



# Updating Speed Performance Measures of Minnesota's Interregional Corridor System

By

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GIS-T 2004





# Background

- Began identifying key transportation corridors in February, 1999
- Several objectives:
  - ◆ IRC roads should be a subset of the state's major roads (principal arterials and National Highway System roads).
  - ◆ The selection roads for IRC designation should be based on clearly defined technical criteria.
  - ◆ Investment priorities should be performance based and should define IRC performance criteria.
  - ◆ The IRC defined should enjoy broad support from local, regional, and state agencies and institutions and from residents and businesses





# IRC Study Process

- Outreach Process
- Main themes expressed by attendees
  - ◆ Need for quick and safe travel,
  - ◆ Need to address increasing delays from traffic signals,
  - ◆ Need to better control and manage access points,
  - ◆ Need to address growth in traffic congestion, and
  - ◆ Need for predictable travel times from trip to trip and for just-in-time freight movements.





# IRC Study Process (con't)

- Second set of small group meetings
- Developed principles and policies:
  - ◆ Definition of regional trade centers,
  - ◆ Identification of the IRC,
  - ◆ Development of interregional corridor principles and policies, and
  - ◆ Development of a corridor management plan guide.





# Regional Trade Centers

- Based on the University of Minnesota's 1963 report, *Trade Centers and Trade Areas of the Upper Midwest*
  - ◆ 0 = Twin Cities (only 1)
  - ◆ 1 = St. Cloud, Rochester, Duluth
  - ◆ 2 = Brainerd, Bemidji, Willmar, Marshall
  - ◆ 3 = Elk River, Little Falls, Montevideo





# Defining the Interregional Corridors



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# Corridor Evaluation Criteria

- State highway principal arterial routes
- 6 criteria used to compare corridors
  - ◆ Average annual daily traffic
  - ◆ Heavy commercial average daily
  - ◆ Seasonal peaking factor
  - ◆ Historical traffic growth rates
  - ◆ Number and level of RTCs connected by the corridor route
  - ◆ 25-yr county population growth projections





# Priority Corridors

- Segments separated into 3 groups
  - ◆ High, medium, low score segments
- Segments combined into corridors connecting RTCs
- Additional factors were considered:
  1. Provide connections between Levels 0, 1, and 2;
  2. National Hwy System designation should influence whether a route is designated as part of the IRC;
  3. Consider District and metropolitan plan priorities
  4. Consider System spacing and geographic coverage
  5. Consider Regional connections to other states





# Priority Corridors Results

- IRC is ~ 2,926 miles long
- ~ 56% of existing principal arterial system
- 1/3 of system – 1,007 miles, is HPI
- 2/3 of system – 1, 919 miles, is MPI
- HPI and MPI account for < 2% of all roadway miles in MN
- But carry > 30% of vehicle miles traveled





# Performance Measures

- Speed (surrogate for travel time) methodology:
  - ◆ Posted speed limits
  - ◆ Number of signals
  - ◆ Congestion
- This established an overall speed or travel time for the corridor





# Performance Targets

- Establishing target levels
  - ◆ 60 mph for HPI
  - ◆ 55 mph for MPI
  - ◆ 50 mph for high-priority Regional corridors





# Evaluating Corridor Performance

## ■ Methodology:

1. Posted speeds from MnDOT's TIS
2. Base Travel Time
3. Capacity Risk
4. Traffic Control Devices





# Evaluating Corridor Performance

- Methodology: (con't)
  5. Capacity
  6. Adjusted Travel Time
  7. Current and future performance compliance





# Adjustments

1. Base speeds were increased by 3 mph
2. Congestion Penalty
3. Signal Penalties



# Performance Target Matrix

Performance Targets			
		<b>Interregional Corridor Priority Level</b>	
<b>Performance Category</b>		<b>High-Priority</b>	<b>Medium-Priority</b>
At or Above		$\geq 60$ mph	$\geq 55$ mph
Below		$< 60$ mph	$< 55$ mph

# Congestion Thresholds

<b>CONGESTION THRESHOLDS</b>		
<b>Volume Threshold (AADT per Lane)</b>	<b>Congestion Index Risk</b>	<b>Added Delay Penalty Level</b>
<b>Freeway</b>		
<= 15,000	Low	0%
15,000 - 20,000	Moderate	$(\text{AADT/Lane} - 15,000) / 167$
> 20,000	Severe	50%
<b>Rural Expressway</b>		
<= 8,000	Low	0%
8,000 - 11,000	Moderate	$(\text{AADT/Lane} - 8,000) / 100$
> 11,000	Severe	50%
<b>Urban Expressway</b>		
<= 5,000	Low	0%
5,000 - 7,000	Moderate	$(\text{AADT/Lane} - 5,000) / 67$
> 7,000	Severe	50%
<b>Two-Lane</b>		
<= 4,500	Low	0%
4,500 - 7,500	Moderate	$(\text{AADT/Lane} - 4,500) / 100$
> 7,500	Severe	50%



# Signal Time Penalty

SIGNAL TIME PENALTY			
Location	Low Congestion	Moderate Congestion	Severe Congestion
	28 seconds	43 seconds	50 seconds
Greater Minnesota	11 seconds	17 seconds	20 seconds
Metro Area	15 seconds	24 seconds	29 seconds
	37 seconds	61 seconds	73 seconds

Yellow = New Equation

White = Original Equation



# Spreadsheet Examples



<b><u>Weighted Posted Speed</u></b>	= Posted speed * (segment length / total segment length)
<b><u>Adjusted Speed</u></b>	= Weighted Posted speed + 3 mph
<b><u>Base Travel Time</u></b>	= (Length / Adjusted speed) * 3600 (to get seconds)
<b><u>Signal Delay</u></b>	= see previous slide
<b><u>Stop Sign Delay</u></b>	= # stop signs * 14 seconds (originally used 37 secs)
<b><u>Weighted AADT</u></b>	= AADT * (segment length / total segment length)
<b><u>Weighted Lanes</u></b>	= Weighted AADT / # Weighted Lanes
<b><u>Facility Type</u></b>	= Vlookup to speed_lanes03 spreadsheet
<b><u>Congestion Index Risk</u></b>	= Formula based on Congestion Thresholds – see slide
<b><u>Added Delay Penalty</u></b>	= Formula based on Congestion Thresholds – see slide
<b><u>Added Congestion Delay</u></b>	= Base Travel Time * Added Delay Penalty
<b><u>TOTAL Travel Time</u></b>	= Base Time + Signal Delay + Stop Sign Delay + Added Congestion Delay
<b><u>Final Speed</u></b>	= (Segment Length / Total Travel Time) * 3600
<b><u>PERFORMANCE</u></b>	= See Performance Target Slide



# Future Performances

- 2014, 2023, 2030
- Updated the road segment capacity
- Original Equation vs New Equation
- Improvements vs No Improvements
  - ◆ Include current year construction
  - ◆ Include STIP 2004 – 2006
  - ◆ 10 year Work Plan (to 2013)





# Future Performances (con't)

- Analysis for High-Priority Regional Corridors
- Creating many “What-If...” scenarios
- Decision to revamp the IRC Speed Performance Spreadsheet



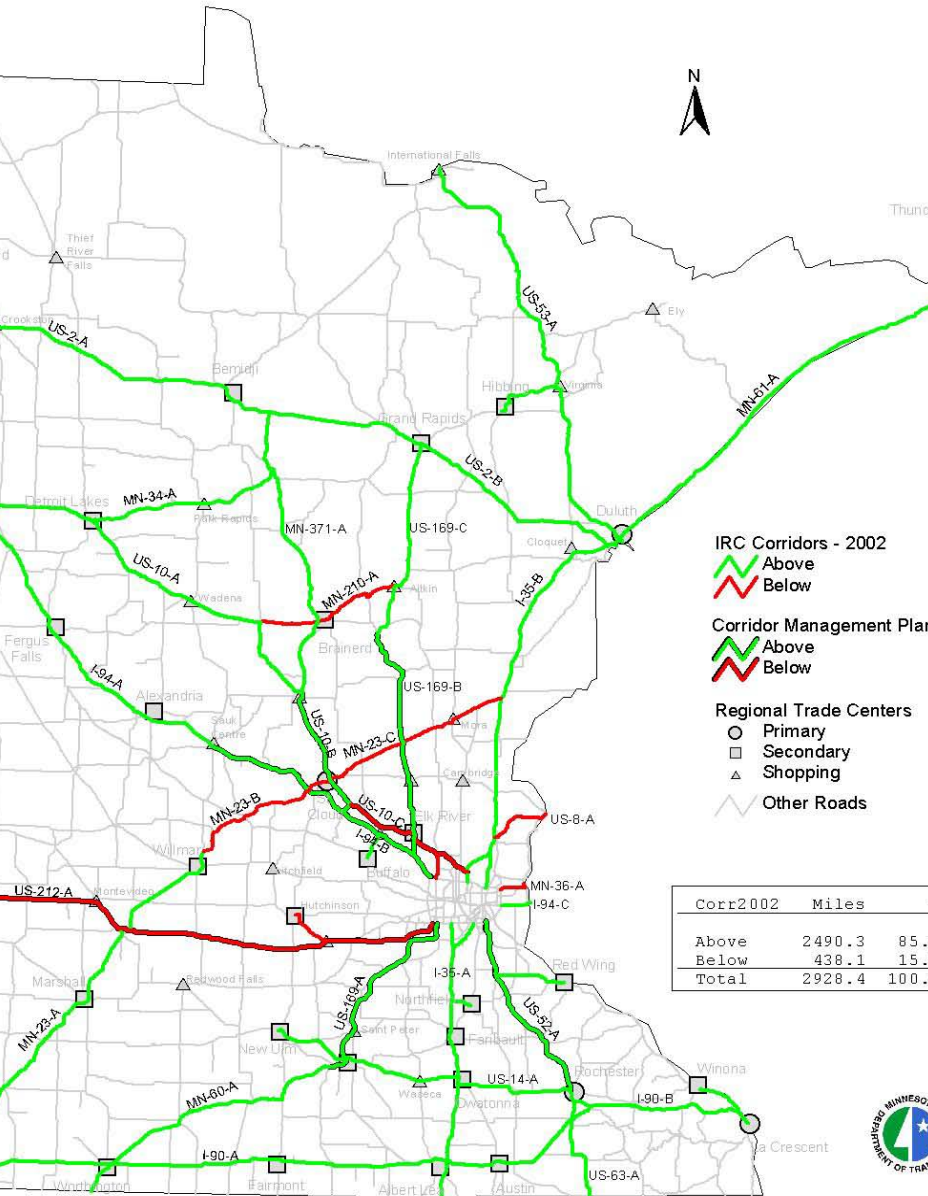


# What's Next

- Continue to finalize spreadsheet
- Incorporate changes into Interregional Corridor spreadsheet
- Automate



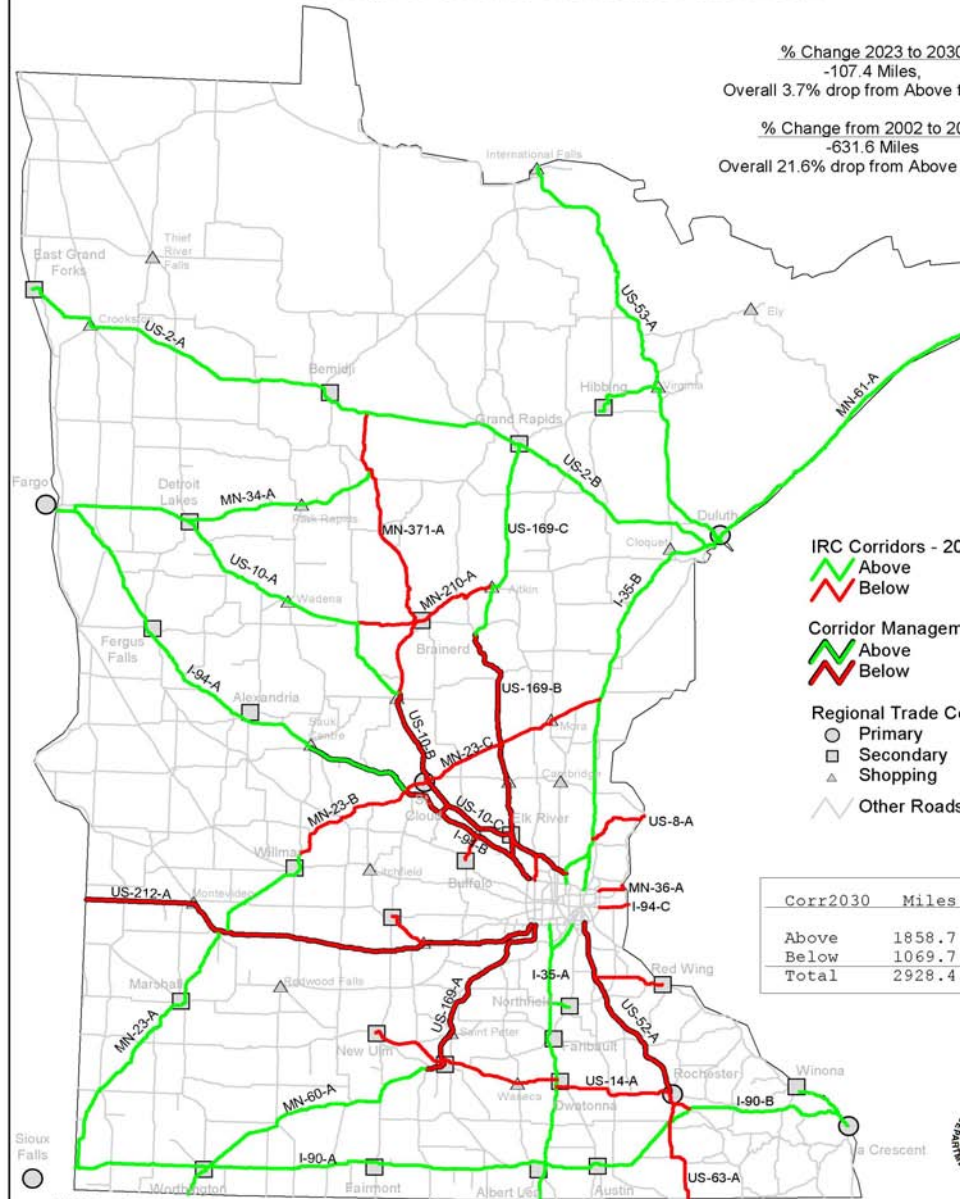
# Year 2002 IRC System Speed Performance by IRC Corridor



Source: MnDOT, Office of Investment Management, 11/14/03; rev 1

# Year 2030 Forecast IRC System Speed Performance by IRC Corridor

No Improvements Reflected After 2002



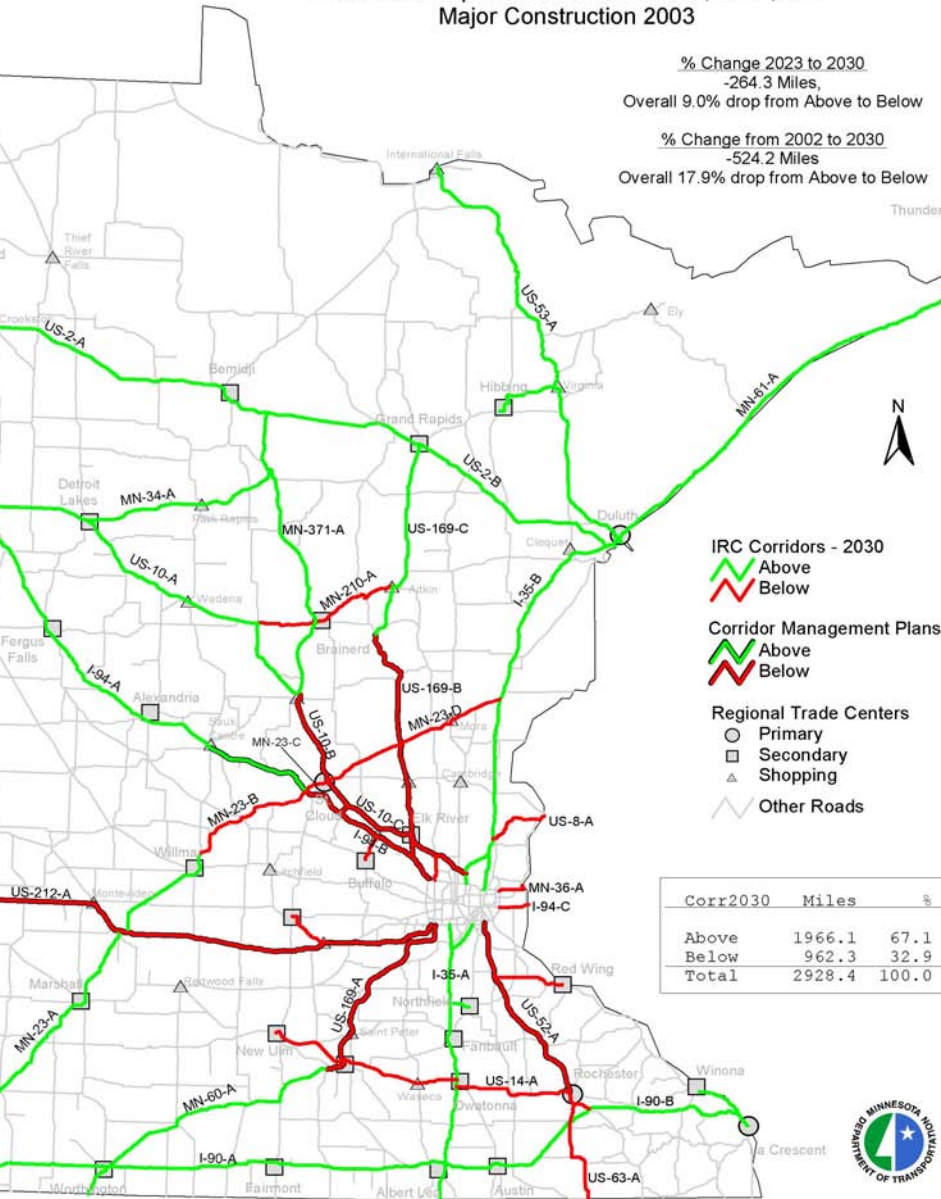
Source: MnDOT, Office of Investment Management, 11/14/03; rev 1

# Year 2030 Forecast IRC System Speed Performance by IRC Corridor

Includes all improvements from BAPs, STIP, and Major Construction 2003

% Change 2023 to 2030  
-264.3 Miles,  
Overall 9.0% drop from Above to Below

% Change from 2002 to 2030  
-524.2 Miles  
Overall 17.9% drop from Above to Below



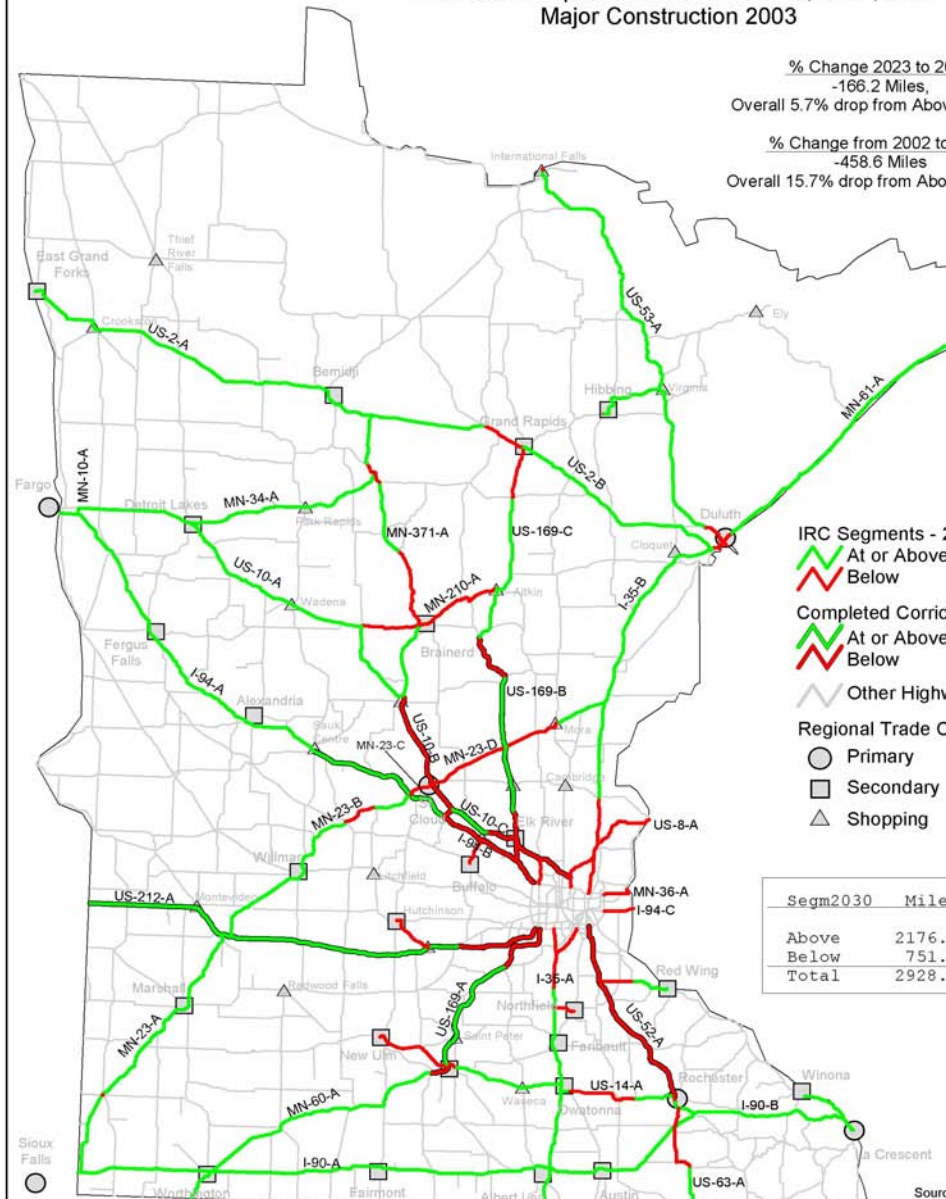
Source: MnDOT, Office of Investment Management, 11/19/03, re

# Year 2030 Forecast IRC System Speed Performance by IRC Segment

Includes all improvements from BAPs, STIP, and Major Construction 2003

% Change 2023 to 2030  
-166.2 Miles,  
Overall 5.7% drop from Above to Below

% Change from 2002 to 2030  
-458.6 Miles  
Overall 15.7% drop from Above to Below



Source: MnDOT, Office of Investment Management, 11/19/03, re





# Closing

- IRCs and planning process widely accepted by local communities
- Corridor importance is recognized
- Provides an opportunity for communities and local agencies to work together





# Data Sources

- *Interregional Corridors – A Guide for Plan Development and Corridor Management, MnDOT, September, 2000*
  
- *Interregional Corridors – Prioritizing and Managing Critical Connections Between Minnesota's Economic Centers, by Linda Zemotel and David Montebello*
  - ◆ *Transportation Research Record 1817; Paper No. 02-3252*





# Contact

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