DEPARTMENT OF TRANSPORTATION

2017 Congestion Report

Metropolitan Freeway System

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Purpose and Need

The Metropolitan Freeway System Congestion Report is prepared annually by the Regional Transportation Management Center (RTMC) to document those segments of the freeway system that experience recurring congestion. This report is prepared for these purposes:

- Identification of locations that are over capacity
- Project planning
- Resource allocation (e.g., RTMC equipment and incident management planning)
- Construction zone planning
- Department performance measures reporting

Introduction

What is Congestion?

MnDOT defines freeway congestion as traffic flowing at speeds less than or equal to 45 Miles per Hour (MPH). This definition does not include delays that may occur at speeds greater than 45 MPH. The 45 MPH speed limit was selected since it is the speed where "shock waves" can propagate. These conditions also pose higher risks of crashes. Although shock waves can occur above 45 MPH there is a distinct difference in traffic flow above and below the 45 MPH limit.

What is a shock wave?

A shock wave is a phenomenon where the majority of vehicles brake in a traffic stream. Situations that can create shock waves include:

- Changes in the characteristics of the roadway, such as a lane ending, a change in grade or curvature, narrowing of shoulders, or an entrance ramp where large traffic volumes enter the freeway.
- Large volumes of traffic at major intersections with high weaving volumes and entrance ramps causing the demand on the freeway to reach or exceed design capacity.
- Traffic incidents, such as crashes, stalled vehicles, animals or debris on the roadway, adverse weather conditions and special events.

Drivers' habits can also contribute to shock waves. Drivers' inattentiveness can result in minor speed variations in dense traffic or sudden braking in more general conditions. In these situations, shock waves move upstream toward oncoming traffic at rates varying according to the density and speed of traffic. As the rate of movement of the shock wave increases, the potential for rear end or sideswipe collision increases. Multiple shock waves can spread from one instance of a slowdown in traffic flow and blend together with other extended periods of "stop-and-go" traffic upstream. This condition is referred to as a "breakdown" in traffic.

Usually breakdowns last the remainder of the peak period if traffic volumes are close to or above design capacity. These types of breakdowns are typical in bottleneck locations on the freeway system.

Methodology

MnDOT began collecting and processing congestion data in 1993. Since this time, MnDOT has improved its data processing and changes in methodology have occurred. These changes as well as variables affecting localized and region-wide traffic volumes, such as ramp metering algorithms, make it difficult to compare congestion from one year to the next. The following are key dates on the progression of developing congestion information in the metro area:

- 1989: MnDOT formed a committee to evaluate congestion on Twin Cities metro freeways
- 1993 – 2003: Rapid expansion of the freeway management systems
- 2001 – 2003: Evaluation and adjustments of ramp metering

How is congestion measured?

For this report, MnDOT derived its congestion data using two processes:

- Surveillance detectors in roadways
- Field observations

Electronic surveillance systems exist on about 95% of the metro area freeway system. For this report, the Regional Transportation Management Center collected October 2017 data from 4,000 traffic sensors on Twin Cities Metro freeways which are either loop detectors embedded in the pavement or radar sensors mounted on the roadside.

Generally, the month of October is used for congestion reports since it reflects regular patterns of traffic. With summer vacation season over and school back in session, commuter traffic flows return to normal levels. During the month of October, most summer road construction project are completed and weather conditions are still generally favorable.

The 2016 evaluation we used 758 directional miles of the Twin Cities urban freeway system to analyze congestion. For 2017 evaluation we extended our analysis which included 12 additional miles of freeways including:

- Newly constructed highway 610 from highway 169 to I-94.
- With the new interchange on highway 36 and English Street, extended our analysis east to the traffic signal at highway 36 and Century Avenue North (highway 120).
- Extended our analysis north on US 169 to highway 610.

The RTMC evaluates the 782 directional miles of the Twin Cities urban freeway system to develop the AM plus PM percentage of Directional Metro Freeway Miles Congested. It tracks the percentage of miles that operate at speeds below 45 MPH for any length of time during the AM and PM peak periods (782 miles AM and 782 miles PM). Mainline detectors are located in each lane of a freeway at approximately one-half mile intervals. Individual lane detectors located at a given location along the same direction of the freeway constitute a station. For the purpose of this report, if any station's detectors experience congestion at any given time, the station is identified as congested.

Speed data is based on the median value of data collected at detector locations. Median values are calculated for each five- minute interval for the periods of 5:00 AM to 10:00 AM and 2:00 PM to 7:00 PM for the twelve midweek days in October. MnDOT uses medians, rather than averages, to minimize the effects of extremes in the data. This process mitigates those occasions of roadwork lane closures, significant traffic incidents, and one-time traffic events not related to daily commuting patterns.

2017 Results

The Twin Cities freeway system had a decrease in the percentage of miles of freeway system congested, from 23.7% in 2016 to 23.2% in 2017. As noted earlier, 12 additional miles were added to the 2017 analysis due to freeway expansions on Hwy 169, Hwy 36, and Hwy 610. With these additional miles, it is difficult to compare 2017 to past years as overall miles of congested roadways actually increased across the system but the total miles of system also increased.

The MnDOT Metropolitan District 20-year Highway Investment Plan has identified several strategies for addressing congestion.

- *Active Traffic Management* – MnDOT currently uses an advanced system of cameras, loop detectors, ramp meters, FIRST incident response trucks, changeable message signs and other traveler information systems. Benefits include increases in average throughput, capacity and reliability, and decreases in incidents and travel time.
- *Spot Mobility Improvements* – These lower cost/higher benefit projects improve traffic flow by relieving bottlenecks on freeways and arterials, improving geometric design and addressing safety hazards. Some enhance capacity by adding short auxiliary lanes, and others focus on system management.
- *MnPASS* – MnDOT currently operates MnPASS Express Lanes on I-394, I-35W and I-35E. During rush hour periods they provide a congestion-free travel option for those who ride bus transit, motorcycles, vehicles with two or more passengers or those driving alone who are willing to pay a fee. They can move more people through a highway corridor and offer commuters a faster, more reliable choice during congestion. They can also improve bus transit service and increase ridership. MnDOT and the Metropolitan Council plan to add lanes to the MnPASS system in the Twin Cities metro area.
- *Strategic Capacity Enhancements* – In some locations, other types of capacity improvements may be needed like bus only shoulders, unpriced dynamic shoulder lanes or interchange capacity improvements.

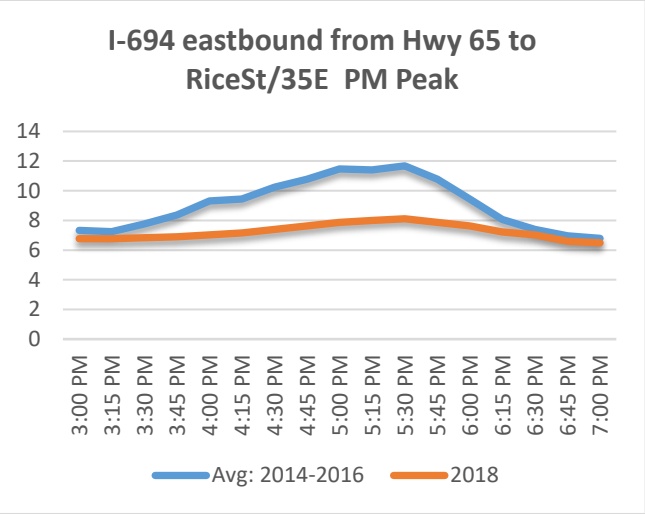
Many factors affect congestion levels such as the local economy, population growth, gas prices, transit ridership and vehicle miles traveled (VMT).

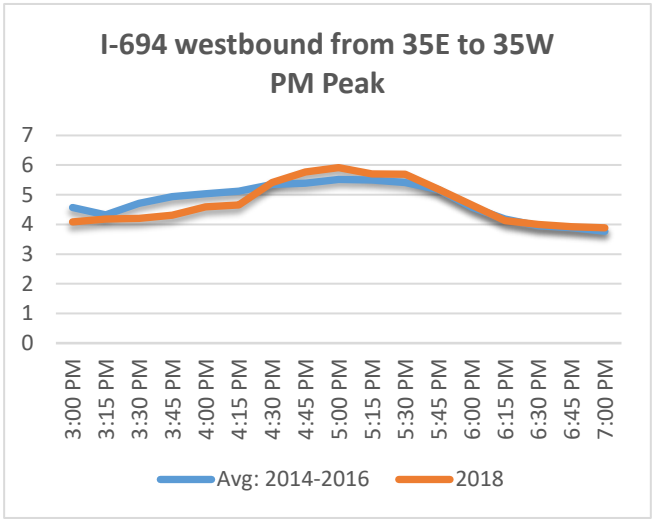
Corridor Highlights

I-694 between Rice Street in Shoreview and Lexington Avenue in Arden Hills

The I-694 corridor was reconstructed between Rice St. and Lexington Ave. adding a third lane in each direction. The project was under construction from April 2016 through November 2017. Since data for this report is not collected until October, the benefits from this project are not captured in the overall congestion measure for 2017.

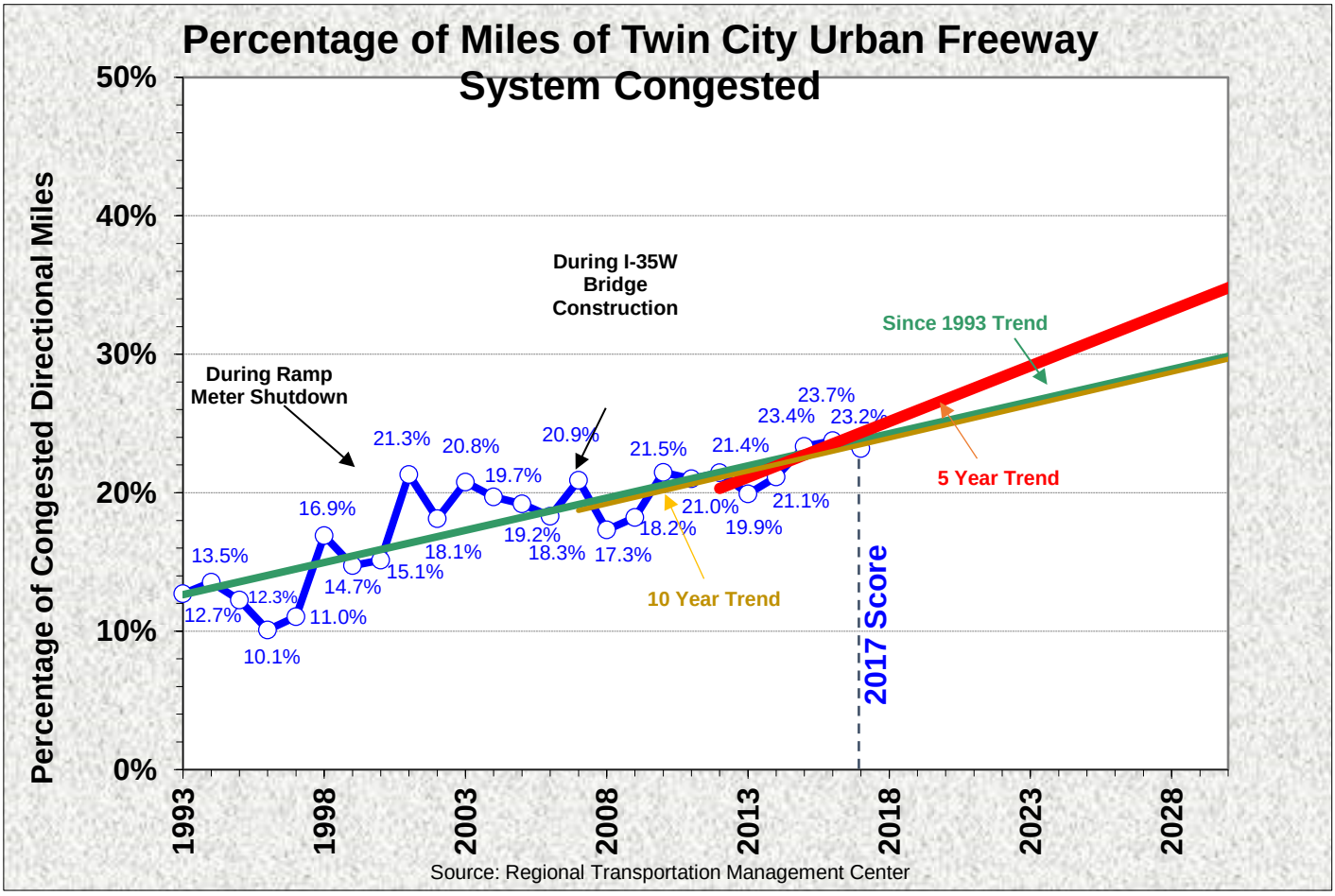
The charts below show travel times leading up to and through the project area before and after the construction. Travel time data was collected from the first quarter of 2018 and compared to a 3-year average for that same first quarter timeframe prior to construction.





Explanation of Percentage Miles of Twin City Urban Freeway System Congested Graph

Mitigating congestion is critical to the traveling public. MnDOT has limited resources to slow projected increases in congestion. The graph that follows represents historical levels of congestion along with projected trend lines based on data collected since 1993 and the past 5 years and 10 years of data. The anticipated trend of increased VMT and increasing construction costs along with improving economic conditions are expected to cause congestion to grow in the future.



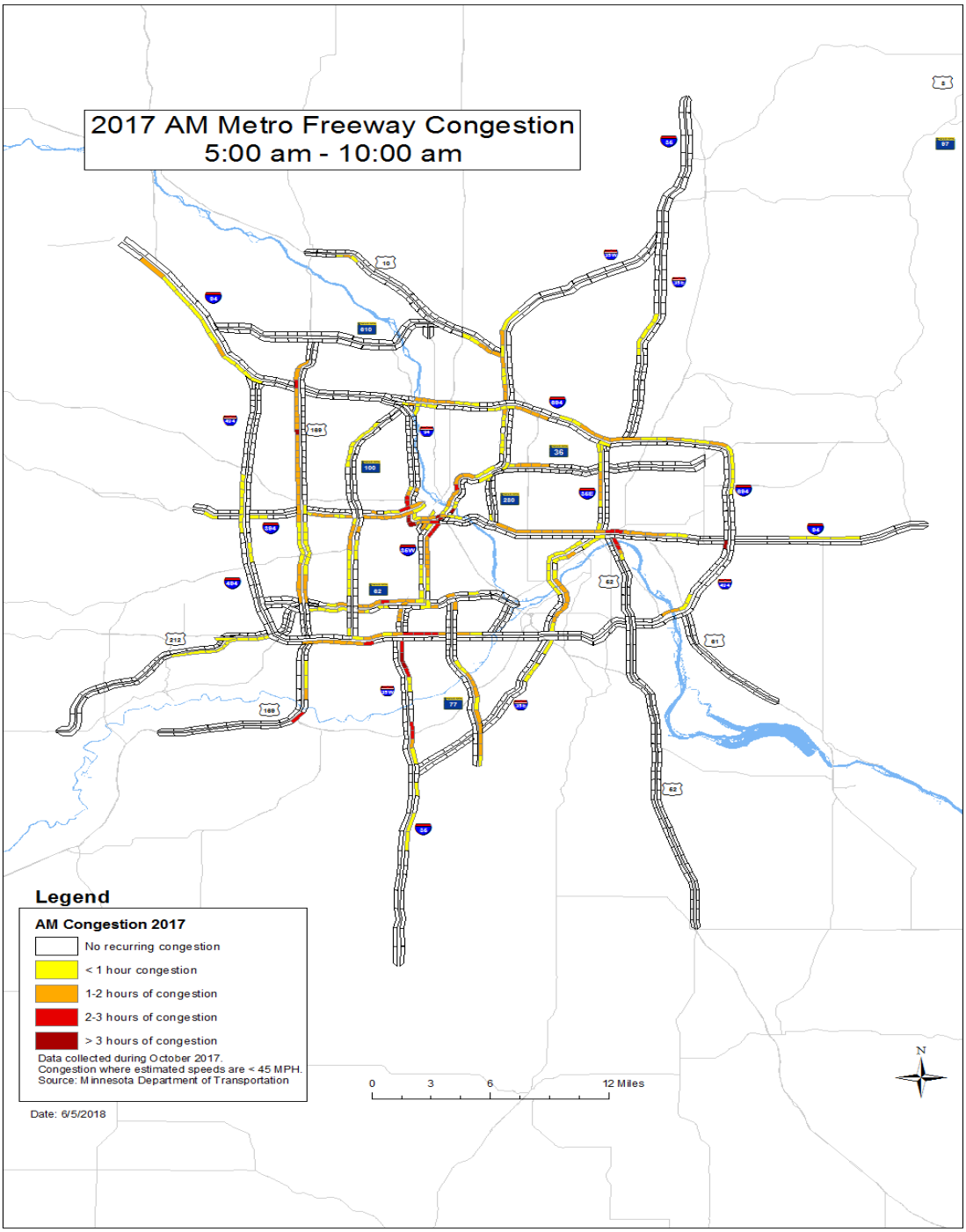
AM Plus PM Miles of Directional Congestion

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Severe	51	55	82	73	85	99	76	115	94	88
Moderate	104	107	127	125	128	90	118	120	125	130
Low	108	114	117	121	113	114	127	120	141	145
Total	**263**	**276**	**326**	**319**	**325**	**302**	**321**	**354**	**360**	**363**

AM Plus PM Percent of Miles of Directional Congestion

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Severe	3.4%	3.6%	5.4%	4.8%	5.6%	6.5%	5.0%	7.6%	6.2%	5.6%
Moderate	6.8%	7.1%	8.3%	8.2%	8.4%	5.9%	7.8%	7.9%	8.2%	8.3%
Low	7.1%	7.5%	7.7%	7.9%	7.5%	7.5%	8.4%	7.9%	9.3%	9.3%
Total	**17.3%**	**18.2%**	**21.5%**	**21.0%**	**21.4%**	**19.9%**	**21.1%**	**23.4%**	**23.7%**	**23.2%**

2017 AM Metro Freeway Congestion: 5:00 am – 10:00 am



Directional Metro Freeway Miles Congested 5:00 AM – 10:00 AM

Congested Interstate Miles (AM) 1

Highway	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
I-35	1	1	0	2	0	0	0	0	2	1.5
I-35E	9	9.5	13.5	14.5	14.5	16	11	13	16	20.5
I-35W	17	24	28	25	23	24	24	28	40	31.5
I-94	23	25.5	28.5	24.5	29	26	23	25	26.5	26.5
I-394/ TH 12	8.5	7.5	8.5	9.5	10.5	7.5	8.5	7.5	6.5	11
I-494	24.5	17.5	14.5	19.5	20	19.5	20	24	27.5	16.5
I-694	9	10.5	12	11	13	14	15.5	19	16.5	20
Subtotal	**92**	**95.5**	**105**	**106**	**110**	**107**	**102**	**116.5**	**135**	**127.5**

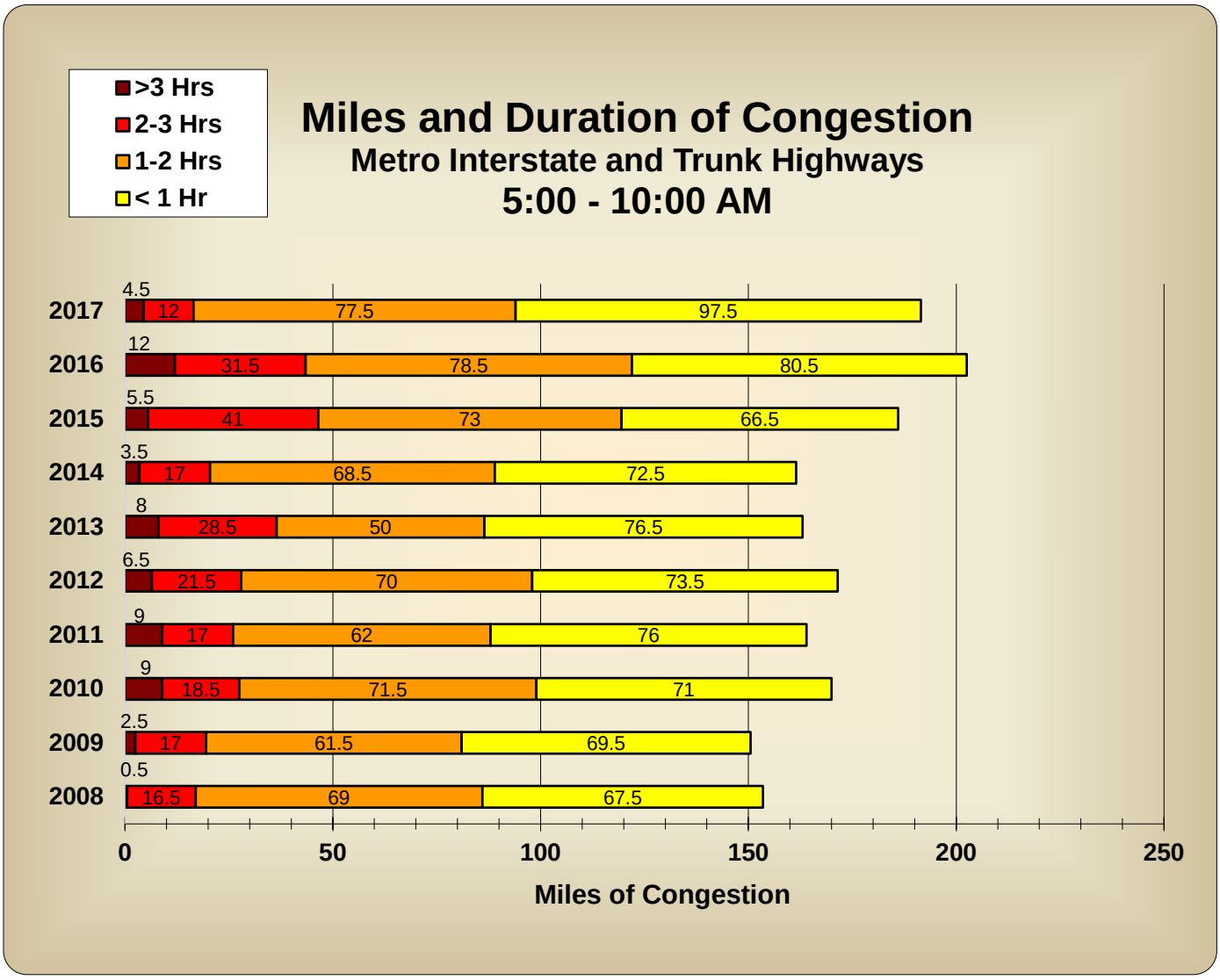
Congested Trunk Highway Miles (AM) 1, 2

Highway	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
TH 5	0	0	0	0	0	0	0	0.5	0	0.5
TH 10	4.5	2.5	5	4	2.5	2.5	3.5	5	4.5	4
TH 36	7	6	7.5	7.5	6.5	6	7.5	7.5	5.5	2.5
TH 52	2	2	2	2.5	2	2	2	2	2	2
US 61	0	0	0	0	0	0	0	0	1	0
TH 62	10	9.5	10.5	9	8.5	8.5	7	7.5	13	10
TH 65	0	0	1	1	0.5	0.5	1	1	0.5	1
TH 100	10.5	10	10.5	7	10.5	8.5	9.5	12.5	14.5	10
US 169	16.5	15	17	16.5	20	16.5	18.5	21	15	21.5
US 212	5	5.5	5.5	5	5.5	4.5	5	6.5	6	5.5
TH 280	0	0	0	0	0	0.5	0	0	0.5	1
TH 610	0	0	0	0	0	0.5	0	0	0.5	0
TH 77	6	4.5	6	5.5	5.5	6	6	6	4.5	6
Subtotal	**61.5**	**55**	**65**	**58**	**61.5**	**56**	**60**	**69.5**	**67.5**	**64.0**

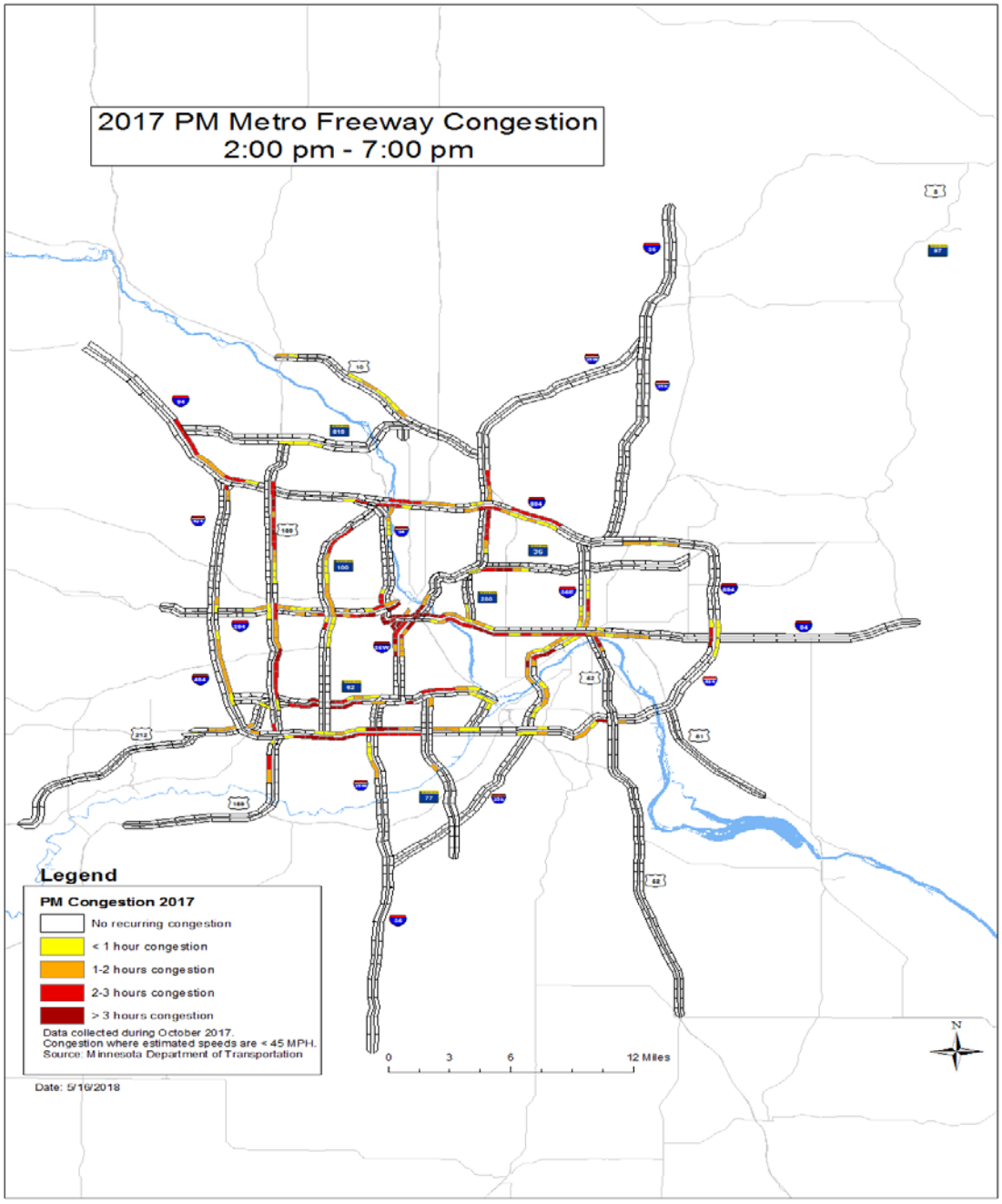
Total Congested Metro Freeway Miles (AM)

Grand Total	**153.5**	**150.5**	**170**	**164**	**171.5**	**163**	**162**	**186**	**202.5**	**191.5**

Miles and Duration of Congestion: 5:00 AM – 10:00 AM



2017 PM Metro Freeway Congestion: 2:00 pm – 7:00 pm



Directional Metro Freeway Miles Congested 2:00 PM – 7:00 PM

Congested Interstate Miles (PM) 1

Highway	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
I-35	0	0	0	0	0	0	0	0	0	0
I-35E	8.5	12.5	12	11	13	11	11	14	13.5	16
I-35W	17.5	15	23	17.5	18	16	22.5	24	22.5	17
I-94	17.5	15	23	17.5	18	16	22.5	24	22.5	29
I-394/ TH 12	6	8.5	9	10.5	11	8.5	7	8	9.5	10
I-494	16	19	23	20	22	24.5	27.5	29.5	24.5	24.5
I-694	11	13.5	17	17.5	13.5	10.5	17	19.5	13.5	19.5
Subtotal	**75.5**	**86.5**	**105.0**	**100.5**	**101.5**	**89.5**	**108.5**	**113.0**	**103.5**	**116.0**

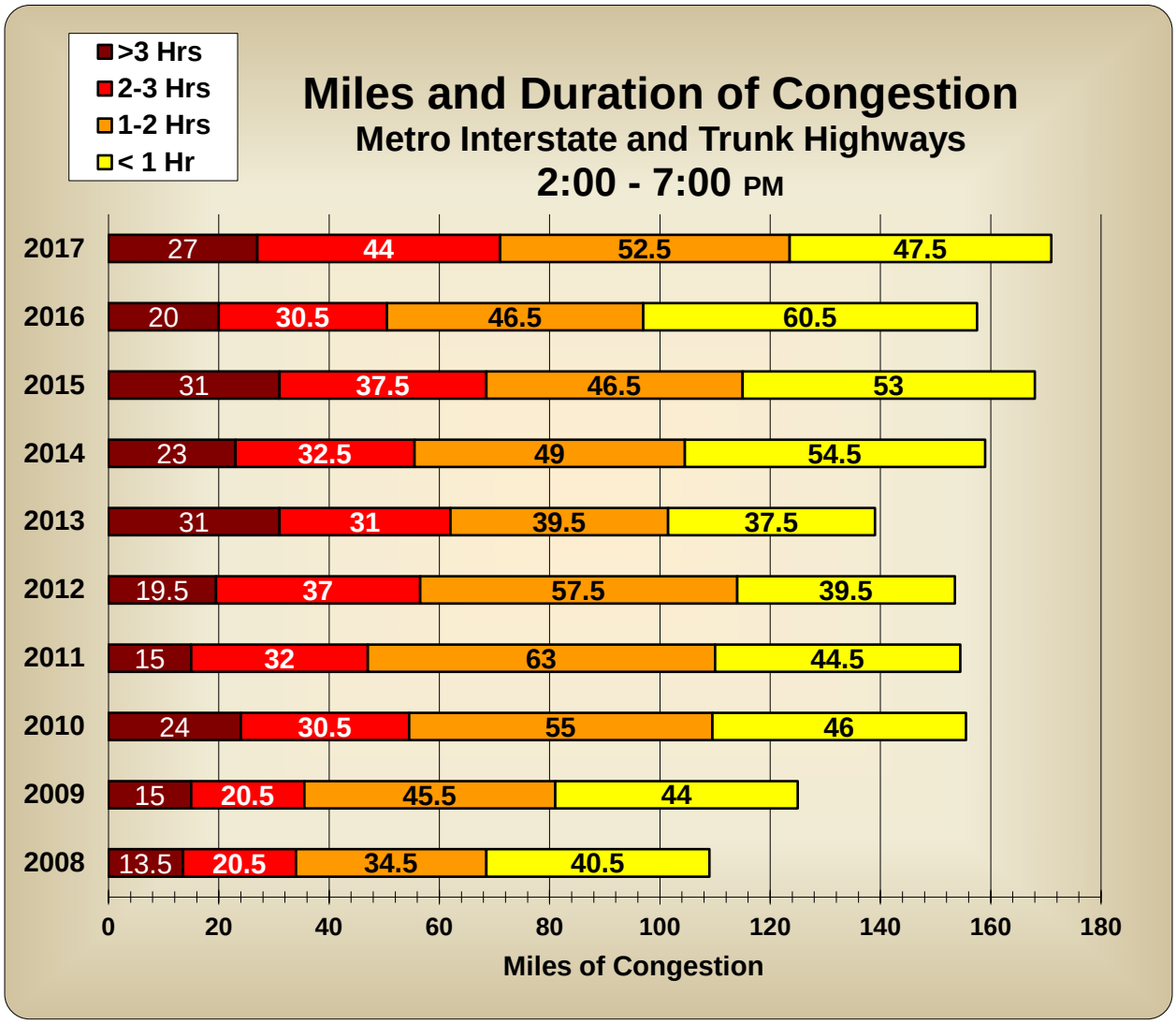
Congested Trunk Highway Miles (PM) 1, 2

Highway	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
TH 5	0	0	0	0	0	0	0	0.5	0	0.5
TH 10	1.5	1.5	3.5	4	4	3	3.5	3	2	4
TH 36	3	3.5	6.5	6.5	4.5	4	2.5	4.5	3	3
TH 52	1	1	0	0	0	0	0	0	1	1.5
US 61	0	0	0	0	0	0	0	0	0	0
TH 62	8.5	9.5	10.5	9.5	10	10	9	9.5	11	12.5
TH 65	1	1.5	1.5	1.5	1.5	0.5	0.5	0.5	1	1.5
TH 100	7.5	11	11.5	12.5	11	10.5	11	11.5	7	9
US 169	9.5	10	14.5	17	18	17.5	18.5	20.5	21.5	16.5
US 212	1	0	0	0.5	0.5	2	3	3	3	3
TH 280	0	0.5	0.5	0	0	0	2	1.5	0.5	1
TH 610	0.5	0	0	0	0	0	0	0	1.5	1.5
TH 77	0	0	2	2.5	2.5	2	0.5	0.5	2.5	1
Subtotal	**33.5**	**38.5**	**50.5**	**54**	**52**	**50**	**51**	**55**	**54**	**55.0**

Total Congested Metro Freeway Miles (PM)

Grand Total	**109.0**	**125.0**	**155.5**	**154.5**	**153.5**	**139.0**	**159.0**	**167.5**	**157.5**	**171.0**

Miles and Duration of Congestion: 2:00 PM – 7:00 PM



Appendix A: Centerline Miles Measured for Congestion

Centerline Miles of Highway Measured for Congestion

Highway	Centerline Miles of Highway	Limits
I-35	16	North split to Hwy 8 & south split to Co Rd 70
I-35E	39	Entire Highway
I-35W	42	Entire Highway
I-94	54	Hwy 101 to St. Croix River
I-394/TH 12	12	Central Ave. to Downtown Mpls
I-494	43	Entire Highway
I-694	23	Entire Highway
Subtotal	**229**	

Centerline Miles of Highway Measured for Congestion

Highway	Centerline Miles of Highway	Limits
TH 5	3	I-494 to Mississippi River
TH 10	12	Hwy 169 to I-35W
TH 36	11	I-35W to Century Ave.
TH 52	25	I-94 to Upper 55th St.
US 61	8	Co Rd 19 to I-494
TH 62	12	I-494 to Hwy 55
TH 65	1	10th St. to I-35W
TH 100	16	I-494 to I-694
US 169	31	Highwood Dr. to Co Rd 15 & I-494 to TH 610
US 212	17	Hwy 147 to Hwy 62
TH 610	12	I-94 to Hwy 10
TH 77	11	138th St. to Hwy 62
TH 280	3	I-94 to Broadway Ave.
Subtotal	**162**	

Centerline Miles of Highway Measured for Congestion Total

Grand Total	**391**	

Appendix B: Daily Congestion Map