Statewide Interregional Corridor Study

November 1999

Submitted to:

Minnesota Department of Transportation

Submitted by:

SRF Consulting Group, Inc.

STATEWIDE

INTERREGIONAL CORRIDOR STUDY

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Prepared for the
MINNESOTA DEPARTMENT OF TRANSPORTATION

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Table of Contents

Table of Contents

List of Figures

List of Tables

INTRODUCTION

More and more of Minnesota's population and economic activities are locating in and around regional centers. Travel along main corridors between these regional centers has been increasing as people seek more diverse employment, shopping, health care, educational service and recreational opportunities. Unfortunately, highway improvements on these main corridors have not kept pace with economic growth and development, and the public's travel expectations. Continued inaction on these important corridors will reduce traveler safety and mobility and, ultimately, will impair the ability of Minnesota's regional centers to compete in today's expanding global marketplace.

While the 1997 Statewide Transportation Plan supports investments that enhance safety and timely travel between activity centers (regional trade centers), it defined the Interregional Corridor System as the entire 5,200-mile principal arterial system. The entire principal arterial system is too large as the interregional system to allow sufficient focus on the key transportation corridors throughout the state. In addition, previous Plans did not provide guidance on how these corridors should perform from a mobility perspective. The result has been a lack of attention on some major corridors and some inconsistencies between districts on how corridors are managed.

As a result, the Minnesota Department of Transportation (Mn/DOT) initiated the Interregional Corridor Study to identify important economic corridors in the state. ***The goal of the Interregional Corridor System is to maintain safe, timely and efficient transportation services between regional centers.*** Providing good transportation service to the main activity centers will improve or maintain productivity, reduce transportation costs and support the interdependencies that exist between different areas of the state and between Minnesota and other states and counties.

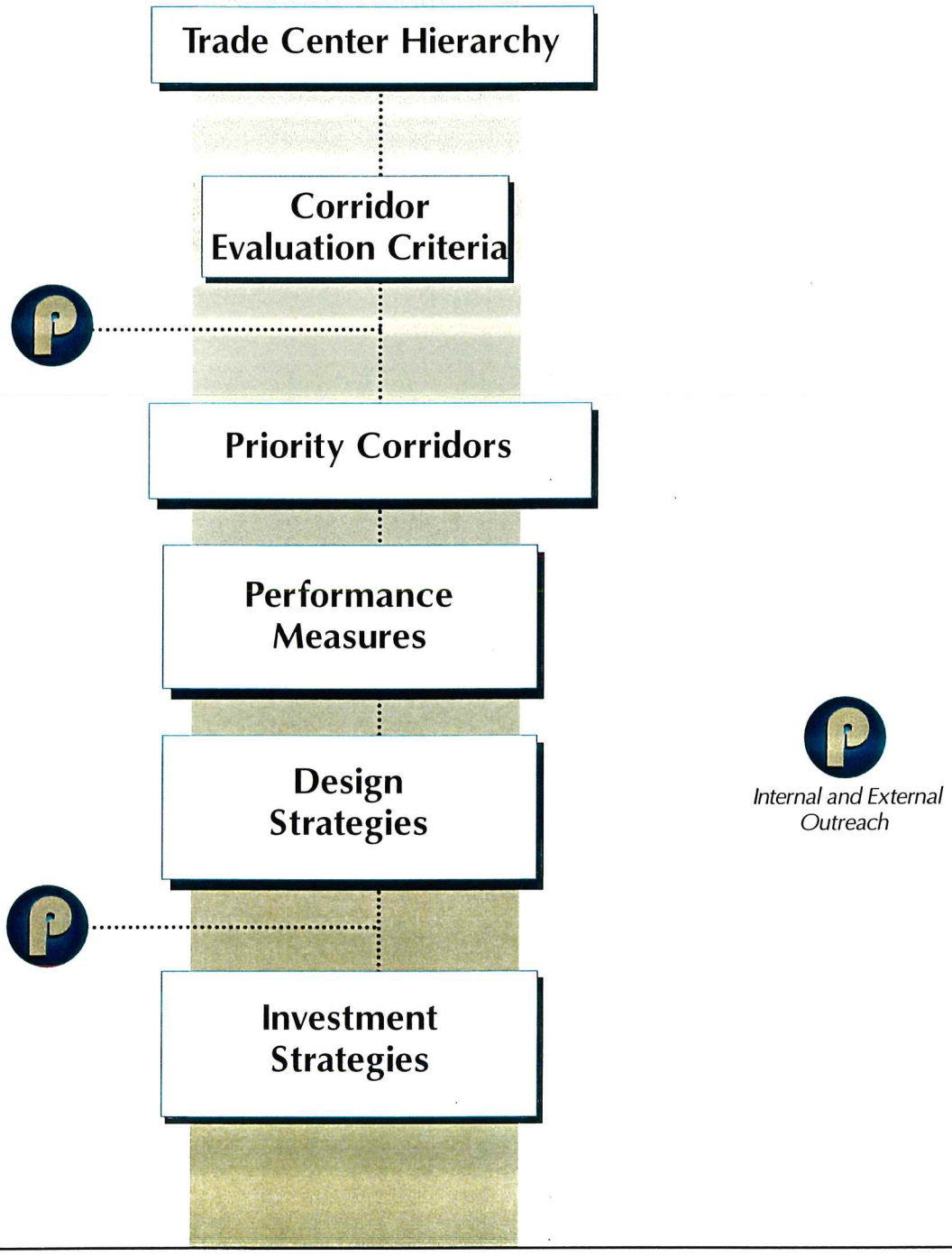
STUDY PROCESS

The overall study process was established at the outset of the study and is shown in Figure 1. The six-step process focused on developing technical criteria for evaluating corridors and establishing performance measures. The steps in the process are summarized next, and are described in more detail throughout this report:

Step One – Regional Trade Center Hierarchy

Over 35 years ago, the University of Minnesota Center for Urban and Regional Affairs (CURA) completed an economic study of the Upper Midwest for the Federal Reserve Bank. This study developed a model for ranking regional trade centers. This model defined an eight-level hierarchy of places from metropolitan areas to hamlets. The model uses population and the number and diversity of businesses in an area to determine

INTERREGIONAL CORRIDORS
IDENTIFICATION PROCESS



IRC	**STUDY PROCESS**	FIGURE 1

Regional Trade Center (RTC) rankings. These rankings provided one method to categorize the relative economic activity of communities across Minnesota and the Upper Midwest.

The regional trade center analysis was updated by CURA in 1989 and again in 1999. The latest update was completed for this Interregional Corridor Study project. For this study, fifty RTCs "Levels 0 to 3" were used (Figure 2) as an integral part in the process of defining the Interregional Corridor System. Counties with one or more of these 50 centers represent over 90 percent of all economic activity within Minnesota. The Twin Cities metropolitan area is the "Level 0" regional trade center in Minnesota, and contains the widest variety of services and businesses. The next highest centers are "Level 1" centers or primary centers (e.g., Duluth, St. Cloud and Rochester). The secondary centers, "Level 2" centers, are centers such as Mankato, Brainerd, Willmar, Bemidji and Marshall. The "Level 3" centers are considered full shopping centers (e.g., Little Falls, St. Peter, Wadena, Park Rapids).

The RTC model also provides a historical context for how centers' ranking have changed over time (three different analyses over a 38-year period). This has proven to be a useful tool for policymakers and researchers by providing insight into how towns and communities grow, shrink, take on new roles and become more or less important in the overall statewide economy. A copy of CURA's *1999 Update of Regional Trade Centers of the Upper Midwest* is provided in Appendix A.

Step Two – Corridor Evaluation

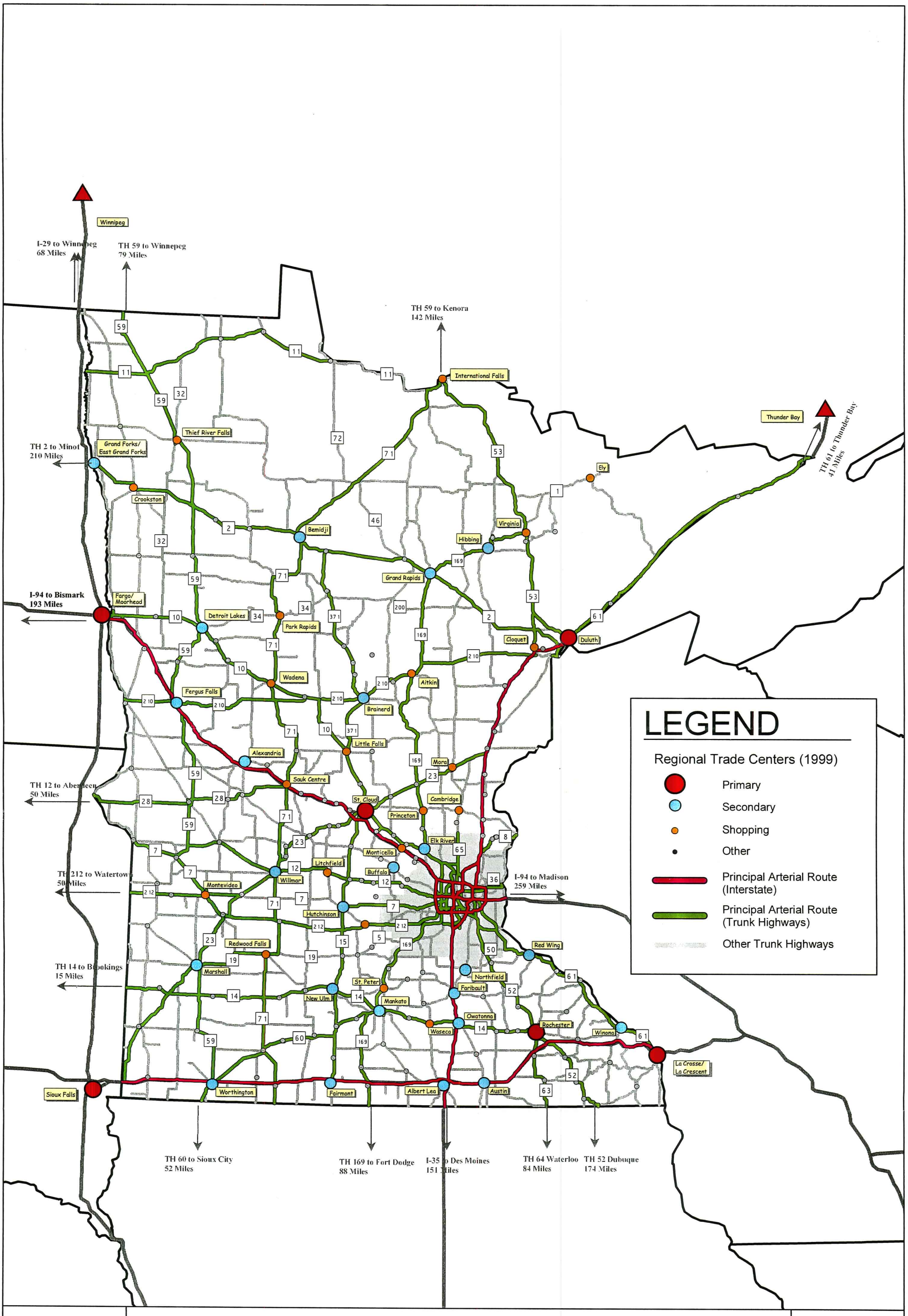
This step involved identifying potential evaluation criteria and then applying those criteria to individual highway segments to obtain a score for each segment. The segments were then separated into three groups reflecting: high-, medium-, and low-scoring segments.

Step Three – Priority Corridors

Individual highway segments were combined into corridors that connected Regional Trade Centers based on their technical evaluation score and a number of other factors (e.g., status in district or metro plans, National Highway System designation, system spacing).

Step Four – Performance Measures

Performance measures were identified that would measure the ability of the corridors to provide timely and efficient transportation between trade centers. A methodology was developed to estimate travel speeds based on posted speed limits, number of signals and level of congestion. Performance targets were then established for each of the corridor priority levels.



Regional Trade Centers

INTERREGIONAL CORRIDOR STUDY

FIGURE

2

Step Five – Improvement Strategies

Both demand management and design strategies were identified to address performance deficiencies. These strategies focus on demand reduction on the one hand, and capacity and safety type improvements on the other.

Step Six – Investment Strategies

Investment strategies were developed for the Interregional Corridor System that focused on corridor segments that were found to perform below target levels and/or segments that exhibited a medium to high risk for signal proliferation.

PUBLIC AND AGENCY OUTREACH PROCESS

Developing an Interregional Corridor System that connects regional trade centers throughout Minnesota has significant implications for many communities, as well as agencies that are responsible for implementing the plan. As a result, an extensive public participation effort was planned to obtain initial input during development of the plan and to obtain feedback on the preliminary findings and recommendations.

The outreach process was separated into external outreach and internal outreach activities. These activities are described in more detail below.

EXTERNAL OUTREACH

External outreach activities were designed to obtain input from a wide variety of interest groups throughout the state, including:

- Small-group meetings with representatives of cities, counties, townships, employers, colleges, freight carriers and shippers, chambers of commerce, agricultural interests, metropolitan planning organizations, regional development commissions and Mn/DOT staff. Fifty-five meetings were held in 25 cities throughout the state. Issues and comments received at these meetings were documented and used to refine the process and methodologies for the study.

- Telephone interviews and surveys were conducted with small-group invitees who wanted to provide input and were unable to attend the initial scheduled meetings.

- Following the first round of small-group meetings, a letter was sent to all invitees, encouraging them to visit the project's interactive Web site **(http://www.oim.dot.state.mn.us/projects/irc)**. The Web site included the comments and information received at the small-group meetings, as well as information regarding the background and development of the plan.

- Mn/DOT planning staff met with eight additional transportation organizations to update them on the study and to obtain their input and feedback on the Interregional Corridor Study (see Appendix B for list).

- A second round of small-group meetings (similar to the initial meetings) was held to obtain feedback on the draft plan and the preliminary findings and recommendations. Twenty-three meetings in 19 cities were held throughout the state. All members of the State Legislature were invited to these meetings. Issues and comments received were documented and used to further refine the analysis and study.

INTERNAL OUTREACH

Internal outreach activities were designed to obtain input from internal Mn/DOT stakeholders (departments, divisions and districts) and other state agencies (e.g., DNR, Minnesota Planning, Metropolitan Council, Department of Trade and Economic Development and Department of Public Safety). Participation consisted of the following activities:

- An Interregional Corridor Steering Committee was formed that included Mn/DOT Assistant Commissioners, Mn/DOT Planning Staff, Minnesota Planning and Department of Natural Resources (see Appendix B for list of members). Mn/DOT's District Engineers and Metro Division Engineer were invited to attend these meetings and provide input. The Steering Committee was the decision-making group for the study. The committee met monthly to provide study direction, review materials and input from the technical committee and other stakeholders, and to make study decisions.

- A Technical Advisory Committee (TAC) was formed to provide input regarding methodology, process and technical data and analysis. The TAC met monthly throughout the development of the plan (see Appendix B for list of members). In addition, a separate meeting with Mn/DOT traffic and pre-design engineers was held to discuss the performance measure analysis.

- Three meetings were held with Mn/DOT District Engineers to review and discuss public participation, the draft plan, technical methodology and performance targets. Input from these meetings was discussed with the Steering Committee and was used to refine the plan and process.

- Numerous internal meetings were held between the consultant and Mn/DOT's Office of Investment Management staff (OIM) to discuss the overall interregional corridor process, data needs, analysis methodology, technical results, and findings and recommendations.

- A Policy Committee met once during development of the plan to review the overall plan policies and framework. The Committee comprised Commissioners from the Minnesota Department of Transportation, Department of Natural Resources, Minnesota Planning, Minnesota Pollution Control Agency and the Metropolitan Council Chair.

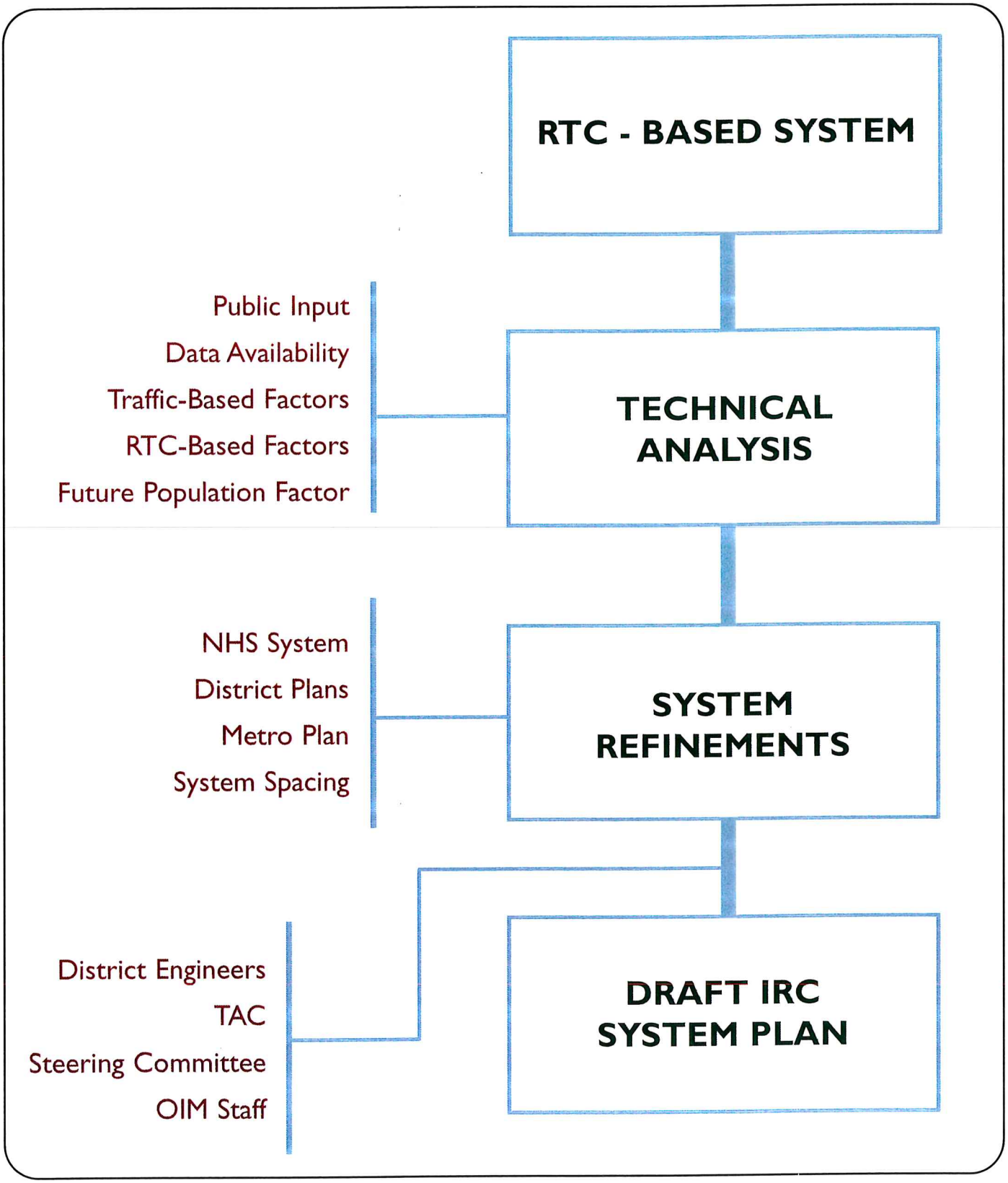
TECHNICAL EVALUATION

A technical evaluation process (Figure 3) was developed to examine the economic importance of corridors on a statewide basis. The purpose of the technical evaluation was to provide an objective, quantitative, replicable process for developing the Interregional Corridor System. Potential evaluation factors were identified early in the study process and discussed in initial public meetings throughout the state. These factors were then screened based on availability (data had to be available for all corridor segments to be considered admissible), accuracy and ability to reflect economic activity. The technical process consisted of three principal components: regional trade center connection, technical analysis and an additional non-technical refinement step. These are described in detail below.

ROUTES ANALYZED

All state trunk highway principal arterial routes (with the exception of the I-494/I-694 beltway, routes within the beltway, and non-radial routes outside the beltway, terminating within the metro area), were initially defined as the set of routes to be analyzed as part of the Interregional Corridor Study. In addition, a few other principal arterial routes in the metropolitan area (e.g., TH 77) were excluded because they carried predominantly intra-regional trips. This initial list of principal arterial routes was expanded to include a limited number of minor arterial routes. These minor arterials were identified as potential interregional corridor candidates from the initial small-group meetings held throughout the state. The minor arterial routes analyzed included:

- TH 7 (west of Hutchinson)
- TH 34 (Walker to Detroit Lakes)
- TH 200 (TH 371 to TH 2)
- TH 19/5 (Redwood Falls to TH 212)
- TH 72 (Baudette to TH 71)
- TH 46 (TH 71 in Northome to TH 2 in Deer River)
- TH 64/200 (TH 10 in Motley to TH 71)
- TH 11 (Baudette to International Falls)
- TH 32 (Greenbush to TH 10)
- TH 101 (Rogers to Elk River)
- TH 55 (Plymouth to Buffalo)
- TH 65 (Blaine to Cambridge)



IRC	**CORRIDOR EVALUATION PROCESS**	FIGURE 3

FACTORS ANALYZED

The principal arterial system and identified minor arterial routes were divided into approximately 150 segments for which data was gathered from a variety of Mn/DOT sources. The data variables were broken into three general categories that represented facility usage, connectivity and growth trend.

Usage is recognized as one indicator of economic activity that can be measured in terms of volume-based factors. The volume-based factors used were daily traffic volumes (AADT), daily heavy commercial vehicle volumes (HCADT), seasonal peaking characteristics (30th highest hour), and growth in traffic volumes (AADT growth trend). These volume-based factors are described below:

1. Volume-Based Factors

   A. Average Annual Daily Traffic (AADT) – Total Traffic Volume

      One measure of economic importance is how much use a facility experiences on a daily basis. The data for this variable is based on 1997 volumes from the traffic table in Mn/DOT's Transportation Information System (TIS) database. AADT is based on actual counts (48-hour counts are collected and then extrapolated to a yearly AADT based on continuous counts from Automatic Traffic Recorder (ATR) stations). Since the Interregional Corridor (IRC) segments do not match the segments used to report AADTs, a single-volume value was created for each IRC segment by weighting each of the volumes according to the length of the segment it represents.

   B. Heavy Commercial Average Daily Traffic (HCADT) – Truck Volume

      Another measure of economic importance is the volume of truck traffic that uses a facility on a daily basis. HCADT for 1997 was obtained from the traffic table in the TIS database. Actual truck counts are collected every six years. Factors are developed to estimate interim-year volumes based on information from Weigh-in-Motion machines. Heavy trucks are vehicles with three axles or more. Since the IRC segments do not match the segments used to report HCADT, a single-volume value was created for each IRC segment by weighting each of the volumes according to the length of the segment it represents.

C. Seasonal Peaking

A significant amount of the state's activities are oriented toward tourism and agriculture. These activities occur during a short summer or harvest season. A seasonal peaking factor was developed to identify routes that experience seasonal traffic. There are two components to the factor: fifty percent of the factor is based on the percentage of AADT in the 30th highest hour of the year; the other 50 percent is represented by the volume of vehicles in the 30th highest hour in excess of 10 percent. Information on the 30th highest hour was extracted from the Sufficiency Rating Table (1997 data).

D. Historical Traffic Growth Trends

Historic growth trends indicate future growth potential for a corridor and whether use is expected to increase, stabilize or decrease over time. Historic traffic volumes were extracted from the Mn/DOT Sufficiency File. Weighted averages were then calculated for each IRC segment, and a regression analysis was done to determine a 14-year growth rate and a six-year growth rate. These growth rates were then converted to a number of vehicles per year. The TAC decided to use a composite growth factor based on a 50 percent weighting of the 14-year and six-year growth rates. This decision was based on the desire to be sensitive to the most recent growth trends (six-year trend), but also providing some stability and consistency from the longer trend (14-year trend).

2. Regional Trade Center Connectivity

The inclusion of a corridor connectivity factor is based on the "tributary flow" concept. Just as brooks flow together to form streams and streams flow together to form larger rivers, highway corridors connect smaller centers with larger centers. These connections form overlapping travelsheds. Corridors that connect many centers or regions are considered more important, in terms of statewide economic flow of goods and people, than corridors that serve few centers.

A factor was established for comparing different segments of the transportation system based on the connectivity to the Twin Cities Metropolitan Area "Level 0" and/or to primary regional trade centers "Level 1." Corridors that did not connect or serve as a conduit to a larger center were considered to have a zero value in this category.

Point weightings were established for connections to the metro and primary regional trade centers from "Level 3" regional trade centers and above. The RTC weights are as follows:

RTC Level	Trade Center	Point Weighting
0	Metropolitan Area	4
1	Primary Center	3
2	Secondary Center	2
3	Shopping Center	1

Corridors were established based upon input received from the small-group meetings and judgement of the logical travel paths to the Twin Cities or to "Level 1" centers. The RTC weighting points, shown above, were totaled along the corridors based upon the number and level of regional trade centers that they connected. The total number of points was divided by the total miles in the corridor to obtain the number of weighted points per mile.

3. Future Population Growth (2025)

The final evaluation factor is future population growth. This variable was supported by the TAC and added to the analysis to take into account the location and magnitude of future population changes within Minnesota. The TAC felt that future population changes are an important consideration for developing the Interregional Corridor System. The future population factor was calculated based on the projected county population increases, from 1997 to 2025, taken from the State Demographer's Office in June of 1998.

Of the 150 IRC roadway segments evaluated, about half are totally contained within single counties. For these segments, the value of the population variable is the projected increase in that county's population from 1997 to 2025. For the remaining IRC segments, which traversed two or more counties, the value was calculated by first determining the percentage of total segment miles within each county. Each county's projected population increase/decrease was then weighted by the percentage of total segment length within the county. Finally, all weighted population increases/decreases for each of the counties were summed to determine the population growth value for the entire segment.

DATA ANALYSIS

The evaluation factors were analyzed and used to develop a technical basis for grouping and ranking corridors. As a beginning point, the study's Steering Committee determined that a tier system approach would be used to provide geographic equity in evaluating the corridors (otherwise, the Twin Cities Metro area would overwhelm the corridor rankings because of the higher volumes and overall activity). In addition, the Steering Committee determined that the interstate routes should be automatically selected as interregional corridors because they are part of the national transportation system that links Minnesota to other states. Therefore, the interstate routes were not included in the technical analysis of individual corridor segments.

Data for each of the corridor segments was assembled and analyzed. A six-step process was employed to determine how each of the segments would rank among other segments in the same tier.

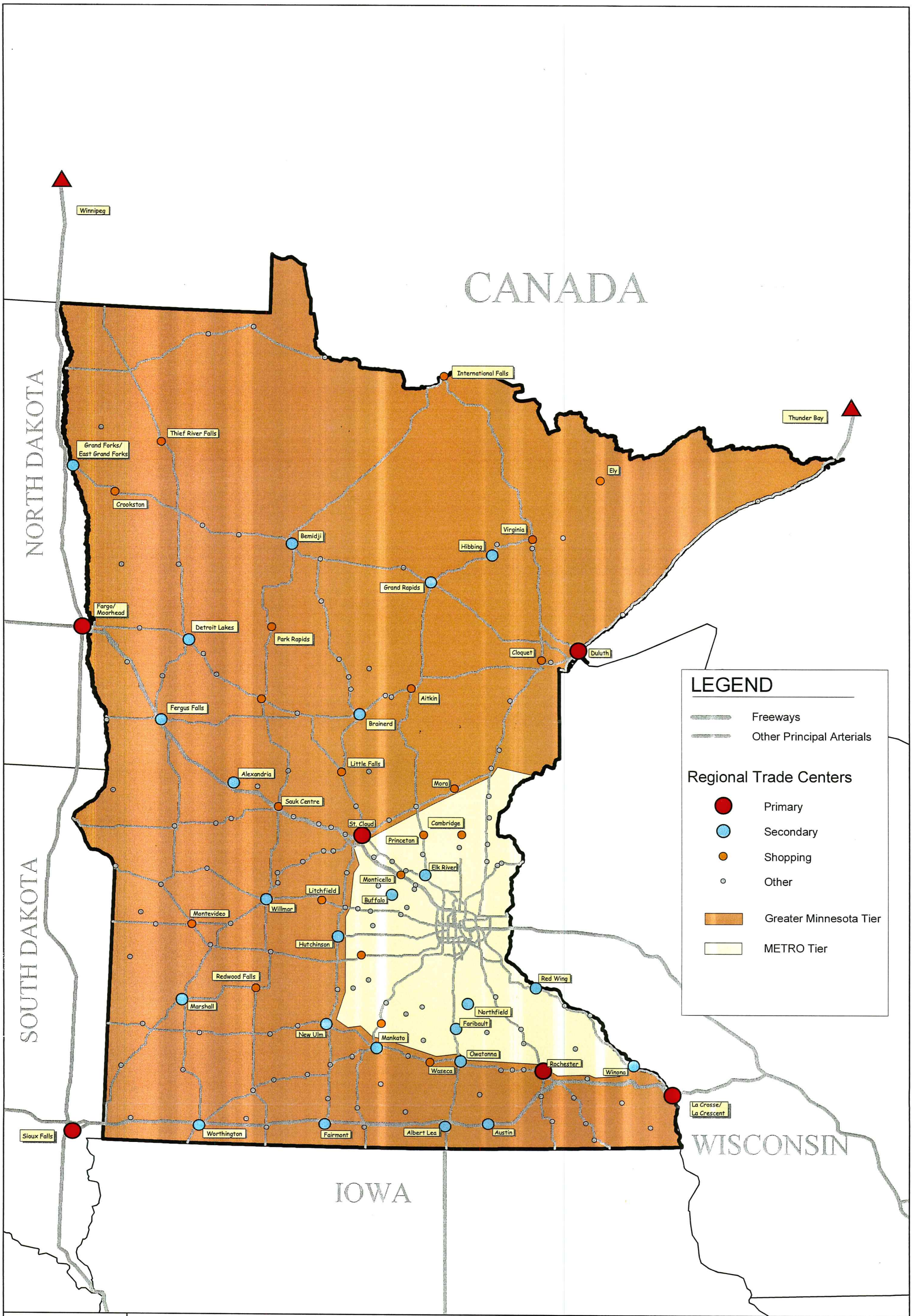
1. Metro Link Tier and Greater Minnesota Tier

   The IRC Steering Committee determined that the routes extending out from the Twin Cities metropolitan area into the 12 adjacent ring-counties should be analyzed separately from routes in greater Minnesota. This policy decision was established based on the need to develop a statewide system that would link the metropolitan area to less urbanized areas. An analysis boundary was established for what is referred to as the "Metro Link Tier." The Metro Link Tier incorporates the seven-county metropolitan area (outside the I-494/I-694 ring), as well as portions of the 12 surrounding counties (Figure 4). The border between the Metro Link Tier and Greater Minnesota Tier is identified by TH 14 on the south, TH 15 on the west, TH 23 on the north and the Minnesota/Wisconsin border on the east. The remaining area of the state is referred to as the "Greater Minnesota Tier."

   After collecting data for each of the factors on each of the 150 segments throughout the state, the segments were organized into either the Metro Link Tier or Greater Minnesota Tier, depending upon their location. In this way, roads in Greater Minnesota would be evaluated against one another and roads in the metro or more urbanized area would be evaluated against one another.

2. Statistical Analysis

   After separating the segments into the two tiers, statistical values (low value, high value, mean, standard deviation) were calculated for each of the six data variables. Table 1 and Table 2 show the statistical values associated with each variable for the Metro Link Tier and the Greater Minnesota Tier.



Tier System

INTERREGIONAL CORRIDOR STUDY

FIGURE 4

TABLE 1
METRO LINK TIER [1]

	Daily Traffic Volumes	Daily Truck Volumes	Seasonal Peaking (Percent)	Seasonal Peaking Volume[2]	Historical Traffic Growth[3]	RTC Connectivity	Future Population Growth[4]
Low Value	4,389	444	9.9	-11	15	.085	710
High Value	52,719	3,123	22.0	2,784	1,540	.179	138,955
Mean	19,357	1,483	13.7	663	443	.123	49,725
Standard Deviation	11,050	631	2.8	595	356	.031	39,510

TABLE 2
GREATER MINNESOTA TIER [1]

	Daily Traffic Volumes	Daily Truck Volumes	Seasonal Peaking (Percent)	Seasonal Peaking Volume [2]	Historical Traffic Growth[3]	RTC Connectivity	Future Population Growth[4]
Low Value	697	76	10.5	207	-150	.031	-11,079
High Value	20,797	2,116	26.9	1,176	405	.112	17,440
Mean	5,451	542	13.9	18	50	.066	1,200
Standard Deviation	4,154	420	2.3	202	62	.021	5,820

Notes (Tables 1 and 2):
(1) Does not include interstate routes
(2) Additional hourly volume over and above 10 percent of AADT
(3) Combination of six-year growth trend and 14-year growth trend
(4) County population growth between 1997 and 2025

3. Standardizing Factors

After computing the statistical values for each of the variables within the two tiers, the data for each of the segments was standardized for each of the six factors. The purpose of standardizing the factors was to place them on an equal scale so that the factors could be summed to provide a total score for the segment. A standardized score for a segment was assigned based on the number of standard deviations from the minimum value in the data set. For example, if an individual segment score was 8, the minimum score was 2 and the standard deviation of the data set was 3. The standardized score for the individual segment (single factor) would be 2 because the individual score is 2 standard deviations from the minimum score of the data set.

4. Total Segment Scores

After standardizing the values for each segment, a total score for each segment was calculated by summing each of the scores for the six factors. Table 3 shows an example of how a total score was calculated for segment US 212-5.

TABLE 3
CALCULATION OF TOTAL SEGMENT SCORES

	Daily Traffic Volumes	Daily Truck Volumes	Seasonal Peaking [1]	Historical Traffic Growth	RTC Connectivity	Future Population Growth	Total Score
Segment **US 212-5** Adjusted Standard Deviations	1.7	2.7	.15	4.3	3.0	.9	23.75

Notes:
(1) Seasonal peaking score was based on a 50 percent weighting of 30th highest hour as a percentage of AADT and a 50 percent weighting of the volume of vehicles represented by the 30th highest hour above ten percent of AADT.

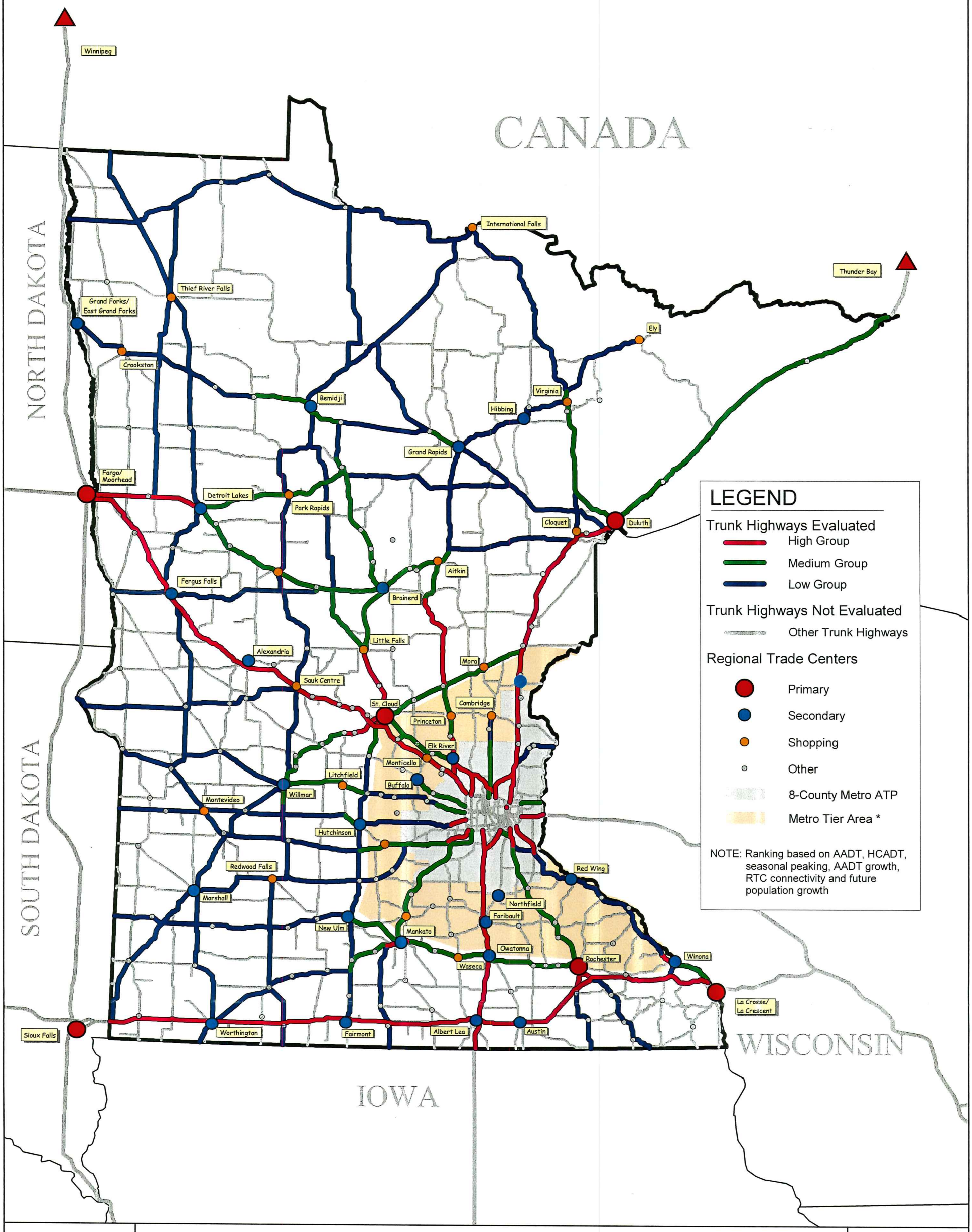
5. Corridor Ranking

Segments were then placed into high-, medium- or low-score groups based on their total score. The clustering was done through a Geographic Information System (GIS) feature called "natural breaks." The natural breaks function divided the segments into three groups by minimizing the variance in each of the groups. The result of this analysis is shown on Figure 5. The technical analysis forms a solid basis from which refinements were made based on a number of supplementary factors and public input.

6. IRC System Refinement

The technical analysis identified high-activity highway segments; however, these individual segments required refinement into longer corridors. This was done through an iterative process, which involved input from the study's Steering Committee and Technical Committee, and input from several meetings with the District Engineers. Documentation of the decisions and rationale for developing the final draft IRC System is included in Appendix C. The following factors were considered when determining the final status of the corridor segments:

- Regional Trade Center System
- National Highway System (NHS) designation



Technical Analysis Results

INTERREGIONAL CORRIDOR STUDY

FIGURE

5

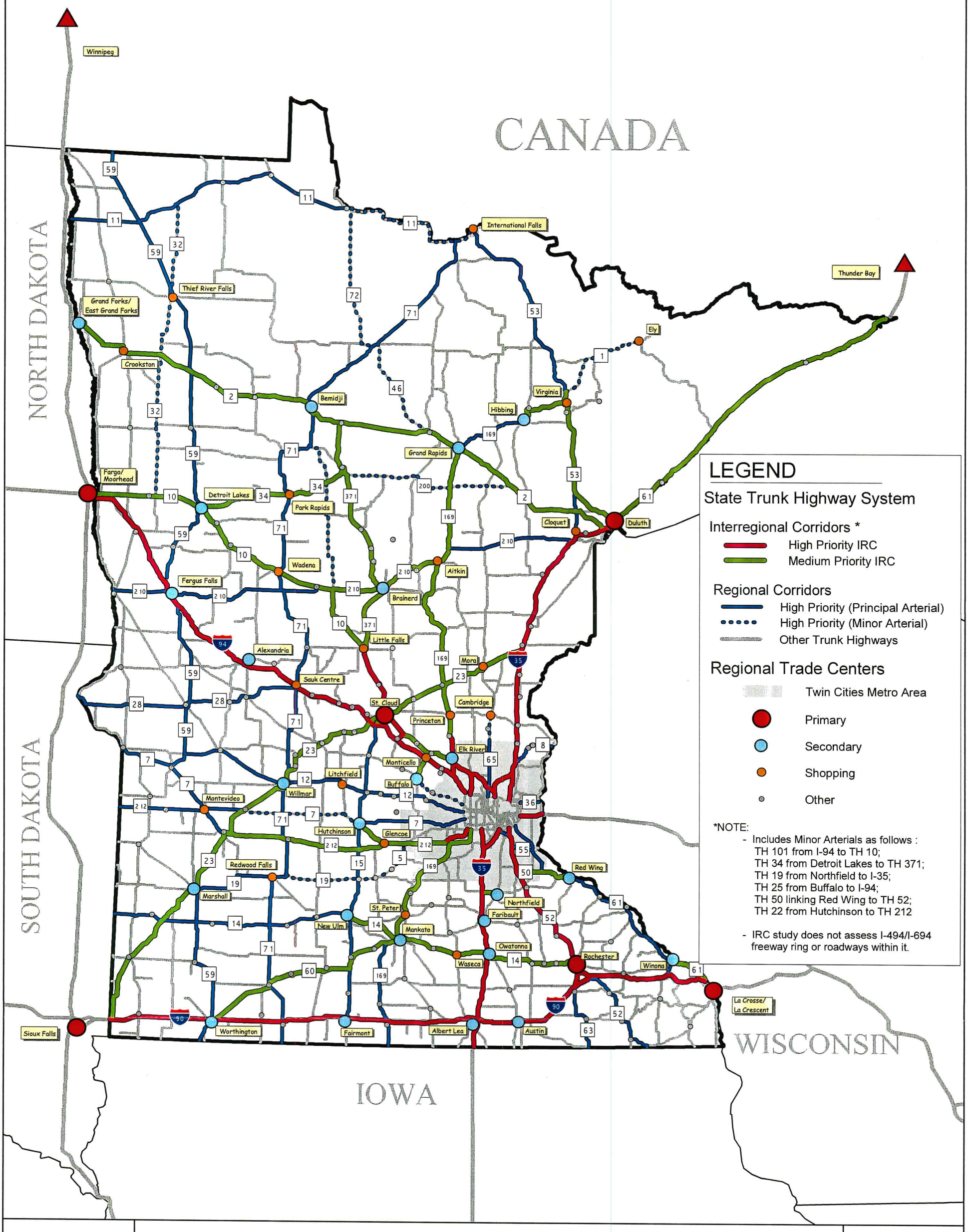
- District Plan Priority
- Metropolitan Plan Priority
- System spacing and travelshed size, ability to have statewide impacts
- Previous Mn/DOT commitments and established corridor vision

The draft IRC system plan shown in Figure 6 shows all state highways with respect to the main trade centers in Minnesota. The objective of establishing an Interregional Corridor (IRC) system is to maintain safe, timely and efficient transportation services between regional centers or regions. Corridors within metropolitan areas were not considered interregional corridors, such as the I-494/I-694 beltway and all routes interior to the beltway.

The state highway system shown in Figure 6 is broken into two categories: interregional corridors and regional corridors. The Interregional Corridor System connects larger regional trade centers and provides transportation services to large travelshed areas. This category has been subdivided into high-priority interregional corridors (HPI) and medium-priority interregional corridors (MPI). The HPI are identified in red and connect all "Level 1" centers. These routes consist of the interstate system and a few other main transportation connections that serve large travelsheds and population centers. The medium-priority interregional corridors are shown in green and also connect large travelshed areas; however, these routes did not rise to the level of HPI corridors due to lower levels of activities.

Routes that did not rise to the level of an interregional corridor were identified as high-priority regional routes (HPR). These routes are shown in either a solid blue line (principal arterial routes) or a dashed blue line (minor arterial routes). These routes typically play significant roles in providing regional transportation services to communities. They connect smaller centers with "Level 1" or "Level 2" centers and may connect directly to the Twin Cities metropolitan area.

The draft Interregional Corridor System map was presented and discussed at all second-round small-group meetings. Numerous comments were received from agencies, communities and the public. One of the comments received throughout the state was the need for connections to states and trade centers beyond Minnesota's borders. Significant comments on system elements were noted and additional information was compiled to assist the Steering Committee in determining what system refinements should be made. After careful consideration, the Steering Committee modified the Interregional Corridor System. These changes are documented in Table 4.



DRAFT
Interregional Corridor System
INTERREGIONAL CORRIDOR STUDY

FIGURE
6

TABLE 4
AUGUST/SEPTEMBER IRC SYSTEM CHANGES

Route	Termini	Miles	Rationale
TH 212	TH 23 to Minnesota/ South Dakota border	51	Provides connection to South Dakota and is only western connection between I-90 and I-94. Route is on NHS system; it connects to I-29 a major north-south interstate route.
TH 60	I-90 to Minnesota/Iowa border	10	Provides southern connection between I-35 and I-29; connects to Sioux City, Iowa (Level 1 Trade Center); Iowa is in process of completing four-lane improvement; TH 60 in on NHS system.
TH 63	I-90 to Minnesota/ Iowa border	31	Provides southern connection east of I-35; connects Rochester to Cedar Falls Waterloo, Iowa (Level 1 Trade Center); TH 63 is on NHS system.
TH 8	I-35 to Minnesota/ Wisconsin border	20	Provides eastern connection north of I-94; and NHS route that serves the travelshed to northwest Wisconsin; route connects to Rice Lake (Level 2 Trade Center); route is one of few St. Croix river crossings.
TH 53	Virginia to International Falls	87	Provides northern international connection between I-29 and TH 61. This corridor has been designated in TEA-21 as a Congressional High Priority Corridor.
TH 336	TH 10 to I-94	-2	Recommend change of TH 10 to regional route west of TH 336 (into Moorhead per discussion with MPO) and MPI route to I-94 on TH 336. Results in net loss of two miles.
TH 169	I-494 to TH 19	0	Recommend change of this segment from MPI to HPI. This is consistent with other routes through urban growth area (TH 19 is at Scott County Line).
TH 36	I-694 to St. Croix River	7	TH 36 is one of the major routes into Wisconsin and serves as a primary connection to the Stillwater area.
TH 18	TH 169 to TH 210	0	Change TH 18 to HPR per District 3 request. TH 18 provides the main connection from TH 169 into Brainerd Lakes Area.

The final Interregional Corridor System map is shown in Figure 7. The final IRC system map is 2,926 miles in length, or about 56 percent of the existing principal arterial system. Approximately one-third of these miles (1,007) are in the high-priority (HPI) category and two-thirds (1,919) are in the medium-priority (MPI) category. The IRC system serves all of the regional trade centers "Level 2" and above and provides accessibility to most of the other trade centers in the state.

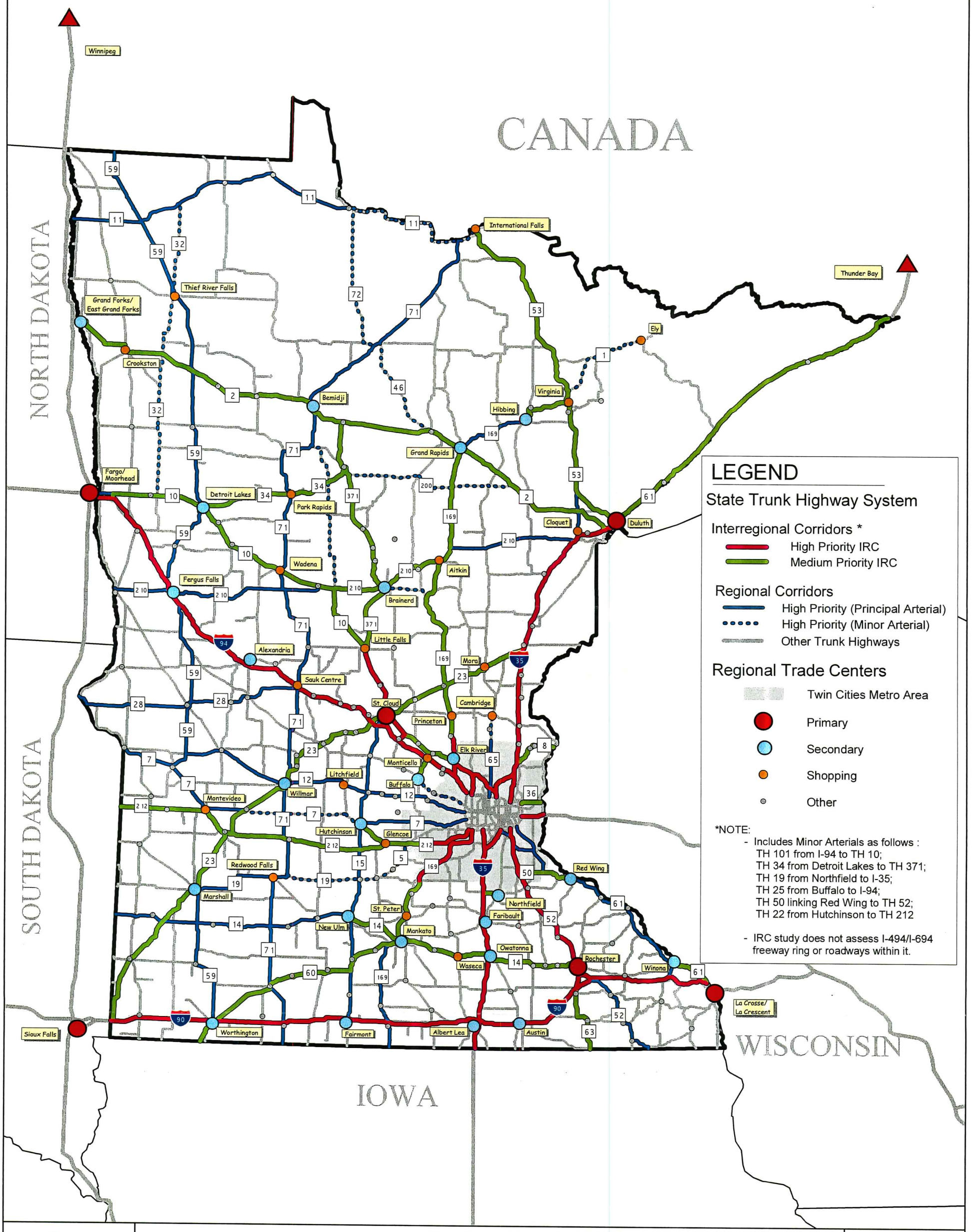
As the final Interregional Corridor System neared completion, there were many discussions about additional routes (e.g., a route has significant truck traffic or a route provides important recreational connections). However, the Steering Committee and the TAC felt strongly that the credibility of the study would be diminished if many other potential routes were added. In addition, the Committee felt that the total number of miles that were identified, approximately 50 percent of the principal arterial system, was a number that could be defended as a reasonable number of miles for the Interregional Corridor System.

SYSTEM PERFORMANCE

The goal of the Interregional Corridor System is to support the economic vitality of the state by maintaining safe and efficient transportation connections between regional trade centers. The development of an Interregional Corridor System Plan will promote economic growth only if performance standards are developed to assess where investments are needed and to measure how well the transportation goals are being achieved. The following section addresses how performance targets were established for the Interregional and Regional Corridor Systems.

The Minnesota Department of Transportation developed a list of measures to help improve performance of the state highway system. Mn/DOT has already used some of these performance measures in updating their District Plans. These performance measures included those for ride quality, bridge and pavement condition. These measures should continue to be used to evaluate the performance of all state highways, including the IRCs.

The initial performance targets outlined for the Districts did not include measures for mobility (time/directness), even though mobility is critically important to the function of all principal arterial routes and many minor arterial routes. The desired outcome for routes that connect regional trade centers (i.e., IRCs) is to provide predictable and acceptable travel times for route users. Initial performance targets were established for each system priority and are shown in Table 5.



Interregional Corridor System

INTERREGIONAL CORRIDOR STUDY

FIGURE

7

TABLE 5
INITIAL MOBILITY PERFORMANCE MEASURES

IRC System	System Priority	Performance Target[1] (Speed – mph)
HPI Range	Above target	≥ 66
	At target	60 – 65
	Slightly below target	57 – 60
	Below target	< 57
MPI Range	Above target	≥ 61
	At target	55 – 60
	Slightly below target	52 – 55
	Below target	< 52
HPR Range	Above target	≥ 51
	At target	45 – 50
	Slightly below target	42 – 45
	Below target	< 42

(1) Performance targets are for peak hour on an average weekday

Developing the performance targets was a difficult task. Mobility is not easy to quantify, since motorists use these corridors for different travel purposes and have varying opinions on acceptable travel speeds and the number of stops. In addition, the transportation corridors are dynamic. There is a wide range of trips, driving characteristics/habits and driver acceptance levels. What is acceptable for one motorist many not be acceptable for another. However, the general consensus from the outreach meetings is that motorists using the IRCs want higher travel speeds and a minimum number of interruptions or stops, especially on longer trips between centers.

Establishment of the performance targets was primarily a policy decision; however, strong consideration was given to the predominant type of facilities identified in each group and their current posted speed range, as well as actual running speed. Minimum target levels were initially proposed at approximately 85 to 90 percent of the posted speed limit. For example, the majority of routes in the HPI category are freeway facilities with posted speeds of 70 mph. The minimum target was therefore established at 60 mph (approximately 85 percent of 70 mph). These initial performance targets were then presented to the TAC, Steering Committee and the public.

Based on public input and additional discussions, the HPR performance range was increased to a minimum of 50 mph. The final mobility performance measures are shown in Table 6.

TABLE 6
FINAL MOBILITY PERFORMANCE MEASURES

IRC System	System Priority	Performance Target[1] (Speed – mph)
HPI Range	Above target At target Slightly below Below target	≥ 66 61 – 65 57 – 61 < 57
MPI Range	Above target At target Slightly below target Below target	≥ 61 56 – 60 52 – 55 < 52
HPR Range	At and/or Above target Slightly below target Below target	≥ 51 47 – 50 < 47

(1) Performance targets are for peak hour on an average weekday

One of the major issues facing transportation officials is the ability to prevent further loss of mobility and/or improve mobility on corridors that are not performing adequately. This is a difficult task given the level of growth and private investment being made in many areas throughout the state. To identify which routes are performing well versus poorly, travel speeds were estimated for each corridor segment and compared to the performance targets (methodology is described in Appendix D).

The overall mobility performance for the Interregional Corridor System and high-priority regional routes can then be measured by assessing the miles of highway that are performing below target levels. Speeds (travel times) were then estimated for existing volumes, future volumes (2020), and future volumes (2020) with ten-year fiscally constrained improvements. These estimated speeds for each of the segments were then compared to the performance targets for their respective categories. The results of this comparison are shown in Figures 8, 9 and 10, and the mileage summarized in Table 7.

TABLE 7
MOBILITY PERFORMANCE RESULTS [1]

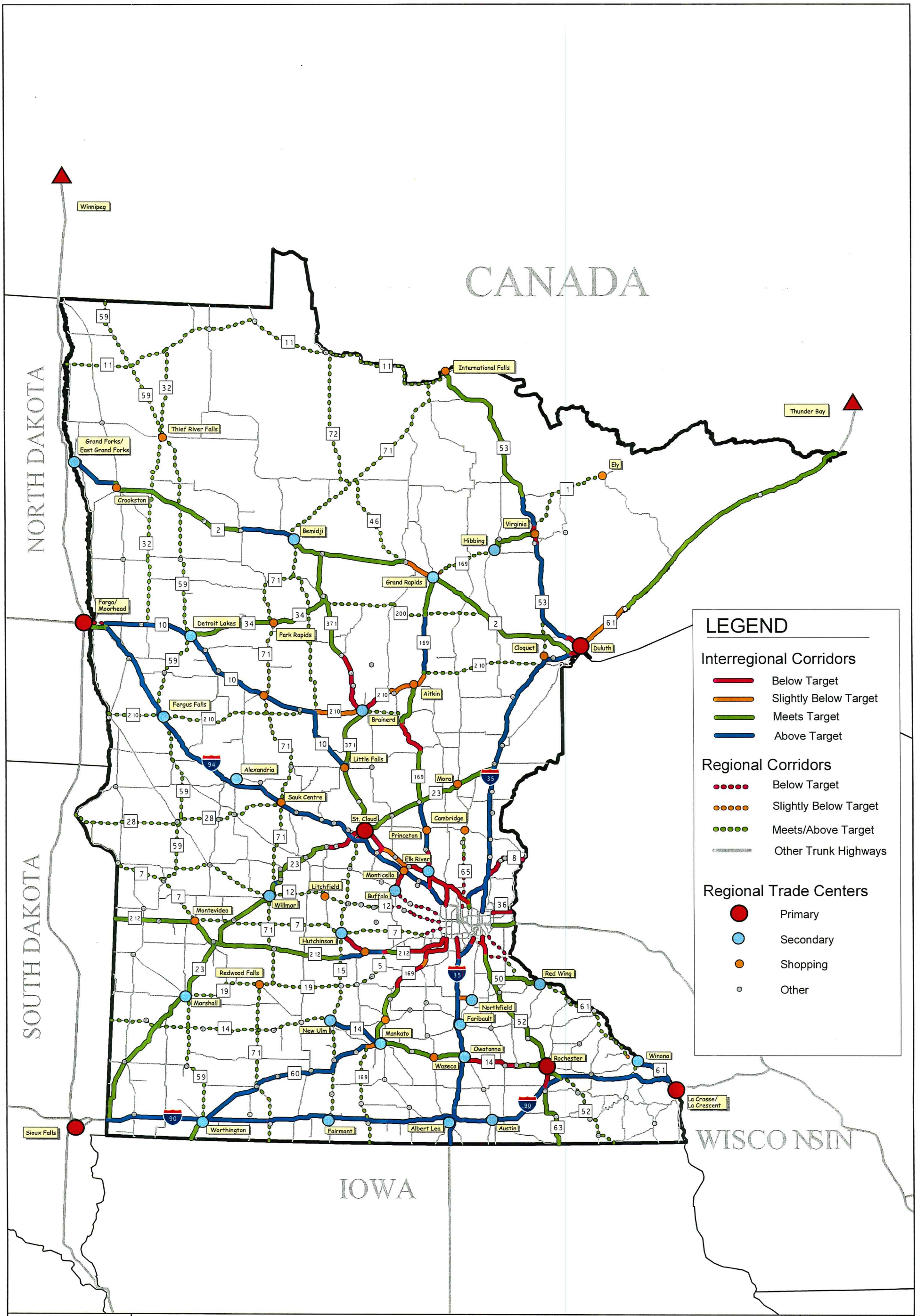
IRC System	System Priority	Existing Performance (miles)	Future [2] Performance (miles)	Future [3] Performance (miles)
HPI Routes	Above target	724	622	622
	At target	111	10	10
	Slightly below target	15	0	0
	Below Target	157	375	375
MPI Routes	Above target	338	306	408
	At target	1,199	1,048	1,070
	Slightly below target	189	143	130
	Below Target	193	422	311
HPR Routes	At or Above target	2,493	2,344	2,354
	Slightly below target	15	47	47
	Below Target	131	248	238

(1) The future performance analysis does not estimate the number of future signals that may be installed on corridors. These would further reduce the performance levels. See discussion on signal proliferation and signal risk.

(2) Future volumes (2020) with no system improvements assumed.

(3) Future volumes (2020) with planned system improvements for the next ten years. System improvements are from major investment category and are fiscally constrained. These projects are either in the three year STIP, work program or study plan. A list of these projects is provided in Appendix E.

The analysis shows that 85 percent of the interregional corridor facilities are meeting the mobility performance measures during the peak hour for the existing condition. The regional facilities are meeting the mobility performance measures on over 90 percent of the facilities. Without major improvements and assuming no additional signals, the mobility on the Interregional Corridor System will decrease by at least ten percent so that approximately 25 percent of the interregional corridor mileage will be under-performing the identified mobility targets. Based on the current level of investment and major projects in the planning stages, no gains in performance would be made on the high-priority interregional system and only marginal gains in performance would be made on the medium-priority interregional system.



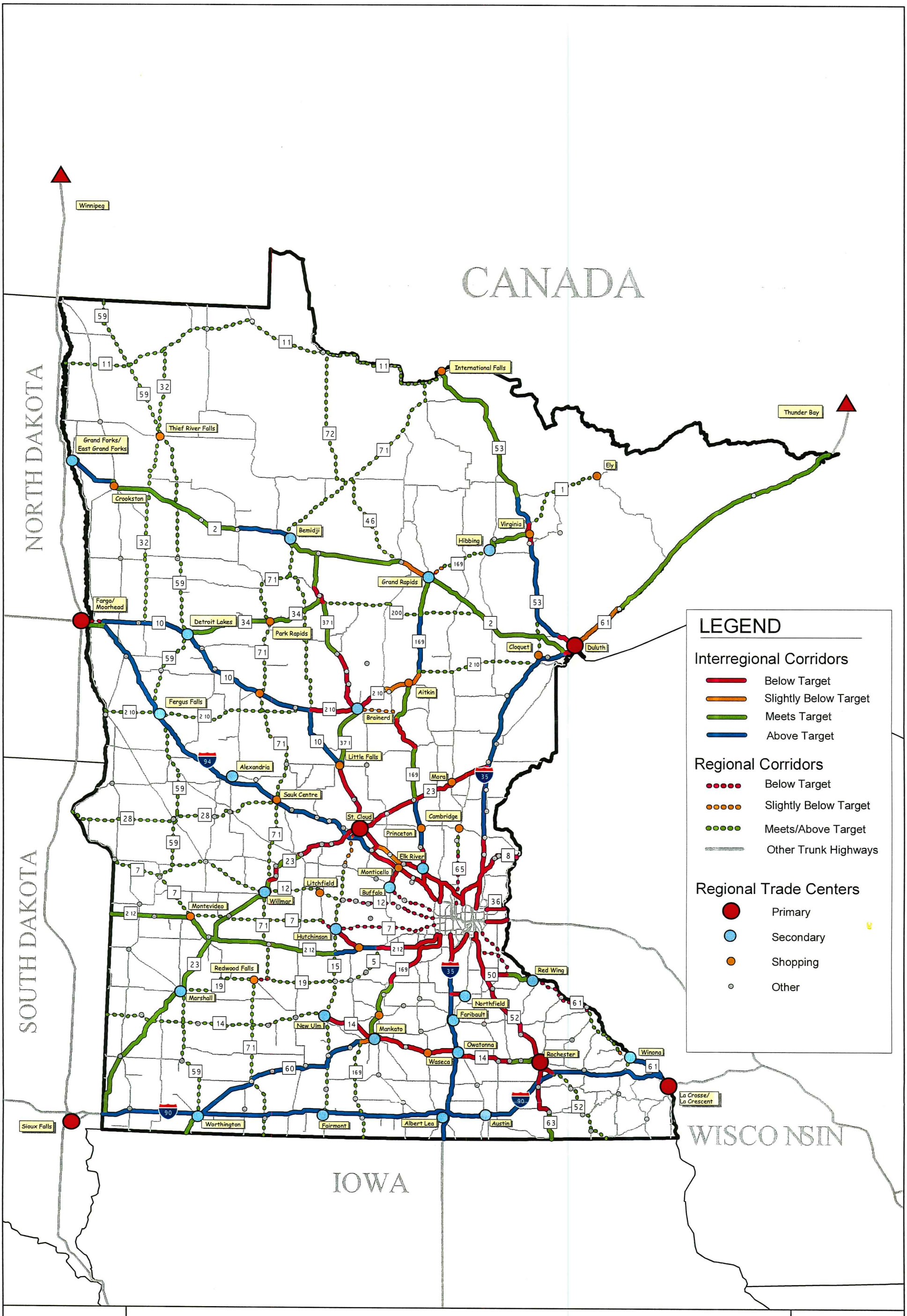
Performance Evaluation

(EXISTING)

INTERREGIONAL CORRIDOR STUDY

FIGURE

8



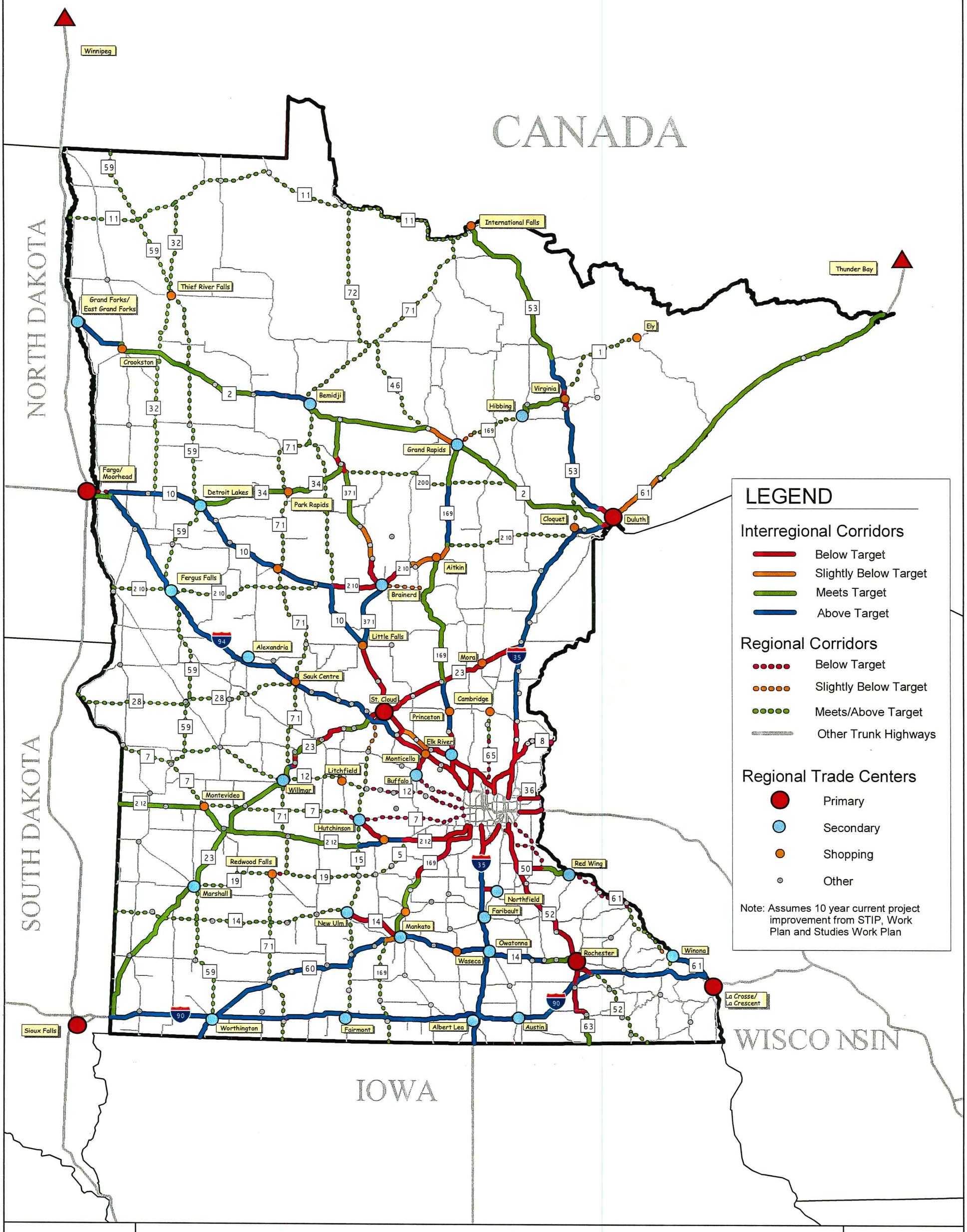
Performance Evaluation

(2020 Performance without 10 year improvements)

INTERREGIONAL CORRIDOR STUDY

FIGURE

9



Performance Evaluation

(2020 Performance with 10 year improvements)

INTERREGIONAL CORRIDOR STUDY

FIGURE

10

SIGNAL PROLIFERATION RISKS

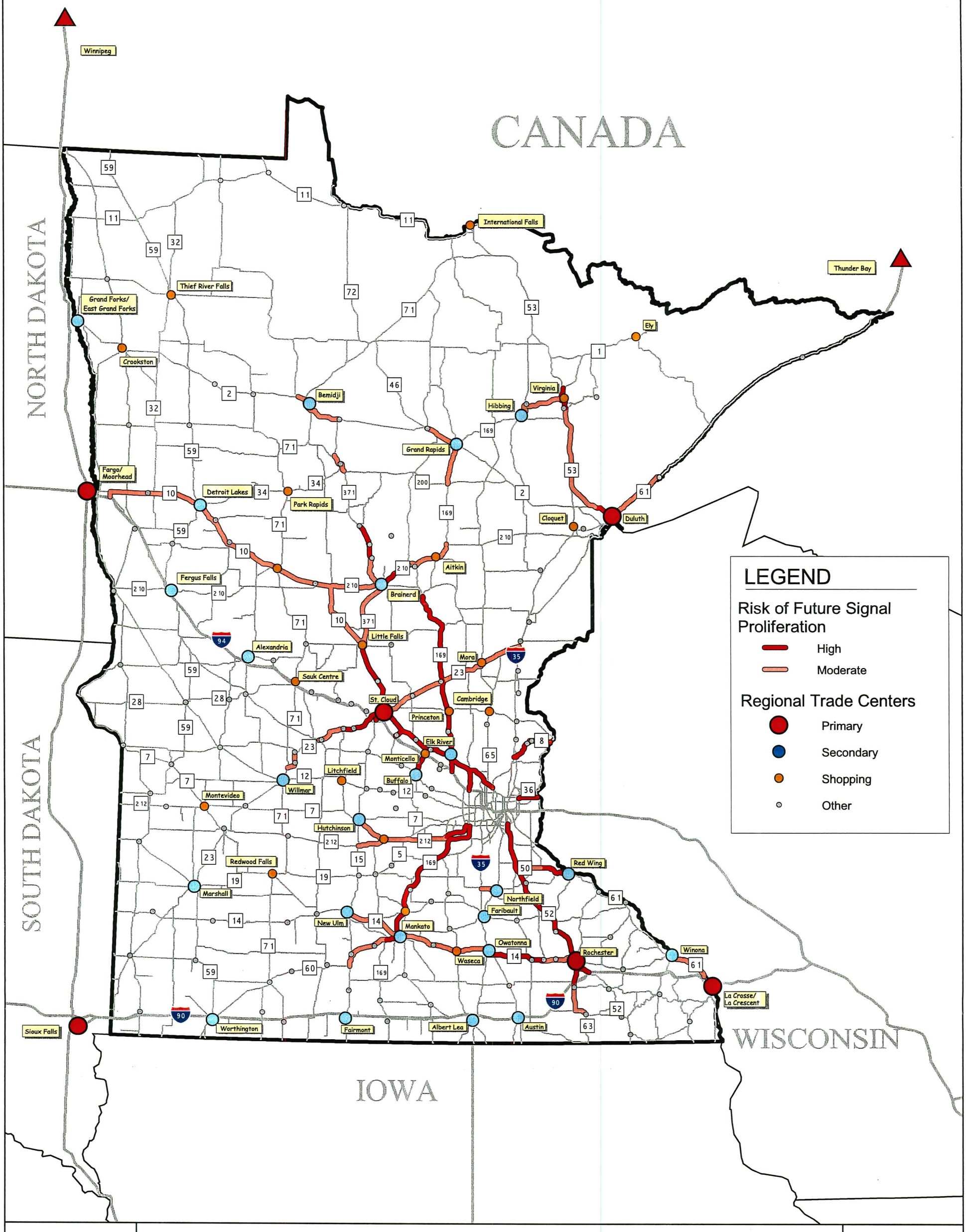
The above performance analysis assesses the mobility of the system with existing signals and stops, as well as increased congestion due to future traffic volume increases. It does not address additional delays due to future signals. Signals provide important traffic safety and side-street benefits; however, they have negative impacts to mainline users in terms of mobility. Many concerns were voiced during the public input process about the proliferation of signals and the negative impact it has on mobility between regional centers.

As a management tool and a way to focus resources, it is important to identify which facilities are subject to greater signal proliferation and manage these corridors accordingly. The study sought to identify routes that currently have or could potentially have signal proliferation problems due to the volume of traffic they carry.

Traffic volumes and vehicle crashes are two of the key determinants for justifying installation of a traffic signal. Since it is difficult, if not impossible, to predict locations of future safety problems, the analysis focused on identifying future signal locations based on volumes. Signal warrants are typically based on threshold volumes for both mainline and a cross-street volume. Volume data was not available for cross-streets throughout the state, and therefore a simplified approach was developed using mainline volumes to assess signal risks. Mn/DOT used this method in the late 1960s prior to the development of sophisticated computer modeling programs to analyze the need for signal installations. This method establishes volume thresholds based on design type to assess the ability to meet signal warrants. These volume thresholds are shown in Appendix F.

The risk for signal proliferation was categorized as high-, medium- or low-risk based on a comparison of corridor volumes to the table of threshold volumes. This comparison was done based on projected 2020 volumes. The results of this analysis are shown in Figure 11. Corridors that were placed in a high-risk category are under the greatest pressure for additional signals, and lower cross-street volumes are required to meet signal warrant criteria. It should be noted that signal risks increase as one approaches urban areas because of increased traffic volumes. The risk can be minimized by doing some or all of the following:

- Increase the capacity (thresholds are higher for multi-lane facilities)
- Separate traffic to reduce conflicts between movements
- Spread out traffic so that it does not concentrate at a single location
- Reduce demand for access at side street locations
- Construct grade-separate approaches
- Local community through-traffic by-pass
- Land use management and development ordinances



2020 Signal Risks

INTERREGIONAL CORRIDOR STUDY

FIGURE
11

SAFETY EVALUATION

Minnesota has been a national leader in transportation safety. It will continue to be a top priority for the Department, as well as individual Mn/DOT Districts. The Minnesota Department of Transportation continually monitors safety characteristics on all of Minnesota's transportation facilities. The number of crashes statewide has stayed relatively stable (100,000 crashes per year for the last ten years[2]), even though the number of vehicle-miles traveled has risen steadily. This means that the number of vehicle crashes per miles driven has decreased overall. There are many factors that have contributed to this trend, including demographics, enforcement, vehicle design and roadway design/improvements. Some key crash facts for Minnesota's entire roadway system are listed below:

- There were 600 deaths in vehicle-related crashes in 1997. This represents about one-half to one percent of all crashes. Highway crashes are the leading cause of death for the age group of 1-34. Vehicle death rates have historically declined from a high in the late 60s of 5.3 fatalities per 100 million vehicle miles (MVM) to the current rate of 1.3 fatalities per 100 MVM.

- Alcohol was involved in 30 percent of fatalities. Alcohol-related deaths have been declining and are at the lowest number in decades. In approximately the 60s and 70s, the proportion was as high as 50 percent.

- The total number of injury crashes has been around 45,000 for a number of years and was 46,064 in 1997. The number of severe-injury crashes, where physical impairment takes place, has been declining for the past ten years. In 1997, the number of severe-injury crashes declined to less than 3,000.

- Fatal and non-fatal crashes tend to peak at "rush hour." The greatest number of fatal crashes occur during the afternoon peak travel times. There are also more fatal crashes during peak summer travel months.

- There is a strong relationship between crash severity and location. Sixty-three percent of the fatal crashes are located in rural areas. These crashes typically involve higher speeds. In addition, rural areas may be further from emergency services. The first hour after the crash is critical in terms of reducing fatality risk.

- Of all of the factors that contribute to vehicle crashes, roadway features are contributory in approximately 27 percent of total crashes.

- Total crash costs in property losses, medical expenses and insurance are estimated at $1.5 billion per year.

[2] "1998Crash Facts," Minnesota Department of Public Safety.

As part of the Interregional Corridor Study, the number of vehicle crashes on the HPI, MPI and HPR systems for each of the last ten years was investigated. The number of crashes was graphed for each year and is shown in Figure 12. Two important conclusions can be drawn from this information:

- The number of crashes on the HPI, MPI and HPR systems has remained relatively stable over the last 10 years.

- The number of crashes on the HPI and MPI is similar to HPR, even though the HPI system represents only 18 percent of the 2,926 miles and the MPI system represents 34 percent of the miles.

Traffic volume, or the amount of traffic that travels over a facility, is another important factor in evaluating safety. An average volume per mile was computed for each system over a ten-year period. These volumes were then graphed to show traffic volume trends (Figure 13). From this graph one can conclude:

- The volumes on the HPI system are substantially higher than the volumes on the MPI and HPR systems. HPI volumes average over three times the MPI volumes and over four times the HPR volumes. The MPI volumes average 40 percent higher than HPR volumes.

- The average volumes on the HPI system have risen from an average of 14,000 to 21,500 vehicles per day. This is an increase of 850 vehicles per day each year over ten years.

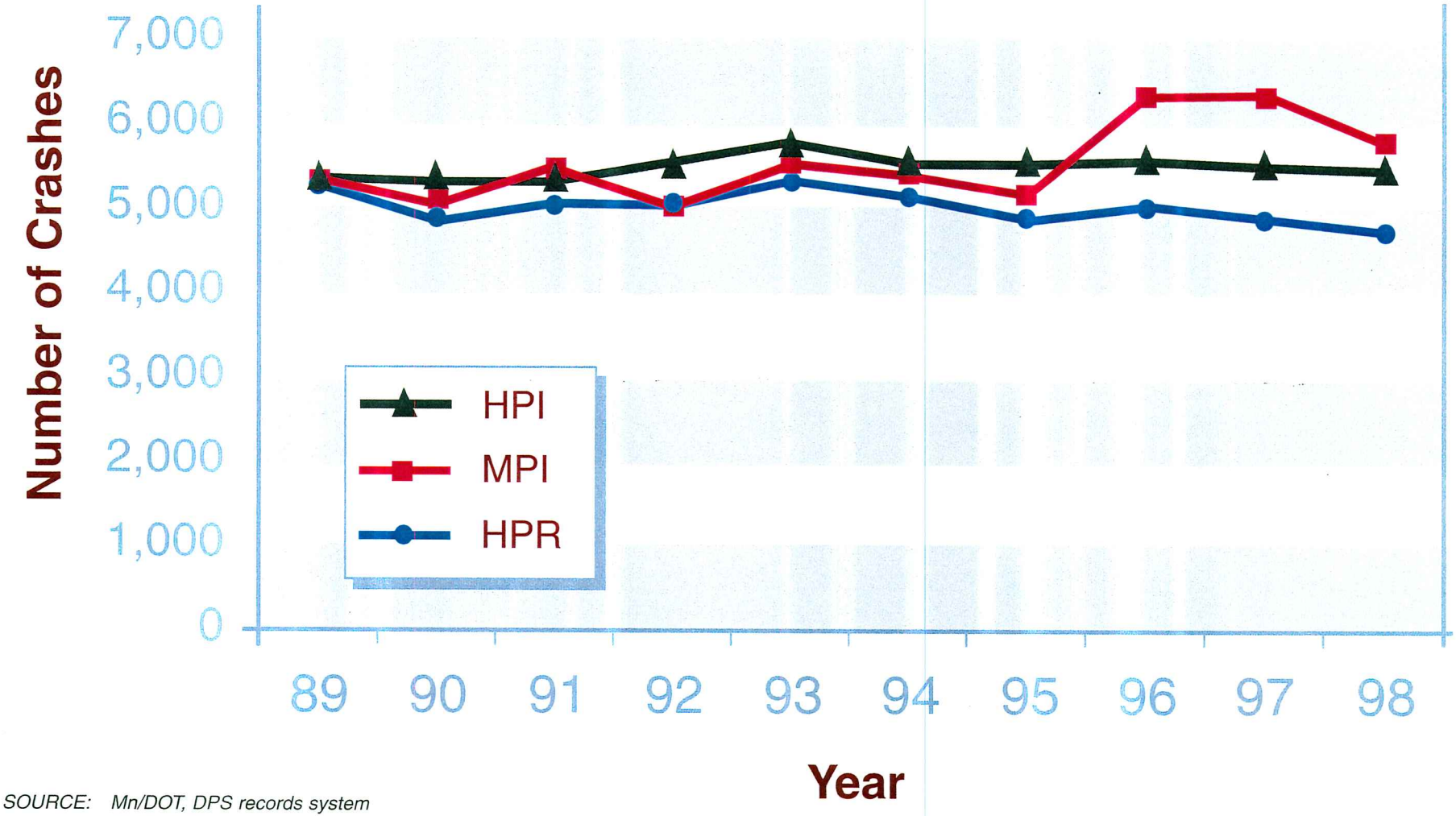
- The average volumes on the MPI system have risen from 4,900 to 6,500 vehicles per day. This is an increase of 160 vehicles per day each year over ten years.

- The average volumes on the MPI system have risen from 3,100 to 3,900 vehicles per day. This is an increase of 80 vehicles per day each year over ten years.

The combination of increasing volumes and a relatively stable number of crashes results in a declining crash rate for each of the three systems (Figure 14). Three important conclusions can be drawn from this graph.

- Crash rates for all of the systems have been declining over the past ten years. However, the HPI crash rate over the last seven years has leveled out substantially.

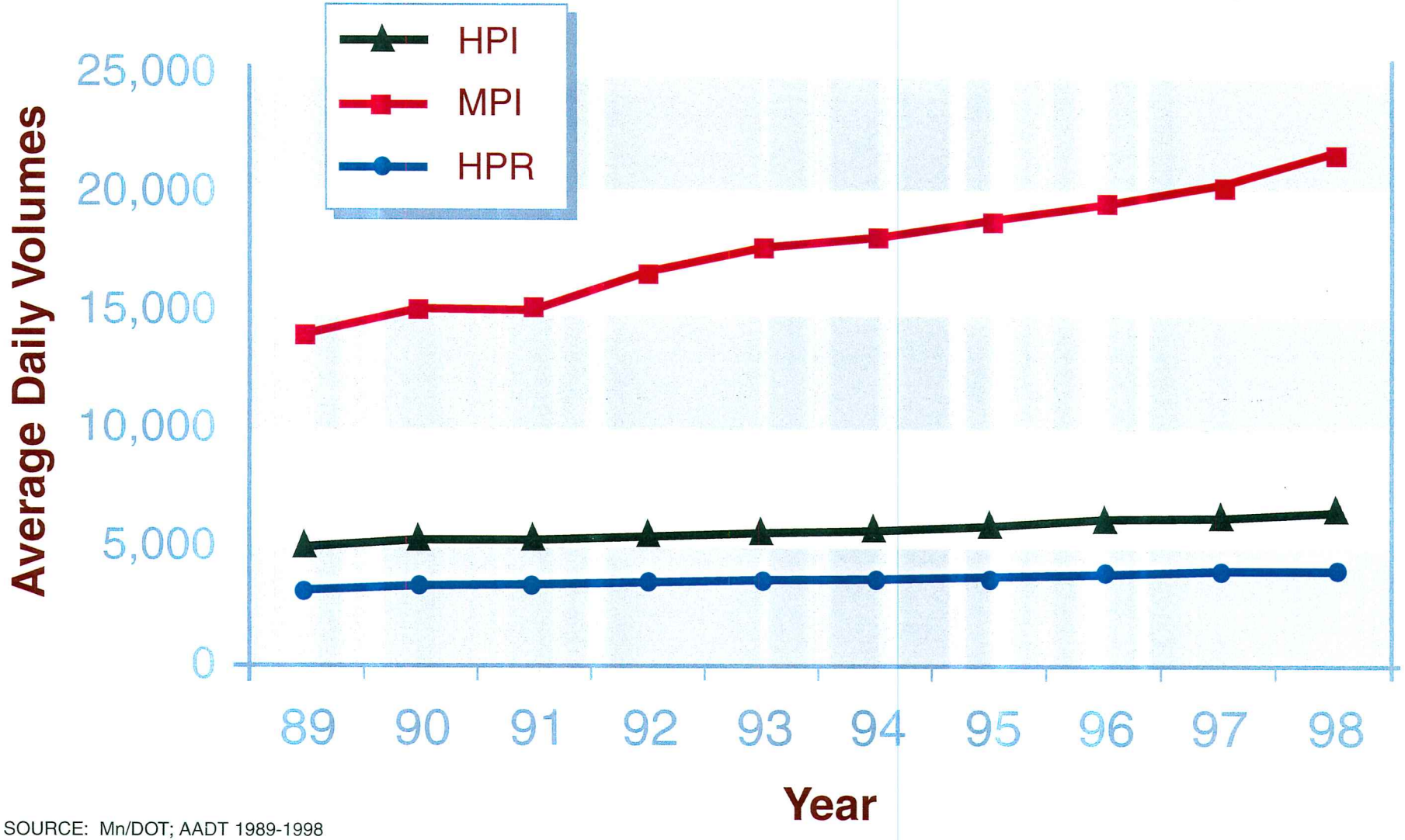
- The crash rate trends have been relatively consistent, which leads to the conclusion that future rates can be predicted.



SOURCE: Mn/DOT, DPS records system 1989-1998

CRASH HISTORY BY IRC SYSTEM
1989 to 1998

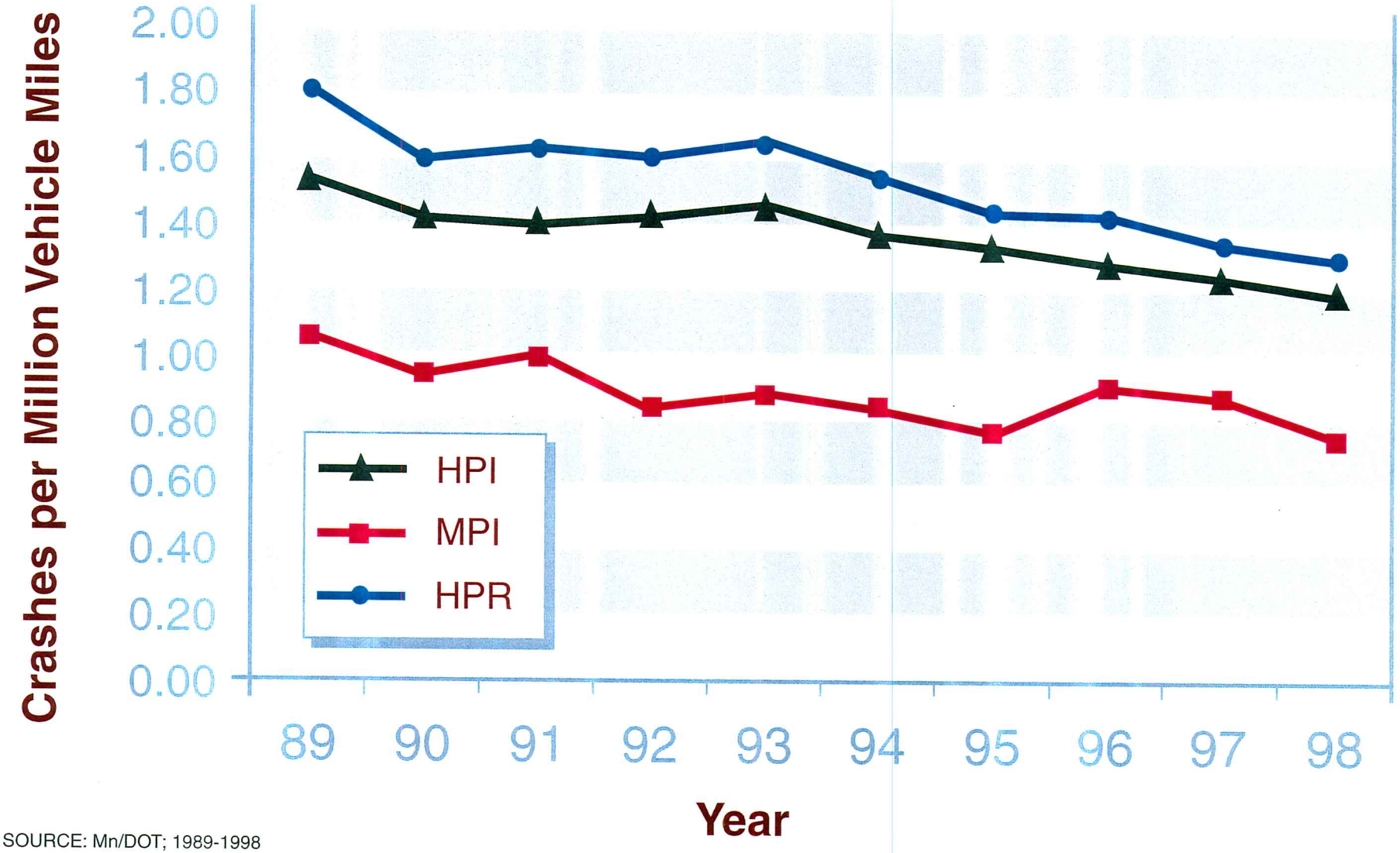
FIGURE
12



SOURCE: Mn/DOT; AADT 1989-1998

VOLUME HISTORY BY IRC SYSTEM
1989 to 1998

FIGURE
13



SOURCE: Mn/DOT; 1989-1998

CRASH RATE HISTORY BY IRC SYSTEM
1989 to 1998

FIGURE
14

- In 1989, the crash rates for the MPI and HPR systems averaged 50 to 80 percent higher than the HPI system. Over time, this difference has been reduced to 30 to 40 percent higher.

The safety objective is to continue to reduce crash rates while improving mobility between regional trade centers. Safety will be addressed on these corridors by reducing and separating vehicle conflicts, reducing severity of crashes and improving guidance and communication to driver to reduce driver error. Some of the less expensive safety improvements are listed below:

Separating and Reducing Conflicts

- Shoulder widening
- Access management
- Turn lanes/bypass lanes
- Passing lanes
- Pavement repair/skid treatments
- Signals/traffic controls

Reducing Crash Severity

- Roadside clearzone (inslope flattening)
- Flattening approaches, rounding ditches
- Obstacle removal/shielding (guardrail)
- Enforcement issues (speed, DWI)
- Emergency response

Reducing Driver Error (Positive Guidance)

- Signing and striping
- Lateral rumble strips
- Lighting

If substantial safety problems are present in conjunction with other mobility and structural problems, the solution may require more significant investments, including:

- Reconstruction (improved horizontal and vertical alignment)
- Reconstruction (add capacity)
- Reconstruction to divided highway facility
- Change to limited access facility

IMPROVEMENT STRATEGIES

General improvement strategies are proposed for improving corridor performance. Strategies were divided into two groups. The first, System Management, primarily enhances corridor performance in congested areas by reducing travel demand. These strategies are more applicable to larger urban areas than to rural areas. The improvement strategies in this group are as follows:

- Improvement of parallel routes
- Develop parallel transit routes, including commuter rail
- Metering access to facilities
- Peak-period pricing of facilities (value pricing)
- Urban growth management
- Travel demand management (TDM – telecommuting, park-and-ride)
- Intelligent transportation systems (ITS – reduce congestion, incident management)

The second group of improvement strategies focuses on infrastructure and access-related improvements in order to preserve or enhance safety and mobility. These design-related strategies are applicable to both rural and urban areas and are as follows:

- Corridor access management
- Providing passing opportunities and reducing conflicts (super-two)
- Developing grade-separated crossings at key intersections
- Construction of interchanges in lieu of traffic signals
- Construction of urban bypasses with limited or no access
- Additional capacity (lane addition)

The objective of this section is not to identify what strategies should be used for specific corridors, but to identify a general list of optional strategies that would be examined and decided through more detailed corridor studies. To achieve mobility and safety objectives, multiple strategies may need to be employed on specific corridors.

STUDY RECOMMENDATIONS

Development of the Interregional Corridor System Plan accomplished a number of objectives. For example, a better understanding of the principal arterial system was reached and community support for protecting and enhancing these corridors was developed through an extensive public outreach process. In addition, Mn/DOT districts benefited from the discussion of local and regional goals versus statewide goals that the interregional system is trying to achieve. The following recommendations are the result of the technical analysis and public outreach process:

1. *Mn/DOT should adopt the Interregional Corridor System Plan and incorporate it into the update of the Statewide Transportation Plan.* The IRC System Plan was approved by the Steering Committee on September 23, 1999 and is being incorporated into the State Plan.

2. *Mn/DOT should adopt the mobility performance measure (speed targets) based on corridor priority and incorporate this measure as part of its family of measures.* The IRC performance measures were approved by the Steering Committee on September 23, 1999.

3. *Mn/DOT should develop a system for verifying, monitoring and updating the mobility performance of interregional corridors with the goal of maintaining efficient connections between trade centers.*

4. *Mn/DOT should develop clear guidelines on how these corridors should operate and then develop an administrative structure that can effectively make decisions and provide the necessary support to implement the overall plan. For example:*

   A. *High-priority interregional (HPI) Corridors should function at a "free-flow" level of operation, with a minimum of 60-mph speeds and minimal conflicts and interruptions to traffic flow. It is recommended that:*

      - *Corridor management policies be put in place to severely limit additional signals and direct access to these corridors. Consideration of additional signals should only be done after exhausting all other feasible alternatives to resolve safety problems including closure, geometric modifications, and signing. If it is determined that signals must be installed for safety purposes, they should be considered "temporary." Whenever "temporary" signals are installed, agreements with local jurisdictions should spell out conditions under which the temporary signal will be removed. In addition, plans should be prepared for replacing the signal with a future interchange, including a plan for preserving the right-of-way needed for developing the interchange.*

      - *Corridor management plans should be developed that identify future access locations and management/improvement strategies that will address long-*

term mobility and safety issues. These plans should be developed in partnership between Mn/DOT, counties, cities, and townships. They should also identify agency implementation roles and responsibilities, and the final plan should be adopted by each of the corridor management partners.

B. *Medium-priority interregional (MPI) Corridors should operate at a minimum of 55-mph speeds, limit the number of conflicts and have minimal interruptions to traffic flow. It is recommended that:*

- *Corridor management policies be put in place that discourage additional signals, as well as direct access to these corridors. If signals must be installed for safety reasons, they should be spaced to preserve the mobility of the corridor. In areas where there are substantial volumes (approaching the capacity of expressways), signals should be considered "temporary." Whenever "temporary" signals are installed, agreements with local jurisdictions should spell out conditions under which temporary signals will be removed. In addition, plans should be prepared for replacing the signal with a future interchange, including preserving the right-of-way needed for developing the interchange.*

- *Corridor management plans should be developed that identify future access locations and management/improvement strategies that will address long-term mobility and safety issues. These plans should be developed in partnership between Mn/DOT, counties, cities, and townships. They should also identify agency implementation roles and responsibilities and the final plan should be adopted by each of the corridor management partners.*

C. *High priority regional (HPR) Corridors should operate at a minimum of 50-mph speeds (depending upon proximity to urban centers), limit conflicts and avoid interruptions to traffic flow. It is recommended that:*

- *Corridor management policies limit the number of signals, as well as direct access to these corridors. Signals should be spaced to promote mobility for regional corridors.*

- *In areas where significant growth is anticipated, corridor plans should be developed that identify future access locations and improvement strategies that will address long-term mobility and safety issues. These plans should be developed in partnership between Mn/DOT, counties, cities, and townships. They should also identify agency implementation roles and responsibilities, and the final plan should be adopted by each of the corridor management partners.*

5. *The interstate beltway around the Twin Cities Metropolitan area is a critical link that interconnects many of the interregional corridors. Even though this beltway was not*

included as part of the Interregional Corridor Study, this facility should distribute interregional corridor trips and function at a level similar to the interregional corridors it connects.

6. *Mn/DOT should focus additional funding on IRCs that have current or anticipated performance deficiencies and/or on corridors that have been identified as having a medium to high signal proliferation risk (Figure 15).*

7. *Mn/DOT should continue to develop a set of recommended access classification and spacing guidelines that reflect the policies and performance targets established as part of the Interregional Corridor Study. Consistency of guidelines across counties in conjunction with model-development ordinances would help provide a uniform playing field and provide better tools to effectively limit the number of access points.*

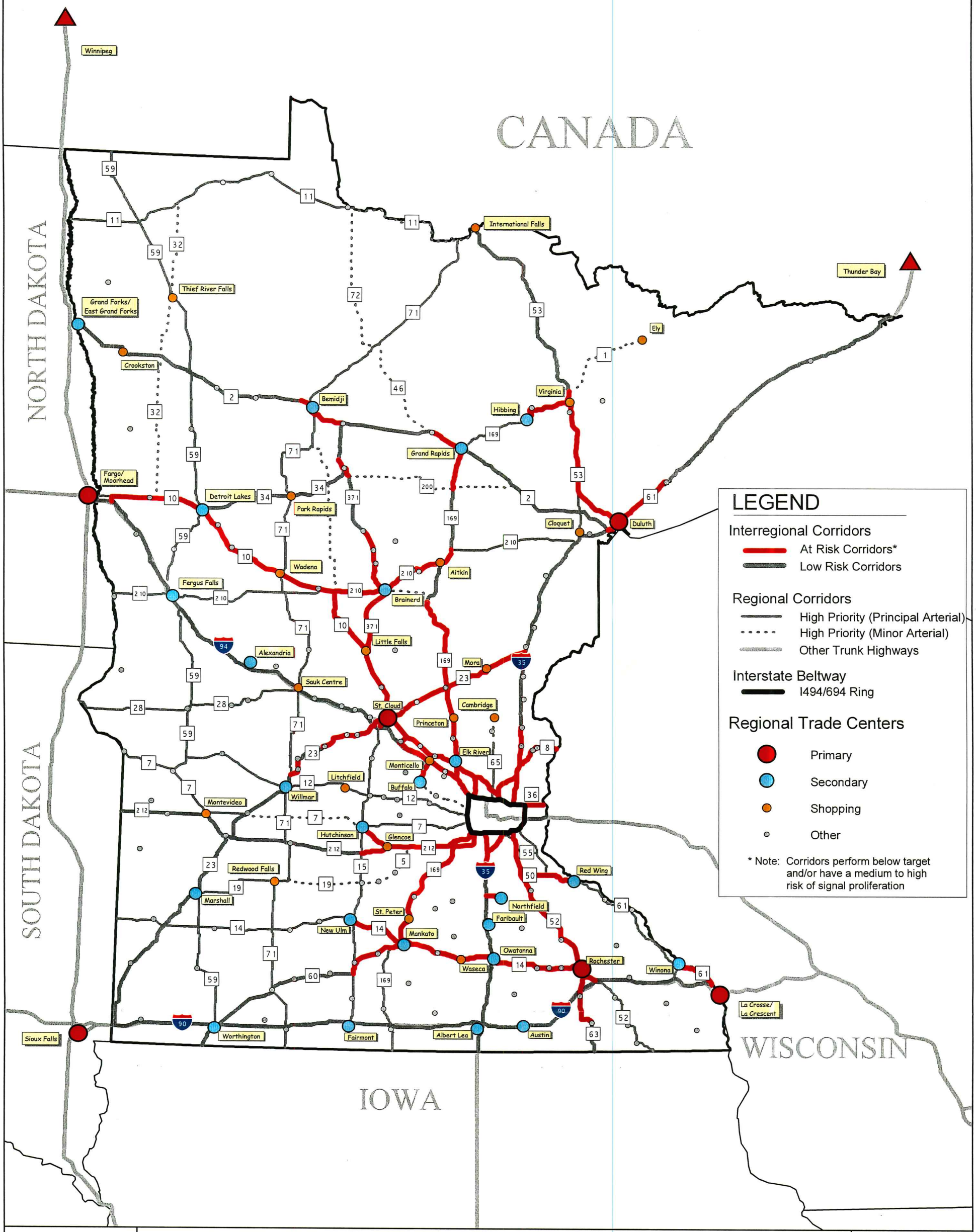
8. *Mn/DOT should work with the Association of Counties, the League of Minnesota Cities and the Association of Minnesota Townships to develop incentives and cost-sharing policies that encourage responsible development that works toward, and is consistent with, the corridor plans.*

9. *Mn/DOT should continue to work in collaboration with Minnesota Planning and local governments to develop example land use planning guidelines, model-development ordinances and educational materials (best practices handbook) that support the Interregional Corridor System. These tools should advocate a logical network of arterials and local streets that support the desired land use and have properly spaced connections to the interregional system. Educational materials should demonstrate, using real examples, the benefits of corridor management, and depict the negative consequences of inadequate planning for right-of-way preservation and access. These materials should be disseminated to all Mn/DOT districts and RDCs, and they should be made available to the counties and cities.*

10. *It is recommended that Mn/DOT conduct follow-up studies or analysis in the following areas:*

    A. Major River Crossings

    Minnesota has a number of major rivers that affect connectivity among regional trade centers. While the IRC study did not focus on river crossings, several crossings were brought to our attention by both the public and agencies during the public outreach process. Rivers tend to concentrate traffic at crossing points and, as a result, are more susceptible to congestion and mobility problems.



SRF Consulting

Mobility Risk Corridors
(Based on 2020 Volumes)
INTERREGIONAL CORRIDOR STUDY

FIGURE
15

The major river crossings that have long been discussed as needing improvements were identified as follows:

- I-94/TH 10: Mississippi River Crossing (Becker to St. Cloud)
- TH 212/TH 169: TH 41 Minnesota River Crossing
- TH 61: Hastings Bridge

These crossings are in areas that are undergoing substantial development, and preliminary studies should be undertaken to determine their feasibility, right-of-way requirements, impacts and costs. Failure to act will reduce opportunities and undoubtedly increase future costs as development continues.

It is recommended that Mn/DOT pursue an update of the 1989 Metro Area Major River Crossings Study. This study reviewed and ranked all of the major river crossings in the Twin Cities area. It is recommended that this study be broadened to include the entire Metro Link Tier.

B. Routes in Regional Centers

The Interregional Corridor Study focused primarily on connections between regional trade centers and therefore excluded some important routes within trade centers. One of the most important is the I-494/I-694 beltway. From the point of view of interregional travel, this route acts as a metro area bypass, distributing trips around the area and connecting the interregional corridors to each other.

In addition to the beltway, there are other regional routes that serve an important interregional connection-distribution function. For example, TH 13, which connects TH 169 to the river terminals near Savage, is an important freight corridor. These types of routes need to function adequately to support the Interregional Corridor System. For example, providing a high performance level on an interregional corridor coming into the I-494/I-694 ring will be counterproductive if the ring is not capable of distributing the traffic to other interregional corridors or regional highways.

C. Metro Area Bypass

Many comments were received from the public about the limited ability of the I-494/ I-694 ring to adequately handle movements around the western side of the metropolitan area. Traffic projections indicate that this facility will continue to function marginally, even after being upgraded to a six-lane freeway. The highest growth outside of the metropolitan area is in southeast Minnesota and north central Minnesota. It was suggested that TH 14 in combination with TH 15 serve as a potential bypass of the metropolitan area. While these facilities do not currently provide this function, there is a significant effort to improve TH 14 from

Rochester to New Ulm. It is suggested that this bypass be studied to determine its ability to divert traffic from the metropolitan ring system.

11. *The Interregional Corridor Study should be updated each time the Statewide Transportation Plan is updated. It is recommended that future IRC updates consider the following refinements:*

A. Improve Traffic Count Data

Additional traffic count data should be collected and analyzed to better determine the seasonal peaking characteristics of both recreational and freight traffic. Traffic information was limited to existing volume counts and automatic traffic recorder (ATR) information. A more thorough analysis of trends is needed to better understand how corridors are functioning today and how conditions may deteriorate over time.

A decision must be made about continuing to include commuter traffic in the evaluation of the importance of interregional corridors. Some have argued that, given the relatively limited travelshed of most commuting trips, they should be excluded from the corridor performance evaluation. This would require better commuter travel data if extraction were desired.

An alternative approach would rely on trip length, where the higher the trip length in a corridor the higher its IRC ranking would be. This would require some type of origin-destination survey.

B. Quantify Importance of Addressing Seasonal Peak Flows and Tourism

How should corridors perform during seasonal peaks? Do corridors with seasonal peaks provide an important enough function, in terms of moving agricultural products or providing access to tourism areas, that they should have higher design or performance levels? These are difficult questions to answer because there is no established policy or sufficient background information to determine if the performance level should be raised. The performance levels used in the final analysis are based on average annual daily traffic and therefore do not account for summer or peak recreational flows. This can significantly affect performance on many corridors. It is recommended that additional work be done in this area to establish a policy for performance on routes with seasonal peaking.

C. Freight Movements

Many questions were raised and comments made regarding the importance of freight movements on interregional corridors. The study used little broad, facility-level freight information other than commercial vehicle counts. Mn/DOT is conducting a freight flow study; however, this information was not available in

time for this report. Knowing the weight and value of freight would be important information that could affect the interregional corridor designation. Information of this type should be reviewed as part of the next IRC Study update. As part of this review, truck trip length (ton-miles) should be examined as a potential factor.

D. No-Passing Zone Information

The inability to pass was brought up as a critical concern for two-lane facilities. Operating speed, sight distance (highway alignment), traffic volumes and vehicle mix (percentage of trucks and recreational vehicles) influences passing opportunities. Lack of consistent data on the above factors prevented the current analysis from sufficiently accounting for these variables. Additional data and analysis are needed to better determine the mobility and safety needs of these facilities.

E. Segmentation (spot locations)

As part of the initial work, study segments were defined based on logical termini, connections with regional centers and significant changes in traffic volume. Because of the statewide nature of the study, it was agreed to keep the number of segments at a manageable level. As the study became more refined and analysis was done to identify segments that were performing below target levels, some spot location problems were not captured due to the length of the study segments. Prior to updating the IRC Study, some discussion should occur regarding the level of detail (length of segments) that the study should track or how to deal with spot problems.

F. Method for Estimating Speed Performance

The speed performance estimation methodology used in the IRC Study relies on posted speeds, adjusted for signal delay, speed changes and congestion. It is suggested that this speed estimation method be validated with actual speed runs and/or use of probe vehicles with GPS/AVL tracking.

G. Update Trade Center Analysis

The trade center methodology that was used as a basis for the Interregional Corridor Study was consistent with previous trade center studies in 1963 and 1990. Questions were raised about the methodology adequately capturing the economic activities of today's economy (e.g., e-commerce, other service industries). The trade center methodology should be reviewed and refined as part of the next update.

H. Interregional Corridor Connections to Adjacent States

In future update of the IRC Study, it is recommended that a more detailed evaluation be made of corridor connections to RTCs in adjacent states. This evaluation would help prioritize these connections based on their importance.

APPENDIX A

1999 UPDATE
REGIONAL TRADE CENTERS OF THE UPPER MIDWEST
(CENTER OF URBAN AND REGIONAL AFFAIRS)

Trade Centers of the Upper Midwest
1999 Update

June, 1999

Prepared By William Casey
Center for Urban and Regional Affairs

Background

More than 35 years ago, *Trade Centers and Trade Areas of the Upper Midwest*[1] described the system of central places that characterized an important region of the U.S. Geographically, its definition centered on Minnesota, but the region also included Montana, North and South Dakota, and part of Wisconsin. Its taxonomy of trade centers defined an eight-level hierarchy of places, with metropolitan areas at the top and hamlets at the base. This taxonomy has since proved valuable to policy makers and researchers.

Using the 1963 study as a starting point, another report, *Trade Centers of the Upper Midwest: Changes from 1960 to 1989*,[2] increased the scope and updated the picture of what was happening economically in the region. Underpinning its analytical model were computerized data sets describing a seven-state region (Iowa, Minnesota, Montana, Nebraska, North Dakota, South Dakota, and Wisconsin). These data, acquired from outside sources, detailed types of business establishments and demographic information, all collected at the zip code level.

When aggregated and analyzed, the data described a complex system that was continuing to evolve. Dramatic economic and spatial changes had occurred across the region, and the report portrayed these changes in several

[1] John R. Borchert and Russell B. Adams, *Trade Centers and Trade Areas of the Upper Midwest*, Upper Midwest Economic Study, Urban Report No. 3, CURA, University of Minnesota (1963).

[2] Thomas L. Anding, John S. Adams, William Casey, Sandra de Montille, and Miriam Goldfein, *Trade Centers of the Upper Midwest: Changes from 1960 to 1989*, Center for Urban and Regional Affairs, Publication No. CURA 90-12, University of Minnesota (1990).

different ways: as measurable shifts in the importance of particular cities and towns, as changes in the role of entire levels in the overall system, and as maps reflecting movements toward centralization.

Models of this sort can be valuable in documenting distributions of economic activity across a region and describing the importance of individual cities or groups of cities. Beyond that, gaining insight into the changing structure of towns and cities—as they grow or shrink, take on new roles, and become more or less economically significant in a larger, overall system—can also be beneficial.

There is no single way to assess the robustness of a place or a region in its many dimensions, regardless of how many measures are collected and analyzed. The method employed here, though, goes beyond simply looking at population to assessing as well levels of economic activity based on the number of local businesses and their mix.

This Update—Using 1998 Data

Working in cooperation with the Minnesota Department of Transportation (MnDOT), the University of Minnesota's Center for Urban and Regional Affairs (CURA) acquired 1998 demographic data from the Claritas Corp. and 1998 business data files from Dun & Bradstreet. These served as a starting point for the 1999 update to the trade centers structure documented in the 1990 analysis. Throughout the study, references to specific data refer to these 1998 data sets.

MnDOT's primary interest in the new study is in identifying those Minnesota trade centers serving relatively large geographic areas (i.e., Levels 0 - 3); consequently, the analysis does not focus on settlements at the bottom of the trade center hierarchy (i.e., Level 6 Convenience Centers and Level 7 Hamlets). Nevertheless, the data acquired allowed analysis of all levels of the hierarchy for the entire seven-state study area. Table 1 identifies all eight levels of the hierarchy, shows the number of cities at each level, and lists example communities in each level.

Table 1

Examples of Regional Trade Center Communities

Level 7	Level 6	Level 5	Level 4	Level 3	Level 2	Level 1	Level 0
Hamlet	Minimum Convenience Center	Full Convenience Center	Partial Shopping Center	Complete Shopping Center	Secondary Wholesale/ Retail Center	Primary Wholesale/ Retail Center	Major Metro Area
Number of Cities							
2036*	1049*	260	239	132	103	18	8
Example Cities							
Brewster (MN)	Goodhue (MN)	Mahnomen (MN)	Blue Earth (MN)	Wahpeton (ND)	Bemidji (MN)	Duluth (MN)	Twin Cities (MN)
Bigelow (MN)	Montrose (MN)	Central City (IA)	Eldridge (IA)	Montevideo (MN)	Mankato (MN)	Fargo (ND)	Milwaukee (WI)
Frost (MN)	Tower (MN)	Flandrau (SD)	Spooner (WI)	Livingston (MT)	Iowa City (IA)	Cedar Rapids (IA)	Des Moines (IA)

*1989 Data

The methodology produces a hierarchy based on population and the numbers and types of business establishments. Changes over time are measured by comparing indices established in previous studies (1963 and 1990) with those derived from the current effort.

The methodology uses nine variables to determine the level in the hierarchy of each community in the seven states (see Table 2).

Table 2

Demographic and Business Variables

Variable	Description
Population	Population of Regional Trade Center zip code(s)
Construction Establishments	Number of establishments in SIC 15, 16, 17
Commercial Service Establishments	Number of establishments in SIC 70-80, 82-84, 87-88
Manufacturing Establishments	Number of establishments in SIC 20-39
Professional Service Establishments	Number of establishments in SIC 60-67, 81, 86, 89
Retail Establishments	Number of establishments in SIC 52-59
Transportation Establishments	Number of establishments in SIC 41-49
Wholesale Establishments	Number of establishments in SIC 50 and 51
Total Establishments	Sum of all establishments

Note: SIC codes 7, 8, 9, 10, 13, and 14 were not included in the study

Data Acquisition and Methods

The 1998 Dun & Bradstreet data contained nearly 300,000 individual records. Each record details the number of businesses with a particular four-digit Standard Industrial Classification (e.g., "2011—Meat packing plants," "5945—Hobby, toy and game stores," and "8062—General medical and surgical hospitals") located in a specific zip code across the seven-state study area. Their data records also indicate the sizes of business establishments reported, based on the number of employees at the site. Unfortunately, a high proportion of the data reports size of business as "unavailable," so size of firms could not be considered in this analysis.

Claritas Corporation supplied a data set describing each zip code in the United States in terms of selected demographic variables. This data set also included boundary information for each zip code, allowing the use of mapping software programs.

The approach in using these new data sets was to update the previous models in a manner as consistent as possible with the analyses of 1963 and 1990. In other words, this work does not introduce, or attempt to introduce, new methodologies into the process of determining the hierarchy of trade centers. At the same time, it has been a priority to document carefully methodological and operational issues as they arose and to prepare a set of guidelines to assist future researchers with any subsequent analyses—whether next year or a decade from now.

Data Operations and Analysis—1999

At a very general level, there are six steps in dealing with the new data sets. Each step noted below has, in most instances, numerous sub-steps.

1) **Derive Zip Tables**—Zip code master tables for the Upper Midwest were derived from the U.S. data files supplied by Claritas.

2) **Validate Establishment Records**—Dun & Bradstreet's business establishment records were examined for legal zip codes as determined above. Other integrity checks on these records were carried out as

well. The number of business establishments in each state in the seven-state study area is listed in Table 3.

Table 3

Number of Business Establishments by State
(1999 Update)

State	Number of Establishments
Iowa	143,713
Minnesota	216,610
Montana	47,314
Nebraska	72,703
North Dakota	34,658
South Dakota	38,842
Wisconsin	194,109
TOTAL	**747,949**

3) **Define Zip/Place Geography**—The geography of the study region was established at the zip code level, which is the lowest geographic unit at which business data are available. This process involved identifying all places in the seven states that might be made up of more than one zip code. Because zip codes are ill behaving in several respects, any or all of several factors had to be considered when making this decision.

The Postal Service name for a place is the starting point in this process of evaluating small cities and towns. Zip codes were automatically aggregated if they had the same Post Office name. A Minnesota example is Mankato, which is the Post Office name for zip codes 56001 and 56003. As zip codes do not normally follow municipal boundaries, the aggregated areas typically do not correspond to municipal entities.

In some cases, though, additional zip codes surrounding a Regional Trade Center appeared to be candidates for inclusion into the trade center, even though their postal names were different. The matter of surrounding areas was an issue whether the trade center consisted of one zip code or several aggregated ones.

The presumption was not to aggregate surrounding zip code(s) unless there was a strong case to do so. Such a strong case would be the presence of contiguous, continuous built-up areas that make one trade center hard to distinguish from a neighboring trade center with a different zip code.

Three general criteria were used to decide whether or not to consider zip codes with different Post Office names as one area:

a. Zip codes were aggregated if the built-up area from one zip code merged with the built-up area of another zip code. **This was the primary determinant in deciding whether to aggregate zip codes.** Strip development along major highways often contributes to continuous, built-up urbanized areas.

b. Zip codes were considered for aggregation if a trade center's municipal boundary "splashed" over into a neighboring zip code AND

   (1) the neighboring zip code represented more than ten percent of the firms in the trade center (conversely, when the number of businesses was less than five percent, the outlying zip code was **not** aggregated)

   AND

   (2) the physical area of the outlying zip code was smaller rather than larger so that the centroid of the neighboring zip code was not too far from the trade center.

c. Zip codes were less likely to be candidates for aggregation when they were separated by a river. Rivers may act as natural barriers to the free flow of cars and economic activity, especially in smaller places.

Decisions about aggregation were informed further by information derived from GIS mapping (i.e., zip code boundaries, highways, municipal boundaries, and urbanized areas) and aerial photos. Applying these decision rules in conjunction with the factors previously noted resulted in relatively few zip code aggregations; in fact, only 56 of the 760 Regional Trade Centers in the seven-state study area included two or more zip codes.

In Minnesota, the list of Regional Trade Centers with more than one zip code includes:

- Brainerd (added: Baxter)
- Detroit Lakes (2 zip codes with Detroit Lakes Post Office name)
- Duluth (11 zip codes with Duluth Post Office name)
- Mankato (2 zip codes with Mankato Post Office name)
- Moorhead (3 zip codes with Moorhead Post Office name)
- Rochester (4 zip codes with Rochester Post Office name)
- St. Cloud (3 St. Cloud zip codes plus Sartell, Sauk Rapids, and Waite Park)
- Twin Cities Metro Area (157 aggregated zip codes)

4) **Update Control Tables**—Not all businesses are included in this model. Data records were culled on the basis of their SIC codes, and those included were aggregated into one of several groups. Data tables delineating the boundaries of the seven-county Minneapolis-St. Paul Metropolitan Area also were reexamined because zip code boundaries shift over time.

5) **Reduce Data**—A series of procedures starts with the preprocessed Dun & Bradstreet data. Dun & Bradstreet selects and aggregates establishment counts into one of the seven categories of SIC codes (i.e., construction, commercial services, manufacturing, professional services, retail, transportation, and wholesale). This yields the cornerstone data set on which the rating of places is carried out. The data for the 1999 update included 540,918 establishments in the 760 Level 0 - 5 Regional Trade Centers.

6) **Rate Places in the Trade Hierarchy**—The starting point for each community is its assigned 1990 level. Then, using the Dun & Bradstreet business data and the Claritas demographic data, averages

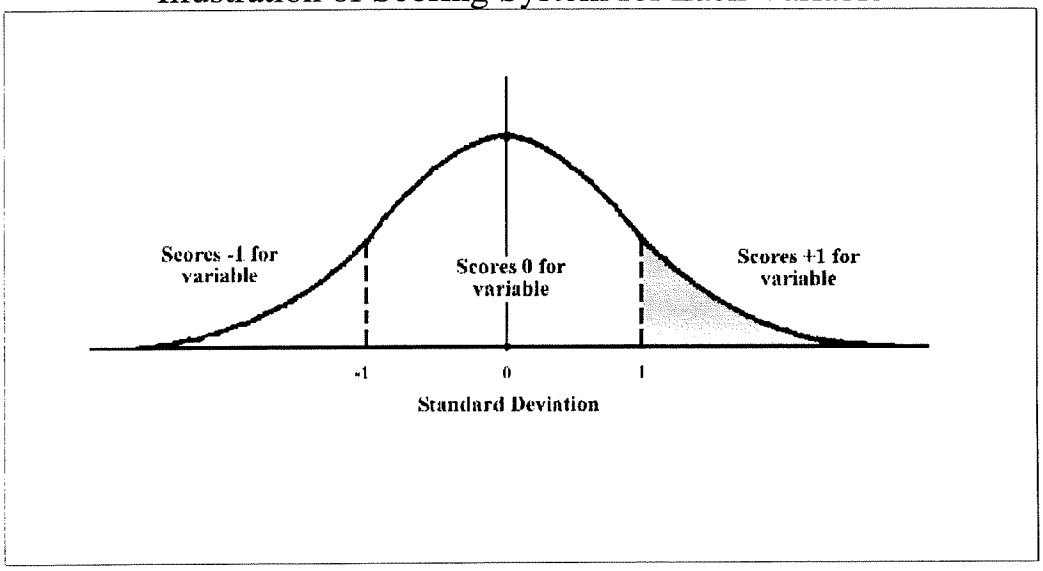
and standard deviations are calculated for each variable for each level. Each community is then compared to the average of that level in the hierarchy for each of the nine variables and given a value of -1 (if it is more than one standard deviation below the average), +1 (if it is more than one standard deviation above the average), or 0 (if it is within one standard deviation of the average).

Ashland, WI can be used as an example of this ranking system. Ashland, a Level 3 trade center, has a population of 13,287. The average population for a Level 3 trade center is 11,037, and the range of populations within one standard deviation of this average is 7,564 to 14,509. Therefore, Ashland received a score of 0 for the population category because it falls within one standard deviation of the mean. In the professional services category, Ashland's number of firms (112) is larger than the range of firms that fall within one standard deviation of the mean (71 to 111), so Ashland received a score of 1 for this category. In the wholesale category, Ashland's number of firms (16) falls below the range of firms that are within one standard deviation of the mean (17 to 36), so it received a score of -1 for this category.

If a community is more than one standard deviation above the average for at least six variables, it becomes a candidate for moving up one level. If it is more than one standard deviation below the average for at least six variables, it becomes a candidate for moving down one level. The communities that are candidates for moving up are then compared to the averages for the next highest level. If they fall within one standard deviation of the mean for at least four of the variables, they are promoted. The candidates for moving down are compared to the next lowest level. If they fall within one standard deviation of the mean for at least four of the variables, they are moved down one level. Figure 1 illustrates the scoring system.

Figure 1

Illustration of Scoring System for Each Variable



As a result of this analysis, levels for 1999 were established for all 760 cities. Table 4 shows the average population and average number of businesses for Level 0, 1, 2, and 3 Regional Trade Centers in the seven-state study area.

Table 4

Profile of Level 0, 1, 2, and 3 Regional Trade Centers
(1999 Update)

Level	0	1	2	3
Average Population	653,352	102,504	28,142	11,036
Average Number of Businesses				
Construction	1,340	281	81	35
Commercial Services	7,479	1,349	375	147
Manufacturing	1,684	217	70	29
Professional Services	6,167	1,002	255	91
Retail	4,302	906	269	107
Transportation	848	195	52	22
Wholesale	1,828	321	76	27
Total Businesses	23,649	4,270	1,178	458

Dun & Bradstreet's count of firms in specified industries was used to calculate a trade center's place in the regional hierarchy. Sales and reliable employment data might be better indicators, but comprehensive data are not available for all communities in the study area or the data are not available by zip code, the geographic unit on which the Regional Trade Center analysis is based.

Inherent in the methodology is that breadth in an economy is rewarded over depth in one or two industries. That is, it is better to have firms in a variety of industries than a few very large employers. For example, a place with an abundance of manufacturing facilities compared with others at the same level is able to advance to the next highest level only when it also has a significant retailing, wholesaling, and service presence.

The Appendix includes a state-by-state listing of Level 0 - 5 Regional Trade Centers in the study area along with their level in the 1990 study; level in the 1999 update; population; number of establishments by SIC code; and total number of establishments.

Evaluating the 1999 Regional Trade Centers System

The 1999 analysis identified 760 Level 0 to Level 5 Regional Trade Centers in the Upper Midwest (see Map 1, page 11, for Level 0 to Level 3 centers). Eight cities were classified at Level 0 (Major Metropolitan Areas), followed by 18 Level 1's (Primary Wholesale/Retail Centers); 103 Level 2's (Secondary Wholesale/Retail Centers); 132 Level 3's (Complete Shopping Centers); 239 Level 4's (Partial Shopping Centers); and 260 Level 5's (Full Convenience Centers).

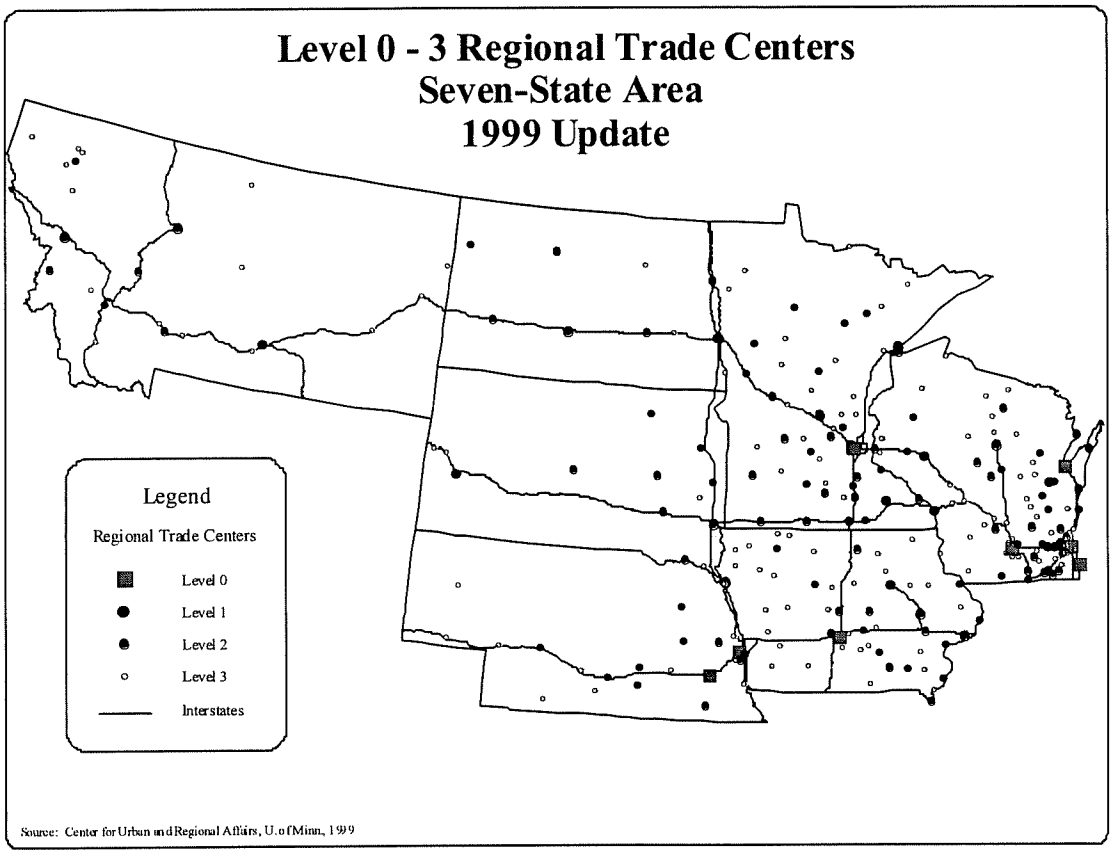
Overall, there is a stable framework of Upper Midwest places. Table 5 shows that the total number of Level 0 - 3 Regional Trade Centers has remained fairly consistent, increasing by only 16 over the nearly 40 years of the study. However, within this overall stability is the change that has occurred as specific trade centers move up or down in the hierarchy of places.

Table 5
Number of Trade Centers by Level
Seven State Study Area
1963, 1990, 1999

Level	Number of Trade Centers 1963	Number of Trade Centers 1990	Number of Trade Centers 1999
Total 0 - 3	**245**	**244**	**261**
0	4	4	8
1	18	13	18
2	34	60	103
3	189	167	132

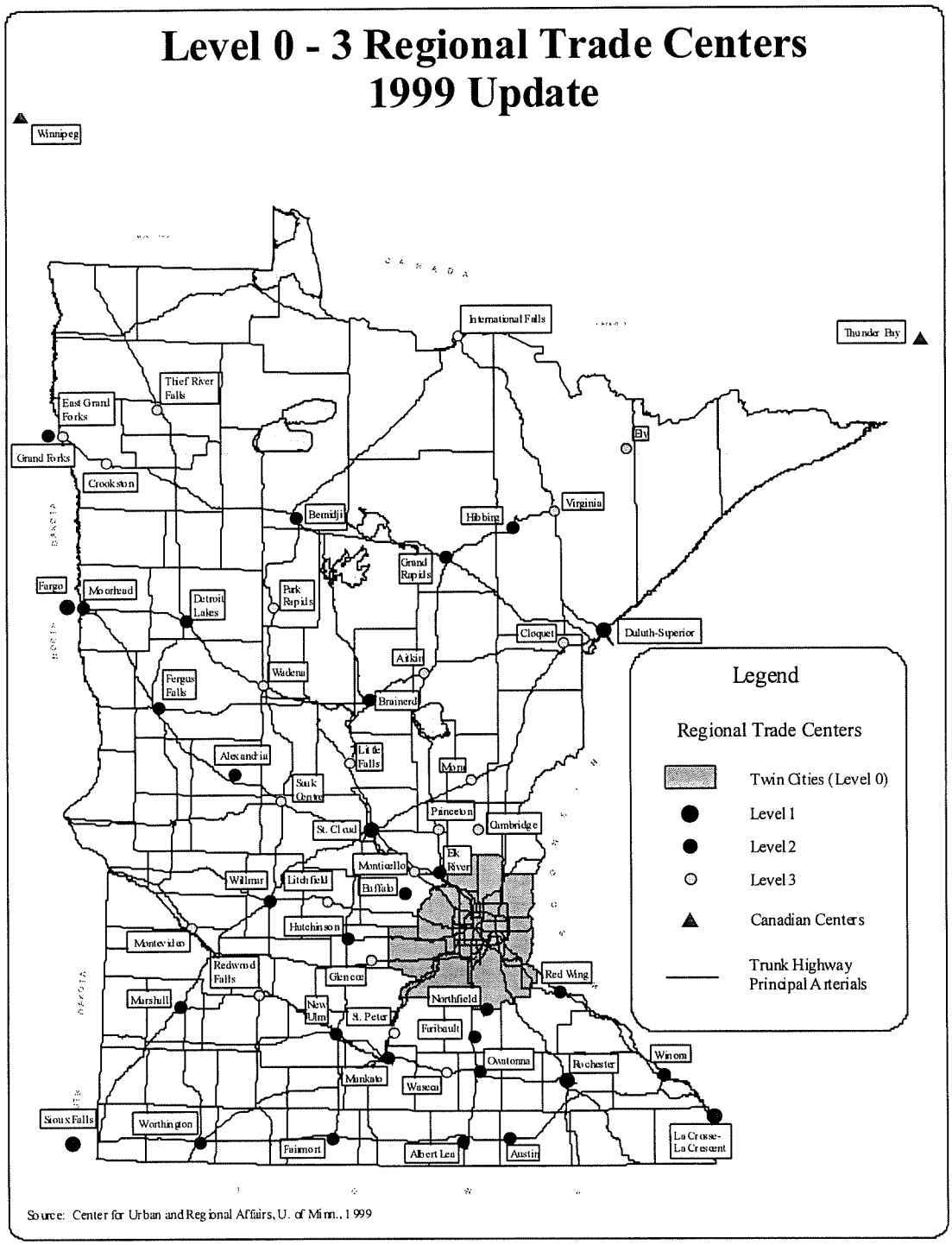
Considering the 1999 ranking of the Level 0 - 5 places identified in 1990, 525 (68 percent) remained at the level reported in 1990. Of those places changing level, 156 (about 20 percent) moved to a higher level in the hierarchy while the remainder moved down. The majority of places that moved down (88 of 94) during the nine-year period were smaller places (Levels 4 and 5). By contrast, the upward movement of trade centers in the hierarchy occurs more uniformly across the range of trade center sizes.

Map 1



The 1999 analysis identified 180 places in Minnesota at a Level 5 or higher in the hierarchy. The seven-county Twin Cities Metro Area was identified as the state's only Major Metropolitan Area. Successive levels of the hierarchy identified three Level 1's; 24 Level 2's; 22 Level 3's; 65 Level 4's; and 65 Level 5's. Map 2 (page 12) indicates the location of Minnesota's 50 Level 0, 1, 2, and 3 Regional Trade Centers.

Map 2


Level 0 - 3 Regional Trade Centers
1999 Update
Winnipeg
Thunder Bay
International Falls
Thief River Falls
East Grand Forks
Grand Forks
Crookston
Bemidji
Hibbing
Virginia
Ely
Grand Rapids
Fargo
Moorhead
Detroit Lakes
Park Rapids
Cloquet
Duluth-Superior
Aitkin
Wadena
Fergus Falls
Brainerd
Alexandria
Little Falls
Mora
Sauk Centre
Princeton
Cambridge
St. Cloud
Elk River
Monticello
Willmar
Litchfield
Buffalo
Hutchinson
Montevideo
Redwood Falls
Glencoe
Red Wing
Marshall
New Ulm
St. Peter
Northfield
Faribault
Owatonna
Rochester
Winona
Mankato
Waseca
Sioux Falls
Worthington
Fairmont
Albert Lea
Austin
La Crosse-La Crescent
Legend
Regional Trade Centers
Twin Cities (Level 0)
Level 1
Level 2
Level 3
Canadian Centers
Trunk Highway
Principal Arterials
Source: Center for Urban and Regional Affairs, U. of Minn., 1999

Over the past 40 years, the story of shifting trade center patterns in Minnesota and the Upper Midwest has involved consolidation, expansion, and growth in higher level centers. This has been coupled with erosion and loss of share in small places. The 1990 report noted:

> The trade center hierarchy as a whole shifted, with higher and lower order places moving away from each other...The lowest three classes of trade centers...occupy a less important position within the regional economic system than they did a generation ago.

The current analysis suggests that in Minnesota's trade center hierarchy a good portion of the growth in cities of modest size and larger appears to be at the expense of smaller places. These findings point to a continuation—and perhaps even acceleration—of the trend previously identified. This is most evident in the robust growth observed among stronger shopping and regional centers. But because this study set aside most lower level places (i.e., the Level 6 Minimum Convenience Centers and Level 7 Hamlets), some data needed for a further analysis of this aspect of change are not available.

Potentially more fascinating in Minnesota is the proposition that the growing phalanx of Regional Trade Centers is gaining a share of its growth from the Twin Cities—the state's traditional economic super-magnet. This could be the case, at least to a limited degree. To gain an additional longitudinal view, the Dun & Bradstreet data sets used in this study were supplemented by similar *County Business Patterns* data from the U.S. Census. These data indicate that the number of Minnesota business establishments grew 17 per cent in the seven years from 1989 to 1996 (the most recent data available), but it is interesting that the Metro Area's share of total business establishments in Minnesota remained nearly the same in both years (about 54 per cent).

Future Studies

Over the course of the more than 30 years since the trade center concept was first developed, there have been significant changes in local, regional, and national economies and in the global marketplace; in the availability of data; and, most recently, the reorganization of the Standard Industrial Classification system into the North American Industry Classification System. These changes suggest that future studies should explore how the

eight-level hierarchy might be improved using the new industrial classifications and whether additional information (such as sales tax data) might enrich the analysis.

UMW Trade Centers Analysis - Iowa

1999 Edition

					Total Establishments>>							
City	State	Level90	Level99	Population	Construction Establishments	Commercial Services Establishments	Manufacturing Establishments	Professional Services Establishments	Retail Establishments	Transportation Establishments	Wholesale Establishments	Total Establishments
Ackley	IA	5	**5**	2,664	8	33	10	43	28	3	5	130
Adel	IA	4	**4**	6,028	16	86	15	60	42	11	14	244
Akron	IA	5	**5**	2,923	5	29	4	17	25	4	8	92
Albia	IA	4	**4**	6,571	15	73	15	54	60	9	18	244
Algona	IA	4	**3**	8,433	32	129	25	91	109	14	26	426
Alta	IA	5	**5**	2,692	10	28	2	28	19	6	5	98
Altoona	IA	3	**3**	11,732	29	91	15	88	66	17	25	331
Ames	IA	2	**2**	50,147	97	567	96	447	427	73	84	1,791
Anamosa	IA	4	**4**	8,192	24	69	5	53	72	11	13	247
Atlantic	IA	4	**3**	8,507	28	146	17	106	106	19	42	464
Audubon	IA	5	**5**	4,030	15	59	13	39	37	10	18	191
Bedford	IA	5	**5**	2,588	9	38	5	34	43	11	7	147
Belle Plaine	IA	5	**5**	3,864	5	45	7	31	36	12	9	145
Bellevue	IA	4	**5**	4,457	18	50	8	26	41	3	14	160
Belmond	IA	5	**5**	3,069	12	54	11	43	48	7	14	189
Bloomfield	IA	4	**4**	6,261	17	84	12	57	60	12	23	265
Boone	IA	3	**3**	16,427	35	174	26	151	132	39	28	585
Britt	IA	5	**5**	3,169	7	50	10	40	33	5	17	162
Brooklyn	IA	5	**5**	2,950	17	37	3	32	23	13	8	133
Burlington	IA	2	**2**	35,239	86	479	83	330	345	73	85	1,481
Camanche	IA	4	**5**	4,559	9	45	10	22	14	10	3	113
Carlisle	IA	4	**5**	5,433	21	34	7	29	29	4	13	137
Carroll	IA	3	**3**	12,420	45	220	26	114	155	31	49	640
Cascade	IA	5	**5**	2,861	14	36	10	26	34	6	13	139
Cedar Rapids	IA	1	**1**	147,767	365	1,699	315	1,494	1,261	302	475	5,911
Center Point	IA	5	**5**	3,290	13	30	5	18	23	5	7	101
Centerville	IA	4	**3**	8,112	20	114	22	84	116	23	19	398
Central City	IA	5	**5**	2,943	7	26	5	17	18	10	12	95
Chariton	IA	4	**4**	7,116	13	96	7	55	69	11	16	267
Charles City	IA	4	**3**	9,506	19	142	15	111	109	17	22	435
Cherokee	IA	4	**3**	7,315	21	134	18	89	95	17	28	402
Clarinda	IA	4	**4**	6,565	23	115	15	59	71	15	16	314
Clarion	IA	5	**5**	3,801	9	51	9	71	46	5	13	204
Clinton	IA	2	**2**	29,956	64	363	46	243	257	44	66	1,083
Clive	IA	3	**2**	11,064	24	191	44	206	160	27	94	746
Colfax	IA	5	**5**	3,614	11	28	5	18	15	4	9	90
Columbus Junction	IA	5	**5**	3,779	7	31	3	25	29	8	4	107
Corning	IA	5	**4**	2,853	9	59	9	47	64	12	18	218
Corydon	IA	x	**5**	2,536	6	43	11	29	31	6	7	133
Council Bluffs	IA	2	**2**	64,633	149	643	85	405	428	79	108	1,897
Cresco	IA	4	**4**	5,685	13	67	21	54	56	12	20	243
Creston	IA	4	**3**	9,386	39	142	20	104	114	18	19	456
Davenport-Bettendorf	IA	1	**1**	133,978	326	1,585	263	1,175	1,102	193	454	5,098

UMW Trade Centers Analysis - Iowa

1999 Edition

					Total Establishments>>							
City	State	Level90	Level99	Population	Construction Establishments	Commercial Services Establishments	Manufacturing Establishments	Professional Services Establishments	Retail Establishments	Transportation Establishments	Wholesale Establishments	Total Establishments
De Witt	IA	4	**4**	6,852	26	98	19	67	65	12	20	307
Decorah	IA	3	**3**	13,537	35	163	28	131	148	17	27	549
Denison	IA	4	**3**	8,168	33	158	30	97	142	31	21	512
Denver	IA	5	**5**	2,943	14	30	9	23	26	1	7	110
Des Moines	IA	0	**0**	313,563	696	3,865	589	3,986	2,571	528	1,014	13,249
Dubuque	IA	2	**2**	68,647	180	750	163	592	689	106	174	2,654
Dyersville	IA	4	**4**	5,310	21	69	24	53	75	15	26	283
Eagle Grove	IA	4	**4**	4,654	9	48	13	43	36	19	7	175
Eldora	IA	5	**4**	3,986	14	62	13	52	29	12	14	196
Eldridge	IA	4	**4**	7,402	24	80	28	33	46	14	23	248
Elkader	IA	5	**5**	2,630	6	55	6	30	37	4	9	147
Emmetsburg	IA	4	**4**	4,518	11	60	10	54	58	9	20	222
Estherville	IA	4	**3**	8,096	26	117	14	74	75	20	13	339
Fairfield	IA	3	**2**	13,377	32	284	60	249	165	36	59	885
Forest City	IA	4	**4**	6,143	18	68	11	60	59	12	9	237
Fort Dodge	IA	2	**2**	28,623	103	442	77	371	356	77	94	1,520
Fort Madison	IA	3	**3**	13,487	35	166	33	117	135	19	22	527
Garner	IA	4	**4**	4,420	6	52	14	46	39	13	18	188
Glenwood	IA	4	**4**	8,153	16	75	7	42	59	10	11	220
Greenfield	IA	5	**5**	3,509	12	54	8	34	38	7	10	163
Grimes	IA	4	**4**	5,502	32	51	10	34	32	19	26	204
Grinnell	IA	3	**3**	12,128	22	152	35	111	89	24	21	454
Grundy Center	IA	5	**5**	3,414	10	56	10	43	42	7	9	177
Guthrie Center	IA	5	**5**	2,630	12	45	6	34	27	6	7	137
Guttenberg	IA	5	**5**	3,233	4	46	15	30	48	1	9	153
Hampton	IA	4	**4**	5,636	13	94	24	65	58	8	20	282
Harlan	IA	4	**3**	6,647	25	118	16	79	91	17	39	385
Hawarden	IA	5	**5**	3,118	7	50	12	22	35	5	15	146
Hiawatha	IA	4	**4**	6,384	20	53	18	65	44	13	20	233
Hudson	IA	5	**5**	2,706	12	30	7	25	16	3	8	101
Hull	IA	5	**5**	3,302	18	38	8	19	22	9	10	124
Humboldt	IA	4	**4**	5,151	10	91	25	73	78	16	21	314
Huxley	IA	5	**5**	2,614	9	32	5	24	14	6	2	92
Independence	IA	4	**3**	7,938	29	104	24	78	95	27	23	380
Indianola	IA	3	**3**	17,479	44	226	23	124	135	19	39	610
Iowa City	IA	2	**2**	79,729	184	1,005	111	663	695	91	142	2,891
Iowa Falls	IA	4	**3**	6,713	22	119	23	91	86	20	29	390
Jefferson	IA	4	**4**	5,624	27	99	12	85	86	23	15	347
Jesup	IA	5	**5**	3,150	17	43	10	28	24	9	11	142
Johnston	IA	4	**4**	7,720	37	94	12	75	34	11	20	283
Kalona	IA	4	**4**	5,016	34	67	17	51	57	11	19	256
Keokuk	IA	3	**2**	14,116	45	196	51	147	155	34	29	657
Knoxville	IA	3	**3**	11,665	33	141	9	106	101	19	22	431

UMW Trade Centers Analysis - Iowa

1999 Edition

City	State	Level90	Level99	Population	Total Establishments>> Construction Establishments	Commercial Services Establishments	Manufacturing Establishments	Professional Services Establishments	Retail Establishments	Transportation Establishments	Wholesale Establishments	Total Establishments
La Porte City	IA	5	5	3,681	11	38	5	33	35	8	18	148
Lake Mills	IA	5	5	2,865	12	40	14	43	29	8	16	162
Le Claire	IA	4	5	4,525	11	30	9	20	24	5	8	107
Le Mars	IA	3	3	12,203	48	152	22	92	126	32	23	495
Leon	IA	5	5	2,711	7	41	5	38	36	5	6	138
Madrid	IA	5	5	4,049	10	39	9	28	18	1	2	107
Manchester	IA	4	3	8,178	24	121	18	72	73	10	26	344
Manson	IA	5	5	2,561	4	31	6	28	27	7	8	111
Maquoketa	IA	4	3	8,331	29	138	25	82	106	15	37	432
Marengo	IA	5	5	3,666	11	54	7	34	31	7	8	152
Marshalltown	IA	2	2	29,800	79	343	65	260	275	53	82	1,157
Mason City-Storm Lake	IA	2	2	41,383	132	596	91	447	508	103	138	2,015
Milford	IA	4	4	5,072	19	54	15	42	53	12	10	205
Missouri Valley	IA	4	4	5,390	21	70	8	52	47	9	10	217
Monroe	IA	5	5	2,932	7	29	7	21	26	2	7	99
Montezuma	IA	5	5	2,721	13	42	13	29	32	10	9	148
Monticello	IA	4	4	5,215	18	96	31	65	74	13	40	337
Mount Ayr	IA	5	5	2,747	9	43	8	29	30	8	8	135
Mount Pleasant	IA	3	3	11,931	29	165	27	118	116	29	35	519
Mount Vernon	IA	4	4	4,882	14	60	6	38	42	5	4	169
Muscatine	IA	2	2	29,382	66	342	77	263	262	68	61	1,139
Nevada	IA	4	4	7,331	27	87	11	64	47	19	18	273
New Hampton	IA	4	4	6,342	21	86	15	63	74	12	30	301
New London	IA	5	5	3,197	8	25	3	22	22	2	5	87
Newton	IA	3	2	18,526	44	261	36	162	174	27	43	747
North Liberty	IA	4	4	6,586	25	69	8	41	38	7	8	196
Northwood	IA	5	5	3,208	13	36	10	34	37	8	6	144
Norwalk	IA	4	4	9,097	21	65	4	37	25	7	6	165
Oakland	IA	5	5	2,623	7	27	5	29	18	2	5	93
Oelwein	IA	4	4	7,967	13	104	21	79	92	12	21	342
Ogden	IA	5	5	3,189	11	35	5	34	27	14	10	136
Onawa	IA	5	5	3,514	13	54	6	44	49	8	11	185
Orange City	IA	4	4	6,650	24	74	16	52	74	12	22	274
Osage	IA	4	4	5,936	14	79	19	59	61	14	23	269
Osceola	IA	4	4	5,927	15	106	19	59	74	17	12	302
Oskaloosa	IA	3	2	14,244	34	198	37	167	163	36	55	690
Ottumwa	IA	2	2	29,490	55	365	36	264	306	59	63	1,148
Parkersburg	IA	5	5	2,860	6	29	7	37	28	7	12	126
Pella	IA	3	3	12,458	36	138	36	101	123	29	40	503
Perry	IA	4	4	7,660	12	112	12	78	66	12	20	312
Pocahontas	IA	5	5	2,908	11	47	8	45	33	4	3	151
Postville	IA	5	5	2,774	13	50	7	27	33	13	13	156
Red Oak	IA	4	3	7,165	24	116	15	80	80	19	25	359

UMW Trade Centers Analysis - Iowa

1999 Edition

					Total Establishments>>							
City	State	Level90	Level99	Population	Construction Establishments	Commercial Services Establishments	Manufacturing Establishments	Professional Services Establishments	Retail Establishments	Transportation Establishments	Wholesale Establishments	Total Establishments
Reinbeck	IA	5	**5**	2,644	5	34	7	29	23	10	9	117
Rock Rapids	IA	5	**5**	3,852	7	41	8	48	36	11	11	162
Rock Valley	IA	5	**5**	4,038	10	68	13	32	35	9	20	187
Rockwell City	IA	5	**5**	2,921	9	34	10	33	41	6	5	138
Sac City	IA	5	**5**	3,624	16	53	9	33	43	11	15	180
Sergeant Bluff	IA	4	**5**	4,512	12	40	10	26	27	11	8	134
Sheldon	IA	4	**3**	6,384	19	101	18	73	81	17	27	336
Shenandoah	IA	4	**4**	6,545	20	100	16	87	103	12	23	361
Sibley	IA	5	**5**	3,749	9	52	11	42	34	11	5	164
Sigourney	IA	5	**5**	3,020	13	58	9	34	41	7	13	175
Sioux Center	IA	4	**3**	6,981	29	102	22	66	65	18	34	336
Sioux City	IA	2	**1**	85,943	206	948	137	764	752	141	253	3,201
Solon	IA	4	**5**	4,761	14	42	9	23	20	3	8	119
Spencer	IA	3	**2**	13,411	39	208	29	188	175	40	53	732
Spirit Lake	IA	4	**3**	6,387	28	142	30	111	119	17	11	458
Storm Lake	IA	3	**3**	11,643	30	160	21	131	149	24	33	548
Story City	IA	5	**5**	3,953	11	51	14	34	67	5	11	193
Sumner	IA	5	**5**	3,804	11	58	10	40	36	8	17	180
Tama	IA	5	**5**	4,226	9	55	8	26	36	7	15	156
Tipton	IA	4	**4**	5,238	13	74	9	54	53	8	15	226
Toledo	IA	5	**5**	3,639	4	45	4	31	35	5	8	132
Vinton	IA	4	**4**	7,536	31	94	17	61	61	16	18	298
Wapello	IA	5	**5**	3,578	10	38	10	34	29	2	6	129
Washington	IA	4	**3**	8,444	36	144	19	94	113	21	33	460
Waterloo-Cedar Falls	IA	1	**1**	110,844	244	1,225	240	970	929	180	235	4,023
Waukee	IA	4	**4**	5,552	18	58	13	37	23	4	18	171
Waukon	IA	4	**4**	6,692	21	88	16	51	77	11	28	292
Waverly	IA	3	**3**	11,274	30	130	30	110	96	12	32	440
Webster City	IA	4	**3**	9,511	24	128	22	111	104	24	19	432
West Branch	IA	5	**5**	3,950	11	52	16	27	28	5	7	146
West Liberty	IA	5	**5**	4,193	12	39	9	32	36	7	16	151
West Union	IA	5	**4**	3,737	9	60	9	55	42	5	15	195
Williamsburg	IA	4	**4**	4,439	14	63	7	37	95	5	12	233
Wilton	IA	5	**5**	3,586	6	38	13	24	35	12	17	145
Winterset	IA	4	**4**	8,022	21	98	16	76	86	16	15	328

UMW Trade Centers Analysis - Minnesota

1999 Edition

City	State	Level90	Level99	Population	Establishments>> Construction Establishments	Commercial Services Establishments	Manufacturing Establishments	Professional Services Establishments	Retail Establishments	Transportation Establishments	Wholesale Establishments	Total Establishments
Ada	MN	4	5	2,418	10	69	6	34	22	10	9	160
Aitkin	MN	4	3	8,339	56	123	20	65	80	18	19	381
Albany	MN	5	4	4,800	18	64	11	28	36	9	17	183
Albert Lea	MN	2	2	20,936	51	321	59	205	210	37	61	944
Albertville	MN	6	5	3,528	10	31	9	17	16	6	6	95
Alexandria	MN	3	2	21,427	107	461	60	234	296	53	78	1,289
Annandale	MN	5	4	4,772	52	118	18	54	51	16	8	317
Appleton	MN	4	5	2,619	6	43	1	39	31	5	12	137
Arlington	MN	x	5	3,610	10	46	11	19	19	1	11	117
Aurora	MN	6	5	4,063	6	47	11	23	25	4	3	119
Austin	MN	3	2	26,140	61	414	41	201	249	37	54	1,057
Avon	MN	6	5	5,734	12	63	12	22	28	5	6	148
Bagley	MN	5	5	4,087	19	77	13	32	38	7	6	192
Barnesville	MN	5	5	3,476	9	63	5	28	27	9	7	148
Baudette	MN	5	5	3,934	6	86	11	36	48	6	7	200
Becker	MN	4	5	5,247	19	53	18	23	38	5	10	166
Bemidji	MN	2	2	29,166	102	538	80	237	312	59	68	1,396
Benson	MN	4	4	4,487	12	112	10	47	49	11	24	265
Big Lake	MN	5	4	9,818	44	95	15	47	43	19	22	285
Blooming Prairie	MN	5	4	3,780	14	62	16	40	33	10	8	183
Blue Earth	MN	4	4	4,885	22	114	19	71	64	23	25	338
Brainerd	MN	2	2	36,363	133	580	75	306	349	48	82	1,573
Breckenridge	MN	3	4	4,585	8	101	3	45	40	7	14	218
Buffalo	MN	3	2	15,819	67	225	36	123	115	27	39	632
Byron	MN	6	4	5,612	31	79	5	34	23	5	11	188
Caledonia	MN	4	4	4,934	15	96	8	34	46	8	13	220
Cambridge	MN	4	3	14,093	41	165	32	101	88	12	16	455
Canby	MN	4	5	3,404	9	72	4	31	39	9	13	177
Cannon Falls	MN	4	4	8,096	20	99	27	66	66	14	22	314
Cass Lake	MN	6	5	5,774	9	66	10	21	24	8	3	141
Chatfield	MN	5	5	3,853	21	62	11	26	26	6	11	163
Chisago City	MN	x	5	4,485	17	46	8	26	26	7	5	135
Chisholm	MN	6	4	6,538	20	81	14	28	46	6	8	203
Clara City	MN	5	5	2,062	9	43	11	26	16	7	8	120
Clearwater	MN	6	5	3,257	16	47	9	19	26	6	5	128
Cloquet	MN	3	3	15,457	34	223	30	87	125	20	19	538
Cokato	MN	5	4	4,764	13	68	29	45	34	7	19	215
Cold Spring	MN	5	4	6,751	31	104	18	31	47	6	8	245
Crookston	MN	3	3	10,521	18	169	22	90	88	16	28	431
Crosby	MN	5	5	2,480	10	62	14	29	37	3	3	158
Crosslake	MN	5	5	930	18	47	3	26	55	4	8	161
Dassel	MN	6	5	3,476	13	47	17	34	29	8	8	156
Dawson	MN	5	5	2,586	7	53	8	36	29	3	12	148
Deer River	MN	5	5	5,068	23	75	7	22	33	7	10	177

UMW Trade Centers Analysis - Minnesota

1999 Edition

City	State	Level90	Level99	Population	Establishments>> Construction Establishments	Commercial Services Establishments	Manufacturing Establishments	Professional Services Establishments	Retail Establishments	Transportation Establishments	Wholesale Establishments	Total Establishments
Deerwood	MN	4	**5**	1,785	25	35	11	14	24	10	9	128
Delano	MN	4	**4**	6,955	45	98	29	46	51	22	15	306
Detroit Lakes	MN	3	**2**	15,120	64	348	32	162	176	35	58	875
Dodge Center	MN	5	**5**	3,448	13	56	7	19	23	2	15	135
Duluth	MN	1	**1**	109,490	274	1,670	202	962	883	173	277	4,441
East Grand Forks	MN	3	**3**	9,585	34	169	21	65	69	19	34	411
Elk River	MN	3	**2**	25,661	92	335	77	160	160	40	47	911
Ely	MN	4	**3**	4,986	29	147	31	59	95	16	6	383
Esko	MN	6	**5**	4,319	17	41	6	14	12	5	10	105
Eveleth	MN	5	**4**	6,952	13	87	14	31	50	11	12	218
Fairmont	MN	3	**2**	12,809	36	242	40	167	161	36	53	735
Faribault	MN	3	**2**	24,572	72	372	53	202	228	39	53	1,019
Fergus Falls	MN	3	**2**	21,965	44	351	58	209	180	40	49	931
Foley	MN	6	**4**	7,262	16	70	10	34	33	12	19	194
Fosston	MN	4	**5**	2,756	13	72	7	23	29	5	11	160
Frazee	MN	6	**5**	4,931	24	55	6	20	26	5	4	140
Gaylord	MN	6	**5**	3,237	11	50	6	37	23	5	9	141
Glencoe	MN	4	**3**	7,653	24	112	19	81	62	18	24	340
Glenwood	MN	4	**4**	4,736	14	105	24	51	52	7	14	267
Grand Marais	MN	5	**4**	2,981	26	99	14	37	57	7	6	246
Grand Rapids	MN	3	**2**	19,388	58	387	46	203	228	43	48	1,013
Granite Falls	MN	4	**4**	4,160	21	86	12	51	55	10	13	248
Harmony	MN	5	**5**	2,053	10	43	5	22	24	4	7	115
Hawley	MN	6	**5**	4,023	14	63	9	30	25	5	8	154
Hibbing	MN	3	**2**	19,535	63	334	38	150	193	32	75	885
Hinckley	MN	6	**5**	3,846	16	54	6	28	37	5	8	154
Howard Lake	MN	6	**5**	3,791	11	43	17	29	25	5	15	145
Hutchinson	MN	3	**2**	16,187	81	301	50	196	219	26	44	917
International Falls	MN	3	**3**	12,350	25	138	19	76	118	18	16	410
Isanti	MN	5	**4**	10,695	33	69	34	42	28	15	14	235
Jackson	MN	4	**4**	5,286	16	107	8	57	47	15	15	265
Janesville	MN	5	**5**	3,620	11	62	5	25	24	8	12	147
Kasson	MN	5	**4**	6,087	22	107	17	61	33	12	11	263
Kenyon	MN	5	**5**	2,846	3	46	10	20	20	7	7	113
Kimball	MN	6	**5**	2,642	19	35	6	25	25	6	6	122
La Crescent	MN	4	**4**	7,525	22	126	10	49	41	6	16	270
Lake City	MN	4	**4**	6,189	26	96	19	51	68	14	16	290
Lake Crystal	MN	5	**5**	3,495	16	59	12	39	30	4	9	169
Lakefield	MN	5	**5**	3,033	13	53	4	24	30	4	17	145
Le Center	MN	5	**5**	3,589	13	63	15	31	24	14	10	170
Le Sueur	MN	4	**4**	5,955	16	93	18	61	46	11	13	258
Lindstrom	MN	x	**4**	5,573	21	79	13	34	61	3	8	219
Litchfield	MN	4	**3**	9,251	30	141	38	88	89	18	28	432
Little Falls	MN	3	**3**	14,641	33	221	31	105	124	34	28	576

UMW Trade Centers Analysis - Minnesota

1999 Edition

					Establishments>>							
City	State	Level90	Level99	Population	Construction Establishments	Commercial Services Establishments	Manufacturing Establishments	Professional Services Establishments	Retail Establishments	Transportation Establishments	Wholesale Establishments	Total Establishments
Long Prairie	MN	4	**4**	6,159	18	84	15	46	61	16	16	256
Luverne	MN	4	**4**	5,981	11	107	13	80	52	16	22	301
Madelia	MN	5	**4**	3,245	12	67	14	38	36	11	5	183
Madison	MN	4	**4**	3,305	11	67	6	41	44	5	15	189
Mahnomen	MN	5	**5**	2,628	9	58	5	27	26	3	13	141
Mankato	MN	2	**2**	51,218	120	831	143	533	478	104	156	2,365
Maple Lake	MN	6	**4**	4,589	34	63	23	25	32	8	7	192
Mapleton	MN	6	**5**	2,738	13	50	5	22	31	4	9	134
Marshall	MN	3	**2**	13,717	51	272	41	152	153	29	45	743
Melrose	MN	4	**4**	4,670	16	72	17	32	42	22	14	215
Milaca	MN	4	**4**	6,062	14	90	7	56	61	13	9	250
Montevideo	MN	3	**3**	8,361	27	165	25	83	91	31	22	444
Montgomery	MN	5	**5**	4,047	9	59	12	20	28	7	8	143
Monticello	MN	4	**3**	13,866	56	176	40	96	99	18	31	516
Moorhead	MN	2	**2**	35,892	76	459	35	239	241	44	73	1,167
Moose Lake	MN	4	**4**	3,521	12	69	8	32	42	10	9	182
Mora	MN	4	**3**	8,434	35	128	19	65	77	15	17	356
Morris	MN	4	**4**	6,653	23	135	14	91	67	13	23	366
Mountain Lake	MN	5	**5**	2,740	5	37	11	30	23	5	9	120
New London	MN	6	**5**	3,369	18	71	11	27	33	9	10	179
New Ulm	MN	3	**2**	16,098	41	305	49	155	156	43	50	799
Nisswa	MN	6	**4**	3,057	32	74	13	34	72	6	10	241
North Branch	MN	x	**4**	9,501	23	102	23	50	73	10	12	293
Northfield	MN	3	**2**	20,142	56	242	37	158	166	21	29	709
Olivia	MN	4	**4**	3,354	14	74	10	41	40	8	16	203
Ortonville	MN	4	**5**	2,406	12	57	7	46	40	7	10	179
Osakis	MN	5	**5**	3,103	14	71	15	28	37	7	9	181
Owatonna	MN	3	**2**	24,387	61	411	73	245	169	52	74	1,085
Park Rapids	MN	3	**3**	9,041	43	219	32	98	138	19	26	575
Paynesville	MN	4	**4**	5,183	24	104	30	57	66	13	23	317
Pelican Rapids	MN	5	**4**	3,794	26	91	10	51	52	15	13	258
Pequot Lakes	MN	5	**4**	2,336	33	86	14	44	57	14	7	255
Perham	MN	5	**4**	6,732	20	138	23	56	70	23	20	350
Pierz	MN	5	**5**	4,697	17	45	8	18	33	10	17	148
Pine City	MN	4	**4**	8,217	23	89	15	64	67	16	10	284
Pine Island	MN	5	**5**	4,630	16	76	12	32	29	5	10	180
Pine River	MN	5	**4**	5,889	25	76	13	25	43	6	15	203
Pipestone	MN	4	**4**	5,721	19	113	17	63	60	16	23	311
Plainview	MN	4	**4**	4,357	9	81	9	35	32	11	17	194
Preston	MN	5	**5**	2,620	5	56	11	28	28	1	9	138
Princeton	MN	4	**3**	11,419	48	130	46	84	86	16	27	437
Red Wing	MN	3	**2**	18,442	44	272	44	156	211	36	38	801
Redwood Falls	MN	4	**3**	7,015	20	142	14	73	87	22	23	381
Rice	MN	6	**4**	5,548	26	71	13	20	25	11	8	174

UMW Trade Centers Analysis - Minnesota

1999 Edition

					Establishments>>							
City	State	Level90	Level99	Population	Construction Establishments	Commercial Services Establishments	Manufacturing Establishments	Professional Services Establishments	Retail Establishments	Transportation Establishments	Wholesale Establishments	Total Establishments
Richmond	MN	6	**5**	2,941	26	68	6	14	26	5	6	151
Rochester	MN	2	**1**	92,456	245	1,364	122	859	787	136	192	3,705
Rockford	MN	5	**5**	5,099	20	62	9	25	29	6	6	157
Roseau	MN	4	**4**	5,606	13	105	12	59	66	15	18	288
Rush City	MN	5	**5**	3,628	15	57	11	26	23	11	7	150
Rushford	MN	5	**5**	3,045	6	53	8	27	22	5	8	129
Saint Charles	MN	4	**5**	3,876	10	64	10	33	26	8	14	165
Saint Cloud	MN	2	**1**	100,303	266	1,519	220	953	796	162	244	4,160
Saint James	MN	4	**4**	6,001	21	103	16	55	55	18	16	284
Saint Joseph	MN	5	**4**	8,269	17	90	25	23	23	10	9	197
Saint Michael	MN	5	**4**	6,419	37	78	22	40	43	8	19	247
Saint Peter	MN	4	**3**	12,595	29	147	19	75	62	14	17	363
Sandstone	MN	4	**5**	3,744	9	32	8	22	24	3	4	102
Sauk Centre	MN	4	**3**	6,819	25	126	24	60	74	28	33	370
Slayton	MN	4	**4**	3,273	14	81	5	49	47	14	9	219
Sleepy Eye	MN	4	**4**	5,711	31	107	22	62	42	15	17	296
Spicer	MN	6	**4**	4,100	29	91	7	40	47	13	9	236
Spring Valley	MN	4	**4**	4,122	16	65	7	46	41	5	18	198
Springfield	MN	4	**4**	3,254	19	66	7	36	39	12	13	192
Stacy	MN	6	**5**	7,007	24	48	13	21	19	6	4	135
Staples	MN	4	**4**	6,557	17	88	27	41	53	9	7	242
Starbuck	MN	6	**5**	2,885	7	35	9	24	35	8	10	128
Stewartville	MN	5	**4**	6,725	21	112	13	36	31	3	10	226
Thief River Falls	MN	3	**3**	12,451	25	189	29	100	127	26	40	536
Tracy	MN	4	**5**	2,779	13	49	4	34	35	9	14	158
Truman	MN	5	**5**	2,265	4	38	7	26	23	5	9	112
Twin Cities	MN	0	**0**	2,509,763	5,328	31,474	7,473	25,220	15,461	3,102	7,699	95,757
Two Harbors	MN	4	**4**	6,684	22	101	24	58	75	8	12	300
Tyler	MN	5	**5**	2,167	9	40	4	20	21	7	7	108
Virginia	MN	3	**3**	12,245	30	228	25	152	201	20	54	710
Wabasha	MN	4	**4**	3,334	9	81	11	35	40	9	5	190
Wadena	MN	4	**3**	6,208	21	149	22	58	88	24	22	384
Walker	MN	5	**4**	3,520	10	119	13	50	71	7	9	279
Warren	MN	5	**5**	3,222	7	51	3	31	23	6	9	130
Warroad	MN	5	**5**	5,439	6	80	11	36	39	4	4	180
Waseca	MN	3	**3**	12,202	29	200	32	104	76	34	28	503
Waterville	MN	5	**5**	2,637	16	67	5	18	37	3	8	154
Wells	MN	4	**4**	3,971	18	64	12	55	40	7	12	208
Wheaton	MN	5	**5**	2,551	6	54	7	41	30	5	12	155
Willmar	MN	2	**2**	22,897	49	468	44	247	237	43	79	1,167
Windom	MN	4	**4**	5,796	15	136	12	68	83	15	28	357
Winnebago	MN	5	**5**	1,977	12	46	9	30	16	8	12	133
Winona	MN	2	**2**	33,352	93	527	124	264	317	57	77	1,459
Winsted	MN	6	**5**	2,641	11	51	20	21	21	12	7	143

UMW Trade Centers Analysis - Minnesota

1999 Edition

					Establishments>>							
City	State	Level90	Level99	Population	Construction Establishments	Commercial Services Establishments	Manufacturing Establishments	Professional Services Establishments	Retail Establishments	Transportation Establishments	Wholesale Establishments	Total Establishments
Winthrop	MN	5	**5**	2,643	9	44	7	32	23	6	7	128
Worthington	MN	3	**2**	11,842	48	243	28	146	155	36	45	701
Zimmerman	MN	5	**4**	8,474	51	76	19	24	32	9	13	224
Zumbrota	MN	4	**4**	4,647	22	70	16	40	52	14	18	232

UMW Trade Centers Analysis - Montana

1999 Edition

					Total Establishments>>							
City	State	Level90	Level99	Population	Construction Establishments	Commercial Services Establishments	Manufacturing Establishments	Professional Services Establishments	Retail Establishments	Transportation Establishments	Wholesale Establishments	Total Establishments
Anaconda	MT	4	**3**	9,096	29	129	10	69	99	14	11	361
Baker	MT	x	**5**	2,507	12	43	5	21	26	14	11	132
Belgrade	MT	4	**3**	8,895	50	114	52	70	77	28	30	421
Big Timber	MT	5	**5**	2,786	18	50	13	38	42	7	11	179
Bigfork	MT	4	**3**	6,419	49	112	32	85	78	17	19	392
Billings	MT	1	**1**	109,250	434	1,774	273	1,379	1,103	271	550	5,784
Bozeman	MT	2	**2**	38,524	174	904	146	638	545	80	128	2,615
Browning	MT	4	**5**	6,140	4	35	4	18	24	7	3	95
Butte	MT	2	**2**	34,252	76	513	63	313	396	83	99	1,543
Columbia Falls	MT	3	**3**	11,020	40	110	34	63	89	19	13	368
Columbus	MT	5	**5**	3,184	12	57	8	30	41	4	11	163
Conrad	MT	5	**5**	3,354	12	75	8	53	47	7	20	222
Corvallis	MT	4	**5**	4,448	15	34	10	19	17	10	9	114
Cut Bank	MT	4	**4**	5,650	14	93	9	48	65	19	24	272
Deer Lodge	MT	4	**4**	5,668	13	61	10	39	47	6	13	189
Dillon	MT	4	**3**	7,643	30	137	20	81	87	19	26	400
Eureka	MT	5	**5**	3,908	14	52	24	34	54	12	11	201
Florence	MT	4	**4**	4,478	30	38	14	26	23	10	3	144
Forsyth	MT	5	**5**	2,718	9	49	3	32	29	4	10	136
Glasgow	MT	4	**4**	5,129	14	100	11	57	75	14	24	295
Glendive	MT	4	**3**	8,286	26	137	10	71	91	26	20	381
Great Falls	MT	2	**1**	72,735	182	1,013	113	724	730	149	251	3,162
Hamilton	MT	3	**2**	11,424	67	209	56	171	179	32	30	744
Hardin	MT	4	**4**	4,438	16	63	11	48	49	9	15	211
Havre	MT	3	**3**	13,766	34	217	15	121	137	35	42	601
Helena	MT	2	**2**	50,790	164	794	99	669	455	105	128	2,414
Kalispell	MT	2	**2**	33,392	211	709	124	446	435	110	134	2,169
Laurel	MT	4	**3**	9,474	26	108	18	61	68	17	25	323
Lewistown	MT	4	**3**	9,228	41	190	31	112	130	19	24	547
Libby	MT	3	**3**	9,870	43	157	43	87	111	27	23	491
Livingston	MT	3	**3**	11,737	53	232	33	128	167	24	24	661
Lolo	MT	4	**4**	5,946	25	50	11	22	32	7	14	161
Miles City	MT	3	**3**	11,440	37	212	18	108	129	29	34	567
Missoula	MT	2	**1**	70,747	256	1,284	201	900	807	180	252	3,880
Polson	MT	4	**3**	7,929	55	154	27	98	113	17	13	477
Red Lodge	MT	5	**4**	3,277	16	82	11	50	72	5	11	247
Ronan	MT	4	**4**	6,006	28	93	15	37	55	9	16	253
Roundup	MT	5	**4**	3,922	22	54	14	30	53	7	10	190
Shelby	MT	5	**4**	2,618	13	61	11	45	45	21	17	213
Sidney	MT	4	**3**	7,516	26	122	14	86	99	19	36	402
Stevensville	MT	4	**4**	7,417	36	89	42	63	56	12	20	318
Thompson Falls	MT	5	**5**	3,384	12	37	19	25	35	8	6	142
Troy	MT	5	**5**	3,308	10	29	9	10	32	2	5	97

UMW Trade Centers Analysis - Montana

1999 Edition

					Total Establishments>>							
City	State	Level90	Level99	Population	Construction Establishments	Commercial Services Establishments	Manufacturing Establishments	Professional Services Establishments	Retail Establishments	Transportation Establishments	Wholesale Establishments	Total Establishments
Victor	MT	5	**5**	3,668	25	34	16	18	35	4	8	140
Whitefish	MT	3	**3**	11,932	55	170	49	145	139	21	21	600
Whitehall	MT	5	**5**	3,179	15	45	6	25	19	5	17	132
Wolf Point	MT	4	**4**	4,649	8	59	5	49	53	8	10	192

UMW Trade Centers Analysis - Nebraska

1999 Edition

					Total Establishments>>							
City	State	Level90	Level99	Population	Construction Establishments	Commercial Services Establishments	Manufacturing Establishments	Professional Services Establishments	Retail Establishments	Transportation Establishments	Wholesale Establishments	Total Establishments
Ainsworth	NE	5	**5**	2,719	8	62	7	31	56	10	10	184
Albion	NE	5	**5**	3,106	9	56	9	29	40	6	14	163
Alliance	NE	3	**3**	11,369	29	155	30	99	107	18	31	469
Ashland	NE	5	**5**	3,550	14	48	11	25	33	6	8	145
Atkinson	NE	x	**5**	2,407	12	51	8	18	26	17	21	153
Auburn	NE	4	**4**	4,588	7	66	9	54	61	13	14	224
Aurora	NE	4	**4**	5,683	17	98	23	68	78	20	24	328
Beatrice	NE	3	**2**	14,583	31	210	48	131	203	36	44	703
Bellevue	NE	2	**2**	25,914	56	242	22	185	216	25	25	771
Blair	NE	3	**3**	11,109	35	154	26	99	120	31	29	494
Broken Bow	NE	4	**4**	5,205	15	105	17	67	73	6	24	307
Central City	NE	5	**5**	3,911	10	58	5	36	50	10	10	179
Chadron	NE	4	**4**	6,863	24	115	11	66	96	16	19	347
Columbus	NE	2	**2**	24,837	81	335	89	230	322	66	72	1,195
Cozad	NE	4	**4**	5,676	20	100	19	65	73	8	24	309
Crete	NE	4	**4**	6,406	18	83	14	38	71	7	10	241
Fairbury	NE	4	**4**	5,122	14	82	15	68	65	12	25	281
Falls City	NE	4	**4**	5,551	20	91	19	76	75	16	26	323
Fremont	NE	2	**2**	26,002	60	357	69	247	294	66	73	1,166
Geneva	NE	5	**5**	2,649	12	61	6	32	32	9	15	167
Gibbon	NE	5	**5**	2,604	6	27	10	17	15	10	14	99
Gordon	NE	5	**5**	3,051	6	48	6	34	47	7	11	159
Gothenburg	NE	4	**4**	4,779	21	75	16	53	51	17	31	264
Grand Island	NE	2	**2**	45,431	143	584	108	424	524	123	172	2,078
Gretna	NE	5	**4**	4,258	17	62	12	32	71	16	9	219
Hastings	NE	2	**2**	25,673	81	368	68	235	289	47	85	1,173
Holdrege	NE	4	**3**	7,263	21	113	15	78	100	22	27	376
Imperial	NE	x	**5**	2,493	7	49	10	34	44	9	18	171
Kearney	NE	2	**2**	28,432	96	446	64	345	366	52	93	1,462
Kimball	NE	5	**4**	3,183	10	67	17	42	57	8	17	218
Lexington	NE	3	**3**	11,158	22	159	30	98	109	22	26	466
Lincoln	NE	1	**0**	220,508	543	2,364	418	1,927	1,685	279	481	7,697
Madison	NE	5	**5**	3,667	5	37	6	18	24	7	8	105
Mc Cook	NE	4	**3**	9,304	31	175	21	111	144	25	48	555
Milford	NE	5	**5**	3,361	14	32	7	21	21	5	7	107
Minden	NE	5	**4**	4,076	13	70	15	41	46	12	17	214
Mitchell	NE	5	**5**	3,694	15	37	10	24	37	11	14	148
Nebraska City	NE	4	**3**	8,187	29	127	23	76	107	27	17	406
Norfolk	NE	2	**2**	27,758	94	382	76	277	329	70	98	1,326
North Platte	NE	2	**2**	27,272	94	393	32	262	325	57	69	1,232
Ogallala	NE	4	**3**	6,555	21	144	17	98	106	22	22	430
Omaha	NE	0	**0**	498,241	1,182	5,174	934	4,474	3,374	727	1,461	17,326
Oneill	NE	4	**4**	5,949	18	102	15	64	89	23	34	345

UMW Trade Centers Analysis - Nebraska

1999 Edition

					Total Establishments>>							
City	State	Level90	Level99	Population	Construction Establishments	Commercial Services Establishments	Manufacturing Establishments	Professional Services Establishments	Retail Establishments	Transportation Establishments	Wholesale Establishments	Total Establishments
Papillion	NE	3	**3**	19,953	40	197	22	121	103	22	26	531
Pierce	NE	5	**5**	2,957	10	44	8	16	23	9	8	118
Plattsmouth	NE	3	**4**	11,167	25	94	18	69	66	16	17	305
Saint Paul	NE	5	**5**	3,279	7	42	4	31	36	3	7	130
Schuyler	NE	4	**4**	6,184	13	70	10	39	58	17	17	224
Seward	NE	4	**4**	7,622	28	97	14	80	73	23	24	339
Sidney	NE	4	**3**	7,137	28	131	20	83	100	28	30	420
South Sioux City	NE	3	**3**	13,550	46	149	35	99	113	30	38	510
Stanton	NE	4	**5**	4,451	8	26	4	16	19	12	6	91
Superior	NE	5	**5**	2,609	5	68	5	37	43	19	12	189
Valentine	NE	4	**4**	4,432	23	95	11	51	76	16	24	296
Wahoo	NE	4	**4**	4,661	18	73	15	50	61	11	12	240
Wayne	NE	4	**4**	6,393	19	84	19	63	72	18	18	293
West Point	NE	4	**4**	5,721	14	75	18	49	69	15	21	261
York	NE	3	**3**	9,777	35	148	29	118	132	31	31	524

UMW Trade Centers Analysis - North Dakota

1999 Edition

					Total Establishments>>							
City	State	Level90	Level99	Population	Construction Establishments	Commercial Services Establishments	Manufacturing Establishments	Professional Services Establishments	Retail Establishments	Transportation Establishments	Wholesale Establishments	Total Establishments
Belcourt	ND	4	**5**	5,913	6	28	3	8	15	4	4	68
Beulah	ND	5	**5**	4,021	12	42	5	37	44	6	6	152
Bismarck-Mandan	ND	2	**1**	82,531	289	1,150	133	872	746	205	273	3,668
Carrington	ND	5	**5**	3,133	12	54	10	33	49	10	28	196
Devils Lake	ND	3	**3**	10,275	27	172	25	95	123	19	22	483
Dickinson	ND	3	**2**	18,922	81	307	40	203	226	55	84	996
Fargo	ND	1	**1**	100,634	327	1,445	253	1,143	834	271	485	4,758
Grafton	ND	4	**4**	6,264	13	95	9	70	65	15	25	292
Grand Forks	ND	2	**2**	62,685	177	673	79	524	542	119	147	2,261
Hazen	ND	5	**5**	3,854	13	49	8	25	32	8	9	144
Hettinger	ND	x	**5**	2,202	4	38	7	31	30	9	15	134
Jamestown	ND	3	**2**	17,581	62	268	29	149	204	37	65	814
Lisbon	ND	5	**5**	3,527	7	50	4	36	36	3	7	143
Minot	ND	2	**2**	53,021	155	721	72	429	486	113	127	2,103
New Town	ND	5	**5**	2,950	7	32	5	15	26	1	6	92
Oakes	ND	5	**5**	2,767	12	47	6	30	35	8	20	158
Rugby	ND	5	**4**	4,069	13	54	6	38	42	11	20	184
Valley City	ND	4	**3**	8,558	24	148	19	90	110	20	35	446
Wahpeton	ND	3	**3**	10,132	35	147	29	104	94	20	44	473
Williston	ND	3	**2**	16,083	66	273	43	190	195	40	91	898

UMW Trade Centers Analysis - South Dakota 1999 Edition

					Total Establishments>>							
City	State	Level90	Level99	Population	Construction Establishments	Commercial Services Establishments	Manufacturing Establishments	Professional Services Establishments	Retail Establishments	Transportation Establishments	Wholesale Establishments	Total Establishments
Aberdeen	SD	2	2	29,410	90	434	58	300	310	61	100	1,353
Belle Fourche	SD	4	4	6,795	23	97	15	64	72	22	29	322
Beresford	SD	5	5	3,009	6	46	10	38	31	5	9	145
Black Hawk	SD	4	5	5,200	30	44	5	22	33	8	7	149
Box Elder	SD	4	5	4,426	6	34	5	17	31	7	5	105
Brandon	SD	4	4	6,691	29	66	10	44	32	15	12	208
Britton	SD	5	5	2,682	7	29	7	30	18	5	11	107
Brookings	SD	3	2	20,100	41	250	35	199	187	34	40	786
Canton	SD	5	5	3,916	17	42	12	36	42	9	11	169
Chamberlain	SD	5	5	3,369	9	84	4	48	53	9	12	219
Custer	SD	4	4	5,088	14	92	28	49	66	10	6	265
Dell Rapids	SD	5	5	4,008	21	59	8	28	39	8	9	172
Flandreau	SD	5	5	3,824	8	38	7	30	33	5	7	128
Hartford	SD	5	5	4,316	16	23	7	22	19	13	8	108
Hot Springs	SD	4	4	5,400	15	95	10	67	65	6	8	266
Huron	SD	3	2	15,410	42	228	32	171	181	34	45	733
Lead	SD	4	5	4,526	9	57	8	30	33	4	6	147
Lennox	SD	5	5	3,062	11	39	7	26	20	3	4	110
Madison	SD	4	3	8,206	23	115	27	84	85	23	25	382
Milbank	SD	4	4	4,765	15	80	12	60	59	19	18	263
Miller	SD	5	5	2,643	10	49	2	25	38	4	11	139
Mitchell	SD	3	2	16,661	46	244	48	182	208	40	54	822
Mobridge	SD	5	4	3,986	13	67	6	53	72	16	17	244
North Sioux City	SD	4	4	4,991	11	61	16	46	33	9	10	186
Pierre	SD	3	2	14,811	48	251	19	239	174	33	41	805
Platte	SD	5	5	2,610	7	42	6	41	39	7	13	155
Rapid City	SD	2	1	76,552	223	1,093	146	854	771	131	230	3,448
Redfield	SD	5	5	4,036	7	54	4	43	45	16	11	180
Sioux Falls	SD	1	1	121,065	341	1,584	205	1,358	1,055	305	444	5,292
Sisseton	SD	4	4	5,181	9	61	10	53	43	6	15	197
Spearfish	SD	3	3	12,745	36	181	35	116	159	23	17	567
Sturgis	SD	4	3	8,931	36	131	24	85	83	21	23	403
Vermillion	SD	3	3	12,326	22	101	15	85	84	19	11	337
Wagner	SD	5	5	3,461	3	34	3	18	29	11	10	108
Watertown	SD	2	2	23,468	77	308	70	250	259	55	101	1,120
Webster	SD	5	5	3,588	8	51	13	38	32	8	11	161
Winner	SD	4	4	4,977	15	74	4	58	60	13	17	241
Yankton	SD	3	2	17,293	58	233	48	174	222	37	54	826

UMW Trade Centers Analysis - Wisconsin

1999 Edition

					Total Establishments>>								
City	State	Level90	Level99	Population	Construction Establishments	Commercial Services Establishments	Manufacturing Establishments	Professional Services Establishments	Retail Establishments	Transportation Establishments	Wholesale Establishments	Total Establishments
Abbotsford	WI	5	**5**	3,397	8	37	14	23	48	6	12	148
Adams	WI	5	**5**	3,736	10	39	8	35	33	5	3	133
Algoma	WI	4	**4**	5,530	16	72	16	30	67	9	14	224
Amery	WI	4	**4**	6,219	30	85	32	76	76	19	14	332
Amherst	WI	5	**5**	2,956	14	40	7	19	38	11	8	137
Antigo	WI	3	**3**	14,121	40	156	42	85	155	37	48	563
Appleton	WI	1	**1**	155,863	360	1,771	444	1,350	1,301	236	427	5,889
Arcadia	WI	4	**4**	4,646	13	40	8	22	53	9	9	154
Ashland	WI	3	**3**	13,287	26	169	34	112	162	29	16	548
Athens	WI	4	**4**	4,709	15	30	11	14	28	10	9	117
Augusta	WI	5	**5**	3,151	7	25	11	26	28	3	4	104
Baldwin	WI	5	**4**	4,363	22	65	13	30	42	7	21	200
Baraboo	WI	3	**2**	16,752	53	227	45	159	185	43	39	751
Barron	WI	4	**4**	5,909	11	78	10	44	35	10	14	202
Bayfield	WI	5	**5**	2,868	9	43	6	20	36	9	5	128
Beaver Dam	WI	3	**2**	19,348	58	243	44	145	211	25	29	755
Belleville	WI	5	**5**	4,303	12	35	10	21	19	4	10	111
Beloit	WI	2	**2**	47,134	87	395	95	275	277	38	47	1,214
Berlin	WI	4	**3**	9,346	32	105	41	56	87	13	24	358
Big Bend	WI	4	**4**	4,693	25	38	29	27	26	14	9	168
Birnamwood	WI	5	**5**	3,031	12	20	5	10	24	5	5	81
Black Creek	WI	5	**5**	4,088	22	25	11	14	31	10	9	122
Black River Falls	WI	4	**3**	8,430	15	111	22	77	92	16	14	347
Bloomer	WI	4	**4**	6,631	33	80	20	48	60	22	13	276
Bonduel	WI	5	**5**	3,465	7	24	6	14	35	13	10	109
Boscobel	WI	4	**4**	4,925	18	57	10	31	47	8	12	183
Brillion	WI	4	**5**	4,983	9	47	11	36	33	6	9	151
Bristol	WI	4	**4**	5,148	20	48	33	21	17	12	10	161
Brodhead	WI	4	**4**	6,149	21	56	18	35	55	9	16	210
Brookfield	WI	3	**2**	19,456	87	533	103	670	349	51	210	2,003
Burlington	WI	2	**2**	24,183	85	289	71	170	175	46	52	888
Cadott	WI	4	**5**	4,636	14	42	7	14	20	1	14	112
Caledonia	WI	5	**5**	3,802	13	22	10	11	26	9	10	101
Cambridge	WI	5	**4**	4,382	18	51	10	37	67	10	8	201
Cameron	WI	5	**5**	3,799	15	47	12	14	28	9	6	131
Campbellsport	WI	4	**4**	6,371	30	75	11	30	47	13	12	218
Cedar Grove	WI	5	**5**	3,405	11	17	8	14	17	11	6	84
Cedarburg	WI	3	**2**	17,336	42	185	69	132	157	20	50	655
Chetek	WI	4	**4**	5,057	27	89	19	44	46	13	8	246
Chilton	WI	4	**4**	7,367	21	107	23	62	53	9	21	296
Clear Lake	WI	5	**5**	3,058	12	34	10	23	21	6	8	114
Clinton	WI	4	**5**	4,474	12	44	9	22	33	4	11	135
Clintonville	WI	4	**3**	9,481	27	81	26	59	89	25	25	332
Colby	WI	5	**5**	3,318	6	32	6	9	24	4	8	89
Colfax	WI	5	**5**	4,391	8	40	5	19	25	6	5	108

UMW Trade Centers Analysis - Wisconsin

1999 Edition

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City	State	Level90	Level99	Population	Construction Establishments	Commercial Services Establishments	Manufacturing Establishments	Professional Services Establishments	Retail Establishments	Transportation Establishments	Wholesale Establishments	Total Establishments
Colgate	WI	4	5	4,984	22	18	8	19	15	6	4	92
Columbus	WI	4	4	7,761	28	81	34	43	54	14	23	277
Cornell	WI	5	5	2,841	5	27	14	19	23	4	5	97
Cottage Grove	WI	4	4	6,625	27	53	12	26	34	9	18	179
Crandon	WI	5	5	3,975	14	59	20	35	45	10	2	185
Cross Plains	WI	4	4	5,086	17	50	10	38	35	4	11	165
Cuba City	WI	5	5	4,153	16	39	5	31	32	10	16	149
Cudahy	WI	3	3	19,188	33	158	58	73	129	51	31	533
Cumberland	WI	4	4	5,081	18	65	18	43	60	13	5	222
Darlington	WI	5	4	4,157	14	56	10	41	39	15	19	194
De Forest	WI	3	3	10,993	36	92	19	61	47	19	30	304
Deerfield	WI	5	5	3,643	14	39	13	16	16	14	4	116
Delafield	WI	4	4	6,616	23	90	15	66	81	8	23	306
Delavan	WI	3	2	12,892	50	152	49	111	149	30	41	582
Denmark	WI	4	4	5,895	20	46	15	24	41	9	19	174
Dodgeville	WI	4	4	5,611	21	112	18	68	77	16	20	332
Dousman	WI	4	4	7,385	29	48	16	29	27	6	13	168
Durand	WI	5	4	3,822	14	62	9	29	47	15	10	186
Eagle	WI	4	5	4,823	18	42	9	17	16	5	5	112
Eagle River	WI	4	3	8,661	45	201	33	67	156	18	24	544
East Troy	WI	4	4	8,956	37	80	27	49	45	13	18	269
Eau Claire-Chippewa Falls	WI	1	1	106,671	271	1,210	244	871	910	152	273	3,931
Edgerton	WI	3	4	10,270	17	92	18	50	78	14	18	287
Elkhart Lake	WI	5	5	3,781	11	34	15	15	17	4	7	103
Elkhorn	WI	3	2	14,233	63	194	53	138	115	33	41	637
Ellsworth	WI	4	4	5,687	19	68	8	37	36	9	12	189
Elm Grove	WI	4	4	6,933	9	134	8	174	59	8	42	434
Elroy	WI	5	5	3,217	6	31	10	17	20	9	8	101
Evansville	WI	4	4	6,976	17	62	11	39	39	11	7	186
Fall Creek	WI	5	5	3,945	8	27	5	19	25	5	6	95
Fennimore	WI	5	5	3,561	14	57	6	32	47	9	16	181
Florence	WI	5	5	3,428	7	35	7	22	29	6	3	109
Fond Du Lac	WI	2	2	57,076	119	578	125	402	439	88	107	1,858
Fort Atkinson	WI	3	2	16,051	45	190	45	121	119	36	29	585
Franksville	WI	4	4	6,098	46	56	33	41	35	22	20	253
Frederic	WI	5	5	3,610	18	50	13	23	44	4	9	161
Fredonia	WI	4	4	4,464	14	35	24	27	16	8	11	135
Fremont	WI	5	5	3,542	16	38	7	19	34	9	8	131
Friendship	WI	5	5	4,041	9	38	12	18	35	5	1	118
Galesville	WI	5	5	3,335	12	33	10	19	23	6	12	115
Genoa City	WI	5	5	4,045	17	27	20	12	23	8	9	116
Germantown	WI	3	3	16,600	62	123	122	108	75	25	75	590
Gillett	WI	5	5	4,374	9	37	8	19	24	5	4	106
Grafton	WI	3	3	14,070	39	137	71	104	77	13	49	490
Grantsburg	WI	4	4	5,064	19	56	18	22	46	9	9	179

UMW Trade Centers Analysis - Wisconsin

1999 Edition

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Green Bay	WI	1	**0**	194,081	537	1,992	524	1,386	1,543	365	615	6,962
Green Lake	WI	5	**5**	2,839	16	52	16	32	39	10	8	173
Greendale	WI	3	**3**	15,343	20	101	33	94	137	7	28	420
Greenleaf	WI	5	**5**	3,612	17	19	5	14	17	8	10	90
Greenville	WI	5	**5**	3,865	24	34	17	37	21	1	16	150
Hales Corners	WI	4	**3**	7,987	17	173	13	106	89	14	23	435
Hartford	WI	3	**3**	17,702	55	170	60	106	132	24	34	581
Hartland	WI	3	**2**	16,565	41	192	79	162	79	23	63	639
Hayward	WI	3	**3**	10,698	49	232	47	92	188	22	19	649
Hillsboro	WI	5	**5**	3,695	9	38	12	23	24	13	13	132
Holmen	WI	4	**4**	8,966	27	72	17	43	39	15	14	227
Horicon	WI	4	**4**	4,894	14	44	14	33	32	15	18	170
Hortonville	WI	4	**4**	6,499	23	51	14	36	39	9	11	183
Hubertus	WI	4	**5**	5,022	19	41	9	25	35	4	10	143
Hudson	WI	2	**2**	20,485	48	247	71	207	151	41	48	813
Hurley	WI	5	**5**	3,142	9	37	10	33	45	7	8	149
Independence	WI	5	**5**	2,702	8	27	7	9	22	10	6	89
Jackson	WI	4	**4**	7,479	23	57	26	23	39	13	12	193
Janesville	WI	2	**2**	68,736	167	706	162	503	500	96	127	2,261
Jefferson	WI	4	**3**	9,522	29	89	30	69	75	13	21	326
Juneau	WI	4	**5**	4,586	7	39	16	18	29	7	6	122
Kaukauna	WI	2	**2**	21,099	67	160	43	77	120	33	48	548
Kewaskum	WI	4	**4**	7,693	22	65	18	26	40	19	11	201
Kewaunee	WI	4	**4**	5,853	21	73	15	27	54	15	5	210
Kiel	WI	4	**4**	5,597	19	64	26	35	53	8	12	217
Kimberly	WI	4	**5**	5,772	8	44	15	27	31	4	9	138
La Crosse	WI	2	**1**	82,039	229	1,012	188	730	797	134	195	3,285
Ladysmith	WI	4	**4**	7,762	16	94	18	43	69	18	12	270
Lake Geneva	WI	3	**2**	13,062	59	239	42	169	193	27	46	775
Lake Mills	WI	4	**4**	7,090	17	80	27	47	53	8	22	254
Lancaster	WI	4	**4**	6,168	19	80	19	59	53	19	19	268
Little Chute	WI	4	**4**	8,457	27	64	22	41	63	8	13	238
Lodi	WI	4	**4**	6,749	27	85	18	47	44	9	13	243
Lomira	WI	5	**5**	2,920	11	27	13	15	23	8	10	107
Loyal	WI	5	**5**	3,233	7	22	12	19	22	2	7	91
Luxemburg	WI	4	**4**	6,258	20	51	13	23	55	11	11	184
Madison	WI	1	**0**	262,295	465	3,383	616	3,036	1,938	342	663	10,443
Manawa	WI	5	**5**	3,512	15	38	8	27	29	6	16	139
Manitowoc	WI	2	**2**	55,766	124	555	149	354	439	90	111	1,822
Marathon	WI	5	**5**	4,332	3	35	13	11	33	12	15	122
Marinette	WI	2	**2**	20,936	43	182	48	128	185	36	36	658
Marion	WI	5	**5**	3,203	10	27	9	23	24	5	14	112
Markesan	WI	5	**5**	3,917	14	32	13	16	21	7	8	111
Marshall	WI	4	**5**	5,268	13	33	7	22	28	3	9	115
Marshfield	WI	2	**2**	27,454	67	305	84	181	271	49	41	998

UMW Trade Centers Analysis - Wisconsin

1999 Edition

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Mauston	WI	4	**4**	8,923	13	91	25	57	83	17	14	300
Mayville	WI	4	**4**	7,085	19	64	25	32	51	12	10	213
Medford	WI	3	**3**	10,411	30	137	39	76	129	30	31	472
Menomonee Falls	WI	2	**2**	30,229	131	367	257	277	242	54	198	1,526
Menomonie	WI	2	**2**	23,557	41	223	39	151	168	35	45	702
Merrill	WI	2	**3**	21,645	47	161	57	106	152	36	24	583
Milton	WI	4	**4**	9,066	41	96	20	46	73	15	17	308
Milwaukee	WI	0	**0**	986,439	1,513	9,661	2,328	7,857	6,201	1,200	2,363	31,123
Mineral Point	WI	4	**4**	4,745	16	69	13	32	66	7	13	216
Minocqua	WI	5	**3**	4,283	45	149	25	83	179	12	12	505
Mondovi	WI	4	**4**	6,466	20	77	11	44	49	13	18	232
Monroe	WI	3	**2**	14,412	53	217	51	158	169	36	52	736
Montello	WI	4	**4**	5,825	15	70	13	22	49	5	9	183
Mount Horeb	WI	4	**4**	7,280	31	88	15	59	60	12	15	280
Mukwonago	WI	3	**3**	17,159	64	157	39	92	109	21	24	506
Muscoda	WI	5	**5**	3,213	8	29	13	13	28	4	7	102
Neillsville	WI	4	**4**	5,747	30	83	14	44	50	15	18	254
New Berlin	WI	2	**2**	28,439	99	261	164	222	162	43	176	1,127
New Berlin	WI	4	**4**	7,320	54	65	25	49	29	13	30	265
New Glarus	WI	5	**5**	3,176	9	42	7	26	36	4	5	129
New Holstein	WI	4	**4**	5,810	13	55	19	34	41	12	8	182
New Lisbon	WI	5	**5**	3,618	10	41	10	22	34	6	9	132
New London	WI	3	**3**	13,724	34	129	32	79	122	16	25	437
New Richmond	WI	3	**3**	10,980	39	143	47	87	110	24	33	483
Niagara	WI	4	**5**	5,693	15	25	10	16	25	12	3	106
Oconomowoc	WI	2	**2**	27,117	98	319	87	220	215	32	70	1,041
Oconto	WI	4	**4**	7,979	18	76	22	40	55	14	9	234
Oconto Falls	WI	4	**4**	5,185	18	56	17	35	48	12	8	194
Omro	WI	4	**4**	5,405	13	55	12	20	38	8	10	156
Oneida	WI	4	**5**	4,835	10	34	10	11	13	6	8	92
Oostburg	WI	5	**5**	4,291	23	35	14	19	20	5	12	128
Oregon	WI	3	**3**	12,185	45	96	26	68	56	16	20	327
Osceola	WI	4	**4**	6,138	16	60	25	32	48	4	14	199
Oshkosh	WI	2	**2**	75,054	152	692	175	540	593	96	153	2,401
Osseo	WI	5	**5**	4,285	10	43	16	25	42	7	13	156
Pardeeville	WI	4	**4**	5,939	20	41	10	23	41	8	17	160
Park Falls	WI	4	**4**	4,963	16	69	18	32	69	8	8	220
Peshtigo	WI	4	**4**	6,803	8	46	22	24	43	14	10	167
Pewaukee	WI	3	**2**	18,444	73	179	71	152	131	39	91	736
Phillips	WI	4	**4**	5,195	23	82	22	57	69	6	14	273
Platteville	WI	3	**3**	16,173	37	145	22	104	115	16	25	464
Plymouth	WI	3	**3**	13,445	41	158	38	118	116	25	29	525
Port Washington	WI	3	**3**	12,870	23	131	41	95	93	22	18	423
Portage	WI	3	**3**	14,011	53	173	43	117	145	30	32	593
Poynette	WI	4	**4**	4,790	13	52	15	22	38	7	15	162

UMW Trade Centers Analysis - Wisconsin

1999 Edition

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Prairie Du Chien	WI	4	**3**	8,372	22	127	25	73	120	15	12	394
Prairie Du Sac	WI	4	**4**	4,575	17	60	13	24	25	5	11	155
Prescott	WI	4	**4**	5,270	13	55	14	35	40	6	9	172
Princeton	WI	5	**5**	2,720	16	36	13	21	44	2	10	142
Pulaski	WI	4	**4**	7,866	23	55	14	25	43	8	18	186
Racine-Kenosha	WI	1	**0**	241,929	454	1,921	588	1,448	1,645	244	331	6,631
Randolph	WI	5	**5**	3,351	14	27	10	29	28	5	11	124
Random Lake	WI	5	**5**	3,613	10	24	15	21	24	8	7	109
Reedsburg	WI	3	**3**	10,960	33	134	32	84	102	28	23	436
Reedsville	WI	5	**5**	4,116	17	26	6	11	20	5	8	93
Rhinelander	WI	2	**2**	24,025	77	299	46	174	249	38	40	923
Rice Lake	WI	3	**2**	15,915	49	228	45	129	182	29	47	709
Richfield	WI	5	**5**	3,552	25	29	24	22	19	10	15	144
Richland Center	WI	3	**3**	9,862	26	134	28	106	118	16	30	458
Rio	WI	5	**5**	2,945	14	18	5	19	15	4	8	83
Ripon	WI	3	**3**	10,675	31	150	32	98	83	21	27	442
River Falls	WI	3	**3**	17,678	47	208	41	113	117	20	29	575
Saint Croix Falls	WI	4	**4**	5,166	16	67	23	51	61	10	11	239
Saint Francis	WI	4	**4**	8,963	16	57	27	32	39	12	13	196
Salem	WI	4	**4**	7,528	22	57	11	27	40	13	11	181
Sauk City	WI	4	**4**	5,274	14	61	17	41	55	7	12	207
Saukville	WI	4	**4**	6,127	16	49	21	25	31	10	10	162
Seymour	WI	4	**4**	7,509	26	58	18	31	33	13	12	191
Shawano	WI	3	**2**	16,631	61	192	40	124	196	33	40	686
Sheboygan	WI	2	**2**	70,664	155	714	199	462	526	94	134	2,284
Shell Lake	WI	5	**5**	3,775	9	34	10	12	20	9	6	100
Siren	WI	5	**5**	2,869	14	56	10	35	50	6	5	176
Slinger	WI	4	**4**	6,670	32	74	30	31	49	19	17	252
Somerset	WI	5	**4**	4,364	25	57	23	28	29	12	7	181
South Milwaukee	WI	2	**3**	21,728	31	138	28	77	97	15	19	405
Sparta	WI	3	**3**	15,215	48	163	42	109	128	30	34	554
Spencer	WI	5	**5**	4,280	12	22	17	14	26	5	6	102
Spooner	WI	4	**4**	7,229	26	119	17	64	89	14	20	349
Spring Green	WI	5	**5**	3,831	16	69	12	30	52	11	11	201
Stanley	WI	5	**5**	3,840	5	42	15	26	32	6	6	132
Stevens Point	WI	2	**2**	50,486	119	514	93	325	400	93	96	1,640
Stoughton	WI	3	**3**	17,349	61	176	41	80	107	18	22	505
Stratford	WI	5	**5**	4,355	13	38	12	18	24	3	14	122
Sturgeon Bay	WI	3	**2**	17,996	69	283	65	159	209	31	48	864
Sun Prairie	WI	2	**2**	23,243	78	205	51	153	135	36	71	729
Superior	WI	2	**2**	32,646	59	334	70	220	293	66	67	1,109
Sussex	WI	3	**3**	15,512	54	90	59	67	59	17	27	373
Thorp	WI	4	**5**	4,616	17	40	12	23	43	13	7	155
Tomah	WI	3	**3**	13,950	36	142	26	84	132	31	25	476
Tomahawk	WI	4	**3**	8,178	37	130	26	51	138	21	17	420

UMW Trade Centers Analysis - Wisconsin

1999 Edition

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Twin Lakes	WI	4	**4**	5,768	28	59	15	42	46	5	10	205
Union Grove	WI	4	**4**	8,291	35	72	24	47	54	17	26	275
Verona	WI	3	**3**	11,444	59	142	23	79	61	16	33	413
Viroqua	WI	4	**4**	8,378	28	92	15	73	80	12	18	318
Walworth	WI	5	**4**	4,306	17	60	27	27	50	9	11	201
Washburn	WI	4	**5**	4,605	15	52	8	19	25	6	7	132
Waterford	WI	3	**3**	13,977	69	103	26	75	86	30	25	414
Waterloo	WI	4	**5**	4,726	11	32	20	26	29	10	12	140
Watertown	WI	3	**2**	16,675	50	184	65	111	167	21	37	635
Watertown	WI	3	**4**	10,579	22	83	13	33	21	10	18	200
Waunakee	WI	3	**3**	12,090	78	122	40	78	60	15	25	418
Waupaca	WI	3	**3**	13,521	50	197	43	100	153	25	26	594
Waupun	WI	3	**3**	12,778	23	109	21	67	67	19	24	330
Wausau	WI	2	**1**	86,202	225	928	215	674	742	181	262	3,227
Wautoma	WI	4	**4**	5,890	22	95	18	53	72	11	11	282
Webster	WI	5	**5**	3,110	20	48	11	29	50	6	6	170
West Bend	WI	2	**2**	35,153	66	265	75	230	221	43	63	963
West Bend	WI	4	**3**	7,843	52	97	44	56	59	23	32	363
West Salem	WI	4	**4**	6,266	15	58	8	47	38	11	18	195
Westby	WI	5	**5**	4,192	14	40	7	34	23	8	8	134
Weyauwega	WI	4	**4**	4,755	22	41	11	19	34	7	11	145
Whitehall	WI	5	**5**	3,222	5	33	7	17	24	8	9	103
Whitewater	WI	3	**3**	19,006	29	119	28	106	102	23	28	435
Winneconne	WI	5	**5**	3,753	19	45	16	20	28	8	4	140
Wisconsin Dells	WI	4	**3**	7,446	38	255	23	82	156	16	16	586
Wisconsin Rapids	WI	2	**2**	44,803	127	466	88	303	399	84	97	1,564
Wittenberg	WI	5	**5**	3,211	10	42	10	22	34	9	7	134
Woodruff	WI	4	**4**	5,914	35	72	15	42	63	9	9	245

APPENDIX B

OUTREACH COMMITTEES AND MEETINGS

POLICY COMMITTEE

Elwyn Tinklenberg, Commissioner of Transportation

Dean Barkley, Minnesota Planning Director

Alan Garber, Commissioner of Natural Resources

Gerald Carlson, Commissioner of Trade and Economic Development

Ted Mondale, Chairman of the Metropolitan Council

STEERING COMMITTEE

Randall K Halvorson, Mn/DOT Assistant Commissioner, Committee Chairman

Patrick Hughes, Mn/DOT Assistant Commissioner

Doug Weiszhaar, Mn/DOT Deputy Commissioner/Chief Engineer

Margo LaBau, Mn/DOT Commissioner's Chief of Staff

Dave Ekern, Mn/DOT Assistant Commissioner

Julie Skallman, Mn/DOT Assistant Commissioner Local Governments

Natilio Diaz, Metropolitan Council Transportation Planning Director

Craig Rapp, Metropolitan Council Director of Community Development

Kurt Ulrich, DNR Assistant Commissioner

Debra Pile, Minnesota Planning

TECHNICAL ADVISORY COMMITTEE

Cecil Selness, Mn/DOT, Director of Special Studies, Chairman

Dick Bautch, Mn/DOT District 7

Scott Bradley, Mn/DOT Office of Environmental Services

Rick Dalton, Mn/DOT Office of Technical Support

Norman Foster, Mn/DOT Office of Investment Management

Cathy Gillaspy, Mn/DOT Office of Investment Management

Tim Henkel, Mn/DOT Metro Division

Terry Humbert, Mn/DOT District 3B – St. Cloud

Abby McKenzie, Mn/DOT Office of Investment Management

Peggy Reichert, Mn/DOT Office of Access Management

Otto Schmid, Mn/DOT Metro Division

Keith Shannon, Mn/DOT Bridge Office

Linda Zemotel, Mn/DOT Office of Investment Management

Patrick Weidemann, Mn/DOT, District 8 – Willmar

Carl Ohrn, Metropolitan Council

Wes Judkins, Region 9 Development Commission – Mankato

Charlie Reiter, Rochester/Olmsted COG

Dave Montebello, SRF Consulting Group, Inc.

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INITIAL PUBLIC OUTREACH MEETINGS

APRIL/MAY 1999

CONDUCTED BY MN/DOT AND SRF CONSULTING GROUP, INC

April 12th, Hutchinson, Willmar (5 meetings)

April 13th, Willmar, Marshall (2 meetings)

April 14th, Red Wing, Winona, Rochester (5 meetings)

April 15th, Owatonna (2 meetings)

April 19th, Buffalo, Elk River, St. Cloud (5 meetings)

April 20th, Brainerd (3 meetings)

April 26th, Grand Rapids, Virginia (2 meetings)

April 27th, Duluth (4 meetings)

April 28th, Thief River, International Falls (2 meetings)

April 29th, Bemidji, Park Rapids (3 meetings)

May 3rd, Mankato, Windom (2 meetings)

May 4th, Metro (6 meetings)

May 5th, Metro (6 meetings)

May 5th, Morris, Fergus Falls, (2 meetings)

May 6th, Moorhead, Detroit Lakes (3 meetings)

Total Meetings = 55

Total Attendance = 246 persons

SECOND ROUND OF PUBLIC OUTREACH MEETINGS

AUGUST 1999

CONDUCTED BY MN/DOT AND SRF CONSULTING GROUP, INC

April 9th, Detroit Lakes - 2 meetings

August 10th, Bemidji - 3 meetings

August 11th, Rochester - 3 meetings

August 13th, Mankato - 2 meetings

August 16th, Metro - 4 meetings

August 16th, Willmar - 3 meetings

August 17th, Brainerd - 3 meetings

August 18th, Duluth - 3 meetings

Total Meetings = 22

Total Attendance = 249 persons

MEETINGS CONDUCTED BY MN/DOT STAFF

Metropolitan Council

League of Minnesota Cities

Association of Minnesota Counties

Transportation Alliance

City Engineers Association

County Engineers Association

Minnesota Association of Townships

Freight Advisory Committee

APPENDIX C

CHRONOLOGY OF IRC SYSTEM DECISIONS

DOCUMENTATION OF IRC SYSTEM MODIFICATIONS (TIMELINE)

1. April 1, 1999 — Began development and collection of data for technical analysis.

2. May 13, 1999 — The use of the Tier System was confirmed at the TAC meeting.

3. May 13, 1999 — Presented results of draft technical analysis to TAC (AADT-based variables only). TAC suggested that SRF develop additional variables for to value RTC and future population. In addition, they suggested that we look at NHS, spacing and interstates outside Minnesota (I-29). TAC also supported decision to remove interstate freeways from mix of routes in the technical analysis (high volumes skew statistical averages). All interstate freeways would all be rated as high-priority interregional corridors.

4. May 1999 — Developed RTC connectivity and future population data and assembled data for all minor arterial routes that had been suggested during public meetings.

5. June 8, 1999 — Presented results of technical analysis (six variables) to District Engineers. TH, TH 23 from I-90 to Willmar, TH 15 from New Ulm to St. Cloud and TH 212 from TH 15 to TH 23 were shown as potential IRC routes. Need to consider spacing and other factors more strongly. Subsequent comments from District Engineers indicated a desire to connect all "Level 2" RTCs on IRC system.

6. June 10, 1999 — Modified map to show potential IRC routes as medium-priority IRC routes (included TH 2, TH 23, TH 15 and TH 212). Presented refined results of technical evaluation (six variables) to TAC. No major modifications in process suggested (need to document rationale for adding routes to system due to other considerations such as NHS, spacing and district priorities/plans).

7. June 18, 1999 — Steering Committee meeting suggested continued focus on connecting all RTC "Level 2" centers. Also, committee suggested that rationale be strengthened for decisions that deviate from technical analysis. Based on this input, connections were added to Winona, Red Wing,

Northfield, Buffalo, Hibbing. TH 15 between New Ulm and St. Cloud and TH 8 from I-35W to Wisconsin border were changed to high-priority regional routes. TH 15 was changed because it was not ranked medium or high on the technical map and it lacked sufficient other factors (NHS, district plans, etc.) to elevate it to an IRC corridor. Also, TH 52 to Rochester was changed from medium-priority IRC to high-priority IRC to account for RTC connectivity (only "Level 1" not connected by high priority route). TH 10 from Fargo/Moorhead to Detroit Lakes was changed from high-priority IRC to medium-priority IRC (based on lower rated connection with RTC-system map and more consistency with status of remaining part of TH 10).

8. July 8, 1999

Presented map changes since June 10 to TAC. District 7 presented letter suggesting that TH 60 from TH 15 to Iowa border should be considered as IRC route versus TH 15. TH 60 issue was discussed and Committee felt that TH 60 to I-90 could be justified based on district plans, NHS and similar volume data. They did not change TH 60 from Iowa border to I-90 based on the fact that study was directed toward in-state centers. For these same reasons, the Committee supported the change of TH 8 (I-35 to Wisconsin border) to a high-priority regional corridor.

9. July 9, 1999

Presented map changes to all District Engineers at weekly operations meeting. TH 60 was discussed and most felt recommendation to Steering Committee should be to include TH 60 as IRC route and designated TH 15 as high-priority regional route. Discussion of short connections to "Level 2" RTCs near metro area did not result in any recommendations for changes. TH 169 north of TH 23 was questioned as high-priority IRC. The IRC for this route will be reviewed prior to July 16th Steering Committee meeting.

10. July 16, 1999

Presented map changes to IRC Steering Committee. Changes include maintaining TH 169 as a medium-priority IRC north of Zimmerman. This would make it more consistent with RTC-system and more consistent with general usage that increases on approach to major centers. Since the July 9th meeting with the District Engineers, additional modifications were requested by District 3. This letter included requests for HPI corridor

status on TH 371 to Brainerd, maintaining HPI status on TH 169 to Garrison, HPR status on TH 18 to Brainerd and TH 10 between Clear Lake and Elk River. The Steering Committee discussed these changes, but did not suggest that any action or changes be made as a result. The committee recommended that the map be changed as follows and distributed for public review:

- Change TH 60 to MPI from TH 15 to I-90.
- Change TH 169 from HPI to MPI north of Zimmerman to Garrison.
- Recommended to not accept requested changes from District 3 due to lack of technical information to support changes and request could result in a "domino" of other changes.
- Recommended that minor arterial routes in HPR category be shown as dashed line. Other minor arterial routes that are shown on IRC system should be foot noted.

The Committee directed that the map should be presented to the public as the draft IRC system (based on a technical analysis), not as the final system map. The Steering Committee acknowledged that the public outreach process will likely result in some changes to the map after the August meetings.

11. August 20, 1999

A summary of the August public meeting comments was presented to the Steering Committee. The primary concerns were on connections to other states (TH 212, TH 60, TH 63, and TH 8) and on TH 53, which is designated as a Congressional Trade corridor. The committee directed SRF to develop a recommendation on these changes, but was inclined to accept these routes as medium-priority interregional corridors. Subsequent informal meeting was held to approve the changes as follows:

- The following routes were added to the system as medium-priority interregional corridors to connect with adjacent states:

- TH 212 from TH 23 to Minnesota/South Dakota border
- TH 60 from I-90 to Minnesota/Iowa border
- TH 63 from I-90 to Minnesota/Iowa border
- TH 8 from I-35 to Minnesota/Wisconsin border

- TH 53 from Virginia to International Falls was added to the system as a medium-priority interregional corridor due to its designation as a Congressional Trade corridor.

The following change was recommended to be consistent with planned improvements. This change was passed by the FM-COG without objection.

- A modification was made to TH 10 near Fargo/Moorhead after discussions with the regional planning agency. The medium-priority interregional corridor was changed to follow TH 10 to TH 336 to I-94. This resulted in TH 10 from TH 336 to the west being designated as a high-priority regional corridor. This change will be consistent with proposed changes to TH 10 and TH 336.

12. September 14, 1999 — The Steering Committee met to discuss final changes to IRC system map and performance targets. The Committee recommended the following changes:

- Extend TH 212 high-priority designation from Chaska out to Cologne.
- TH 36 be added to system as medium-priority IRC
- Extend TH 169 high-priority designation from Jordan to TH 19.

13. September 23, 1999 — Steering Committee met and approved final map.

APPENDIX D

EVALUATION OF CORRIDOR SPEEDS

EVALUATION OF CORRIDOR SPEEDS (TRAVEL TIME)

Speed is one of the most important factors to the traveler in selecting alternate routes or transportation modes. The value of a transportation facility in carrying people and goods is judged by its convenience and economy, which are directly related to its speed".[3] Travel times are affected by a number of design/management factors, including posted speeds, urbanized areas, signals and stops, level of congestion, vehicle mix, parking, pedestrians, roadway alignment and turn lanes. In addition, they are affected by a number of uncontrollable factors such as weather, driver behavior and vehicle operating characteristics such as acceleration and deceleration. Travel speeds were selected as the principal measure of performance for interregional corridors.

The following methodology was used to develop an estimate of the current and future corridor speed, and make comparisons to the performance targets.

Step One: Posted speeds were obtained from the TIS database for all study segments. Because the segments could include both urban and rural areas, the posted speeds were weighted based on individual lengths of each posted speed area as compared to the overall length of the segment. The weighted-speeds were then adjusted to account for driver behavior (average running speed is higher than posted speeds by ten percent on most two-lane facilities). Therefore, weighted speeds for two-lane segments throughout the state were increased by ten percent (increased based on information obtained from Minnesota's Speed Monitoring Program). This means that the average running speed on a rural two-lane roadway would be 60 mph (posted 55 mph).

Step Two: Base travel times were computed for each of the segments using the weighted speed values calculated in step one. The travel times reflect unimpeded or free flow times.

Step Three: This step sought to identify routes that currently have or could potentially have capacity problems (capacity-risk) based on the roadway's ability to accommodate a stream of moving vehicles. The capacity/risk was categorized as high-, medium- or low-risk based on a comparison of either current or future corridor volumes to a table of threshold volumes (see Table D1). If the threshold volumes are exceeded, the ability of the roadway to service the volume or demand is reduced (speeds are reduced and backups may occur).

[3] A Policy on Geometric Highway Design of Highways and Streets, 1990 "Green Book"

The steps in assessing the capacity/risks are as follows:

- Existing Average Annual Daily Traffic (AADT) values for each of the corridor segments were divided by the number of lanes for that segment to get an AADT volume per lane.

TABLE D1

CORRIDOR CAPACITY-RISK ANALYSIS

Capacity Index Table [1]			
Type of Facility	**Volume Threshold (AADT per Lane)**	**Congestion Risk Index**	
Freeway	≤ 15,000	1	Low
Freeway	15,000 – 20,000	2	Medium
Freeway	> 20,000	3	High
Rural Expressway	≤ 8,000	1	Low
Rural Expressway	8,000 – 11,000	2	Medium
Rural Expressway	> 11,000	3	High
Urban Expressway	≤ 5,000	1	Low
Urban Expressway	5,000 - 7,000	2	Medium
Urban Expressway	> 7,000	3	High
Two-lane	≤ 4,500	1	Low
Two-lane	4,500 - 7,500	2	Medium
Two-lane	> 7,500	3	High

(1) Volume thresholds developed based on experience and values developed by TTI for the Urban Mobility Study

- The AADT-per-lane values for each segment were compared to the corresponding volume threshold for the facility type. The comparison determined if the corridor volume was in the high-, medium- or low-risk category.

- The AADT values for each corridor segment were factored to future 2020 volumes using a growth factor that was developed by Mn/DOT's Traffic Office. The 20-year growth factors were developed for principal arterial highways in each county. For corridors extending through multiple counties, a weighted averaged was developed based on the percentage of the length in each county. (A final adjustment was made to extend the growth factor from the year 2017 to 2020 by using a factor of 1.15).

The 2020 volumes were compared to the threshold volumes in the table. Adjustments to the number of lanes were made to segments where capacity improvements are planned through 2010 (list of improvements is provided in Appendix E).

- A reasonableness check was made of the results by plotting the risk levels and then checking the results against previously published transportation plans and corridor information. Based on this check, the majority of the results were consistent with previously published information. Some minor inconsistencies were found; however, these could be explained by some lane configuration details that are not represented at the level of detail for this statewide corridor analysis.

Step Four: Adjustments to the unimpeded travel time were made to account for signal and stop delays. These adjustments (time penalties) were calculated as follows:

Industry Square Tables from the Texas Transportation Institute

Initial Speed	**Auto Delay (1)**	**Truck Delay (1)**
55 mph	21 seconds	105 seconds
60 mph	22.5 seconds	112 seconds
65 mph	24 seconds	120 seconds

(1) Estimate of acceleration/deceleration delay for vehicles that are required to stop. Passenger car and truck delay for deceleration of vehicles to stop; then acceleration from stop to posted speeds. Truck acceleration was assumed to be five times slower based on acceleration tables.

- Assuming ten percent trucks and a 60 mph speed, the average delay for the traffic stream was computed. Average delay = 90 percent autos * (22.5 seconds) + 10 percent trucks * (112 seconds) or 31.5 seconds (non-stopped delay). If one assumes that 40 percent of the mainline traffic is interrupted, this will equate to an average delay of 12.6 seconds per vehicle for the entire traffic stream (round to 13 seconds per vehicle).

- To calculate the stopped delay, the following assumptions were used. A 75-second signal cycle length for Greater Minnesota Tier and 120-second signal cycle length for the Metro Link Tier were assumed. In addition, it was assumed that 60 percent of cycle length is allocated to mainline and 40 percent to side street traffic (mainline traffic is impacted 40 percent of the time). Therefore, 40 percent of 75 is 30 seconds and 40 percent of 120 seconds is 48 seconds. The 30 and 48 seconds assume that all of the stopped traffic would arrive at the beginning of the cycle and be delayed the full length of the stop phase. Vehicles normally arrive at random (rural or suburban intersections spaced more than one mile); therefore, assume random arrivals so that average length of stopped delay is 50 percent of this time or 15 seconds and 24 seconds, respectively.

- If a roadway is not a capacity risk, the total delay is calculated by summing the stopped delay and the delay due to acceleration/deceleration. This corresponds to a 28-second and 37-second delay for Greater Minnesota and for the Metro Link Tier, respectively.

- If a segment has a moderate/capacity-risk and the segment contains signals, there is a greater risk for delay (at a minimum, a greater portion of the vehicle stream will have to stop). As a result, additional delay time was assumed (assumed all vehicles would stop for full cycle time). This would result in a total delay of 43 seconds and 61 seconds for Greater Minnesota Tier and Metro Link Tier, respectively. If a segment has a high/capacity risk, the signal delay is increased by an additional 50 percent of stopped delay for a total delay of 50 seconds and 73 seconds, respectively. This would account for some vehicles not clearing the intersection on the first cycle. These delay assumptions are summarized in Table D2.

TABLE D2
ASSUMED SIGNAL DELAY PER VEHICLE

Location	Uncongested	Moderate Congestion	Severe Congestion
Greater Minnesota Tier[(1)]	28 Seconds	43 Seconds	50 Seconds
Metro Link Tier[(2)]	37 Seconds	61 Seconds	73 Seconds

(1) Based on a 75-second cycle length, acceleration and deceleration time, assumes 10 percent trucks, and 40 percent stops
(2) Based on a 120-second cycle length, acceleration and deceleration time, assumes 10 percent trucks, and 40 percent stops

- The calculation for a stop-controlled intersection is similar to signalized intersection, with the exception that all mainline vehicles are required to stop. Therefore, the total delay is assumed to be 31.5 seconds (same acceleration/deceleration delay without reduction for percentage of stopping traffic) plus 4.5 seconds for observing vehicle clearance, for a total of 36 seconds.

Step Five: Adjustments to the unimpeded travel time were made to account for capacity problems. These adjustments (time penalties) were calculated as follows:

- A check was made to determine if the segment was in a high- or medium-capacity risk area by checking if the segment volumes exceed thresholds shown in Table D1. If the segment fell into a high-risk category, the base travel time was increased by 50 percent. If it was a medium-risk category, the base travel time was increased by 30 percent. These percentages were derived based on the speed/volume-to-capacity

ratio chart that shows that speed is reduced by approximately 50 percent when the v/c ratio is close to one.

Step Six: A new estimated travel time was computed for each segment based on the weighted posted speed, stop/signal delay and capacity limitations. This was then converted into a final estimated travel speed for the segment.

Step Seven: The average travel speed for each segment was compared to the travel speed targets for each of the different classes of interregional and regional corridors. For example, all HPI segment speeds were evaluated against the performance targets for HPI corridors. Based on the evaluation, the segments were placed into one of four performance categories and the number of miles tallied for each:

- Above target
- At target
- Slightly below target
- Below target

APPENDIX E

IMPROVEMENT ASSUMPTIONS

Improvement Assumptions for Future Performance Analysis [1]

Route	Termini	Major Improvement
TH 14	Kasson to Mankato	Two lanes to four lanes
TH 371	Little Falls to Brainerd	Two lanes to four lanes
TH 23	TH 71 "Y" to New London	Two lanes to four lanes
TH 23	Richmond to I-94	Two lanes to four lanes
TH 60	I-90 to Windom	Two lanes to four lanes
TH 371	North of Baxter to Pine River	Two-lanes to four lanes
TH 169	Onamia to Garrison	Two-lanes to four lanes
TH 60	Worthington to Windom	Two-lanes to four lanes
TH 61	Wakota Bridge	Four-lane Expressway to freeway

(1) Project assumptions are based on constrained funding scenario. Projects must be in STIP, Work Plan and/or Study Plan, and must provide mobility improvements to the corridor segment (reconstruction, pavement rehabilitation, spot improvements type projects not included).

APPENDIX F

SIGNAL PROLIFERATION RISKS

TABLE F-1

SIGNAL PROLIFERATION RISK ANALYSIS[1]

Type of Facility	Volume Threshold (Two-way AADT)	Signal Risk Index	
Rural Expressway	≤ 10,000	1	Low
Rural Expressway	10,000 – 20,000	2	Medium
Rural Expressway	> 20,000	3	High
Two-lane	≤ 8,000	1	Low
Two-lane	8,000 - 14,000	2	Medium
Two-lane	> 14,000	3	High

(1) Volumes thresholds developed based on SRF practice and values developed as part of Investigation TAU 390, "Guide to Estimating Traffic Signal Warrants and Tests of ADT Estimates," Minnesota Highway Department, June 1965.