33 18 26 33	20 24 26 21 28 21 22 12 16 13 13 15 22 47 42 27 21 23 37 31 15 15 18	20 14 12 10 11 10 10 9 8 7 8 9 9 12 17	22 22 53 56 53 60 60 60 50 60 56 56 56 47 42 45 37 47 45
May 8, 2015	Fri	45 53 47 47 47 47 47 47 47 42 42 50 50 50 60 56 56 60 60 40 56 56 56	10 56 65 56 56 40 30 53 45 56 56 37 40 33 35	28 38 22 30 29 28 21 24 20 25 24 19 27 29 29 15 17 18 23 15 9 11 11	15 11 15 10 11 8 9 6 7 7 8 9 11 19 14	20 17 56 56 47 60 56 53 50 45 60 47 53 60 60 53 56 53 60
May 11, 2015	Mon	37 56 60 60 60 50 56 56 56 60 60 60 60 60 65 60 56 56 56 60 60 65 56 56	60 56 56 56 56 45 53 50 53 20 35 42 40 27 27	53 50 60 50 53 34 29 33 24 35 50 40 33 47 45 45 40 45 27 22 19 34 34	11 9 10 12 11 9 12 10 12 10 10 12 18 38 56	56 60 65 45 56 56 60 60 56 60 60 56 56 60 60 56 56 56 56
May 12, 2015	Tue	60 37 53 19 45 53 53 53 60 60 53 60 56 60 60 60 60 53 65 60 60 56 65 60	65 56 50 56 53 47 53 34 56 47 24 27 33 47 38	42 56 30 38 56 47 56 24 29 37 47 35 30 47 34 45 34 47 42 26 18 15 5	20 15 15 14 16 10 8 9 10 10 13 12 11 21 50	53 50 60 53 53 60 56 56 56 65 56 65 60 60 56 65 60 60 56
May 13, 2015	Wed	56 53 56 56 53 56 56 53 53 60 60 60 65 56 60 56 56 56 56 60 60 56 60 60	38 47 30 47 29 42 50 50 53 25	47 47 50 35 56 56 38 25 33 40 38 31 16 35 45 22 19 18 16 17 14 10 13	9 11 11 11 10 8 8 7 6 12 12 11 12 13 20	45 56 60 56 56 53 60 53 60 60 53 53 56 60 71 56 60 56
May 14, 2015	Thu	56 60 53 56 56 56 56 56 56 56 56 56 65 60 60 56 56 53 60 60 60 56 65 65	56 65 56 56 34 29 47 33 45 47 34 20 23 31 20	25 20 20 27 29 38 28 26 21 30 19 17 16 18 24 18 19 15 17 18 12 17 26	17 17 16 12 12 12 8 13 14 12 13 18 14 18 27	53 26 56 56 60 53 56 53 45 53 56 53 60 60 56 53 60 56
May 15, 2015	Fri	65 60 60 53 56 50 53 65 56 53 60 60 53 65 53 60 65 65 60 60 56 56 65 53	65 56 60 56 31 37 40 50 60 24 20 24 21 22 18	20 18 20 15 17 13 18 17 15 17 18 13 13 16 15 7 7 7 8 7 7 6 6	8 7 7 4 8 6 7 6 7 8 13 10 8 11 15	10 16 34 53 60 60 56 56 53 60 56 47 65 50 65 53 56 45 50
May 18, 2015	Mon	71 71 71 56 60 60 56 60 56 56 53 53 47 53 65 65 60 60 65 60 65 60 65 60	60 56 65 60 53 53 50 29 45 21 47 45 53 22 34	34 30 38 35 27 56 40 30 26 42 17 10 9 10 17 31 38 37 33 28 19 21 21	11 14 10 16 10 9 9 8 10 12 11 16 18 12 40	60 65 60 60 65 56 56 53 56 56 60 60 50 53 53 53 56 56 60
May 19, 2015	Tue	56 60 60 60 50 60 65 56 60 56 56 53 53 53 60 60 60 60 60 53 60 56 56 56	56 53 56 56 60 53 50 45 19 25 33 28 38 26 42	50 56 60 50 53 24 53 40 28 50 53 30 40 35 31 33 42 35 21 21 20 22 17	13 9 13 12 10 7 7 10 9 11 9 10 10 15 13	50 60 53 60 53 56 53 53 56 50 60 47 53 65 60 60 60 60 60
May 20, 2015	Wed	56 60 56 56 50 60 60 60 38 65 60 60 65 53 56 56 56 60 60 60 60 56 56 56	60 56 60 65 50 40 53 16 25 17 21 17 35 17 14	18 38 40 42 35 40 35 50 22 31 34 26 37 29 28 21 22 37 22 15 16 24 19	21 19 14 18 13 15 10 8 12 13 12 14 11 12 26	42 45 60 50 60 56 65 60 56 53 47 47 56 60 56 56 60 60 60
May 21, 2015	Thu	71 56 60 56 60 60 53 60 60 60 60 60 53 60 53 53 53 53 53 53 56 56 56 60	45 50 28 28 38 26 22 22 21 34 25 45 31 37 22	28 26 20 20 24 50 40 37 30 26 35 29 30 42 22 24 24 25 29 26 27 27 17	12 18 12 12 10 9 12 6 10 10 9 12 13 17 60	56 53 60 60 60 47 33 56 50 50 53 9 53 53 60 60 53 65 50
May 22, 2015	Fri	60 53 53 56 56 53 56 56 56 53 53 42 42 60 56 56 60 45 56 60 56 65 50 56	60 56 65 65 50 60 28 33 26 34 26 31 26 45 27	20 26 27 18 26 22 18 27 17 20 18 15 12 17 21 21 20 18 15 12 11 17 10	8 8 9 9 8 9 9 10 8 12 11 17 11 13 22	26 23 18 56 47 56 53 56 53 53 60 53 28 53 56 56 53 56 56
May 25, 2015	Mon	60 53 56 60 60 60 60 60 56 50 53 60 60 65 71 56 60 60 60 60 60 56 60	71 53 56 56 56 60 60 65 56 60 56 60 65 56 56	65 53 65 71 60 60 60 60 65 56 53 65 56 60 56 60 60 53 56 65 56 60 50	40 42 53 47 50 47 56 56 56 60 50 71 53 60 56	47 45 53 60 53 42 42 45 65 65 60 60 60 65 65 56 60 60 60
May 26, 2015	Tue	56 65 56 65 53 60 47 60 56 60 60 56 60 60 60 60 60 60 22 56 56 53 60	60 60 56 50 53 50 30 33 23 26 47 33 35 33 20	26 31 60 37 45 24 35 30 6 27 22 40 34 34 26 34 26 53 11 18 24 18 17	20 14 21 11 14 13 2 8 11 9 11 14 16 14 15	11 27 53 56 56 56 56 47 50 40 40 40 50 53 56 56 56 60 53
May 27, 2015	Wed	60 53 47 50 53 50 53 53 47 53 56 60 60 60 60 53 56 53 53 53 60 60 53 65	60 53 60 50 53 26 47 60 47 50 20 42 12 31 20	35 28 38 28 56 56 50 50 60 50 47 56 53 20 28 21 21 20 18 16 18 19 18	15 14 15 11 14 13 13 11 11 13 11 12 12 16 25	60 60 56 60 56 60 65 53 50 56 60 60 60 60 60 53 60 56
May 28, 2015	Thu	56 60 60 60 60 42 60 60 60 60 60 53 65 60 60 65 65 56 60 56 47 60 60	60 65 56 56 56 38 26 56 47 16 28 30 34 30 26	23 35 38 35 45 40 33 29 37 24 34 28 29 30 33 15 16 23 18 22 20 17 16	20 15 16 11 10 10 11 10 9 8 11 11 13 20 15	7 12 60 37 53 56 53 56 53 53 23 12 6 8 22 50 56 56 53
May 29, 2015	Fri	47 42 53 42 56 35 45 47 38 45 42 47 50 34 9 50 47 45 45 40 56 65 50 50	56 56 60 60 56 53 47 56 65 53 60 56 47 40 38	60 56 38 53 37 28 22 31 20 23 18 18 22 15 15 18 13 12 17 7 12 13	10 7 6 7 6 7 8 7 8 10 11 6 9 9 5	7 5 8 8 8 10 15 24 42 25 24 15 9 5 7 8 6 9 6 2

Legend
speed, mph

1	10
11	20
21	30
31	40
41	50
51	60
61	70



Evaluating Operational Fixes

NOTE: Highlighted areas are not drawn to scale. TxDOT graphic

PROJECT STATUS:

December 2013: Environmental clearance received

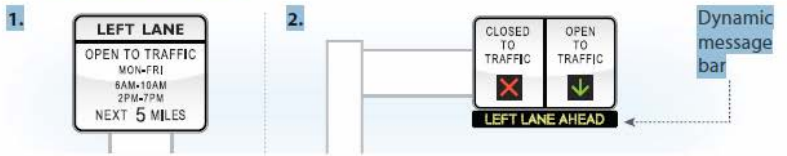
January 2014: Contract awarded to Austin Bridge and Road L.P. ($3.7 million)

NEXT STEPS:

Spring 2014: Begin construction

- **Traffic cameras**
- **Dynamic message signs**
- **Illumination**
- **Pilot project providing wreckers**
- **Emergency pull-off locations**

REGULATORY SIGNS



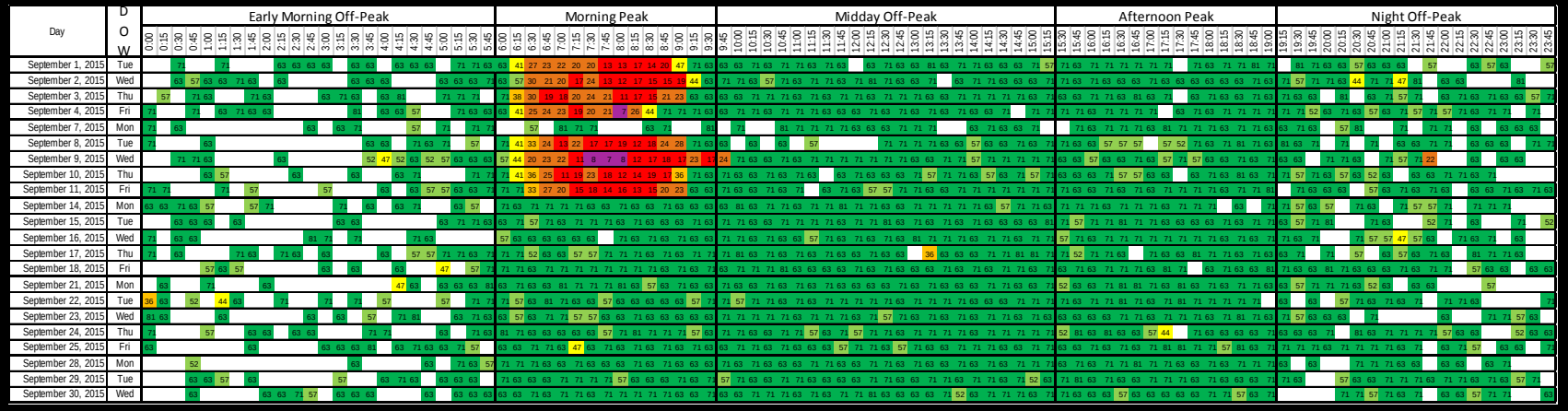
PEAK HOUR

OFF-PEAK HOUR

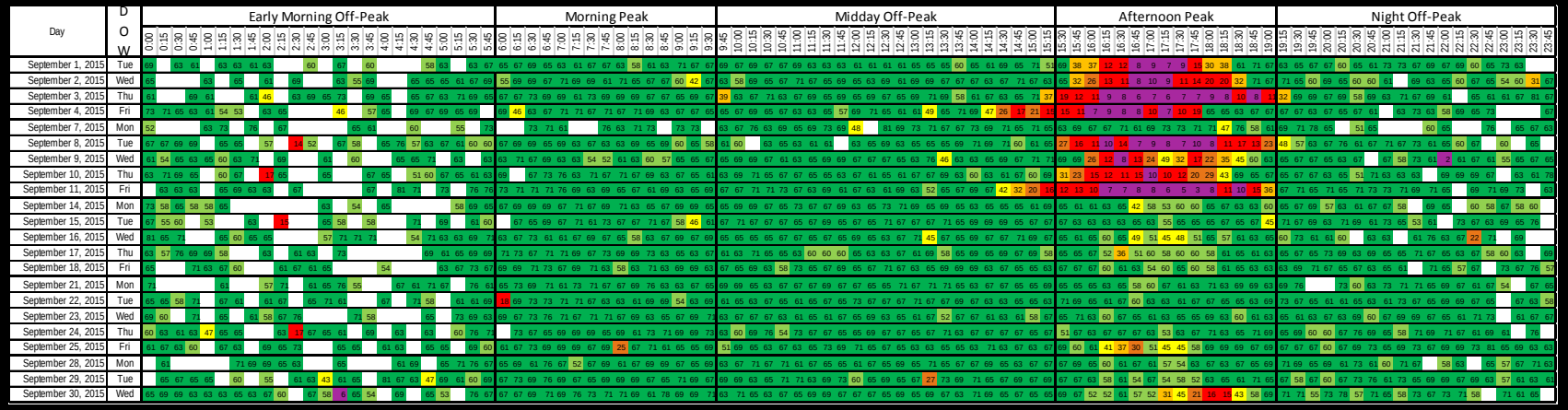
NOTE: Illustrations are not drawn to scale. TxDOT graphic

Evaluating Operational Fixes

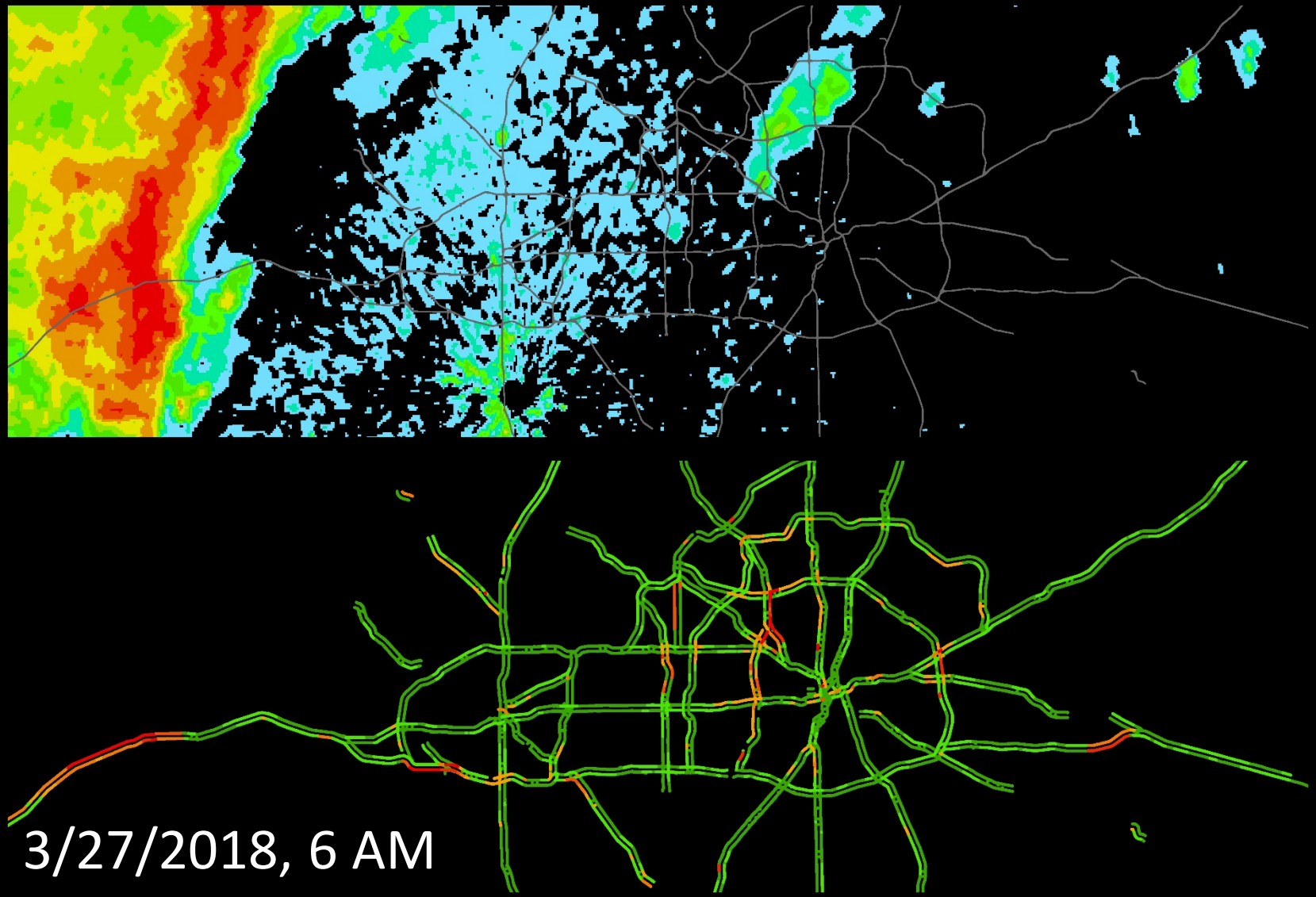
SH 161, NB



SH 161, SB

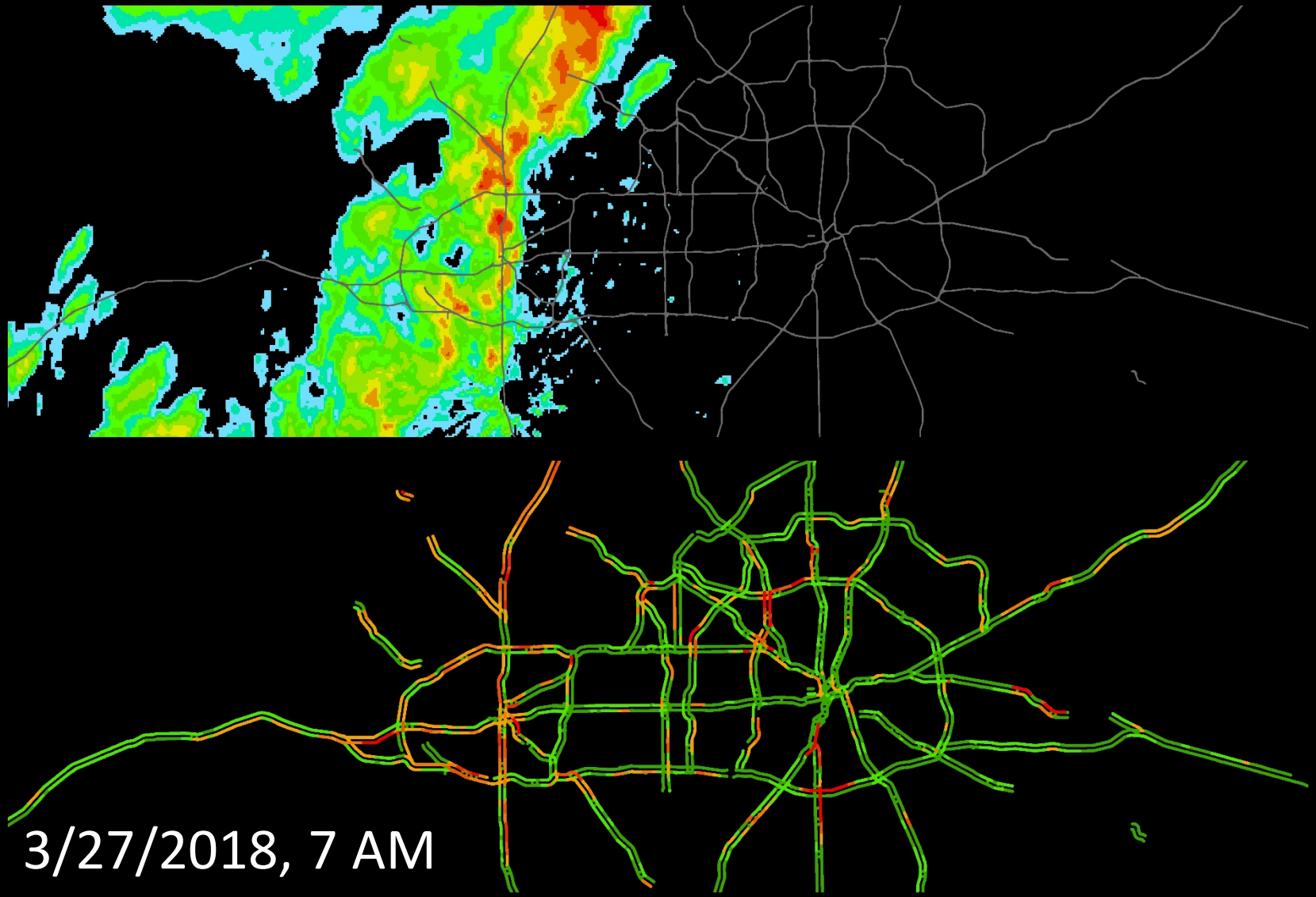


Weather Events



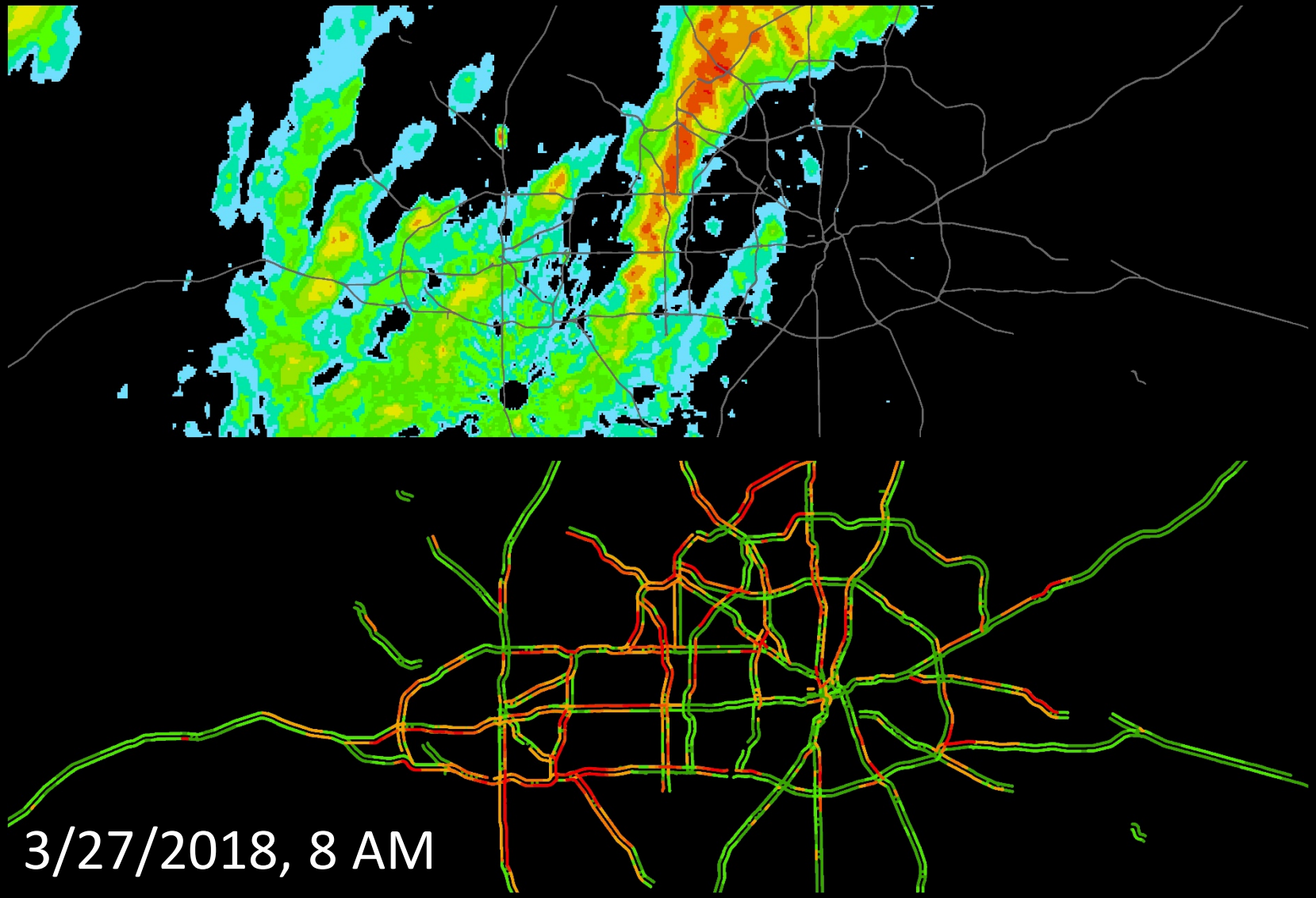
3/27/2018, 6 AM

Weather Events



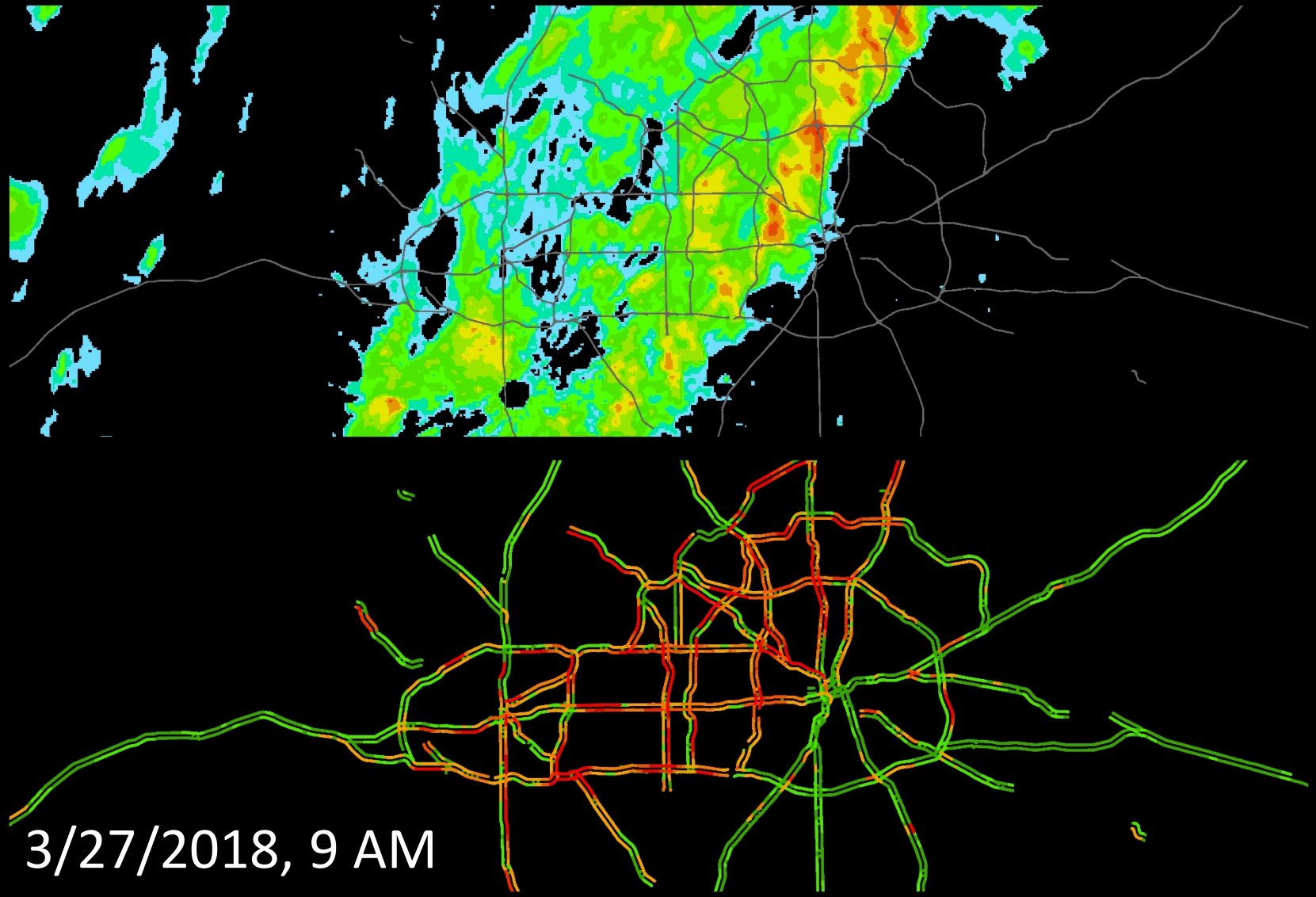
3/27/2018, 7 AM

Weather Events



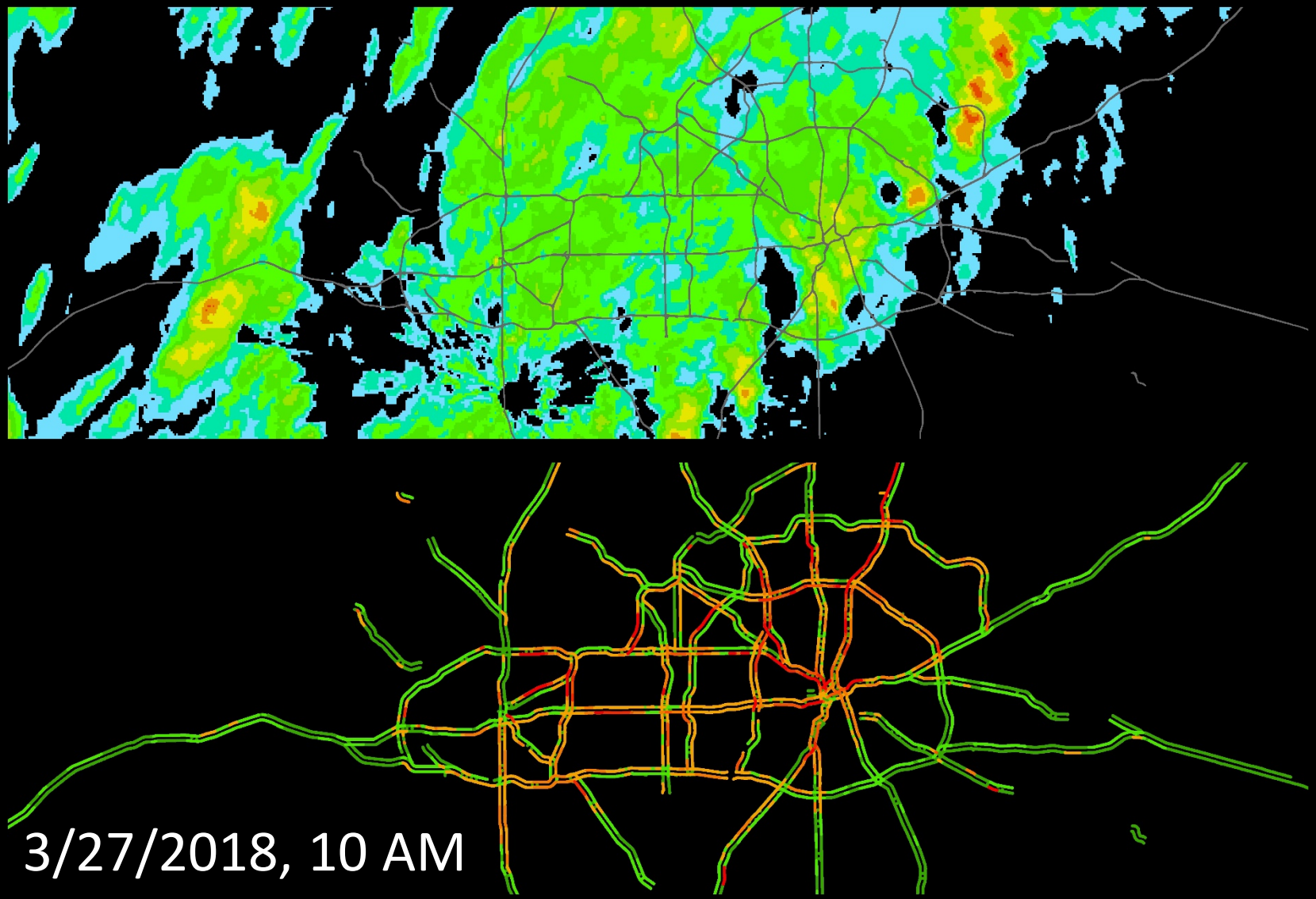
3/27/2018, 8 AM

Weather Events



3/27/2018, 9 AM

Weather Events



3/27/2018, 10 AM

Integration Into Plans

- Upcoming long-range plan (Mobility 2045) is in progress
- NPMRDS used to add a reliability component to our project selection/prioritization process
  - Used versions of reliability metrics from rulemaking spatially joined to project network
- Only usable for existing corridors, but helps to highlight issues other congestion data sources might miss

Future Work

- Continuing to report required measures and set targets
- Linear referencing with other roadway datasets
  - Data sources and guidance need to stabilize first
- Calculating and publicizing measures above and beyond those required by rulemaking
- Use these and other datasets to further strengthen data-driven decision making in future plans

For More Information

- FHWA Introduction to Performance Measurement and NPMRDS:
  - https://ops.fhwa.dot.gov/perf_measurement/index.htm
- FHWA Transportation Performance Management Program:
  - https://www.fhwa.dot.gov/tpm/
- NCTCOG's Mobility 2045:
  - https://www.nctcog.org/mobility2045

Questions?

James McLane

Senior Information Analyst

jmclane@nctcog.org

817-704-5636

Francisco Torres

Data Applications Manager

ftorres@nctcog.org

817-608-2356

Dan Lamers, P.E.

Senior Program Manager

dlamers@nctcog.org

817-695-9263