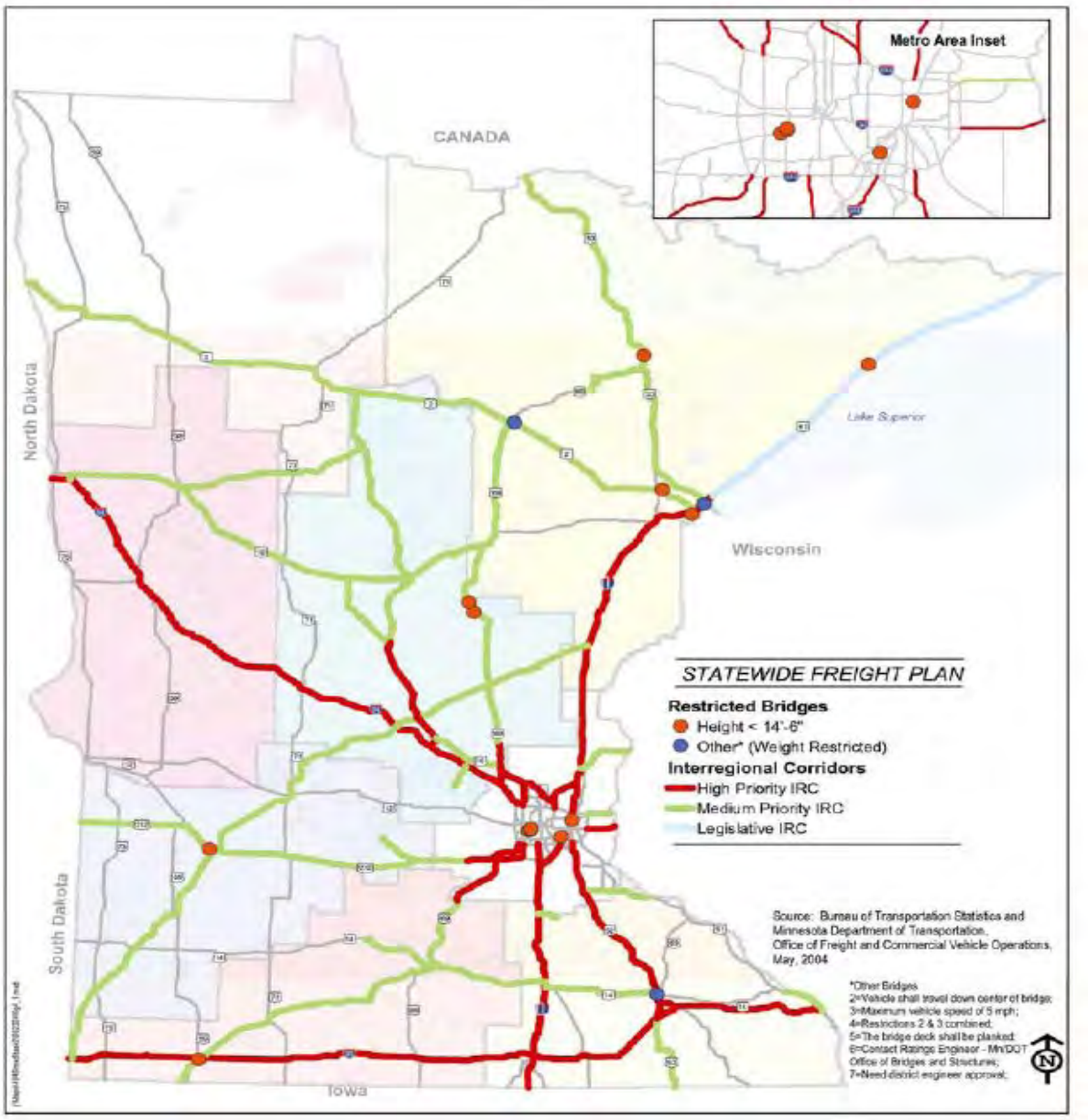
11.0 BOTTLENECK ANALYSIS

Bottlenecks impede of block the flow of freight, in Central Minnesota the following bottlenecks have been considered to be physical impediment to the freight system:

Highway Geometric Bottlenecks- Low clearance and other restricted bridges; fifteen bridges in the state have a high restriction of less than 14 feet, six inches. This height was selected because it is the height at which physical signing of a height restriction is provided, and concerns with decrease in clearance are critical with respect to maintenance and overlays. Two of the bridges are located in Central Minnesota both on truck highway 169.

Exhibit 63: Bottlenecks in Minnesota



11.1 Railroad Geometry Bottlenecks

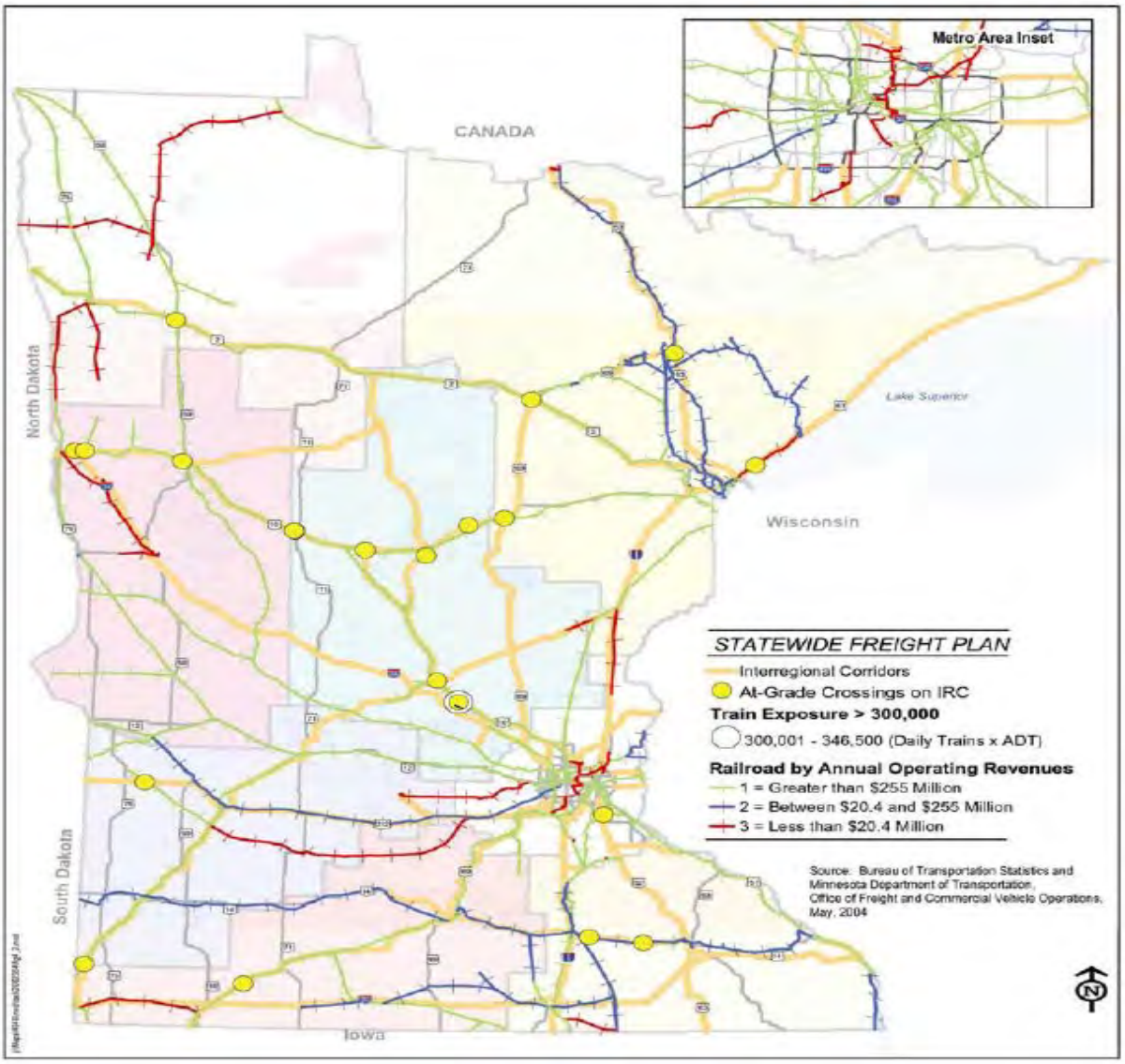
At-grade railroad crossing bottlenecks at six at-grade rail crossings with IRC's, result in truck freight traffic delays when a train is present. These delays can be eliminated by reconstructing the at-grade crossing to grade-separated crossing. One location along US 10, the junction of TH 24 in the City of Clear Lake, shows up as having a high-exposure value. Areas with a high-exposure value also indicate the potential for safety concerns.

Exhibit 64: At Grade Crossings on IRC in the Central Minnesota Study Area

Crossing Number	Roadway	Location
076288V	TH 10	Motley
061646H	TH 10	St. Cloud
*067230N	TH 24	Clear Lake
9174335	TH 371	Baxter
076186C	US 71	Wadena

(*) Train Exposure > 300,000

Exhibit 65: At-Grade Crossings in Minnesota



11.2 Highway Operational Bottlenecks

Most congested corridors are located in and radiating from the Twin Cities metro area. The only exception is TH 23 in Central Minnesota. I-94 from the Twin Cities to the North Dakota border is the most congested corridor in the state radiating from the metro area. Despite planned future improvements by 2030, I-94 from the Twin Cities to St. Cloud is expected to perform below target.

11.3 Rest Area Analysis

Interstate 94 West Corridor (ref Mn/DOT Truck Parking Study: Phase 2)

The Interstate 94 West Corridor has the most rest areas of all six study corridors and has more congested rest areas (six) than any other corridor, two of which are over capacity more than 50

percent of the time. Elm Creek, the state's most congested public rest area, in terms of truck parking, is located near Interstate 94's confluence with Interstate 494. Twenty-eight miles up the road at Enfield is another eastbound rest area. This rest area has eighteen truck stalls and has minimal congestion. It may be possible to relieve much of the congestion in Elm Creek by making the parking availability information. In addition, providing additional truck parking capacity of about 5 to 8 spaces at Elm Creek, coupled with better information, could provide relief. A similar relationship exists between the Burgen Lake and Middle Spunk Lake rest areas. Making this information available to truckers may be the cheapest and least laborious means of relieving congestion, at least in the short-term. Another option for Burgen Lake is to expand truck parking capacity by 10 to 15 spaces. Capacity improvements of between 5 and 10 spaces could also be considered at the Fuller Lake rest area. Improved information could be useful in relieving congestion at the remaining facilities along this corridor, especially since the Lake Lakota, Lake Iverson, and Hansel Lake rest areas are not as favorable for capacity improvements. Suggested recommendations for this corridor are:

- Capacity enhancement of Elm Creek, Burgen Lake, and Fuller Lake facilities.
- Improved information regarding parking availability.

Exhibit 66: Congested Rest Area

State Rank	Site Name (Direction)	Corridor	Mile Post	Truck Stalls	Auto Stalls	Truck/Auto Stall Ratio	% Days at or over capacity
6	Fuller Lake (W.B)	I-94 West	177	17	80	0.21	45.8%

2010 Interstate 94 Average Truck Speed

In 2010, I-94 from the Twin Cities to St. Cloud average speed was between 49 and 54 miles per hour. St. Cloud to Twin Cities average speed was between 49 and 54 miles per hour.

Exhibit 67: 2010 Interstate 94 Average Truck Speed

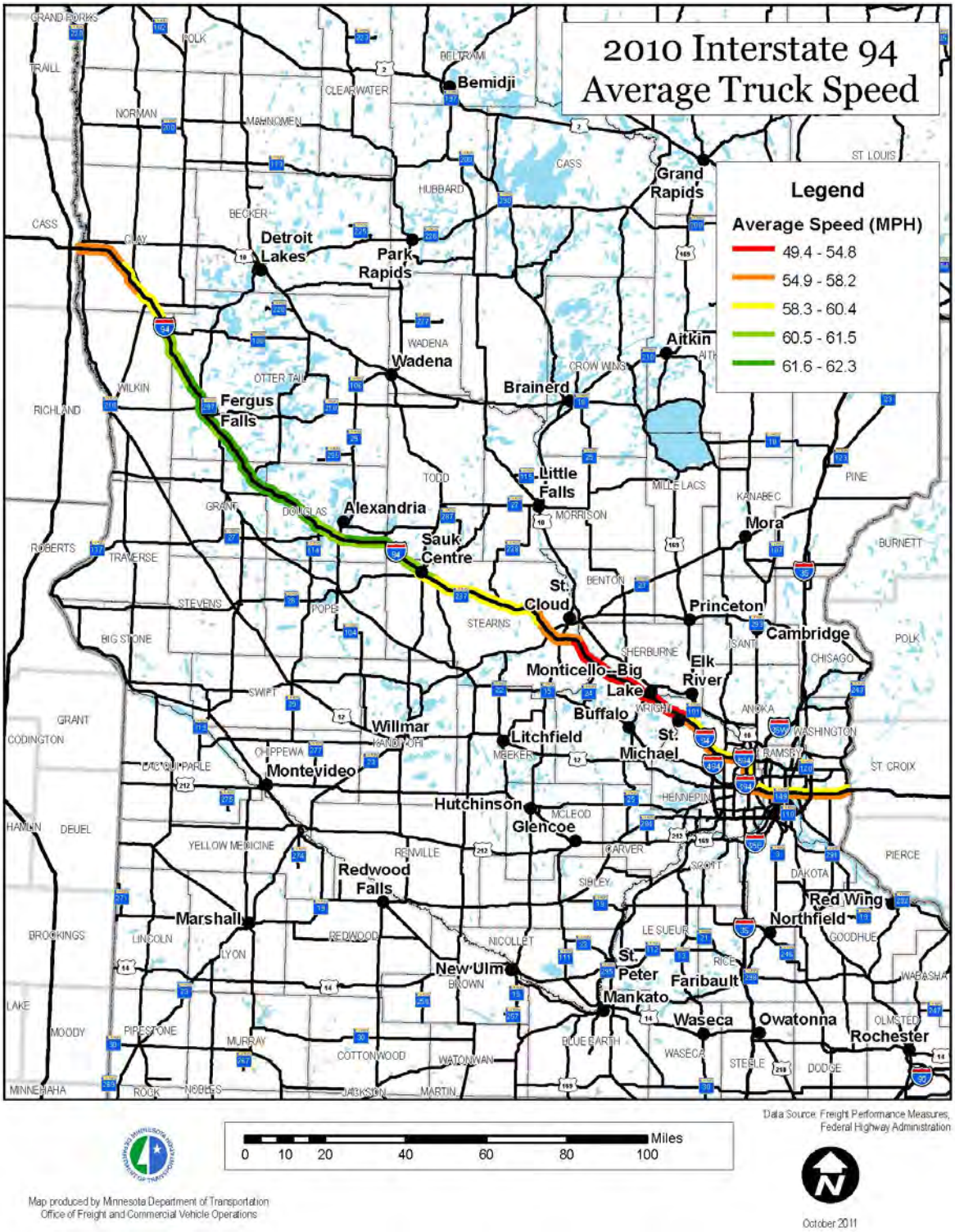
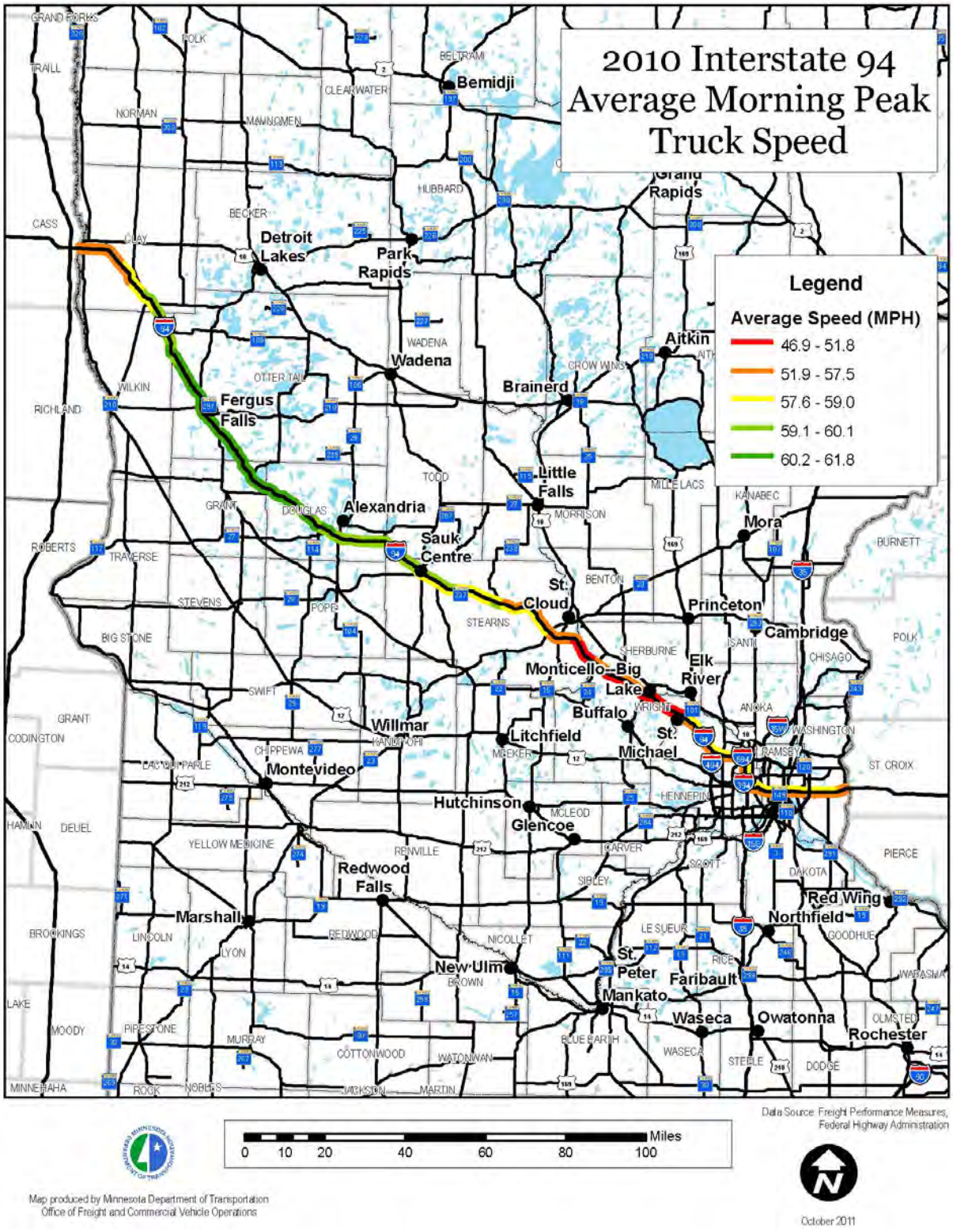


Exhibit 68: 2010 Interstate 94 Average Morning Peak Truck Speed



In 2010, I-94 from St. Cloud to the Twin Cities average speed was 51 to 57 miles per hour. From the Twin Cities to St. Cloud average speed was 46 to 51 miles per hour.

2010 Interstate 94 Average Evening Peak Truck Speed

In 2010, I-94 from St. Cloud to Twin Cities average speed was 53 to 57 miles per hour. From the Twin Cities to St. Cloud average speed was 49 to 53 miles per hour.

Exhibit 69: 2010 Interstate 94 Average Evening Peak Truck Speed

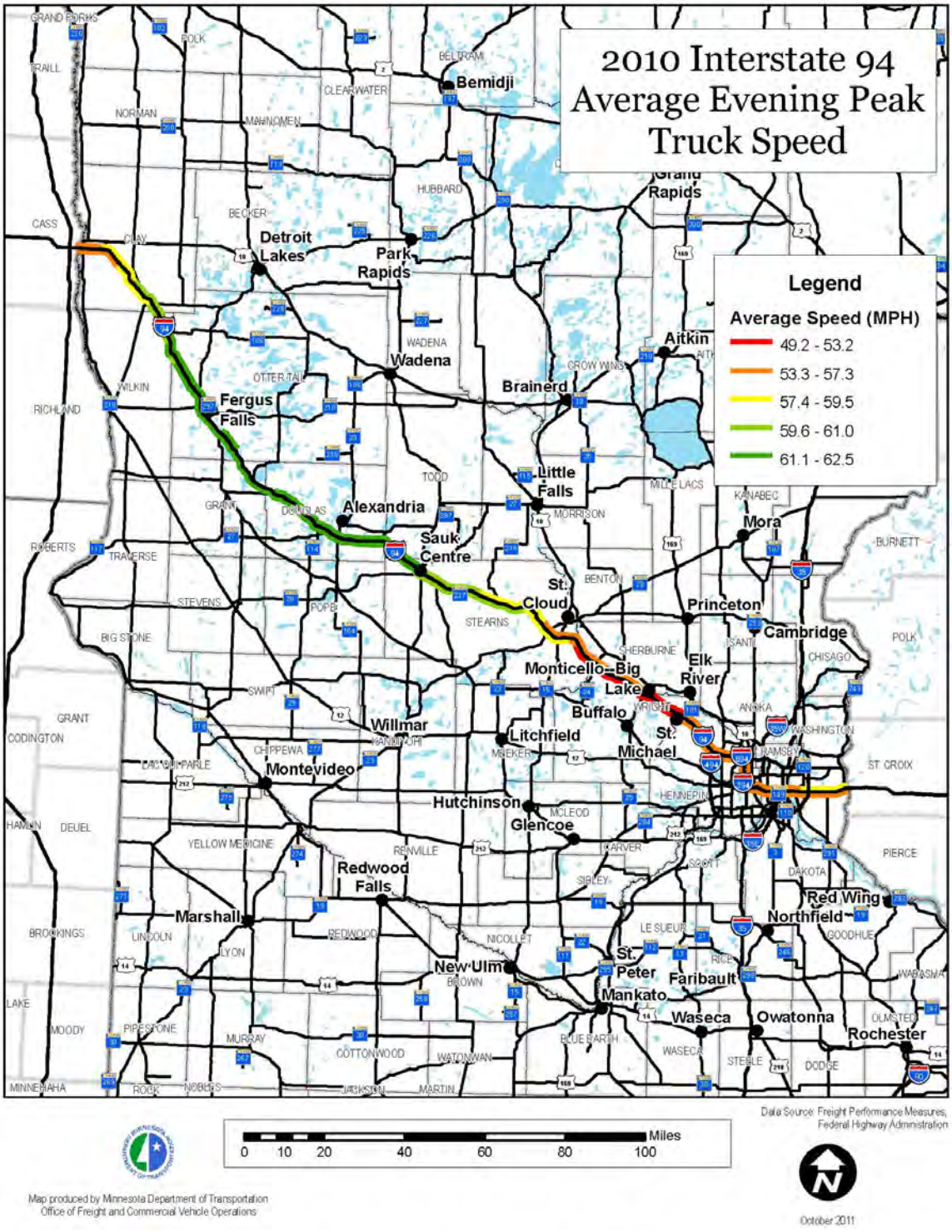
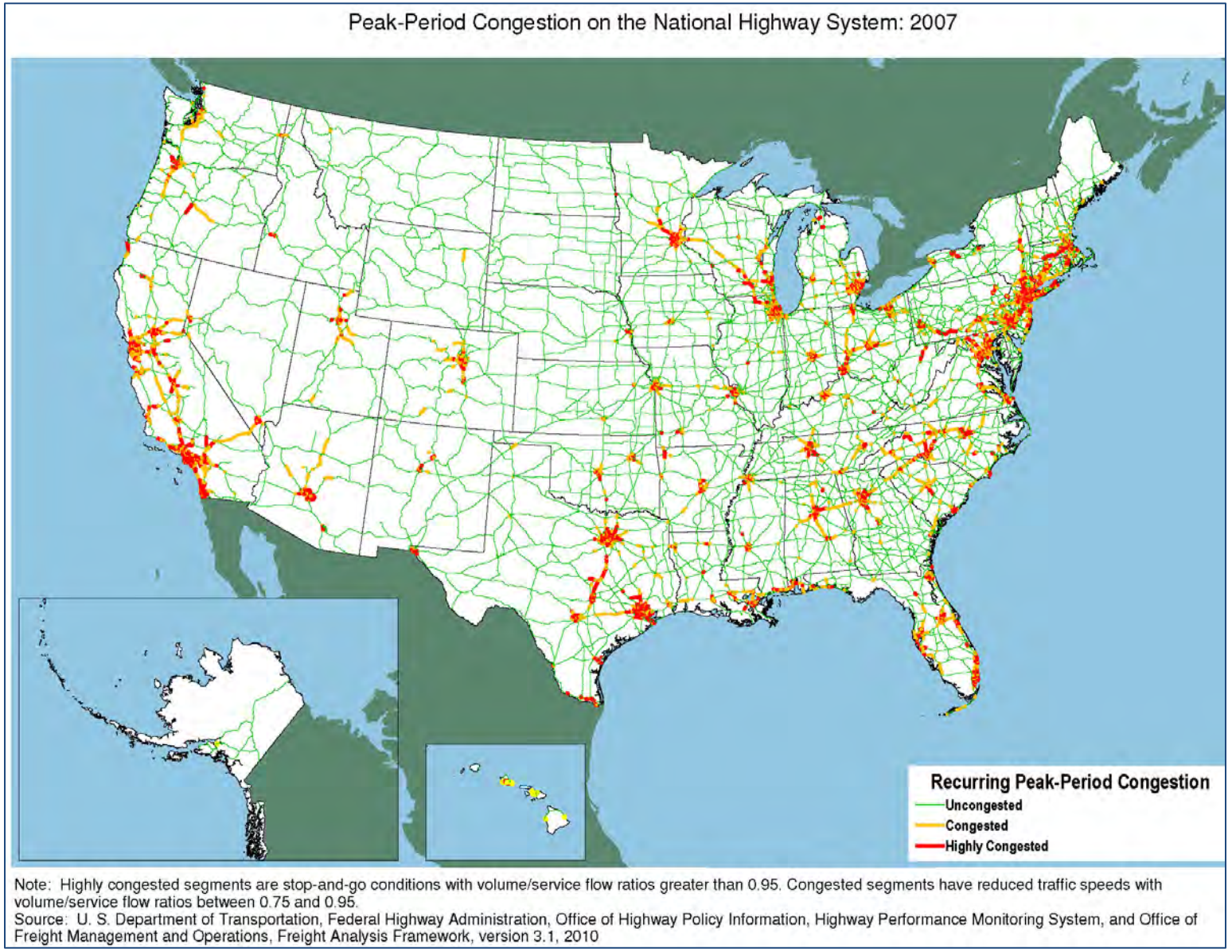


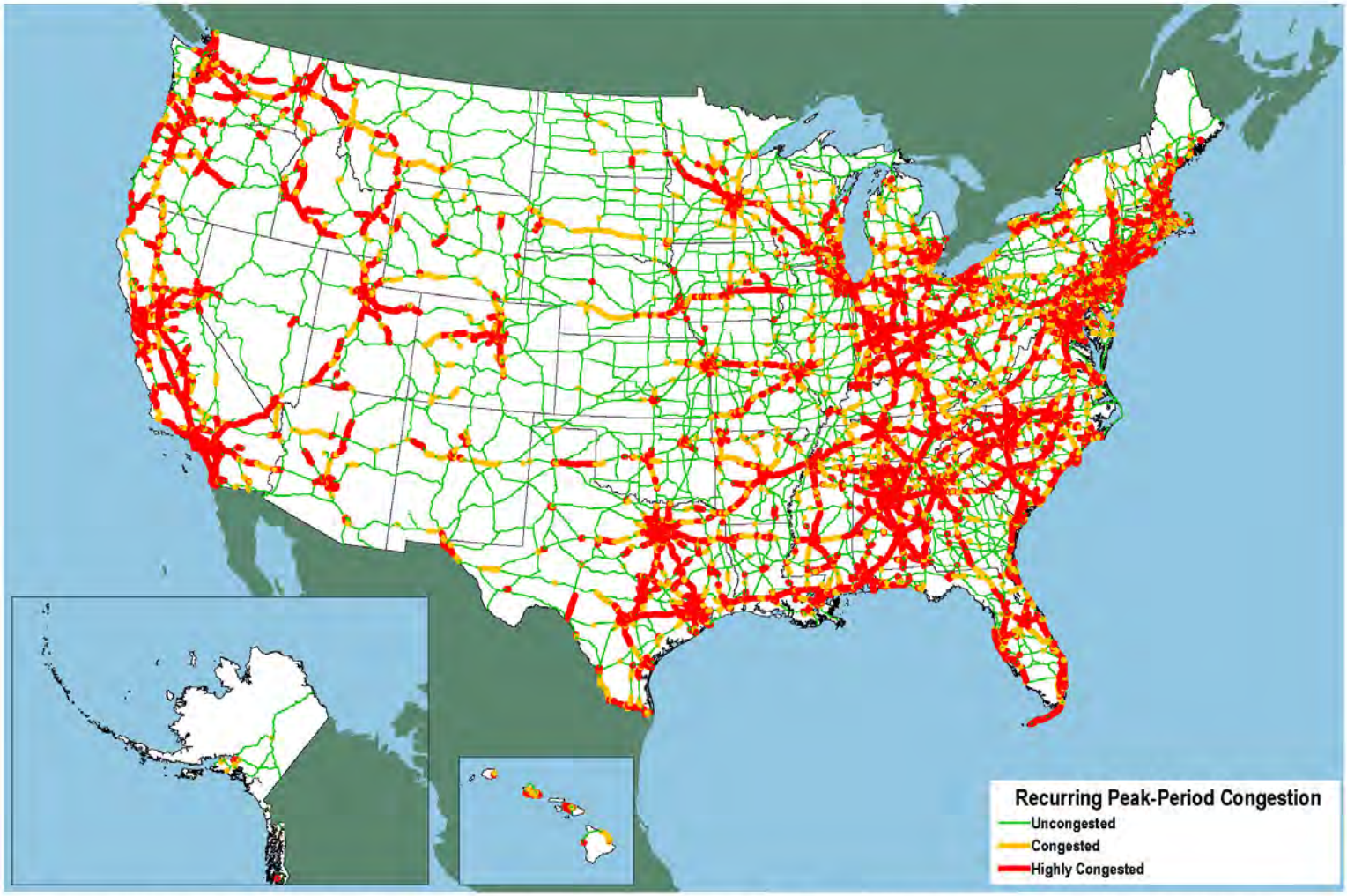
Exhibit 70: Peak-Period Congestion on the National Highway System, 2007



Note: Highly congested segments are stop-and-go conditions with volume/service flow ratios greater than 0.95. Congested segments have reduced traffic speeds with volume/service flow ratios between 0.75 and 0.95.
Source: U. S. Department of Transportation, Federal Highway Administration, Office of Highway Policy Information, Highway Performance Monitoring System, and Office of Freight Management and Operations, Freight Analysis Framework, version 3.1, 2010

Exhibit 71: Peak-Period Congestion on the National Highway System, 2040

Peak-Period Congestion on the National Highway System: 2040



Note: Highly congested segments are stop-and-go conditions with volume/service flow ratios greater than 0.95. Congested segments have reduced traffic speeds with volume/service flow ratios between 0.75 and 0.95. The volume/service flow ratio is estimated using the procedures outlined in the HPMS Field Manual, Appendix N
Source: U. S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, Freight Analysis Framework, version 3.1, 2010

11.4 Journey to Work

Hennepin County has a total of 35,107 commuters from the following counties: Benton, Cass, Crow Wing, Isanti, Mille Lacs, Morrison, Sherburne, Stearns, and Wright. The top three are from the following counties: Wright County 19,132, Sherburne County 9,548, Isanti 2,404.

Exhibit 72: Commuters in Hennepin County

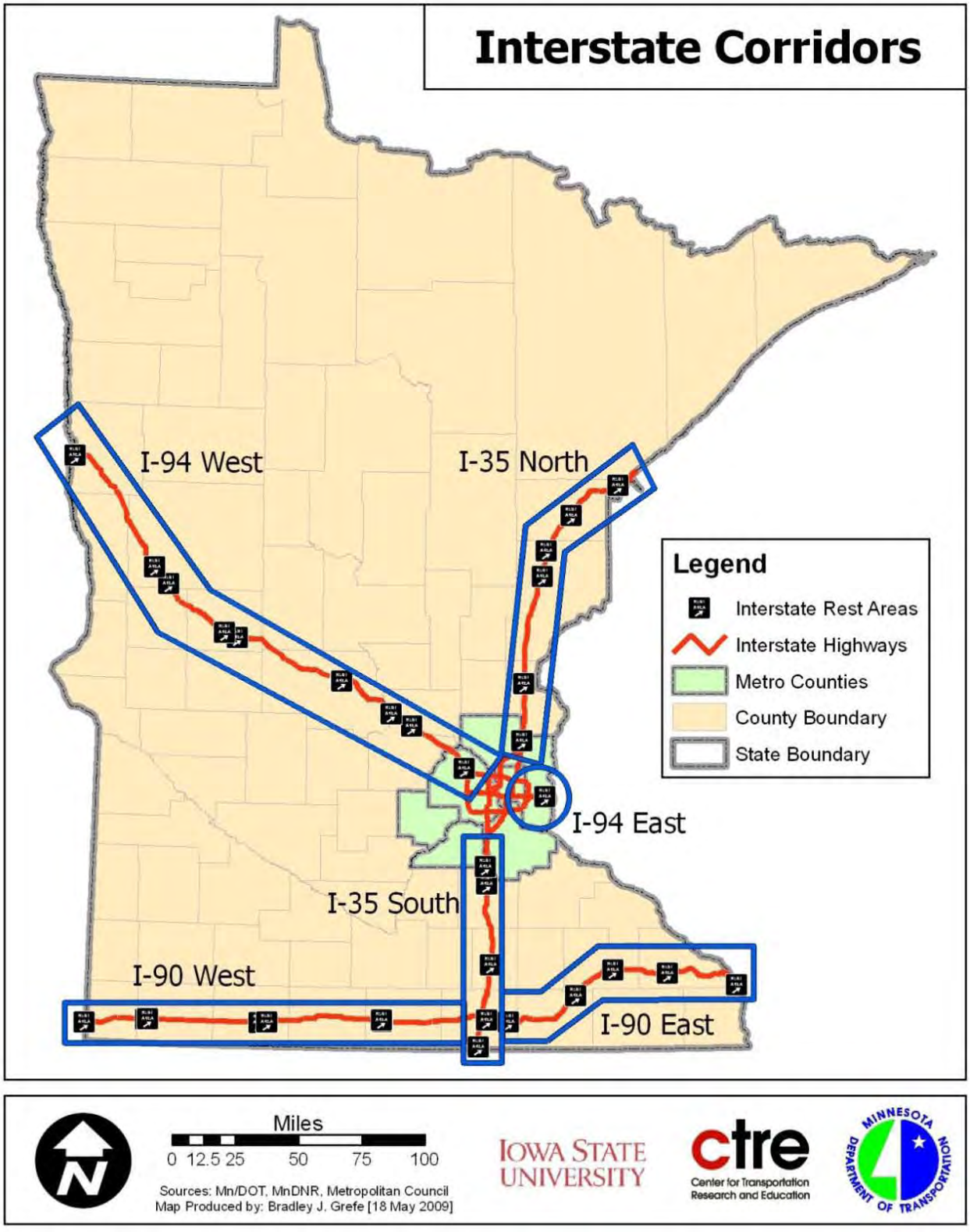
Residence State - County Name	Work State	Work County	Work (C)MSA	Work PMSA	Workplace State - County Name	Count
Benton Co. MN	027	053	5120	9999	Hennepin Co.	423
Cass Co. MN	027	053	5120	9999	Hennepin Co.	196
Crow Wing Co. MN	027	053	5120	9999	Hennepin Co.	338
Isanti Co. MN	027	053	5120	9999	Hennepin Co.	2,404
Mille Lacs Co. MN	027	053	5120	9999	Hennepin Co.	958
Morrison Co. MN	027	053	5120	9999	Hennepin Co.	215
Sherbune Co. MN	027	053	5120	9999	Hennepin Co.	9,548
Stearns Co. MN	027	053	5120	9999	Hennepin Co.	1,893
Wright Co. MN	027	053	5120	9999	Hennepin Co.	19,132
					Subtotal:	35,107

Ramsey County has a total of 3,978 commuters from the following counties: Benton, Cass, Crow Wing, Isanti, Mille Lacs, Morrison, Sherburne, Stearns, and Wright. The top three are from the following counties: Isanti County 1,155, Wright County 1,125, Sherburne County 901.

Exhibit 73: Commuters in Ramsey County

Residence State - County Name	Work State	Work County	Work (C)MSA	Work PMSA	Workplace State - County Name	Count
Benton Co. MN	027	123	5120	9999	Ramsey Co.	101
Cass Co. MN	027	123	5120	9999	Ramsey Co.	34
Crow Wing Co. MN	027	123	5120	9999	Ramsey Co.	110
Isanti Co. MN	027	123	5120	9999	Ramsey Co.	1,155
Mille Lacs Co. MN	027	123	5120	9999	Ramsey Co.	149
Morrison Co. MN	027	123	5120	9999	Ramsey Co.	57
Sherbune Co. MN	027	123	5120	9999	Ramsey Co.	901
Stearns Co. MN	027	123	5120	9999	Ramsey Co.	346
Wright Co. MN	027	123	5120	9999	Ramsey Co.	1,125
					Subtotal:	3,978

Exhibit 74: Interstate Corridors in Minnesota


Interstate Corridors
I-94 West
I-35 North
I-94 East
I-35 South
I-90 West
I-90 East
Legend
Interstate Rest Areas
Interstate Highways
Metro Counties
County Boundary
State Boundary
Miles
0 12.5 25 50 75 100
Sources: Mn/DOT, MnDNR, Metropolitan Council
Map Produced by: Bradley J. Grefe [18 May 2009]
IOWA STATE UNIVERSITY
ctre
Center for Transportation Research and Education
MINNESOTA DEPARTMENT OF TRANSPORTATION