

Metropolitan Freeway System 2014 Congestion Report

Metro District Office of Operations and Maintenance

Regional Transportation Management Center

May 2015

Your Destination... Our Priority



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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 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 collisions increases. Multiple shock waves can spread from one instance of a slowdown in traffic flow and blend together

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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
- Late 1990’s: Change in approach from “reducing” congestion to “slowing projected increases” in congestion
- 2001 – 2003: Evaluation and adjustments of ramp metering
- 2002: Completion of detection calibration

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 90% of the metro area freeway system. For this report, the Regional Transportation Management Center collected October 2014 data from 3,500 detectors embedded in the mainline roadway (there are 5,500 surveillance detectors, which includes ramps) on Twin Cities freeways.

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 projects are completed and weather conditions are still generally favorable.

The RTMC evaluates the 758 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

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percentage of miles that operate at speeds below 45 MPH for any length of time during the AM and PM peak periods (758 miles AM and 758 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.

2014 Results

In 2014, the Twin Cities freeway system experienced an increase in the percentage of miles of freeway system congested, from 19.9% in 2013 to 21.1%.

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 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 and I-35W. During rush hour periods they provide a congestion-free travel option for those who ride express transit, who are in carpools, or those driving alone who are willing to pay. 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.

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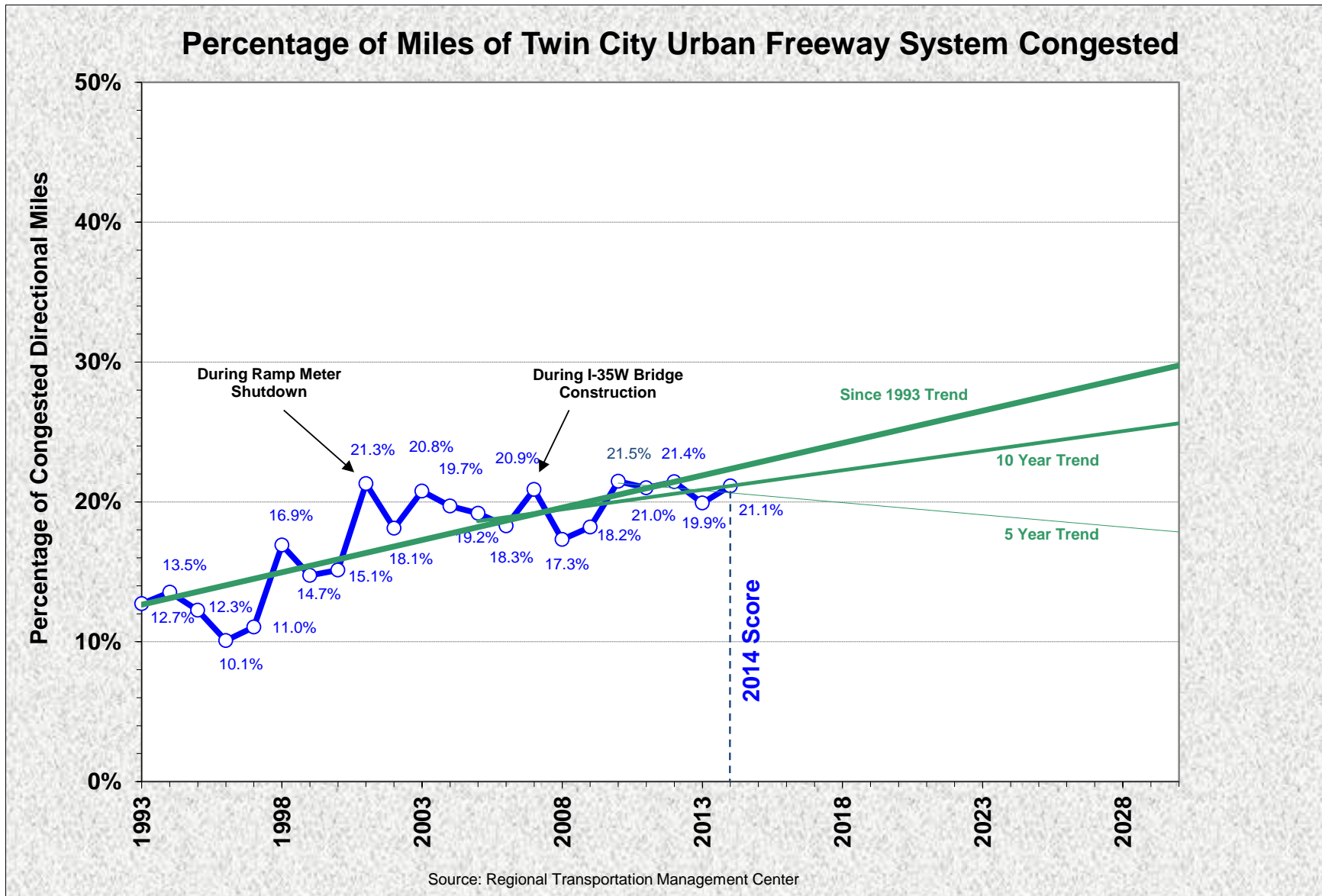
- *Strategic Capacity Enhancements* – In some locations, other types of capacity improvements may be needed like bus only shoulder, unpriced dynamic shoulder lanes or interchange capacity improvements.

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

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 the past 5 years, 10 years and 15 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.

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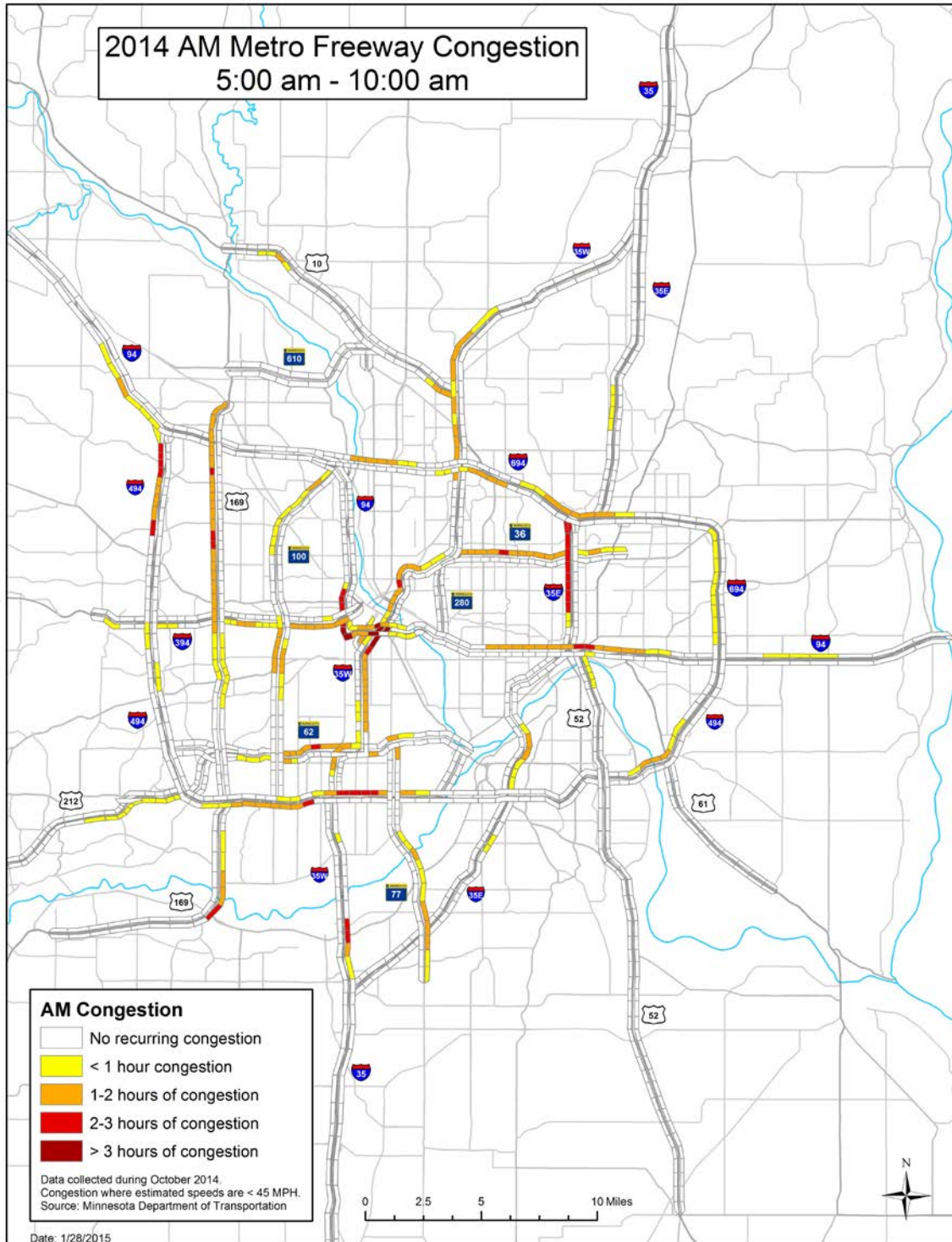
AM Plus PM Miles of Directional Congestion

| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|-----------------|------|------|------|------|------|------|------|------|------|------|
| Severe | 83 | 64 | 82 | 51 | 55 | 82 | 73 | 85 | 99 | 76 |
| Moderate | 94 | 97 | 112 | 104 | 107 | 127 | 125 | 128 | 90 | 118 |
| Low | 101 | 107 | 111 | 108 | 114 | 117 | 121 | 113 | 114 | 127 |
| Total | 277 | 267 | 305 | 263 | 276 | 326 | 319 | 325 | 302 | 321 |

AM Plus PM Percent of Miles of Directional Congestion

| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Severe | 6.4% | 4.9% | 6.3% | 3.4% | 3.6% | 5.4% | 4.8% | 5.6% | 6.5% | 5.0% |
| Moderate | 7.3% | 7.5% | 8.6% | 6.8% | 7.1% | 8.3% | 8.2% | 8.4% | 5.9% | 7.8% |
| Low | 7.8% | 8.2% | 8.6% | 7.1% | 7.5% | 7.7% | 7.9% | 7.5% | 7.5% | 8.4% |
| Total | 19.2% | 18.3% | 20.9% | 17.3% | 18.2% | 21.5% | 21.0% | 21.4% | 19.9% | 21.1% |

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

Congested Interstate Miles (AM) 1

| <i>Highway</i> | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|-----------------|------|------|------|------|------|------|------|------|------|------|
| I-35 | 0 | 0 | 1 | 1 | 1 | 0 | 2 | 0 | 0 | 0 |
| I-35E | 15 | 12.5 | 13 | 9 | 9.5 | 13.5 | 14.5 | 14.5 | 16 | 11 |
| I-35W | 26.5 | 27 | 22 | 17 | 24 | 28 | 25 | 23 | 24 | 24 |
| I-94 | 24.5 | 26 | 24.5 | 23 | 25.5 | 28.5 | 24.5 | 29 | 26 | 23 |
| I-394/TH 12 | 4 | 6.5 | 6 | 8.5 | 7.5 | 8.5 | 9.5 | 10.5 | 7.5 | 8.5 |
| I-494 | 13 | 13 | 16.5 | 24.5 | 17.5 | 14.5 | 19.5 | 20 | 19.5 | 20 |
| I-694 | 12.5 | 10.5 | 12.5 | 9 | 10.5 | 12 | 11 | 13 | 14 | 15.5 |
| Subtotal | 95.5 | 95.5 | 95.5 | 92 | 95.5 | 105 | 106 | 110 | 107 | 102 |

Congested Trunk Highway Miles (AM) 1, 2

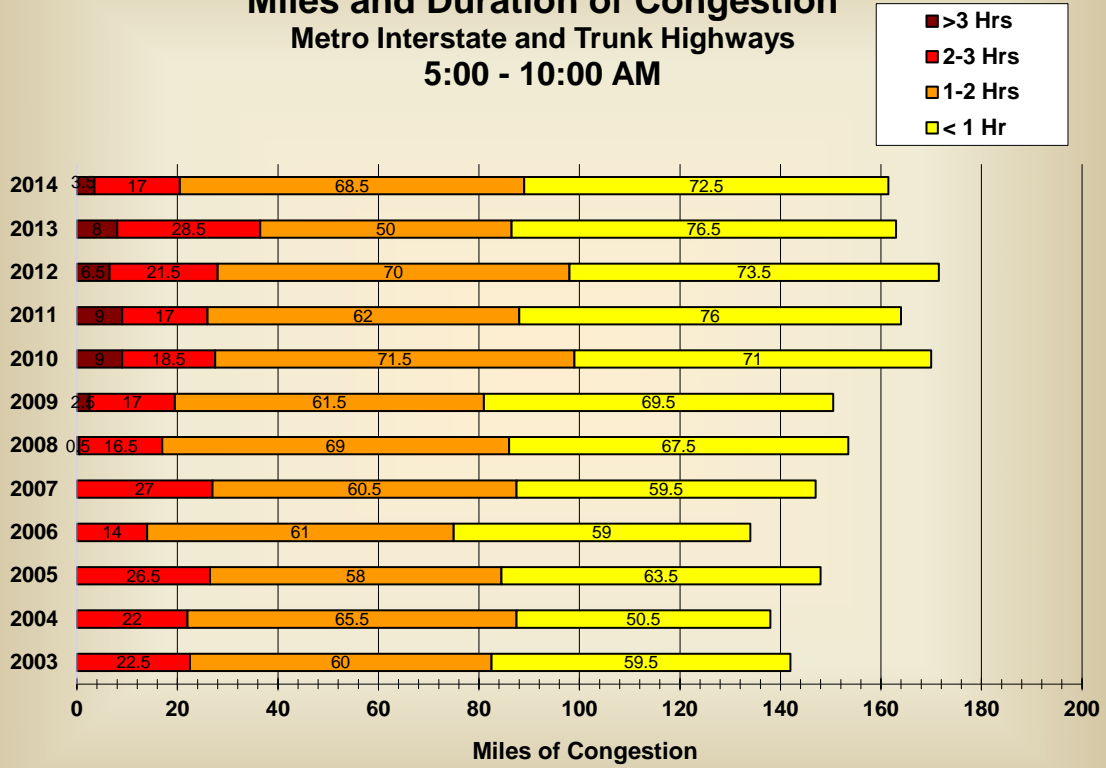
| <i>Highway</i> | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
|-----------------|------|------|------|------|------|------|------|------|------|------|
| TH 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TH 10 | 4.5 | 4.5 | 4 | 4.5 | 2.5 | 5 | 4 | 2.5 | 2.5 | 3.5 |
| TH 36 | 7.5 | 7.5 | 1.5 | 7 | 6 | 7.5 | 7.5 | 6.5 | 6 | 7 |
| TH 52 | 1.5 | 2 | 2.5 | 2 | 2 | 2 | 2.5 | 2 | 2 | 2 |
| US 61 | - | - | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TH 62 | 6.5 | 6.5 | 10 | 10 | 9.5 | 10.5 | 9 | 8.5 | 8.5 | 7 |
| TH 65 | 0.5 | 0.5 | 1 | 0 | 0 | 1 | 1 | 0.5 | 0.5 | 1 |
| TH 100 | 10.5 | 5 | 9 | 10.5 | 10 | 10.5 | 7 | 10.5 | 8.5 | 9.5 |
| US 169 | 15.5 | 6.5 | 14 | 16.5 | 15 | 17 | 16.5 | 20 | 16.5 | 18.5 |
| US 212 | 0 | 0 | 0 | 5 | 5.5 | 5.5 | 5 | 5.5 | 4.5 | 5 |
| TH 280 | 0 | 0 | 3.5 | 0 | 0 | 0 | 0 | 0 | 0.5 | 0 |
| TH 610 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.5 | 0 |
| TH 77 | 6 | 6 | 6 | 6 | 4.5 | 6 | 5.5 | 5.5 | 6 | 6 |
| Subtotal | 52.5 | 38.5 | 51.5 | 61.5 | 55 | 65 | 58 | 61.5 | 56 | 59.5 |

Total Congested Metro Freeway Miles (AM)

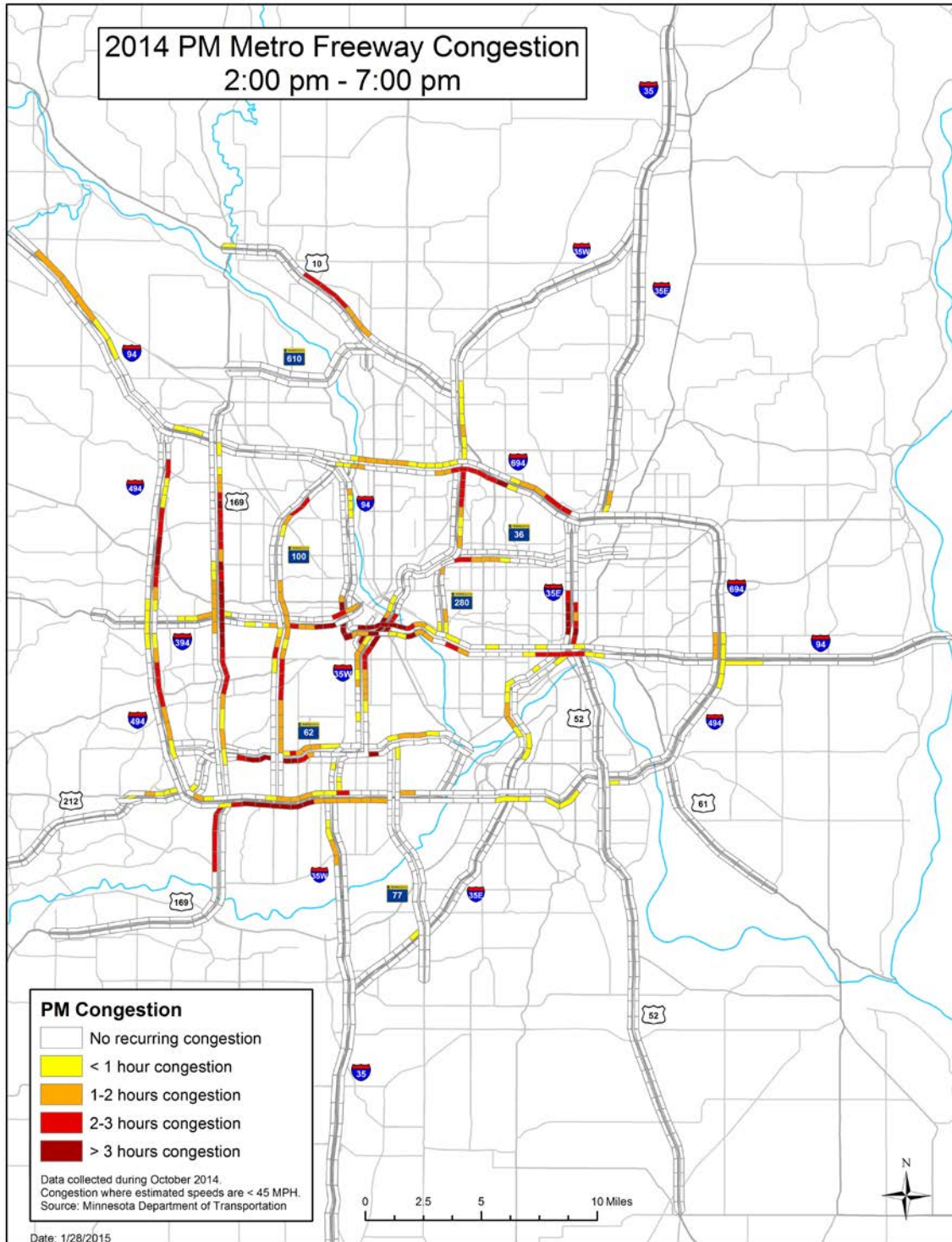
| | | | | | | | | | | |
|--------------------|-----|-----|-----|-------|-------|-----|-----|-------|-----|-------|
| Grand Total | 148 | 134 | 147 | 153.5 | 150.5 | 170 | 164 | 171.5 | 163 | 161.5 |
|--------------------|-----|-----|-----|-------|-------|-----|-----|-------|-----|-------|

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Miles and Duration of Congestion Metro Interstate and Trunk Highways 5:00 - 10:00 AM



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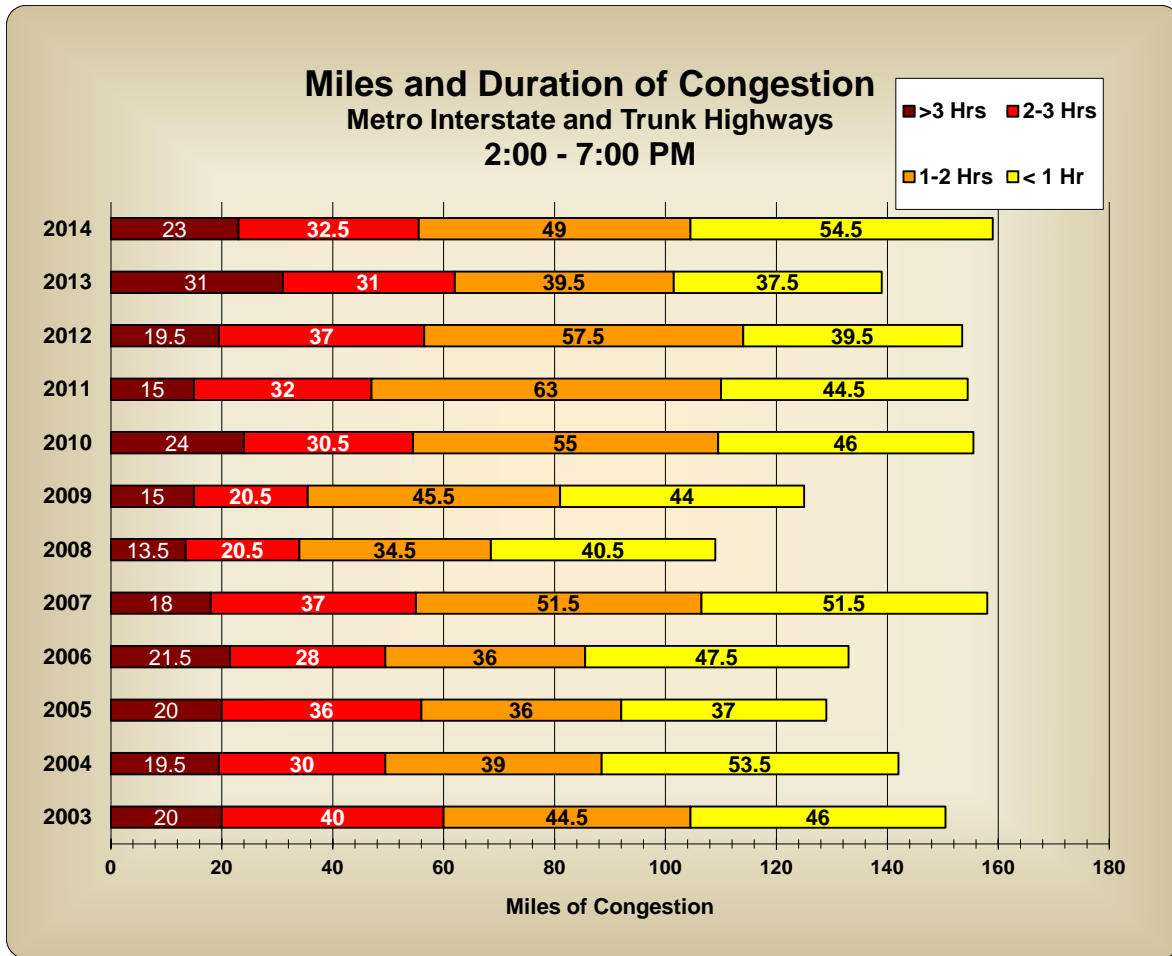
Directional Metro Freeway Miles Congested 2:00 PM - 7:00 PM

| Congested Interstate Miles (PM) 1 | | | | | | | | | | |
|-----------------------------------|------|------|------|------|------|------|-------|-------|------|-------|
| Highway | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
| I-35 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| I-35E | 8.5 | 14.5 | 16.5 | 8.5 | 12.5 | 12 | 11 | 13 | 11 | 11 |
| I-35W | 25 | 22 | 14.5 | 17.5 | 15 | 23 | 17.5 | 18 | 16 | 22.5 |
| I-94 | 23 | 26.5 | 24.5 | 16.5 | 18 | 21 | 24 | 24 | 19 | 23.5 |
| I-394/TH 12 | 5 | 6.5 | 8 | 6 | 8.5 | 9 | 10.5 | 11 | 8.5 | 7 |
| I-494 | 17.5 | 16.5 | 21 | 16 | 19 | 23 | 20 | 22 | 24.5 | 27.5 |
| I-694 | 11.5 | 9 | 19.5 | 11 | 13.5 | 17 | 17.5 | 13.5 | 10.5 | 17 |
| Subtotal | 90.5 | 95 | 104 | 75.5 | 86.5 | 105 | 100.5 | 101.5 | 89.5 | 108.5 |

| Congested Trunk Highway Miles (PM) 1, 2 | | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|------|
| Highway | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 |
| TH 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TH 10 | 1 | 1 | 3 | 1.5 | 1.5 | 3.5 | 4 | 4 | 3 | 3.5 |
| TH 36 | 3 | 4.5 | 4.5 | 3 | 3.5 | 6.5 | 6.5 | 4.5 | 4 | 2.5 |
| TH 52 | 1.5 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| US 61 | - | - | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| TH 62 | 7 | 8 | 10.5 | 8.5 | 9.5 | 10.5 | 9.5 | 10 | 10 | 9 |
| TH 65 | 1.5 | 1.5 | 1.5 | 1 | 1.5 | 1.5 | 1.5 | 1.5 | 0.5 | 0.5 |
| TH 100 | 9 | 4 | 12.5 | 7.5 | 11 | 11.5 | 12.5 | 11 | 10.5 | 11 |
| US 169 | 14.5 | 15 | 16 | 9.5 | 10 | 14.5 | 17 | 18 | 17.5 | 18.5 |
| US 212 | 0 | 0 | 0 | 1 | 0 | 0 | 0.5 | 0.5 | 2 | 3 |
| TH 280 | 0 | 0 | 3 | 0 | 0.5 | 0.5 | 0 | 0 | 0 | 2 |
| TH 610 | 0 | 0 | 0 | 0.5 | 0 | 0 | 0 | 0 | 0 | 0 |
| TH 77 | 1 | 3 | 2 | 0 | 0 | 2 | 2.5 | 2.5 | 2 | 0.5 |
| Subtotal | 38.5 | 38 | 54 | 33.5 | 38.5 | 50.5 | 54 | 52 | 50 | 51 |

| Total Congested Metro Freeway Miles (PM) | | | | | | | | | | |
|--|-----|-----|-----|-----|-----|-------|-------|-------|-----|-------|
| Grand Total | 129 | 133 | 158 | 109 | 125 | 155.5 | 154.5 | 153.5 | 139 | 159.0 |

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Appendix A: Centerline Miles Measured for Congestion

| <i>Highway</i> | Centerline Miles of Highway | Limits |
|--------------------|-----------------------------|--|
| I-35 | 16 | North split to Hwy 8 & South split to Cty 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 | |

| <i>Highway</i> | | |
|--------------------|-----|---|
| TH 5 | 3 | I-494 to Miss Rvr |
| TH 10 | 12 | Hwy 169 to I-35W |
| TH 36 | 7 | I-35W to English St |
| TH 52 | 25 | I-94 to Upper 55th St |
| US 61 | 8 | Cty 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 | 28 | Highwood Dr to Cty 15 & I-494 to 77th Ave |
| US 212 | 17 | Hwy 147 to Hwy 62 |
| TH 610 | 7 | Hwy 169 to Hwy 10 |
| TH 77 | 11 | 138th St to Hwy 62 |
| TH 280 | 3 | I-94 to Broadway Ave |
| Subtotal | 150 | |
| Grand Total | 379 | |

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Appendix B: Daily Congestion Map

