Metropolitan Freeway System 2008 Congestion Report

Minnesota Department of Transportation
Metro District Office of Operations and Maintenance
Regional Transportation Management Center

March 2009

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Metropolitan Freeway System 2008 Congestion Report

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 under capacity
- Project planning
- Resource allocation (e.g., RTMC equipment, incident management planning)
- Construction zone planning
- Department performance measures

Introduction

What is Congestion?

Mn/DOT 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 breaking 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

with other extended periods of "stop-and-go" traffic upstream. This condition is referred to as a "breakdown" in traffic.

Usually it lasts 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

Mn/DOT began collecting and processing congestion data in 1993. Since this time, Mn/DOT 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: Mn/DOT 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
- 2008: 55 miles of freeway added to this report

How is Congestion Measured?

For this report, Mn/DOT 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 2008 data from 2,950 detectors embedded in the mainline roadway (there are 5,200 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 % 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 (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 fourteen midweek days in October. Mn/DOT 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.

Historical Data

Large construction projects dramatically change traffic patterns. These patterns can be highly variable due to ongoing changes to the roadway and these projects often remove surveillance detectors from operation. Therefore this report uses data from before a project began in some instances. These areas are described in a map in Appendix B (along with the areas without detection) and this year includes only the "Crosstown" project at the interchange of Interstate 35W and Highway 62.

2008 Changes

In 2008 analysts added freeways to this report that are within the metro district. These were mostly interregional corridors. The additional 55 miles of freeway were combined with last year's 324 miles. These are documented in this report's maps and included in the calculation of the AM Plus PM % of Directional Metro Freeway Miles Congested performance measure. Most of these new miles of roadway were added retroactively to 1993 because they existed at that time. These were added as free flow miles, historically. A few of these sections of freeway were built since then: they were added retroactively to the appropriate year.

This does change the calculation of the percentage of Twin Cities freeways that are congested. It generally shifts the calculated performance measure of all years downwards because most of the added freeways experience no recurring congestion. The only exception is Highway 212, which is already experiencing some eastbound congestion in the mornings. Appendix A describes these added corridors in a detailed table. This appendix also includes a map that shows the locations of these added corridors and a graph that shows how this year's change impacted the measurement of overall percent of congested freeways. Generally, the measurement of congestion with these added miles is parallel, but lower, to the historical measure.

In addition, this report expands the measurement of congestion in the AM peak from 6:00 AM–9:00 AM to 5:00 AM–10:00 AM. This change has little effect now but Mn/DOT expects that, over the longer term, the morning peak will spread into these added hours.

2008 Results

In 2008, the Twin Cities freeways saw a substantial drop in congestion, from 20.9% in 2007 to 17.3%. A significant part of this change was attributed to the completion of the Interstate 35W bridge over the Mississippi River. However, this drop was also large enough to improve upon the 2006 value of 18.3%, before the collapse of the Interstate 35W bridge. Excluding 2007, congestion has dropped each year since 2004. This short term trend is largely credited to the completion of large construction projects and, most recently, a decline in Vehicle Miles Traveled (VMT). It is expected that, in the next few years, congestion will plateau or continue to decline as current and planned projects are completed. However, future plans include fewer capacity-adding projects. Mn/DOT expects this will lead to a long run trend of growing congestion.

In recent years, completed construction projects are largely credited with the recent trend of retreating congestion. These include:

- New bridge carrying Interstate 35E traffic over the Mississippi River
- Addition of lanes in each direction along Interstate 694 from Brooklyn Boulevard to Interstate 494
- Addition of lanes in each direction along Interstate 494 from Highway 55 to France Avenue
- Addition of lanes on Interstate 94 over McKnight Road
- Addition of lanes on Highway 100 at Highway 7
- Completion of the first of two bridges carrying Interstate 494 over the Mississippi River adding a lane in each direction

Since 2007 congestion was measured, two large projects were completed that contributed to the most recent decrease in congestion. They were:

- New bridge carrying Interstate 35W over the Mississippi River
- Addition of lanes and separation of movements at the interchange of Interstate 35E and Interstate 694.

The new Interstate 35W bridge over the Mississippi River included an additional lane in each direction and improved southbound exits to Washington Avenue, and westbound Interstate 94 and Hiawatha Avenue. The Unweave project at Interstate 35E and Interstate 694 expanded this interchange from three lanes to six lanes in each direction along with eliminating significant needs to weave across lanes by presorting traffic before the commons sections.

In addition, most of the Traffic Restoration projects[1] that were completed as a reaction to the collapse of the Interstate 35W bridge remain in place. These continue to contribute to reduced congestion. They include:

- Highway 280 conversion to a freeway and addition of a Traffic Management System
- Interstate 94 conversion of shoulders to an additional lane in each direction between Highway 280 and Interstate 35W
- Highway 100 addition of auxiliary lane southbound between Duluth Street and Highway 55
- Addition of one lane to northbound Highway 100 exit to eastbound Interstate 694
- Interstate 694 addition of one eastbound lane at Highway 47

Many factors affect congestion levels (e.g., local economy, population growth, gas prices and transit ridership), but VMT is critical. The long term trend of increased VMT has recently reversed, largely due to economic conditions[2]. While this year's congestion level increased slightly in the AM peak, it decreased dramatically in the PM peak. It is commonly accepted that the AM peaks include proportionately more commuting trips and the PM peaks include a larger proportion of discretionary trips. Clearly people are reducing travel when practical. Future changes in economic conditions will affect future congestion levels.

Before next year's report, the Urban Partnership Agreement projects[3] will implement these strategies to reduce congestion:

- A High Occupancy Toll lane on much of Interstate 35W south of Minneapolis,
- Bus rapid transit and park-and-ride lots on Interstate 35W and Highway 77, and
- Promotion of telecommuting

Other capacity-adding projects that will be completed in the coming years include:

- Crosstown at Interstate 35W and Highway 62
- Wakota bridge/Interstate 494 over the Mississippi River
- Lane additions on Highway 10 from Hanson Boulevard to the east
- A new separated grade interchange where Highway169 crosses County Road 81

[1] A complete list of projects is available at http://www.dot.state.mn.us/i35wbridge/traffic_changes.html
[2] Appendix C provides details of recent changes in VMT
[3] Urban Partnership Agreement is a joint project of US DOT, Mn/DOT and the Metropolitan Council to improve transit use and traffic speeds on Interstate 35W and Highway 77 from Minneapolis to the southern suburbs.

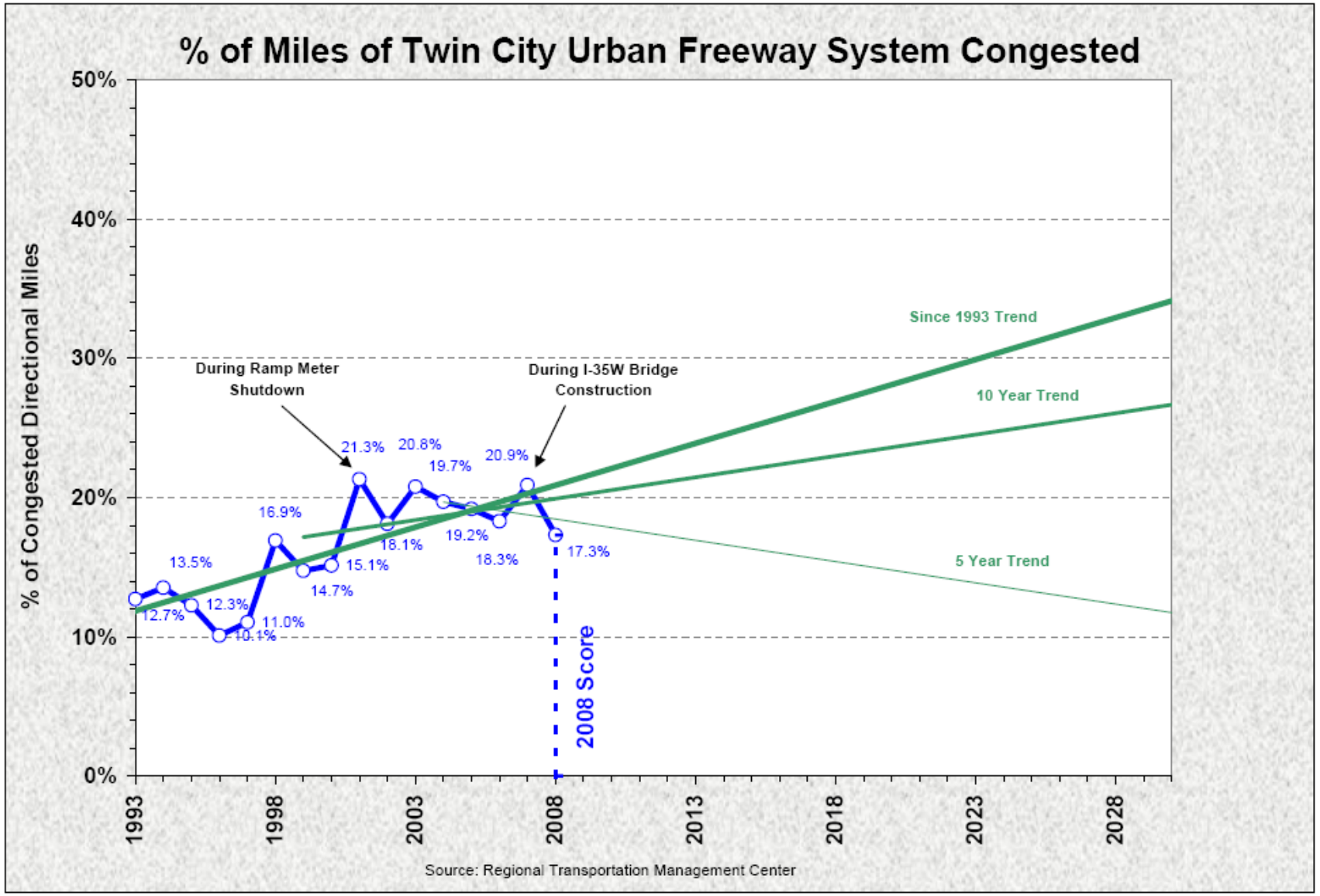
- Completion of third lanes on Interstate 494 between Highway 61 and Interstate 94
- Yet to be determined projects resulting from the federal American Recovery and Reinvestment Act of 2009[4].

The 2007 Congestion Management Planning Study – Phase 1 identified low cost projects that yield a high benefit in mitigating congestion in the near term. These projects are similar to projects completed in recent years on Interstate 394 from Louisiana Avenue to Highway 169 and on Highway 100 at Highway 7. Mn/DOT continues to explore the feasibility of similar projects that could be implemented in a one to two-year time frame.

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

Mitigating congestion is critical to the traveling public. Mn/DOT 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. In the short term the congestion trend might continue to be flat or downward due to the completion of projects. However, the long run trend of increased VMT and increasing construction costs are expected to cause congestion to grow in the future.

[4] For information on Minnesota's transportation projects see http://www.dot.state.mn.us/federalrecovery/.


% of Miles of Twin City Urban Freeway System Congested
% of Congested Directional Miles
50%
40%
30%
20%
10%
0%
1993
1998
2003
2008
2013
2018
2023
2028
Since 1993 Trend
10 Year Trend
5 Year Trend
During Ramp Meter Shutdown
During I-35W Bridge Construction
2008 Score
12.7%
13.5%
12.3%
10.1%
11.0%
16.9%
14.7%
15.1%
21.3%
18.1%
20.8%
19.7%
19.2%
18.3%
20.9%
17.3%
Source: Regional Transportation Management Center

AM Plus PM Miles of Directional Congestion

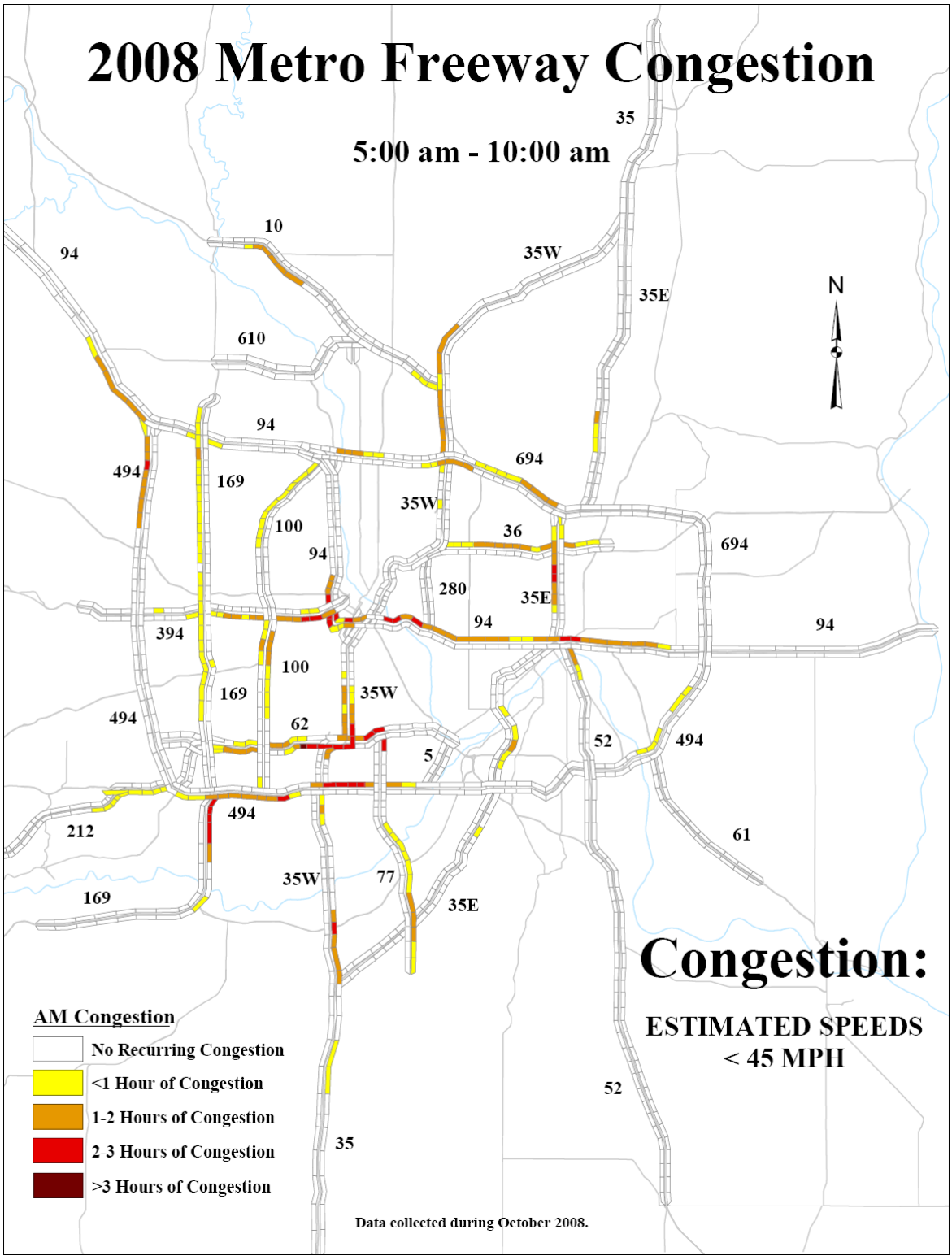
	1999	Early 2000	Late 2000	2002	2003	2004	2005	2006	2007	2008
Severe	34	41	125	70	83	72	83	64	82	51
Moderate	77	68	93	84	105	105	94	97	112	104
Low	97	105	82	101	106	104	101	107	111	108
Total	208	213	300	255	293	280	277	267	305	263

AM Plus PM Percent of Miles of Directional Congestion

	1999	Early 2000	Late 2000	2002	2003	2004*	2005*	2006*	2007	2008*
Severe	2.7%	3.2%	9.8%	5.5%	6.4%	5.5%	6.4%	4.9%	6.3%	3.9%
Moderate	6.0%	5.3%	7.3%	6.6%	8.2%	8.1%	7.3%	7.5%	8.6%	8.0%
Low	7.6%	8.2%	6.4%	7.9%	8.2%	8.0%	7.8%	8.2%	8.6%	8.3%
Total	14.7%	15.1%	21.3%	18.1%	20.8%	19.7%	19.2%	18.3%	20.9%	17.3%

For years prior to 2004, Percent of miles of directional congestion = am + pm miles (table above) / 1280 miles. 1408 miles = 352 centerline miles X 2 (directional miles) X 2 (am and pm)

*** In 2004, 2005, 2006 and 2008 new freeways were completed which brought the total to 379 centerline miles, see Appendix A for details.**


2008 Metro Freeway Congestion
5:00 am - 10:00 am
N
Congestion:
ESTIMATED SPEEDS
< 45 MPH
AM Congestion
No Recurring Congestion
<1 Hour of Congestion
1-2 Hours of Congestion
2-3 Hours of Congestion
>3 Hours of Congestion
Data collected during October 2008.
35
10
94
35W
35E
610
94
694
494
169
35W
100
36
694
94
280
35E
394
94
94
100
169
35W
494
62
52
494
5
494
212
61
35W
77
169
35E
52
35

Metropolitan Freeway System 2008 Congestion Report

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

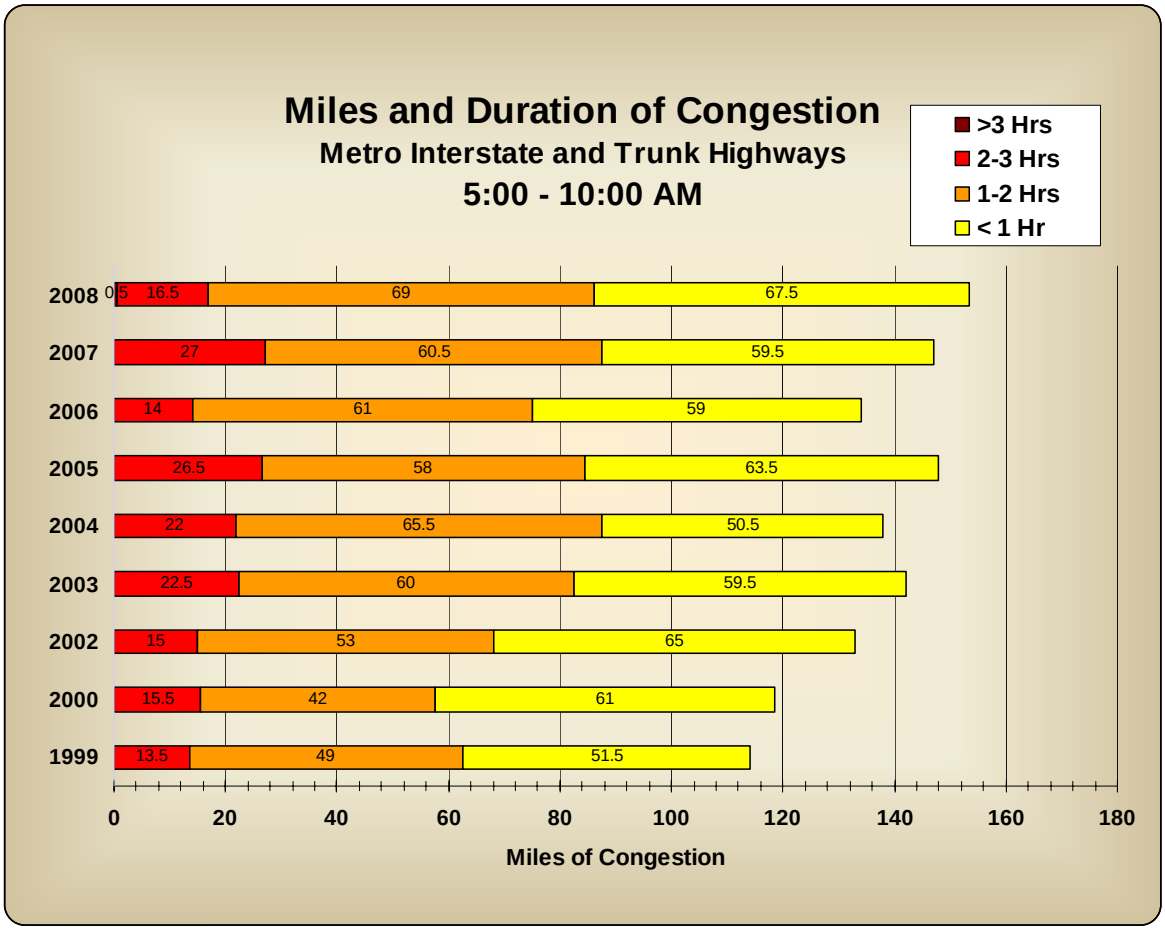
Congested Interstate Miles (AM) 1										
Highway	1999	Early 2000	Late 2000	2002	2003	2004	2005	2006	2007	2008
I-35	0	0	0	0	0	0	0	0	1	1
I-35E	6.5	7.5	10	10	9	9.5	15	12.5	13	9
I-35W	24	27	33.5	25.5	25	23	26.5	27	22	17
I-94	17.5	16	26	23.5	23	23.5	24.5	26	24.5	23
I-394/TH 12	8.5	6.5	6	7	8.5	8.5	4	6.5	6	8.5
I-494	15.5	20	23	15.5	19	18.5	13	13	16.5	24.5
I-694	8.5	8	9	9	9.5	9.5	12.5	10.5	12.5	9
Subtotal	80.5	85	107.5	90.5	94	92.5	95.5	95.5	95.5	92

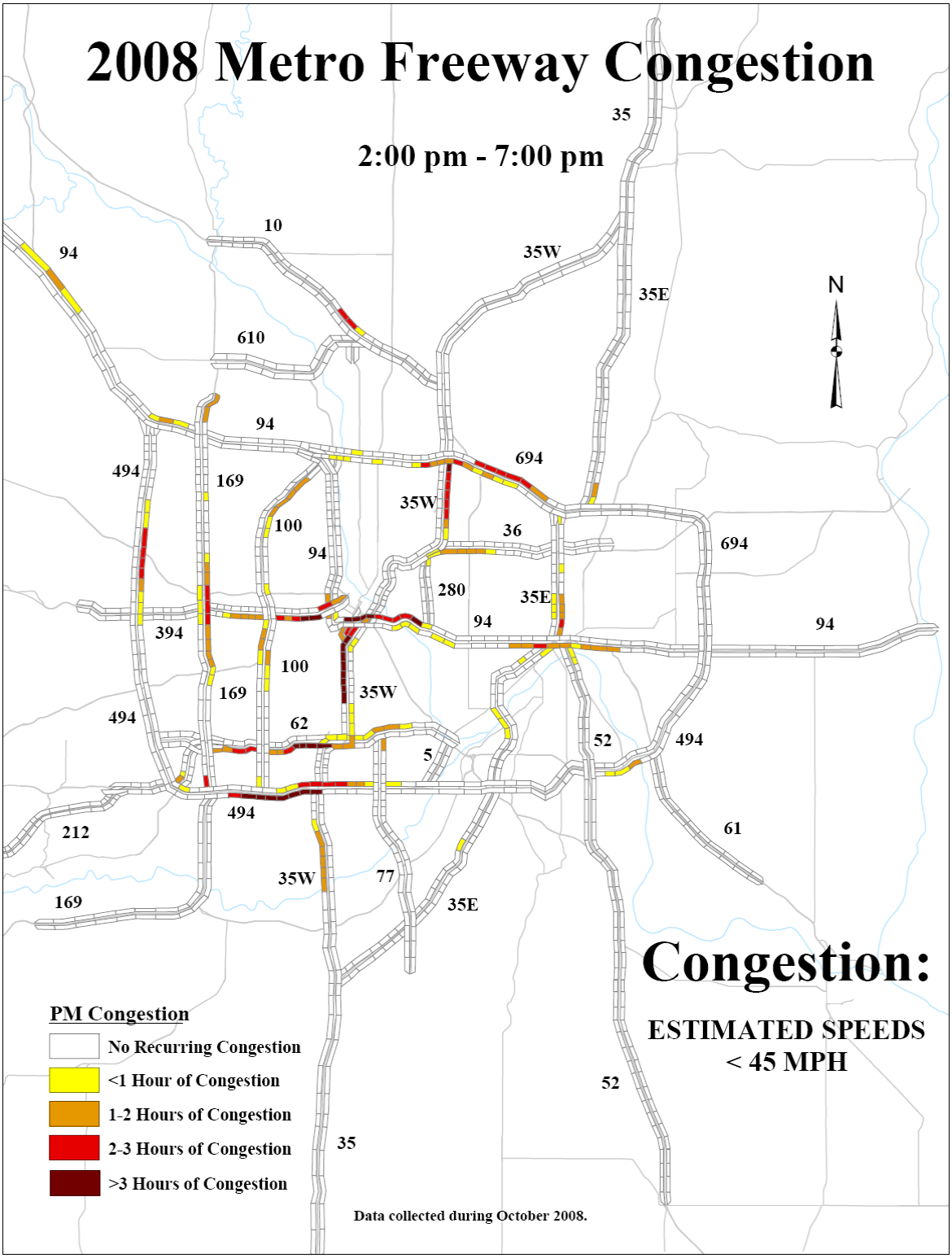
Congested Trunk Highway Miles (AM) 1, 2										
Highway	1999	Early 2000	Late 2000	2002	2003	2004	2005	2006	2007	2008
TH 5	0	0	0	0	0	0	0	0	0	0
TH 10	-	-	-	4.5	4.5	4.5	4.5	4.5	4	4.5
TH 36	3.5	6	6.5	6	7.5	7.5	7.5	7.5	1.5	7
TH 52	1	1	1	1	1	1	1.5	2	2.5	2
US 61	-	-	-	-	-	-	-	-	-	0
TH 62	10	10	8.5	9	10.5	9	6.5	6.5	10	10
TH 65	0	0	0	0	0.5	0	0.5	0.5	1	0
TH 100	5.5	5.5	6	5	4.5	4.5	10.5	5	9	10.5
US 169	10	8	16	11.5	13	12.5	15.5	6.5	14	16.5
US 212	0	0	0	0	0	0	0	0	0	5
TH 280	0	0	0	0	0	0	0	0	3.5	0
TH 610	-	-	-	0	0	0	0	0	0	6
TH 77	3.5	3	4	4.5	6.5	6.5	6	6	6	0
Subtotal	33.5	33.5	42	41.5	48	45.5	52.5	38.5	51.5	61.5

Total Congested Metro Freeway Miles (AM)										
Grand Total	114	118.5	149.5	132	142	138	148	134	147	153.5

1 2008: Interstate Miles = 458 TH Miles = 300 Total Miles = 758

2 Congestion was measured for the *freeway* segments of trunk highways


Miles and Duration of Congestion
Metro Interstate and Trunk Highways
5:00 - 10:00 AM
>3 Hrs
2-3 Hrs
1-2 Hrs
< 1 Hr
2008
2007
2006
2005
2004
2003
2002
2000
1999
0.5
16.5
69
67.5
27
60.5
59.5
14
61
59
26.5
58
63.5
22
65.5
50.5
22.5
60
59.5
15
53
65
15.5
42
61
13.5
49
51.5
0
20
40
60
80
100
120
140
160
180
Miles of Congestion


2008 Metro Freeway Congestion
2:00 pm - 7:00 pm
N
Congestion:
ESTIMATED SPEEDS
< 45 MPH
PM Congestion
No Recurring Congestion
<1 Hour of Congestion
1-2 Hours of Congestion
2-3 Hours of Congestion
>3 Hours of Congestion
Data collected during October 2008.
35
10
94
35W
35E
610
694
494
169
100
36
280
394
62
5
52
61
212
77
Data collected during October 2008.

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

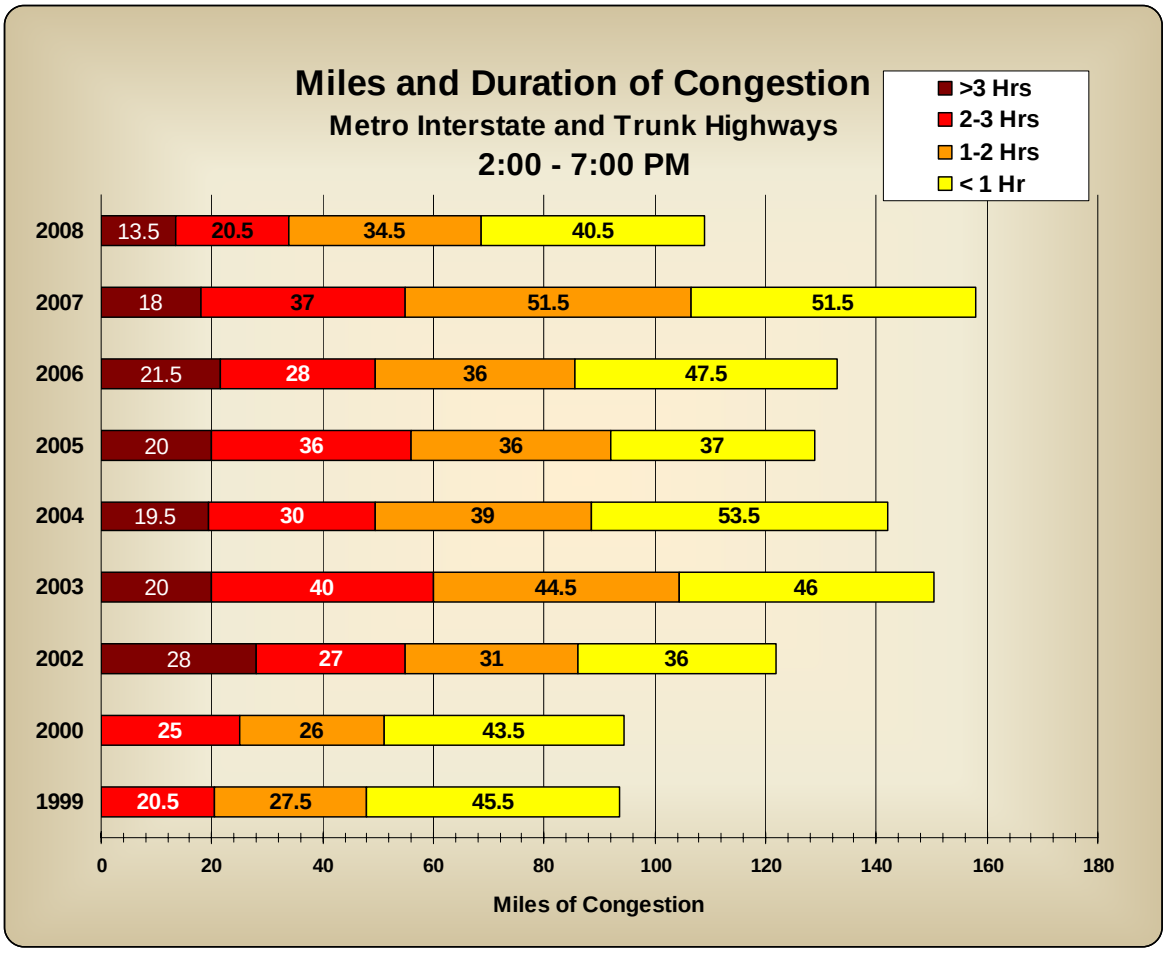
Congested Interstate Miles (PM) 1										
Highway	**1999**	**Early 2000**	**Late 2000**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
I-35	-	-	-	-	0	0	0	0	0	0
I-35E	4.5	3.5	8.5	6.5	15	9.5	8.5	14.5	16.5	8.5
I-35W	16	19	27.5	23	26	24.5	25	22	14.5	17.5
I-94	21	17.5	33	25.5	31	29	23	26.5	24.5	16.5
I-394/TH 12	7.5	8	10.5	10.5	11	10	5	6.5	8	6
I-494	14.5	15.5	26.5	16	20	20.5	17.5	16.5	21	16
I-694	5	5	5	6.5	9	9	11.5	9	19.5	11
Subtotal	68.5	68.5	111	88	112	102.5	90.5	95	104	75.5

Congested Trunk Highway Miles (PM) 1, 2										
Highway	**1999**	**Early 2000**	**Late 2000**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
TH 5	0	0	0	0	0	0	0	0	0	0
TH 10	-	-	-	1.5	2.5	1.5	1	1	3	1.5
TH 36	2.5	2	4	3	4	4	3	4.5	4.5	3
TH 52	0.5	0.5	0.5	0.5	1	1	1.5	1	1	1
US 61	-	-	-	-	-	-	-	-	-	0
TH 62	8.5	7	8.5	7	9.5	11.5	7	8	10.5	8.5
TH 65	0	0	0	1.5	1	1.5	1.5	1.5	1.5	1
TH 100	7	8	10.5	6	6	5	9	4	12.5	7.5
US 169	6	8	14	12	14	12.5	14.5	15	16	9.5
US 212	0	0	0	1	0	0	0	0	0	1
TH 280	0	0	0	0	0	0	0	0	3	0
TH 610	-	-	-	0	0	0	0	0	0	0.5
TH 77	0.5	0.5	1	0.5	1	2.5	1	3	2	0
Subtotal	25	26	38.5	33	39	39.5	38.5	38	54	33.5

Total Congested Metro Freeway Miles (PM)										
Grand Total	93.5	94.5	149.5	121	151	142	129	133	158	109

1 2008: Interstate Miles = 458 TH Miles = 300 Total Miles = 758

2 Congestion was measured for the *freeway* segments of trunk highways

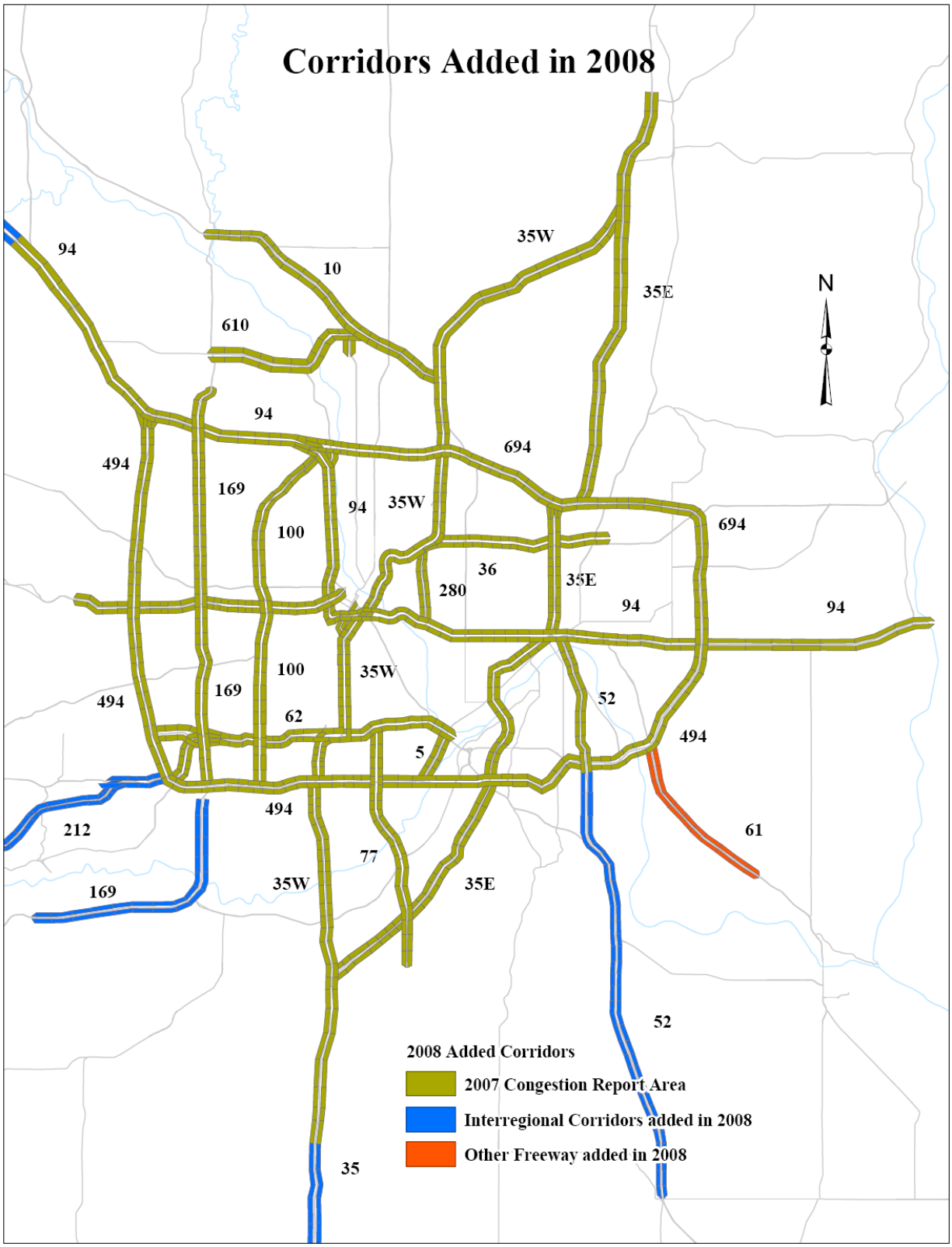

Miles and Duration of Congestion
Metro Interstate and Trunk Highways
2:00 - 7:00 PM
>3 Hrs
2-3 Hrs
1-2 Hrs
< 1 Hr
2008
13.5
20.5
34.5
40.5
2007
18
37
51.5
51.5
2006
21.5
28
36
47.5
2005
20
36
36
37
2004
19.5
30
39
53.5
2003
20
40
44.5
46
2002
28
27
31
36
2000
25
26
43.5
1999
20.5
27.5
45.5
0
20
40
60
80
100
120
140
160
180
Miles of Congestion

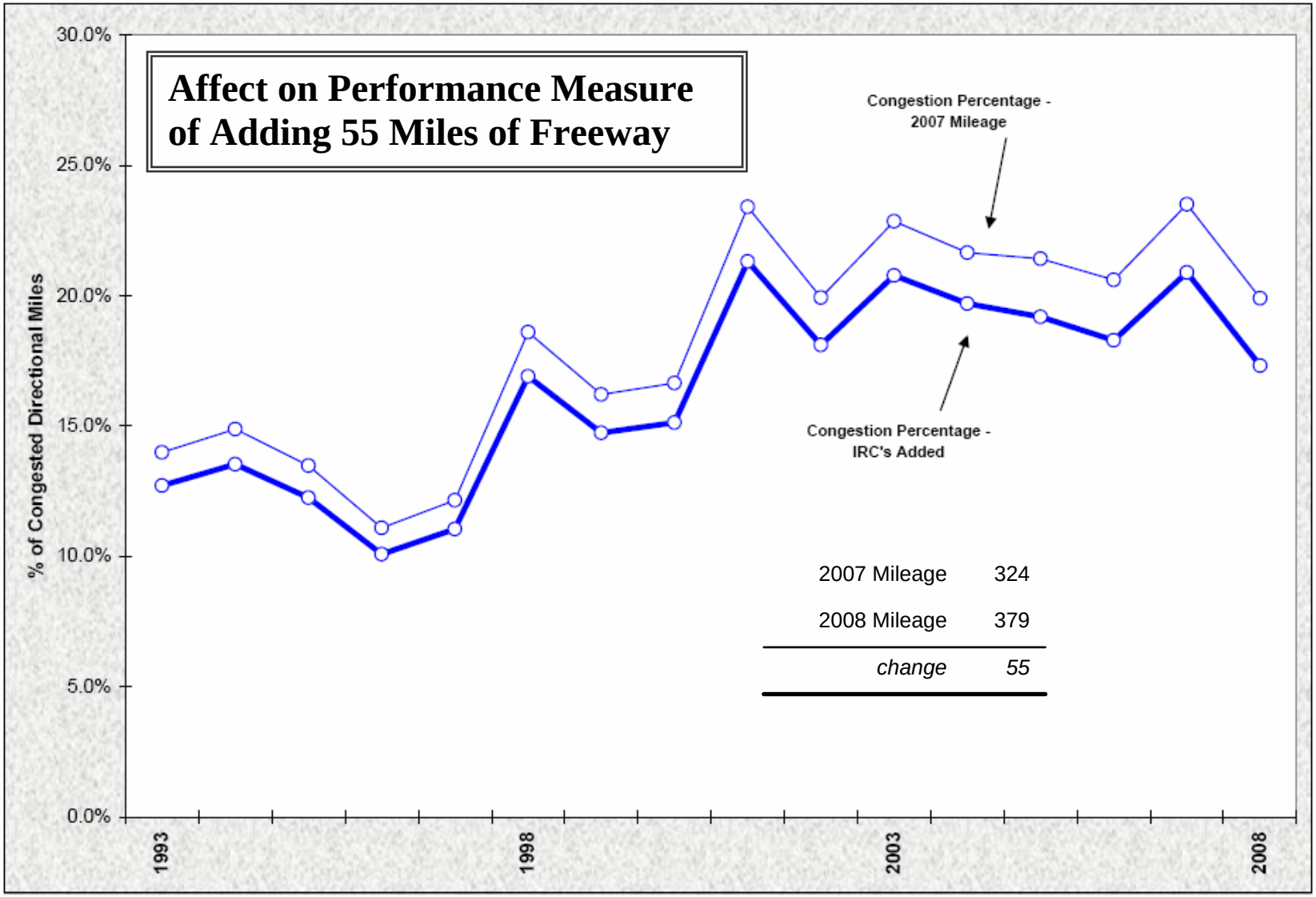
Appendix A: Centerline Miles Measured for Congestion

Highway	Centerline Miles of Highway	Limits	Additions for 2008
I-35	16	North split to Hwy 8 & South split to Cty 2	Cty 2 to Cty 70 (retroactive to 1993)
I-35E	39	Entire Highway	
I-35W	42	Entire Highway	
I-94	54	Hwy 241 to St. Croix River	Hwy 241 to Hwy 101 (retroactive to 1993)
I-394/TH 12	12	Central Ave to Downtown Mpls	
I-494	43	Entire Highway	
I-694	23	Entire Highway	
Subtotal	229		

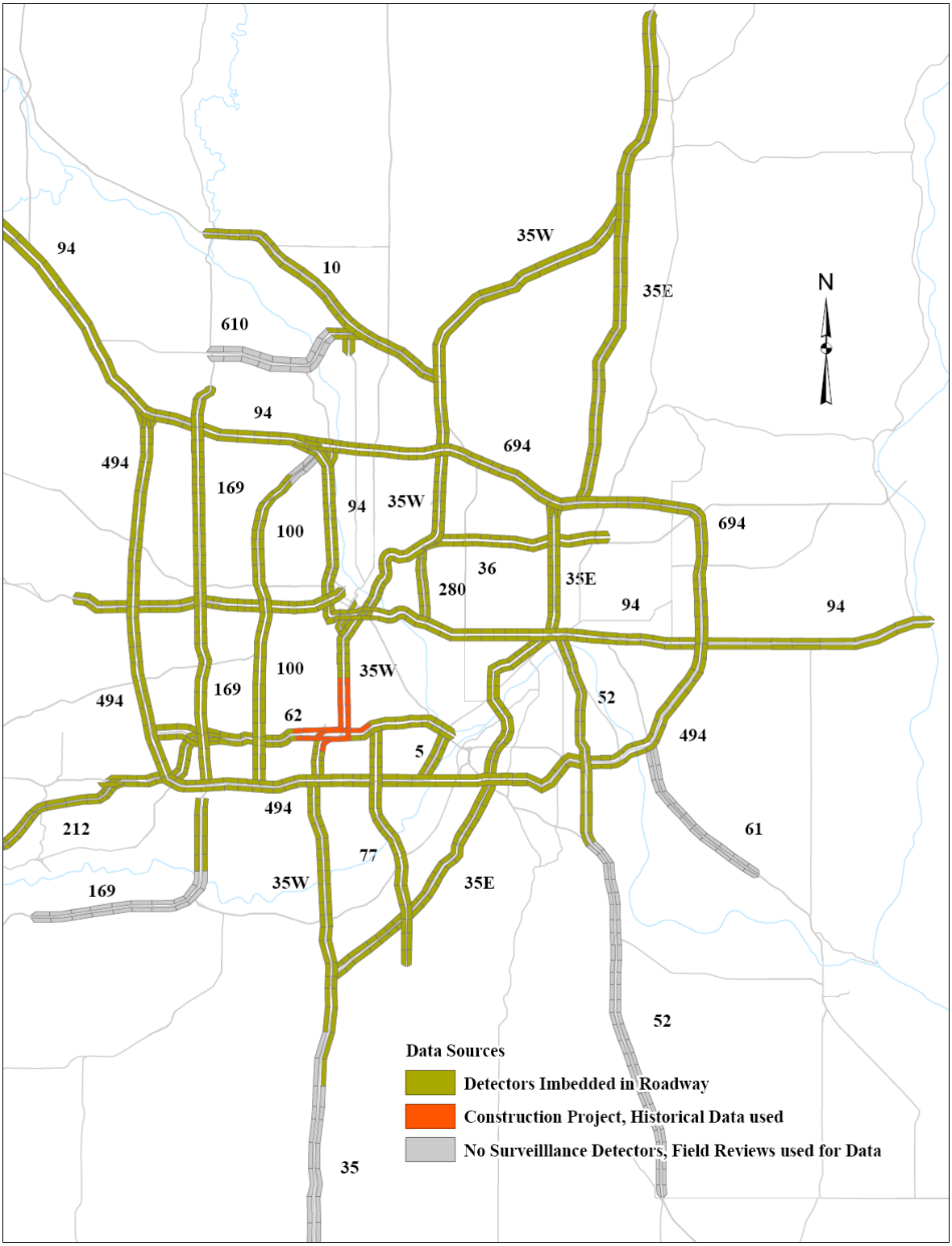
Highway			
TH 5	3	I-494 to Miss Rvr	
TH 10	12	Hwy 169 to I-35W	
TH 36	7	I-35W to English St	
TH 52	25	I-94 to Hwy 50	Hwy 50 to Upper 55th St (retroactive to 1993)
US 61	8	Cty 19 to I-494	Cty 19 to I-494 (Cty 19 to 80th St retroactive to 1993, rest to 2005)
TH 62	12	I-494 to Hwy 55	
TH 65	1	10th St to I-35W	
TH 100	16	I-494 to I-694	
US 169	28	I-494 to 77th Ave	Highwood Dr to Cty 15 (Highwood to MN River retroactive to 2006, rest to 1993)
US 212	17	I-494 to Hwy 62	Hwy 147 to I-494
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		

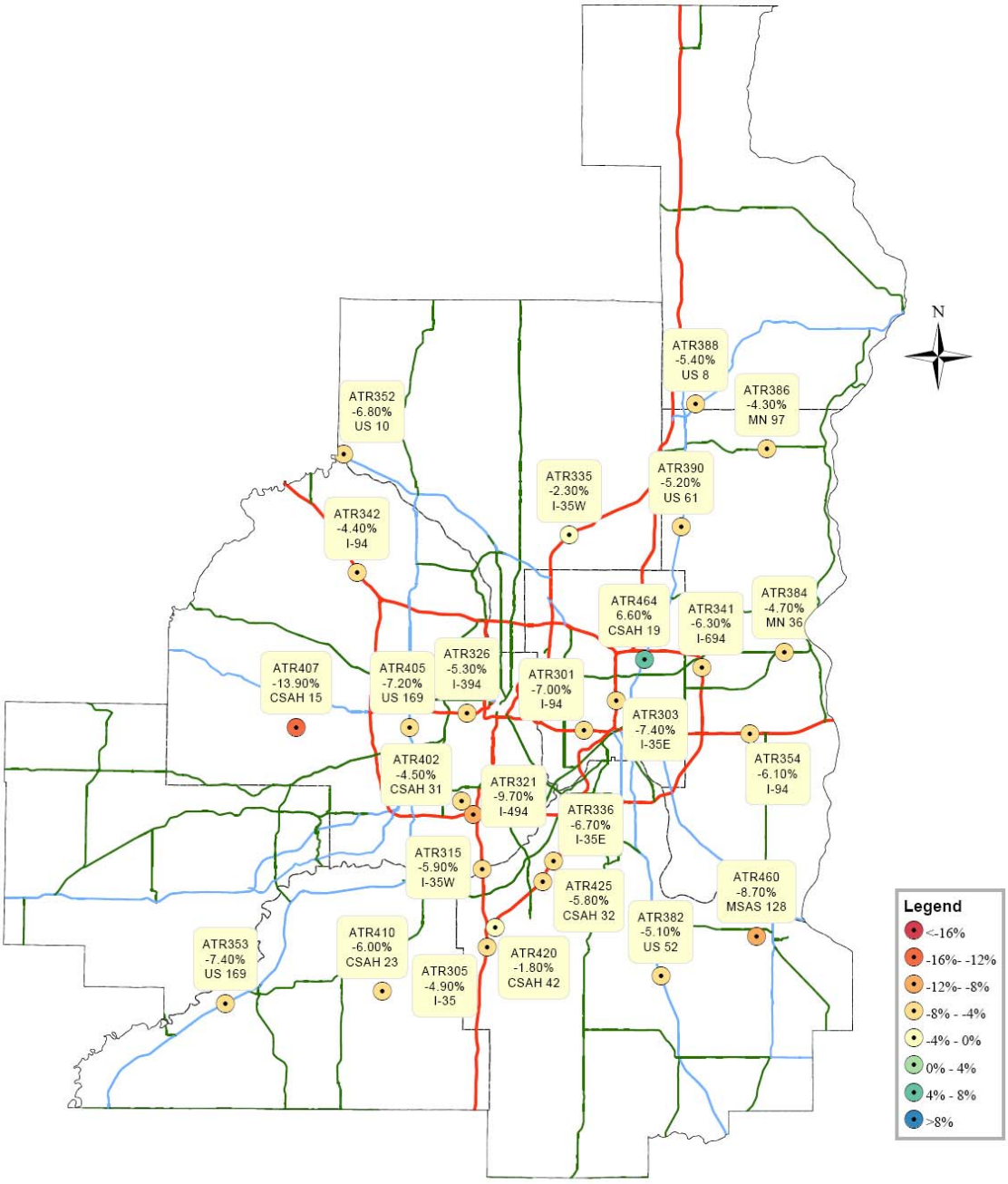

Corridors Added in 2008
94
10
35W
35E
610
N
94
694
494
169
94
35W
694
100
36
280
35E
94
94
100
35W
169
494
52
62
494
5
494
212
61
77
35W
35E
169
52
35
2008 Added Corridors
2007 Congestion Report Area
Interregional Corridors added in 2008
Other Freeway added in 2008


Affect on Performance Measure of Adding 55 Miles of Freeway
Congestion Percentage - 2007 Mileage
Congestion Percentage - IRC's Added
% of Congested Directional Miles
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
1993
1998
2003
2008
2007 Mileage 324
2008 Mileage 379
change 55

Appendix B: 2007 Metro Freeway Data Sources



Appendix C: Change in Vehicle Miles Traveled
February 2008 - February 2009



Source: Mn/DOT, Office of Transportation Data and Analysis