# From Footpaths to Freeways

## A Survey of Roads and Highways in Minnesota

By Joel Katz, P.E., PTOE

Minnesota Department of Transportation

## DEDICATION

This book is dedicated to the thousands of Minnesotans — past and present — who have been involved in the planning, design, construction, maintenance, and operation of the roads, streets, and highways of Minnesota, , as well as those who have played essential roles in such areas as financing, administration, research, education, and communications. These are the people who have been employed by the federal, state, and local governments; contractors; consultant firms; and educational institutions who have applied their professional and trade experience in developing a transportation system on which our way of life and economic viability has become so greatly dependent. Some of these employees lost their lives while performing construction, maintenance, and enforcement activities. All have worked diligently, loyally, and professionally — especially in emergency situations.

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## Acknowledgements

Anyone who has read a few "Acknowledgements" pages knows that most books do not reach the shelf of a bookstore without the considerable help and encouragement of many individuals from the time the concept for a story is born in the mind of the author until a fully edited manuscript is ready for the printing plant. That is definitely true of this book, and I would certainly be remiss if I did not acknowledge those who made it possible.

First, I must thank Douglas Differt, then deputy commissioner of the Minnesota Department of Transportation (Mn/DOT), and Robert Johns, director of the University of Minnesota's Center for Transportation Studies (CTS). I have doubts that this book would have ever been published had it not been for their interest and persistence. The three of us met for breakfast in January 2005 at a hotel across Rice Street from the Mn/DOT Central Office building in St. Paul to discuss my preliminary proposal for the project. More discussion with Doug and Bob over the next year led to contracts wherein Mn/DOT provided funding to CTS to manage and facilitate the project.

Mn/DOT's Sue Lodahl managed the contracts and served as the liaison between the two agencies. She kept Mn/DOT staff informed of project progress and took the initiative to assure continued department backing when a new leadership team took over its administration. That change came at a time when funding had become tight – especially for projects that did not directly build or maintain highways.

CTS appointed retired Mn/DOT Metro Division Engineer Charles Siggerud to assemble and chair a technical advisory panel charged with the following tasks:

- Review the book's proposed contents
- Review early chapter drafts
- Assure that Mn/DOT's contract provisions were being met
- Review the text prior to preparation of the final version for publication

The panel members included Doug Differt and former Mn/DOT principal officials Doug Weiszhaar, Ed Cohoon, F. C. (Fritz) Marshall, and John Sandahl. The panel's advice and counsel was extremely helpful and most appreciated – and I must say that I thoroughly enjoyed the several meetings we had with such distinguished transportation experts. Their collective experience contributed immeasurably to the content of the following pages.

CTS also appointed a project manager from their staff, initially Chad Rathmann and later (after Chad left for other employment), Shawn Haag – both of whom were charged with keeping the project on track and taking care of administrative details. CTS also hired student researchers: Lisa Hartley was on board for the first several months followed by Mercedes Tuma-Hansen who was hired when Lisa's appointment expired. Both spent many hours at the Minnesota Historical Society, at Mn/DOT's library, and with other collections searching for documents and photos covering the early days of road transportation in Minnesota. Mercedes also carried out the initial editing of many of the book's chapters.

A special thank you goes to Mike Robinson, district engineer in Mn/DOT's Duluth office. He made a point of asking his staff to offer whatever assistance was asked regarding the history of I-35's construction through the city as well as other state highways in the district. Particularly helpful in that regard was John Bray, special assistant to the district engineer, who provided a wealth of photos, facts, and figures regarding I-35 and information about other Mn/DOT projects. John also has had some of his own writing on I-35 published, work that I used extensively in preparing the write-up on that freeway.

I must also mention Jim Newland who was a highway design engineer in the Mn/DOT Duluth district office during the many years it took to reach consensus on the planning and design details for the big Interstate projects. Jim offered a considerable number of constructive criticisms while reviewing my initial work on the Duluth freeway segments. I also enjoyed the great stories he told about his years in the district.

During most of the period I spent writing this book, I was employed at the Golden Valley office of WSB & Associates, Inc, a consulting engineering firm specializing in transportation and related in-frastructure projects. Tony Hepplemann and Chuck Rickart kindly agreed to my working part time for the company, permitting my use of the firm's facilities, and providing me with some administra-tive support while I worked on the book. Transportation Planner Peter Langworthy gave me copies of student papers he wrote on the impacts caused by the construction of I-94 west of downtown St. Paul, thus contributing background for Chapter 6, and Sharon Montague provided invaluable assis-tance in the reproduction of chapters for the early reviews by the technical advisory panel and Mn/DOT's contract liaison. Erica Hurt did some of the photography early in the project and pro-vided photos from the WSB files. She also showed me how to operate a digital camera. Other em-ployees offered encouragement and let me know that they were anxious to see the finished product.

I was most fortunate to have a fine editor in Nancy Baldrica. She deftly cut down my original manuscript from a size that made it more fit for a child's booster seat than a coffee table decoration. We agreed early on that this publication should not require a backpack to get it from the bookstore to your car. Her professional guidance and assistance also made it possible for real people like you to read a book written by an engineer. The same goes for Jennifer Wreiser who spent many hours in the design of the book and the layout of its contents.

Speaking of my engineering background, there were others who, early on, had a crack at making this work more intelligible. (Words like "signal phasing" and "collector distributor road" do not always command instant recognition with lay readers.) Therefore, I am grateful that Mercedes Tuma-Hansen was available for the initial editing for a major part of the manuscript. Other readers providing comments and suggestions on portions of the text were Mark Glickman, Harriet Katz, John Sandahl, and Rochelle Samuels. Their editorial help was much appreciated.

Many people offered historical information from their early years at the Minnesota Highway De-partment. I want to thank especially colleagues Kenneth W. Anderson, Evan Green, and Dan Bran-nan for the documents, maps, and photos they provided. Mickey Morris, who in the 1980s wrote an unpublished history of the Highway Department (the forerunner of today's Mn/DOT), sent me a copy of his manuscript – a wealth of information about employees and their work, many of whom had retired before I had started working for the department in 1957. A most enjoyable reading was John Pawlak's memoir covering his career at the Highway Department. His daughter, Jean M. Ro-zeske, who graciously sent me a copy, transcribed the work that John had culled from his daily dia-ries.

Credit for helping me with historical information is also due to Patricia Zankman, director of the Cook County Historical Society. While gathering information on the Gunflint Trail, she pulled a file on the "Outlaw Bridge." The background for what became part of Chapter 12 was totally unknown to me and would not have been included in this book had it not been for her going beyond what I was looking for. The story behind this 1917 bridge covers one of the most unusual construction projects in Minnesota – *and* Ontario.

There were other contributors – too many to identify indentify in this space; however, I sincerely appreciate all their efforts, large and small.

Finally, I want to thank my wife, Harriet, for her forbearance, support, and encouragement. Over the years, she learned more about roads and highways than she ever wanted to know. On this project, she put up with late hours; limited access to our computer; and closets piled high with boxes stuffed with old photos, notes, maps, and discs. She compared the experience to giving birth to a child – ex-cept, in this case, the gestation period was more than four years! I think I understand at least part of what she meant.

– JOEL KATZ, June 2009

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# FOREWORD

I am honored to be asked to prepare a foreword to "***Footpaths to Freeways***," a long-overdue chronicling of the rich history of transportation in Minnesota. From the early trails walked by Indians to the modern, integrated system employing many facets of intelligent transportation system design, the evolution of moving people throughout the state is a fascinating study.

Decision-making, design, implementation, and construction of the highway system in Minnesota involved the talents of countless professionals at all levels of government and in the private sector. Joel Katz aptly documents how the history of the state is colored by the history of these transportation visionaries and their projects. The inclusion of many rare and historical photos makes this book an excellent coffee table piece.

Katz rightly pays tribute to Charles L. Babcock's efforts in the early 1900s to get the ball rolling on permanent highway funding. The development of an integrated and effective transportation system requires steady and predictable funding, and I am pleased that Babcock's contribution to this important facet of developing is recognized.

***Footpaths to Freeways*** provides historical context for the political and practical constraints involved in the criteria for the design and construction of the interstate highway system. The Interstate Highway Act was passed in 1956. Initially the year that was to be used for design was 1975, meaning that the states had to project the anticipated traffic for 1975 on each interstate segment and determine required capacity accordingly. Although the design year was later changed to 1985, both dates were, in retrospect, extremely shortsighted on the part of the rule makers. In addition, each state Department of Transportation had to create a potentially functioning system on paper that would include all of the interstate segments as well as any other major arterial highways they anticipated building. In Minnesota, over one-third of the overall system used in the design network was never built. At the 50th anniversary of the interstate system in Minnesota, I was one of three speakers, including Carol Molnau, then Minnesota's Commissioner of Transportation, and Tom Sorel, then Federal Highway Administrator for Minnesota. I mentioned this point, and it was a surprise to most of those attending the ceremony. With the design years used and the vast portions of the system that never materialized, we are lucky the system works at all.

I am pleased to see that this book highlights the increased emphasis on the importance of highway safety over time. Protecting those who use the transportation system from potential harm to the fullest extent possible is a critical component of freeway design and use.

With our multitude of rivers and over 10,000 lakes, bridges are a critical facet of transportation in Minnesota. Joel provides thorough coverage of the history of bridge design and placement to support highway travel, which is much appreciated by this transportation engineer who always wanted to be a bridge designer.

Finally, I am heartened to see that ***Footpaths to Freeways*** cites many examples of how the Minnesota Department of Transportation has been recognized as a forerunner in transportation research. Minnesotans should be proud of not only Mn/DOT's development of a fine transportation system, but also the agency's many contributions to improving the efficiency and safety transportation services worldwide.

Richard P. Braun
May, 2009

*Richard P. Braun has received more than 50 state, national, and international awards for his work in transportation. He was head of the Minnesota Department of Transportation for eight years, appointed by both a Democratic and a Republican Governor. He served as Chairman of the Twin Cities Area Metropolitan Airports Commission, and he founded the Center for Transportation Studies at the University of Minnesota, where he served as the Center's first Director for 7 years. He was the first Co-Chair of Minnesota Guidestar, which was organized to implement the intelligent transportation systems in Minnesota and, in 1990, he was recognized as Minnesota's Engineer of the Decade for the '80s.*

# INTRODUCTION

## Why This book?

I wrote this book to recognize and honor the role that Minnesota roads and highways have played in enhancing the state's quality of life and economy over the years.

Roads and highways are integral to the high standard of living we enjoy. Today, beyond air, water, and sleep, just about everything we need — to say nothing of everything we want — travels to us by road or street. Our food, the materials and personnel required to build our homes, and the equipment we need to communicate all arrive at their destination by trucks using roads and streets.

I am even willing to suggest (with only a modest placement of tongue in cheek) that if Abraham Maslow were defining his Hierarchy of Human Needs in today's world, he would place transportation — and, by extension, roads and highways — somewhere near the level shown in the illustration below.

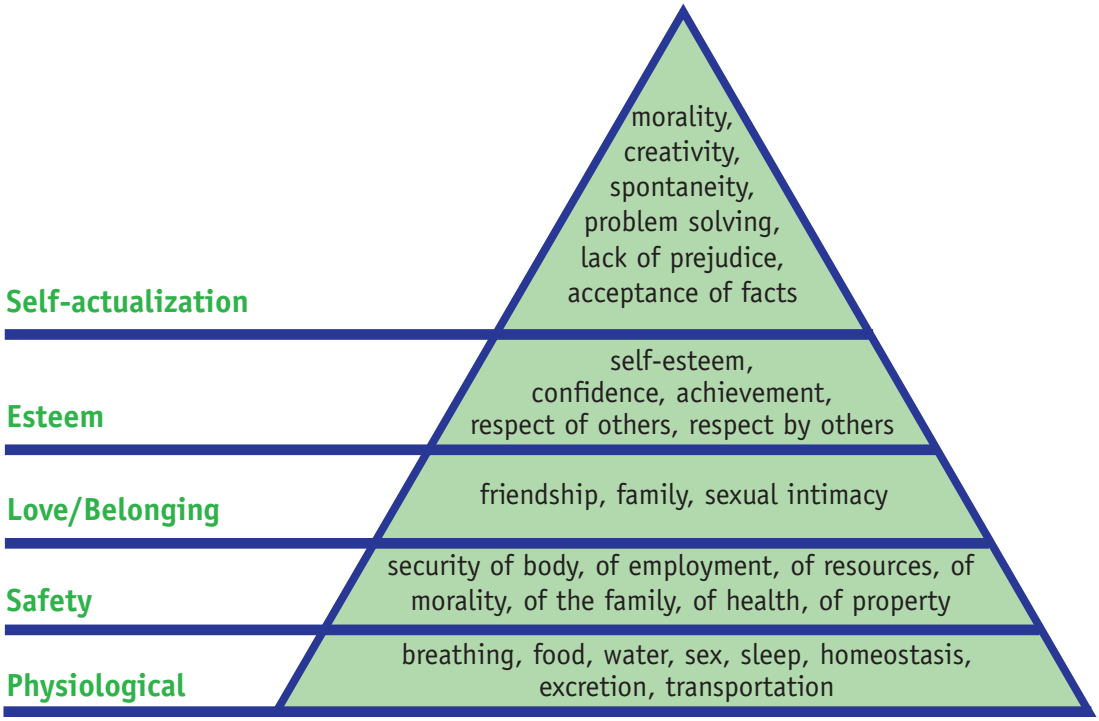
Still unconvinced of roads' importance? Consider these two revealing statistics:

1) Nearly everyone in Minnesota over the age of 16 years has (or has had) a valid driver's license, and
2) There are about 1.2 registered motor vehicles for every licensed driver, or an average of more than two vehicles for every household in the state. Those drivers use the roads and streets every day to get to work, buy food, and take advantage of recreational activities.

## Recent Anniversaries

Beyond the importance of roads to our very way of life, recent transportation anniversaries make this a good time to reflect on Minnesota's roads and highways and their influence on the state's growth.

The year 2006 marked the 50th anniversary of Congress' passage of the 1956 Federal Aid Highway Act that enabled construction of the Dwight D.



Eisenhower National System of Interstate and Defense Highways — one of the world's all-time greatest public works projects. Former President Eisenhower championed the establishment of this system for many years prior to 1956, and it is fitting that his name is memorialized in the official title.

In an event closer to home, the 150th anniversary of Dodd Road's construction was celebrated in 2003. One of the first major roads in the state, the Minnesota Territorial Legislature commissioned it to link Mendota with St. Peter — a city that was once slated to become the state's capitol by legislation proposed in 1857. Captain William B. Dodd headed the commission in 1853, and his name still graces the winding route.

Finally, Minnesota's sesquicentennial anniversary in 2008 requires a look back at the state's 150-year history and the role that roads have played in shaping the state's development through settlers, trade and economic growth, and connections with people near and far.

## The Romance of Roads

I admit that roads do not have the mystique associated with railroads of the nineteenth and early twentieth centuries or the romance associated with aviation that began in earnest with the Wright brothers' successful flight in 1903. And, given that just about everyone in Minnesota lives within several hundred feet of a road or street, it is understandable that some might believe this subject is just too familiar to warrant a book. But, I believe, in the following chapters, you will find some surprising stories to pique your interest.

I have always sensed the mystique and romance associated with roads and highways. At a very young age, I enjoyed making roads in the snow. When the snow was slightly wet, I would drag my heels through it to make roads with hills and curves. I even constructed bridges with scraps of wood or roofing shingles. I am happy to report my interest — and my technique — in road building matured over the years. During the spring of my junior year in high school, an uncle gave me a phone number that led to a summer laborer position on a Minnesota Highway Department construction survey crew. Before the summer was over, I knew that highway engineering would be my profession. Thus, this book was somewhat destined to be the cap on my highway career.

Of course, coffee table books are not generally known for changing the direction of the world, and this one is no exception. It does not reveal the secrets that will make you a millionaire. And there is nothing in the following pages that guarantees you will lose twenty-three pounds in three weeks. Let's face it: In comparison to great novels and political exposés, coffee table books usually spend more time decorating the table than being read, which may explain why we spent considerable time trying to find a suitable cover images.

My hope is that you will enjoy reading this book — or at least enjoy looking at the photos. I believe you will gain new insight into what I have found to be an exciting and most rewarding subject.

– Joel Katz, June 2009

## MINNESOTA DEPARTMENT OF TRANSPORTATION

Mn/DOT, or the Minnesota Department of Transportation, was created in 1976 by the Legislature to assume the activities of the former Departments of Aeronautics and of Highways and the transportation-related sections of the State Planning Agency and of the Public Service Department. Today, Mn/DOT develops and implements policies, plans and programs for aeronautics, highways, motor carriers, ports, public transit and railroads.

In creating the Department of Transportation in 1976, the Legislature determined that Mn/DOT would be the principal agency to develop, implement, administer, consolidate and coordinate state transportation policies, plans and programs (Minn. Stat. Ch. 174).

Mn/DOT makes special efforts to consider the social, economic and environmental effects of its decisions and aggressively promotes the efficient use of energy resources for transportation purposes. It also maintains close working relationships with the many public and private individuals, groups, and associations involved in transportation.

**Minnesota Highway Department Commissioners**

| | |
|---|---|
| 1917 – 1932 | Charles M. Babcock |
| 1933 – 1938 | N.W. Elsberg |
| 1939 – 1957 | M.J. Hoffman |
| 1957 – 1961 | L.P. Zimmerman |
| 1961 – 1965 | James C. Marshall |
| 1965 – 1967 | John R. Jamieson |
| 1968 – 1971 | N.T. (Nils Theodore) Waldor |
| 1971 – 1974 | Ray Lappegaard |
| 1975 – 1976 | Frank Marzitelli |

**Minnesota Department of Transportation Commissioners**

| | |
|---|---|
| 1976 – 1978 | James Harrington |
| 1979 – 1986 | Dick Braun |
| 1986 – 1991 | Leonard Levine |
| 1991 | John H. Riley |
| 1991 – 1999 | James Denn |
| 1999 – 2002 | Elwyn Tinklenberg |
| 2003 – Feb. 2008 | Lt. Gov. Carol Molnau |
| Feb. 2008 – Apr. 2008 | Robert J. McFarlin (Acting Commissioner) |
| April 2008 – | Thomas K.Sorel |

## CENTER FOR TRANSPORTATION STUDIES (CTS)

The Center for Transportation Studies (CTS), the organization that managed the project to bring forth this book, is the University of Minnesota's focal point for transportation. The Center's work is in keeping with the university's land-grant mission — to provide education to a wide range of learners, to carry out new research, and to bring the results of this research into practical use. The mission of CTS is to be a catalyst for transportation innovation through research, education, and outreach.

CTS was created in 1987 to address the need for closer cooperation between university faculty and state and federal departments of transportation, and to strengthen the university's role in transportation research and education. Originally a part of the Institute of Technology, CTS is now an independent university center reporting to the Senior Vice President for System Academic Administration.

In the years since it was established, the center's capabilities have steadily expanded with the addition of new components like the federally funded Intelligent Transportation Systems Institute and the statewide Local Technical Assistance Program. CTS leaders have continued to work closely with university administrators and faculty, bringing diverse academic fields together to tackle complex transportation issues.

Today, CTS is a nationally prominent center that attracts more than $20 million annually for research, education, and outreach programs. The center works with more than 75 faculty from 25 different departments in seven colleges — including a spectrum of disciplines that encompass engineering, economics, public policy, human factors, and environmental studies. Funding sources include numerous federal, state, local, and private-sector sponsors.

Throughout its history, the center has served as a resource and facilitator, helping talented university researchers develop new knowledge about transportation and helping share that knowledge with transportation professionals and policymakers. Ultimately, this knowledge improves transportation decision-making — meaning better and safer transportation systems, smarter investments, and a higher quality of life for Minnesota and the nation. CTS' strong partnership with the Minnesota Department of Transportation has led to significant advancements in transportation innovation and has fostered successful technology transfer.

CTS complements the research and education expertise of department faculty with a staff of 27 professionals with skills and experience in project management, client coordination, publications and website development, training, outreach, and financial management.

## TIMELINE OF STATE INVOLVEMENT IN ROADS AND HIGHWAYS

**1858** — The Minnesota Legislature begins passing laws to direct townships and counties in road and bridge building.

**1898** — A constitutional amendment allows the state to participate directly in road development.

**1903** — State licensing of motor vehicles begins; only 920 motor vehicles are registered this year.

**1905** — The Minnesota State Highway Commission is established.

**1912** — The Dunn Amendment for revising the road and bridge section of the constitution is passed. Following the adoption of this amendment, an annual one-mil tax levy is passed, and rural roads are divided into three classes for construction and maintenance purposes: state, county, and township.

**1917** — The Legislature abolishes the Highway Commission and creates the Department of Highways. Charles M. Babcock of Elk River is chosen to be the first commissioner and is empowered to employ a support staff and a deputy commissioner, who was to be trained as an engineer as well as a road builder.

**1920** — A constitutional amendment allows for the creation of a system of 70 trunk highways. There are 324,166 registered motor vehicles in the state this year.

**1921** — Legislation is passed to make the trunk highway plan possible. This legislation requires the commissioner of highways to carry out the provisions of the trunk highway amendment. The mandate for the department is to acquire right-of-way; locate, construct, reconstruct, improve, and maintain the trunk highways; let necessary contracts; buy needed material and equipment; and expend necessary funds. The same legislation authorizes the commissioner to appoint two assistant commissioners, one of whom is to be an experienced highway engineer. The commissioner is also authorized to employ skilled and unskilled employees as needed.

**1925** — Babcock fights for — and wins — an amendment to the state constitution to use taxes on gasoline solely to build and maintain roads.

**1944** — The Federal Aid Highway Act authorizes funding for the postwar programs to improve secondary rural and urban roads.

**1945** — The State Aid Division is created in the Department of Highways to work with Minnesota's cities and counties.

**1956** — Congress enacts laws that set up funding for the National System of Interstate and Defense Highways. Minnesota voters approve a constitutional amendment to provide for the percentage distribution of state road user funds: 62 percent for state, 29 percent for county, and 9 percent for municipal roads.

**1969** — The Legislature establishes the Department of Public Safety. The Highway Patrol and Drivers License Bureau, both formerly part of the Highway Department, are transferred to this new department.

**1976** — The Legislature establishes the Minnesota Department of Transportation to assume the activities of the former Department of Aeronautics, Department of Highways, and the transportation-related sections of the State Planning Agency and the Public Service Department. In founding the Department of Transportation, the Legislature determines that Mn/DOT will be the principal agency to develop, implement, administer, consolidate, and coordinate state transportation policies, plans, and programs. In so doing, the department makes a special effort to consider the social, economic, and environmental effects of its decisions and aggressively promotes the efficient use of energy resources for transportation purposes. It also maintains close working relationships with many public and private individuals, groups, and associations involved in transportation.

**2006** — A constitutional amendment is passed requiring the motor vehicle excise tax to be rededicated exclusively to transportation purposes over a five-year period. The amendment directs that at least 40 percent of the revenue shall be for public transit assistance and that not more than 60 percent shall be for highway purposes.

# Minnesota's Early Road History 1

## NATIVE AMERICAN TRAILS

With the vast road building and maintenance system in place today in Minnesota and the nation, it can be difficult to remember that transportation was not always as easy as it is in the twenty-first century — even with our modern congestion and funding problems. The first "roads" in Minnesota predated the automobile by several centuries. Before that, trails were established by animals and followed by Native Americans, who traveled on foot. These early travelers followed the lay of the land, and there was no such thing as trail maintenance. When a trail became impassable, travel patterns were changed accordingly.

The trails were established with purposeful destinations that served to sustain survival. In 1832, for example, the Reverend W. T. Boutwell wrote about the travels of several Native American families that he accompanied on their way to a summer hunting ground. Since the trip presumably took several days or possibly weeks, the families carried the necessary household implements of daily living on their backs, including kettles, traps, axes, and nursing infants.

Today, most of the trails are obscured, but the location of Snelling Avenue in St. Paul and Roseville is thought to have been one such Native American trail. Another followed the location of St. Anthony Avenue, eventually becoming part of the Red River trails and now the route of a segment of I-94 in St. Paul.

### Fur Trade, the Voyageurs, and Exploration

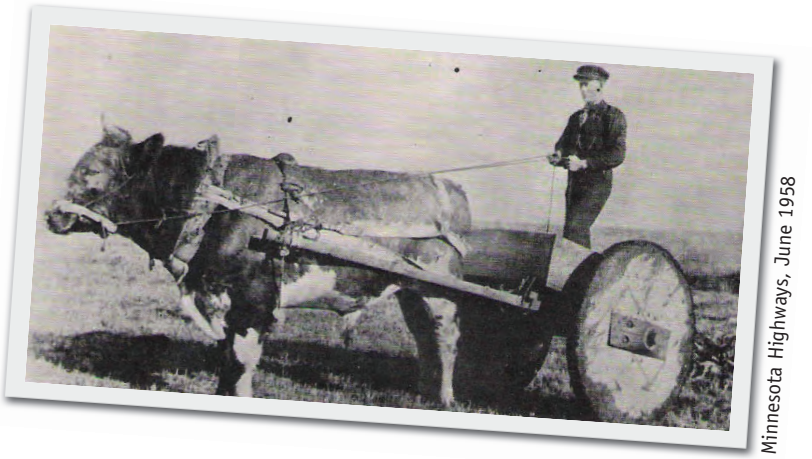
It must be acknowledged that in many areas of pre-territorial Minnesota, rivers streams, major bodies of water, and chains of smaller lakes served as the primary transportation corridors. "Trails" between these lakes served as canoe portages, and their sole purpose was to provide a means to continue voyages on the water.

The fur trade brought regular white travel through Minnesota. The rival Hudson's Bay and Northwest Fur Companies took advantage of Minnesota's many waterways for the fastest and easiest travel. Thus, the "Voyageurs' Highway" was made of water, not land. Where water could not provide an uninterrupted passage, voyageurs had to portage overland to the next water route, making trips back and forth with thousands of pounds of furs and trade goods on their backs. Their travel took them across water and portages to the center of trade at Grand Portage, in the far northeastern corner of Minnesota. There were no government-established roads to make travel easy for trade or settlement. The rugged fur trade and Native American trails provided the most accessi-

ble ways to get around. Reverend W. T. Boutwell's experience in the little-charted Minnesota area was typical of such travel through the middle of the nineteenth century.

## The Red River Trails

The Red River Trails played a major role in the development of Minnesota's first commercial transportation routes to the northwestern region, using ox carts, such as the one pictured at right.



Minnesota Highways, June 1958

Red River ox carts provided the major mode of transportation and hauling on Minnesota's early roads.

The Red River ox carts were made entirely from wood, with wheels that were six to seven feet in diameter. The spokes were constructed of wooden pegs held together with buffalo rawhide. The hubs were not greased; thus it can be assumed that constant squeaking accompanied their motion. A cart could carry approximately 800 pounds of freight, and two or three carts, managed by one driver, could be strung together end to end.

Alexander Henry wrote in 1801 that men at his post in Pembina (located in North Dakota, just across the Red River in the extreme northwest corner of Minnesota) built wooden carts with solid wheels sawed from tree trunks. In 1802, they made "a new sort of cart which facilitates transportation, hauling home meat, etc. They are about four feet high and perfectly straight; the spokes are perpendicular, without the least bending outward, and only four to each wheel. . . . This invention is worth four horses to us, as it would require five horses to carry as much on their backs as one will drag in each of those large carts."

Although it seems natural to assume that the Red River Trails would have pushed northwesterly from St. Paul, it didn't happen quite that way. One

### Exploring MINNESOTA

*The following are excerpts from the Travel Journal of Rev. W. T. Boutwell describing the U.S. Exploring Expedition to Lake Itasca in 1832:*

> [June 25:] To begin this portage, which is nine miles, we are obliged to ascend a bluff sixty or seventy feet, in an angle of at least forty-five degrees. Up this steep [slope], all our baggage and the lading of two barges must be carried on the heads or backs of the men. . . . [A] voyageur always rests his portage collar on the head. A portage is always divided into *poses*, or resting places, which vary in length according to the quality of the road or path, but average about a half mile.
>
> [June 26:] Our way to-day has been over hills, across deep ravines, and some of the way through mud and water half leg deep. But not-with-standing the rain and badness of the path, the voyageurs are cheerful and prompt at their task. They carry their load half a mile, when it is thrown down and they return for another. Some of them, to-day, have taken three bags, 240 pounds, the whole supported by a strap across the temples, the ends of which are made fast around the bags.

of the earliest routes extended *southerly,* from Hudson's Bay to Fort Garry, then a major destination near present-day Winnipeg, Manitoba, and reaching Lake Traverse on the current Minnesota western border by 1789. However, the first oxcart didn't arrive in St. Paul until 1844. It consisted of six carts of goods brought by fur trader Norman W. Kittson, an American Fur Company trader based at Pembina. He brought $1,400 worth of animal pelts and spent $12,000 in St. Paul on supplies.

By 1851, 102 carts had arrived in St. Paul via the trails, and by 1857, 500 carts had arrived, with another 600 following the next year. Red River carts brought more than $250,000 in raw animal pelts, pemmican, buffalo robes, food, and other goods in 1864, and the traders spent more than a million dollars at merchants' shops in the city.

The trails followed three primary corridors from St. Paul to Fort Garry, two of which had several routes. A common factor of the routes was proximity to a major river, which made sense since water was an absolute necessity for travel on the trails. The most direct route was via St. Cloud, not far from current Highway 10, with several branches near I-94 to the west. The Middle Trail was the easiest to travel, and it thus became the most used. The distance to Pembina via this route was approximately 450 miles. Another corridor continued north from St. Cloud near current Highways 10 and 371, turned west near Highway 210, and then turned northwest near Highway 10.

The longest (and least-used) route headed southwest along the Minnesota River to a point near Mankato, where it continued to follow the river with several parallel branches to Lake Traverse. North of the lake, on the way to Canada, the various trails converged with three parallel branches — one adjacent to the Red River and the other two approximately 40 miles either side of the river in Minnesota and North Dakota.

Minnesota Historical Society

The Red River Trail followed three primary corridors from St. Paul to Fort Garry. This trail marker notes the former location of the trail in Crow Wing Park. Weather and agriculture have obliterated much of this trail's evidence, but you can still faintly see the ruts left by oxcarts.

Red River routes were generally wide travel areas over the prairies, where carts could travel side by side. Where it was necessary to travel single file, the carts made a three-rutted track from the wear of the two wheels and the ox.

Routes of the Red River Trails are quite well known, according to historical records; however, the tracks themselves are hard to find because they varied by season and year over the open prairie. Weather and agriculture in the last century have obliterated much of their evidence.

Given a probable cruising speed of two to three miles per hour and traveling perhaps 18 to 20 miles per day, the trip from St. Paul to Pembina by the most direct trail would have taken as long as four weeks, assuming good summer traveling conditions and allowing for grazing and limited repair stops. Several additional travel days would permit carts to get to Fort Garry. With less-favorable conditions, the total trip could have required as much as an additional two weeks. (Today, a truck and semi trailer, carrying the equivalent of about 50 cartloads, can

travel from St. Paul to Winnipeg in ten hours or less under most conditions, and the most direct route is about 50 miles shorter than the most direct trail route. Of course, by air, it only takes 1½ hours — but that doesn't include travel time to and from the airport and waiting at the terminal.)

By the mid-1860s, the ox-cart trails were beginning to be replaced by rails. The railroads were building west and northwest across the state from St. Paul. By 1871, the St. Paul and Pacific was extended to the Red River at Breckinridge, and in 1872, the Northern Pacific arrived at Moorhead on a line destined to reach the West Coast. It was a clear signal that the ox-cart era was about to end, although some Canadian trails remained in service until 1890.

## The First Constructed Roads

The first constructed road in Minnesota was built by British soldiers before 1816. The road extended from Grand Portage to Fort Charlotte on the Pigeon River near the tip of the Arrowhead in the northeastern part of the state.

The establishment of Fort Snelling in 1819 prompted an expanding radius of roads and trails that were built to connect the fort with other places in pre-territorial Minnesota. The fort had been the area's earliest center of trade, hunting expeditions, and travel for pleasure, exploration, or military purposes. By 1836, a road had been constructed from Taylor's Falls to the fort, and another was completed from St. Paul to Stillwater. The latter was the only road connecting the capital with the outside world (via the state of Wisconsin) when Minnesota was organized as a territory in 1849.

## The Military and Territorial Roads

After the Minnesota Territory was established in 1849 and the population boomed from 6,077 in 1850 to more than 150,000 in 1857, better roads were needed to provide for settlements and commerce, as well as to protect against attacks by Native American tribes. The territorial government legislated that its roads be surveyed and marked, and, most importantly, that they be permanent. A bill based on the laws of the Territory

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Travel by oxcart was slow, taking weeks and months. In comparison, today, a semi-trailer truck can carry the equivalent of 50 cartloads from Winnepeg to St. Paul in 10 hours. A train boxcar can carry the equivalent of 200 cartloads.

of Wisconsin was enacted to survey and mark mile points, develop detailed plats and maps showing the features of the land, and construct roads in the Minnesota Territory.

The Legislature also passed an act in 1849 outlining the responsibility of counties to develop roads. Each county had a board of commissioners whose duties were to "…layout, discontinue, or alter county roads within their respective counties, and to license ferries and fix toll rates." Every male citizen between the age of 21 and 50 was required to work on the roads for at least two days each year. The Legislature also approved a road tax, based on real estate values, that could be paid outright or offset through the aforementioned road work at a rate of two dollars a day.

Each county was divided into road districts headed by a local resident who was appointed as road supervisor. His responsibilities included enforcing the labor tax law, supervising construction and maintenance of legally approved roads, erecting signs at crossroads that gave the distance to nearby towns, and submitting an annual road inventory and roadwork record to the county commissioner.

In 1850, Congress passed the Minnesota Road Act, authorizing the construction of five military roads to help protect the Territory and provide a means of transportation for early settlers. For most of the remainder of the nineteenth century, state statute revisions in 1851, 1858, and the early 1860s were sufficient to regulate the state's roads.

## DID YOU KNOW

In his book *Tracing Minnesota's Old Government Roads,* author Grover Singley gives an account of road building in the 1850s that shows some similarities to today's methods of measurements and pay quantities:

> Road building procedures in the 1850s were basically very similar to those in use now. Sections of road were let on sealed bids to private contractors; clearing was done by the acre; excavating and earth filling were measured by the cubic yard. Culverts and small bridges could be constructed of hewed timbers cut at the location; their construction was paid for by the linear foot. Bridges over 20-feet long were to be built according to the plan of . . . an engineer in the topographical corps. The road right-of-way was to be opened a hundred feet wide with a center strip for wheeled vehicles to be thoroughly cleared for a width of 50 feet.

Minnesota Historical Society

An abandoned halfway house on the military road between Sunrise and Harris in Chisago County, ca. 1925.

Minnesota Historical Society

A road crew at a construction site.

To secure funding for a road program, the Legislature followed the precedent set by many other states and territories and requested aid from the United States Congress. In a House of Representatives' bill introduced in 1850, Henry H. Sibley, Minnesota's first territorial delegate to Congress, asked for appropriations to construct military roads. The bill was passed that year, providing $40,000 to construct four roads and to permit surveys for a fifth under the supervision of the Secretary of War. The work was to be carried out by the War Department's Bureau of Topographical Engineers.

In a Bureau report to the Secretary, the five roads were described as 1) a road from Point Douglass, on the Mississippi *via* Cottage Grove, Stillwater, Marine Mills, Falls of . . . [the St. Croix], to the falls or rapids of the St. Louis river of Lake Superior; 2) a road from Point Douglass *via* Cottage Grove, Red Rock, St. Paul, and Falls of St. Anthony, to Fort Gaines [Ripley]; 3) a road from the mouth of the Swan river, or the most available point between it and the Sauk Rapids, to the Winnebago agency at the Long Prairie; 4) a road from Wabasha to Mendota; and 5) a survey and layout of a military road from Mendota on the Mississippi, to the mouth of the Big Sioux, on the Missouri [in Iowa]. The Bureau also noted that the $40,000 appropriation would cover only half the estimated cost of building the roads.

In 1852, President Fillmore signed a bill acknowledging that the original funding would be inadequate to cover the cost of constructing the authorized roads, as determined by the road survey parties in the previous year. The bill provided an additional $45,000 in funds, allocated as follows: $20,000 for the St. Louis River road; $10,000 for the Fort Ripley road; $5,000 for the Long Prairie road; and $5,000 for the Mendota-Wabasha road. An additional $5,000 was also allocated to the Mendota-Big Sioux River military road to cover the estimate for the survey that was legislated in 1850.

Congress appropriated additional funds for the four roads in 1855, 1856, and 1857. However, not unlike some planned road-building and improvement projects of today, only the military road from Swan River to Long Prairie was completed. The other designated roads needed additional work, only some of which was carried out before funding ran out in 1859. The government road office that had been headquartered in St. Paul was closed in 1861, after which, the military roads were maintained by the local communities through which they passed.

In addition to the initial five projects, the federal government continued to fund construction for new roads, before and after the closing of the road office, including the following:

- A road from St. Anthony Falls to Fort Ridgely on the Minnesota River, 1855.
- A road from Fort Ridgely to the South Pass in the Rocky Mountains in the future state of Wyoming, 1856.
- A military road from Duluth to Nett Lake, 1869. (This road, originally intended to serve the Chippewa Indians on the Nett

Lake Reservation, was constructed only as far as Lake Vermillion. However, it thus provided a route to newly discovered gold deposits in the area.)
- A bridge over the Mississippi River from Fort Snelling to St. Paul, connecting to a road to the state capitol, 1880.

The federal government also funded several wagon roads, as agreed upon in treaties with Minnesota tribes. Included were roads between the following locations:

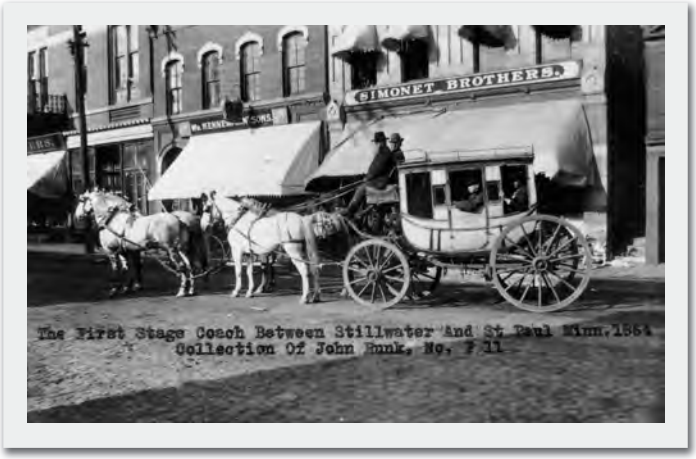
- Rum River at the Mississippi in Anoka and Lake Mille Lacs, 1855.
- Crow Wing and Leech Lake, 1855.
- The Leech Lake and Red Lake Agencies, 1865.
- Leech Lake and White Earth Reservations, 1870.
- Leech Lake/White Earth and the railroad at Detroit Lakes, 1875.

In addition to the federal road-building projects of this period, hundreds of roads were authorized by the Territorial Legislature, although many of them were never constructed.

Almost none of the total mileage of roads built from 1850 to 1880 is still in use today in the original locations. The alignments and grades, although generally satisfactory for horse and buggies, were totally inadequate for automobiles.

## HORSE AND BUGGY DAYS

As the nineteenth century drew to a close, Minnesotans were able to travel with horse-drawn vehicles on dirt roads in most parts of the state. Therefore, it is easy to understand why many of these roads were seasonably impassable. Hard-surface roads of any kind were nearly nonexistent outside of a few cities. However, gravel and/or oil surfacing was provided on a few of the busiest thoroughfares.




Minnesota Historical Society

The first stagecoach to travel between Stillwater and St. Paul, following a road built in 1836. Note the cobblestone road surface.

Although today's Minnesota drivers have few qualms about getting into their cars and driving halfway across the state for a weekend, that type of trip was hardly possible when Minnesota became a state in 1858. Since road construction and maintenance was essentially a local responsibility well into the dawn of the next century, roads that crossed jurisdictional lines could vary considerably in road quality within a distance of only a few miles. Stream crossings were often made by fording — at best, a risky undertaking and, at worst, impossible. Bridges, where they existed, were often inadequately designed and subject to failure. Furthermore, there was little to guide a traveler taking an inter-regional trip from point A to point B. Travelers had to make frequent stops to get directions, to determine if the road ahead was passable, to ask where they might be able to stay overnight, and to find water for their horses. (Wise travelers brought their own food, drink, and bedroll from home.)

With the uncertainties of the existing road systems, most people who needed to travel more than sever-

Minnesota Historical Society

Horse and buggy on a county road, 1884.

al miles elected to use available commercial transportation. For some, that meant taking a train. For others, that meant taking a stagecoach. A stagecoach? In Minnesota? Certainly. Stagecoaches, in spite of their portrayal in the movies, were not limited to the colonial eastern United States or to the Wild West. In Minnesota, stagecoach lines connected many towns. Some of those towns served as "hubs," bringing stagecoach passengers to railroad stations.

## PLANK ROADS

During Minnesota's first seventy years, the territorial and state governments were rather leery of getting into the road and highway business. On the other hand, it was obvious that roads were an absolute necessity for the development of the state and the well being of its citizens. The Minnesota Territorial Legislature clearly recognized this need by granting a charter to private companies that proposed to build, operate, and maintain public roads. In 1851, the Legislature enacted a statute to regulate the incorporation of plank and turnpike road companies.* Plank roads and turnpikes (toll roads) had gained some favor for a very brief period during the 1850s in the Midwest and many years earlier in the eastern portion of the United States.

Today, the word "turnpike" brings to mind roads like the Pennsylvania and Ohio Turnpike, and other limited-access toll roads that were the forerunners of the National System of Interstate and Defense Highways. Originally, the term meant a pike or pole blocking access to a road. The "pike" was "turned" to allow passage upon payment of a toll. Into the nineteenth century, "turnpike" generally came to mean a road that was improved with gravel and broken stone. These were the highest-quality roads of the time, and they were preferred for travel between two distant points because of their greater comfort and higher speeds. Private companies built the turnpikes, and they collected tolls to cover the construction and operating costs, as well as to provide a return to the companies' investors.

### Plank Roads

Plank roads were just what the name implies. They were constructed by placing planks of pine or oak, eight- to sixteen-feet-long and three- to four-inches-thick, across "sleeper" or "stringer" timbers placed parallel to the road. Current-day counterparts are the plank walking trails in many Minnesota parks — an improvement that allows dry passage through low-lying areas that might otherwise be periodically or totally inaccessible to hikers.

The state of Michigan, a leader in plank road construction, built 1,200 miles of these roads by the end of the 1850s. A law covering specifications for their construction stated that the road right-of-way had to be two to four rods (33 to 66 feet) wide, 16 feet of which was to be "a good, smooth, permanent road, well drained by ditches on either side." At least 8 feet of the road was to be covered with three-inch planks. The law further stated that grades were to be no greater than 10 percent (a rise of 10 feet in 100 feet of length.) **

**Arthur J. Larsen, The Development of the Minnesota Road System, Minnesota Historical Society, St. Paul, Minnesota, 1966, Pages 245, 246.*

***"The Plank Road Craze: A Chapter in the History of Michigan's Highways," Philip P. Mason, Wayne State University, Copyright © 2001-2007 State of Michigan, http://www.michigan.gov/hal/0,1607,7-160-17451_18670_18793-52863--,00.html, as of March 4, 2007.*

## TIPS FOR VIEWING A STEREO PHOTO

If you don't happen to have a stereo viewer, you can still see the three-dimensional effect of a stereo photo by placing the photo about 2 feet in front of you, with the plane of your eyes and the horizontal borders of the photos parallel to one another. With the photos and your head in that position, focus on the black line separating the photos and slowly begin to cross your eyes. Within a second or two, it will seem that there are three photos instead of two. At that point, focus on a distinct feature in the photo, such as the overhead crane or the tree leaves hanging down in the foreground. The center photo should then coalesce into a 3-D image, with the overhanging leaves appearing to be much closer than the crane. (Be assured that in spite of what your mother told you, your eyes will not get stuck in the crossed position.)

***Some helpful hints:*** Before crossing your eyes, hold a pencil vertically about halfway between the photos and your eyes and line it up with the black line between the photos. While focusing on the pencil, slowly bring it toward your eyes. You should notice the third image starting to appear between the two photos. Keep focusing on the pencil until it is within a few inches of your eyes. At that point, a full-width third image should coalesce. *Note that only a very slight crossing of the eyes is required.* If the two photos seem to fly apart, you have crossed your eyes too far. If you think you have the photos nearly in sync, but you still see two overhead cranes in the center photo instead of one, try tilting your head slightly until the cranes pop into a single image.

If you find after a few minutes that this procedure is just not working, set it aside for a while, relax your eyes, and then come back and try it again. You should not have to strain your eyes to make it work. With a little practice, it should be quite easy to do. If, however, after several tries, all you have achieved are sore eyes and a headache, keep in mind that some libraries still have stereoscopes and stacks of stereo photos for your viewing pleasure.

Minnesota Historical Society

A stereo photo of an old bluff road at Fort Snelling.

So, what was it really like back then? The photos that follow will provide some clues, but given the freeway culture of 2008 and the technological gadgets that "simplify" our lives, it might be a little difficult to see ourselves in the pictures.

Minnesota Historical Society

A road below Fort Snelling.

Minnesota Historical Society

View from the road of the hexagonal tower at Fort Snelling.

The second state capital.

Minnesota Historical Society

Minnesota Historical Society

Travel by stagecoach was slow and dangerous. As can be seen in this photo, many of the dirt roads were seasonably impassable.

Minnesota Historical Society

A stagecoach in front of Douglas House, Alexandria, 1876. Although stagecoaches may seem out of place in Minnesota history, they played a primary role in getting people and goods from one town to another in the early years of Minnesota's statehood.

Stagecoaches were not limited to rural areas in Minnesota. This one is parked in front of the West Hotel at Fifth Street and Hennepin Avenue in Minneapolis with Minnesota territorial pioneers on board for a trip to the Minnesota State Fair on September 6, 1900.


Minnesota Historical Society


Minnesota Historical Society

A procession on Nicollet Avenue at Third Street, Minneapolis, ca. 1910, portraying the development of transportation over nearly a 100-year period. The Red River cart on the left was owned by railroad magnate James J. Hill. When this photo was taken, the stagecoach era was coming to an end, as suggested by the number of automobiles bringing up the rear.

# The Push for Good Roads

# 2

## THE GOOD ROADS MOVEMENT AND THE BABCOCK AMENDMENT

Well into the early part of the twentieth century, dirt tracks and mud lanes remained the main routes between many towns in Minnesota, making travel laborious and time consuming for wagons and often impossible for bicycles and automobiles, as shown in the photos accompanying this chapter. Even in larger cities, hard-surfaced roads were not particularly common, except on the most heavily traveled streets. As late as mid-century, many of the residential streets in the capital city consisted of earth or gravel that was annually treated with liquid tar or asphalt.


Minnesota Historical Society

The Minnesota Highway Department and AAA fought for the improvement of roads like this in 1927. Note the bottom line of the message on the spare tire cover showing through the two leaves of the bumper. It reads: GOOD ROADS.

The movement for better roads began late in the nineteenth century and was chiefly driven by such diverse advocates as bicycle owners and merchants. At the time, most new-road construction around the state served farm-to-market needs and provided access to the railroads. Minnesotans bought their first automobiles in 1895, but it wasn't until ten years later that road design and construction adapted to accommodate automobile drivers' needs.

To address the lack of an adequate road system, the first statewide Good Roads convention was held in St. Paul in 1893, and the Good Roads Association of Minnesota was formed three years later. The convention led a movement to allow the state government to participate in the cost of road maintenance. At that time, the Minnesota Constitution forbade the state from involvement and assigned nearly complete responsibility for roads to town boards.

Charles M. Babcock was an early advocate of road improvements. As a young man working in his father's general store in Elk River, Babcock often discussed the need for a safe and dependable road

into town with local farmers and merchants. Eventually, a road was improved that allowed for easy access from farms into market. Soon thereafter, Babcock was elected as a county commissioner. (See sidebar, page 18.)

Major progress toward providing for satisfactory roads came in 1898 when voters passed a constitutional amendment allowing the state to participate in road maintenance. It also established a three-person, unpaid Minnesota State Highway Commission.*

Minnesota Historical Society

One of the first passenger buses on a Minnesota highway, ca. 1915. A farmer with a team of oxen was hired to stand by.

The amendment did not go into effect until 1905, and the State Highway Commission took office a year after that. In recognition of his leadership in the better roads movement in Sherburne County, Babcock was appointed to the Highway Commission by Governor Adolph Eberhardt in 1905. The commission oversaw the construction of roads built with state funds and provided assistance to county highway engineers in their planning and contract administration. In 1907, counties across the state began receiving state aid for road improvements.

As automobiles grew more popular throughout the state, the need for good roads grew with them. In response, the Dunn Amendment of 1912* greatly increased the tax levy for roads. Aid for local roads was further enhanced in 1916 with the passage of the Federal Highway Aid law, which led to the establishment of a 6,200-mile federal aid road system connecting all Minnesota county seats and population centers. The system was placed under the administration of the State Highway Commission.

## BABCOCK AMENDMENT MARKETING

Campaign literature in favor of the Babcock Amendment was prepared by the Minnesota Highway Improvement Association, Inc., and published in the *Minneapolis Sunday Tribune*. The association also noted that overhead expenses of the Department of Highways were 6 percent compared to an average of 10 percent for private corporations at that time. This ensured that 95 cents of every dollar went directly into road development.

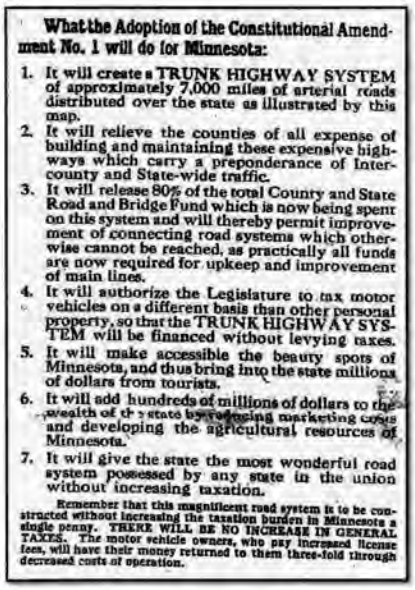
Testimonials regarding expected savings for road users, including the following, were also published during the campaign for the amendment:

- A southern Minnesota car owner found that the good roads savings on mud chains, alone, offset his yearly car taxes.
- A woman making frequent trips between Minneapolis and Faribault said that dry cleaning savings with the dustless pavement were more than the highway tax collected on the luxurious family car.
- One man said that the signs and markers alone were worth more to him than his annual license fee. The time he lost by stopping and inquiring, or sometimes taking the wrong road, before the highways were marked, was worth many dollars a year.

In an action to further promote the development of good roads, the 1917 session of the Legislature replaced the Minnesota Highway Commission with a single commissioner and established the State Department of Highways. Governor J. A. A. Burnquist appointed Charles Babcock as its first commissioner.

## Babcock Amendment

At the same general store where Babcock had envisioned his plans for a reliable road in Sherburne County, he began formulating plans for a statewide system of interconnected highways to benefit Minnesota's citizens. Because Minnesota's economy was based on agriculture, dairying, and mining, Babcock recognized that reliable, high-quality roads were essential for transporting products from farms and mines to markets. The establishment of a statewide system would enable economic growth and development of Minnesota industries across the state.



**What the Adoption of the Constitutional Amendment No. 1 will do for Minnesota:**

1. It will create a TRUNK HIGHWAY SYSTEM of approximately 7,000 miles of arterial roads distributed over the state as illustrated by this map.
2. It will relieve the counties of all expense of building and maintaining these expensive highways which carry a preponderance of Inter-county and State-wide traffic.
3. It will release 80% of the total County and State Road and Bridge Fund which is now being spent on this system and will thereby permit improvement of connecting road systems which otherwise cannot be reached, as practically all funds are now required for upkeep and improvement of main lines.
4. It will authorize the Legislature to tax motor vehicles on a different basis than other personal property, so that the TRUNK HIGHWAY SYSTEM will be financed without levying taxes.
5. It will make accessible the beauty spots of Minnesota, and thus bring into the state millions of dollars from tourists.
6. It will add hundreds of millions of dollars to the wealth of the state by reducing marketing costs and developing the agricultural resources of Minnesota.
7. It will give the state the most wonderful road system possessed by any state in the union without increasing taxation.

Remember that this magnificent road system is to be constructed without increasing the taxation burden in Minnesota a single penny. THERE WILL BE NO INCREASE IN GENERAL TAXES. The motor vehicle owners, who pay increased license fees, will have their money returned to them three-fold through decreased costs of operation.

The push for good roads required convincing state residents to support road development with tax dollars.

As part of his campaign to build the highway system, Babcock promoted the savings that good roads would provide to motorists. He insisted, "We pay for good roads, whether we have them or not, and pay more when we do not have them." He proposed a constitutional amendment calling for the design and construction of 70 trunk highways to connect all counties and cities with populations of more than 1,000 people. With this plan, he intended to remove the economic burden on counties and townships for road construction without imposing another burdensome tax.

Voters approved the Babcock Amendment in 1920 by a 5:2 margin, and the measure was implemented with legislation passed in 1921.

## Funding

The trunk highway system was funded through a motor vehicle tax, highway bonds, and federal aid. By 1924, voters approved a constitutional amendment that authorized a 2 cent per gallon tax for the trunk highway fund. In 1925, a gas tax was added to increase road funding. Those who crafted and implemented the amendment viewed the motor vehicle and gas taxes as the fairest ways to spread the burden of paying for new roads with the smallest impact on individuals' expenses. For example, the *Minneapolis Journal* reported that a southern Minnesota car owner could offset his yearly car taxes by good roads' savings on mud chains alone.

Another amendment in 1928 placed one-third of the gas tax revenues in a state road and bridge fund, with the remaining two-thirds designated for trunk highways. By 1929, a state-aid road system was established, and in 1941, the gasoline tax was increased to 4 cents per gallon, with $1.2 million apportioned annually to state-aid roads.

Later, a 1956 amendment provided an increased amount of road funds for the counties and, for the first time, provided state aid to cities with a population of more than 5,000. At that time, the Highway User Tax Distribution Fund was established and apportionments from it were set at 62% for trunk highways, 29% for the county state-aid system, and 9% for the municipal state-aid street system.

## Execution of the Plan

The first step in establishing the trunk highway system was hiring a workforce to manage the new

road network. Within 60 days of amendment implementation, a force of nearly 1,000 workers began performing daily maintenance activities on 5- to 7-mile sections of existing road that were now part of the new system.

A primary maintenance task in those days was blading the gravel road surface to reduce "washboarding" produced by vehicle traffic. Gravel was considered more desirable than hard surfaces for roadways, and almost all of the higher-class rural highway mileage consisted of gravel-surfaced roads in 1921. However, as traffic increased, the cost to maintain gravel began to outweigh its benefits. Paving roads soon became an objective for the trunk highway system.

## DID YOU KNOW

Seventy trunk highway routes are actually provided for in the Minnesota State Constitution as amended by the Babcock Amendment. All 70 are described in Statute §161.114 and typically identify a starting and ending point for each and the cities through which they must pass. A typical trunk highway description is as follows:

> Route No. 1. Beginning at a point on the boundary line between the states of Minnesota and Iowa, southeasterly at Albert Lea and thence extending in a northwesterly direction to a point in Albert Lea and thence extending in a northerly direction to a point and on the southerly limits of the city of St. Paul and then beginning at a point on the northerly limits of the city of St. Paul and thence extending in a northerly direction to a point on the westerly limits of the city of Duluth and then beginning at a point on the northerly limits of the city of Duluth and thence extending in a northeasterly direction to a point on the boundary line between the state of Minnesota and the province of Ontario, affording Albert Lea, Owatonna, Faribault, Northfield, Farmington, St. Paul, White Bear, Forest Lake, Wyoming, Rush City, Pine City, Hinckley, Sandstone, Moose Lake, Carlton, Duluth, Two Harbors, Grand Marais and intervening and adjacent communities a reasonable means of communication, each with the other and other places within the state.

The above trunk highway route describes what in more recent times is — or was — Highways 65 and 3 in southern Minnesota, and Highway 61 north of St. Paul to the Canadian border northeast of Grand Marais. Note that the trunk highway is not designated within the city limits of St. Paul and Duluth, a condition of all trunk highways that approached the limits of cities of the first class. Although the numbers used to sign the trunk highway routes across the state have changed over the years to maintain route continuity — particularly with the national numbering for the Interstate and US route systems — the constitutional routes have retained the numbers designated in the statute.

Because of their constitutional nature, moving a trunk highway out of a designated city requires passage of a constitutional amendment. When planning a highway bypass of a city, a far more expedient means to comply with the constitutional requirement has been to move the city limits out to the location of the planned highway. This is apparent when looking at the maps of such cities as Sandstone, Pine City, and Moose Lake, covered in the above example, where the city limits can be seen reaching out to the highway.

The constitutional amendment of 1920 provided for additional routes that are numbered 71 through 338, 380 through 384, and 390 through 396. These additions to the Trunk Highway System were permitted to assure that trunk highways could be built to serve all of the state's cities. The last group was added when the Interstate routes were added to the Trunk Highway System after its approval by Congress in 1956. These routes are described in the statutes similarly to the constitutional routes; however, since they are specifically identified as "legislative" routes, they can be adjusted as needed by the Legislature without a constitutional amendment.

In the beginning stages of implementation, the main goal of the trunk highway system was to put revenue to immediate use. Within 90 days, $5 million of new building had begun. Babcock envisioned that the benefits of funding and construction would be spread equally throughout the state. Soon after the amendment was implemented, Minnesota became a nationwide leader with its comprehensive road system.

Another immediate goal of the plan was to create uniform traffic signs for the statewide system. Standards for traffic control devices, signing, and markings left much to be desired in the early days of the automobile, and they varied considerably from one local jurisdiction to another.

* *The amendment was named after State Representative Robert C. Dunn who had been the 1904 Republican candidate for governor. He was a legislator who fought for good roads during four terms in the Minnesota House up to the time of the amendment and, subsequently, in two terms in the Senate representing the Princeton area. (He was also elected state auditor for two terms prior to his gubernatorial campaign.)*

## MARKETING OF THE 2006 TRANSPORTATION CONSTITUTIONAL AMENDMENT

*In 2006, a constitutional amendment on the general election ballot proposed to dedicate the entire revenue from the motor vehicle sales tax for roads and transit incrementally, over a five-year period. (At the time, 46 percent of the tax went to the state's general fund.) It is interesting to compare some of the similarities in the following campaign literature excerpts from the 2006 initiative with that of the Babcock Amendment campaign 90 years earlier. The 2006 amendment was approved by a substantial majority.*

Whatever the reason, this is the chance for Minnesota citizens to see their transportation taxes go to the right place - roads and transit.

If approved, this Transportation Amendment will help provide safer, more efficient roads and transit options for all Minnesotans.

- **Less time stuck in traffic!**
- **Support for our rural economy!**
- **Safer travel!**
- **More jobs and stronger economy!**
- **Cleaner environment!**
- **More travel options!**

A YES vote sends the message that Minnesotans want more investments in roads and transit. By saying YES to dedication of all transportation revenue to transportation purposes you can help fund critical safety and efficiency improvements to Minnesota's roads, bridges, and transit. Your vote will boost transportation funding by more than $300 million every year!

Minnesotans want a balanced transportation system that can support our quality of life and economic viability now and into the future. The Transportation Amendment is an important step toward achieving that goal. Currently, only 54 percent of the existing motor vehicle sales tax revenue is being spent on transportation and there is no dedicated revenue source for public transit. If the Transportation Amendment is approved by voters, 100 percent of the revenue will go to highways and public transit. More than $300 million per year in additional revenue will be available for Minnesota's roads, bridges, and transit, **without raising taxes**. The phase-in of the revenue will occur over five years, beginning in 2007 with the full 100 percent dedication in place by 2012.

But, the Amendment does **NOT**:

- Raise taxes. The motor vehicle sales tax is an existing tax – this will simply put all revenue generated by a transportation related tax directly to transportation purposes.
- Solve all of Minnesota's transportation funding problems because there is no quick fix for needed investments.

## CHARLES M. BABCOCK, 1871-1936

*Minnesota's First Commissioner of Highways*

Minnesota Historical Society

Charles M. Babcock

Charles M. Babcock was Minnesota's first Commissioner of Highways. While serving from 1911 to 1933, he established the foundation upon which Minnesota roads have since been built. During his 22 years as commissioner, he orchestrated the improvement of 11,340 miles of roads, at a cost of millions of dollars. His greatest accomplishment was the Trunk Highway System, more than 7,000 miles of arterial highways running across the entire state.

Babcock first became interested in the need to regulate and improve roads when he observed the poor condition of roads around his home in Elk River. He was also quite aware that drivers from out of town — and out of state — drove on roads in his county without paying taxes toward the roads' upkeep. In 1930, the *St. Paul Pioneer Press* told the story of how Babcock's involvement in roads began:

> Back in 1907 or thereabouts a country merchant of Elk River, Minn., used to sit in his front yard on Sunday afternoons and watch the new-fangled automobiles chug by. Elk River was on the road between the Twin Cities and St. Cloud and St. Cloud was about a day's run from St. Paul, the way cars ran (if any) those days.
>
> In the merchant's hand was a printed list of registered Twin Cities automobiles together with the names of their owners. As each car went by he would turn to this list and find out to whom it belonged. This was a thrilling sport and much more stimulating than bridge or pinochle. It stimulated the mind of the merchant to thoughts something like this:
>
> "Now there goes Mr. So-and-So. He comes clear up here in his car and uses our roads but he doesn't help pay to keep them up. There ought to be some way of collecting from the automobile drivers to help pay for the roads."
>
> By this time Mr. So-and-So, or whoever it was, would probably be 200 yards away, tearing along at the rate of 15 miles per hour, and would thus temporarily escape. But the country merchant eventually found a way to halt all these motorists and collect from them. The queer part of it is that the motorists generally approve of this action. It provides them with good roads almost anywhere they have a mind to go.

Babcock's interest in roads was already well established, especially after he bought his own automobile in 1909 — the first car in Elk River. Babcock described driving his car around rural areas, using the creative tactics he developed.

> It had two cylinders, carbide lights and no top or windshield. The first trip of any length I ever made in it was to Onamia, about 60 miles away. I started out one afternoon and drove from Elk River to Princeton and took 20 miles off the distance that way.
>
> We took an axe, pick and shovel and rope. In some places we hauled rocks out of the road and in others we had to build roads over rocks that were too heavy to move, and stumps. In some places there was a drop of two feet from the bridge or culvert approaches, to the road itself. We left Princeton at 6 A. M. and got to Onamia about 6 P. M. It was considered a wonderful run. I don't believe the car would do over 25 miles per hour even if the road was good.

People recognized that automobiles were here to stay, and they needed roads to drive on. Beginning in 1910, Babcock served with Louis W. Hill and C. I. McNair on Minnesota's first commission given the task of planning a state highway system. When they began, "there was not a foot of paving outside the limits of the cities, and mighty few blocks of paving inside them for that matter." And when the sun "blast-

ed down, the roads turned to a churned veil of dust and when the rain fell they were deep channels of mud. In the winter the snow drifted to frozen mountainous waves and communication was practically paralyzed for any but bob sleds and sleighs."

> In fulfilling his duties as commissioner, Babcock became president of the American Road Builders Association, and Presidents Coolidge and Hoover appointed him as a delegate to the Pan American Road Congress. In 1925, he traveled to the Road Congress meeting in Buenos Aires.

Babcock was forward thinking in developing the state's roads. During his tenure from 1911 to 1930, the number of automobiles in Minnesota increased from 25,000 to 775,000, intensifying the need for roads that would stand up to higher speeds and traffic. Before his work, most roads were not surfaced. They were simple trails that had evolved wherever cars happened to drive. By 1930, there were 1,272 miles of paved rural highways, and, within 20 years, there were 36,000 miles of roads with gravel surfacing or better in the state. By far, however, Babcock's greatest accomplishment was completing, within two years, a traversable state highway system that included more than 7,000 miles of good roads.


J. Katz.

Babcock Trail in Inver Grove Heights is named in memory of Charles M. Babcock.

Indeed, to Babcock, automobiles symbolized modernization and a high standard of living, for which people must pay taxes. He saw the huge benefits of good roads:

> If we want to cut down our road expenditures, all we have to do is to stop traveling, and make our own clothes, grind our own flour, and kill and cure our own meat at home, as they did in the last century. But if we want to travel and if we want to buy and sell and live in Twentieth century style, we must have roads for our vehicles to use. As long as we have motor vehicles, we pay for good roads whether we have them or not, and we pay more when we do not have them.

Babcock maintained his dedication to this lifelong project with his belief that "a road is more than just a strip of man-made something on which to travel. It is a line of communication over which passes the doctor to the sick baby, over which is hauled food for the nation, that which enables men and women to maintain closer contact even though many miles separate them, in fact it is genuinely an artery of the body social."

## THE TRANSPORTATION BILL OF 2008

One of the most important events in recent years for road transportation in Minnesota was the passage of a funding bill in the 2008 session of the Legislature. Similar legislation was passed but vetoed by Governor Tim Pawlenty in each of the two previous legislative sessions. The latest bill was vetoed as well. However, enough votes were mustered in the House of Representatives to override the veto by a slim margin. The bill included an 8.5-cent increase in the gasoline tax — the first increase in 20 years. Over that time period, the value of the existing 20-cent tax per gallon had been reduced to 12 cents in 1988 dollars.

In spite of a multitude of endorsements, the bill was very controversial, prompting State Senator Steve Dille to respond to concerned citizens in his district (McLeod, Meeker, and part of Wright Counties) with the following letter explaining his vote. It's interesting to compare his talking points with those of the Babcock Amendment proposal.

February 29, 2008

Dear Minnesota Citizen Interested in Transportation Funding,

Thank you for your recent correspondence concerning my vote on the transportation bill. I have received hundreds of emails, phone calls, and letters from my constituents and residents of our great State. I voted for the transportation bill that was vetoed by the Governor and then overridden by the House of Representatives on a 91 to 44 vote and by the Senate on a 47 to 20 vote. I would like to take the opportunity to explain why I supported this legislation.

This bill will provide an additional 660 million dollars per year for 10 years to help catch up on delayed maintenance and reinvestment in our transportation infrastructure. Some of this money will be used by cities, counties, and townships decreasing the need to increase property taxes. For example Wright County will receive an average of 2.7 million dollars more per year, Meeker County will receive 700,000 more per year, and McLeod County will receive 1.1 million more per year.

The lack of action to improve roads and transit is costing us all real money as the cost of construction continues to increase and we lose out on potential federal funds. Investing in transportation will create jobs and boost economic activity. Also, we can make improvements to the safety of our roads and bridges and reduce fatalities and injuries.

The Minnesota Chamber of Commerce supported this bill and stated in their support letter that "Transportation is a critical issue for Minnesota businesses. Chamber members are users of the system – they recognized that it is important for businesses to move freight and other goods efficiently and safely, and for employees to get to work in a timely and safe manner."

Over 140 organizations and many individual citizens supported this bill including the Minnesota Truckers Association, Minnesota Farm Bureau, and Minnesota Farmers Union. This bill was supported by all of the farm commodity organizations including Minnesota Corn Producers, Minnesota Soybeans Producers, Minnesota Wheat Producers, Minnesota Potatoes Producers, Minnesota Sugar Beets Producers, and Minnesota Pork Producers. In addition, this bill was supported by 21 environmental protection organizations and many local government organizations such as the Minnesota Association of Counties, Minnesota Association of Townships, and the League of Minnesota Cities. The transportation bill was opposed by two organizations, the Republican Party and the Taxpayer League, and many individual citizens.

The final bill summary contains the following:

- 5 cent per gallon increase in gas tax
- 3.5 cent per gallon surcharge on gas for servicing the trunk highway bond debt

- $1.8 billion in trunk highway bonds over 10 years
- Eliminating caps on license tab fees and changing the depreciation schedule
- Dedicating sales tax on leased vehicles to Greater MN transit and local roads
- Providing a $25 tax credit for low-income residents
- Authorizing metropolitan area counties to impose a 1/4 percent sales tax for transit without a referendum
- Authorizing counties in Greater MN to levy a sales tax of up to 1/2 percent for transportation purposes with a referendum
- Increased authorization for Mn/DOT to spend trunk highway funds in FY 08 and FY 09 to reflect federal emergency funding related to the I-35W bridge project.
- $60 million in GO bonds for local roads and bridges

The cost of this bill will vary per citizen. The 1/4 percent sales tax increase to support mass transit will only affect those who live or shop in the seven-county metro area. The increase in tab fees will not affect existing cars until they are sold or if you buy a new car. The increase in tab fees will still be lower than they were 10 years ago when Governor Ventura changed them to a flat fee.

The average family driving 15,000 miles per year averaging 20 miles per gallon will have an increased monthly cost of 5 dollars due to the 8.5-cent gas tax increase. The last time the legislature raised the excise tax on gasoline was 1988. After twenty years of inflation, the purchasing power of the 20-cent gas tax enacted has decreased to an inflation-adjusted 12 cents per gallon. This tax increase brings the purchasing power back to 17 cents per gallon. Based on an amendment to our State Constitution that the citizens of Minnesota voted for in 1956, every penny of the state gas tax is 100% dedicated to roads and bridges.

Since a gas tax increase is regressive for low income earners, this bill includes a $25 tax credit for individuals and married couples who are in the lowest state income tax bracket.

This increase in revenue may sound like a lot but it is only one-third as much as Governor Pawlenty's own Department of Transportation estimated is needed which is 1.7 billion more per year for 10 years. Also if you calculate the increased revenue against the state and local units of governments' annual budgets, it comes to only a 1.5% annual increase in government spending. In most years' budgets increase much more than that.

Many opponents claim this bill is the largest tax increase in state history which is just not true. The fiscal analyst from the Non-partisan Senate Counsel identifies the Minnesota Miracle of the early 1970s which reformed K-12 education funding as the largest tax increase in recent state history. State and local taxes went up 16%. Adjusted for inflation, this would be a 3 billion dollar annual increase in 2008 dollars.

Some will argue that this is the worst time to increase taxes because we are in a recession. According to our state economist, Tom Stinson, most recessions only last 10 months, and some are over in 8 months. By the time this bill is fully implemented, the recession will probably be over.

Others argue we should fix our roads by selling bonds, or in other words borrowing the money, instead of increasing our taxes. The bill that passed includes some bond sales but the debt must be paid back, so a surcharge was added of 3.5 cent per gallon of fuel to service this debt. I prefer to pay as we go rather than pass the cost on to the next generation.

Once again thank you for all the correspondence on this important issue.

Sincerely,

Steve Dille

# State-Aid Roads

3

## RECOGNIZING A STATE-AID ROAD

All county roads in Minnesota are officially designated either a "County State Aid Highway (CSAH)" or a "County Road (CR)." But there is nothing on the roads that definitively identifies their status. Some CSAHs are signed with a distinctive blue pentagon-shaped route marker, while some CRs have a white, square marker with black numerals. However, this system can be somewhat arbitrary, as some counties sign all of their roads — CSAHs and CRs, alike — with the pentagon marker, and some use only the white square markers. CSAHs are also more likely to have higher road design standards, e.g., wider shoulders, flatter side slopes, and more traffic, etc., whereas CRs are more likely to have gravel rather than paved shoulders, sharper and more frequent curves, and steeper grades. On the other hand, it is not uncommon for a recently reconstructed CR to appear to be a higher grade than a CSAH that has not been rebuilt for some time.





In some counties, it is more reliable to identify road classification by checking an official highway map, wherein CSAHs are identified with a route number in a circle, while CRs are shown with a route number in a diamond-shaped symbol. (Many Minnesota county websites have their maps available online.) However, many counties do not follow that convention for identification on their official maps. Probably the most reliable identification can be found on the county maps published by Mn/DOT for all 87 counties. The circle and diamond symbols containing the route numbers follow the convention noted above. These maps are all available on the Internet at http://www.dot.state.mn.us/tda/html/counties.html.

But what about "Minnesota State-Aid Streets (MSAS)"? There is nothing visible on a state-aid street that definitely tells you whether it is a part of any specific system. The lack of route markers may suggest that the road is *not* a Minnesota trunk highway or a county road (CSAH or CR). However, there are some trunk highways and county roads that are not marked through cities. There is, on the other hand, some degree of assurance that a city street is on the state-aid system if it does not have a numbered route marker but is clearly a well-traveled arterial compared to other streets within the city. But, there is, in fact, a better way: City traffic flow maps published by Mn/DOT are

available at http://www.dot.state.mn.us/tda/html/Cities_alpha_counts.html and show every street. The daily average, two-way traffic flow is shown, in color, on all system streets. The system streets are identified by route marker symbols (shields for Interstate and US numbered routes, squares with rounded corners for state numbered routes, circles for CSAH routes, and diamonds for CR routes). The MSAS routes are identified by a number in italic type, slightly larger than the type used for the street names.

## MINNESOTA STATE AID BY THE NUMBERS

87 ..... Number of Minnesota Counties
30,000 ..... Miles of County State-Aid Highways
$356.4 Million ..... Estimated 2006 Distribution to Counties
136 ..... Number of Eligible Municipalities
3,128..... Miles of Municipal State-Aid Streets
$111.5 Million ..... Estimated 2006 Distribution to Municipalities
$26.7 Million .....Estimated 2006 Distribution to Townships

## STATE-AID ROAD DESIGN STANDARDS

With 87 counties in Minnesota and 130 municipalities that qualify for state-aid road funding, it is imperative that uniform standards be applied for the design of those roads. Given that the typical road user is likely to cross several jurisdictional boundaries in the course of a daily drive, it is in the public interest to minimize the differences in the geometric and safety features of roads that cross those lines. There is also an economic interest in the cost of constructing, maintaining, and operating those road systems. The task of developing and promulgating such standards is one of the responsibilities assigned to the Mn/DOT State Aid Division. The process for establishing and revising standards follows Minnesota government official rule-making procedures. While the standards are quite specific, many of them are stated in terms of a range of values rather than a single number, and engineers are expected to use their judgment in applying them. The rules also provide for a variance procedure to address extenuating circumstances.

The following is an example of a set of design standards currently in use for rural and suburban construction projects.

Minnesota Rules 8820.9920[a]
STATE-AID GEOMETRIC DESIGN STANDARDS; RURAL AND SUBURBAN

UNDIVIDED, NEW, OR RECONSTRUCTION PROJECTS.

New or reconstruction projects for rural and suburban undivided roadways must meet or exceed the minimum dimensions indicated in this chart.

| Projected ADT[b] | Lane Width | Shoulder Width[c] | In-Slope[d] | Recovery Area[e] | Design Speed[f] | Surfacing | Structural Design Strength[g] | Bridges to Remain, Width Curb to Curb[h] |
|---|---|---|---|---|---|---|---|---|
| | Feet | Feet | Rise:Run | Feet | mph | | Tons | Feet |
| 0-49 | 11 | 1 | 1:3 | 7 | 30-60 | Gravel | | 22 |
| 50-149 | 11 | 3 | 1:4 | 9 | 40-60 | Gravel | | 22 |
| 150-749 | 12 | 4 | 1:4 | 15 | 40-60 | Paved | 9 | 28 |
| 750-1,499 | 12 | 4 | 1:4 | 25 | 40-60 | Paved | 9 | 28 |
| 1,500+ | 12 | 6 | 1:4 | 30 | 40-60 | Paved | 10 | 30 |

(a) From Minnesota Rules, Office of the Revisor of Statutes.

(b) For rural divided roadways, use the geometric design standards of the Mn/DOT Road Design Manual, with a minimum ten tons structural design and minimum 40 mph design speed.

(c) Shoulders are required to be a minimum width of 8 feet for highways classified as minor arterials and principal arterials with greater than 1,500 ADT projected.

(d) Applies to slope within recovery area only.

(e) Obstacle-free area (measured from edge of traffic lane). Culverts with less than 30-inch vertical height allowed without protection in the recovery area. Guardrail is required to be installed at all bridges where the design speed exceeds 40 mph, and either the ADT exceeds 749 or the bridge clear width is less than the sum of the lane and shoulder widths. Mailbox supports must be in accordance with chapter 8818. For roadways in suburban areas as defined in part 8820.0100, the recovery area may be reduced to a width of 10 feet for projected ADT under 1,000 and to 20 feet for projected ADT of 1,000 or greater. Wherever the legal posted speed limit is 40 mph or less, the recovery area may be reduced to a width of 10 feet.

(f) Subject to terrain. In suburban areas, the minimum design speed may be equal to the current legal posted speed where the legal posted speed is 30 mph or greater.

(g) Phased projects must be constructed to attain design strength within three years of completion of final grading. In suburban areas, the minimum structural design strength is nine tons or ten tons as needed for system continuity. Approach side slopes must be 1:4 or flatter when the ADT exceeds 400.

(h) Inventory rating of H 15 is required. A bridge narrower than these widths may remain in place if the bridge is not deficient structurally or hydraulically.

## WHAT'S IN A NAME?

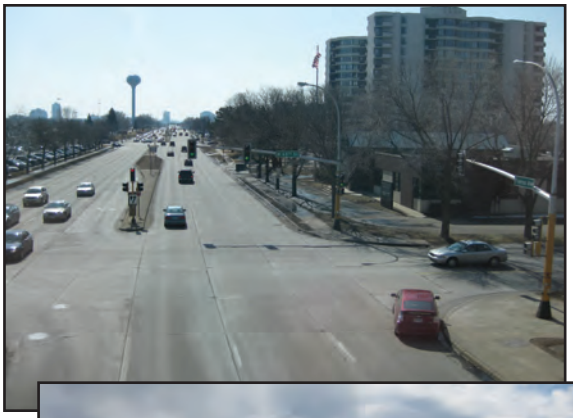
For those who work regularly with State Aid for Local Transportation, the Mn/DOT State Aid Division is almost always referred to simply as "State Aid" in day-to-day communications, which can cause confusion. Apparently, "state aid" means different things to different people. It should not be surprising, then, that the division office, as well as the Mn/DOT district state-aid offices, occasionally get calls asking for assistance in providing funding for educational and other institutions. They have even received calls from individuals asking how they can qualify for scholarships or small business loans.


J. Katz.

Koochiching County Road 113 is not a state aid highway. As such, it is not required to meet the standards defined on this and the previous page. The road, intersecting Highway 11 less than one mile east of International Falls, is only 3/8 of a mile long. The Average Daily Traffic (ADT) varies from 75 to 95 vehicles per day. While the road appears to be of a rather minimal design, note that gravel surfacing would be considered adequate according to the table if it were designated a state-aid road.

## DID YOU KNOW

State aid for transportation is generally associated with building and maintaining roads. However, state-aid funds have been expended on road-related purposes such as buying computers for the counties and cities. The computers are used to submit required administrative data to the State Aid Division. A somewhat more remotely road-related purpose was the funding of historic building renovations as part of the Great River Road program. The J. J. Hill House, Ramsey House, and the Burbank Livingston Griggs House in St. Paul, and Historic Fort Snelling were refurbished under the program, citing their historical significance to the Mississippi River and early travel in the United States.



J. Katz.


J. Katz.

County state-aid highways range from this two-lane, rural road in Blue Earth County, just north of Highway 60, to the six-lane urban section of Hennepin County Road 17 (France Avenue) in Edina (above).

State-aid funds covered a portion of the cost to complete this bridge and its approaches for Stearns County Road 1 and Benton County Road 3 over the Mississippi River between St. Cloud and Sauk Rapids. An outstanding structural feature is the helix ramp on the left side of the bridge that provides pedestrian access from the bridge to Lions Park, on the river bank, below. The old bridge, downstream to the left, was still in place when this photo was taken during the opening day procession in October 2007.

J. Katz.


J. Katz.

This Yellow Medicine County State-Aid Highway (CSAH) is located in Granite Falls. Concrete surfacing can be expensive and not easy on a county budget, but it can be very competitive with bituminous when considered over the life of the pavement.

# Construction, Past and Present

4

## CONSTRUCTION, PAST AND PRESENT

Any retrospective on Minnesota's road history would be incomplete without mentioning the frustration that road construction can sometimes cause drivers. After snow removal, construction is surely the best-known road and highway activity in Minnesota. It is the cause of extended lane closures, detours, and traffic delays. In fact, Minnesota is often jokingly said to have only two seasons: "winter" and "road construction." The following is a photo essay of road construction, past and present, in Minnesota.

Minnesota Historical Society

This is what road construction looked like in 1932 on Ramsey Hill, as seen from the intersection of Grand and Pleasant Avenues in St. Paul. This was about 45 years before orange barrels, concrete barriers, and work zone traffic control as we know it today appeared. Night visibility was likely poor, at best.

J. Katz.

Nearly 77 years after the Stillwater Bridge over the St. Croix River was constructed (see below), Highway 36 was upgraded to a freeway between White Bear Avenue and Highway 120 in Maplewood and North St. Paul. Although this type of work is often done with temporary lanes and bypasses under traffic, it was decided that the highway would be closed and detoured completely for four months, thus reducing the duration of the project by one construction season. The result was improved safety, lower cost, increased production, and better quality.

J. Katz.

Constructing the approach to the Stillwater bridge over the St. Croix River in 1930 (below). This photo is approximately 10 miles to the east of the location shown in the photos above.

Minnesota Historical Society

J. Katz.

Here's how the upgrade of Highway 36 looked after completion in 2008. This image was captured with the camera facing west.


J. Katz.

J. Katz.

During the 2007 summer that Highway 36 was upgraded, I-35W in south Minneapolis was closed on a Saturday for bridge removal during the rebuild of the I-35W/Highway 62 "commons" section. Above, the Diamond Lake Road bridge is demolished, as can be seen between the barricade boards. The extremely rare sight at left (i.e., no traffic moving on I-35W) was seen from the 50th street bridge. Eventually, both bridges were replaced, as neither was long enough to accommodate the number of lanes that the freeway would run under them upon completion of the project.

J. Katz.

One year after its start in 2007, the I-35W project shown on the previous page had some of the steel for the new 50th Street bridge in place over the northbound roadway, with an overhang extending partway over the future southbound side of the freeway. Note that three lanes of traffic were being carried in each direction with room to spare, all on the northbound side, giving some idea of how wide the freeway would be upon completion.

J. Katz.

Piers for westbound roadways east of Nicollet Avenue (in the foreground) on the common section of the I-35W/Highway 62 reconstruction in 2008.


Kevin Adolfs, Mn/DOT District 1

Blasting rock on Highway 53 north of Virginia in 2007. The project adding a parallel roadway to the highway was built with federal "earmark" funds.

Kevin Adolfs, Mn/DOT District 1

Organic soils were excavated and replaced with granular material to provide a stable roadbed on the Highway 53 project.

Kevin Adolfs, Mn/DOT District 1

Bridge construction was underway on the Highway 53 project north of Virginia in 2007.

## DESIGN-BUILD

The highway construction project development process known as "design-build" is a recent and significant departure from the traditional "design-bid-build" procedure that public road and highway agencies employed almost exclusively for 150 years in Minnesota and elsewhere in the US. In the design-bid-build mode, a road agency develops a project through the detail design (construction plans) stage before taking bids for construction. That means undertaking all the preliminary engineering and public involvement activities necessary to develop several alternatives for consideration by the agency, as well as other government units that may have an interest in the impacts of each alternative. Eventually (if a consensus can be reached), an alternative is selected for the development of actual detailed construction plans, right-of-way is purchased, permits are acquired, and a myriad of other details are attended to. After all the "loose ends are tied up" including the local approval of the construction plans, the agency advertises for bids from construction contractors. The contract is then awarded to the lowest bidder — provided that other qualifying criteria are met — and construction begins.

Under design-build, some of the preliminary engineering tasks are undertaken by the road agency, usually up to the point of obtaining approval for a preferred alternative preliminary design. At that point, bids are called for, and a contract is awarded to a contractor to design *and* build the project according to the agency's specifications. If the project is to reconstruct an existing highway (where at least a major portion of the needed right-of-way already exists), the contractor can begin construction work as soon as the contract is awarded. As detailed design work will also be just beginning at this time, construction work will have to be limited to clearing the right-of-way and rough grading until the most critically needed plans can be prepared and approved by the agency. However, the process can shave as much as two years off the project development time, a major selling point for the design-build approach. In an era where construction costs are rapidly inflating, a two-year advance in the building of a project can yield significant savings and earlier benefits to road users.

Design-build is usually used for "mega" projects. In Minnesota, design-build projects have included the reconstruction of the Highway 52 freeway around Rochester (ROC 52); reconstruction and expansion of I-494 in Eden Prairie and Minnetonka; the construction of new Highway 212 in Chaska, Chanhassen, and Eden Prairie; and the construction of the Hiawatha light rail line in Minneapolis and Bloomington. The design and construction of a bridge to replace the collapsed I-35W structure over the Mississippi River in Minneapolis was also a design-build project. The 13-month schedule for the completion of the new bridge would not have been feasible under a traditional process.

Despite the major project image evoked by the design-build concept, considerably smaller projects have been carried out under this process, as well. These included the 2006 construction of an interchange at the intersection of Highways 10 and 32, midway between Moorhead and Detroit Lakes, and the reconstruction of the interchange at the intersection of Highways 14 and 218, along with a short extension of divided roadway to the east on Highway 14 near Owatonna in 2004.

Design-build is not limited to transportation projects. Commercial building also uses the process, although recognition is generally not as great as it is for highways — perhaps because private sources cover most of the financing. Nonetheless, the building industry has taken interest in it for both its time and cost savings.

A typical design-build highway-contracting firm is usually a consortium or a partnership of construction contractors and engineering consultants specifically organized to submit a bid for a specific project. A group might consist of one or more highway construction contractors, engineering design consultants, consultants specializing in right-of-way acquisition, and representatives from whatever other specialties are warranted by the unique conditions of the project. Other participants might be identified as subcontractors for such tasks as soils and foundations investigation, highway sign manufacturing and installation, and work zone traffic control, etc. The thus-formed entity chooses a name for itself, under which the bid is submitted. If the bid is not successful, the consortium most likely is dissolved. Similarly, the successful bidder is not likely to continue its partnership arrangement when the project is completed, as the next project up for bids can be expected to warrant a different mix of engineering and consulting specialties.

J. Katz.

Looking north from the Second Street Southwest bridge in Rochester at the six-lane freeway completed as a Design-Build project in 2005. The new highway is a nearly total reconstruction of the four-lane freeway that was built on the west and south sides of the city in the 1960s and '70s.

One of the interesting practices to grow out of the design-build process is the co-locating of project personnel — including engineers and technicians as well as contractor's and public agency's project management personnel — in a single office near the project site. This arrangement makes it easy for everyone to interact on a personal level and at a moment's notice. Project personnel, if not residents of the immediate area, can be expected to find temporary living quarters within a reasonable commuting distance of the project office, the cost thereof to be covered as a project expense. (Project decisions on design-build work, if not made in a timely manner, can hold up workers in the field, i.e., the project cannot afford the time it would take to route these decisions through the home offices of the participants, some of which are likely to be located in different states.)

Mn/DOT has identified the following as some of the benefits and drawbacks of the design-build process:

## Benefits

- Completion time is shortened because design and construction tasks overlap.
- Construction can begin before all design details are final.
- Greater innovation and flexibility can be exercised in selecting designs, materials, and construction methods.
- Claims due to design errors are likely to be reduced because construction occurs under the same contract.
- The team effort can be expected to accelerate response time and dispute resolution.
- A single contact point for quality, cost, and schedule is available from design through construction.
- The shortened project delivery time can reduce user costs.
- The use of "best-value" project award selection criteria evaluates both technical and financial elements.

## Drawbacks

- As design-build is a relatively new and evolving process, and because stakeholders' roles are changed, a high learning curve is likely.
- Government agencies, contractors, and engineering consultants are much more familiar with traditional methods.
- Developing a bid is a more involved and expensive process for design-build teams.
- Project coordination is more challenging due to the faster pace.

## ROC 52

The Highway 52 freeway around the west and south sides of Rochester is a prime example of success in design-build highway work in Minnesota. However, a few words about that project are in order here. The upgrading of the highway from just east of its junction with Highway 63 (South Broadway Avenue) to 85th Street Northwest was under consideration for several years prior to the start of its construction in 2002. Under traditional project reconstruction, Mn/DOT would have let a series of contracts that would have been scheduled to take eleven years to complete — a concept that the business community adjacent to the highway viewed with considerable alarm.

A later consultant study indicated that significant time and expense could be saved by combining the entire reconstruction under one project. However, there was little Mn/DOT precedent for combining a project of this scope and expense. Even the state's most ambitious Interstate freeway work had been let in a series of individual projects, ranging from building demolition to major bridges, with costs generally less than $25 million each. The 12-mile ROC 52 project, as suggested by the study, would involve the complete removal of the existing pavement, removal of many of the existing bridges, construction of 26 new bridges, concrete paving of three lanes in each direction for most of the length of the project, one new interchange, and the reconstruction of several in-place interchanges, major retaining walls, a huge rock excavation, new or rebuilt frontage roads, and landscaping at an eventual cost of $240 million — the largest highway project in Minnesota at the time — plus consumption of most of Mn/DOT's southeast Minnesota district's construction budget for several years.

Fortunately for the commercial interests along the highway, the road users, and the city of Rochester, the design-build concept was winning advocates in Minnesota and the Federal Highway Administration during the time that alternatives for the upgrading of Highway 52 were being deliberated. Many design-build projects were underway around the nation, and a few projects were being developed in Minnesota. It became apparent that design-build might be a way to get

J. Katz.

Detail of the railings and planter boxes on the north sidewalk of the Second Street Southwest bridge. Plantings were yet to be installed at the time the photo was taken.

the ROC 52 project underway much sooner than anticipated, at a lower cost, and with a significantly reduced period of disruption to the community and the road users.

The opening of the entire ROC 52 project to traffic was kicked off with a community celebration on October 1, 2005 — several months ahead of schedule. In a news release announcing the celebration, Mn/DOT summarized some of the features of the rebuilt highway, conditions set forth in the design-build contract, and benefits realized by the community and the road users:

## ROC 52 Features

- Six lanes from Highway 63 to 75th Street NW (approximately 90% of the length of the project).
- A new interchange at 75th Street NW, replacing the former at-grade crossing and access.
- New grade separations at 65th and 85th Streets NW (no access to Highway 52).
- New frontage roads between 65th and 85th Streets NW, and reconstructed frontage roads between the south junction with Highway 14 and 37th Street NW.
- Reconstructed interchanges at 6th Street SW, 2nd St. SW, the north junction with Highway 14 (Civic Center Drive), and 19th Street NW. The latter is the first single-point diamond interchange built in southeastern Minnesota — a compact design incorporating extensive retaining walls with all four ramps meeting in a single intersection at the center of the overpass instead of the two intersections that define the vast majority of conventional diamond-type interchanges on highways throughout the nation. (Several such interchanges have been constructed in Minnesota in recent years to reduce the amount of right-of-way needed for the ramps and to eliminate some of the conflicts in traffic operations inherent in two closely-spaced, high-volume, multi-lane intersections, as highlighted elsewhere in this book.)
- Intelligent transportation system enhancements to manage and optimize traffic operations and to quickly respond to highway incidents.
- A design guide to coordinate the aesthetic elements of the freeway, including bridges, retaining walls, noise barriers, and landscaping.

## Contract Conditions

- Highway 52 reconstruction had to be completed in five years or less once construction began.
- Four lanes of traffic (two lanes in each direction) were required to be maintained during peak travel periods, 6:00 a.m. to 7:00 p.m. Monday through Friday. (Lane closures were allowed during non-restricted hours, i.e., nights and weekends.)
- Access to residences and businesses were to be maintained.
- East-west connections across Highway 52 were to be maintained, except at 6th Street SW.
- A temporary pedestrian bridge was required at the 6th Street SW crossing.
- Construction was to be minimized during the November and December holiday shopping season.

## Benefits

- A contract letting for improvements on County Road 14 (75th Street NW), scheduled to be let in February 2003, was accelerated to October 2002 to coincide with the ROC 52 construction.
- An estimated $30 million was saved in inflationary costs.
- Several millions in future right-of-way acquisition costs were saved by acquiring all of the needed properties at the outset of the ROC 52 project rather than waiting for each of the projects contemplated over the earlier-proposed eleven-year schedule for upgrading of the highway.
- The emphasis placed on the early completion led to better project coordination and communications with all concerned as well as innovations in design and construction.

- There was less construction inconvenience and stress for residents, area businesses, and highway users.
- There were lower project administrative costs for Mn/DOT, the city, and the county.
- More opportunities were available to achieve the best value in terms of cost, staging, and timing.

## Project of the Year Award

In 2006, ROC 52 was named a public works project of the year by the American Public Works Association (APWA). Mn/DOT, along with primary contractor Fluor Daniel and primary consultant URS, were presented with the award during APWA's International Public Works Congress and Exposition in Kansas City, Missouri, that year.

In the more than $100-million range award category, the APWA cited many of the features and benefits of the project as noted above. It also cited several innovations the project introduced to the Minnesota design and construction industry, including computer-aided visualization, construction machinery control, subsurface utility engineering, and aesthetics. For example, a before-and-after animated "fly-through" visualization was created to show how moving the location of the key bridge at the Civic Center Drive interchange would reduce construction time by one year. The visualization was shown at several public meetings and was placed on the project website. In another cited example, machine control for the guidance of construction equipment using global positioning satellites and engineering design computer files was tested and implemented for roadway grading work. The enhanced machine control eliminated a significant amount of field survey time and several months of construction time.

## To Oronoco and Beyond

It was somewhat anticlimactic after ROC 52, and it certainly did not receive anywhere near the publicity, but, it is likely that ROC 52 "paved the way" for another design-build project on Highway 52 that was begun in 2006 and completed in the following year. The project for an interchange, bridges, and frontage roads upgraded the highway to freeway standards from the 85th Avenue Northwest overpass (the northern limits of ROC 52) to Oronoco, five miles to the north.

Other projects for interchanges (though none in the design-build category, so far) for interchanges or grade separations had been completed or were in the planning stages at the time of this publication toward Mn/DOT's overall plan to upgrade Highway 52 to freeway standards between I-90, southeast of Rochester, and I-94 in St. Paul. Completed at that time were approximately 22 miles from I-90 to Oronoco, 4 miles through Zumbrota, and 10 miles through Inver Grove Heights, South and West St. Paul, and St. Paul. A preferred plan had been selected for an interchange in Cannon Falls to eliminate the last two traffic signals on the highway between Rochester and St. Paul.

Some readers may recall that, in the 1950s, Highway 52 between Rochester and the Twin Cities was a two-lane highway that passed through most of the towns along the way. The 1960s and 1970s saw the construction of bypasses around some of those towns and the addition of a parallel roadway to provide for a divided highway. The 1970s and 1980s saw widening or replacement of the older, narrow parallel roadway and the paving of shoulders that made the roadway essentially compatible with the design standards of the newer roadway. The original freeway, around Rochester, was constructed under several projects starting in 1959 and into the 1970s. Commercial development on both sides of the highway soon followed. The freeway segment from I-90 to Highway 63 was completed in 1978 to provide easterly access to and from the Interstate from Rochester.

# Engineering the Interstate Highway System

5

## A 50-YEAR RETROSPECTIVE OF ADVANCES AND CONTRIBUTIONS

*Much of the following was published as an article in the May-June 2006 edition of* Transportation Research News *by Lester A. Hoel and Andrew J. Short in celebration of the 50th anniversary of the Congressional act establishing the National System of Interstate and Defense Highways. It has been included here to provide some background on the act that gave rise to this unprecedented program of which a few of the Minnesota components are reviewed in the following chapters.*

The Interstate Highway System, having marked its 50th anniversary in 2006, was the largest and most expensive public works project in U.S. history. The Interstate's role in promoting economic development, strengthening the nation's defense, and facilitating vehicular travel is well known, but its impact on engineering and technology is not widely understood.

Although some of the technology and engineering expertise needed for this massive undertaking was already in place, the 42,500-mile Interstate Highway System was a complex engineering effort without precedent in the history of transportation. Many advances and techniques developed as the project progressed.

### On the Shoulders of Giants

When President Dwight D. Eisenhower signed the Federal-Aid Highway Act of 1956 that authorized the Interstate project, the concept of a national highway system had been under investigation for many years. Enormous challenges were associated with the bold plan for a limited-access highway system that would link the contiguous 48 states. For example, the geography, geology, and climate of the United States varied greatly from state to state, as did the expertise in highway engineering and construction.

#### *Lessons from Rail*

The experience of the railroad era demonstrated the feasibility of constructing a national transportation system. Railroad building began on a massive scale after the Civil War (1861–1865). By 1880, the system included about 94,000 miles of track, which peaked at more than 254,000 miles in 1918, at the end of World War I.

Engineers learned important lessons about soil behavior, drainage, structural design, and grading that would prove useful to the engineers building roads in the 1930s and 1940s. Railroad construction proceeded without the kinds of equipment and technology that were available for highways in the 1950s. Many highways followed along the right-of-way of previously constructed railroads.

Minnesota Highways, October 1962

Dedication ceremonies were held for an 11.5-mile segment of I-94, a bypass to the west and south of Fergus Falls, on October 3, 1962. This was the first section of I-94 to be completed in the north-central part of Minnesota. Future projects extended the highway in both directions toward completed projects near Moorhead and the existing divided section of Highway 52 west of St. Cloud. Governor Elmer L. Andersen (waving) was riding in the back seat of the 1904 two-cylinder Rio with Highway Commissioner James C. Marshall.

### *Highway Precedents*

Limited-access highways in America were not unknown in 1956. Parkways and freeways had been constructed in several states between 1920 and 1945. The Henry Hudson and Bronx River Parkways in New York, the Merritt Parkway in Connecticut, and the Arroyo Seco Parkway in Los Angeles are early examples of highways that served as models for the Interstates.

Perhaps the best example of an early limited-access highway is the Pennsylvania Turnpike. Modeled after the German autobahns, the Pennsylvania Turnpike opened in 1940 with higher geometric and design standards than had been applied in the United States. The facility still serves as a major east-west artery in Pennsylvania and is now a segment of the Interstate System. Interstate design standards would be based on similar principles.

### *Bridge and Tunnel Models*

Many railroad and highway bridges and tunnels were constructed in the nineteenth and early twentieth centuries, well before Interstate highways. The Holland Tunnel, which opened in 1927, connected lower Manhattan with New Jersey. It was the world's first long, underwater, mechanically ventilated tunnel. The twin-tube design consisted of 115,000 tons of cast iron and 130,000 cubic yards of concrete. The Lincoln Tunnel, the second tunnel under the Hudson River, opened in 1937 and remains a significant crossing for the New York metropolitan area. Both tunnels served as models for those to be constructed during the Interstate era for highway and rail transit.

The George Washington Bridge, completed in 1931, connected New York City with northern New Jersey. Built over a four-year period, its two steel towers with a span length of 3,500 feet are embedded deep in rock and concrete. The towers rise more than 600 feet to support steel suspen-

sion cables that contain more than 107,000 miles of wire. The bridge carries approximately 300,000 vehicles per day and is one of the most heavily traveled bridges in the world.

In 1937, the Golden Gate Bridge connected San Francisco to Northern California. Its 4,200-foot span is an engineering achievement that continues to serve as a major artery for the California highway system.

### *World War II Experience*

World War II had an impact on the development of the highway engineering expertise that would be needed to design and build the Interstate. Military engineers faced large and complex challenges in the European and Pacific theaters. Many construction projects — including roads, bridges, airstrips, and harbor facilities — were completed quickly and under adverse conditions.

When hostilities ended in 1945, many returning servicemen enrolled in engineering schools funded by a federal grant known as the GI Bill. Some attended state or private universities that were redirecting their training and research programs toward this new area of studies. Schools such as the University of California at Berkeley, Yale University, and Northwestern University were early leaders in highway engineering and traffic management education.

State highway departments, as well as the U.S. Bureau of Public Roads* (BPR) and consulting firms, eagerly employed engineering graduates to embark on careers that would center on the Interstate System.

World War II also advanced the state of U.S. construction practice. Servicemen returning from the war had experience with construction equipment. In addition, the expanding manufacturing sector brought the development of highway construction equipment to a new level of performance.

## Overcoming Constraints

Several unique engineering problems faced the engineers who were tasked with building the Interstate System. The problems centered around three constraints: the size of the project, the scope of the project, and the time required to complete the project.

The enabling legislation had anticipated completion within 13 years, but engineers soon learned that the scope and cost of the project would greatly exceed early estimates of the materials and personnel required. In contrast to earlier projects, in which the major challenge was conquering nature, the Interstate System was conceived as a means to connect cities and to relieve traffic congestion. Consequently, engineers were constructing these facilities in a difficult and more hostile environment.

The Interstate Highway System became known as the most extensive engineering project since the construction of the Great Pyramids. The complexity and challenges of the project greatly exceeded those faced by earlier builders of the nation's transportation infrastructure. Contractors expended about 2.6 billion person-hours building Interstate highways and used more than 1.5 million tons of explosives to excavate material in large cut sections and tunnels.

### *State Preparations*

Although the federal government provided at least 90 percent of the cost, individual highway departments were responsible for building the segments of the system within their state. The Federal Aid Road Act of 1916 required all states to establish a Department of Highways as a condition for receiving federal funds. Only a few states, however, had the expertise and the engineering staff qualified to design and construct highways at an Interstate scale.

Many agencies competed to secure qualified engineers; those who were hired became "the

** Now the Federal Highway Administration*

Interstate generation." States such as New York, California, and Pennsylvania had organizations with seasoned employees who were prepared for the challenge. In-house staff, contractors, and consultants would establish working relationships during the course of the Interstate program.

States shared enthusiasm and excitement for the work. Ellis Armstrong, BPR Commissioner from 1958 to 1961, predicted, "many obstacles" and conceded, "We're up against a pretty tough schedule." Nonetheless, he believed that the industry would respond and the Interstates could be built on schedule.

State highway engineers recognized the Interstate as a challenge and an opportunity of a lifetime. Although the desire to succeed was strong, concerns arose that shortages of engineers, materials, construction equipment, and contractors could hinder completion.

### *Uniformity in Practice*

Fortuitously, by 1956, through the efforts of BPR, the American Association of State Highway Officials** (AASHO), and the Highway Research Board*** (HRB), a network was in place for creating and transmitting technical information between state highway departments. The process for communication and the establishment of design policies had been perfected during the first half of the twentieth century, long before the Interstate System was begun, during a period when highway building was an active priority in many states.

- BPR, established in 1893 as the Office of Road Inquiry, helped state and local governments create road projects that would employ workers during the Great Depression of the 1930s and spearheaded the federal government's involvement in national highway building, including the Interstate System.
- AASHO, formed in 1914, facilitated coordination between states, brought an orderly arrangement to road systems, established standards for construction, and promoted highway development.
- HRB, organized in 1920 as part of the National Research Council associated with the National Academy of Sciences, established relationships between the states and the federal government to serve as a facilitator of highway research and to assist in dissemination of new information to the highway community.

These three organizations were instrumental in developing uniformity and consistency in engineering practice throughout the country, a necessity for the successful completion of a system with the Interstate's scale. Engineers could tailor design criteria to special conditions, and lines of communication emerged as the nation was inventing the modern discipline of highway engineering.

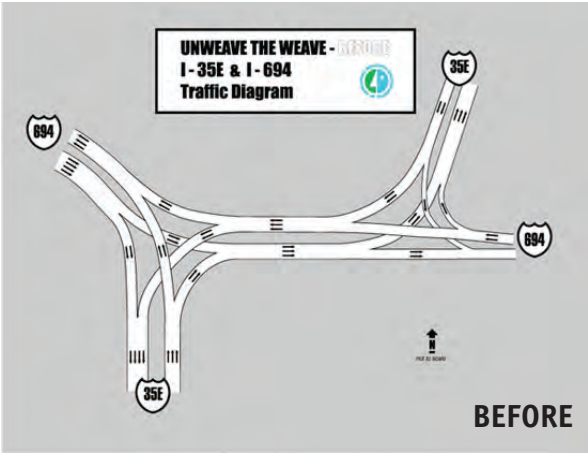
## Design and Construction Standards

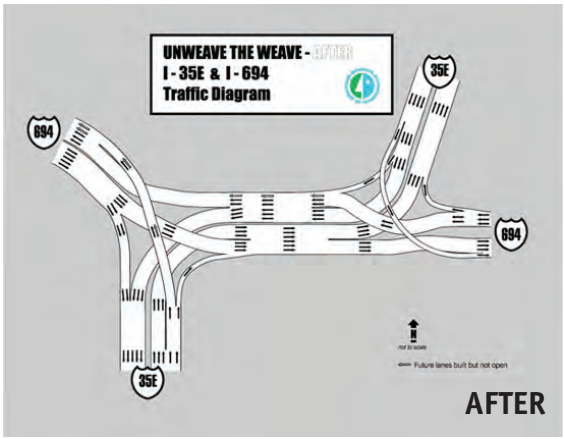
An important feature of the Interstate was the uniformity in design practice that assured safety and efficient operations. Design standards could be modified, however, as innovations and new techniques were developed. In partnership, AASHO and BPR assembled and codified the knowledge gained by states before the Interstate project and communicated the information to all state highway departments. The partnership proved valuable in sharing technical knowledge and in establishing consensus within the engineering community.

### *Research Studies*

The policies published by AASHO were the result of proven engineering research and experience, based on studies conducted by BPR, the National Cooperative Highway Research

** *Now the American Association of State Highway and Transportation Officials*
*** *Now the Transportation Research Board*




Schematic layouts of the I-35E and I-694 common section showing the before and after configuration of the "Unweave the Weave" roadways. The project was completed in 2008.

Program (NCHRP) established under HRB in 1962, state research laboratories, and universities. The partnership effectively disseminated information in such subject areas as geometric design, pavement and bridge design, highway capacity, and traffic control.

Highway departments could build Interstate projects because of these established standards, which were based on results secured from state practice. Many states had minimal experience in building limited-access highways. Yet through creativity, sensitivity, and engineering practice, each state could construct highways that were uniform in some respects, but also unique to their settings.

### *AASHO Road Test*

One of the most significant research projects of the Interstate era was the AASHO Road Test, conducted between 1958 and 1960. The purpose of the project was to develop pavement design criteria for Interstate conditions. Standards for asphalt and concrete pavements and bridge design would assure a long design life that could withstand expected increases in heavy truck travel.

The testing was conducted in Ottawa, Illinois, and consisted of more than 800 concrete and asphalt pavement sections arranged in six loops. Each lane on the loop carried traffic with axle loads ranging from 2,000 to 30,000 pounds. Test vehicles, driven by members of the U.S. Army, traveled around the loops continuously for more than two years. The pavement conditions were measured and analyzed to produce pavement design relationships describing how various pavement structures would deteriorate with exposure to traffic.

The results became the basis for pavement design practice in the United States and throughout the world. The AASHO Road Test advanced knowledge of pavement structural design, pavement performance, load equivalencies, climatic effects, and the design of short-span bridges.

## Advances in Technology

The construction of the Interstates produced significant advances in civil engineering technology, particularly in asphalt and concrete pavements, drainage, bridge design, soil mechanics, and traffic forecasting.

In 1876, Belgian chemist Edmund DeSmedt supervised the asphalt paving of Pennsylvania Avenue in Washington, D.C., and in 1891, George Bartholomew paved Main Street in Bellefontaine, Ohio, with concrete. Soon other cities in the East and Midwest began paving their roads.

Paved roads, however, rarely ventured outside of cities. When automobiles arrived, the need for hard-surface roads became critical, prompting efforts to discover how to build better pavements.

Engineers had limited knowledge of the properties of concrete and asphalt before the Interstate, especially about the wearing and load-bearing characteristics. Between 1945 and 1955, the total number of automobiles in the nation doubled to 61 million. States had conducted quality testing of pavements, but the requisite knowledge was not developed until the AASHO Road Test. The Interstates were to be designed for 20 years of service, but many sections lasted many more years, and some portions have carried three to four times the loads for which they were designed.

### *Asphalt*

Asphalt technology greatly improved during World War II because military aircraft required surfaces that could withstand heavy loads. But Interstate construction called for larger equipment than was available. Electronic leveling controls, extra-wide finishers for paving two lanes at once, and vibratory steel wheel rollers were developed. Innovative construction techniques of the time — now considered state of the art — included "rubblization" and crack-and-seat methods, which enabled the use of worn roadbeds as the foundation for asphalt surfacing.

The basic principles of highway construction remain the same, but many elements have changed in the past 50 years. Recent improvements in asphalt pavement design include Superpave®, stone-matrix asphalt, and open-graded friction courses. Superpave — which stands for Superior Performing Asphalt Pavement — can be tailored to climate and traffic and has shown durability in highway performance. The open-graded friction course design has improved surface drainage of water, reducing hydroplaning and skidding.

Research to produce a quieter, more durable, and economical paving material continues. Underway is the development of warm-mix asphalt, which may lower the production and construction temperature for asphalt pavement material by 50 to 100 degrees. This new technology would require less energy to produce the mix; would reduce emissions, fumes, and odor; and would age more slowly in production, making it less prone to cracking.

### *Concrete*

Concrete generally has a higher initial cost than asphalt but lasts longer and has lower maintenance costs. The first concrete roads were primitive, and each was unique to the builder. From the 1920s until 1960, the concrete for pavements was produced on-site. With the development of a large central mixer, concrete trucks could take the mix directly to the project site, improving the speed of the concrete placement and the quality of the mix. The central plant mixer was up to 12 times faster than on-site production.

Another advance in concrete paving was the slip-form paver, developed in an Iowa laboratory in 1947. Two years later, a slip-form paver was available that produced a section 9 feet wide and 6 inches deep. With the construction of the Interstate, larger and more efficient pavers were developed, greatly increasing construction workers' productivity.

Other improvements in concrete technology include fiber reinforcement and superplasticizers for admixtures. High-performance concrete was introduced in 1987. Areas of ongoing research on concrete pavements include improving information for inputs into pavement management systems, comparing the performance of alternative designs under dynamic loads, finding solutions to durability problems, and developing more economical ways of recycling and reconstructing old pavements.

The goal is to devise mixtures that are economical and long lasting. Although high-quality concrete

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Minnesota's only 12-lane Interstate highway is the common section of I-35E and I-694 in Vadnais Heights and Little Canada. Part of the "Unweave the Weave" project, the 12-lane segment is only one-mile long. However, its construction was the solution to one of the state's more notorious bottlenecks. Before the project was begun, there were only three lanes in each direction and drivers that wanted to continue on I-35E from St. Paul to points north had to move from the right side of the road to the left (i.e.,"weave" across); drivers from the west on I-694 wanting to stay on I-694 had to weave to the right. Similar maneuvers were required to make the opposite moves coming from the north or the east. With the reconstruction of the interchanges on each end of the common section, traffic headed in any of the four directions is separated before it ever gets to the commons. In this view facing east, most of the traffic headed to the east on I-694 is in the right three lanes; I-35E traffic is in the three lanes to the left. How this is done is shown on the schematic on page 41. Finishing touches on the project were underway when this photo was taken in 2008.

was available in small quantities at the inception of the Interstate, quality control often was sacrificed for speedy construction. Engineers and contractors later fully understood the implications of high-quality concrete for durability and longevity.

### *Culverts and Drainage*

The Interstate also advanced drainage techniques, including culvert design and materials. Before the Interstate, culverts were made of clay or concrete, and during the 1950s, highway builders used metal or concrete culverts.

Today, the development of plastic pipes has provided engineers with another alternative. In a recent project in Salt Lake City, Utah, for example, corrugated polyethylene pipe allowed completion of a $1.5 billion project on I-15 in time for the 2002 Winter Olympics. The pipe's long length reduced the number of joints, saving labor and installation time.

### *Bridges*

As noted earlier, many long- and short-span bridges for railroads and highways had been constructed before the Interstate. For example, the Brooklyn Bridge opened in 1883.

Yet the dramatic progress in bridge engineering during the Interstate years is illustrated by a partial list of advances that came into widespread use on highway bridges constructed during the past 50 years: prestressed concrete, segmental con-

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Bridges under construction in 2009 at the west junction of the common section of I-35W and Highway 62 in Richfield and Minneapolis. At the time, construction was underway on various I-35W upgrading projects from Burnsville on the south to East 26th Street in Minneapolis on the north. As well as relieving the extreme congestion on the common section, the work provided a high-occupancy toll (HOT) lane over that entire distance.

struction, high-performance concrete, high-strength steel, weathering steel, welded connections, computerized analysis and design, cable-stayed spans, elastomeric bearings, epoxy-coated reinforcement, radiographic inspection, and bridge management systems.

### *Planning*

Travel forecasting was necessary for Interstate planning because the design had to size the system to accommodate traffic volumes 20 years into the future. In contrast to other aspects of engineering design, the state of the art in travel forecasting was in its infancy.

Large-scale urban transportation planning studies had been initiated in cities such as Chicago, Detroit, and Los Angeles. The pioneer effort was the 1955 Chicago Area Transportation Study, which developed a series of models to forecast traffic patterns and flow based on a four-step methodological procedure that included trip generation, trip distribution, modal split, and traffic assignment. Many of these models are still in use today.

Other contributors were Alan Voorhees, whose seminal paper, "A General Theory of Traffic Movement," proposed a "gravity model" for forecasting trip origins and destinations. His planning firm and others completed many transportation studies applying these principles. BPR perfected the planning methods developed for the Interstate, which have been implemented in many urban transportation studies in the United States and worldwide.

### *Operations and Safety*

Travel monitoring was another challenge for highway engineers. Among the many advances in this area was the first high-tech roadway, the 27-kilometer Glenn Anderson Freeway-Transitway, I-105 in Los Angeles. This Interstate section, which opened in 1993, featured the latest in highway technology, with sensors buried in the pavement and links to computers that allow technicians to monitor traffic flow. In addition to meters that helped regulate traffic on ramps, closed-circuit television cameras alerted officials to accidents on the highway.

Road safety standards also have improved in the past 50 years. As early as 1960, researchers were developing reflective markings for highway pavements. Other developments included guardrail designs such as the Jersey [concrete] Barrier, breakaway signs, clear zones, and reflectorized traffic signs. Construction zone practices assured safety for highway workers. Statistics show that the Interstates have had the best safety record of all classes of roadways.

### *Other Advances*

The Interstate has brought with it many advances that have contributed not only to the highway, but [also] to many other engineering projects. Engineers have adapted highway design to comply with environmental laws and regulations. For example, in Florida's Everglades, the construction of I-75 — known as Alligator Alley — included underpasses that allow the endangered Florida panther and other wildlife to cross under the highway. Improved drainage also has enhanced the flow of water within the Everglades.

The Chesapeake Bay Bridge-Tunnel in Norfolk, Virginia, opened in 1964 and was named one of the "Seven Engineering Wonders of the Modern World" in a 1965 competition. The structure connected Virginia Beach and Norfolk to Virginia's

J. Katz.

Four roadways comprise the common section of I-35W and I-494 south of downtown Minneapolis. This is the western end of the common section as seen facing west from the Park Avenue bridge over the freeway. The tunnel at left is one of three on nearby segments of the Interstate system. I-35W can be seen turning to the left on a 35 mile-per-hour curve over the tunnel as I-94 continues to the right of the tall apartment building.

Eastern Shore, with bridges and tunnels that totalled 17.6 miles in length and featured two mile-long tunnels beneath the ocean bottom to allow passage of commercial and military ships.

The most recent engineering challenge was the I-90 and I-93 Central Artery-Tunnel Project, or "Big Dig," in Boston, Massachusetts. The original elevated highway was chronically congested, plagued by sharp turns and many entrance and exit ramps.

Engineers employed the slurry wall technique to create 120-foot deep concrete walls on which the old highway could rest while a new road was constructed below. The concrete walls also stabilized the construction site and prevented cave-ins during the tunneling. Completed over budget and five years behind schedule, the $15 billion project nonetheless was considered an outstanding engineering accomplishment.

## Looking Ahead

Engineers will continue to address challenges in maintaining, improving, and adapting the Interstate Highway System to the needs of the future and to the Information Age. The can-do attitude of the Interstate generation remains the standard for transportation engineers today and in the future.

As Stephen D. Bechtel, Jr., a noted engineer and highway builder, has stated: "For those of us who are fortunate to have been trained and to serve as engineers, there is great satisfaction in working on historic and important infrastructure projects. They improve the quality of life, in both safety and convenience, and facilitate improved commerce and economic growth around the world."

As the twenty-first century began, the engineers and planners who designed and built the Interstate Highway System were in the twilight of their careers. It is important to remember the lessons learned and the skills acquired in completing the Interstate Highway System. The torch has passed to a new generation of transportation engineers who will face new challenges in a fast and changing technological world.

# Minnesota's Interstate Freeways 6

## MINNESOTA'S FIRST INTERSTATE FREEWAY: I-35, OWATONNA

Minnesota and the Department of Highways were well poised to take advantage of the Interstate Highway Program. Several projects were already in the "pipeline" at the time Congress approved the Interstate System in 1956 and, with a little fine tuning to meet the Interstate standards, construction of the first project — a segment of I-35 from Owatonna to Medford — was completed and opened to traffic on August 21, 1958. The opening took place during the Minnesota statehood centennial year, and that Interstate segment, at 50 years old, coincided with the state's sesquicentennial celebration in 2008. Other projects soon followed, with construction of the initial segments of I-90 and I-94 (bypasses of Austin and Fergus Falls, respectively). Work also began on the first segment of I-35 between the Twin Cities and Duluth, and the first Interstate construction in the Twin Cities metro area was begun in Bloomington and Richfield.

Prior to the start of the first construction on I-35, a project was completed in 1956 on Highway 65, a four-lane divided road on new alignment from north of Medford to Faribault, bypassing the latter city. The Highway 65 project was part of a general plan to provide an improved route from Minneapolis to southern Minnesota. The next project in that upgrading plan was to have been an 8.3-mile extension of that four-lane highway south to Owatonna. With the passage of the Interstate Highway Act in 1956, that next segment of new Highway 65 became part of the Interstate System, and construction, at a cost of more than $3,100,000, was underway the following year.

Minnesota Highways

Aerial photograph of I-35 under construction northwest of the city of Owatonna, facing south. This was the first section of Interstate freeway completed in Minnesota, opening to traffic on August 21, 1958. As was true across the country through the 1960s, '70s, and '80s, completed segments of the Interstate system would end and a temporary ramp to a local road would take traffic back to the old highway. However, as short as some as these segments were, people would go out of their way to drive on them. The diamond interchange is located at 26th Street N.W.

Minnesota Highways

The formal opening of the first Minnesota link in the Interstate highway system was climaxed by the cutting of a ribbon – decorated with red, white, and blue roses – with a four-foot pair of steel shears. L to R: Deputy State Highway Commissioner (and future Commissioner) Frank Marzitelli, State Treasurer Val Bjornson, Highway Commissioner L. P. Zimmerman, Congressman (and future Senator) Eugene McCarthy of St. Paul, master of ceremonies Dan C. Gainey of Owatonna (partially hidden), Governor Orville Freeman, State Representative John A. Hartle, Owatonna, Assistant Regional Engineer of the Bureau of Public Roads Ira E. Taylor of Kansas City, MO., Mayor Glen Myers of Owatonna, and State Senator Harold S. Nelson of Owatonna (behind the mayor).

At the dedication, Governor Orville Freeman and Commissioner of Highways, L. P. Zimmerman, hailed the freeway as the start of a new era in the state's highway facilities. The governor said the new freeway would influence people's thinking and have far-reaching social and economic consequences. He saw the road as opening Minnesota's recreational facilities to more tourists, envisioned a striking effect on industrial development, and predicted creation of new industries and commercial centers to serve the Interstate traveler.

Commissioner Zimmerman said that, "In every sense of the word, this is a highway for the future," because it was designed and constructed "so that it will serve for many years to come." He added that no effort had been spared "to make this not only a beautiful highway, but also the safest that human ingenuity can devise." The commissioner also complemented employees of the Highway Department and contractors who built the highway for their excellent work in translating the plans into the finished highway and structures, saying that, "This is truly a monument to their labors."

## I-35 OWATONNA PROJECT BY THE NUMBERS

| | |
|---|---|
| $3,090,000 | Total Cost |
| $1,100,000 | Grading |
| $1,500,000 | Paving |
| $490,000 | Six Bridges |
| 2,000,000 Cu. Yds. | Earth Moved |
| $1,500,000 | Value of Grading Equipment |

**Grading Equipment Fuel:**

| | |
|---|---|
| 102,000 Gal. | Gasoline |
| 238,000 Gal. | Diesel Fuel |
| 7,400 Gal. | Motor Oil |
| 235,000 Sq. Yds. | 9" Pavement |
| Up to 6 RR Cars/Day | Paving Cement |
| $15,000/Wk. | Paving Contractor's Payroll |
| App. 500 | Total Project Employment |

At a civic luncheon preceding the dedication ceremony, Ira E. Taylor of Kansas City, assistant regional engineer for the Bureau of Public Roads (predecessor agency to the Federal Highway Administration), said Minnesota is "particularly


Minnesota Highways

Employees of the Minnesota Highway Department who were on-site workers for the state's first completed link in the Interstate highway system. L to R, front row, G. W. Johnson, R. C. Wandrey, M. L McGowan, Tom Fowler, M. G. Johnson, and D. L. R. Kohnert; second row, I. B. Anderson, A. L. Sotebeer, I. L. Anderson, Resident Engineer Don Larson, E. N. Erickson, R. K. Kenow, A. R. Baud, and E. J. Reyer; third row, G. E. Coin, T. H. Duerre, J. M. Larson, J. E. Mracek, H. J. Hoglund, and C. M. Sommerstad. All except Don Larson were highway technicians.

fortunate to be served by *one of the outstanding highway departments in the nation.*" [Emphasis added.] He said the department's advice and council "has always been most helpful to the Bureau . . . and has been sought by many of the other states in the development of modern practices in the field of highway administration and design."

More than 100 persons, including state officials, state legislators, and civic leaders attended the luncheon, presided over by Charles E. Cashman, an Owatonna attorney. More than 200 people were at the dedication ceremony where Daniel C. Gainey, president of the Jostens Manufacturing Company of Owatonna, was master of ceremonies. Paul Mathews, Jr., was chair of the dedication committee.

## THE FIRST METRO-AREA INTERSTATE HIGHWAY CONSTRUCTION: I-35W, BLOOMINGTON AND RICHFIELD

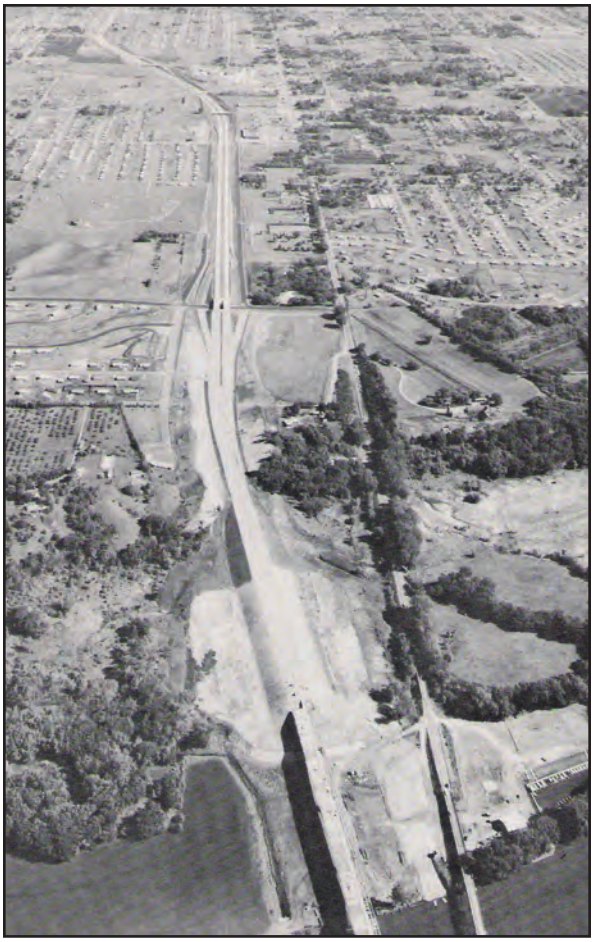
Only three years after Congress passed and President Eisenhower signed the Federal Aid Highway Act of 1956 authorizing the funding and construction of the Interstate System, I-35W was opened to traffic in the cities of Bloomington and Richfield. Usually, the development and construction of a major highway project cannot be carried out that quickly — and it was not for this project, either. In fact, parts of the roadway had been graded before the start of World War II, and the twin bridges carrying Highways 5 and 100 (later designated as I-494) over the freeway were completed in 1956. As was the case with the early completion of other Minnesota Interstate projects, the I-35W segment was planned and designed before the official authorization of the Interstate System. The project had been part of an overall plan to upgrade Highway 65 between the Iowa border and Minneapolis, as had the previously completed Faribault bypass on Highway 65 and the I-35 project at Owatonna.

The I-35W project covered 5.1 miles from West 106th Street in Bloomington to 66th Street in Richfield. A temporary 1.5-mile extension of the road to the intersection of 56th and Lyndale Avenue South in Minneapolis was also part of the project. The extension eventually was numbered Highway 190 (currently 121), and it permitted through traffic formerly using Lyndale (then Highway 65) to travel one block west on 106th Street to the freeway and back to Lyndale at 56th. The bypass avoided the traffic congestion on Lyndale in between the two streets that had resulted from the rapid commercial and residential development of the area in the 1950s. Ironically, some drivers now choose to travel on Lyndale Avenue to avoid the traffic congestion on I-35W.

When it opened to traffic, I-35W was not quite a non-stop drive. Because planning took place long before the Interstate System was approved, a totally

Minnesota Historical Society

Before Highway 65 (later signed as I-35W) was relocated to the west, it followed Lyndale Avenue through Bloomington and Richfield. Lyndale is shown in this photo near its intersection with West 66th Street in the late 1950s. The two-lane street very inefficiently carried a mix of local, commuter, and long-distance through traffic.



Minnesota Highways

Looking north from the Minnesota River at the Twin Cities first completed segment of the Interstate System in 1959. The portion opened to traffic starts at the 106th Street interchange in Bloomington about midway from the bottom of the photo. The grass median no longer exists; it was replaced by a third lane in each direction in 1995. The I-35W Bridge under construction in the foreground next to the Lyndale Bridge was also widened at that time. The Lyndale Bridge was removed soon after the I-35W Bridge was completed in 1960.

grade-separated highway had not always been envisioned. While redesign to freeway standards was accomplished for most of the road before construction began, the bridge at 76th Street was not included in the project. A temporary, at-grade intersection on I-35W in Richfield between Highways 5 and 100 at 78th Street and 66th Street was required for local traffic; therefore, a temporary signal remained at the intersection for about one year until the bridge and an interchange were completed. (The bridge, completed in 1960, was replaced with a wider bridge in 2008.)

## Unique Design Concepts

A somewhat unique feature of the freeway was its depressed design through most of its length in Bloomington. The depression of the roadway made it feasible to construct the bridges at Old Shakopee Road; West 94th, 90th, 86th, and 82nd Streets; and the Minneapolis, Northfield and Southern Railroad at 96th Street, with very little change to the elevation of those streets and the railroad as they crossed the freeway. The depression also helped reduce the highway noise levels in the adjacent residential area and improved the highway's visual and aesthetic appeal in the surrounding area.

Although depressing a highway had long been recognized as a desirable design feature in urban areas, cost usually prohibited its practice in the 1950s, even when hauling the excavated earth a reasonable distance was possible. Fortunately, in the Bloomington case, a considerable amount of fill would soon be needed for nearby approaches to a new bridge over the Minnesota River that was scheduled for construction as the next segment of I-35W.

Minnesota Highways

The first pre-stressed concrete beams to be used on a bridge in Minnesota were lowered onto the west pier and abutment of the 94th Street overpass in 1957. They were 36 feet long and weighed 7.5 tons. In addition to the steel reinforcing rods used in structural concrete, the girders contained wire cables under tension to provide structural strength. (The cable anchors can be seen at the end of the girder in the lower left corner of the photo.)

The depressed design concept eventually caught on and was used for other freeway construction projects in urban locations, even when hauling the excess earth within the project area or to an adjacent project was not always feasible. Examples of such construction in the Twin Cities included I-35W between Diamond Lake Road and 35th Street in south Minneapolis, and I-94 from Snelling Avenue through the capitol approach area in St. Paul. Excess excavation from projects on the latter segment found its way to Snelling Avenue, south of the State Fairgrounds, and South of the Mississippi River near downtown St. Paul, to serve as fill for Highways 51 and 52, respectively.

Minnesota Highways

I-35W dedication at the 86th Street Bridge, August 17, 1959. Deputy Highway Commissioner Frank Marzitelli, left center, congratulates R. C. Beito, project engineer. Other department onlookers are, left to right, Assistant Construction Engineer Arnie Wahlroos, Assistant Chief Engineers C. C. Colwell and J. C. Robbers, Maintenance Engineer George Meskal, Bridge Engineer A. E. LaBonte, Construction Engineer Stan Ekern, Assistant District Engineer Harold Van Krevelen, Public Information Director Vince Bovitz, Chief Engineer John Swanberg, Metropolitan District Engineer E. J. McCubrey, and Assistant District Engineer Don McFadden.

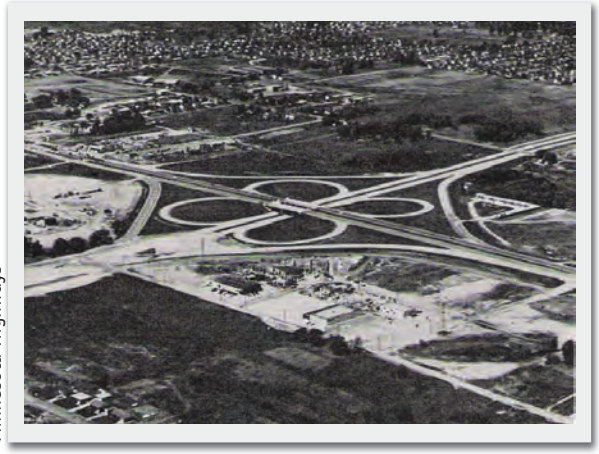
Another key distinction associated with this early segment of Interstate freeway was the West 94th Street overpass. It was the first state highway bridge in Minnesota to use pre-stressed concrete beams. While standard reinforced concrete bridges were common in Minnesota at the time, longer spans were generally constructed with steel girders. However, a shortage of structural steel in the 1950s prompted the development of alternate concepts. Within a pre-stressed girder, steel cables along the length of the beam, under tension, provided the necessary strength to bear the weight of the bridge deck, traffic loading, and the weight of the girder, itself. To date, a considerable number of pre-stressed concrete bridges, many with spans significantly greater than those at 94th Street, have been built in Minnesota. They are economically competitive with other structural methods, and contractors have often been offered the option of using steel or concrete pre-stressed beams.

## Dedication Ceremony

A dedication ceremony, sponsored by the Minneapolis Area Chamber of Commerce, was held on August 17, 1959, at the 86th Street Bridge with Chamber President E. William Boyer presiding. Governor Orville Freeman was the principal speaker before a crowd of several hundred persons. He stressed the economic betterment, travel convenience, safety, and national defense provisions that the Interstate System would bring to the country. Distinguished guests included Mayors P. Kenneth Peterson of Minneapolis, Irving Keldsen of Richfield, and Gordon W. Mikelthun of Bloomington. Torchy Peden of Bloomington, a former bicycle road-racing world champion, provided the highlight of the event. Instead of wielding a giant pair of shears, to officially open the highway Peden pedaled his bike through the ceremonial ribbon, accompanied by music played by the Bloomington City Band.

## Current Capacity Deficiencies

In 2003, a report from the Texas Transportation Institute noted that traffic congestion on the Twin Cities freeway system was increasing at the nation's second-fastest rate. Congestion at the I-494/I-35W interchange has been one of the growing concerns. When it first opened in 1959, the interchange easily handled the daily demand of 46,500



Minnesota Highways

This is what the cloverleaf interchange at I-35W and I-494 (then Highway 5 and 100) looked like in 1958, one year before the first segment of I-35W was completed. The east-west divided highway and the twin bridges, constructed in 1955 and '56, were already carrying traffic. Note the contrast in the development of the area by comparing it to the present development shown in Mn/DOT's computer-generated proposal for reconstruction of the interchange on the following page. The camera is facing northwest, with I-35W headed north to the upper right corner.

vehicles. (This was long before nearby local streets were widened and parallel Highways 169, 100, and 77 were upgraded to freeway standards. Construction of Highway 62 also helped carry much of the increasing traffic demand in the region.) However, by 2000, traffic volume at the interchange had quintupled to more than 265,500 vehicles per average weekday, including 85,000 vehicles using the ramps and loops to change direction. At 14,080 trucks per day, the interchange was carrying the highest heavy commercial volume of any interchange in Minnesota. Altogether, the I-35W/I-494 interchange has handled a higher traffic volume than any interchange in the entire metro area except the I-35W/I-94 interchange south of downtown Minneapolis.

There are other indications that improvements at this interchange are warranted. "Stop and go" conditions are encountered during 74% of the afternoon peak period each day on westbound I-494, and average vehicle speeds are far below the posted limit for ten hours per day. In fact, traffic approaching the interchange slows as early as 6:30 a.m. on any given weekday.

If the interchange is not improved, traffic projections indicate that traffic on westbound I-494 will move at an average speed of 4 miles per hour as it approaches I-35W during the afternoon peak period by 2037. Projections also indicate that, during the 2037 morning peak, traffic on northbound I-35W will move at an average speed of 13 mph as it approaches the interchange, generating congestion perhaps as far south as the Minnesota River Bridge.

But even the present-day traffic demand is taxing the capacity of the interchange. The average annual daily traffic volume in 2004 (including weekend days) was 256,000 vehicles per day — at least 50,000 above the practical capacity, according to a very rough calculation. Total weekday traffic now often exceeds 300,000. Mn/DOT's Regional Traffic Management Center reports that I-35W is running at or above capacity from before 6:00 a.m. to after 7:00 p.m. every weekday, and average speeds, just as they are on I-494, are well below the posted limit for at least ten hours per day. These volumes can be explained, in part, by the 45 million square feet of office space in the area adjacent to these two freeway corridors in Richfield, Bloomington, and Edina. (Compare that to the 40 million square feet of office space in downtown Minneapolis.)

J. Katz

In spite of the third lane added to I-35W when it was reconstructed in 2003, evening peak hour traffic is still congested in this view of the northbound lanes (on the left) as seen from the 73rd Street pedestrian overpass.

## Traffic Safety Concerns

In addition to the traffic-carrying capacity problems at the I-35W/I-494 interchange, another issue speaks to its inadequacies: crashes. The I-35W portion of the interchange has had a crash rate of 1.6 collisions per million vehicle miles traveled, 45% higher than the state average for urban Interstate highways. (In recent years, Mn/DOT and the Minnesota Department of Public Safety has used the terms "crash" or "collision" instead of "accident" to more appropriately describe these incidents.) The rate on the I-494 portion has been 2.5 crashes per million miles traveled — the highest of all the interchanges on the I-494/I-694 freeway ring around the Twin Cities and 127% above the state average. The 432 crashes in a recent three-year period were 170 more than the second-highest of all the Interstate-to-Interstate interchanges on the beltway. Put another way, there is an average of one crash reported every 60 hours at the I-35W/I-494 intersection.

The capacity and safety deficiencies described above should not be attributed to poor planning or lack of foresight by those responsible for the original design of I-35W and, in particular, its interchange with I-494. The original interchange was planned in the early 1950s, and I-35W was opened to traffic in 1959. It has long been recognized that the reliability of traffic volume forecasting (and urban land use forecasting, in general) beyond a 25- to 30-year period is questionable, at best, and cannot be much better than mere speculation. It is quite reasonable to say that detailed planning beyond such a period is irresponsible and not in the public interest when considering the cost of transportation facilities and the burden borne by those who pay for them. Furthermore, the sophistication of early traffic prediction models was quite primitive compared to today's methods. The computers that drive today's prediction models, variations, and iterations of alternative planning scenarios were not even imagined at the time. Given these limitations, both I-35W and I-494 were designed as four-lane roads with room for additional lanes that were eventually constructed in each direction. That design was expected to be adequate into the 1980s.

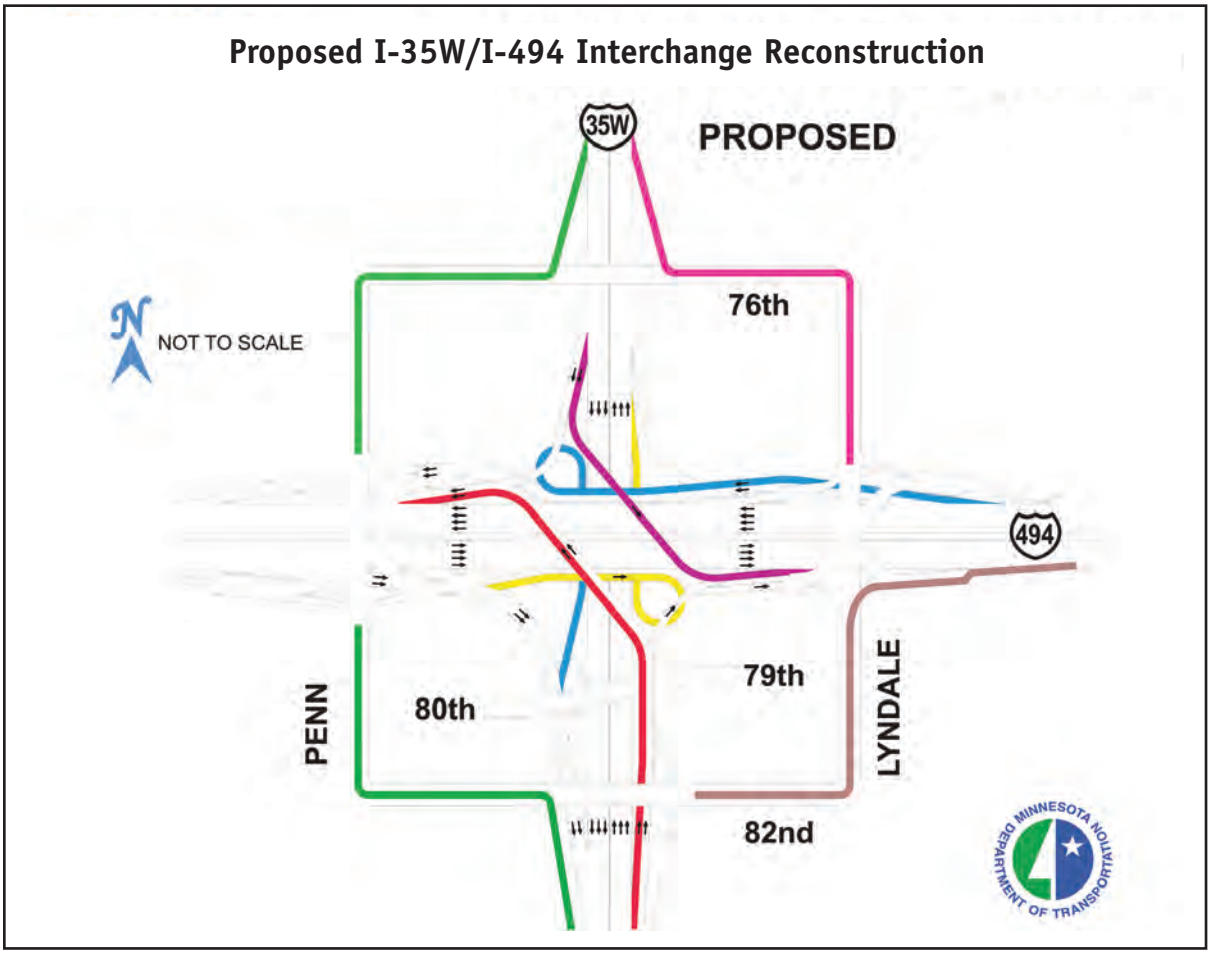
Today, 60 years after the interchange was planned, any blame for traffic congestion and safety problems should be assigned to those who failed to keep pace with the growth of the region, the state, and the nation. It is easy, of course, to castigate politicians and/or administrators for the time lost in traffic, the injuries, and the loss of life, but it might be fairer to say that the blame lies with all of us.

## A Glimpse into the Future

Mn/DOT officials and administrators of the cities through which these two highways pass recognize that the ailments of the existing I-35W/I-494 interchange will continue to worsen. Therefore, even with a financial picture, which as of this writing, does not yet specifically identify funding to address the need, Mn/DOT has been developing preliminary plans for major reconstruction of the two freeways as well as the interchange between the two that would serve for many years into the future. A computer-generated view of the proposed revised interchange is shown below.


Mn/DOT

This view, facing east along I-494, highlights one of the proposed reconstructed I-35W interchange's features – the collector-distributor roadways separated from the mainline roadways by raised medians. This separation of interchanging traffic from through traffic greatly improves the overall flow of traffic and mitigates the inefficient weaving movements typical of cloverleaf loops and other closely spaced ramps that can be observed on older freeways.




Mn/DOT Website

A schematic representation of the proposed replacement interchange at the intersection of I-35W and I-494. Note that the "flyover" ramp from northbound to westbound is two lanes wide. This ramp would accommodate a traffic volume equal to more than twice the capacity of the existing loop in the northeast quadrant of the interchange that currently provides for the northbound to westbound movement. Colored lines on Penn and Lyndale Avenues and 76th and 82nd Streets indicate how local traffic would move between the four interchanges on those streets.


J. Katz

Aesthetics and landscaped terraces were not high on the priority list for the designers of the first segment of I-35W in the 1950s. However, with the reconstruction of the freeway completed in 2001, there was an expectation that Richfield would participate in the development of the design for the rustic treatment of retaining walls, seen here just south of the 66th Street interchange.

## 1959 I-35W PROJECT BY THE NUMBERS

| | |
|---|---|
| 2,600,000 Cu. Yds. | Excavation |
| 450,000 Tons | Gravel Base |
| 70,000 Tons | Bituminous Surfacing |
| 145,000 Sq. Yds. | Concrete Paving (10") |
| 35,000 Sq. Yds. | Concrete Paving (9") |
| 657,000 Lbs. | Steel Mesh Reinforcing |
| 57,000 Lin. Ft. | Concrete Curb |
| 53,000 Lin. Ft. | Bituminous Curb |
| 52,500 Lin. Ft. | Fencing |
| 3,800 Units | Trees and Shrubbery |
| 7,000 Cu. Yds. | Concrete for 12 Bridges |
| $1,654,592 | Paving Contract Low Bid |

## THE FIRST AND ONLY INTERSTATE PARKWAY IN MINNESOTA: I-35E

The 3.5-mile segment of I-35E from its interchange with West 7th Street in St. Paul to its junction with I-94 near the capitol is quite unique. It is the only part of the 914-mile Interstate System in Minnesota designated as a "parkway." As such, trucks weighing more than 9,000 pounds are not permitted, and the speed limit is 45 miles per hour. Parkway legislation also limits the road to four through lanes.

Minnesota Historical Society

Grading for I-35E was underway when this photo was taken in 1971, south of what appears to be the St. Clair Avenue bridge.

This section of freeway was not originally planned to be a parkway. In fact, excavation and earth moving for a six-lane freeway was about 75% complete and nine bridges had been constructed in the corridor by 1972. As of that date, completion of the project was expected in five years. However, it would actually be 18 more years before any traffic was carried on the road.

This photo was taken facing south from the St. Clair Avenue Bridge, after the landscaping in the parkway median had matured and the original pavement had been covered with a bituminous overlay.

J. Katz

Early Interstate construction in Minnesota was carried out with relatively little controversy. Even in urban areas, some of the initial freeway development encountered little resistance. Certainly, not everyone was happy with it — especially those people who had to leave their homes and businesses. However, as covered in other sections of this book, controversies did become more frequent starting in the mid-1960s, and they often resulted in significant changes from original freeway plans. Cases in point:

- Disputes in Duluth over whether to build the I-35 freeway through the downtown area were resolved with a plan for four tunnels, shifts in highway alignment, the relocation of a major railroad yard, and the designation of the end of the freeway at 26th Avenue East. Earlier plans had not contemplated the tunnels or the railroad removal, and a once-

J. Katz

This view of I-35E is looking northeast toward downtown St. Paul from nearly the same vantage point as the photo on the previous page. Note the absence of trucks.

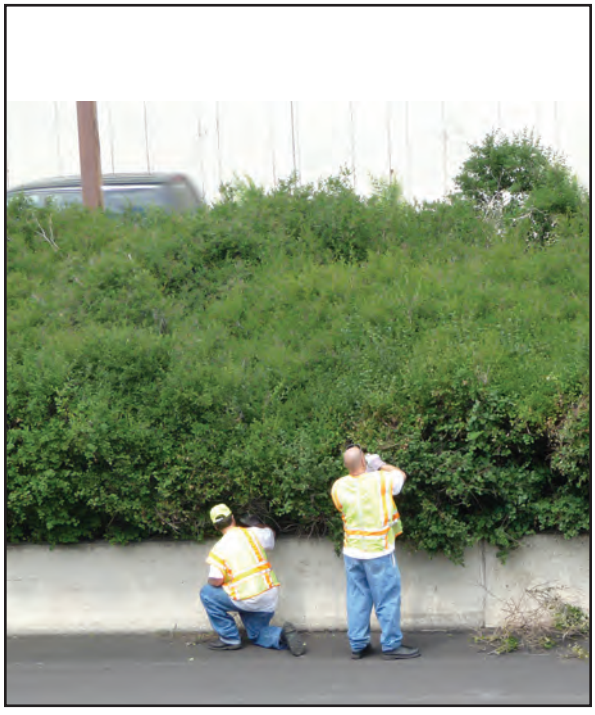
approved plan would have extended I-35 to 68th Avenue east to tie into the Two Harbors expressway. Federal money that had been programmed for extension was deposited in an Interstate Replacement Fund account that redirected funding to several non-Interstate transportation projects in the Duluth area.

- Although almost all of the needed right-of-way for I-335 in Minneapolis had been acquired and cleared, opposition to the project did not abate. The project was abandoned, and much of the property was filled in with new housing. The abandonment led to Interstate Replacement Funds being made available for several non-Interstate projects in the Twin Cities metro area, including an interchange on Highway 100 at West 36th Street in St. Louis Park.
- A construction contract was about to be let for the grading of I-94 east of St. Paul to the St. Croix River on right-of-way that had been acquired one mile north of and parallel to Highway 12. The Commissioner of Highways canceled the letting at the last minute for restudy of the project. Years later, I-94 was constructed over the existing Highway 12 alignment, a plan that had at one time been approved but was later abandoned in favor of the northern location.

For I-35E through the southwest corridor in St. Paul, an unprecedented type of compromise finally resulted in the construction of the parkway over essentially the same alignment as had been proposed in the early 1950s — the same route that had been under construction through 1972. But before the dust settled, the protracted wrangling involved the Highway Department (and its successor agency, the Department of Transportation) — including several successive commissioners, St. Paul officials (including the mayor), the State Legislature, the Metropolitan Council, the Federal Bureau of Public Roads (the local division office as well as its Washington headquarters), Dakota County cities, and, of course, the citizens groups. And, not necessarily as a last resort, the courts were inevitably brought into the battle.

There were varied interests represented in the struggle:

- St. Paul citizens groups did not want a freeway in their neighborhoods. That was not a surprise; how many people, given a choice, would ask for a freeway in their backyard? In addition to the organization known as RIP 35E (Residents in Protest of 35E, the most visible and vocal group), there were the Lexington-Hamline Community Council, the Summit Hill Association, the West Seventh Street Association, and the Ramsey Hill Association.
- At least one St. Paul neighborhood was not opposed to the freeway. Residents near West 7th Street and Lexington Parkway signed petitions in favor of completing I-35E immediately. Their objective was to get the freeway built so that traffic congestion on Lexington would be alleviated. Some of that congestion had resulted from the 1965 completion of the I-35E bridge over the Mississippi River, immediately to the south of the area in dispute.
- The Highway Department was charged with building the Interstate System. It had already spent $23.5 million through 1972 on the construction that had been underway. Department staff did not want the project to be delayed, and they certainly did not want to have to return funds to the federal government.
- St. Paul officials were concerned about losing economic development and employment opportunities to Minneapolis. Traffic from the south had been able to get to downtown Minneapolis via I-35W since 1968.
- Rapidly growing numbers of western Dakota County commuters were concerned about getting to downtown St. Paul, and county and local city officials recognized the possible negative repercussions their communities would suffer if the freeway was not completed.
- Dakota County also had an active advocate group, the Urban Council on Mobility. Unlike most of the St. Paul groups, this organization was strongly in favor of the freeway. It was formed in 1974 in response to long delays in the



J. Katz

The dense growth of vegetation in the parkway's median is due, in part, to the irrigation system that was installed during I-35E's construction. That growth, however, requires upkeep, and a large group of Mn/DOT maintenance workers were doing just that on a warm day in August 2008 when this photo was taken.

construction of the last link of the I-494/I-694 ring (South St. Paul to Pilot Knob Road in Mendota Heights and Eagan) and the Highway 77 freeway across the Minnesota River, as well as I-35E. (The I-494 and Highway 77 projects had some disputes of their own.)

- The Bureau of Public Roads, of course, was obligated to follow through on the development of the entire Interstate System, following the routes laid out when Congress authorized the system.
- The Legislature and the Metropolitan Council were brought into the fray partly because of the inability of the directly involved parties to make progress toward a solution and partly due to those bodies' assumed concern with the "big picture," i.e., their responsibility to ensure that the best interests of the state and the region were being met, respectively.
- And, supposedly, because of their impartiality, as well as their capacity to wring out a "just" settlement, the dispute landed in the courts.

An act of Congress brought another, although neutral, player into the conflict. At the same time that the dispute over completing I-3E through the Pleasant Hill area began to heat up, Congress passed the National Environmental Policy Act of 1969 (NEPA). The purposes of the act, as written therein, were to ". . . declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality."

While it was clear that the act would have major impacts on the highway project development process — especially on urban Interstate projects — no one really knew what those impacts would be. The act was not strong on specifics. Such specifics would not be clear until regulations were promulgated to implement the act. (It seems that under some ways of thinking, "promulgate" can be interpreted to mean, "take a long time.") But eventually, the act caused many highway development plans to be put on hold for several years, not only because of the act, itself, but also for some actions that were taken in the name of the act.

Eventually, NEPA regulations were approved and published, spelling out requirements that included public involvement, the investigation and analysis of alternatives to a proposed action (including "no build"), and review by all agencies that might — even remotely — be expected to have some official interest in one or more of the environmental, economic, or social impacts resulting from the alternatives. Not surprisingly, this level of investigation and analysis brought with it a massive increase in the number of required project development reports, all culminating in an Environmental Impact Statement (EIS).

The EIS, itself, was a major undertaking, which required years for investigations, draft EISs, agency reviews, and final documents. NEPA required an EIS on major federal construction projects, and the state of Minnesota required an EIS for projects like major highway construction. In some respects, the state requirements added redundancy to the process, i.e., separate federal and state EIS documents were prepared for the same project, although research for both could be performed concurrently.

Fortunately, the Highway Department was determined to be proactive in implementing NEPA in its project development process rather than dragging its feet, as some agencies were prone to do. Although it bogged down the development of many of projects that were underway, meeting NEPA head-on saved the department some grief on other projects in the long run. But incorporating NEPA requirements into the resolution of the dispute on I-35E did not come easy. A lawsuit

initiated by members of RIP 35E, the city of St. Paul, and others in 1972 prompted the Highway Department to halt construction and begin preparation of an EIS. However, even though three years had passed since the passage of NEPA, the content and requirements of an EIS were yet to be defined.

In 1974, increasing pressure to complete the freeway from the St. Paul Chamber of Commerce, the Lexington neighborhood group, labor, and the Urban Council on Mobility, along with support from a soon-to-be-named new Commissioner of Highways was culminating in a reversal of the St. Paul City Council's position. By the end of the year, members of RIP 35E became aware of the rising sentiment for completion of the freeway as well as an apparent need for them to acknowledge its necessity for the city. RIP 35E remained opposed to the freeway in its neighborhood but, as an alternative, proposed that Pleasant Avenue (a city thoroughfare immediately adjacent to the planned freeway corridor) be rebuilt as a four-lane parkway. The group also stipulated that the proposed parkway should have no direct connection to I-94 in the vicinity of the capitol. As for I-35E, the group proposed that it be built along Shepard Road or routed over the Lafayette Freeway (now Highway 52 through South and West St. Paul).

Rip 35E submitted its parkway proposal as an alternative to completing the EIS. Group members also believed that the Bureau of Public Roads would be willing to provide federal funding for both the parkway and an alternative location for I-35E. The St. Paul City Council voted to support the proposal.

Spring of 1975 brought the release of the long-awaited "Butler Report." As a consultant to the Highway Department, the Walter Butler Engineering Company had prepared the report as a means to analyze I-35E location alternatives — including "no build" — and evaluate engineering and environmental issues. It was not a formal EIS (as noted above, NEPA EIS requirements had yet to be adopted); however, it was anticipated that the document would meet the intent of the 1972

J. Katz

The Walnut Street pedestrian bridge over I-35E. Note the cantilevered sidewalk overhanging the southbound roadway – replete with the classic St. Paul-style streetlights. A dominant feature of the parkway is its retaining walls that, on this north end approaching the junction with I-94, include wrought iron fences reminiscent of a century ago.

agreement regarding the preparation of an EIS. The report concluded that the best location alternative was the Pleasant Avenue corridor, where construction was halted in 1972. Butler also recommended several design revisions, including a depressed, rather than elevated, section in the vicinity of Grand Avenue and Ramsey Street, and measures to assure preservation of historic sites. The report was met with skepticism in the Pleasant Avenue neighborhood: it was a concession to the automobile. But, of course, it was received with enthusiasm in Dakota County and the business community. In accordance with the agreement, a public hearing on the report was held in May.

J. Katz

The grand stair case leading to the Walnut Street pedestrian bridge over I-35E that connects West Seventh Street on the near side to Pleasant and Irvine Avenues on the far side. The spire in the center rests atop the St. Paul Cathedral.

In the meantime, the 1975 session of the Legislature took up and passed a bill that included a two-cent increase in the gas tax as well as a two-year moratorium on all work — including preliminary engineering, environmental studies, and right-of-way acquisition — on I-335, I-394, a proposed road extending to the north from the University of Minnesota Interchange (Huron Boulevard) on I-94, Highway 55 (Hiawatha Avenue in Minneapolis), and the disputed section of I-35E. Construction of all those roads was being disputed at the time of the bill's passage, including a section of I-35 in Duluth identified in the bill. Both houses approved the moratorium, similar to one that failed to pass in 1973, after metro-area legislators threatened to kill the bill (along with its gas-tax increase) unless the moratorium provisions were included. Incidentally, an influential member of the House of Representatives, a resident of the Pleasant Avenue neighborhood, had a major role in shepherding the legislation.

Passage of the bill led to another lawsuit only a few months after the 1975 Legislature adjourned. This time, it was the St. Paul Chamber of Commerce charging in Ramsey County Court that the legislation was unconstitutional because only the federal government had the power to shut down a federally funded highway project. RIP 35E members obtained permission to be a party to the case on the basis that the freeway would be damaging to their neighborhood. On the plaintiff side, Dakota County joined the Chamber in the lawsuit. Within a year, the court ruled that the Legislature had acted within its authority. Shortly after the court ruling, the Chamber reversed its earlier position and announced support for the parkway; however, it appealed the decision upholding the highway moratorium. The case was argued before the Minnesota Supreme Court in 1977, and the High Court declined to overturn the county court's ruling.

During the 1977 session of the Legislature, Dakota County unsuccessfully lobbied to lift the moratorium. The parkway proposal was gaining acceptance in the neighborhood by that time, and

a bill to provide for its construction was introduced but failed to gain sufficient support. Later that year, in an apparent effort to resolve the dispute, Governor Rudy Perpich announced that the decision about building alongside Pleasant Avenue should be made by the city of St. Paul. The city approved the parkway plan, and in 1978, a legislative bill was passed permitting its construction, including a connection to I-94. The bill thus lifted the moratorium with respect to building in the Pleasant Avenue Corridor. The bill also directed that the Metropolitan Council, rather than Mn/DOT (the Highway Department's successor agency as of 1976), would take responsibility for preparing a draft EIS.

Although the Metropolitan Council's draft EIS identified twelve alternatives, only two of them had significant support: the parkway with a direct connection to I-94, and the parkway without a connection. Mn/DOT, the Metropolitan Council, and the St. Paul Planning Commission favored the former. Several neighborhood groups continued to vigorously oppose the direct connection despite the likelihood that it would not qualify for the standard 90% federal funding for Interstate projects. They believed the end result would be too much like a freeway, and, eventually, there would be considerable pressure to raise the speed limit and permit use of the road by trucks. In a letter of appeal to the United States Secretary of Transportation, the citizen groups requested that 90/10 funding be provided for the indirectly connected parkway (i.e., over city streets to I-94). The letter also stated that legal action would be taken to stop the construction of any alternative that included a direct connection. In spite of the threat, the Secretary did not give them a favorable response.

In 1981, St. Paul City Council members once again reversed their position. Along with the Metropolitan Council and Mn/DOT, they stated their support for the parkway with a direct connection to I-94. The Commissioner of Transportation formally selected the design with the direct connection later that year. Bills were introduced in the 1982 session of the Legislature to permit the construction of a parkway with the direct connection. However, the passed bill stipulated that the decision to provide a direct connection would be left to the Commissioner. Also in 1982, the Metropolitan Council and the Federal Highway Administration (the Bureau of Public Roads successor agency) gave approval to the final EIS. Now, only ten years after the decision to prepare an EIS, it was approved and construction could begin!

Well . . . not quite yet. Early in 1983, as threatened, RIP 35E and several of the other neighborhood groups brought another lawsuit. The suit alleged that both the draft and final EIS were inadequate and biased because ten of the eleven alternatives identified in the final document followed the Pleasant Avenue corridor. Furthermore, there was no comparison of the direct and indirect connection to I-94 with respect to traffic volumes and speeds. It was implied that there would be wholesale violation of the 45 mile-per-hour speed limit with the direct connection, which would raise noise and pollution levels. The suit also contended that earlier agreements had been arbitrarily dismissed with insufficient warrant.

At the same time that the lawsuit was being filed, the St. Paul City Council was moving to approve the final design for I-35E. Letting of construction contracts was tentatively scheduled for May 20, 1983. It seemed quite likely that contracts would be awarded unless an injunction was issued. Early the following year, the U.S. District Court ruled against the plaintiffs. The judge found the EIS to be adequate and the processes to arrive at its conclusions reasonable.

Although the court had acted in their favor, Mn/DOT and the city of St. Paul believed it was necessary to take a further good-faith step to ameliorate the dispute over I-35E that had stalled the project for so many years. That step was identified as a design concept initiative to address sen-

sitive issues — particularly in the area from Grand Avenue to I-94 — regarding the narrow right-of-way, historic sites, landscaping, architectural details, local access, and pedestrian and bicycle facilities. A nationally-recognized highway design expert was brought in to advise the Lower Cathedral Hill Design Task Force and the St. Paul Planning Commission on the development of aesthetic enhancements that would best blend the parkway into its surroundings and provide a suitable "gateway" environment for travelers approaching downtown and the capitol area. (Some of the results of their work are depicted in photos in this chapter.)

On October 15, 1990 — 26 years after construction work began in the I-35E Pleasant Avenue corridor — a ribbon-cutting ceremony was held to dedicate the parkway and open it to traffic. Fifteen years later, a writer looking back on the protracted dispute over the project summed it up as follows:

> If the measure of a successful compromise is that no one is totally happy with the result, then the I-35E link was a success. Members of RIP 35E and other neighborhood freeway opponents were unhappy because there was a direct link with I-94. Dakota County residents were unhappy because they wanted a high-speed freeway. Truckers were unhappy because they could not use the route. . . . Yet, the result was undeniably innovative, drawing interest from highway engineers from around the United States. The unusual median and attractive landscaping was funded by federal mitigation funds, and this part of the regional and federal Interstate Systems was kept intact. In addition, the court order provided secure protection for the nearby neighborhoods. As recently as 2004, the St. Paul City Attorney's office interpreted the court order as akin to a legal contract to which the state is legally bound. Periodic legislative efforts to increase the speed limit or allow trucks have failed, and if such action passed, it most certainly would be met with a credible legal challenge. In the world of political maneuvering, the fact that this dispute was resolved in court resulted in an unusually firm agreement.*

**From a detailed discussion of the history leading to the onset of the I-35E dispute and the protracted actions and reactions that took place during the 1972-1984 period as set forth by Patricia Cavanaugh in Politics and Freeways, a publication of the Center for Transportation Studies and the Center for Urban and Regional Affairs, both at the University of Minnesota. The publication is available, on line, at http://www.cura.umn.edu/publications/freeways.pdf.*

## NORTH OF THE METRO AREA

### The First Project on I-35 North of the Metro Area: Hinckley and the Pavement "Scandal"

To most Minnesotans, driving on I-35 at Hinckley means they are about halfway on a trip between the Twin Cities and Duluth. And for more than a few people making that trip, it also means a stop for a caramel roll or a meal at Tobies Restaurant and Bakery (one of several restaurants in the area serving travelers), or spending a day at Grand Casino. However, to some, the Hinckley area may be remembered as the first segment of the Interstate System to be built on I-35 north of the Twin Cities. As such, many Minnesotans went out of their way to take advantage of it.

Actually, the new freeway conveniently intersected at both ends with Highway 61, the road that had been the primary artery between the Twin Ports and the Twin Cities for many years. The 16-mile segment was completed between Hinckley and Sandstone in 1962. As with the other rural

Interstate highways in the state, subsequent construction continued in each direction from the original segment until the freeway was completed in 1970 from the junction of I-35E and I-35W north of St. Paul to a point between Carlton and Scanlon. At that north end, traffic was routed into Duluth via a four-lane divided segment of Highway 61 (now Carlton County Road 61) built in 1950.


Minnesota Historical Society

Tobie's Eat Shop and Bus Stop as it appeared in 1950. The business was established in 1920. Note the Greyhound logo on the wall at right. The road on the left was Highway 61 (now Pine County Road 61); the intersecting road is Main Street. Railroad tracks are immediately to the left of the photo.

But beyond the locals' concerns and the travelers' interest in getting the freeway completed, most Minnesotans were generally oblivious to the construction of I-35 — that is, until the "scandal" broke! Of course, it was hardly a scandal compared to some other road-building scandals during the early part of the twentieth century. No taxpayers got "ripped off," and no one committed extortion of an exorbitant amount of money. However, the scandal did result in a threat to withhold federal highway funds designated for Minnesota projects, and the publicity it generated did help decide the 1962 gubernatorial election in favor of DFL challenger, Karl Rolvaag, over Republican incumbent, Elmer L. Andersen.

Highway-related scandals in Minnesota have been extremely rare, both at the state and local level. Yes, there were a few instances of bid rigging — wherein two or more contractors got together to agree on the lowest bid they would make to procure a contract. And one headline-making scandal occurred on a road-maintenance project for which the contractor outrageously overcharged the state for equipment operation hours. More recently, a Mn/DOT employee was terminated for charging ineligible travel and telephone expenses in a series of incidents that never would have made the evening news had they not had some tangential connection to the collapse of the I-35W bridge over the Mississippi River in 2007. Even the collapse, itself, certainly was not the result of a scheme to get around standards and regulations governing the administration of highway contracts. In short, organized crime, collusion, or deliberate attempts to shortchange public works agencies have not played a role of any significance in the history of Minnesota's road operations.

What happened in Hinckley were a few inadvertent, minor deficiencies in the quality and placement of a miniscule amount of project materials. One of the deficiencies was the placement of reinforcing steel mesh in the concrete pavement at a depth outside of tolerances covered in the specifications. A Highway Department paving inspector on the project mentioned it to his brother who, in turn, reported it to officials in the Rolvaag campaign. But, this was not a matter of *not* installing the reinforcement (a tactic that, if undetected, could have saved the contractor thousands of dollars), nor was it a deliberate act on the part of the contractor to get away with substandard work — a tactic that would have saved the contractor nothing and likely would have resulted in the state not paying for the work, paying for it at a reduced unit price, or requiring the replacement of the pavement at the contractor's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Governor Elmer L. Andersen (right) with Mayor Max Lehman of Hinckley and Duluth Chamber of Commerce officials at the November 1, 1962, dedication of I-35. As the picture was taken, the president of the chamber was presenting the governor with a jug of water drawn from the Gulf of Mexico and Lake Superior, symbolizing the termini of I-35 at Laredo, Texas, and Duluth.

expense, all depending on the severity of the deficiency. As it turned out, the Highway Department project engineer exercised all three penalty options in dealing with project deficiencies.

The steel placement was found to be outside of tolerances on 532 lineal feet of pavement out of a total of 32 *miles* of the project's north- and southbound roadways. Some "honeycombing" (excessive air voids) were found in 13 lineal feet of pavement on one of the Highway 23 interchange ramps near Hinckley, and four truckloads of bituminous shouldering material did not meet specifications. It should be understood that even the best and most-experienced construction contractors find it nearly impossible to totally avoid such deficiencies on a project. That is why inspection is an integral part of the construction process and why final payments are not made until a contract is closed out and all issues are resolved. Contracts often include clauses holding the contractor liable for deficiencies discovered within a number of years after project completion.

Although it might be construed as biased, it is illuminating to review Governor Andersen's personal account of the scandal as written in an autobiography, *A Man's Reach,* a book covering his years of public service*:

> . . . [T]he campaign for governor was taking a nasty turn. [Minnesota's] U.S. Sen. Hubert Humphrey, the DFL Party's undisputed leader, had come home from Washington to stir things up for the DFL. Working with a number of DFL operatives, including U.S. Rep. John Blatnik, Humphrey inflated a highway worker's allegations that there had been faulty construction on Interstate Highway 35 near Hinckley, between the Twin Cities and Duluth. The reason for it, they alleged, was my desire to hasten the road's completion and dedication on the Thursday before the election.
>
> The charge that construction was faulty was false. Very minor irregularities were found in a subsequent investigation by the federal Bureau of Public Roads, all of which were corrected by the contractor at his expense. The corrections cost the contractor $996.24. These were routine deviations, much like those found on other stretches of new highway all over the country. All of the DFL allegations about major construction errors were found to be without merit. The most damning charge – that concrete was poured on frozen ground, contrary to specification, in order to stage a ribbon-cutting ceremony prior to the November 6 election – was completely groundless. Tests showed that the concrete in question was of greater than required strength and that ground temperature was adequate on the day it was poured, even though air temperature may have dipped

*Elmer L. Andersen, *A Man's Reach*, edited by Lori Sturdevant of the Minneapolis StarTribune, University of Minnesota Press, 2000.*


J. Katz

Tobies Restaurant and Bakery as it appears today. The popular restaurant was moved to its present location in the southeast quadrant of the I-35 interchange with Highway 48 on the east side of town by its third owners four years after the freeway was completed in 1962. By then, the original 16-mile segment of I-35 had been extended 14.5 miles to Highway 70 on the south and 18.5 miles to Highway 73 on the north.

below the requisite ground temperature of thirty-five degrees Fahrenheit.

The DFL accusations had their root in the observations of a low-level highway technician . . . . [His] job was to run tests on the gravel being used to build the highway, to make certain its coarseness met the roadway's specifications. On September 19, he had run a number of tests that had "failed," according to his understanding.

He reported the matter to his superiors, who did exactly what they were supposed to do: inform the contractor and ask for better material, inform the state highway inspector, and make a record of the findings in the project's diary. Nothing was covered up. The allegedly faulty material was inspected by engineers and found to be within the allowable tolerance of deviation.

Whether [the inspector] was aware of all that his superiors did with his September 19 report was never clear to me. But what was clear, as the full story of this episode was revealed after the election, is that [he] took what little he knew straight to his younger brother . . . , a twenty-four-year-old operative in the Rolvaag campaign. [The brother] shared the report with the campaign's leaders, who took [the] account at face value and ran with it. They added to [the inspector's] first account his report of October 23 and 24, that concrete had been poured on a day when the temperature was subfreezing, and therefore, he thought, sure to make poor quality pavement. [The inspector's] account made no mention of the temperature that really mattered to the work, the ground temperature. If the DFL officials who rode the I-35 accusations so hard in the campaign's final days understood that distinction, they never let on.

[Minnesota Representative John] Blatnik, chairman of the house committee that investigated improprieties in the federal highway program, called a press conference to say the allegations were "serious," and to suggest that in other states people had been indicted on similar charges. Humphrey, on the eve of the third and final televised debate

between Rolvaag and me, had his office say that the flow of federal highway funds to Minnesota would be suspended until questions about construction quality on I-35 were answered. It was a lie. Humphrey had no authority to suspend funds, and no additional dollars were expected until the completion of the highway and the usual audit that follows. Nevertheless, that was the story that Rolvaag and Humphrey carried as they stumped the state the weekend before the election. . . .

The DFL smear campaign on I-35 was launched in earnest just a week before the November 6 election. A Blatnik operative worked in the Bureau of Public Roads, and a member of Minnesota's politically active Foley family was in the Secretary of Commerce office. Between them, they arranged for two functionaries from the Bureau of Public Roads to come to Duluth on the pretext of investigating highway construction. Their very presence was enough for the DFLers to point to as they asserted that deficient materials were being used to build the road to hasten its construction for political reasons. It was enough for Rolvaag to call for a congressional investigation – and for me to call for one too, on the politically motivated activities of the Bureau of Public Roads.

A dedication ceremony for the highway took place at Hinckley on November 1. Blatnik and [the Minnesota] division engineer of the Bureau of Public Roads were scheduled to appear but did not. They claimed that they could not attend when "bodies with which they were associated" were investigating the road's alleged shortcomings. I was angry, and, to my regret, I let it show. News stories reported that my voice was hoarse and rough with emotion, and my face was flushed, as I addressed the crowd:

> I deeply resent the cheap, dirty politicians who, to get a few votes, have besmirched Minnesota's good name all over the country. . . . The reason Congressman Blatnik is not here is because he knows I would be shaking my finger right in his face, and asking questions he doesn't want to answer.

Hindsight has convinced me that I employed the wrong approach. I was too defensive. I let them get to me. Instead of delivering a tongue-lashing, I should have pulled a magnifying glass out of my pocket and stooped down at the new highway to make a big show of looking for nonexistent defects. I should have made a joke of their charges, to show how laughable they were. Anger never reflects favorably on anybody.

I did one thing right in my defense. I called U.S. Secretary of Commerce Luther Hodges, whom I had known through Rotary International. I surmised from the DFLers' talk about a possible cutoff of federal highway funds for Minnesota that they might approach the Secretary of Commerce to sign an order delaying a payment or an order for the state. I called him to inform him about the political motives that would be behind any such request. I said, "I know you can't get involved in a political race in Minnesota, surely not for a Republican candidate. But I wanted to ask you to do one thing: please watch what you're asked to sign relating to Minnesota. Be sure that whatever it is, is justified. I think an effort is going to be made to get you to sign something routinely that will have a big impact in Minnesota. All I ask of you is to just pay attention to what you're signing that relates to Minnesota."

He said he would, and he did. After the election, he told me, "Elmer, they did have a paper they wanted me to sign stopping funding, but I didn't sign it." The day after the election, of course, the request for his signature was withdrawn.

Humphrey was an important person. The fact that he was personally accusing me of tolerating deficient construction practices on the new highway added a great deal to the charges' credibility. Nobody would believe that he would cook up such a thing. On one TV show, the state's three top DFLers – Humphrey, Mondale, and Rolvaag – all spoke in mournful tones about how bad it was that poor construction practices were being tolerated on a major freeway, what a blot it was on Minnesota's good name, and on and on. They were convincing.

The final Minnesota poll had been conducted from October 26 through October 28 – before the DFL charges about I-35 were made in earnest. It showed me leading among likely voters, 52 percent to 48 percent. Moreover, I had the endorsement of most of the state's newspapers, one of whom was already calling the highway issue a "smear." Heartening as that was, I knew that the campaign developments in the last week had probably changed things – and not for the better.

I spent my last day of campaigning in northeastern Minnesota, the region where I had focused so much time and energy as governor. My last appearance was in Hibbing. Then I flew home to St. Paul and climbed into bed at 3:00 a.m. I slept for only a few hours. Eleanor and I wanted to get to the polls early, and I needed to go to the capitol for several meetings. I returned home at 4:00 p.m., and then started making the rounds of election-night parties at 8:30. We arrived at our own party at the Leamington Hotel at about 10:00, to settle in and wait out the returns.

Little did we know that our wait would last four and a half months.

A protracted vote recount determined that Karl Rolvaag had won the election by only 91 votes out of a total of more than 1.3 million cast.

It is somewhat ironic in hindsight to note that major pavement maintenance projects have been no more prevalent on the Hinckley segment of I-35 than on any other segment to the north or south, all of which were constructed several years later.


J. Katz

Fall colors are a great attraction on the way to Duluth and beyond. These bushes are located on the I-35 northbound exit ramp to Highway 70 in Hinckley.

## DULUTH

*Much of the following is based on an article by J. I. Newland in the April 1962 edition of* Minnesota Highways. *Another primary source was two chapters from* The Will and the Way – How a Generation of Activists Won Public and Private Achievements for their Community and Region, *written by John Bray, District Public Affairs Director and Special Assistant to the District Engineer at Mn/DOT's Duluth district office; and Kent Worley, a Duluth landscape architect who was directly involved in several aspects of the freeway design and its amenities. The book was published by Manley Goldfine and Donn Larson in 2004.*

By the time it was completed in 1994, the project to build I-35 through the city of Duluth was one of the most frustrating ever undertaken by the Minnesota Department of Highways (and its successor agency, the Department of Transportation). What was finally built adjacent to and east of the downtown area, however, became one of the finest examples in the nation of integrating a freeway into a dense urban environment. In hindsight, the city is now far better off than it was before the freeway arrived. And instead of the dire consequences that many feared would befall the city if some of the earlier plans had been carried out, the freeway corridor enhancements have created a showcase of accomplishments in which all the involved players should be proud.

Ironically, in looking back over the turmoil of the 37 years it took to get the freeway planned and constructed, it has been almost forgotten that the most difficult part of it — the portion past the central business district and beyond to 26th Avenue East — was not part of the original route for I-35. When Congress authorized the National System of Interstate and Defense Highways in 1956, I-35 was only proposed to extend far enough into Duluth to get the freeway to the then-planned High Bridge across St. Louis Bay. I-35 was to be constructed as far as 22nd Avenue West, where it would have turned to the southeast to follow the route of what is now I-535 to Superior, Wisconsin. Had that been the case, a lot of anguish would have been saved and the story that follows could not have been written.

In 1957, the city submitted a request to the Bureau of Public Roads (the predecessor agency of the current Federal Highway Administration) to extend the freeway from 22nd Avenue West to 28th Avenue East. The following year, the bureau approved an extension, but only to Tenth Avenue East. Preliminary planning on the highway's extension began that year for the portion adjacent to the central business district.

During the next two years, 20 different layouts and variations for the proposed freeway were considered and rejected. Obstacles that had to be addressed as the planning got underway included the tracks and depots of five railway companies, numerous docks and warehouses on the waterfront of Lake Superior, business buildings facing Michigan Street (only one block from and parallel to downtown Duluth's main thoroughfare, Superior Street) and unstable soils along much of the proposed corridor. However, by 1960, the Department of Highways and the city had agreed on a route for I-35 through Duluth.

The agreed-upon preliminary plan between Tenth Avenue West and Fourth Avenue East included a four-lane, 6,000-foot-long elevated structure, varying in height to as much as 45 feet above ground level. The elevated design was necessary to deal with the unstable soils, the many streets that needed to remain in place and in service, and the railroads that needed to continue in operation. Furthermore, it was not economically or politically feasible to consider the placement of an earth fill that would have required a wide right-of-way in an area so close to the central business district.

In hindsight, perhaps one of the most interesting results of the planning that culminated in the 1960

agreement was the city's expectation that *all* of the Interstate segments within the city limits were expected to be under contract for construction by 1968. That expectation would not be realized.

Construction did get underway in the western part of Duluth, with rapid progress starting in the mid-1960s. The upper portion of the freeway's spectacular descent into the city, a 2.2-mile-long segment from Boundary Avenue through the Thomson Hill area, was completed in 1967. In 1969, another segment was completed between 40th and 26th Avenues West. By 1971, the Thomson Hill section extended to 40th Avenue West, and the six-lane section from the I-535 inter-


Minnesota Historical Society

The principal highway through Duluth, before I-35 was completed in 1992, was Highway 61. The highway followed Superior Street in the downtown area, shown in this photo taken in 1925. This view is facing east from Sixth Avenue West. Streetcars were seen on Duluth streets before the twentieth century began. Electric trolley buses were in service from 1931 until 1957.

## I-35 DOWNTOWN DULUTH EXTENSION BY THE NUMBERS

| | |
|---|---|
| 1985 | Year construction began. Opened to traffic between Mesaba Avenue and 26th Avenue East on October 28, 1992. |
| $250 million | Construction cost: 90% Federal Interstate, 10% state and local |
| Mn/DOT & 8 consulting firms | Design team |
| 7 prime contractors, 58 sub-contractors | Construction firms |
| 3.2 miles | Total length from Mesaba Avenue to 26th Avenue East |
| 8 vehicular, 6 pedestrian | Bridges |
| 4 at a total length of 3,445 feet | Tunnels (the length of the Leif Erikson Tunnel is 1,480 feet, the longest in Minnesota) |
| 42.4 million pounds | Reinforcing steel |
| 106,418 feet | Total length of steel piling (more than 20 miles) |
| 15.4 miles | Storm and sanitary sewer, ranging in size from 12 to 132 inches in diameter |
| 288 streetlights, 1,508 tunnel lights | Lighting |
| 5,956 feet (1.13 miles) | Total height of manholes and catch basins |
| 235,890 cubic yards | Rock excavation (enough to cover 57 football fields to a depth of more than 3 feet) |
| 275,113 cubic yards | Concrete (enough for a 1,428-mile, 3-foot-wide, 4-inch-thick sidewalk – the distance from Duluth to Boston, Massachusetts |
| 37,100 vehicles per day east of Mesaba Avenue; 41,000 east of Lake Avenue; 21,700 at 26th Avenue East | Average daily traffic (2007) |

change to Mesaba Avenue was opened to traffic. But it would be another 12 years before construction east of Mesaba Avenue would be underway.

The Highway Department and the city's 1960 agreement for the downtown section of I-35 had gone by the boards. The 1970s brought a new cast of players to the freeway project that ranged from those who totally opposed its construction to those who believed it should be extended even further to the northeast. To those opposed, the freeway's terminus at Mesaba Avenue was quite logical and appropriate. At the other extreme was a contingent that wanted the freeway extended beyond the Lester River (a few blocks past 61st Avenue East) to tie into the Highway 61 expressway to Two Harbors that had been completed in 1967. They didn't want all that through traffic to be dumped on the city streets (specifically, London Road).

With the controversy and construction challenges, the project to extend I-35 the 3.3 miles from Mesaba Avenue to 26th Avenue East spanned more than 30 years. It was one of the most controversial, and most lauded, transportation projects in U.S. history. By the end of the 1980s, it was the only unfinished section of the 1,600-mile I-35 freeway that starts at the Mexican border in Laredo, Texas.

The controversy dragged on so long that by the time it was resolved, six mayors had held office in Duluth and three district engineers had taken their turns in charge of Mn/DOT's Duluth district office. However, their efforts, along with unprecedented involvement of community members, transformed the initially approved 1960 highway design into what by 1994 became, "one of the best designs throughout the entire 44,000-mile Interstate System," according to Mn/DOT District Public Affairs Director John Bray.

Although Bray's remark could be dismissed as self-serving on behalf of Mn/DOT and the public involvement effort, it is supported by the fact that only five communities around the world had

## DID YOU KNOW

In 1962, the Minnesota Department of Highways and the city of Duluth had planned to locate the portion of I-35 between Second Avenue East and Tenth Avenue East along, and partially out beyond, the Lake Superior shoreline. Although the Great Lake can be almost placid at times, it is subject to violent storms. Without some form of protection from the elements, the highway could have been subject to extremely hazardous driving conditions — especially during sub-freezing temperatures. Protection in the form of a great sea wall was proposed to prevent Superior's giant waves and spray from reaching the roadway.

To test the adequacy of the proposed wall, the University of Minnesota's St. Anthony Falls Hydraulic Laboratory in Minneapolis constructed a model. The laboratory is equipped to duplicate, in miniature, existing wave action and other hydraulic forces to which a proposed marine structure would be subjected. After initial testing, a model is then modified to optimize its structural stability under various hydrological conditions, and recommendations for the construction of the actual structure are made accordingly.

The design of the wall proved to be sufficient for the expected conditions, as determined by records of some of the worst storms that had occurred in the Duluth area. But as a final test of the wall design, the laboratory waves were ramped up until the intensity was sufficient to breach and/or destroy the wall. The model wall was destroyed; however, the forces necessary to do so were determined to be far in excess of those generated by any storm in the recorded history of the weather in the Duluth harbor area.

In an effort to more precisely determine the scouring forces that could be expected from wave action near the proposed wall foundation, a Norwegian consultant was engaged. The study included the placement of colored rocks on the lake bottom. Divers operating from tugboats in the harbor would periodically mark the movement of the rocks during the investigation.

As it turned out, the I-35 roadbed was not located in the lake. The parts of the road built nearest the water were located within tunnels, and the sea wall was never constructed.

Neil Kveberg, Mn/DOT

A full aerial view of the intersection of I-35 (left to right) with I-535 (lower right) and Highway 53 (upper left). The location of the signalized ramp intersection is in the center of the complex to the left.

successfully designed and completed a project on such a scale. (The others were Florence, Italy; Barcelona, Spain; Seattle, Washington; and Boston, Massachusetts.) At $250 million — more than five times the amount estimated in 1958 to complete the entire segment of I-35 from the west limits of the city — the downtown project was, by far, the largest single transportation project undertaken in Minnesota at the time.

The Highway Department in 1958 certainly did not ignore highway aesthetics, social considerations, and environmental impacts, but there were no formal requirements to take such concerns into account at that time. For the most part, the department's overriding concern had been the need to stretch limited funds as far as possible. That concern is generally at odds with the way business is conducted today — even though the funding crunch in the early years of the twenty-first century is just as critical, if not more so, than it has ever been. However, had the official attitudes and policies of the 1950s continued, it would have been impossible to build the kind of freeway through Duluth that was completed in 1994.

Minnesota Historical Society

The I-535 Bridge as it appeared shortly before its completion in 1961. Note the traffic using the old Interstate bridge, below. Except for the three truss spans, the remainder of the 1.5-mile I-535 Bridge was widened in 1993 to provide safety refuge shoulders for stalled vehicles.

### THE BLATNIK BRIDGE (I-535) BY THE NUMBERS

| | |
|---|---|
| 7,975 | Length of the bridge in feet (1.51 miles; longest bridge in Minnesota and Wisconsin at time of construction) |
| 51 | Number of supporting piers |
| 600 | Length of the main channel span in feet |
| 120 | Clearance over the main channel in feet |
| 3% | Percent grade on each approach to the main channel span |
| 1897 | Year that the nearby toll bridge was constructed* |
| 1961 | Year that the bridge was opened to traffic |
| 1971 | Year that the bridge was named in honor of Rep. John A. Blatnik |
| 1993 | Year that the bridge was widened to provide full shoulders |
| 29,500 | Average daily traffic volume in 2006 |

*The Great Northern Railway constructed the toll bridge. It had two tracks with narrow vehicular roadways on each side. The bridge had a swing span that was opened for boats as much as four hours per day during the peak of the shipping season. Most of the bridge was removed after the Blatnik Bridge was completed, but a 750-foot portion from the Duluth lakeshore to where the swing span was located is still in place on the north side of the bay, approximately 200 feet to the east of its Interstate replacement.

Freeway construction had come to a halt with the completion of the highway from the west to Mesaba Avenue. In addition to the controversy over further extension, other factors led to a complete re-evaluation of the highway's location and

## LANDSCAPE ARCHITECTURE AS AN INTEGRAL PART OF HIGHWAY PLANNING

Landscaping (sometimes called "highway beautification") was almost always an afterthought in the earlier years of the building of the Interstate Highway System. It was usually established under a separate construction contract after road building was completed. The work consisted primarily of tree and shrubbery plantings. In some instances, the state's, county's, or city's own forces performed the work, especially on city parkways.

Some exceptions to the "afterthought" rule stand out. Notable is the construction of Highway 100 through the western suburbs of Minneapolis in 1940, where landscaped waysides were planned as part of the project.

The concerns regarding the building of I-35 through the heart of Duluth eventually led to landscape architecture becoming a primary element in the planning, design, and construction of the highway. Landscape architect Kent G. Worley describes below how his firm addressed one of the challenges:

> After a long public involvement process that identified the negative impacts of a freeway between the downtown and the lakefront, the design team proposed a three-acre, $10 million park structure over the freeway as a design concept to address these negative impacts. . . .
>
> The citizens of Duluth and State/Federal Departments of Transportation recognized these potential impacts, and we moved forward in addressing them. The design team included Mn/DOT administration and staff, the city of Duluth and several consulting civil, structural, mechanical, and electrical engineers. My role was as urban design lead, and included conceptual through final design services for architectural and site components of Lake Place.
>
> Defining the needs and programming the extent and levels of improvement of the facility were my initial challenges. This early conceptual work and extensive project justification became the basis to obtain federal, state, and city funding commitments involving a wide range of design opportunities — all focusing on design solutions to "integrate" the highway and city in linking the public with Lake Superior.
>
> Lake Place, completed in 1990, incorporates two major elements. First, a wall was constructed between the roadway and the lake. A covering deck was then built over the highway to provide protection from Lake Superior over-spray and wind-driven debris. Second, and most important, the deck of the protective structure was planned as a multiple-use outdoor area in conjunction with the development of lakefront trail systems. These multiple-use concepts for Lake Place and the urban highway corridor have created [a] harmonious transportation, recreation[al], open space, and quality environment — far exceeding visions of client-city-citizen expectations. They also resulted in community reinvestment and renewal of once marginal lakefront property. This unique oasis for travelers and residents not only protects, but becomes a gateway for the most valuable natural resource of the region — Lake Superior.
>
> Design concepts insured that the freeway would not visually or physically separate the lakeshore from the city. The two-block-long Lake Place park structure forms one of four highway tunnels within the corridor. Although a "tunnel" in name, Lake Place was envisioned as a pedestrian "bridge" connecting people and places, and once it was completed, acceptance [was] enthusiastic as citizens could finally see, and physically reach their lake.

A 580-foot-long ceramic tile Image Wall mural on the outside highway wall, facing lake-level use areas, was designed and assembled. . . . Consistent with community waterfront themes, the wall depicts historic marine images and provides an additional highlight for lakefront trail visitors. Lake Place continues to accomplish one of its goals with new adjacent improvements, development, and attractions; several adjacent downtown blocks will see eventual renewal as a direct result of this multiple-use highway improvement.


Would you believe that there is a freeway immediately behind and more than 30 feet below the evergreens in these photos? The award-winning design of the three-mile section of I-35 through downtown Duluth mitigated many of what would have otherwise been undesirable environmental elements. The design included four tunnels and this deeply depressed section adjacent to Superior Street. Most of the freeway is not visible to pedestrians and motorists using the surface streets, and highway noise is significantly toned down.

A comprehensive Mn/DOT/Federal Highway Administration undertaking, the urban I-35 resulted in several individual multiple-use improvements with Lake Place as the focus. These were designed as a system, and share continuity of design philosophy, design vocabulary of materials, colors, textures, native vegetation, site lighting, and subtle messages of environmental awareness. Public acceptance is best illustrated by observing response through public use and enjoyment of these rediscovered resources. I recently heard the comment. "With these improvements, there is a new spirit in Duluth!"

The downtown Duluth Interstate issues with the 20-year environment stalemate illustrates the crucial importance for landscape architects to state their cases and initiate leadership to attain "something better." Lake Place and other highway corridor multiple-use improvements are living examples of a larger context of human and community opportunities which need to be managed through a process of inventory, analysis, and solution.

design. In 1969, the Federal Environmental Policy Act became law, affecting all planned major highway projects that had not yet reached the construction phase. Some of the Act's requirements, such as the preparation of environmental impact statements, added years to the project development process for major improvements. This was especially true in the early years when few had experience dealing with the Act. Other federal and state policies soon followed with procedures for relocating displaced property owners and renters, protecting endangered species, and ensuring occupational safety. To its credit, the Highway Department and other Minnesota government agencies did not drag their feet in implementing measures to deal with these require-

## THE TRAFFIC SIGNAL IN THE I-35/I-535 INTERCHANGE

An oddity on the Minnesota Interstate Highway System is the elevated, at-grade intersection with a traffic signal at the I-35, I-535, and Highway 53 interchange. Although this interchange in Duluth was completed in 1971 and the signal installed in 1972, the question is still asked, "Why is there a traffic signal on a bridge in the middle of a freeway interchange?" That question leads to two more: "Why was the interchange built that way?" and "Who was responsible for the design?" These questions imply that 1) a traffic signal should not be part of a freeway-to-freeway interchange, 2) an at-grade intersection has no business being part of a freeway-to-freeway interchange – especially on a bridge, and 3) those responsible for the design should have figured out some way to separate the cross traffic and construct the interchange accordingly.

There are answers to each of the questions, and part of the answer to the first two questions is quite simple: Highway 53 is not a freeway — although it certainly can be argued that it is a freeway for a short distance immediately to the north of I-35. The 2005 upgrade of Highway 53 between West Third Street and the Skyline Parkway, though incorporating some up-to-date features, did not make it a full freeway because several at-grade intersections remained. Of course, the classification of Highway 53 does not necessarily address the efficacy of an at-grade intersection in the middle of a major interchange.

In regard to the first question of the traffic signal, some kind of traffic control is usually necessary at an intersection. The only exception is when there are very low entering traffic volumes with good visibility and low speeds. At the intersection in question, however, the entering volumes and the approach speeds on the ramps can be rather high. Therefore, some kind of traffic control is necessary. Placing stop signs on one or both ramps would have likely caused long queues to develop on one or both of the ramps, with a risk of those queues extending back to mainline roadways on northbound I-35 and/or southbound Highway 53. Such a backup would be especially hazardous on I-35, as it would be in the left lane. Given the inadequacy of stop signs in this situation, a traffic signal was clearly the best form of control to keep traffic moving efficiently and safely. At this intersection, approaching traffic actuates the signal's timing and operation, thus minimizing queuing and optimizing traffic flow on both approaches.

Yet to be explained is why there is an at-grade intersection in the interchange in the first place. Partly, it is because the ramp from northbound I-35 to northbound Highway 53 was not included in the original layout of the interchange. It was intended that the movement provided by that ramp would be served from the 27th Avenue West interchange on I-35, a short distance to the southwest. However, the absence of a northbound I-35 connection to northbound Highway 53 would have violated an interchange design principle regarding the need to provide a return movement for each directional movement within an interchange; i.e., since a ramp is provided for the southbound Highway 53 to southbound I-35 movement, a ramp should also be provided for the northbound I-35 traffic to get to northbound Highway 53.

While the argument for providing movements in both directions is sound, it was not the overriding concern in the local community. Business proprietors in the "Furniture District," a commercial and light industrial area in the vicinity of the interchange, voiced concern that the 27th Avenue West interchange would not provide adequate access to their establishments. They made their concern known to two state legislators and Duluth City Council members who, in turn, sought to intercede with the Highway Department to influence a change in the design. That leads to the answer to the third question: the responsibility for the design. In response to the elected officials, the department's Duluth district engineer charged his design engineer with looking into the possibilities for a direct northbound connection between the two highways.

It was a tough assignment. No less than 15 different layouts and variations were previously developed and considered for the interchange. The topography, soft foundation soils, the nearby railroads, the urban environment, and the short distance between the I-35 interchange and the planned exit from Highway 53 to 20th Avenue West did not easily lend themselves to conventional solutions to the designer's dilemma. An obvious solution at a less-confined location would be a "flyover" ramp. But, at this interchange, the hilly topography would have made the ramp's grade too long and/or too steep, compromising the safe and efficient merging of traffic. Additional right-of-way would have been necessary, and the overall cost would have been prohibitive.

While contemplating the limited possibilities one Sunday afternoon, the design engineer came to the realization that he could minimize the flyover grade problems by designing the desired ramp so that it intersected the ramp from Highway 53 to I-535 at grade. The engineer made a rough sketch of his idea and took it to the office the next morning to get input from other engineers. They thought it might work, but they urged the designer not to show his idea to the district engineer. While they found the at-grade intersection and traffic signal difficult to accept, they were even more concerned that the design required a left exit from northbound I-35. Left exits (as well as entrances) are usually avoided — especially on Interstate freeways — because they violate drivers' expectations.

Under the intense political pressure to quickly come up with a plan for a direct northbound connection to Highway 53, the design engineer felt he had little choice but to show his sketch to the district engineer. The district engineer liked the plan — perhaps, in part, because he was loathe to expend any more public funds than absolutely necessary — and soon the Highway Department, the Federal Bureau of Public Roads, and the local officials approved it. The intersection of the two ramps was incorporated into the design, and the interchange was constructed accordingly.

While still engendering some controversy, the design has not proved to be unduly hazardous or the cause of any significant operational problems. Although seemingly inconsistent with design practices, a signalized intersection should not necessarily be considered a great violation of driver expectation for southbound Highway 53 drivers who have just proceeded through several upstream, signalized intersections. Similarly, for northbound drivers, an exit to a road marked as a U.S. highway does not necessarily imply that the exit leads to another freeway-type facility; therefore, violation of driver expectations is diminished to some degree. On the other hand, since both ramps meet on an elevated structure, some drivers might understandably be surprised that they are no longer in a freeway environment.

Although negative feelings persist regarding the intersection of the two ramps, it is not likely that their separation will occur anytime soon. There is a remote possibility, however, that some revisions might be considered. As of this writing, Mn/DOT was evaluating parts of I-35 through Duluth in preparation for major rehabilitation projects. (Parts of the freeway have been in place for more than 40 years, so an overhaul is due.) One of the suggested recommendations that might result from the evaluation is reconstruction of the Highway 23 (Grand Avenue) interchange to relocate a left exit and a left entrance. Perhaps, recommendations of a similar nature could be forthcoming regarding the I-535/Highway 53 interchange.

ments; however, in many instances, the new regulations amounted to restarting the location and preliminary planning process from "square one."

By 1970, controversy intensified regarding the freeway's location, its endpoint, and the impact construction would have on downtown Duluth. A grassroots Duluth organization, Citizens for Integrating Highways and the Environment (CIHE), was formed that year. The organization's members advocated a complete re-analysis of alternative solutions to transportation problems east of Mesaba Avenue.

The founder of CIHE was local landscape architect Kent Worley, a visionary who later designed virtually all of I-35's Lake Superior waterfront amenities.

In August 1972, citizens formed the Stop the Freeway Action Group to oppose the extension of the freeway beyond Mesaba Avenue. In October of the following year, 1,100 citizens attended a public hearing on freeway issues, held in the Duluth Auditorium. Discussion centered on whether to terminate the freeway at 10th, 26th, or 68th Avenue East. The Duluth City Council in 1960 had unanimously approved a freeway route ending at 10th Avenue East, but citizens continued to debate the issue. Some felt that the freeway might divide Duluth's downtown district and the Lake Superior waterfront. Although Duluth's waterfront area consisted primarily of abandoned warehouses and a railroad yard, these citizens saw the Lake Superior shoreline as a major asset. They were concerned that I-35 would obscure views of the lake, ending hopes of ever reconnecting the shoreline to the downtown area. Others were concerned that a historic brewery and other buildings located in the proposed path of I-35 would have to be demolished.

In December 1975, newly elected Mayor Robert Beaudin appointed proponents and opponents of extending the freeway as members to yet another new group, the I-35 Citizens Advisory Panel. The panel was charged with studying the options and making recommendations. Subsequently, the mayor convinced the state and federal governments to put a hold on the project, scrap their earlier plans for the freeway, and start over with a clean slate. The panel was empowered to work with government officials to fully integrate the design of the freeway into Duluth's urban environment.

Mayor Beaudin directed the advisory panel to assure the community that any eventual extension of I-35 would unfold into a renewal opportunity for the city's urban core, be the catalyst for the renaissance of the downtown central business district, and be the stimulus to reconfigure the city's link-

## DID YOU KNOW ?

The Lake Avenue/Canal Park Drive interchange on I-35 was only the second interchange of its type to be constructed in Minnesota. The design is usually identified as a "single-point diamond" or an "urban interchange." The primary distinction of this type of interchange is a single intersection of the ramps with the local street, located in the center of the interchange either above or below the highway, as opposed to two intersections at a conventional diamond interchange. Intersection traffic is controlled by a three-phase signal system that provides for movements as follows:

1) simultaneous left turns to the on-ramps from each direction on the crossroad;
2) two-way traffic on the crossroad (no turns); and
3) simultaneous left turns from each off-ramp to the crossroad.

Right turns are not controlled by the signal and are usually designed as a "yield" condition. In addition to the advantage of a single intersection (and only one signal system), the urban interchange generally requires less right-of-way. Its major disadvantage is that it requires a more complex bridge if the highway is on the lower level, and a longer bridge if the highway is on the upper level. Also, because the ramps are usually located very close to the highway, extensive retaining walls are required.

The Lake Avenue/Canal Park Drive bridge over I-35 opened to traffic in 1984; however, six years passed before the freeway connections were completed to the southwest. Two more years of construction were needed before the freeway was opened to the northeast, thus permitting full utilization of the interchange.

After the design for the Lake Avenue/Canal Park Drive interchange was approved, a number of similar interchanges were built in the Twin Cities metro area, one was built in Rochester, and more were being designed. Single-point diamond interchanges have also become popular throughout the United States.

ages to Lake Superior. The panel and its partners from the Minnesota Highway Department, the Federal Highway Administration, and the city of Duluth worked together for nearly three years. The panel then voted 11-2 in support of an "inland" freeway route (much as it is today) that would result in a tunnel under Superior Street and continue through Leif Erikson Park.

Neil Kveberg, Mn/DOT

Moving Endion Station. The railroad depot was moved from the I-35 right-of-way at 15th Avenue East and placed on a new foundation adjacent to the Lakewalk at Lake Avenue and First Avenue East. This photo were taken on London Road at 12th Avenue East on June 25, 1986.

Meanwhile, in 1977, the Federal Highway Administration approved Interstate funding for a freeway that would end at 68th Avenue East, and discussions began on how to use that money if I-35 ended closer to downtown. Eventually, during the administration of Mayor John Fedo, $74 million in federal funding that had been earmarked to construct the freeway beyond 26th Avenue East financed several other city and state projects. Included were reconstructing, bricking, and "streetscaping" downtown streets; building four downtown skywalks; rebuilding Haines, Arrowhead, and Martin Roads; and providing improvements for the Duluth Transit Authority.

The question of where to end the freeway was put to a referendum in 1980. Duluth residents cast 21,107 votes to terminate I-35 at 26th Avenue East, and 16,404 votes to terminate it at 10th Avenue East. The Duluth City Council soon agreed with the majority of its citizens and voted to end the freeway at 26th Avenue East. But in 1984, the council reversed itself, voting 6 to 3 to terminate I-35 at 10th Avenue East. Mayor Fedo vetoed the action only to have a council majority override his veto. Later that year, Governor Rudy Perpich signed a bill requiring the state to extend the freeway to 26th Avenue East, thus overturning the city council decision. The freeway would end at 26th Avenue East.

While the controversy continued over the freeway's end point, others worked on the innovative design recommended by the I-35 Citizens Advisory Panel. Architectural Resources, Inc., of Duluth was hired as a consultant for a multiple-use study of the areas through which the freeway would pass. Mn/DOT also worked with eight other major consultants to design the freeway extension.

A first order of business was to move the railroad yard away from the waterfront. Financed by Mn/DOT and the Federal Highway Administration at $45 million, it took eight years for the five independent railroads (Duluth, Winnipeg & Pacific [DWP]; Burlington Northern [BN]; Duluth, Missabe & Iron Range [DMIR]; Chicago North Western [CNW]; and the Soo Line) to move their switching operations to a new yard constructed southwest of Superior, Wisconsin. Four existing yards in Superior were upgraded, as well. The project involved shippers, unions, property owners, and local officials. Coordinating efforts was even more complicated with the many government agencies and jurisdictions involved. Approval or rulings were required from at least 23 public agencies. In November 1984, the new yard was finally completed.* A federal Railroad Administration official later called it "one of the best urban rail consolidation projects in the country."


J. Katz

The Lake Walk, bicycle path, and the excursion train railroad were all part of the I-35 construction project. The freeway is to the left of the Fitgers Building, immediately across from East Superior Street, upon which the building fronts. However, the highway is nearly invisible to drivers and pedestrians on the street.

J. Katz

A tile mosaic with Duluth lakeshore scenes covers the retaining wall that supports Lake Place Park.

Construction of the I-35 tunnels began in 1983. The final design featured four tunnels: the Lake Place Park Tunnel, the Brewery Historic District Tunnel, the Jay Cooke Plaza Tunnel, and the Rose Garden Tunnel.

Endion Station, a railroad passenger depot listed on the National Register of Historic Places, lay directly in the path of the freeway. It was moved 15 blocks from 15th Avenue East to its present location adjacent to Duluth's downtown Lakewalk near Lake Avenue and First Avenue East. The fragile 4,000-ton brick and sandstone building was moved via city streets at a cost of $370,000.

On October 28, 1992, the I-35 extension officially opened to traffic. Because of the freeway's innovative design and construction, Duluth gained many new amenities, while preserving and enhancing many existing ones. The 2.5-acre Lake Place Park was built atop a cut-and-cover tunnel, linking the lakeshore to downtown Duluth. The Lakewalk, a favorite place to stroll, was designed to follow the rebuilt shoreline. The Minnesota Slip drawbridge offered access to Canal Park. A new lake trout spawning reef was located offshore near the renovated Fitger's complex and 6th Avenue East. A 580-foot mosaic Image Wall — an award-winning creation of Kent Worley and Mark Marino — was added on the lake side of the Lake Place Park tunnel, depicting lakefront, marine, and ship images in ceramic tiles. Other park areas include Lake Place, just north of the relocated Endion Station, and Jay Cooke Plaza Park, offering a panoramic view of Lake Superior. Walkers can enjoy pedestrian bridges in Leif Erikson Park, and the historic Fitger Brewery, October House, and Hartley buildings were all preserved for posterity.

The Rose Garden in Leif Erikson Park had to be torn up and reconstructed over the tunnel at a cost of $3.8 million. Because of the disruption to the many community groups that relied on the park for their activities, Mayor Fedo and Mn/DOT were able to obtain additional federal funds. The city received $616,000 for replanting, maintenance, and other expenses associated with the restoration.

John Bray, Mn/DOT District 1

The Duluth Rose Garden in Leif Erikson Park had to be removed so that the I-35 tunnel could be constructed. Restoring the Rose Garden over the tunnel raised the cost of the freeway project by $3.8 million. The tunnel portal is at the lower right. The North Shore Scenic Railroad and the bicycle path are to the left of the retaining wall and adjacent to the Lake Superior shore.

John Bray, Mn/DOT District 1

The Rose Garden as it appeared at the rededication on August 27, 1994. It is one of the few formal English rose gardens in the United States. The fence in the background is atop the retaining wall shown in the above photo.

The Federal Highway Administration presented three of its "Excellence in Highway Design" awards to Mn/DOT in 1992, 1994, and 1998 for phases of the exceptional I-35 project. The awards also recognized the cooperative effort put forth by the community, local agencies, consultants, and the construction contractors, all of whom played invaluable roles leading to the finished product.

*Note that the railroad yard relocation was only considered to be feasible because of the existence of the Oliver Bridge across the St. Louis River.*

## THE FIRST INTERSTATE 90 PROJECT: AUSTIN

The first of the Interstate "free-ways" *[yes, the word was hyphenated by some writers back then]* to be constructed in Minnesota, according to an announcement at the end of 1955, was to be a bypass skirting the north limits of the city of Austin. (As you already know, however, the honor of actually being first went to the eight-mile section of I-35 north of Owatonna in 1958. The Austin project was completed in 1961.) Although it was understood to be part of the Interstate Highway System, this project was announced several months before the system was actually approved by Congress. Of course, the Interstate had been proposed and talked about since the 1930s, so identifying the bypass as an "Interstate" project was not new to people who had seen the flurry of news and magazine articles about a national superhighway network.

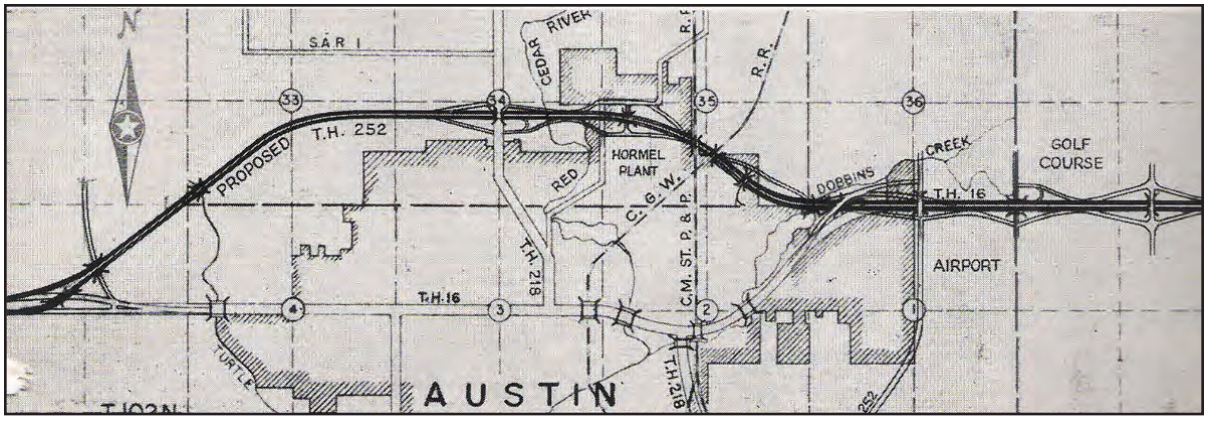
Minnesota Highways

An aerial view of the I-90 construction in 1959. Looking west from above the Austin airport, Highway 252 (presently Highway 218) is the street in the foreground, ahead of the directional interchange connection to Oakland Place S.E. (then Highway 16) passing to the left of East Side Lake and on to the business district. Beyond the lake on I-90 is the Division Street interchange, followed by two railroad grade separations and, beyond the second curve, the Hormel interchange. The railroad on the nearer separation has since been abandoned.

The new five-mile bypass was originally designated as Minnesota Highway 252, and its purpose was to divert the heavy through traffic from Highway 16 through the heart of the city. At an estimated cost of $2 million, including a two-mile section of two-lane highway along the east city limits (also designated as Highway 252), the freeway was planned to have nine traffic interchanges, two railroad grade separations, and three stream-crossing bridges. Federal funds were anticipated to cover 60% of the project's cost, with the state Trunk Highway Fund to cover the remainder. However, with the Federal Aid Highway Act of 1956, Congress authorized the funding of the Interstate System at a 90%–10% ratio. At completion in 1961, the total cost had risen to nearly $5 million. Today, more than 50 years later, that sum would not even cover construction of one interchange on the Austin bypass.

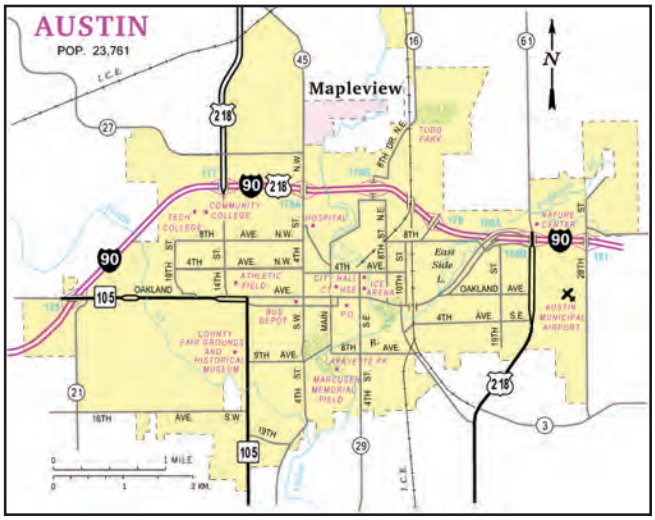
On the next page is an illustration of the highway route as it was proposed in 1955 and, in comparison, a recent Mn/DOT map showing the as-built alignment of the highway, which generally followed the original proposed plan. However, the plan was not without fault. Providing eight interchanges within a 5-mile segment of highway, even by the standards of the time, was far too many. It meant that the entrance ramps from one interchange to the exit ramps at the next were too close together, presenting "weaving" problems for traffic entering and leaving the highway. The design also created excessive conflicts with through traffic that intensified as traffic volumes increase.

The weaving problem certainly was not unique to the Austin bypass; there were other freeway inter-




Minnesota Highways

This map of the proposed Highway 252 bypass of the city of Austin accompanied an article describing the project in the December 1955 issue of *Minnesota Highways*, the Department of Highways in-house magazine. Notice the close spacing of the interchanges. The current alignment of the highway is essentially the same as shown in this early plan. A number of design features were altered, however.




Mn/DOT Official Highway Map

In comparing this present-day map to the earlier one above, it can be seen that the alignment of I-90 was changed very little from the plan that was offered in 1955. However, of the nine originally proposed interchanges, only eight were built and some of them were constructed at slightly different locations.

changes in Minnesota and throughout the United States that had less-than-desirable spacing. One of the more-notorious problem areas in Minnesota is the short weaving distance between the 35th and 31st Street entrance and exit ramps on I-35W in south Minneapolis.

Shortly after Congress approved the Interstate System as part of the Federal Aid Highway Act of 1956, the American Association of State Highway Officials and the Federal Bureau of Public Roads developed design guidelines for the system, including interchange spacing. The Twin Cities Metropolitan Planning Commission (a predecessor agency to today's Metropolitan Council) recommended that interchange spacing be at least 1 mile in urban areas. At the time of that recommendation, however, several freeway segments — including I-35W in Bloomington — were already under construction, and others were well along in the planning.

The Austin freeway remains the Minnesota bypass with the most interchanges for a city of its size. Later, as the Interstate and other freeway-type bypasses were constructed, interchanges generally were limited to one for the smallest cities, one at each end of the bypass for cities in the ±5,000 population range, and one at each end plus one in between for cities in the ±10,000 range. It is interesting to note that the city of St. Cloud, with a metropolitan population approaching 90,000, has only six interchanges serving the area adjacent to I-94 as it bypasses the city on the west and south.

## DID YOU KNOW

Although the Austin bypass had originally been identified as Highway 252, the route number was no longer needed when the freeway was designated as I-90. Many years later, 252 was assigned as the replacement number on Lyndale Avenue North and West River Road in the cities of Minneapolis and Champlin, when Highway 169 was rerouted west to Highways 100 and 52. About that same time, the remaining portion of Highway 52 was renumbered as 81 when the 52 route west of St. Cloud was taken over by I-94. (Highway 52 still serves southeastern Minnesota, ending in downtown St. Paul.) A few years later, Highway 169 was moved further west to Hennepin County Road 18 when that road was taken over by the state. In turn, Highway 252 north of Highway 610 was turned back to the county and was designated as County Road 12. South of I-694, Lyndale Avenue was turned back to the city of Minneapolis as a city street. (The portion of Lyndale north of 49th Avenue has functioned as a local access road since the construction of I-94.) The remaining segment of Highway 252 was then reconstructed a few years later as a four- and six-lane highway on new alignment slightly to the west of the old two-lane road between I-694 and Highway 610. Highway 81 was also turned over to the county when County Road 18 became a state highway. It retained the 81 route number as a county road.

It has been rumored over the years that some of the residents of Austin have never returned due to all the confusion. By the way, U.S. Highway 52 can still be found in North Dakota. It takes off northwesterly from I-94 at Jamestown, through the city of Minot and on to the Canadian border.

Minnesota Highways

This curved concrete box girder bridge carried westbound traffic from I-90 into Austin on Highway 16. (The road was subsequently renumbered 116, as Highway 16 was routed over the Interstate. Neither number exists in Austin today, as US 16 has been eliminated in Minnesota and Highway 116 was eventually turned back to the city.) Several gracefully curved bridges of this type have been constructed on Minnesota highways.

Minnesota Highways

Highway Department officials present at the ribbon cutting on November 9, 1961, (alternating rear and front) were District Engineer C. E. Burrill, Deputy and Commissioner Frank D. Marzitelli, Chief Engineer John Swanberg, Commissioner James C. Marshall. Also attending were State Representative Emil Schaffer of Austin, Governor Elmer L. Andersen (with shears), State Senator P. J. Holand of Austin, unidentified, Austin Mayor C. R. "Baldy" Hansen, and Otto Baudler, Austin civic leader.

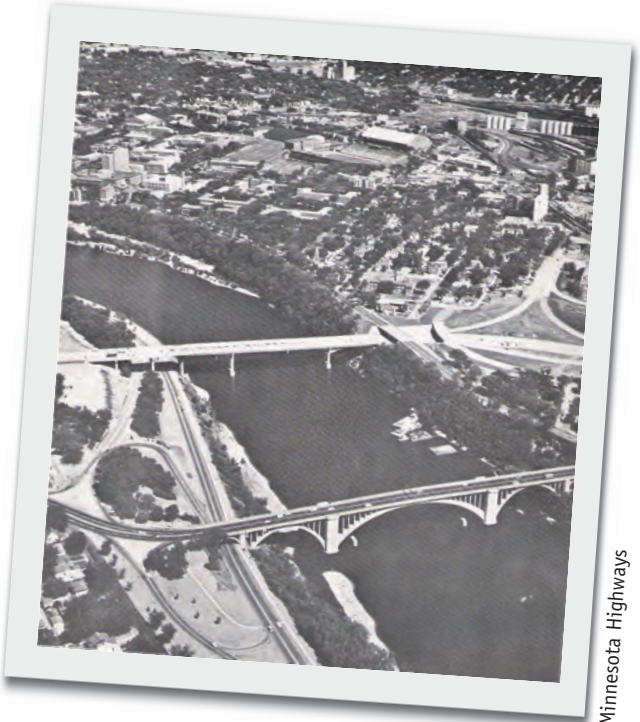
## THE FIRST PROJECTS ON INTERSTATE 94 IN THE METRO AREA

*Much of the following was compiled from material researched and authored by Patricia Cavanaugh for* Politics and Freeways, *a 2007 publication of the Center for Urban and Regional Affairs and the Center for Transportation Studies, both of which are located at the University of Minnesota in Minneapolis.*

For many years prior to the late 1960s, the primary automobile route between the downtowns of Minneapolis and St. Paul was on Washington Avenue over the Mississippi River through the University of Minnesota's Minneapolis Campus to its end at the "Y" junction with University Avenue, then continuing on the latter street through the "Midway" area to the state capitol. It was a fairly direct route, and it carried Highway 12 into the central business districts of each of the two cities. It also carried the streetcar line known as "Minneapolis/St. Paul." There were other, more-or-less parallel routes, though not quite as direct, that could be used in various combinations to provide minor advantages for the half-hour trip, depending to what part of town one was headed. The most pleasant of them was along the Mississippi River and Summit Avenue.

However, as early as 1920, engineers and planners were considering the need for a facility between the two cities to move greater traffic volumes at higher speeds than could be accommodated on a typical city street. At that time, the St. Paul city engineer had begun to propose routes for a system of highways radiating from downtown, including one along St. Anthony Avenue to Minneapolis — a route with historical ties. Although planning was more than 40 years ahead of actual construction, it is rather remarkable how close the route resembles today's location of I-94.

The 1930s saw the outline of the Interstate System taking shape as the concept for a national system of superhighways began to gather some momentum. Maps from that time through 1956, when the system was approved and funded, always showed a diagonal route from Chicago and Milwaukee through the Twin Cities to Fargo, North Dakota. Although the original concept for the Interstate System proposed that the highways would bypass the nation's large cities, as was the case with many of the major toll roads that served as a model for the system, the routing of these freeways into the heart of these cities became the prevailing notion long before the 1956 authorization of the system. A vision of the freeways solving urban traffic problems and, incidentally, serving as an "urban renewal" tool had grown over the years and had virtually guaranteed that the once-imagined high-level facility between Minneapolis and St. Paul would be constructed as one of the Interstate freeways.



Minnesota Highways

The I-94 bridge over the Mississippi River, several months before its completion in 1964. The Franklin Avenue Bridge is in the foreground. Both bridges have been modified since this photo was taken. Only the concrete piers from the original construction of the I-94 bridge remain in place today. There are twice as many vertical supports above the arches of the Franklin Bridge than exist today. Every other one was removed during a major rehabilitation in the late 1960s. Piers from an earlier bridge are visible underneath the largest arch.

Although the St. Anthony Avenue route had been the early favorite for what was eventually to become I-94, an alternative identified as the "northern route" was proposed in the mid-1940s. The St. Paul city engineer at the time was generally opposed to building highways in the city. He believed it was inappropriate in terms of the use of the land and unjustifiable in terms of the numbers of residents and businesses that would be dislocated. The northern route he proposed would have minimized those dislocations, as it would have been built adjacent to railroads that were in place long before automobile ownership proliferated. Many of those railroad tracks are still in place today. Ironically, sixty years later, a similar northern route was suggested (but rejected) as a light rail location alternative to University Avenue, where a rail line is expected to be constructed between the cities in the 2010 decade.

However, the Minnesota Highway Department chose to locate the highway on the St. Anthony route, with a Mississippi River crossing at 26th Street in Minneapolis, near the massive railroad trestle (and in the vicinity of the once-proposed 28th Street crosstown freeway. In support of its decision, the department cited better service to the Midway area and more direct routing between the two cities' central business districts. Minneapolis and St. Paul officials expressed general agreement on the location plan at that time, and it was approved by the St. Paul City Council in 1947.

There were local concerns about the St. Anthony Avenue location. East of Lexington Parkway, the proposed road alignment divided the Rondo Avenue neighborhood, home to a great majority of St. Paul's African American community. Urban renewal projects, starting in 1949, had cleared much of that community's residential area west of the state capitol grounds. The clearing made the St. Anthony alignment all that much more appealing to the Highway Department, city officials, and business and labor supporters of the highway. However, it was not until 1955, when federal funding of the Interstate System appeared to be assured, that the community was sufficiently concerned to deal with the freeway. Area residents established the Rondo-St. Anthony Improvement Association. Within several years, many such groups organized in Twin Cities' communities to respond to concerns about freeway proposals.

Given the apparent futility of opposing the St. Anthony Avenue alignment for I-94, the Rondo-St. Anthony Improvement Association soon decided that concentrating their efforts on mitigating the impacts of the freeway on their community was the most effective way to proceed. One of the group's primary objectives was to ensure that relocation of Rondo residents would not be subject to the discriminatory housing practices of the time. (It would be several years before clear-cut and

Minnesota Highways

Cages placed over pedestrian bridges, such as this one under construction on I-94 at Grotto Street, were just beginning to make their appearance in Minnesota in 1964. High fences were also being installed over railings next to sidewalks on some vehicular bridges.

enforceable federal guidelines relating to relocation on federal-aided projects would be promulgated, and little progress was forthcoming on a city ordinance prohibiting such discrimination.)

Association appeals to Governor Orville Freeman and Highway Department officials for a state agency to assure nondiscrimination in relocation was referred to the State Commission on Human Rights; but in spite of hearings held in 1956, little action was taken except for the hiring of appraisers from the neighborhood on the premise that they would be sympathetic to the homeowners. During the right-of-way acquisition for I-94, one of every eight African American homes in St. Paul was purchased. Black-owned businesses were lost, and most were not replaced. Of the homes demolished for the highway, 72% were African Americans' residences. Demographic analyses also revealed that the density of nonwhite residents increased in all parts of the surrounding area after the relocation was completed. Despite claims by supporters of the freeway that it would encourage new development and economic opportunity in the neighborhood, the once-flourishing, integrated community became primarily black and economically disadvantaged. Some of those negative impacts are still evident today, despite some resurgence of the neighborhood that has occurred in recent years.

The Rondo Association also worked to realize the construction of a depressed (i.e., below-grade) freeway. It was assumed that a depressed configuration would mitigate the resultant negative visual and roadway noise impacts that the planned elevated freeway over Lexington Parkway and Victoria Street would have on the neighborhood. The association was successful in convincing, in turn, the St. Paul Planning Board, the city council, and the city engineer of the efficacy of the depressed design. Although Highway Department officials believed that the Federal Bureau of Public Roads was unlikely to approve the additional cost of a depressed highway, the department accepted the city's recommendation. The funding was approved, and as anyone driving today on I-94 from the Mississippi River to downtown St. Paul can readily observe, the freeway passes *under* every bridged cross street except Fairview Avenue.

The cost to cover the additional excavation required to depress the freeway was not a total burden on the highway taxpayers. The material from the excavation was hauled to Snelling Avenue (Highway 51) between Hewitt and Como Avenues and to Lafayette Road (the site of the present Highway 52 crossing of the Mississippi River south of downtown St. Paul) to serve as the roadbed for both of those highway improvement projects.

By 1959, concerns similar to those of the Rondo neighborhood were being raised in the Merriam Park neighborhood regarding the western portion of the proposed I-94 freeway in St. Paul. While the freeway itself and its location were not being contested, the Merriam Park Residential Protective association was opposed to the proposed elevated design from Cleveland Avenue to Snelling Avenue. The Association also objected to a proposed interchange at the Prior Avenue intersection, stating that an interchange at Cretin Avenue/Vandalia Street would be preferable. It was noted that church property, including schools and a hospital as well as a public school and a city park, would be adversely affected by an interchange at Prior.

In initial meetings between the Merriam Park Association and the Highway Department, the association was not able to convince department officials that the adverse impacts of the Prior Avenue interchange were sufficient to outweigh anticipated traffic operational problems that would result from an interchange located at Cretin Avenue and its close proximity (approximately one-half mile) to the planned interchange at Highway 280. Eventually, the association and the Archdiocese of St. Paul brought their concerns to the attention of the Bureau of Public

Roads in Washington. The Bureau then asked the Highway Department to re-assess the elevated highway design and the interchange locations.

The association's objectives were achieved. By the time the Merriam Park section of the freeway was constructed, an interchange had been approved for Cretin Avenue rather than at Prior Avenue, and the plan had been revised, placing the roadway below grade. The highway was opened to traffic in 1968.

One of the revised plan's anticipated traffic operational problems due to the close spacing of the Cretin Avenue and Highway 280 interchanges was essentially avoided by locating the eastbound I-94 exit ramp to Cretin at a point west of the left-side entrance ramp from Highway 280. Thus, it is not possible for traffic coming for Highway 280 to exit at Cretin Avenue. (Had the exit ramp been placed to the east of the entrance from Highway 280, the exit to Cretin would have been accessible to traffic coming from Highway 280. However, drivers attempting to get to the exit would have had to cross three lanes of eastbound I-94 — a highly hazardous maneuver, considering the extremely short distance that would have been available for the movement.)

The first two segments of I-94 between the downtowns of Minneapolis and St. Paul were completed and opened to traffic in 1964. The Dartmouth Bridge (so named, unofficially, due to its proximity to Dartmouth Street Southeast) over the Mississippi permitted traffic to enter and exit the one-quarter-mile length of new freeway on interchange ramps at Riverside Avenue on the west side and at Huron Boulevard on the east side of the river. The six-lane roadway thus served as little more than an out-of-the-way alternate route for traffic that normally used the Franklin Avenue Bridge, two blocks downstream. Although getting to the new bridge required a circuitous route for most users, many drivers chose to use it, perhaps if only because of the novelty at the time of driving on a freeway. Some years later, the presence of the freeway made it possible to close the Franklin bridge for a major rehabilitation project without severely impacting travel for its users.

Minnesota Highways

A photo of the full segment of I-94 from Snelling to Western Avenues in St. Paul, taken in 1964, the year it opened to traffic. The freeway was depressed below grade for the entire 2.9-mile distance. Thus, the bridges and their approaching roadways have almost no arching over the freeway. An earlier plan had proposed that the freeway would be elevated over some of the cross streets.

The I-94 river bridge was a rather unusual type for Minnesota, as two huge steel box girders supported the entire deck. Periodic inspections were conducted inside the girders to monitor inside-surface conditions. After just 33 years of service, the deck and the girders were replaced with a wider deck, supporting four lanes and full-width right and left shoulders in each direction over conventional plate girders in 1997. Only the concrete piers of the original structure — modified to carry the wider deck — remain in place today. The East River Parkway, Huron Boulevard interchange, and 27th Avenue Southeast bridges were

replaced, and the I-94 bridge over Franklin Terrace (on the west bank) was widened to make room for the additional lanes on the freeway. The widened roadways made it possible in 2007 to re-stripe the river bridge deck for five lanes in each direction, when I-94 served as a detour route after the I-35W bridge collapse over the river.

The other freeway segment completed in 1964 was more substantial. It was the 2.9 miles from Snelling Avenue to Western Avenue, including the portion through the Rondo neighborhood (approximately half the length of the project at the eastern end). It was the first eight-lane highway in Minnesota. Such a concept was so foreign to some local news publications that many of the reports on the road during its planning and construction stages referred to it as a "four-lane, divided highway" — the terminology used to describe the actual configuration of many miles of existing local highways with which the reporters and editors were familiar. (All the completed urban segments of I-35W, I-35E, and I-494 at the time had a total of only two lanes in each direction. I-494 through Bloomington and Richfield was not widened to six lanes until 1965.) Even the Highway Department's own in-house magazine made the same mistake in one of its articles.

Commuters were only too happy to begin using the new freeway as soon as the barricades were removed. Drivers heading west from downtown St. Paul — including those who formerly used the Marshall/Dayton Avenues one-way pair — found their way to Kellogg Boulevard and used a temporary ramp at Marion Street to get onto to I-94. Other motorists, pleased with the opportunity to avoid all the signalized intersections on University Avenue, headed south on Marion Street to the I-94 entrance ramp. After three minutes of freeway travel, all traffic had to exit at Snelling Avenue and head south to Marshall Avenue or north to University Avenue to continue westerly trips.

The above-described on-and-off-the-freeway driving was a common practice all over the country in both urban and rural areas in 1964. Interstate System construction was in high gear by then, but it could not all be built at once. The Minnesota Highway Department, however, made a concerted effort to plan the construction so that, wherever feasible, the work progressed in both directions from the initial completed sections on the three major routes (I-35, I-90, and I-94) across the state as well as in the Twin Cities metro area, thus minimizing the number of points where it was necessary to leave one completed section of freeway and drive several miles over conventional roads to reach the next completed freeway section. For example, new construction continued on I-90 in both directions from the initial project at Austin. By 1964, an uninterrupted 45-mile section of I-90 was in service from east of Albert Lea to southwest of Rochester.

The long-awaited freeway between the cities was completed in 1968. It was possible to drive at highway speeds from the entrance to I-94 near the intersection of Hennepin and Lyndale Avenues in Minneapolis to the Marion Street exit in St. Paul without encountering a traffic signal. Thirty-four roads and streets, five railroads, and seven pedestrian crossings passed over or under the freeway. The travel time between the two points had been reduced to ten minutes.

## The I-94 Freeway that was Almost Built Somewhere Else

For many years, my sister nagged me each time she arrived in Minneapolis from Milwaukee. She couldn't believe that Highway 12 from the St. Croix River to its junction with I-494/I-694 east of St. Paul was still not upgraded to a freeway. She was right, of course. The construction of I-94 between those two points was another one of those protracted project developments that gave all indications it would outlast the engineers, the neighborhood groups, and the politicians.

In 1959, when preliminary planning for I-94 was underway, my sister was 14 years old. By the time construction finally started on the I-94 project in Washington County, she had already graduated from the University of Wisconsin, gotten married, and had five children.

In some respects, Minnesota lagged far behind neighboring Wisconsin on progress toward completion of the Interstate System within its borders. For example, 55 miles of the I-94 freeway from the St. Croix River to a few miles west of Eau Claire, Wisconsin, had been completed by 1959. By 1969, Wisconsin had completed all of its rural Interstate highway mileage, thanks to state legislation passed in 1966 to accelerate the freeway construction program. At that time, only 70% of the rural Interstate highways had been completed across the rest of the nation. (Purists, of course, will point out that I-39 and I-43 in Wisconsin had not been completed by that date; however, approval to add those two highways to the system did not come until many years after Congress approved the original program in 1956.) And, as if to add insult to injury, by 1983, Wisconsin was already undertaking major pavement replacement and expansion projects on segments of its Interstate highways, while Minnesota had not yet begun construction on the 9.5-mile segment to the St. Croix River.

The segment of freeway being discussed here had been shown on maps of the proposed Interstate Highway System as early as the 1930s. There was never any question that a first-class highway connecting Chicago to the Upper Midwest was needed. As the toll roads connecting Boston and New York City to Chicago were being built in the 1940s and '50s, there were proposals to build a similar-type highway from Chicago to the Twin Cities. That highway became a certainty when Congress approved the Interstate System in 1956. There would be one major difference, however: no tolls would be collected on I-94 through Wisconsin and Minnesota.

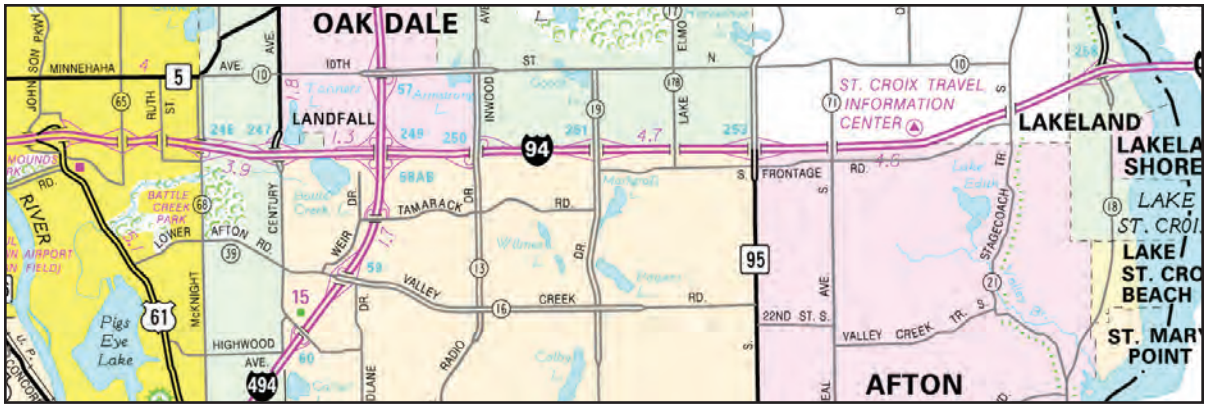
## DID YOU KNOW

When Mn/DOT finally received all the needed approvals in 1979 to construct I-94 in the Highway 12 corridor, FHWA was being pressured in Washington to hold the line on the cost to finish the uncompleted segments of the Interstate System. As originally passed by Congress, the system was to have been completed in 1969 at a projected cost of $38 billion (1958 estimate). As of 1979, that estimate had increased to $113 billion. (The actual, final, cost in 1991 was $129 billion, 3.4 times the original estimate.)

Most of the rural Interstate highway mileage in Minnesota had been completed by 1979. However, there were several urban segments yet to be constructed, and they were by far the costliest portions of the system. Therefore, FHWA scrutinized the I-94 project for cost-reduction options. Significant savings could be realized by limiting the number of traffic lanes on the highway, and the Minnesota office of FHWA vigorously pursued building I-94 with only two lanes in each direction.

Mn/DOT was just as vigorous in its objection to the traffic lane limitation. It pointed out that there would have been a total of eight highway lanes in the corridor had the FHWA-approved northern route been constructed as planned in 1973. The department further made note of the high truck traffic volume already using Highway 12. Mn/DOT was also quite aware that traffic congestion on existing freeways in the Twin Cities metro area was rapidly increasing, and it did not want to add another capacity-deficient highway to the system.

Mn/DOT eventually prevailed. The design was approved with three lanes in each direction and a median of sufficient width to provide for the construction of a fourth lane in each direction when needed in the future. Furthermore, the shoulder pavement width was approved at 12 feet rather than the usual 10, in recognition of the high volume of trucks. The wide shoulder came in handy as a temporary traffic lane during a major pavement rehabilitation project in 2004.




The last link of I-94 to be completed on the entire length of the route from Seattle to Detroit was this 9.5-mile link from I-494/I-694 to the St. Croix River in 1987.

The saga of the effort leading up to the construction of the Washington County segment of I-94 is a very good example of how the focus of highway project development has changed over the years. Rather than focusing primarily on a set of engineering tasks, the I-94 project became focused on dealing with political entities, government agencies, and citizen groups regarding the location of roads, access points, mitigation of environmental impacts, and more. The history of these projects, including I-94, reveals that local government units, state agencies, and citizen groups often opposed one another as well as the agency proposing the road construction.

Much of the citizen controversy here, as well as elsewhere in those later years of the Interstate construction, boiled down to NIMBY (Not In My Back Yard). Newly elected administrations at the state and/or local level caused some reversals on issues and approvals. The promulgation of new and revised government regulations also upset the decision-making process on occasion.

The following is a chronology that outlines the progression and false starts of the I-94 project, beginning with the first routing proposals and ending with the completion of construction 29 years later.*

**1958** – The Minnesota Highway Department proposed three possible routes for the freeway, each running from downtown St. Paul to the St. Croix River.

**This chronology is based primarily on material researched and authored by Patricia Cavanaugh for Politics and Freeways, a 2007 publication of the Center for Urban and Regional Affairs and the Center for Transportation Studies, both of which are located at the University of Minnesota in Minneapolis.*

View of I-94 facing west from the Lake Elmo Avenue overpass (Washington County Road 17B). The median between the roadways is wide enough to provide for the construction of a fourth lane in each direction. This is one of the few sections of highway in Minnesota with concrete shoulders.

J. Katz

- Route A: An upgrade of existing Highway 12, which had been built as a four-lane divided highway, parts of which had been completed as early as 1950.
- Route B: An upgrade of existing Highway 12 past White Bear Avenue, then angling to a new route parallel to Highway 12, one-half mile to the south to County Road 17 (Cottage Grove Drive), returning thereby to Highway 12 and on to the river.
- Route C: A route following existing Highway 12 past White Bear Avenue, then a new route as per Route B parallel to Highway 12, one-half mile to the south to the river bluff, returning to Highway 12.

**1959** – Route A received the most support in public hearings. Studies indicated that keeping the Highway 12 alignment would be best for local development and would have the least impact on surrounding communities.

**November 15, 1960** – The Federal Highway Administration (FHWA) approved Route A.

**1961-1963** – As continuing studies were conducted, a fourth route emerged. Route D was proposed to follow Highway 12 to a point one-half mile east of I-494/I-694, and then turned north to a line one-half mile north and parallel to Highway 12 to Highway 95, where it rejoined Highway 12.

**1964** – Public hearings were held on Route D. It became known as the "northern route." Technical studies were completed.

**August 1965** – FHWA approved the northern route, rescinding its approval of Route A.

**1969** – The National Environmental Policy Act (NEPA) was enacted by Congress and signed into law by President Nixon. (This act sent Interstate projects across the nation "back to the drawing board.")

**1971** – Design approval for the northern route was granted by FHWA. There was relatively little controversy regarding the project up to this time.

## I-94 BY THE NUMBERS (I-494/I-694 TO THE ST. CROIX RIVER)

| | |
|---|---|
| 1,400 Miles | The total length of I-94 from Billings, Montana, to Port Huron, Michigan |
| 9.5 Miles | The last remaining gap to be closed on I-94 in 1984 when construction began on the segment in Washington County |
| 715 Sheets, 75 Pounds | The number of construction plan sheets and their weight |
| Approximately 3,000 Hours | The amount of overtime put in by up to eleven Mn/DOT design personnel working evenings and weekends over a four-month period to complete the construction plans by the contract letting date |
| $30 Million | The estimated cost of the project (not including bridges let as separate projects), the most expensive Mn/DOT project up to that time (1984) |
| 165 Property Parcels, 28 Homes, 19 Buildings | The right-of-way acquisitions necessary for the project |
| 76,000 Feet | The length of drainage pipe installed |
| 95,000 Feet | The length of chainlink right-of-way fencing installed |
| 6 Million Cubic Yards | The amount of earth moved |
| 392 Acres | The area seeded for turf upon completion of grading |
| 176,000 Cubic Yards | The volume of concrete pavement placed (704,000 square yards of 9-inch pavement) |

## I-94 LANE CONTINUITY IN MINNEAPOLIS AND ST. PAUL

While it is no secret that I-94 south and east of downtown Minneapolis and north of downtown St. Paul are two of the most congested sections of freeway in the Twin Cities area, some readers will remember that it was once worse than it is today. At the time that sections of I-94 were being completed in the 1960s, '70s, and '80s, Federal Bureau of Public Roads (BPR) design guidelines limited the planned traffic-carrying capacity of each segment between and through Interstate freeway interchanges to the amount of traffic forecasted for each segment of roadway. That criterion was considered more important than lane continuity. Therefore, there were several "lane drops" at interchanges on I-94, such as those at the Highway 280 interchange. Similarly, there were only two through lanes in each direction through "spaghetti junction" (the Hiawatha interchange at the east junction of I-94 with I-35W and Highway 55) and the University of Minnesota interchange at Huron Boulevard S.E. Although there were as many as five lanes in each direction at some locations on I-94 from north of the Lowry Hill tunnel (near Lyndale and Hennepin Avenues) and east of downtown St. Paul, not one of those lanes in the eastbound direction continued uninterrupted for the entire distance. Left-side entrances from I-35W also affected traffic flow on I-94 in both directions through the Hiawatha interchange and westbound at the Highway 280 interchange.

As time passed and traffic volumes greatly exceeded the original forecasts, it was eventually acknowledged that lane continuity should generally take precedence over forecasted traffic volumes when determining the number of lanes for each segment of freeway between and through interchanges. The two-lane segments through the interchanges discussed in the previous paragraph had created bottlenecks so severe that Mn/DOT and Federal Highway Administration (the BPR's successor agency) officials felt justified in constructing temporary third lanes at those locations in 1989. The result was narrow shoulders and substandard ramp and acceleration lane design at some points — a deviation from Interstate standards that was difficult for some Mn/DOT engineers to accept. Other engineers believed that a significant reduction in crashes — a probable outcome of the additional lanes — was a mitigating factor in the decision.

Several years later, permanent reconstruction provided more congestion relief and remedied some of the deficiencies created by the temporary solutions. The common section of I-94 with I-35E north of downtown St. Paul was completely rebuilt with additional capacity in 1990. The westbound left entrance from I-35W near Portland Avenue was moved to the right side in 1993; however, the left entrance from I-35W in the eastbound direction was left in place. Bridges in the Hiawatha interchange were widened in 1994, and a major reconstruction of the 1964 Dartmouth Bridge over the Mississippi River provided for the complete replacement of the deck and the addition of a fourth lane in each direction in 1997. The latter project permitted realigning the cramped, temporary entrance to westbound I-94 from Huron Boulevard to its original configuration. (The temporary alignment of the entrance had been necessitated by the addition of the temporary third lane in 1989.)

After the collapse of the I-35W bridge over the Mississippi River in August 2007, a temporary lane was added in each direction on I-94 between the Hiawatha and Highway 280 interchanges to accommodate traffic detoured from I-35W. The widening was accomplished primarily by utilizing the highway shoulders and re-striping the roadways. Although the additional lanes were designated as temporary, there was considerable sentiment voiced by road users and the press to retain the lanes until a permanent widening project could be undertaken. (Even with the additional detour traffic, it appeared that congestion was less severe on I-94 than it was before I-35W was detoured.)

After the new I-35W bridge over the river was opened to traffic in September 2008, the temporary two-lane exit to Highway 280 was returned to its original one-lane configuration. Most of the remaining temporary lanes were left in place. Incidentally, some of the undesirable effects of the left entrance from I-35W to eastbound I-94, discussed above, were ameliorated because the additional lane was designed to begin at that entrance. Therefore, it is no longer necessary for entering vehicles to merge with traffic in the lane to the right.

**1971-1973** – Right-of-way acquisition was completed on the northern route, the Metropolitan Council approved the project, municipal approvals were granted, and construction plans were completed.

**Early 1973** – Residents Against Pavement Pollution (RAPP I-94), a citizens' opposition group representing residents in the vicinity of the northern route, was formed to advocate for the Highway 12 upgrade – Route A. RAPP I-94 asked Minnesota Commissioner of Highways Ray Lappegaard to prepare an Environmental Impact Statement (EIS) for the project.

**June 1973** – The Highway Department received bids for roadway grading on the northern route.

**July 1973** – Commissioner Lappegaard halted all activity on the project and announced that construction contracts would not be awarded as planned. (RAPP I-94 had declared that the project had not met NEPA's EIS requirements.)

- Commissioner Lappegaard ordered a restudy of the I-94 project and the formation of an I-94 Management Committee, which was made up of transportation and planning professionals; one citizen and elected representative from each of the six municipalities along the corridor; and representatives from Washington County, FHWA, the Highway Department, the Metropolitan Council, and the Metropolitan Transit Commission. A second group, the Interdisciplinary Study Group, was formed to provide information and conduct studies of the areas in dispute. This group was made up of specialists from nine areas within the Highway Department.
- The Metropolitan Council staff announced that it would not be bound by its previous approval of the northern route.

**1974** – The I-94 Truth Association, a citizens' group representing residents living near Highway 12 and opposed to its upgrading, was formed to advocate for the northern route.

- The State Legislature became involved in the I-94 location dispute. Representative Walter Hanson introduced a bill directing the Highway Department to build I-94 in the Highway 12 corridor. Senate and House Transportation Committees heard testimony from the two citizens' groups. Highway Department representatives expressed reservations about the legislative involvement, stating that there was no precedent for the Legislature to select a freeway corridor.
- The I-94 Management Committee held public meetings in communities in both corridors.

**December 1974** – The Metropolitan Council announced that either corridor would be consistent with its transportation policy.

**March 1975** – The I-94 Management Committee was surprised by a news media report that the Highway Department had been conducting technical studies on a fifth route. (The route followed the alignment of the northern route from I-494/I-694 to County Road 15, and then turned south to join the Highway 12 alignment.) The committee voted to form a subcommittee to study the fifth route.

**1975** – The citizens' groups argued over construction cost estimates for the two corridors (the northern route and Highway 12) and apparent inconsistencies in how the estimates were prepared.

- Representative Hanson re-introduced his bill directing that I-94 be constructed in the Highway 12 corridor. Co-authors included two Washington County representatives. The I-94 Management Committee passed a resolution stating such legislation was contrary to the purposes of the committee as charged by the Commissioner of Highways. Members of the House Transportation Subcommittee

questioned the neutrality of the I-94 Management Committee, noting that several members were from city councils that previously had endorsed the northern route.

**May 1975** – The I-94 Management Committee announced selection of the northern route as the most desirable location for the freeway. Majority and minority reports were covered in the report, justifying the northern and Highway 12 locations, respectively.

**October 1975** – The I-94 Management Committee formally submitted its report selecting the northern route. Commissioner of Highways Frank D. Marzitelli said he would give it careful consideration.

**1976** – Representative Hanson introduced his bill for the third time, directing the construction of I-94 on the Highway 12 route. A companion bill was introduced in the Senate. Commissioner Marzitelli made it known that he was going to select the Highway 12 route; the bills were then dropped.

**June 1976** – Commissioner Marzitelli announced his decision, selecting the Highway 12 route.

**April 1977** – FHWA approved the Highway 12 location.

**January 1978** – Washington County and the cities of Woodbury, Lake Elmo, and Afton filed a lawsuit to stop construction of I-94 on the Highway 12 alignment. The suit contended that Commissioner Marzitelli arbitrarily rejected the I-94 Management Committee's selection of the northern route. The apparent intent of the suit was to encourage the FHWA to direct the Department of Transportation (the Highway Department's successor agency) to construct I-94 on the northern route.

**1978** – Lake Elmo approved the Highway 12 location, although the city council passed a resolution stating that it reserved the right to challenge the plan in court. Afton did not act within the 90-day period for approval, thus approving the plan by default. The city of Lakeland also approved the plan.

Woodbury objected to the layouts for some of the frontage roads. Mn/DOT referred the issue to the Metropolitan Council (according to the authority granted by the Legislature for the resolution of highway location and design disputes). The council approved the Mn/DOT design.

**January 1979** – All approvals for constructing I-94 over the Highway 12 alignment were in order.

**1984** – The first contract for construction of I-94 east of I-494/I-694 was awarded.

**1987** – Construction of I-94 between the interchange with I-494/I-694 and Highway 95 at the St. Croix River was completed. The freeway was finally built. After 29 years of bumps and potholes in the project development process, bitter divisiveness between cities and neighborhoods, and political maneuverings of politicians and activist groups, the last segment of I-94 from its beginning point in Billings, Montana, to its terminus in Port Huron, Michigan, was completed.

So, was my Milwaukee sister happy? Well, yes and no. As of 1987, the six-hour trip from her Milwaukee home to Minneapolis could be driven without any stoplights; *but*, there was the little matter of the reduction in lanes, from three to two, west of the project beyond the I-494/I-694 interchange. I heard about that bottleneck each time she visited from 1987 until 2004, when Mn/DOT completed a reconstruction project that added a third lane in each direction, thereby providing lane continuity all the way to downtown St. Paul.

## OTHER MINNESOTA INTERSTATE FIRSTS (AND LASTS)

Rob Sheppard, Mn/DOT Scene

A parade of antique cars, including a 1937 Chevrolet (foreground) and a 1946 Ford, participated in the I-90 dedication. The Chevrolet is crossing the gold-tinted pavement panel symbolizing the last link in the freeway from Seattle to Boston.

The first segment of Interstate 94 to be completed in Minnesota was only 1 mile long — but only about three-quarters of that segment was opened to traffic when it was completed in 1960. About the same time, North Dakota had completed a long, uninterrupted stretch of freeway across the eastern part of the state to the Red River of the North—the state line. The Minnesota Highway Department built its short segment, including the bridges over the river, and ended it at Highway 75 to provide a bypass around Fargo and Moorhead to and from Highway and 10 and, rather indirectly, Highway 52. Two years later, the department completed another 3.2 miles of freeway that provided a direct connection to Highway 52, thus making it possible to avoid city streets while driving past the two cities.

Building 4.2 miles of freeway in four years might seem like a slow start. At that rate of completion, it would have taken about 246 years to complete I-94 to the opposite Minnesota state line at the St. Croix River east of St. Paul. Of course, it did not take quite that long. In fact, 10.8 miles of I-94 was opened to traffic around Fergus Falls in 1962. By 1970, when the remaining ten-mile gap in the freeway between Moorhead and Fergus Falls was closed, drivers could travel from the west state line to Albany, Minnesota, on a continuous ribbon of freeway — nearly 150 miles into the central part of the state.

Several years later, the I-94 bypass was completed around the south side of St. Cloud. Planning had commenced years before for a bypass that was closer to the city. However, as urban development expanded to the south, a decision was made to restart the highway location process. Even today, the bypass has a decidedly rural environment.

Before the St. Cloud bypass was completed, I-94 had been extended over the alignment of old Highway 152 from northwest of the Twin Cities metro area near Rogers to St. Augusta, just south St. Cloud, which took a lot of pressure off Highway 10, the parallel road only a short distance across the Mississippi River. Now, with current I-94 congestion levels (particularly on summer Friday evenings and Sunday afternoons, as well as during daily commuting times), planning is underway to upgrade Highway 10 to freeway standards from the existing segment of freeway in St. Cloud to the freeway section that begins in Anoka. However, with the transportation funding situation still quite murky at the time of this writing, many at-grade crossings on Highway 10 can be expected to remain in place for a long time yet to come.

As you know, the I-90 Austin bypass was planned to be the first segment of Interstate highway to be completed in Minnesota. However, I-35 near Owatonna got the jump on those honors in 1958. The Austin bypass was not completed until 1961.

Around the same time as Austin was being bypassed, work started on I-90 at the South Dakota state line. A long stretch of freeway was being constructed in South Dakota on new alignment parallel to U.S. Highway 16. In order to get the traffic to and from the freeway, the Minnesota Highway Department completed a 3.6-mile segment of I-90 in 1961 up to the point where it would have crossed Highway 16 (now Rock County Road 4). An interchange was constructed there near the town of Beaver Creek. Construction on the next section of I-90 to the east was not finished until 1965.

Meanwhile, 270 miles to the east, the Highway Department started construction on one of the more scenic Interstate routes in Minnesota. Five miles of I-90 was built near the old Highway 14 and 61 alignment along the Mississippi River, opening to traffic in 1964. Work was supposed to continue from the earlier completion in Austin in both directions, as well as east from the short segment completed at the South Dakota line and west from the Mississippi, until the two gaps were filled in. It didn't quite work out that way. The bridge over the river to Wisconsin was not finished until 1967. But in 1972, all 49 of the remaining miles of I-90 in Winona County were opened to traffic, including the spectacular section on both sides of the Hiawatha Valley.

On September 23, 1978, 22 years after the authorization of the Interstate System, a ceremony attended by more than 2,500 people commenced near Blue Earth to commemorate the

## DID YOU KNOW

The three major Interstate highways crossing Minnesota (I-35, I-90, and I-94) share a somewhat notable distinction: Each roadway contained the last gap to be closed on those freeways across the nation.

Closing the gap on I-90 is covered on this page. The last link in the 1,568 miles on I-35 from Laredo, Texas, to Duluth was unusual in that it was the most northerly segment of the freeway. It was opened to traffic past downtown Duluth to 26th Avenue East in 1992. The last nine of the 1,604 miles of I-94 freeway from Billings Montana, to Port Huron, Michigan, was completed when the segment from I-494/I-694 to the St. Croix River was opened in 1987.


Jenny Seelan, Mn/DOT

Commemoration pens resembling a golden railroad spike were distributed at the freeway linking celebration in 1978 to commemorate the nationwide completion of I-90 in Blue Earth.

## DID YOU KNOW

Mn/DOT employees who worked on building I-90 said there was intense pressure to complete the job because of its national significance. Delays — such as having to excavate vast areas filled with muck — also added pressure to the project.

Paul Koenig worked as a grading inspector on I-90 for about three years, often putting in 12- to 14-hour days. Working on weekends was not unusual. Koenig said he worked Saturday morning, September 9, his wedding day, to keep the project on track. "I had strict orders from my bride-to-be not to be late for our 4 p.m. ceremony," he said. He wasn't.

closing of the last gap on the nation's longest Interstate route. At 3,099 miles, I-90 extends from Seattle, Washington, to Boston, Massachusetts. The event was marked by the placement of gold-tinted concrete pavement panels on the freeway's east- and westbound lanes in front of the rest areas, just west of Highway 169. The colored pavement harkened back to the driving of the golden spike that marked completion of the first transcontinental railroad at Promontory Summit, Utah, in 1869. The dedication included speeches by U.S. Secretary of Transportation Brock Adams, Governor Rudy Perpich, and former Governor and U.S. Senator Wendell Anderson. Gold spike-shaped pens were provided as mementos of the occasion. Adding to the festivities on that September day were a military display by the Minnesota National Guard, the Guard's band and string ensemble, and a

Rob Sheppard, Mn/DOT Scene

U.S. Secretary of Transportation Brock Adams speaking at the I-90 dedication

Rob Sheppard, Mn/DOT Scene

The I-90 ribbon cutting. Left to right: Martin County Commissioner George Cavers, Blue Earth Mayor pro tem Loren Leing, Senator Wendell Anderson, Secretary of Transportation Brock Adams, Miss America Kylene Barker, and Miss Minnesota Susan Erickson.

squadron of low-flying planes providing a salute before the ribbon cutting.

The last gap on I-90 was the 14-mile segment between Guckeen on Highway 16 (now Faribault County Road 16) and Frost. (The latter is located a few miles south of the freeway on Highway 254.) Those towns were probably a little more well known in those days, as they were located near the point where drivers left the freeway to travel the 14-mile stretch of two-lane Highway 16. Given that I-90 was complete for more than 1,000 miles in each direction, there must have been a lot of frustrated motorists in bumper-to-bumper traffic between those two towns. With the freeway funneled down to one lane in each direction, there would have been few opportunities to pass.

In 2006, Mn/DOT resurfaced I-90 in the Blue Earth area, covering up the gold-tinted concrete that was placed in 1978. To make sure that this historic link was not forgotten, state, county, city, and historical representatives worked together to produce and install appropriate markers on the grounds of each of the Blue Earth rest areas. Gold-colored shouldering material was also placed on I-90, adjacent to where the gold pavement was once visible.

# Twin Cities Freeway System

7

## THE TWIN CITIES FREEWAY SYSTEM

In terms of its coverage, the Twin Cities boasts one of the best freeway systems in the country. A typical resident in the Twin Cities metro area lives closer to a freeway than a typical resident in Los Angeles — a city that definitely conjures up images of freeways. For example, consider the proximity of the north/south freeways on the metro area's west side: Highways 494, 169, 100, and the combination of Highways 94 on the north and 35W on the south. The average distance between each of them is less than 3 miles. On the south side, Highways 77, 35E, and 52 can be added to the north/south listing. Similarly, in the east/west direction, freeway travel is provided by Highways 494, 62, the combination of 394 and 94, 36, 694, and the combination of 10 and 610 in various parts of the area. In addition to the above-named freeway routes, shorter freeway connecting segments give a high proportion of area residents, and particularly commuters, the option to use freeways for a significant portion of trips longer than 5 miles.

The Twin Cities metro-area freeway system totals 403 miles. The "metro area" is labeled as such on the official State Highway Map. That map is available on the Mn/DOT website.

Although the freeway system is not a complete grid across the entire area, it does provide choices for Twin Cities drivers; e.g., a resident of Eden Prairie has several route choices for getting to downtown Minneapolis, as does a resident of Maple Grove headed to downtown St. Paul. It also means that east-west and north-south trips can be spread over several routes instead of being concentrated on one or two freeway arteries in each direction, as is often the case in other cities in the United States. It also provides the opportunity for motorists to select an alternate route when a particular freeway experiences abnormal congestion due to a crash, a major sporting or community event, or construction and maintenance activities.

Of course, the fact that there are two downtowns in the metro area is one reason that the Twin Cities has so many freeway routes. Another reason is that much of the freeway system envisioned back in the early 1960s was actually constructed. This did not happen in many cities: a prime example is San Francisco. Even in Los Angeles, several freeways on the early planning maps were never built. Closer to home, Milwaukee's freeway plan was only partially implemented. In both San Francisco and Milwaukee, incoming freeways from the outlying suburban areas come to an end and, in effect, dump their traffic onto city streets.

While the freeway system in the Twin Cities metro area offers good coverage, it does not

always provide sufficient capacity. One retired Mn/DOT engineer used to comment about the area's "skinny" freeways. He noted that a significant portion of the freeway system was built with only two lanes in each direction. In particular, he would point to the common route of I-94 and I-694 in Maple Grove, Brooklyn Park, and Brooklyn Center where the road supported both a radial route (I-94) and a circumferential route (I-694) on a total of four lanes. There were some capacity improvements constructed on the east end of that segment in 1982, and in 2004, the highway was finally rebuilt to provide three lanes in each direction for the full length of the segment. Before that, however, it was known as one of the more-notorious bottlenecks in town.

Another prime example of a "skinny" freeway was the segment of I-494 from Highway 100 to 34th Avenue South, constructed in 1959 with only two lanes in each direction. Although it was tacitly agreed that the two lanes would not be adequate when additional segments of I-494 were completed, the Bureau of Public Roads (the forerunner of today's Federal Highway Administration) did not have confidence in the Highway Department's methods for forecasting future traffic demand. Therefore, it would not approve more capacity at that time. Fortunately, there was little objection to building a roadway with a median wide enough to permit the construction of an additional lane in each direction. In this case, those additional lanes were built only six years later. (Some readers may recall a similar situation on I-35E from Maryland Avenue, north of downtown St. Paul, to I-694. For the same reason, it was built with only two lanes in each direction in 1961, with a third lane added in 1965.) However, in the last twenty-five years, I-494 has experienced extreme congestion on a daily basis. The congestion level statistics on I-494 are often associated with its interchange at I-35W: it carries the second-highest traffic volume of all the interchanges in the Twin Cities area. As of 2004, the interchange carried 251,000 vehicles and 14,000 trucks per day. The interchange also has had the highest crash rate of all nine of the Interstate-to-Interstate interchanges on the I-494/I-694 beltway around the Twin Cities. A total of 432 collisions occurred over a recent three-year period — 170 more than the next-highest total on the beltway.

## DID YOU KNOW

The Highway Department held a public hearing on the proposed Southwest Diagonal freeway in 1966 at West High School in Minneapolis. (The school on West 28th Street, just west of Hennepin Avenue, was closed in 1982 and razed several years later.) The audience was packed with citizens, most of whom were opposed to the proposed highway, and they interrupted with loud applause when speakers voiced their opposition. Interruptions of Highway Department speakers took on a somewhat different tone: officials were actually booed. Though unusual in Minnesota and rather out of character with "Minnesota Nice," this reaction was not an isolated phenomenon. Urban freeway projects around the country at this time, primarily as a result of the Interstate System moving into "high gear," were arousing opposition as citizens recognized they had the power to affect decisions regarding highway location and design.

As the evening wore on, it was clear that there would not be enough time to hear all the people who wished to make a presentation. Therefore, it was agreed that the hearing would be extended. The following week, the hearing continued at the American Hardware Mutual Insurance Building on Lake Street, near Lake Calhoun at Dean Boulevard. Word of the response at West High the previous week had gotten around, and another full house convened at the continuation. Coincidentally, the Minneapolis City Council election campaign was underway at the time, and several candidates who had missed the previous week's meeting took the opportunity to do a little campaigning at the hearing. As at the earlier meeting, proponents for the project were few and far between.

J. Katz

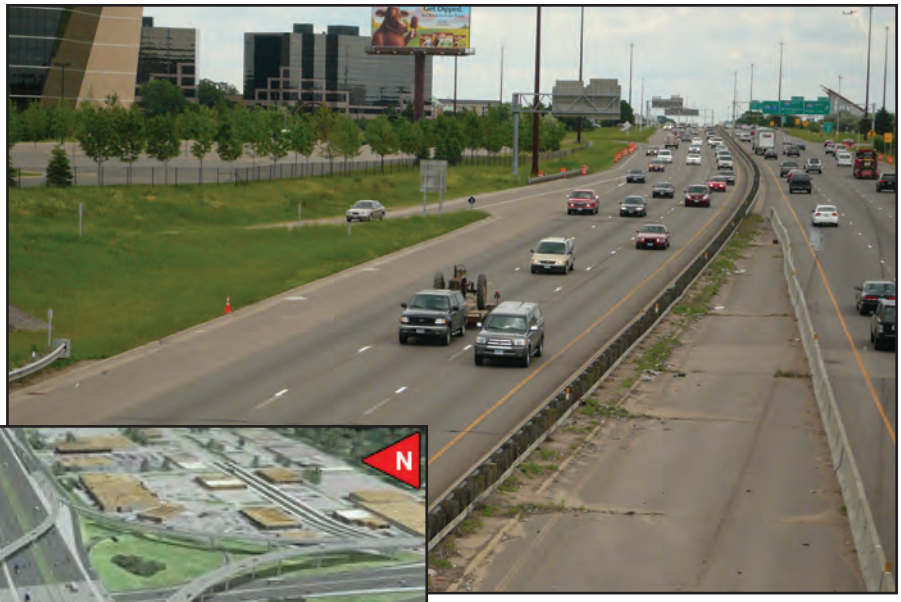
Not all of the freeways constructed in the Twin Cities metro area were of the "skinny" variety. This one (I-94 through north Minneapolis looking south from the Lowry Avenue bridge with the downtown skyline in the distance) has five lanes in each direction. The total width of paving, including the median barrier and the curb and gutter, is approximately 165 feet.

For the past several years, the Texas Transportation Institute has ranked the Twin Cities as one of the fastest-growing traffic congestion areas in the United States. One of the factors contributing to that ranking is how the 1965 Highway Department envisioned the Twin Cities' freeway and expressway system for 1985.


MN Highway Department, courtesy of Keneth W. Anderson

I-494 looking east from the Penn Avenue Bridge just before construction began on the addition of the third lanes in the median in 1965. The interchange with I-35W is in the background.

Whether the 1985 plan was a realistic expectation is debatable. Although more highway funding was available at that time (in terms of a constant dollar) than is available today, much of it was earmarked for the Interstate System. Very little of the other freeway mileage was actually programmed as of 1965.



Penn Avenue South over I-494, looking to the east toward the I-35W interchange. Since 1964, several office buildings have been added to the scene, some of which have taken the place of the three auto dealerships that once occupied the area behind the fence to the left.

Mn/DOT Website


Mn/DOT Website

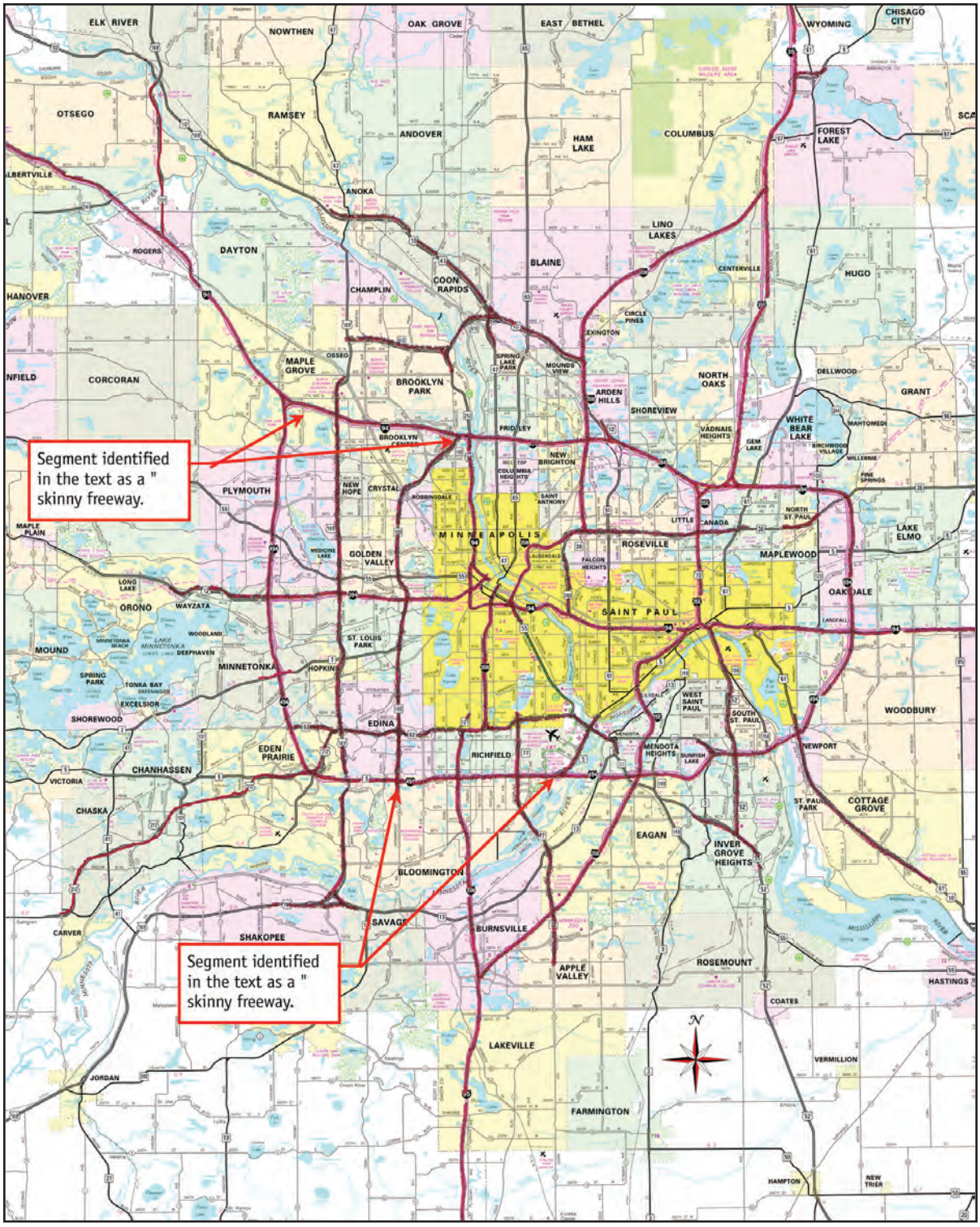
The view of I-494 in this illustration is from a higher elevation above Penn Avenue. It is a Mn/DOT computer-generated view of what has been proposed as a much-needed upgrade of I-494 that would extend from a point west of Highway 100 to east of 34th Avenue South.

However, traffic forecasting for the Twin Cities metro area roads was being carried out with the assumption that the freeways and expressways would be in place by 1985.

The needed traffic capacity (i.e., the number of lanes) for each freeway was also based on the assumption that each of the other freeways would be in place. For example, had the parallel 28th Street Crosstown freeway been constructed, as suggested by the 1965 plan, consider how that might have ameliorated the nearly day-long congestion on the common section of I-35W and I-94 south of downtown Minneapolis. The I-335 "north ring" near downtown would also have diverted a significant amount of traffic away from the common section as well as from the Lowry Hill tunnel to the west. Similarly, it is obvious that I-35W would be experiencing considerably less congestion had the 1965 plan's parallel freeway adjacent to Cedar Avenue and the Hiawatha freeway been built.

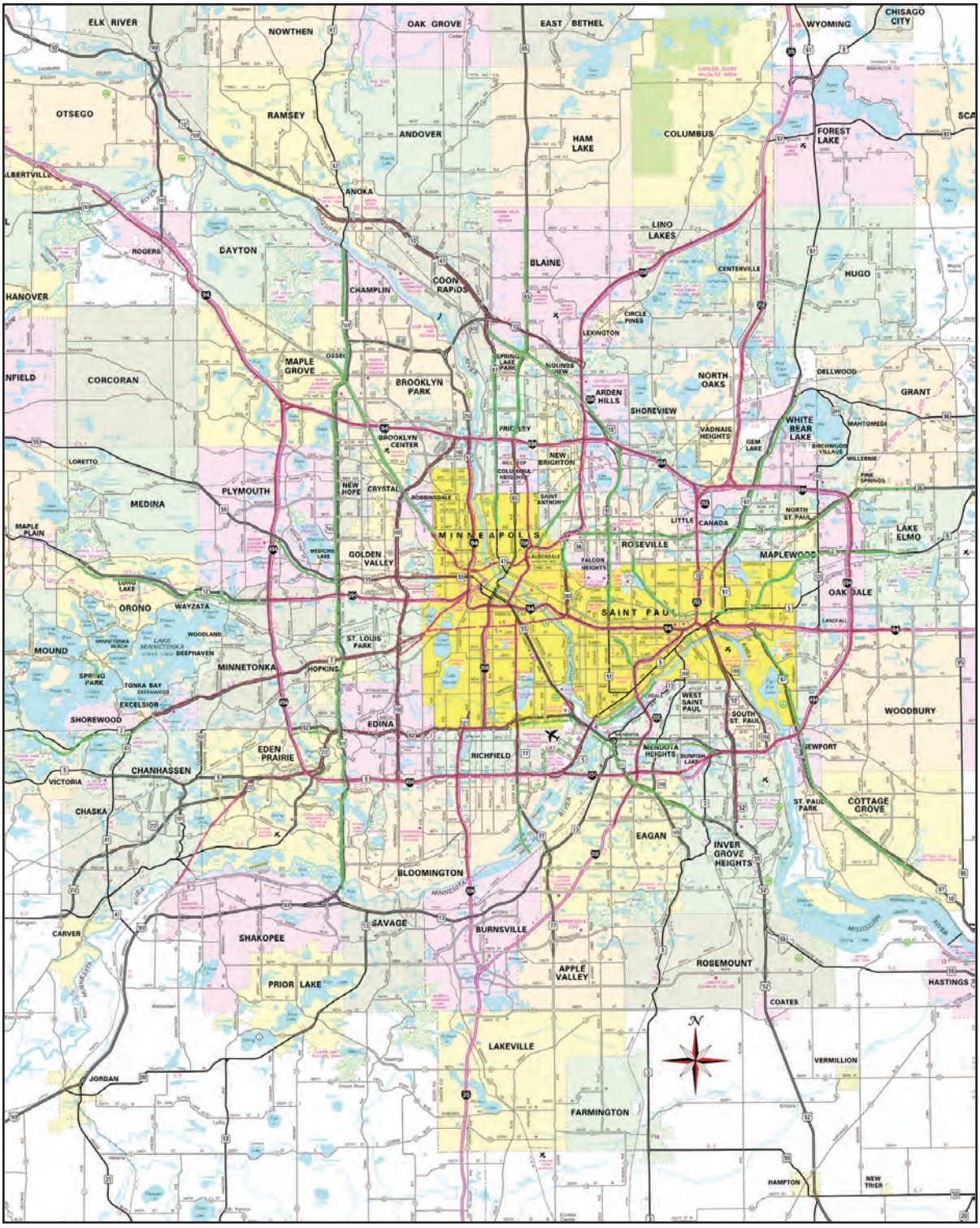
Conversely, would the high-occupancy vehicle lanes on I-394 have been built if Highway 7 and Highway 55 (Olson Highway from Highway 100 to I-94) had been upgraded to freeway standards? And what would the traffic conditions on I-494 and Highway 100 be like if the parallel Highway 169 freeway in between the two had been built as an expressway? Also, would I-94 east of Highway 280 in St. Paul have been able to handle the traffic delivered to it by the proposed 28th Street Crosstown highway? And, finally, how would I-35W operate if the proposed interchange at the east end of I-335 had been built?

These questions were more than just academic concerns after 1965. Right-of-way had been purchased and homes had been cleared in anticipa-




Mn/DOT Official Highway Map, 2005-2006

The Twin Cities freeway system as of 2009 is depicted by the red lined highways.




Mn/DOT Official Highway Map, 2005-2006

The 1985 Twin Cities freeway and expressway system as envisioned in 1965 by the Minnesota Highway Department according to the "System 5" traffic-forecasting model. (The red overlayed lines represent proposed freeways; the green represent proposed expressways.) Note that some of the freeways shown on this map, such as I-335 (the Minneapolis "north ring" and its extension, "the northwest diagonal"), Highway 7, Olson Highway, the "southwest diagonal," Hiawatha Avenue, Cedar Avenue between Highway 62 and Hiawatha Avenue, Highway 65 from I-35W to I-694, the 28th Street Crosstown, and the Highway 61 extension north from downtown St. Paul, were never built and most likely never will be.

tion of I-335's construction. And when I-35W was built in 1976, exit and entrance ramps were graded and acceleration lanes were paved to provide for the I-335 interchange. These connections and other features of the anticipated interchange can still be seen today in the vicinity of the East Hennepin Avenue and Johnson Street N.E. grade separations. As for the cleared right-of-way, new housing has been built on the previously vacant land.

The Southwest Diagonal freeway that would have extended from the I-94/I-394 interchange in Minneapolis to Highway 100 south of Highway 7 in St. Louis Park was also advancing in the planning stages. A public hearing was held in 1966 and, although planning for the proposed highway stalled shortly thereafter, the interchange with I-94 and I-394 was designed and constructed in 1986 to accommodate the diagonal's ramps. While not as obvious as the I-35W/I-335 interchange accommodations, there are some elements of the I-394-Southwest Diagonal interchange provisions visible to I-394 drivers today on the bridge over I-94 and elsewhere.

The 28th Street Crosstown freeway never got very far in the planning process. However, the concept of such a highway carried sufficient credibility to justify provisions in the design and construction of the I-94/Highway 280 interchange in 1968 to accommodate future legs to the southwest. Those legs would have been the east end of the crosstown freeway just beyond a new Mississippi River Bridge. As with the proposed I-35W/I-335 and I-394/Southwest Diagonal interchanges discussed above, there are still visible indications of the connections to the crosstown freeway in place at the I-94/Highway 280 interchange.

Commuters who are approaching retirement age might remember that, for many years after 1968, the left lane of westbound I-94 ended in the middle of the Highway 280 interchange. Some aggressive drivers would race along the left lane hoping to find a gap just large enough to squeeze into before running off the road at the lane-ending taper. The dropped left lane was intended to be temporary; that lane was proposed to continue as a leg of the interchange heading to the southwest and the crosstown freeway. (Some commuters might also remember that a short gap remained in the Highway 280 roadway north of University Avenue until several years after the I-94/Highway 280 interchange was completed. Completion of construction in the gap allowed southbound Highway 280 traffic to avoid traffic signals at University and Franklin Avenues, but it also permitted traffic to arrive at I-94 at a faster rate, thus adding to the congestion at the I-94 interchange.)

The eastbound roadway of I-94 also had a congestion-causing feature at the Highway 280 interchange. Although the left lane did not end, it served as the exit lane to Highway 280, so only two of the three I-94 lanes continued through the interchange. A short distance to the east, a right lane was added that would have served as a continuation of an eastbound ramp coming from the proposed — but never built — 28th Street Crosstown freeway. A bit further to the east, a left lane joined the eastbound roadway as a continuation of the south- to eastbound ramp from Highway 280. So, while there were only two eastbound I-94 lanes through the interchange itself, there were four lanes immediately to the east of it.

In the early 1990s, when prospects for construction of the 28th Street Crosstown freeway had long since dimmed, preliminary engineering began on a major project that would have moved all of the left entrance and exits on I-94 to the right-hand side of each roadway. However, that project was not pursued beyond the preliminary stage. Some minor reconstruction on the roadways and repositioning of the lane markings at that time provided for the continuation of the formerly dropped westbound left lane, a conventional exit from the eastbound roadway to northbound Highway 280

(albeit a left-hand exit), and a continuation of the eastbound left lane through the interchange. The latter revision provided for the three eastbound I-94 lanes through the interchange that are in place today.

The left entrance for southbound Highway 280 traffic to westbound I-94 remained in place until 2007, making for a rather disconcerting merging maneuver for strangers, as well as regular drivers. That was remedied when re-striping for the I-35W bridge collapse detour provided an additional westbound left lane that begins at the entrance from Highway 280.

## THE 28TH STREET CROSSTOWN FREEWAY

Although the Highway 280 interchange constructed on I-94 provided for the future construction of a connection to the 28th Street Crosstown freeway, which was proposed in the 1960s, the proposal never gained much momentum. In hindsight, the justification for the freeway is quite obvious today: The segment of I-94 through the Lowry Hill Tunnel to Highway 280 and the common portion of that freeway with I-35W is severely overloaded well beyond what is typically considered to be the normal morning and evening peak traffic periods, and its crash record is the worst in the entire Twin Cities-area freeway system. The proposed freeway would have been an extension of Highway 7 (also being proposed at that time for an upgrading to freeway standards from Highway 41 west of Excelsior to the Minneapolis city limits) between Lake Calhoun and Lake of the Isles and then south of and parallel to 28th Street to a new bridge across the Mississippi River, ending at the interchange of I-94 with Highway 280.

J. Katz

Not all of the land cleared for I-335 has been redeveloped as shown in the upper photos on the facing page.

One of the more interesting preliminary layouts prepared by the Highway Department for the freeway carried the road on a structure over the railroad tracks for much of its distance between west Minneapolis city limits and Hiawatha Avenue. Although this suggested sharing of a transportation corridor would have significantly reduced the amount of private property and housing needed for the freeway right-of-way, most of its elevation would have been well above grade, a rather unacceptable environmental situation — and very expensive.

However, funding for the freeway's construction was never identified, and local support was not forthcoming. The construction of I-35W and I-94 through the city had many negative repercussions, and the proposal for another major freeway would likely have been as poorly received in 1970 as the Southwest Diagonal had been in 1966.

J. Katz

Much of the right-of-way that had been cleared for the construction of once-planned I-335 north of downtown Minneapolis has since been filled with new housing units, such as these townhomes on 3rd Avenue N.E.

J. Katz

(Below) As noted in the text, after 40 years, there are still some visible indications at the intersection of I-94 and Highway 280 in St. Paul that a connection to the proposed 28th Street Crosstown freeway was anticipated. A close look at the alignment of the curb and gutter on the outside shoulder just beyond the guardrail reveals a slight flare to the west. That is where a ramp from the proposed crosstown would have joined I-94.

J. Katz

# Twin Cities Highways

8

## HIGHWAY 7: ALMOST A FREEWAY

Had the 1965 freeway plan prevailed, by 1985, Highway 7 would have been reconstructed as a six-lane freeway from Highway 41 in Shorewood to the proposed Southwest Diagonal and the 28th Street Crosstown freeways near Minneapolis's west city limits. A preliminary design of the entire length of the freeway was prepared in the early 1960s. Of course, it never got built. That is, *most* of it never got built. But more about that, later. For now, a little background.

Much of existing Highway 7 between Excelsior and Highway 101 was constructed over the right-of-way of the Twin City Rapid Transit Company that had built a streetcar line from Hennepin Avenue and West 31st Street in Minneapolis through Hopkins and Excelsior to Tonka Bay by 1908. The line also had a branch that ran from Hopkins to Deephaven. The line west of Brookside (about one-half mile west of Highway 100), including the Deephaven branch, was abandoned in 1932, and the remainder closed along with the last of the Twin Cities' streetcar system in 1954. Highway 7 was widened in 1934 as a four-lane, undivided highway from Excelsior to a point just west of the location for the then-planned new Highway 100. It was one of the earliest four-lane highways in the metro area. In 1939, the highway was constructed with four lanes and a narrow, grass median from Highway 100 to the Minneapolis city limits. A 1954

Minnesota Historical Society

Highway 7 over Highway 100 as it appeared in 1940. Note the lack of trees. A considerable number of oaks were planted shortly after this photo was taken.

improvement provided for the reconstruction of the west end from its junction with Highway 41 to Excelsior as a four-lane divided highway.

In the mid-1960s, medians with left-turn lanes were constructed at several of the busier intersections on Highway 7.* One of them was at Highway 101 where dual left-turn lanes were installed in the east- and westbound directions — a somewhat rare configuration for the time. (Some years later, second north- and southbound left turn lanes were added to the intersection. Thus, with the right-turn lanes, each of the four legs now has five lanes of approach to the intersection.)

Another, in 1965, was the preparation of construction plans for installation of a 6-foot wide, raised median for much of the distance between Excelsior and Highway 100 that was constructed in 1969 and for which I served as a design squad leader. With that project, many of the intersections that had full access at that time were closed to cross and left-turning traffic by the new median. That still left a considerable number of right-in, right-out accesses, many of which still exist today, but by the 1970s, only one full intersection remained between Excelsior and Highway 100 (Ellerdale Road/Maple Lane, immediately west of the I-494 interchange) that was not controlled by traffic signals.

**DID YOU KNOW**

In the 1930s, Highway 7 was still known by its constitutional route number, Trunk Highway 12. (This should not be confused with today's Highway 12, which was known as Trunk Highway 10 at the time.)

In 1988, the segment of Highway 7 from Highway 100 to the Minneapolis city limits, along with several other segments of state highways, was turned over to Hennepin County in exchange for Hennepin County Roads 62 and 18. The former was a new freeway completed by the county in several segments during the 1960s and '70s; the latter was a two-lane county road that was gradually upgraded to a freeway, with county projects starting in 1957 into the '80s. Both were taken into the trunk highway system, and County Road 18

**In 1965, I was actually assigned by the Highway Department and the project engineer to oversee the construction at two of those intersections.*


J. Katz

J. Katz

A 2007 photo, shows how Highway 7 appears today on the short freeway portion of the highway.

The most recent improvement project on the portion of Highway 7 covered in this chapter included replacing the narrow, raised median with the concrete barrier shown here, looking east from the Mill Street (Hennepin country road 82) Bridge in Excelsior. The project also replaced a rather harrowing left-hand exit and entrance ramp with the entrance ramp shown here on the right and an exit ramp shown in the top center of the photo.


J. Katz

The historical marker shown at left replaced the one pictured below. The monument style was favored by the Minnesota Highway Department in the 1950s. The logo in the lower left corner of the plaque reads "State of Minnesota Department of Highways."


Minnesota Historical Society

The historical marker at right was located in a wayside park on the south side of Highway 7 in Shorewood. The marker explains that a nearby lake was named after Charles W. Christmas, the first Hennepin County Surveyor.

became the route for the relocated Highway 169. The segment of Highway 7 east of Highway 100 was then designated as Hennepin County Road 25.

With several projects during the period from 2000 to 2004, a concrete median barrier replaced the 1960s-style raised median, thereby nearly eliminating the potential for head-on collisions on the Excelsior to Highway 100 portion of the highway. One of those projects included closing the crossover at the Ellerdale Road/Maple Lane intersection mentioned above; thus, the only way to cross that portion of highway today is at an intersection controlled by traffic signals or via several grade separations. The last of these projects included reconstruction of the interchange at Second Street in Excelsior, eliminating a left exit and left entrance on Highway 7 that had created rather disconcerting maneuvers for strangers.

So what does all of the above have to do with the freeway proposed in the 1965 plan? As it turned out, the plan was, in fact, more than just a pipe dream. In 1969, a 1.2-mile segment of the planned freeway was actually built between I-494 and Shady Oak Road in Minnetonka, including an interchange with Baker Road. The road was designed with room in the median to provide for the eventual construction of a third lane in each direction had the freeway ever been extended to the east and west.

It was quite obvious that an early extension of the freeway to the west was on the minds of Highway Department designers. Their plans for the temporary connection on the westbound side of the road, just beyond the interchange with I-494, called for an "S" curve with very short radii to tie the westbound roadway back to the existing location of Highway 7. (The temporary connection was constructed as part of the original I-494 interchange project in 1964.) The tight curving alignment was quite inconsistent with the much gentler curvature of the road that was — and still is — characteristic of the entire highway from Excelsior to Minneapolis. The "temporary" connection, however, remained in place for 42 years until the curvature was flattened as part of the reconstruction project on I-494 that was completed in 2006.

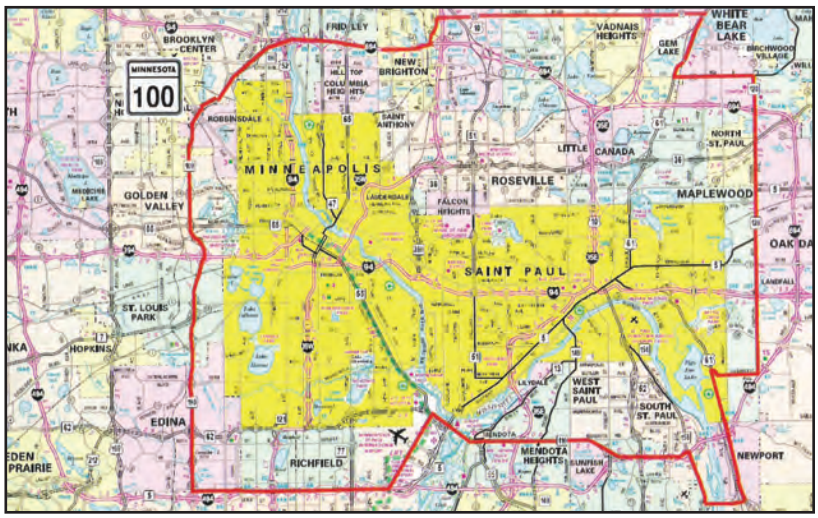
By 2004, the traffic volume on Highway 7 west of I-494 had increased to an average of 50,000 vehicles per day. (That's several thousand more than the 2004 volumes on the Highway 62 freeway west of Shady Oak Road in Minnetonka and Eden Prairie. Similarly, the segment of Highway 36 in North St. Paul that was reconstructed as a freeway in 2008 had a volume fewer than 50,000, as did the segment of Highway 101 from Rogers to Elk River that was also being upgraded to a freeway at that time. It should be understood, of course, that there are other non-freeway roads in the Twin Cities area that carry more than 50,000 vehicles per day. But it is a volume more than sufficient to justify construction of a freeway.) In the meantime, the original concrete pavement on the 1965 freeway segment has been overlaid with asphalt; the overhead, freeway-type signing at the Baker Road interchange continues to direct traffic, and no further action has ever been taken to extend the freeway in either direction. A major upgrading of Highway 7 is not likely to occur in the foreseeable future.

As for drivers who use Highway 7 every day, the 1.2-mile freeway segment probably doesn't register as a freeway. Similarly, it is likely that most of the Mn/DOT people responsible for operating the trunk highway system today have never thought of those 1.2 miles as being part of the metro-area freeway system.

Had the full length of the Highway 7 freeway been built, it would have taken some of the load off I-394, a parallel freeway to the north. (During peak hours, a significant number of vehicles travel between the west on Highway 7, north on I-494, continue east on I-394, and *vice versa*.) And it would have improved the traffic flow on Highway 7, where traffic queues often extend from the traffic signal at Williston Road back through the signal at Woodland Road/Tonkawood Road — a distance of more than 0.7 miles. In the other direction, traffic waiting for the signal at Williston often backs up onto the southbound mainline on I-494. On the other hand, the coordinated, computerized traffic signal system on Highway 7 helps handle considerably more traffic, more efficiently than the systems that were in place in the 1960s.

## HIGHWAY 100


Aside from Minnesota's Interstate routes, perhaps Highway 100 is the state's most well-known highway. The highway extends 15 miles from I-494 on the south to I-94 and I-694 on the north through Edina, St. Louis Park, Golden Valley, Crystal, Robbinsdale, and Brooklyn Center. During a 35-year period ending in 2006, Highway 100 was gradually reconstructed as a freeway.




Mn/DOT Official State Highway Map, 2005-2006

The 66-mile route of Highway 100 as it existing in the early 1950s is overprinted in red on a current map of the Twin Cities metro area's primary roads. The 15-mile-long section of highway from I-494 to I-694 to the west of Minneapolis is the only portion of the old Beltline that carries the Highway 100 route marker today. Today's freeway ring (I-494 and I-694) around the Twin Cities was completed in 1986.

## DID YOU KNOW

Before it was replaced in 2003, the old overpass at Duluth Street served as an experiment for extending the life of bridge decks. A weak, continuous electrical current was passed through the deck reinforcing steel bars in an effort to reduce corrosion (rusting) and the resulting pressure on the surrounding concrete. The principle was sound; however, it was never adopted as a common practice. Epoxy coating of steel reinforcing bars emerged as a more promising alternative and is used extensively today. (The coating is light green in color and can usually be seen wherever a structural concrete construction project is underway.) More than 40 years after it was constructed, the bridge was replaced as part of the 2002 freeway projects on Highway 100.

## Highway 100 as our Grandparents Remember It

Looking back to the 1950s, Highway 100 was a 66-mile route, known as "The Beltline," that completely encircled the Twin Cities. In addition to the present north-south route west of Minneapolis, the highway continued north of the cities across the Mississippi River on the present alignment of I-694 (the in-place river bridge continued to serve for many years on the eastbound roadway of the freeway) and old Highway 8 to what was then Minnesota Highway 96 (now Ramsey County Road 96) to the White Bear Lake area. Along the east side of the cities, Highway 100 followed Century Avenue — apparently so named because of the highway number. Today, that Maplewood city street, while still carrying the Century Avenue name, has been designated as Highway 120 by Mn/DOT. At the south end of Century, Highway 100 followed Highwood Avenue to Highway 61.

To get back to the west side of the Mississippi River, Highway 100 followed Highway 61 through Newport into St. Paul Park, where it turned west on Third Avenue to a toll bridge built over the river in 1895 for the South St. Paul Beltline Railroad at a cost of $115,000. The structure consisted of several double-deck truss spans with a swing span over the navigation channel. The railroad was carried on

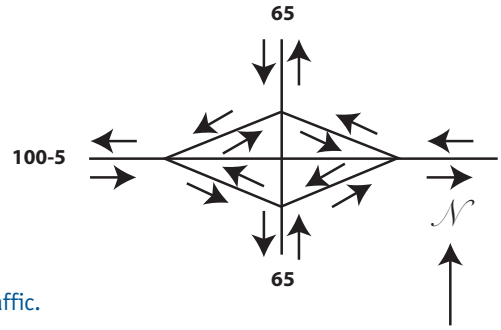

Minnesota Highway Department

A 1947 photo (above) of the Highway 100 Bridge over the Mississippi River between St. Paul Park and Inver Grove Heights, facing west, showing the railroad tracks on the upper deck and the swing span in the open position. The Chicago, Rock Island & Pacific Railway posted the sign.

Minnesota Historical Society

The wood plank lower deck, ca. 1934.

the upper deck, and automobiles were carried on the lower-deck timber plank roadway. The bridge was closed in 1999 due to structural deficiencies, at which time the toll was 75 cents. It was the last toll bridge in Minnesota. Part of the abandoned bridge collapsed in late 2008. The structure was demolished by Washington and Dakota Counties in the spring of 2009 at a cost of nearly $1,400,000 - 12 times the cost of its original construction.




*A schematic of the traffic flow on the old Highway 65 interchange.*

The ramps carried two-way traffic.

On the west side of the river in South St. Paul and Inver Grove Heights, Highway 100 turned north on Concord Street (then also Minnesota Highway 56) to an intersection near the location of today's I-494. The highway then proceeded west over what was to become I-494, then westerly over the presently signed Highway 110 to a junction with Highway 13 at the southeast end of the Mendota Bridge.

Crossing the Minnesota River with Highway 55 on the Mendota Bridge, Highway 100 joined Highway 5 at Fort Snelling. The highway then headed on a southwesterly diagonal across land now occupied by Minneapolis-St. Paul International Airport runways and Fort Snelling National Cemetery. At 34th Avenue South, the beltline followed the alignment of what is now I-494 along East and West 78th Street between Richfield and Bloomington, completing the circle around the Twin Cities at Normandale Road, where it turned north and Highway 5 continued to the west.

Although most of the old beltline route can be traveled today on roads located very close to the 1950s alignment, much of what was then Highway 100 has either been upgraded to freeway standards or rebuilt in some other way. One portion of the highway that remains was abruptly cut off in 1959 by the extension of two runways at the Minneapolis-St. Paul International Airport. Also, as noted above, the bridge across the Mississippi River was closed in 1999.

The approval of the Interstate Highway System by Congress and President Dwight D. Eisenhower in 1956 signaled the end of Highway 100's familiar

**DID YOU KNOW**

The full cloverleaf interchange on Highway 100 at Highway 7 was originally planned to be built at the Excelsior Boulevard intersection. However, when planning began in the mid-1930s for Highway 7's construction, it became rather obvious that the major interchange should be built at the junction of the two new roads. This alarmed the business community along Excelsior Boulevard, and shop owners made a concerted effort to promote the original plan. They knew that traffic bound for Minneapolis would bypass their commercial street if drivers had an alternative route at Highway 7. The Excelsior Boulevard proponents did not prevail, and as a result, an at-grade intersection was in place at the Highway 100/Excelsior Boulevard intersection until an interchange was built in 1969. By then, it had become one of the worst traffic crash locations in Minnesota. In 2006, two of the Highway 7 interchange loops and one ramp were removed as part of a Highway 100 widening project. Thus, all three of the WW II-era cloverleaf interchanges on Highway 100 were modified in recent years.

designation as the Twin Cities "beltline." That distinction was to be taken over by I-94, I-494, and I-694, although those highways are not often described as a beltline. The Highway 100 route markers were removed from the north, east, and south legs of the circumferential route by 1965.

## Early Improvements

Existing roads in the 1920s and '30s that would eventually become part of the old beltline were, for the most part, two-lane roads. Some traffic capacity improvements, however, were started in the late 1920s along the general north-south alignment of the road that remains designated as Highway 100 today. Grading and surfacing projects were underway from 1926 through 1928 to provide a four-lane, undivided road through Edina and St. Louis Park from West 50th Street to the highway's temporary terminus at Excelsior Boulevard. The lanes were only 10 feet wide (compared to today's standard 12 feet). The need for the project, which included an overpass at the Twin City Lines streetcar right-of-way at West 44th Street, was due, in part, to the fact that Highways 169 and 212, and much of the traffic they carried, were routed over Highway 100 for the length of the project. The segment of the highway between West 78th Street and 50th Street in Edina (a gravel road at that time) was widened and paved for four lanes (also not divided) in 1936, but with wider lanes than the segment to the north.

### DID YOU KNOW

The original interchange on Highway 100 at Minnetonka Boulevard did not have a loop in the northeast quadrant. Northbound exiting traffic originally used a typical diamond ramp on the south side of Minnetonka Boulevard. However, as traffic volumes increased in the early 1950s, merging conflicts between the traffic entering on the ramp from Highway 7 and traffic exiting to Minnetonka Boulevard became a serious hazard. It was concluded that moving the exit to the north side of the interchange was highly advisable, despite the 15 mile-per-hour curve on the loop necessary to stay within the existing right-of-way. Problems at closely spaced entering and exiting ramps led the Twin Cities Metropolitan Council to declare in the 1960s that interchanges on future freeway construction should be located no closer than 1 mile apart.

## Lilac Way

The late 1930s saw the extension of Highway 100 to the north of Excelsior Boulevard. The project was part of the federal "alphabet" relief programs (e.g., P.W.A., F.E.R.A., W.P.A., etc.) of the Great Depression era. By 1937, as many as 1,500 men were working on the projects on any given day. At one point, 3,500 men were each working a one-

J. Katz

After sitting in one of Highway 100's roadside parks at Minnetonka Boulevard for nearly 70 years, this stone "beehive" fireplace was waiting on a rainy October day in 2008 to be moved to a new home in a park.


J. Katz

Lilacs were planted near the Highway 100 east frontage road south of the 36th Avenue North interchange, as well as at many other locations, in 2006 after the highway was reconstructed. (The dandelions were not intended to be part of the landscaping project.)

week shift per month for which they were paid only $22.* However, some of the programs did provide transportation from downtown Minneapolis for the workers.

The Minnesota Department of Highways and the Hennepin County Highway Department cooperated in this 1935-1941 period to construct the highway over a new alignment through St. Louis Park, Golden Valley, Crystal, and Robbinsdale as far as the present location of County Road 81. It was the first highway in Minnesota to implement "limited access,**" an innovation that, by definition, is a standard feature today of all freeways and of many other conventional roads, as well. Limited access is intended to maintain an optimal level of traffic flow and safety. The concept was not particularly new at the time, however. It was acknowledged that the German Autobahn was a model for this section of the beltline, as well as a few roads with freeway-type characteristics and limited access that were being built at the time elsewhere in the United States.†

## DID YOU KNOW

The Highway 100 interchange at Duluth Street was completed in 1960, one year before Duluth Street itself was constructed. Upon opening the interchange to traffic, the intersection at Golden Valley Road, one-quarter mile to the south, was closed to cross traffic. To maintain continuity for Golden Valley Road, its traffic was routed on the highway frontage roads on either side of Highway 100 to the underpass at the future Duluth Street location. The relocation of the highway access and the circuitous route for cross traffic caused some people to wonder whether the interchange was built as a self-serving access to the Highway Department's Golden Valley district headquarters building, completed in 1958 in the northwest quadrant of the interchange. Actually, the interchange location and the Duluth Street extension were part of the city redevelopment plan for commercial and residential uses (and the Highway Department building) on what had been a gravel pit and a concrete products plant. Of course, today, only a small fraction of the heavy traffic using the interchange has the headquarters as its destination. Although the building is still a busy maintenance and construction facility, the district headquarters was relocated to Roseville shortly after two metro area Mn/DOT districts were merged.

** By any measure, it should be obvious that one $22 check per month in 1937 was hardly a living wage. In comparison, I believe it is worth noting that I worked as a laborer for the Minnesota Highway Department for the entire summer of 1957 earning $42 per week. While those wages almost seem like small change today, five years of summer work with MHD (with a raise each year) provided enough income to cover tuition, books, and incidentals while earning a civil engineering degree. Incidentally, my route to work included the section of Highway 100 covered in the noted and following paragraphs.*

*** No access is permitted except at interchanges on freeways and at well-controlled, widely-spaced intersections on other roads.*

Engineer Carl F. Graeser guided much of the preliminary project planning as well as the construction for the futuristic highway. Although noted as the "Father of the Beltline" according to his 1944 obituary he, nonetheless, was chided for building a super highway out in the country where no one would ever use it.* "Super Highway," in this case, meant a four-lane road on which none of the major crossings between Highway 7 and West Broadway intersected at grade. Given that premise, some of the earliest cloverleaf interchanges built in Minnesota were constructed at the intersections with Highways 7, 12, and 55. A diamond interchange was also built at Minnetonka Boulevard, and grade separation bridges were constructed at 42nd Avenue North and West Broadway. Railroad grade crossings were separated south of Highway 7, south of Highway 12, north and south of Highway 55, and adjacent to Broadway Avenue.

Another major figure in the highway's development was landscape architect Arthur Nichols. He worked with Graeser to design five roadside parks and picnic areas that were a significant part of the highway's original construction. The parks included picnic tables, benches, and beehive-shaped fireplaces made of Minnesota limestone. (The last of the fireplaces was moved in 2008 from the park in the northeast quadrant of the Minnetonka Boulevard interchange to another park near the intersection of Highways 7 and 100. The Minnetonka Boulevard park had been inaccessible for many years following the construction of an exit loop around it.)

With the encouragement of the Golden Valley Garden Club, landscaping of Highway 100's wide (by 1940s standards) roadside included planting 7,000 lilac bushes from Excelsior Boulevard to West Broadway — despite a Highway Department

** The average daily traffic over the length of this segment of Highway 100 in 2006 ranged from 67,000 to 125,000 vehicles per day according to figures published by Mn/DOT.*

J. Katz

Original Highway 100 lilac plantings from the 1940s still bloom, as shown in this 2007 photo at the Lake Street/Minnetonka Boulevard interchange.

policy that discouraged the use of flowering plants. The violet spring blooms led the *Minneapolis Journal* to dub the road "Lilac Way." The name stuck, as some of the frontage roads on both sides of the highway were soon officially designated as "North Lilac Drive." A Highway Department district office was built in 1958 on one of the so-named frontage roads in Golden Valley.

As originally constructed, the north- and southbound lanes of Highway 100 between St. Louis Park and Crystal were separated by a median only where center piers were needed to support the overpass bridges. Given his vision for the characteristics of a highway of the future, Graeser had lobbied unsuccessfully for wide medians — 30 feet and greater — similar to the ones constructed during the later projects north of 36th Avenue North. However, within a few years of the earlier construction, a 2-foot-wide concrete median was added to the undivided roadway segments. This center island was nothing like the concrete barriers that separate opposing traffic on the highway today. It was only 5-inches high, as shown on page 121. Beyond providing a visual indication of separation, it did little to prevent an errant vehicle from reaching the wrong side of the road. But it was not until the 1960s that concrete or steel barriers replaced the low concrete islands and provided a reliable measure to prevent head-on collisions.

Although major cross streets were grade separated with over- or underpasses during the 1940 construction of Highway 100, a number of lesser streets with lower traffic volumes did have at-grade access to the highway — several with full access, and some that only permitted right turns. The full-access intersections included Cedar Lake Road, Glenwood Avenue, Golden Valley Road, 36th Avenue North, 39th Avenue North, and Highway 52 (now County Road 81). One of the most notoriously hazardous crossings, known as the "Tennant Company Crossover," was located immediately north of the Highway 55 cloverleaf at an abrupt widening of the median. The widening was insufficient to provide left-turn lanes for Highway 100 traffic, and the opening was only large enough to hold one waiting eastbound and one waiting westbound car between the north- and southbound roadways. This crossover was still open in the later 1960s when rush-hour traffic was already taxing the capacity of the highway. It was closed a few years later.

Some senior readers of this history may have less-than-fond memories of the median opening for West 26th Street that existed into the early 1950s. There was no traffic signal, no widening of the median to provide refuge for a waiting driver, and no left-turn lanes on Highway 100 at the intersection. A southbound driver waiting to make a left turn onto 26th Street was at great risk of a rear-end collision (a wait was nearly certain during the peak traffic hours) and at further risk of a right-angle collision while crossing the northbound lanes — especially if a truck or bus in the northbound left lane was hiding a vehicle in the right lane.

In an act of fortuitous foresight, at about the time when divided highways were first being built in Minnesota, the Legislature passed a statute permitting the Commissioner of Highways to close median crossovers at his discretion. Subsequently, as traffic volumes and hazardous situations increased over the years, the Highway Department closed many such crossovers around the state. In response to an increasing number of crashes on Highway 100, nine of the road's intersections were closed to left turns in 1953. The 26th Street crossover and a similar one at 28th Street were closed in 1956. However, as indicated above, the Tennant Company crossover remained open for another 15 years.

The Highway 100 crossover at Cedar Lake Road was also eliminated in 1956 by rerouting the road closer to the Great Northern Railroad tracks and sharing the space underneath the highway overpass at that location. Interchange ramps were con-

structed to provide access between the two roads. (Incidentally, the northbound exit loop to Cedar Lake Road had an unusual feature: it had an automobile dealership building that was constructed within it.) Today, however, the loop serves traffic from the highway's east frontage road that begins at a new exit further to the south on Highway 100.

Some older Minneapolis and St. Louis Park residents might also remember that Cedar Lake Road once crossed the tracks on a wooden bridge one-half mile to the east of Highway 100. It was possible at that time to continue on Cedar Lake Road on a northeasterly diagonal to its terminus at Glenwood Avenue in Minneapolis about one-half mile west of Lyndale Avenue. The road was later closed at what was then Highway 12, many years before the construction of I-394. Some continuity remained, however, as pedestrian bridges were constructed at both of the severed roadway locations.

Highway construction was limited in Minnesota during World War II. Therefore, extension of Highway 100 beyond what is now County Road 81 was deferred until 1947, at which time the highway was completed to Lyndale Avenue North (then Highway 169) and the Mississippi River Bridge (now the location of I-694) that had been completed two years earlier. It was constructed as a four-lane, divided highway as far as Highway 152 (Osseo Road),* but continued with only two lanes from there to Lyndale Avenue. The parallel roadway that added two more lanes was not completed until 1967. Lilacs played a very limited role in the extension of Highway 100 north of Country Road 81.†

** Osseo Road was later renamed Brooklyn Boulevard. Some years later, the road was turned back to Hennepin County, and it was designated as County Road 152.*

*† A political dispute involving engineer Carl Graeser is said to have been the reason why no lilacs were planted along Highway 100 in Edina. However, some lilac bushes were planted along the highway when it was reconstructed as a freeway in the 1980s. Graeser had passed away several years before the highway was extended north of County Road 81.*

In 1955, a four-lane section of Highway 100 was built east of the Mississippi River over what is now the alignment of I-694 as far as University Avenue Northeast (Highway 56 at the time and signed today as Highway 47). It passed under the Northern Pacific Railroad bridge that had been built the year before. The bridge survived as a somewhat substandard underpass for I-694 — there were very narrow shoulders — until it was replaced when the freeway was widened in the late 1980s.

## Traffic Congestion – Lilac Way Fades into the Present Era

In addition to the traffic hazards posed by Highway 100's at-grade crossovers, those intersections eventually caused a severe congestion problem on what was supposed to have been a free-flowing road. The end of World War II was the beginning of rapid development of the suburbs west of Minneapolis that resulted in a heavy increase in traffic volume on Highway 100. The installation of traffic signals became necessary at many of the at-grade intersections to permit east-west traffic to cross or access the highway. But there is a limit to how efficiently traffic can be managed by traffic signals. By 1970, northbound traffic approaching the traffic signal at 36th Avenue North during the afternoon peak period was stopped as far back as Duluth Street — a distance of 1.5 miles! This occurred every weekday afternoon for more than 30 years, despite the installation of intersection capacity-maximizing measures that included dual left-turn lanes, sophisticated signal-timing programs, and more-accurate vehicle detection systems. Such was also the case for many of the other signalized intersections on Highway 100, morning and evening, from one end of the road to the other. As listed on page 124, signals were located at 21 intersections on the 15-mile length of highway, at one time or another.

New parallel north-south corridors provided some relief for drivers on Highway 100, as seg-

ments of I-494, I-94, and I-35W were completed, and County Road 18 (now Highway 169) was upgraded to freeway standards in the 1960s, '70s, and '80s. But it was becoming clear, even before 1960, that Highway 100 would have to be upgraded to carry its share of the overall north-south traffic through the western portion of the Twin Cities area and to minimize overloading on the other parallel corridors.

Modern era upgrading of Highway 100 began in Golden Valley in 1960 with construction of an interchange at Duluth Street and another at Glenwood Avenue in 1963. And, finally, after missing out on a cloverleaf proposed prior to 1940, an interchange was constructed at Excelsior Boulevard in 1969. Despite having one of the first dual left-turn lanes constructed in Minnesota, the intersection was forced to handle traffic volumes well in excess of its practical capacity. (Excelsior Boulevard to the east and Highway 100 to the south was still the route of Highways 169 and 212 at the time.)

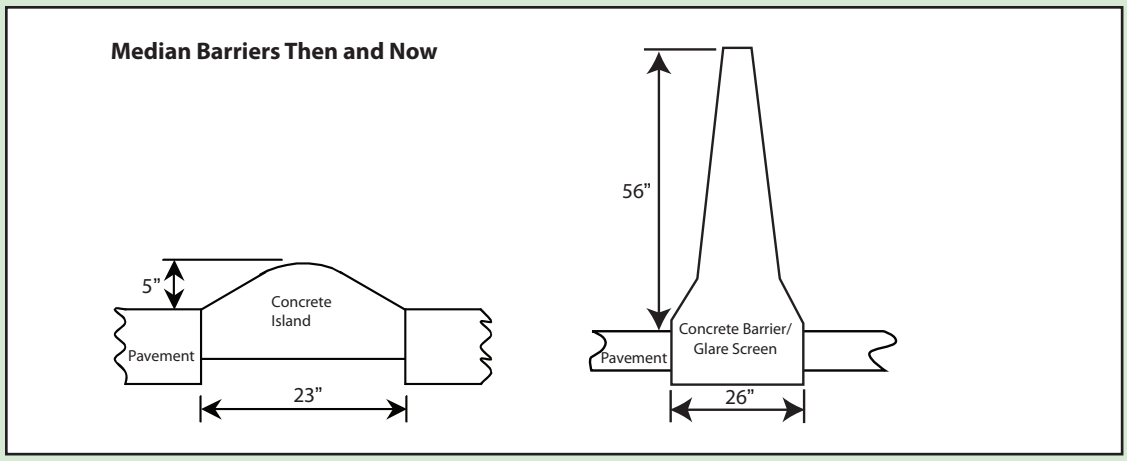
During the mid-1960s, the Highway Department purchased additional right-of-way adjacent to the existing four-lane highway from a point south of 36th Avenue North to 42nd Avenue North for the planned upgrading of Highway 100 to a six-lane freeway. This project was to include the long-awaited 36th Avenue interchange to alleviate traffic congestion centered at that intersection. However, it wasn't to be built until 40 years after much of the right-of-way was purchased. Funding setbacks and project development issues shifted priorities, and traffic backups in both directions intensified on Highway 100 for another generation of commuters. Although some of the right-of-way had been cleared for the road construction, homes on several blocks of the purchased land became rental property managed by the Highway Department for much longer than anyone had anticipated. In the meantime, some interim improvements to enhance safety and provide congestion relief were completed in the project area, including interchange ramps at the 42nd Avenue North overpass, a pedestrian overpass at the 39th Avenue North intersection, and eventually, the closing of the street and the removal of the traffic signal at that location.

Upgrading of several short Highway 100 segments continued from 1965 through 1971. A second roadway with a depressed median ditch was constructed during that time, extending the divided highway from Brooklyn Boulevard northerly to I-94/I-694, where a Highway 100 interchange had been completed in 1965. Ramps to and from 50th Avenue North were constructed on the northbound side of the highway, and bridges and ramps were constructed at Brooklyn Boulevard, 57th Avenue North (County Road 10), and John Martin Drive.

## The South End

On the south end of Highway 100, six-lane freeway construction was underway in 1973 and 1974 between Highway 62 and Excelsior Boulevard, replacing the narrow 1928 four-lane road north of West 50th Street in Edina and St. Louis Park. This round of construction added interchanges at Benton Avenue and 50th Street, and replaced the original bridges at Minnehaha Creek and West 44th Street. The bridge over Highway 62, built in 1960, was widened to accommodate six through lanes, and two pedestrian overpasses were constructed to serve the Edina High School neighborhood. The interchange at West 77th Street/Industrial Boulevard was also built in 1973. The last leg of the southerly upgrade provided for interchange construction at West 70th Street, an overpass for 66th Street, and some major retaining walls in 1977. The interchange with I-494 was rebuilt in 2004 and 2005 to increase its traffic-carrying capacity, relieving some of the daily recurring congestion on both highways.

In 1984, the West 36th Street traffic signal in St. Louis Park was removed with the completion of a




This is a comparison of the original and most-recently installed medians between the north- and southbound lanes on Highway 100. On the left is the shape and dimensions of the narrow median placed in the 1940s. It was painted yellow to increase its visibility, but it had little ability to prevent a vehicle from crossing over to the other side of the road. At a height of more than 4.5 feet, the barrier on the right can stop a wayward vehicle, as well as significantly reduce headlight glare for drivers traveling in opposing directions.

new interchange. It was the only signal remaining on the 11.5-mile section of Highway 100 between West 84th Street at Normandale Boulevard (the County Road 34 extension of Highway 100 south of I-494 in Bloomington) and 36th Avenue North in Crystal. It had been the site of a major bottleneck with an extremely high crash record for many years. Its removal may have been delayed for several more years had it not been for Federal Interstate "Replacement Funds" that became available with the decision not to build I-335 north of downtown Minneapolis. Unfortunately, the interchange remained a long-standing bottleneck for northbound traffic, as three freeway lanes narrowed into two. Backups to West 50th Street and beyond remained twice-daily problems until 2006 when temporary third lanes were completed on Highway 100 in both directions up to the existing three lanes at Cedar Lake Road. (A permanent reconstruction of that portion of the highway was scheduled for 2014 at the time of this writing. However, hints of possible funding difficulties suggested that the project might be further delayed.)

## Traffic Management Systems

In the early 1990s, Mn/DOT installed traffic management systems on Highway 100 to improve traffic flow. The systems included video surveillance, wire loop vehicle detection underneath the pavement surface, ramp meters, "Highway Helper" motorist assistance patrols, high-occupancy vehicle ramp meter bypass lanes for buses and carpools, and overhead variable message signs. These measures increased the carrying capacity of the highway and reduced both the daily recurring congestion and occasional incident congestion resulting from crashes and stalled vehicles. However, these measures still fell far short of meeting the daily traffic demand.

## The Mid-Section

A major improvement to the mid-section of Highway 100 came with the completion of the I-394 interchange in 1989. In addition to reconstructing the old Highway 12 (now I-394) cloverleaf, the project involved reconstructing the Cedar

## DID YOU KNOW

Although the first modern segment of Highway 100 was built with cloverleaf interchanges, the ends of the ramps and loops were controlled by stop signs. (In those days, stop signs in Minnesota had black lettering on a yellow background.) In the early 1950s, shortly after red stop signs were introduced, the yellow stop signs were replaced with triangular "YIELD RIGHT OF WAY" signs and later with the same-shaped sign that no longer included the words "RIGHT OF WAY" (both black on yellow). Eventually, the now-familiar red-on-white "YIELD" signs replaced the yellow signs and, in turn, "MERGING TRAFFIC" signs replaced them. By that time, many of the ramp acceleration lanes had been lengthened. Since the publication of the 1971 edition of the *Manual on Uniform Traffic Control Devices*, the standard merge signs have used a two-tailed merging traffic arrow symbol rather than a worded message. (By the way, the merge sign colors are black on yellow.)

Lake Road and Glenwood Avenue interchanges, as well as establishing a series of collector-distributor roadways and grade-separated ramp crossovers on Highway 100. The additional roadways and ramps smoothed out merging and diverging traffic maneuvers between the closely spaced entrances and exits. One unusual result of this project was that Highway 100 now passes over I-394 rather than under it, as it did before I-394 replaced Highway 12. Several construction stages were necessary at this location to complete the project, as traffic was carried through the work area, rather than detoured around it, on both highways. The interchange reconstruction also included building high-occupancy vehicle lanes and ramps. To accommodate the additional lanes on Highway 100, the Glenwood Avenue Bridge (a structure that was only 26 years old) had to be replaced.

## The Big Finish

In what was the largest concentrated effort to upgrade Highway 100 to freeway standards, several projects were developed for construction between 2002 and 2005, covering the segment from Glenwood Avenue to Brooklyn Boulevard. These projects completely reconstructed all but the southern end of the pioneering section of highway that was completed in 1941. In so doing, the cloverleaf interchange at Highway 55 was replaced by what is variously known as a "single-point diamond," an "urban interchange," or other designations that indicate the ramp terminals end at one signalized intersection rather than two intersections. Also, the interchange at 36th Avenue North finally materialized. Other interchanges were built or rebuilt at Duluth Street, 42nd Avenue North, County Road 81 (another long-standing bottleneck dating back to the 1950s), and France Avenue North. The northbound ramps at 50th Avenue North were removed.

On an August day in 2004, as the projects neared completion, a momentous event took place on Highway 100: the last traffic signal on the entire



A view, from the north, of the Highway 100/I-394 interchange. Freeway-to-freeway, as well as local access to both highways, is combined at this interchange, the most complex of the 22 interchanges serving Highway 100. Some of the complexity is due to the ramp access to the Mn/Pass lanes situated between the east- and westbound roadways on I-394.

length of what could then properly be called a freeway was removed at 50th Avenue North.

A few special features of the last construction projects are worth noting. One is the rustication treatment of the concrete surfaces on bridges and retaining walls. This treatment is a rather realistic inset of Minnesota dolomite limestone blocks produced by rough-faced concrete forms and earth-tone paints. This process has been used on many road projects in Minnesota in recent years and has turned structural surfaces into a pleasing addition to the landscape — or, at least, a less-objectionable intrusion on the environment. Photos on Page 116 and 125 show some of the results incorporated into the Highway 100 bridges and noise barriers.

The projects' structures also incorporated architectural elements of the 1940s-era bridges that were demolished in the upgrade. Abutments, piers, and railings distinctly recall the lines of the bridges that had been in place for 60 years at Highway 55, 42nd Avenue North, the Great Northern Railroad, and West Broadway. Such recognition of the past was a fitting tribute to those who believed that Minnesota's highways deserved something both beautiful and functional in design.

As for the lilacs, many of the bushes planted during the 1940s were removed during the upgrading projects, but landscaping work upon completion of the reconstruction restored the fragrant blooms to Lilac Drive.

## The Last Bottleneck

It is ironic that the last remaining bottleneck segment of the original 1940s highway was the last to be addressed by the Highway 100 upgrade. As noted earlier, the segment between West 36th Street and Cedar Lake Road, until 2006, had only two through lanes in each direction. Thus, every weekday for more than 15 years after the interchanges in the vicinity of the I-394 intersection were upgraded, traffic queued up on the existing three-lane segments back to West 50th Street on the northbound roadway and to Highway 55 on the southbound roadway. That year saw the con-



This single-point diamond interchange on Highway 100 at Olson Highway (Highway 55) replaced the cloverleaf built in 1940. There is only one signalized intersection in this type of interchange compared to the two signalized intersections needed at most busy standard diamond interchanges.

## SIGNALIZED INTERSECTIONS ON HIGHWAY 100

At some time during the life of Highway 100 until as late as August 2004 when the last traffic signal was removed at 50th Avenue North, the following intersections were controlled by signals — much to the frustration of the highway users, but much to the relief of those who needed to cross the highway or make a left turn.

- Highway 5 (West 78th Street)
- West 77th Street/Industrial Boulevard
- West 70th Street
- West 66th Street
- Valley View Road
- Eden Avenue
- West 50th Street
- West 41st Street (Brookside School)
- Excelsior Boulevard
- West 36th Street
- Glenwood Avenue
- Golden Valley Road
- 36th Avenue North
- 39th Avenue North
- Lakeland Avenue (Highway 52, later Hennepin County 81)
- Indiana Avenue
- France Avenue
- 50th Avenue North (temporary during freeway construction)
- Osseo Road (now Brooklyn Boulevard, Co. Rd. 152)
- 57th Avenue North (Co. Rd. 10)
- Lyndale Avenue (Old Highway 169)

struction of a temporary relief project that added a third lane in each direction.

Mn/DOT designated the additional lane construction as a "temporary" project because a permanent fix would require replacing four 1940s-style bridges in order to provide enough room underneath for three standard-width traffic lanes and full shoulders in each direction. (The existing bridges only had enough room for three narrowed lanes and minimal shoulders.) Much to the consternation of city officials in St. Louis Park, Mn/DOT deferred a permanent, though certainly justified, improvement until the middle of the next decade because funding was not available to totally reconstruct the roadways and replace the bridges at Highway 7, Minnetonka Boulevard, and the railroad and trail overpasses immediately to the south.

The reconstruction project noted above and one completed a few years earlier resulted in the reconfiguration of two of Minnesota's earliest full cloverleaf interchanges. A single-point diamond was constructed at Highway 55, as noted earlier in this chapter, and a "folded diamond" interchange and a collector-distributor road on the southbound side of Highway 100 replaced the full cloverleaf at Highway 7 to help mitigate the traffic conflicts caused by closely spaced ramps in the merging area between the Minnetonka Boulevard and the West 36th Street interchanges.

In what might seem to be a downside for the revised interchanges, drivers on both Highways 7 and 55 now encounter additional traffic signals. On the other hand, those signals are consistent with the traffic control provided at many intersections both east and west of Highway 100 for a considerable distance from the interchanges.

Coordination of the signal timings and sophisticated vehicle-detection systems minimize the delay at the signals, and stops are much more likely for crossing or turning vehicles than for through vehicles. Even during peak traffic periods, chances are good that a driver can travel through the signals at several intersections in succession without stopping.

J. Katz

Highway 100 at 36th Avenue North. This bridge, as well as all of the new bridges between Highway 55 and 50th Avenue North, incorporated the pier and railing features of the 1940-style bridges that were replaced. The "limestone" facing is actually concrete with a relief created by the formwork and paint.

## Highway 100 Today

Today, the only visible remnants of the pioneering 1940s highway are the railroad overpasses south of Highway 7 and the bridges at Highway 7 and Minnetonka Boulevard. The interior lanes of the bridge over Cedar Lake Road that was first widened in 1979 and widened again during the recent projects reveal some original construction that can be seen from the roads below. (For those who are interested, look for the rounded arches at the tops of the interior piers.) Original pavement still exists under the road surface in the vicinity of Highway 7 and Minnetonka Boulevard. For the most part, Highway 100 — from I-494 on the south to I-94/I-694 on the north — has been totally reconstructed, and some sections have been reworked several times.

With all the effort that went into rebuilding Highway 100 as a modern freeway, it would seem reasonable to assume that traffic now flows freely and that congestion caused by the former bottlenecks is a thing of the past. Unfortunately, peak period traffic in some locations runs at "slow and go" speeds (a phrase popularized by one of the local traffic radio announcers) or even "stop and go." Some of those locations include parts of the most recently reconstructed sections of the highway.

Obviously, the road carries more traffic than ever before. (In 2006, average daily traffic volumes on Highway 100 ranged from 59,000 vehicles per day [VPD] north of I-494 in Edina, to 125,000 VPD south of I-394 in St. Louis Park, to 56,000 VPD south of I-694 in Brooklyn Center.) Where did all those vehicles come from? Certainly many came from the overloaded parallel routes — I-494, Highway 169, I-94, and I-35W — despite recent major improvements to I-494. Also, it is fair to point out that some of the reconstruction on Highway 100 is now more than 30 years old. In addition, some of the traffic that had previously used the I-35W bridge over the Mississippi River in 2007 and 2008 diverted to Highway 100 after the bridge collapse. (The effects of the additional traffic flow were mitigated to some degree by restriping the southbound roadway to provide for an auxiliary lane between the Duluth Street and Highway 55 interchanges.) Overall, the congestion experienced on Highway 100 is not atypical of what is being experienced on other freeways in the Twin Cities metro area and other cities throughout the country. And as has been noted, the increase in traffic demand for the last 35 years has far outpaced the effort, here and elsewhere, to keep up with it.

But, despite the discouraging conclusion drawn here, it is wise to remember that this "super highway built way out in the country where no one would ever use it" has served drivers well for nearly 70 years.

## WHATEVER HAPPENED TO HIGHWAY...?

Minnesotans who have traveled around the state over the years probably recognize that some highway numbers and locations have changed over time. Major changes occurred when the American Association of State Highway Officials (AASHO) developed a national numbering system for roads that became known as "US" routes during the 1930s. (US routes actually have no federal standing such as the Interstate System. The numbering is merely a system of convenience begun in 1926 for identifying key routes having significance across and beyond state borders.) In Minnesota, US routes include east-west Highways, 2, 8, 10, 12, 14, 52, 212, and 218; and north-south Highways 59, 61, 63, 65, 69, 71, 75, and 169. (You may detect a pattern here: east-west routes are even numbered and are generally identified consecutively from north to south across the United States. Similarly, the north-south routes are odd numbered and run from east to west, with US 1 following the East Coast, and US 101 following the Pacific Coast. However, there are some routes, both east-west and north-south, that deviate from the general pattern.)

Some previous US routes in Minnesota no longer exist, including 10N, 10S, 16, 55, 77, 210, and 371. The latter two were designated as Minnesota state highways of the same numbers when it became generally acknowledged that US routes should cross at least one state line. US 16 was discontinued because much of it was the location for Interstate 90. Most of the road west of I-35 is still in place, carrying a variety of county road numbers. East of a point near the city of Austin (as I-90 heads off to the northeast) to a point near the Mississippi River, old US 16 is now signed as Minnesota Highway 16.

When AASHO renumbered many Minnesota highways as US routes, most of the state's trunk highways were also renumbered for mapping and signing purposes. These had been previously identified with consecutive numbers under the 1920 constitutional amendment that established the state's Trunk Highway System. Although most of the 70 constitutional routes and the approximately 250 that were added by later legislation are still in service today, a considerable number of changes have occurred in the numbers actually marked on the roads today. It can be assumed that changes will continue to be made in the future. A few of the more interesting and, perhaps, familiar changes are described below.


### US Highway 61

US Highway 61 (two parts of which are still on the statute books as Trunk Highways 3 and 1 from south to north) at one time followed the easternmost edge of Minnesota from La Crescent in the southeast corner to Grand Portage at the tip of the Arrowhead region. Before the days of the numbered highways, the section of road from St. Paul to Winona was identified on utility poles as the "National Parks Highway" from Seattle to Chicago. A section of the road near St. Paul and another along the entire length of road from Duluth to Port Arthur, Ontario (now a part of the City of Thunder Bay), was known as the "Mississippi River Scenic Highway." Much of that route between St. Paul and Duluth was carried over roads in the state of Wisconsin.

Today, US 61 ends in the city of Wyoming, approximately 28 miles north of St. Paul, although for many years, as parts of I-35 opened to traffic in the '60s, '70s, and '80s, it was signed over the Interstate between St. Paul and Duluth. When the freeway was completed, the US 61 markers were removed.

A short segment of what had been US 61 between Rush City and Minnesota Highway 70 is now identified as State Highway 361; however, most of

the old road in Chisago County is now signed as County Road 30. In Pine and Carlton Counties, the old road is now signed as County Road 61, as if to retain a bit of the mid-twentieth century past. From I-35's endpoint at 26th Avenue East in Duluth to the Canadian border, US 61 is now signed as Minnesota Highway 61.


## US Highway 8

US Highway 8 never did have a very long route in Minnesota — extending only from Minneapolis to Taylors Falls. But when I-35W and I-35 were completed from Minneapolis to Forest Lake, the 25-mile portion of Highway 8 from near downtown Minneapolis to I-35 — more than half its total length — was eliminated. The freeway had reduced that portion of Highway 8 to a route of essentially local significance. The route is now signed as Hennepin County Road 66 (Broadway Street N.E.), heading east from Highway 65 (Central Avenue), Hennepin County Road 88 (New Brighton Boulevard), County Road 77 and Old Highway 8 in Ramsey County, Anoka County Road 23 (Lake Drive), and Minnesota 97 and US 61 in Washington County.


## US Highway 169

The combination of US and State Highway 169 is one of the longer highway routes in Minnesota, extending from the city of Elmore on the Iowa border, north to Mankato, northeasterly to the western suburbs of Minneapolis, and north to Virginia as US 169; and as Minnesota 169, northeasterly to the city of Winton (a few miles east of Ely), for a total distance of 417 miles. Before the days of numbered highways, part of the highway was identified as the "Daniel Boone Trail" (from Iowa through Blue Earth and Mankato to the Twin Cities). Sections of the route near Ely at the north end of the highway were known as the "Green Trail" and the "Mississippi Valley Highway," starting in Gulf Port, Mississippi. The portion of the route through the Iron Range was also posted as the "Vermillion Trail" with a marker consisting of white and green bands.

Many Minnesotans will recall a number of changes to the route of Highway 169 through Minneapolis and the western suburbs. From Shakopee, the road shared a route with Highway 212 on Flying Cloud drive through the cities of Chanhassen and Eden Prairie, and what is now Hennepin County Road 158 (Vernon Avenue) in Edina to Highway 100. Both highways followed Highway 100 to Excelsior Boulevard through St. Louis Park to Lake Street in Minneapolis. Highway 169 split off from Highway 212, turning north on Lyndale Avenue, through the famous Hennepin/Lyndale "bottleneck" area and on to the West River Road in Brooklyn Center (for a time, Minnesota Highway 152 and now Hennepin County Road 12), through Champlin, and across the Mississippi River to Ferry Street in Anoka. The route turned west to join what was then US Highway 10 on Main Street where, a few blocks to the west, Highway 169 is still located today. In the past, Main Street also carried Highways 52 and 218.

In the 1980s, Highway 169 followed a newly constructed freeway route in Eden Prairie to get to Highway 100 from I-494 via Highway 62. At that time, Highway 169 was moved out of the city of Minneapolis by continuing on Highway 100 north of Excelsior Boulevard to what was then Highway 52 (now Hennepin County Road 81) to Osseo and North to Champlin and Anoka. By that time, Highway 169 no longer turned onto Main Street, but instead continued on Ferry Street for a few blocks to join Highway 10 via the Ferry Street interchange.

Still more major relocations for Highway 169 were in the works. When Hennepin County decided that it was no longer interested in main-

taining two freeways it had built in the 1960-1980 period, an exchange of roads was arranged: Mn/DOT took over the freeways, and the county took over several state highways within the county. Highway 169 was moved west one more time to what had been Hennepin County Road 18 from Eden Prairie to Osseo, where it connected to the previous move. As the twentieth century drew to an end, the Shakopee bypass freeway was completed with a new bridge across the Minnesota River. Highway 169 was moved from Shakopee's First Avenue and what is now Scott County Road 69 to the bypass.

With the completion of the Shakopee bypass, the travel time between Shakopee and the city of Elk River via Highway 169 was significantly reduced from what it had been in the 1950s. However, a glance at a map shows that the shortest distance between the two cities is still along Minnesota Highway 101, despite its 1930's twisting and turning characteristics. Although part of that road is now Hennepin County Road 101, it is rumored that fishermen coming to Minnesota from Iowa still follow the 101 "shortcut" to get to Lake Mille Lacs on Highway 169.


## Highway 100

Most of the people driving around Minnesota's Twin Cities today are not old enough to remember that Highway 100 (the "Beltline") completely encircled the two towns until 1965. With the pending construction of I-494 and I-694 and their proximity to the north, east, and south legs of Highway 100, it was obvious that those legs would no longer serve the intended beltline function. Indeed, segments of the north and south legs actually became the location of I-694 and I-494. Other alignments of the old highway still exist, although most have been improved to some degree, including Ramsey County Road 96 in the northern suburbs, Minnesota 120 on the Maplewood/Oakdale border, and Minnesota 110 in suburbs south of St. Paul. While the southern half of what remains of Highway 100 today is essentially aligned over its original route, the northern half, until the late 1930s, followed some of the local streets in St. Louis Park, Golden Valley, and Robbinsdale.


## US 65

US 65, for a brief time in the mid-1930s, extended from the Iowa border to Highway 2, where it continued as Minnesota 65 to the north. Today, US 65 only covers thirteen miles from the border to the city of Albert Lea — the remainder another victim of the Interstate Highway System. In its former life, it made its way up to Faribault via today's Steele and Rice County Road 45. From Faribault, it followed today's Highway 3 northeasterly through Northfield and then north to the present Dakota County Road 50, where it headed west to a point west of Lakeville. From there, it turned north to cross the Minnesota River on the old Lyndale Avenue South Bridge, just a few hundred feet downstream from the present I-35W bridge. Highway 65 followed Lyndale to Lake Street in Minneapolis, where it jogged over to Third Avenue South and on to downtown Minneapolis. The US designation ended at Washington Avenue, where Minnesota 65 took over, crossing the river on the Third Avenue Bridge to Central Avenue, where it continues today to the city of Littlefork, just 8 miles south of the Canadian border.

By 1958, the portion of US 65 between Faribault and Dakota County Road 50 was moved west to what had been Minnesota 165, a straight shot from Faribault to the city of Burnsville and the Lyndale Avenue Bridge. Upon completion of I-35, US 65 north of Albert Lea was dismissed from Minnesota's Trunk Highway System. However, the road is still in service, and parts of it can be seen from I-35, mostly on its northbound side. As noted above, it is designated as County Road 45 in Steele and Rice Counties and as Scott

County 46 and Dakota County 5. The year 1958 also saw the completion of a four-lane bypass to the west of Faribault for Highway 65 that for many years served as a connection for completed segments of I-35 from the north and south. Ironically, when it came time to close the gap in the I-35 freeway, the Highway Department decided to build it as a bypass even further to the west. The original bypass is now marked as Minnesota 21 and Rice County Road 48.


## US 218

US 218 is another highway that has been drastically reduced in length. One of the oldest US numbered routes — dating back to at least 1927 — it enters Minnesota from the Iowa border, skirts the city of Austin near its east city limit, and then turns west, joining I-90 for three miles. It then heads northwesterly to Owatonna, where it joins Highway 14 and ends at the junction with I-35. It was not always that way. Back when US route markers looked like the one shown at the head of this paragraph, Highway 218 made its way to St. Paul via the former US 65, and today's Highways 3 and 149. It then followed University Avenue (as Minnesota 218) along with Highways 12, 52, and 56, all of which were marked — in some locations with stacked individual route markers and, in others, with a single black-on-white sign that had only the four route numbers printed on it. Highway 218 followed the route of US 52 from Minneapolis to Anoka, where it joined Highway 10 as far as today's Highway 25, using that route to Brainerd and beyond. In the early 1960s, the Department of Highways began to pare down the number of routes carried over one road. Highway 218 was one of the routes eliminated, except for the 47 miles from the Iowa border to Owatonna.


## Highway 110

Is it possible to just pick up a highway and completely move it to another location? That is not really what happened to Highway 110. However, we do know that at one time it was a north-south highway on the west side of Lake Minnetonka. And now it is an east-west highway south of St. Paul. In its first incarnation, it was identified with the star route marker, a standard for Minnesota state highways that was phased out in the 1950s — about the same time that the road was turned back to Hennepin County. The road is still in place, marked as County Road 110, essentially on the same alignment from Highway 7 at St. Bonifacius to Highway 12 in Maple Plain.

In its second life, the route number was transferred to what had been a part of Highway 100. Due to its loss of function as the Beltline and the Highway Department's reluctance to unnecessarily carry more than one number on a road, the remaining disconnected remnants of Highway 100 were given new numbers as I-494 and I-694 were being completed. The number 110 was available and, since the number had a vague relationship to 100, 110 was assigned to the four-mile section from the southeast end of the Mendota Bridge to its junction with I-494, near the interchange with Highway 3 (Robert Street) in Inver Grove Heights. The other remnant of Highway 100 that was renumbered was the segment along the border between the cities of Maplewood and Oakdale, east of St. Paul. It carries the number 120, probably for the same reasons suggested above. For a good number of years, Highway 110, along with Highway 5 near the Twin Cities International Airport and the Mendota Bridge, served to fill the gap between the temporary ends of I-494 at 34th Avenue South and Highway 3. (What was then Highway 3 is now Highway 52. The two highways traded places with Highway 3, taking Highway 52's old location on South Robert Street. It's no wonder that some people are confused — especially those who are still trying to find Lake Minnetonka!)


## Highway 36

Minnesota Highway 36 is another road that got into trouble with the Interstate Highway System. This

is a highway that originally extended from Highways 5 and old 100 (Now I-494 and Highway 5) on Cedar Avenue in Richfield through south Minneapolis, over the Tenth Avenue Bridge at the Mississippi River, and through Roseville and Maplewood to a junction with Highway 212, just southwest of Stillwater. In the late 1950s (shortly after the state route marker design replaced the white star), the southern terminus was extended to Highway 13 in Burnsville. After I-35W was constructed in proximity to the Highway 36 route in northeast Minneapolis, Highway 36 was eliminated between Highway 62 on the Richfield/Minneapolis city limits and the point at which I-35W turned north (Cleveland Avenue) in Roseville. The Highway 36 eastern terminus was eventually extended into the city of Stillwater, concurrent with Highway 95, to the lift bridge over the St. Croix River. The highway will one day be rerouted over a new river bridge to Wisconsin that, as of this writing, was still going through a long and contentious approval process. With the vacation of the south Minneapolis route, the remainder of the highway south of Highway 62 was renumbered Minnesota 77 and eventually extended to 138th Street in Apple Valley. For a few years, Highway 77 followed 138th Street to the Minnesota Zoo entrance, but that segment is now marked as Dakota County Road 38.


## US 52

US 52, before the completion of I-94, crossed the state of Minnesota from the Iowa border south of Rochester to Moorhead. As much of the I-94 route from North Dakota to St. Paul was in proximity to Highway 52 (and, in some locations, was an actual upgrade of the existing road), Mn/DOT did not deem it fit to carry the 52 route marking on the freeway, despite the fact that Highway 52 still exists in North Dakota. However, Highway 52 apparently has not been eliminated from the state highway system, as can be seen on recent, Mn/DOT-prepared county maps that show the freeway carrying both I-94 and Highway 52. Whatever the official status is, Mn/DOT has placed Highway 52 route marking signs only on the road from the Iowa border to its junction with I-94 in St. Paul. Curiously enough, some of the counties in western Minnesota have identified the old US 52 route as County Road 52.

## Minnesota 35, 135, 90, 190, 94, and 194

No, these are not the route numbers assigned to just one Minnesota highway over the last 70 years. But, they are not six separate highways, either. These are actually three highways that were caught up in one situation in 1959. At that time, the national numbering scheme for the Interstate Highway System was approved, assigning the numbers 35, 90, and 94 to the three major Interstate routes in Minnesota. And because the Highway Department made it a practice to eliminate duplicate numbers on the Trunk Highway System (no distinction is made between Interstate, US, and Minnesota numbered routes — they are all trunk highways as far as the practice is concerned), existing Highways 35, 90, and 94 were renumbered by prefacing the old numbers with a "1."

Minnesota 135 is actually Constitutional Route 35, as designated between the cities of Virginia and Tower, and was marked with that number until the above-noted change took place in 1959.

As for Highway 90 and 190, it was marked over 50th Street from Highway 100, Lyndale Avenue to 46th Street, and 46th Street to Cedar Avenue in Edina and south Minneapolis. The segment in Edina (Highway 100 to France Avenue) was apparently never an official trunk highway, but was assigned a "courtesy route marking" or identified as an "accommodation route" to provide continuity and eliminate short gaps in the highway system. Some years after the number change and the elimination of US 65 due to the completion of I-35W, the 190 number was assigned to the spur from the Interstate that continued north to Lyndale Avenue at 58th Street from I-35W at Highway 62. Additionally, 50th and 46th Streets were no longer identified as state highways. Later yet, the spur number was changed to Highway 121. Just for the record, 50th Street between France and Lyndale Avenues is now Hennepin County Road 21, Lyndale

Avenue from 58th Street to Franklin Avenue is County Road 22, and 46th Street between Lyndale and Cedar Avenues is County Road 46.

Highway 194 is an eight-mile connecting road between Highways 2 and 53 northwest of Duluth, although it terminated at Highway 23 in the city before 1997.


## Highway 62

Highway 62 is one of only two Minnesota state highways that show up in two separate parts of the state. (The other is Highway 65, discussed above.) The original Highway 62 is a 24-mile route connecting the cities of Fulda and Windom, between Highways 59 and 60 in southwestern Minnesota. It is a constitutional route dating back to 1920, although the current number was assigned several years later. The other Highway 62 is a legislative route that was established in 1988 when Hennepin County traded two freeways to the state in exchange for a bundle of trunk highways within the county that Mn/DOT had determined were no longer of regional significance. The latter Highway 62 extends from I-494 in Minnetonka and Eden Prairie to Highway 55 at Fort Snelling. The road was constructed by the county beginning in the 1960s and was identified as County Road 62 under the county practice of assigning route numbers to match street numbers when a county road follows a numbered street. (Much of the highway follows the location of 62nd Street between Minneapolis and Richfield. The segment west of I-494 to County Road 101 continues to be identified as County Road 62.)

So, why didn't Mn/DOT renumber one or the other of the two Highway 62s in 1988? As noted above, Mn/DOT did just that regarding the renumbering of Highways 90, 35, and 94, to avoid duplication with the new Interstate highways of the same numbers. Wouldn't it then have been simple enough to renumber one of the roads as Highway 162? It can be supposed it was understood that renumbering a widely known, high-traffic-volume road might cause confusion for drivers — confusion that could lead to safety problems. On the other hand, it might also have been pointed out that the considerable distance between the two highways made the reasons for avoiding duplication less compelling. (It does, however, lend credence to the truism that where there are rules, there are exceptions.) As one concession to maintaining some distinction between the two Highway 62s, the mileposting for the newcomer does not begin with 0. Instead, the first milepost marker is 104, located about 1/2 mile east of I-494, based on the remote possibility that the segment west of I-494 might be extended as a state highway to a junction with Highway 7, as per a very early plan. Highway 62 could then begin at milepost 100 at that junction.

### ROUTE NUMBERING: WHO DECIDES?

The route numbers used to identify Minnesota's state highways have changed considerably since the trunk highway system was first authorized by the Constitutional amendment of 1920 and subsequently supplemented by legislation. Although the original numbers are kept on the books, a group of Mn/DOT officials — the Route Numbering Committee — was given responsibility to assign marking numbers as they saw fit. Even though the numbers selected were essentially arbitrary, the committee members were quite aware of the economic impact a change could have on businesses whose addresses were tied to a highway number, as well as the general confusion that could ensue from such changes. The committee balanced those impacts with the necessity for a coherent and logical system of highway route numbers.

The Route Numbering Committee no longer exists; however, occasionally the need to change numbers does arise. Changes are now handled as an administrative matter directed by Mn/DOT traffic engineering officials.

# Along the Way

# 9

## POETRY ON THE ROAD – BURMA SHAVE

*I know I'll never hear an ode,*
*As lovely as the open road . . .*

There was a time when poetry — if jingles can be considered poetry — was located adjacent to highways all over the country. This poetry was delivered to road users in a series of five, six, or seven red sign panels with white lettering, mounted at 100-foot intervals along the roadside, the last one of which always read:


These pieces of Americana originated in Minnesota in the 1920s. If you were born before 1955, you will probably always remember these signs. During an all-day drive to visit grandparents, reading these messages out loud and laughing at the punch lines helped to pass the time. The Burma Shave advertising was so plentiful that a family would pass multiple sets of the signs in a day's drive. A typical message might have been something like this:

IF YOU
DON'T KNOW
WHOSE SIGNS
THESE ARE

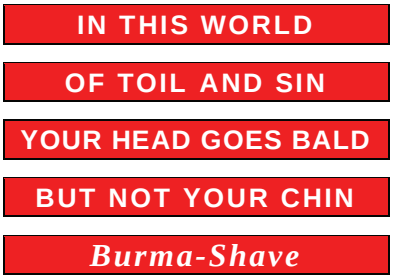
YOU CAN'T HAVE
DRIVEN VERY FAR
*Burma-Shave*

Or this:

THE MONKEY TOOK
ONE LOOK AT JIM
AND THREW THE PEANUTS
BACK AT HIM
HE NEEDED
*Burma-Shave*

The Burma Shave craze began in 1926 when Clinton Odell and his son, Allan, were trying — unsuccessfully — to market their company's new brushless shaving cream. Back in those days, long before the invention of aerosol spray cans, most shaving soap was solid, like bar soap. To begin your shave, a soft wet brush was rubbed on the soap to work up a lather, and then the lather was brushed onto the face. Burma-Shave, a product of the Burma-Vita Company of Minneapolis, was sold in tubes or jars, and just a small dab rubbed lightly on the face was enough to lather up the entire beard in a few seconds. But however good the product might have been, it lacked any kind of

a sales promotion, and its first-year sales were dismal.

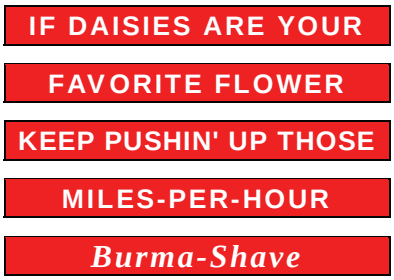



As luck would have it, as Allan was driving on a Minnesota highway one day during that unprofitable year, he happened upon a series of signs advertising a roadside gas station. The new Burma Shave sign campaign was born, and Allan convinced his father to invest $200 in lumber and paint to get the campaign underway. Allan and his brother, Leonard, installed their first set of signs along a road near Lakeville that was later designated as Highway 65.


Despite "experts" warnings that such an advertising campaign would never work, Allan and Leonard personally installed the signs all over the rural Midwest. They looked for good spots, got permission from the property owners, dug postholes, and mounted the finished slats all in one day. Of course, the brothers never placed their signs on the highway right-of-way, but to the motorists, the jingles were as much a part of the highway as the official traffic signs.

After the first year, Burma-Shave sales increased to $68,000, and within a few years, the jingles were seen on highways across the nation. By that time, Allan's work shifted from writing the verses and installing the signs to reading and judging thousands of entries in a contest for new jingles. Each winner received $100.

By the 1930s, road users' complaints were intensifying about the increasing proliferation of billboards along the busier highways. However, the Burma-Shave signs weathered the public storm, and by the early 1940s, the Odells were spending $100,000 per year on new installations. At that time, the signs appeared in countries around the globe. During World War II, American soldiers saw Burma Shave signs in Italy and coincidentally [?] on the Burma Road in the British colony of Burma. That the signs often promoted highway safety might have contributed to the longevity of the company's unique approach to reach potential customers:




Although the company was spending $200,000 per year by 1960, it was becoming evident that advertising along the roads was not as effective as it had been, and the company shifted some of its advertising budget to radio and television. Furthermore, with the advent of the Interstate Highway System and other modern roads, highway rights-of-way were widening, pushing advertising signs further from the road. Travel speeds and traffic were also increasing, making it more difficult for motorists to concentrate on the signs.

The year 1963 signaled a major shift in Burma Shave's marketing focus, as Phillip Morris, Inc., bought the Burma-Vita Company and concentrated advertising in other media. The new own-

ers started to uproot the signs and, within a few years, the Burma-Shave jingles were completely gone. Today, the product itself is no longer available. At the close of a 40-year era, Leonard Odell presented a rather ironic set of Burma-Shave signs to the Smithsonian museum:

SHAVING BRUSHES
YOU'LL SOON SEE 'EM
ON THE SHELF
IN SOME
MUSEUM
*Burma-Shave*

*Much of this write-up was based on articles by Richard and Joan Dunlop, "What Happened to the Burma-Shave Signs?" Home and Away magazine, July/August 1989, Pages 18-19; and William Childress, "Those Rollicking, Rousing Road Signs," Geico Direct magazine, spring 1991, Pages 32-33.*

## REST AREAS AND WAYSIDES

Minnesota has a long history of providing and maintaining rest areas and waysides along its highways. The following is a pictorial essay of some of these strategically located stopping places that provide a place to stretch, exercise, take a picnic lunch, or just take a break from the monotony of the road. Safety experts and health professionals recommend stopping every two hours on long trips.

J. Katz

The exit ramp to a westbound I-90 rest area southeast of Rochester in Olmstead County.

J. Katz

Picnic shed at locally-maintained park on Highway 23 in Bruno.


J. Katz

Another view of the Bruno Park.

J. Katz

Rest area building on northbound I-35 in Chisago County. A trail, off the right edge of the photo, circles through a wooded area.

J. Katz

This Minnesota travel and information center is unusual because it is not located in Minnesota. It's on eastbound I-90, about one mile west of the Minnesota state line in South Dakota. The woman on the bench is looking over some promotional material for southwestern Minnesota attractions, restaurants, and lodging that she picked up at the desk inside the building. Engineering investigations determined that Minnesota sites for the center were not suitable when it was being planned. The trucks in the background are stopped at a South Dakota travel center on the westbound side of the highway.

## SERVICE STATIONS

Automotive service stations and repair garages, much like the Burma-Shave signs, are not part of the street or highway right-of-way, but they are always immediately adjacent to it. And without them, motor vehicle transportation as we know it would be impossible. In the early days of the automobile, operators knew, without a doubt, that repairs would be needed several times a year. Tires would go flat, fan belts would break, and water pumps and brakes would fail. Today, such failures are rather rare in newer vehicles. Drivers who have been leasing cars for the past 15 years have probably not bought a new tire in all of that time. On the other hand, most drivers need to fill up the gas tank at least every two weeks. Furthermore, without regular maintenance, severe damage to moving parts can be expected over extended periods, although the mileage between recommended oil changes and lubrication has been increased considerably since our grandparents' time. So it is quite fitting to make mention of the automotive service stations in looking back over the evolution of roads in Minnesota's past.


Minnesota Historical Society

Francis Walch garage, ca. 1911, Rollingstone (northwest of Winona). By this date, the notion that the "horseless carriage" was a passing fad had long faded, and those far-sighted entrepreneurs who might have operated blacksmith shops or were in the wagon business were quick to branch out into automotive repairs. Note the "Good Year" sign in the window.


Minnesota Historical Society

Cars and Cowan Garage, ca. 1915, Windom. Note the word, "Livery," in the sign at the roofline. Judging from what appear to be several new autos parked in front of the building, this may have been an auto sales agency as well as a repair garage. All the cars are thought to be Buick models.


Minnesota Historical Society

Was this brand of gasoline well known in its time? Whether it was or was not, the pictured gas station south of Osseo was quite typical of the 1920s – two pumps and a small office. However, canopies were not quite so common. Service bays came on the scene a few years later.

Paynesville Oil Company, ca. 1920, Paynesville. This inviting scene was on the back of a post-card. Another early example of protection over the pumps, the canopy covers an area more than twice the size of the office. The post at left appears to be an air pump stand.


Minnesota Historical Society

Security Service Garage, ca. 1920. Hibbing. It appears that several autos could be serviced at one time in this garage. As in the other photos of the era, the word, "Garage," is prominently posted in a sign on the building; the term is not so commonly used in the auto service context today. Note the single gasoline pump at the curb.


Minnesota Historical Society


Minnesota Historical Society

Mobil Service Gas Station, East 46th Street and Minnehaha Avenue, Minneapolis, 1956. The architecture is very typical of its time. The hand-lettered sign in the foreground is not in error; regular gas was selling for $0.269 – not $4.269 – a half century ago.

Minnesota Historical Society


Minnesota Historical Society

The only gas station designed by Frank Lloyd Wright was constructed in Cloquet in 1958. He thought that most gas stations were ugly and were not properly integrated into the urban environment. The design shown here would have fit quite nicely into the modern city that he had in mind. A community celebration of its 50th year was planned in August 2008.

The station as it appeared in 1960. (Pine Journal)

# Maintenance, Then and Now 10

## MAINTENANCE, THEN AND NOW

Tens of billions of dollars have been spent establishing Minnesota's road and highway systems. With such a huge investment, a great effort must be expended to protect it. Therefore, maintenance of those systems becomes a top priority — over and above new construction and additions to the systems. Pictured here are some of the necessary maintenance activities that make it possible for our roads to remain in service and maximize their utility.

Minnesota Historical Society

Snow removal by public road departments is usually thought of in terms of mechanization. This was all the mechanization that was available in 1898 in Minneapolis.

Mn/DOT

Snow and ice control is one of the most visible of all maintenance activities and one that most immediately affects road users' safety and mobility. In this photo taken from an overpass on I-35E in St. Paul, seven Mn/DOT trucks are taking part in a "gang plowing" operation. It is a most effective way to remove snow from a multilane road.

The infamous Armistice Day Blizzard, November 11, 1941. Only one lane of southbound Highway 100 under the Highway 12 bridge had been cleared when this photo was taken two days after the storm.

Minnesota Historical Society

People may not realize that when snow is plowed to the curb in many central business districts, the job is only half done. Phase two involves removing the snow and hauling it away. Here, a snow auger and conveyor is loading trucks with snow that has been pulled back from the sidewalk on Minneapolis' Nicollet Avenue at Fifth Street in 1936.


Minnesota Historical Society


Minnesota Historical Society

Street repairs on LaSalle Avenue in Minneapolis, 1936. Worker protection leaves something to be desired according to today's standards. Safety vests were not even thought of until the late 1950s. The portable sign seems to indicate that parking is permitted next to the work area. Shovels appear to be the only tools assisting in the work.

J. Katz

Minnesota Historical Society

Surface restoration on Minnetonka Boulevard, in the city of Minnetonka, 2007. Prior to the paving operation, the surface was "milled" (scarified) and the recycled material was used along with fresh bituminous to renew the surface. While this operation may be thought of as "construction," it is usually budgeted as a maintenance activity.

Highway mowing somewhere in Minnesota in 1960. The machinery is a hammer-knife or "flail" mower. Forty years ago, it was common practice to mow the entire right-of-way in some areas; however, highway mowing has been reduced considerably since then as an economy move and a reversion to a more natural roadsides.

# Traffic Congestion & Mitigation 11

## THE ONSET OF TRAFFIC CONGESTION AND ITS MITIGATION

It may seem like traffic congestion has always been with us — particularly if you live in an urban area. But, believe it or not, there was a time when traffic jams were generally limited to traffic incidents (a crash or a stalled vehicle) or special events like football games, the State Fair, the fishing opener, Friday evenings on Main Street, or Fourth of July fireworks.

Minnesota Historical Society

Congestion has not been limited to the post World War II era as the photos on this and the following page clearly show. These automobiles were crawling on Harmon Place in Minneapolis, ca. 1935. Winter road conditions often exacerbate congestion levels.

Much of what we know as traffic congestion today proliferated after World War II when gasoline rationing ended, the suburbs began to grow, vehicle ownership rapidly increased, and transit ridership began to decline. However, as can be seen in the photographs accompanying this chapter, some traffic jams clearly predated the war, and even back then, people were trying to do something about it.

### Early Congestion Remedies

During the time when local road units were trying to get us out of the mud, traffic levels — even on some rural roads — were starting to cause concern. An early response to that concern was to pave *two* lanes of those roads instead of one. While the practice of paving only one lane might seem foolish today, at the beginning of the twentieth century, one lane of pavement was thought to be quite sufficient. On the infrequent times when two automobiles would be traveling in opposite directions, one driver would simply pull off the pavement and let the other automobile pass. Similarly, when a slow vehicle was encountered, the slower driver was expected to pull off the pavement to allow the faster vehicle to pass. Perhaps one of the reasons that the automobile horn was invented was to help accomplish this maneuver.

Mn/DOT Library

Congestion was not limited to urban areas – even as early as 1941. It doesn't appear that the Highway Patrol officer can do very much to alleviate the situation. This is a trunk highway intersection, somewhere in Minnesota – perhaps the junction of Highways 55 (to the left) and 49 (Highway 149 today) in Eagan.

In the 1930s, paving both lanes of a two-lane road had already become a standard practice, but, even then, safe passing opportunities became harder to find — particularly near the Twin Cities. Too much traffic was coming from the opposite direction. The solution? A three-lane highway. Not today's familiar three-lane road in which the middle lane is reserved for left-turning vehicles; rather, a road in which the middle lane was reserved for passing in either direction. (Most passing drivers would make sure that another driver was not attempting to do the same thing from the other direction before pulling into the middle lane. *Most* . . . but not all.)

The three-lane highways with the passing lane were located primarily in the Twin Cities metro area and included Highway 8 from Minneapolis to Forest Lake and beyond, Highway 10 north of St. Paul to Anoka, Highway 5 from Rowland Junction ("Flying Red Horse" to you oldtimers, "Eden Prairie" to you youngsters) to Fort Snelling, and Highways 169 and 212 from north of Shakopee to Highway 100, among others. Service station maps — which were free at the time — identified these roads as "super highways."

The highways with a passing lane were 27-feet wide — only 9 feet per lane, as compared to today's standard 12-foot traffic lane. Furthermore, on grades steep enough to cause erosion of the gravel shoulders from rainwater running off the road surface, the pavement was constructed with sloping curbs on the edges to control drainage. To drivers, the curbs made the narrow lanes appear to be even narrower. Drainage control curbs to protect the shoulders were also placed on the low

## DID YOU KNOW

A 2007 report by the nonprofit Reason Foundation of Los Angeles ranked Minnesota 49 out of 50 states for its level of urban Interstate freeway congestion. The report noted that 78 percent of Minnesota's urban Interstate mileage was congested. Only California had a worse level (83 percent). States with the least urban Interstate highway congestion included North and South Dakota (0 percent). Overall, 52 percent of the nation's urban Interstate was rated as congested. The Minnesota ranking might be considered suspect by anyone who has driven on urban Interstate highways in Illinois, Texas, Washington State, and some of the eastern states.

The foundation ranked the overall performance of state highways based on 12 different categories, including traffic fatalities, congestion, pavement condition, bridge condition, highway maintenance, and administrative costs, to determine each state's ranking and cost-effectiveness. On that overall scale, Minnesota ranked 13, with North Dakota and California again taking first and last places, respectively.

edge of super-elevated (banked or tilted) roadway curves. Therefore, significant portions of these roads were lined with curbs that forced drivers to concentrate on avoiding them.

All of these three-lane road surfaces were constructed of concrete, with the joint lines (rather than paint stripes) serving as lane markings. For hill crests and curves that did not provide sufficient sight distance for safe passing, a yellow paint stripe was added, beginning with a diagonal across the passing lane and continuing adjacent and parallel to the joint line, directing traffic to stay in the right lane until sight distances became adequate for passing.

Needless to say, driving on these "super highways" was rather uncomfortable, even for experienced drivers. Passengers would grit their teeth and hope that their driver, while snaking through the narrow passing lane, would know what to do if a car approached from the other direction. On a crowded Sunday afternoon, a lot of near misses were likely.

The three-lane highways disappeared from the scene in the late 1950s. A stripe was painted down the middle, converting them to two-lane roads with an extra-wide 13.5-foot lane in each direction. This, of course, reduced the number of passing opportunities as well as the opportunity to pass several vehicles in one passing maneuver. But it also reduced the likelihood of head-on collisions.

A few years later, another safety measure was implemented on those highways that were now two-lane roads. The Highway Department removed the curbs. In their place, the shoulders were paved where erosion of the gravel could be a problem.

## Major Capacity Improvements

A much safer solution to the passing problem and the related traffic congestion was the widening of roads to four traffic lanes. In many cities of all sizes in Minnesota, there had been enough foresight in the construction of major streets to make four-lane roads feasible with little pain. In some cases, it was as simple as converting angle parking to parallel parking and providing lane striping. Some roads in relatively undeveloped locations were widened within existing rights-of-way, or new alignments bypassing developed areas were pursued. Widening was nearly always accomplished without a dividing median. Although some divided roads were constructed, they were usually parkways within cities, and traffic capacity was not an important consideration in their design.

The left lane of these four-lane streets and highways was popularly referred to as the "passing

### DO YOU REMEMBER?

Early highway traffic lanes were narrower than today's standard 12-feet width. (Roads built prior to 1940 could have had lane widths as narrow as 9 feet or less, depending on when they were constructed.) A traffic phenomenon often occurred on those narrow roads with two-way traffic: a loud "whoosh" and a sudden rocking from side to side when two vehicles passed one another. The experience and its intensity were dependent on several factors: the stability of one's vehicle, the width of the lanes, the speed of one's vehicle, the speed of the opposing vehicle, the size of the opposing vehicle (large trucks or buses produced the greatest effect), the quality of the sound insulation in one's vehicle, and whether the vehicle's windows were open. The sensation would quickly dissipate, assuming the car's shock absorbers were in good condition, but if the lanes were very narrow, or the other vehicle very large and fast, the shock could seem sufficient to push your car sideways. And if several vehicles in a queue were being passed, the noise and the reverberations would repeat themselves in quick succession — "Whoosh!, Whoosh!, Whoosh!, Whoosh!"

lane," and they worked quite well as long as through traffic was light enough to keep to the right lane. However, when traffic volumes were high and a significant number of vehicles were making left turns, the potential for rear-end and sideswipe collisions increased as drivers used the left lane as a through lane. Drivers making lane changes to avoid the turning traffic compromised the efficiency and safety of the road. (Left-turn and right-turn lanes were not provided in the 1930s when these roads were widened.) In addition to city streets around the state, several four-lane (undivided) highways were constructed in the Twin Cities area during this time, including Highway 7 from Excelsior to Highway 100, Highway 52 from the West Broadway Avenue traffic circle through Robbinsdale and Crystal (now Hennepin Country Road 81), Highway 100 from Highway 5 to Excelsior Boulevard, Highways 169 and 212 on Excelsior Boulevard in St. Louis Park, and Highway 36 north of St. Paul. Shorter segments of highway and many wide city streets were marked for four lanes around the state, most of which were the main street of larger towns.

Congestion on rural roads became more prevalent over time. However, in most cases, the traffic volume on these roads was never sufficient to justify the expense of building and maintaining a four-lane highway. But, as traffic increased, passing opportunities decreased, making for long queues of vehicles and increasing the potential for unsafe maneuvers and crashes. Construction of appropriately spaced passing lanes on some of these roads has provided safe passing opportunities for drivers. Where such passing lanes are provided, many drivers will wait until they arrive at one rather than pulling out into opposing traffic. To help maintain patience and increase safe driving behavior, signs are frequently posted to inform drivers of the distance to the next passing lane.

Another relatively recent (mid-1970s) innovation to address urban congestion was the re-introduction of the three-lane road. The middle lane did not provide for passing, however. Rather, it was designed as a continuous, two-way, left-turn lane for use on roads and streets that had closely spaced driveways on both sides. The design nearly eliminated the congestion caused by drivers waiting to make left turns. Initially, there was reluctance to provide these two-way, left-turn lanes because it seemed they would provide a high potential for head-on collisions between opposing drivers attempting to turn into driveways just beyond one another. A number of studies of the initial three-lane installations, however, showed that such concern was unwarranted. Other studies also showed that the overall operational efficiency of this type of facility was better than four-lane streets without turn lanes. Accordingly, a number of four-lane streets were converted to three-lane operation. In some locations with high traffic volumes, a five-lane road has been provided with a two-way, left-turn lane.

## Divided Highways

By the mid-1930s, some of Minnesota's rural roads were operating at capacity level on weekends, as residents traveled to "the lake." One of the first rural divided highways in the state, Highway 10 between Elk River and Anoka, came into existence in 1938 when a parallel roadway (eastbound) was constructed and the existing roadway was improved to address weekend traffic demand. The westbound roadway, having served since 1919 as a two-way highway with an 18-foot-wide concrete pavement, was re-graded to accommodate a 24-foot driving surface. It is perhaps interesting to note that 24 feet continues to be the standard width for a two-lane road. (The Massachusetts Turnpike was constructed in 1957 with 26-foot roadways [13-foot lanes]; however, the additional width never caught on as a standard.)

Increasing traffic volumes and congestion in urban areas made divided highway approaches to major cities much easier to justify. Obviously,

daily traffic volumes of that time did not even remotely approach the six-digit volumes carried by some of our freeway routes today, but traffic planners of the day had future traffic demand and safety on their minds.

One of the most ambitious prewar highway projects was the construction of Highway 100 in St. Louis Park and Golden Valley starting in the late 1930s. Extremely high unemployment rates resulting from a severe economic depression were part of the impetus for undertaking the project. A far-sighted plan to encircle the Twin Cities with a beltline also provided motivation for building the highway. Although parts of the highway were not initially constructed as a divided road (much to the chagrin of the project engineer), it was the first highway in Minnesota to employ grade separations at all major road crossings. Three of the first cloverleaf interchanges in the state were part of the project. (Divided roadways for Highway 12, mostly on new alignment both east and west of the Twin Cities, were constructed in 1940.)


Minnesota Historical Society

Congestion, 6th and Minnesota Streets, St. Paul, ca. 1930. In "downtown" areas, pedestrians are an added factor in congestion levels.

Also before the war, a divided roadbed on a new location for Highway 65 was graded through Bloomington and Richfield as far north as 56th Street in south Minneapolis. However, as the war effort intensified and highway development slowed, placement of the driving surface was deferred. Highway 65, therefore, remained on Lyndale Avenue South until 1959 when I-35W was opened for traffic over what had been intended as the new location for Highway 65. (Route markers for both highway numbers were posted on the freeway when it was first opened to traffic.) Several more bridges were added to the roadway layout to comply with the no-at-grade-intersection requirement for Interstate freeways.

## Postwar Traffic

The end of World War II marked the beginning of a significant increase in the state's traffic volume levels and miles driven. Gas rationing ended, the mandatory 35-mph wartime speed limit was rescinded, and automobile manufacturing resumed after nearly a four-year hiatus. The number of motor vehicles registered in the state had climbed from 2,500 in 1905 to 747,000 in 1940; but only ten years later, the number rose to 1.2 million, and traffic congestion was quickly beginning to outpace the wherewithal of the state, counties, and cities. Before 1950, one car per family was the norm (and not every family had one); but as women entered the workforce in increasing numbers and student employment increased, two- and three-car families became more common.

By 2000, there were 4.2 million licensed vehicles, traveling a total of 52.4 billion vehicle-miles per year. One recent indicator of rising traffic volumes in the state is the number of

new homes being built with three-car garages — a nearly unheard of amenity before the later twentieth century. Another indicator is the mileage of six-lane city streets and the proliferation of dual left-turn lanes that have been constructed in recent years in the Twin Cities suburban area. It wasn't that long ago that a four-lane divided road seemed to be more than adequate to serve as a major arterial.

Rising traffic congestion in the Twin Cities area has also been a result of the downward trend in transit ridership, which peaked in 1922. Although there was a significant recovery in ridership during World War II, by 1957, rider numbers had plummeted to less than one-third of what they had been 35 years earlier, despite the conversion from streetcars to an all-bus system in 1954. The conversion permitted easy expansion of the transit routes to the post-war developing suburban areas without the expense of extending track in the old rail system. However, the dispersal of the population and its lower density on the outskirts made extension of most transit routes economically unfeasible in outlying areas. The following table highlights the dramatic ridership decline:

| Transit Ridership<br>Twin City Rapid Transit<br>(Metro Transit from 1967) | |
|---|---|
| **Year** | **Ridership** |
| 1922 | 226,543,924 |
| 1940 | 104,313,619 |
| 1946 | 201,527,022 |
| 1957 | 74,479,993 |
| 1980 | 70,000,000* |
| 1998 | 66,000,000 |
| 2006 | 73,400,000 |

Note: Figures do not include ridership of local "opt-out" transit providers in the Twin Cities area. *Estimate

Minnesota's growing population — particularly in the Minneapolis-St. Paul metro area — has also been a contributing factor in congestion, as shown in the two tables that follow:

| Minnesota Population | |
|---|---|
| **Year** | **Population** |
| 1920 | 2,387,125 |
| 1940 | 2,792,300 |
| 1960 | 3,413,864 |
| 1980 | 4,075,970 |
| 2000 | 4,919,479 |
| 2005 | 5,210,000* |

*Estimate

| Twin Cities<br>Metro Area Population | |
|---|---|
| **Year** | **Population** |
| 1920* | 728,327 |
| 1940* | 967,367 |
| 1955 (Est.)* | 1,245,900 |
| 1980 (MSA)** | 2,234,190 |
| 2000 (MSA) | 2,968,806 |
| 2006 (MSA, Est.) | 3,175,041 |

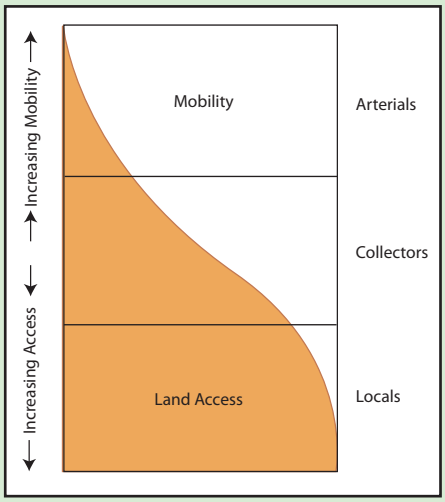
*Five County Area
**Metropolitan Statistical Area (12 counties)

## The Freeways' Debut

In 1958, the first Interstate highway project in Minnesota was completed near Owatonna. The 8.3-mile segment of I-35 was also the first true freeway to be constructed in the state. By virtue of its limited access and absence of at-grade crossings, a freeway's traffic-carrying capacity is con-

## A PLANNING DILEMMA: LAND ACCESS VS. MOBILITY

There are many factors that contribute to traffic problems, but one reason for traffic congestion in populated areas is that roads in such locations serve dual purposes: *land access* and *mobility* — purposes that have a high degree of mutual interdependence and incompatiblity. Without land access, roads are of no use. But without high mobility, road function is greatly hampered.



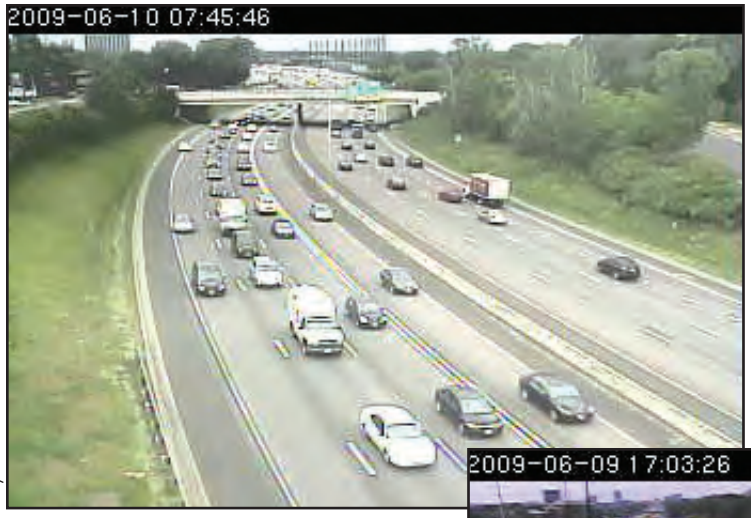

The curve at right shows a relationship between roads with high mobility and those with optimal land access. At the top of the scale are freeways. No trip begins or ends on a freeway, i.e., the freeway is not a destination — and, by definition, a freeway does not have any intersecting driveways or at-grade intersections with other roads. At the bottom of the scale are local destinations, such as residential streets, roads leading to employment center parking lots, or access roads into shopping malls. In a residential area, a street might have individual driveways leading to each house on both sides of the street.

The problem is that most roads between the extremes of freeways and local streets serve both access and mobility needs. A worst-case scenario might be a two-lane street that provides the only reasonably direct road between two relatively distant major destinations, has extensive commercial development on both sides with direct access driveways, has intersections at one-block intervals (some with traffic signals or all-way stops at randomly-spaced intervals), and has no restrictions on turning movements — a street that most people would choose to avoid if they could.

In practice, most roads can effectively provide both access and mobility needs. However, that cannot be achieved without some compromise: access has to be limited to some degree, and mobility must be sacrificed to some extent. The compromises also need to be suited to the density of the adjacent development and the level of through traffic that the road is expected to serve. In the worst-case scenario described above, there are a number of measures that might be taken to optimize service toward both purposes. Of course, the earlier such steps are taken in the development of a traffic corridor, the easier it is to implement those measures. Whether earlier or later, some significant expenditures are likely to be necessary.

Both mobility and access have been improved by constructing turn lanes, reorienting driveways to frontage roads and "backage" roads, and limiting turns with signage or medians. Proper spacing of signalized intersections, re-timing the signal systems, coordinating them to limit the number of stops, and implementing vehicle detection systems on each approach to a signalized intersection all contribute to significant improvements in traffic flow. Each of these measures and others have been shown to increase road capacity, reduce driver frustration, reduce auto emissions, and improve business in the affected locations.

In some instances, access control tends to make access more circuitous and results in a slight increase in the distance traveled to a destination; however, studies have shown that the total elapsed trip time from origin to destination remains comparable. Studies over time have also shown that when access management measures such as those described here are implemented, property values increase, and there is a tendency for the land use to evolve to "higher and better use"; e.g., fast food establishments or used car lots are eventually replaced by office, entertainment, retail, and restaurant developments.




Mn/DOT RTMC Website

Congestion is evident on eastbound I-394 in Golden Valley during the morning peak period shown in this Mn/DOT surveillance camera image in June 2009. Note that traffic volume is somewhat lighter on the Mn/Pass lane next to the median.

I-494 in Bloomington was widened to eight lanes a few years before the date on the photo, but traffic is heavy – particularly in the eastbound direction. The eastbound roadway narrows to three lanes at the East Bush Lake Road exit, nearly one mile to the east of the RTMC surveillance camera from which this still reproduction was taken. See the traffic flow map that corresponds to the time that this photo was taken on page 160.


Mn/DOT RTMC Website

siderably greater than other types of highways or, as they are sometimes identified, "conventional roads." Studies have shown that a four-lane freeway, at capacity, can carry more vehicles than a modern six-lane, divided, conventional road. Quite understandably, then, the freeway was seen as a highly effective way to deal with traffic congestion. That may account for the major change in the Interstate System's concept by the time Congress approved it in 1956. When the system was envisioned in the late 1930s, freeways would have approached the country's major cities but bypassed them on the outskirts. The system approved in 1956, however, identified routes through those major cities and close to their central business districts.

Freeways in Minnesota, in fact, carry a traffic load far out of proportion to their mileage. Although they account for less than 1 percent of the state's total road mileage, Interstate highways carried 23 percent of the vehicle-miles traveled in 2001, a figure close to the national average. Generally, freeways are favored over conventional roads by most motor vehicle commuters and intercity travelers. Furthermore, as towns' urban limits have spread ever further into the countryside, freeway bypasses have become increasingly important in controlling attendant congestion. (A case in point: In 1957, a four-lane, divided bypass was constructed outside of the city of Faribault for Highway 65. Some years later, when I-35 was constructed in the same vicinity, it was built as a bypass even further to the west rather than routing it over the earlier Highway 65 bypass, partly because of the intense development that followed construction of Highway 65.)

## Congestion Catches Up with the Freeways

In 2006, the National System of Interstate and Defense Highways celebrated the 50th anniversary of its authorization by Congress. But, today, the freeways that were supposed to be an answer to traffic congestion have, themselves, become congested. Many reached their twenty-year forecasted traffic volumes long before twenty years had passed, and a large majority of those freeways

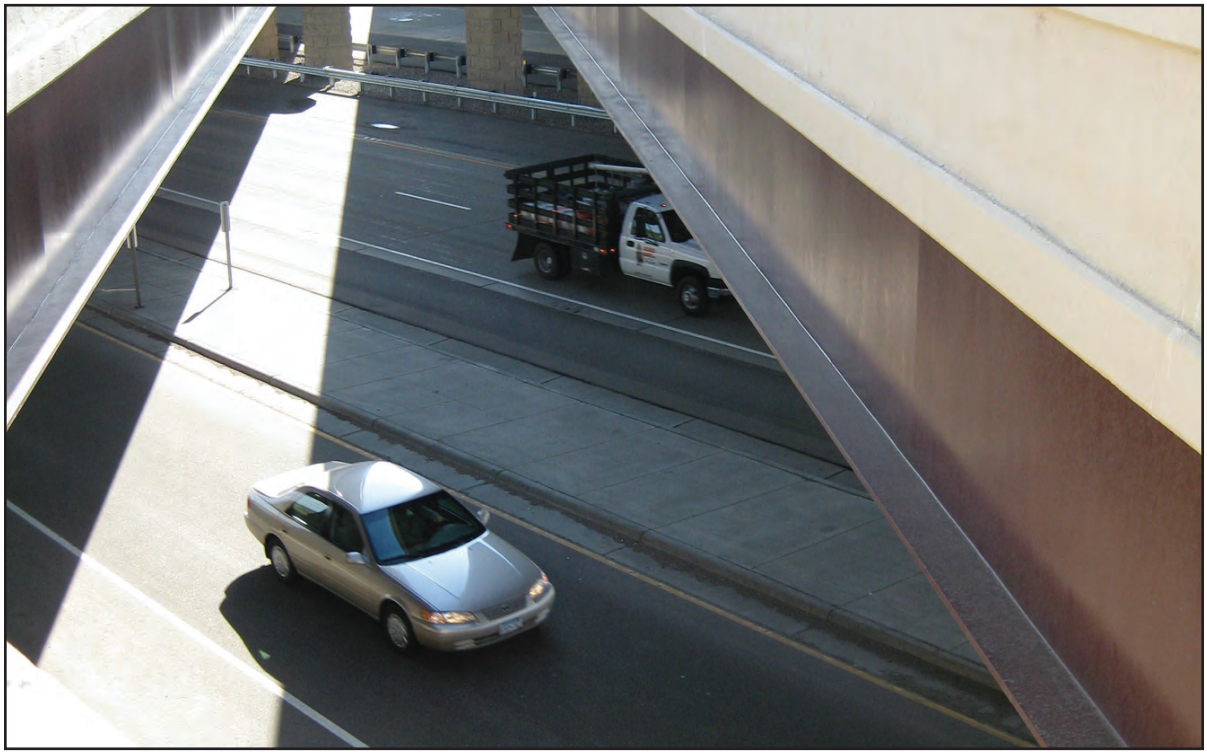
were completed before 1980. The amount of travel on Minnesota freeways has increased dramatically. Mn/DOT has reported a pertinent measure of the increase in congestion levels in the Twin Cities: The capacity of metro-area freeway and arterial systems increased by approximately 12 percent in the decade ending in 2006, while the vehicle-miles traveled on those systems in that same period increased by 25 percent.

The pace of road and highway construction has lagged significantly behind the pace of population and economic growth in Minnesota. In 2009, only a few miles of major freeway capacity improvements were underway in the Twin Cities and only a few more miles of highway were being upgraded to freeway standards. A few proposals for short segments of freeway were in the preliminary planning stages, but given the available funding, construction of any of them might be many years in the future.

Planning for rural freeways to connect major population centers in Minnesota — over and above the city bypasses that were built throughout the state — was begun by Mn/DOT in the late 1990s, namely between Rochester and the Twin Cities and between Mankato and the Twin Cities. Some interchanges were constructed on both of the existing expressways — a few as early as the 1960s, and some in the current century. However, most of the funding for upgrading those routes had not been identified by the time of this publication. Maintenance of the existing system, presumably the first priority, is underfunded, and a substantial amount of highway construction in the state has been subject to delays and deferrals, some of which were necessary to fund other high-priority road projects.

## More Congestion Statistics

Twin Cities' area commuters have good reason to believe that congestion has taken over a signifi-



J. Katz

Highway 169 was reconstructed as a four-lane divided highway between Mankato and Shakopee, starting in the 1950s. Much of the upgrading was carried out on new alignment that took the highway out of several cities along the way, making for much easier trips and a reduction of traffic (especially heavy trucks) on "main street." This unusual view of one of the latest reconstructions in Belle Plaine looks down between the twin bridges of Highway 25 over Highway 169 from the north abutment.


J. Katz

This photo of the Highway 169/Highway 25 interchange features the loop in the southwest quadrant.

A rather quiet mid-afternoon, looking east on Main Street in Luverne. Before the parallel I-90 was completed one mile to the south in 1965 and 1966, Main Street was the route of US Highway 16, which crossed the southern tier of Minnesota counties from South Dakota to Wisconsin. Most of the traffic has left Main Street, while Highway 75 between I-90 and Main Street has been widened and business appears to be lively.


J. Katz

cant portion of the freeway system. A 2002 Mn/DOT report cited approximately 55 one-way miles of the system that were experiencing congestion (speeds less than 45 miles per hour) for more than three hours during the late-afternoon peak period. An additional 55 one-way miles were experiencing congestion for two to three hours. Tellingly, the late-afternoon peak period, commonly identified as 4:00–6:00 p.m. in the 1960s, was identified as 2:00–7:00 p.m. for the 2002 study. Similarly, the definition for the morning peak hours, formerly 7:00–9:00 a.m., was identified as 6:00–9:00 a.m in the study. Additionally, a noontime peak has recently become evident in some locations, and there are segments of the system where Mn/DOT has concluded that the freeway is running full from 6:00 a.m. to 7:00 p.m. While this situation includes hours when the travel speed is greater than 45 mph, a congested condition still prevails — and it should be understood that congested conditions at higher speeds increase the potential for, and the severity of, crashes.

Other statistics also confirm that the level of traffic congestion on Minneapolis and St. Paul area roads is not just a perception of drivers that use them. Despite the metro area's population density of 489.656 persons per square mile that ranks 74th out of 331 in the nation, Minneapolis/St. Paul ranks 17th in terms of the most traffic delay, according to the Texas Transportation Institute's 2007 *Urban Mobility Report* covering data collected in 2005 for the country's 85 largest urban areas. That translates into 40 hours per person per year in traffic delay (three hours more than in 2004 and 38 hours more than in 1982); 30 gallons of gasoline per year per peak-period commuter; and $1.1 billion in total economic loss in terms of wasted fuel, lost productivity, and delayed deliveries.

Pictures on page 152 give some indication of what is happening to the metro area freeway system. The photos are stills taken from the Regional Transportation Management Center's CCTV cameras during the daily peak traffic hours in 2009. Even with the economic recession that was underway at the time, only a slight reduction in traffic volumes

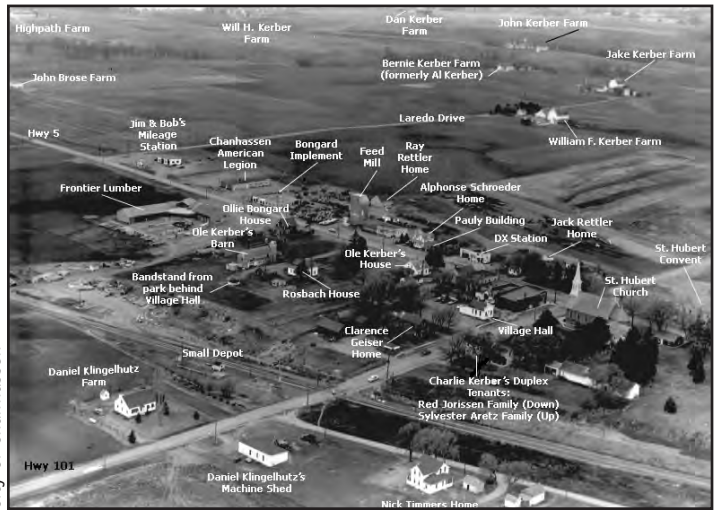
was noted on most of the freeway system. Although the recent period of $4/gallon gasoline increased the number of transit riders in the I-394 MnPass lane, congestion is still evident. Stop and go traffic is shown on I-494 where only a few years before, the former four-lane freeway was widened to eight lanes.

As another example, consider the daily recurring congestion on the three parallel freeways on the west side of the metro area: I-494, Highway 169, and Highway 100. In 2006, completed reconstruction on I-494 added a third lane in each direction; similarly, completed reconstruction of Highway 100 in 2004 added another lane each way. These two freeways now have up-to-date design features employing geometric standards that virtually eliminate impediments to optimal traffic flow. Highway 169, although an older freeway with only two lanes in each direction, somewhat steeper grades, and a few interchange geometrics that might have been smoothed out had they been designed under current practices, is, however, essentially a straight road with only limited impediments to optimal traffic flow.

Congestion occurs every weekday evening (with some complementary congestion occurring in the morning in the southbound direction) on each of the three freeways. Ironically, northbound Highway 100 backs up 1½ miles from Duluth Street to 36th Avenue North, just as it used to each day for 30 years when there were only two northbound lanes and a traffic signal at the 36th Avenue intersection.

It is also worth noting that there is one more parallel freeway serving north-south traffic in this region. I-94 in Minneapolis, with as many as five lanes in each direction, is located only three miles east of Highway 100. It did not exist when traffic started backing up on Highway 100 from 36th Avenue North; however, soon after I-94 was completed, queues back to Duluth Street once again became an everyday occurrence.

Although traffic congestion is usually thought of as an urban phenomenon, rural freeways and other roads have not been spared. As more and more people have moved to the outlying areas to take advantage of lower housing costs, many of them must commute over what had previously been considered rural areas, thereby increasing daily traffic volumes on both local and regional roads. Cities such as Princeton, Cambridge, and North Branch on the north; all cities in western Wisconsin on the east; Red Wing, Faribault, and New Prague on the south; and Belle Plaine, Victoria, Buffalo, and Monticello on the west have clearly developed as "bedroom" communities for the metro area. Commuting also takes place from St. Cloud, Mankato, and Rochester — to say nothing of the daily traffic congestion that is experienced in and around those cities. In fact, Rochester experienced traffic levels sufficient to justify the reconstruction and expansion of the Highway 52 freeway bypass to six lanes around the south and west sides of the city in 2006.




City of Chanhassen

This black-and-white photo, courtesy of the city of Chanhassen, shows what the city looked like in 1954 with Highway 5 running through the middle of its commercial district. In 1964, Highway 5 was constructed on a new alignment, bypassing the city by as much as one-quarter mile to the south. The congestion that exists today on the old Highway 5 is totally local traffic due to the tremendous expansion of commercial venues along the street.

Roads to the locations mentioned in the previous paragraph have also experienced an increase in traffic congestion occurring on the weekends. The Friday-afternoon rush out of the metro area has begun earlier in the day, as drivers try to beat the traffic. And late-Sunday afternoon returns are characterized by a traffic crawl on southbound I-35, from as far away as Pine City, more than 50 miles to the north. Saturday shopping traffic has also become congested in many locations.

Increases in semi-trailer truck traffic on rural freeways and other primary routes are another reason for an increase in congestion levels. In the latter half of the twentieth century, a significant number of railroad abandonments led to an increase in the number of long-haul truck operations on the highways. Though it has the eighth highest total in the United States, the miles of railroad in Minnesota dropped more than 40 percent, from 8,421 in 1941 to 4,989 miles in 2006. The amount of trucking, of course, also reflects the general growth in Minnesota's economic activity. Today, truck traffic comprises more than 10 percent of the total traffic volume on the more heavily traveled rural routes across the state. In some locations, the numbers exceed 20 percent. It becomes startling clear that our national economy is highly dependent on trucking when you examine the traffic flow on I-94 over the St. Croix River into Hudson, Wisconsin.

## Is Traffic Congestion Here to Stay?

So, what is the prognosis for congestion amelioration on Minnesota roads and highways? Given the 2009 local and Mn/DOT transportation funding situations, as well as the highly complex project development procedures (including lengthy agency and environmental reviews, citizen involvement process, and a reluctance to condemn urban property), it seems quite unlikely that the state will be able to provide sufficient traffic capacity to keep pace with growing congestion problems. In other words, congestion will likely continue to increase. Certainly, local improvements will deal with bottlenecks; but without a corridor-wide solution, the bottlenecks will tend to move downstream and generate new congestion problems in new places.

This is not a condemnation of the current project development process. For the most part, it has provided projects that have served the overall public interest. A case in point: the construction of I-35 in Duluth east of Mesaba Avenue, as covered elsewhere in this book. However, it should be recognized that it took 37 years to plan, gain approvals, and complete construction on the Duluth project.

However, the situation is not entirely hopeless. Twin Cities area park-and-ride spaces seem to fill up as fast as they can be built, indicating drivers' desire to ameliorate the congestion situation. For example, the Maple Grove Transit Station's 924-stall parking ramp, opened in 2003 near the intersection of I-94 and Hemlock Lane, was filling up by 8:30 a.m. in late 2007, in spite of the city's 2006 opening of another park-and-ride site at a nearby Wal-Mart parking lot on I-94 at County Road 30. The latter site was intended as a stopgap measure to deal with overcrowding at the ramp.

As if to underscore the significance of the park-and-ride popularity, Maple Grove Transit, an express bus service provided by the city, had a 52 percent increase in ridership between 2005 and 2007. Given the combined capacity of the two park-and-ride sites, it can be assumed that at least 900 vehicles are *not* part of the peak period traffic demand on I-94/I-694 in the northwest part of the metro area. This number is significant when considering that the capacity of a freeway lane is about 2,400 vehicles per hour — assuming that modern traffic management systems are in effect.

The Maple Grove case is not an isolated phenomenon. Overflow parking beyond the marked

spaces of park-and-ride lots can be observed at locations around the Twin Cities area. Metro Transit has constructed parking ramps on many of the lots that were overflowing, and some of the ramps have been expanded as they have filled up. Park and ride popularity is probably part of the reason that transit ridership is on the upswing after a long period of decline.

The implementation since 1992 of bus-only shoulders has also had an influence on traffic congestion trends. By 2007, nearly 300 miles of these shoulders (the highest total mileage of any metro area in the United States) were designated on one or both sides of Twin Cities' freeway segments and other arterials. During peak congestion periods, bus drivers may use these shoulders at their discretion (according to guidelines that have been written into statutes) to pass slow traffic, thus assuring faster travel and more predictable trip times for bus passengers.

At one of the highest-use freeway shoulder locations, 250 buses per day have been observed. Without the authorized shoulder use, these buses would be mixed in with the other traffic on the regular lanes of a crowded highway. Furthermore, if the buses themselves did not exist, an estimated 10,000 additional vehicles would be on the freeway (based on a somewhat conservative estimate of 40 passengers per bus). On a freeway already carrying nearly 200,000 vehicles per day, another 10,000 could not be easily accommodated.

Rising gasoline prices are also playing a role in transit ridership. The increase in the number of passengers in 2008 closely paralleled the increase in price per gallon of gasoline.

Another encouraging figure is the use of transit bound for the Twin Cities' central business districts. The latest reports indicate that 40 percent of commuters to downtown Minneapolis arrive by transit; the figure for downtown St. Paul is 17 percent. On the other hand, less than 20 percent of daily trips in the metro area are headed to the Twin Cities' central business districts. Most of the remainder of daily trips to employment centers are made by single-occupant automobiles. The fact that the areas' major *circumferential* and *cross town* routes are often congested in both directions during peak traffic periods indicates that drivers are not using transit or carpooling for a significant portion of those trips. Furthermore, a very high percentage of the trips on *radial* routes that approach the central business districts are pass-through trips that use those roads only because they are the most convenient routes between home and employment locations.

However, there are a few bright spots. Despite the opposition during the 30 years leading up to its completion, the Hiawatha light rail line appears to be a success, generating a ridership well above forecasts. At the time of this writing, planning for a line between the Twin Cities' downtowns was underway. Construction on the North Star commuter rail project began in 2007, with service scheduled to begin in 2009 between Big Lake and Minneapolis, and trip time estimated to be half that by automobile. The corridor it will serve is one of the fastest-growing in the nation. Also, the University of Minnesota, one of the largest traffic generators in the metro area, continues to have a relatively high percentage of students using a network of express transit routes specifically designated for the university.

As encouraging as the transit picture seems to be, however, it must be pointed out that the outlook for completion of a rail network covering the Twin Cities is several decades away, given available funding and the length of project development.

## What Else Can Be Done?

The decidedly pessimistic view of congestion trends has not deterred Minnesota transportation officials from seeking solutions. In 2007, Mn/DOT and the Twin Cities Metropolitan Council aggressively pur-

sued funding through a new federal program designed specifically to address the nation's urban traffic congestion problems. Mn/DOT and local sources put up $55 million to match $133 million in federal funding in an Urban Partnership Agreement (UPA), with the understanding that the following projects wold be underway by 2008, with completion or implementation no later than 2009. The installation of traffic control devices, including signs and traffic signals, continues to be, by far, the most prevalent and obvious measure available to deal with traffic congestion. Some of these devices have been around as long as the automobile. More recently, roundabouts have gained popularity all around Minnesota as an efficient means for dealing with intersection traffic. A section covering the background and operation of this traffic control strategy is found elsewhere in this book. Freeway traffic management is another huge and relatively recent way to effectively mitigate congestion.

In a specific instance of dealing with traffic congestion, Mn/DOT and Twin Cities Metropolitan Council officials aggressively pursued funding in 2007 through a new federal program designed to address the nation's urban traffic congestion problems. The Urban Partnership Agreement (UPA) awarded $133 million to Minnesota with the understanding that the following projects and strategies would be underway by 2008 and completed or implemented no later than 2009:

- Priced dynamic shoulder lanes, similar to the I-394 MnPASS, on I-35W from 46th Street to downtown Minneapolis
- Addition of a High-Occupancy Toll (HOT) lane in the I-35W/Highway 62 reconstruction project from 66th Street to 46th Street
- Conversion of the High-Occupancy Vehicle (HOV) lane to High-Occupancy Toll (HOT) lane on I-35W from Burnsville Parkway to 66th Street


Mn/DOT RTMC

A widened left shoulder on I-35W north of 46th Street will serve buses, carpools, and MnPASS holders during peak traffic periods, starting later in the 2009, as shown in this computer-generated image. The overhead signing will include changeable message modules that can be used as lane-control indications (green or yellow arrows, red X) or advisory speed indications. The shoulder lane will be an addition to the four existing freeway lanes.

- Implementation of the Highway 77/Cedar Avenue Bus Rapid Transit (BRT) improvement between downtown Minneapolis and Lakeville built ahead of formerly scheduled date.
- Construction of additional park-and-ride lots along the I-35W corridor north and south of Minneapolis
- Construction of additional dedicated bus lanes on Marquette and Second Avenues in downtown Minneapolis
- Partnerships with major employers along the I-35W corridor to promote flex-time and telecommuting programs
- Use of additional Intelligent Transportation Systems (ITS) technology

Mn/DOT has also developed a priority listing of relatively low-cost congestion-relief projects based on three model projects carried out in the last several years:

- Lane additions to I-94 between McKnight Road and Century Avenue in Maplewood
- Lane addition to westbound I-394 between Xenia/Turners Crossroad and Highway 169 in Golden Valley
- Lane additions to Highway 100 between West 36th Street and Cedar Lake Road (just south of I-394) in St. Louis Park

Strategies developed for these projects were used in the wake of the I-35W bridge collapse in 2007 to provide temporary congestion relief on I-94 from I-35W to Highway 280, as well as on Highway 280, itself, and elsewhere in the affected area.

## Minnesota is Not Alone

It may be small consolation, but traffic congestion is not just a Minnesota problem. Indeed, most states have at least one concentrated urban area and the traffic problems commonly associated with such areas. Furthermore, it might be encouraging to know that traffic congestion is considerably worse in some states than it is in Minnesota, despite how we may feel about our local situations. Minnesota is fortunate that its urban growth is generally not constrained by physical features such as large bodies of water or mountain ranges, as are Seattle, Milwaukee, and Chicago. Such features tend to concentrate growth in one lateral direction, or at least to one side of town, thus often limiting the number of feasible and practical transportation corridors. Also, since congestion is a nationwide problem, there is some guarantee that it will continue to warrant federal attention, as it has over the last few years.

## A Summary of the Congestion Situation

Traffic congestion has rendered many of our roads and highways less effective in moving traffic at a reasonable pace from Point A to Point B. Over the years, there have been many attempts to deal with the problem. Relocating roads over better alignment, bypassing built-up areas, adding lanes, constructing turn lanes at intersections, installing traffic control devices, and freeway traffic management systems have all helped improve congested routes. However, all these remedies have limitations, and, as is all too plainly evident, some of the so-called solutions have led to even greater levels of congestion than what was experienced before implementation.

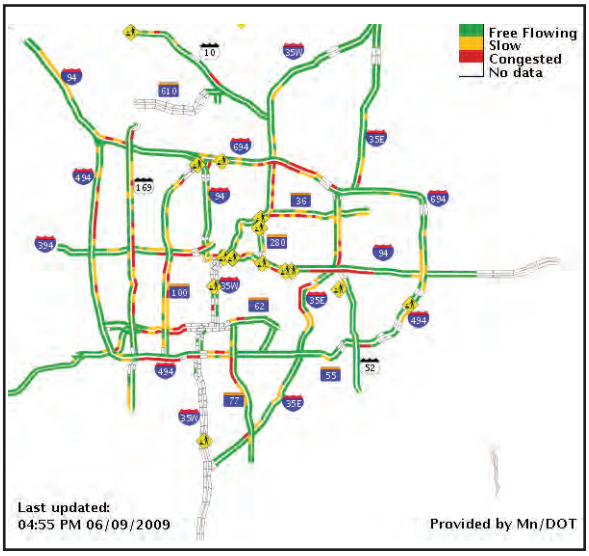
A case in point: In 1967, a four-lane freeway was completed for Highway 10 on new, parallel alignment approximately one mile to the north to replace the then-existing two-lane highway between Greenhaven Road in Anoka and Highway 47 (University Avenue) in Coon Rapids. (Incidentally, that segment of former Highway 10 once was one of the three-lane highways noted at the beginning of this chapter.) The freeway was extended east to I-35W by 1999. Long before the later extension was completed, the former Highway 10 (Coon Rapids Boulevard NW) was carrying more traffic than it did before the parallel freeway was built. Therefore, the old road was widened to four lanes (divided for most of its length) by Anoka County and Mn/DOT. Traffic on the new Highway 10 has long since increased to a level that would justify adding the third lane in each direction that was allowed for in the original design and which would probably be programmed, if funding were available.

## TRAFFIC MANAGEMENT

In 1970, the Highway Department began trials on methods to more effectively deal with operational difficulties on freeways in the Twin Cities metro area. These methods were tools in a field identified as "traffic management" in which Mn/DOT (the Highway Department's successor agency) became an early leader. In the 1990s, Mn/DOT became involved with an evolving field that, at first, was known as "intelligent vehicle highway systems" and, later, as "intelligent transportation systems" (ITS). Although some argue that traffic management and ITS were two distinctly different technologies, they both had similar goals and objectives: to more effectively and efficiently deal with the flow of traffic.

It could be acknowledged at the time of ITS's ascendancy that it recognized the need to blend the passive elements of traffic control strategies with the active elements represented by the vehicle and driver. It might also have been acknowledged that traffic management was the more practical player in that its priority was to implement existing technology, whereas ITS placed more emphasis on developing "cutting edge" technology. Of course, it is obvious by now that both traffic management and ITS are nothing more than the continuing technological evolvement of highway engineering's specialty field of traffic engineering, as it took advantage of refinements in computers and electronic communications, as well as the expertise in those fields.

Whatever differences there might have been, neither traffic management nor ITS technology was ever intended as a total solution to the very real capacity problems on freeways and conventional roads. Over the years, however, both — in an ever-increasing blurring of the distinctions between the two — have implemented technology that has boosted the practical capacity of Minnesota freeway traffic lanes from an average of 1,800 vehicles per lane per hour to as many as




Mn/DOT RTMC Website

The RTMC traffic flow map is available on the Internet at www.511mn.org. There was no data on most of the southern half of I-35W on this day because the major reconstruction project on that freeway had interrupted fiber optic communications. Note the red line indicating congested flow on eastbound I-494 at the lower left. A surveillance camera view of that congestion is shown on Page 152.

2,400 vehicles per lane per hour. Both have provided for a safer and more reliable environment for the road user, and the improvements have been implemented with a relatively low cost when compared to construction of additional lanes or other roadway upgrades.

### Ramp Meters

Ramp meters are a highly visible element of freeway traffic management and are one of its most effective tools. Meters control the rate and amount of traffic entering the freeway so overloading downstream can be avoided. They also help smooth out the merging process by only permitting one vehicle at a time to join the traffic stream in the right lane. Metering is carried out by devices similar to traffic signals that have been installed on entrance ramps.

The first meters in Minnesota were installed on several ramps on southbound I-35E north of

downtown St. Paul in 1970 to test the metering concept and to determine if it would be beneficial for traffic operation. The meters were on a fixed time schedule, starting and stopping at set times during the peak morning traffic period. The cycle timing of the signal (i.e., its operating rate) was also fixed based on traffic counts taken prior to implementation of the test rather than on real-time analysis of the density of traffic on the freeway and the ramp. Furthermore, the traffic queues at the meters were limited to a single lane rather than two or more lanes, as they are today. However, the test yielded promising results, and Mn/DOT began installing permanent metering systems around the metro area shortly thereafter. The installation was the earliest Minnesota manifestation of the modern traffic management era.

## Traffic Management Centers

Along with the installation of the first permanent management system on I-35W in south Minneapolis, Richfield, and Bloomington came the construction of the first traffic management center, which was located on the edge of downtown Minneapolis in 1972. The center included a computer system that was able to monitor the traffic levels on the freeway and change the metering rates as necessary to optimize traffic flow. By the time of this writing, the metering system had grown to 419 meters — a number second only to the Los Angeles, California, area. Of these, 213 meters were operating in the morning peak period and 266 in the evening peak.

Metering has come a long way since the first non-traffic-responsive meters were installed on I-35E. Researchers continue to develop improvements to the ramp-metering algorithm used by the Regional Transportation Management Center (RTMC) computers to monitor traffic flow and regulate metering rates.

The current metering algorithm, implemented in 2002, replaced one that succeeded in increasing vehicle throughput on Twin Cities' area freeways but that produced excessive delays for drivers waiting to enter the freeways during peak traffic periods. Public dissatisfaction with the original algorithm influenced the State Legislature to mandate a six-week shutdown of the system in 2000 during which a before-and-after study confirmed the benefits of the metering but also led to the development of the current algorithm that reduced wait times. However, in an effort to make the system even more responsive to increasing traffic levels (volume on Twin Cities freeways has been growing by about 2.6 percent, annually), researchers at the University of Minnesota continue to work on improvements to the algorithm.

There are now several regional centers in Minnesota operated by Mn/DOT and other entities. Of course, the most well-known center covers the Twin Cities metro area: the Roseville facility — one of the largest such centers in the country —manages traffic operations on most of the freeway mileage in the metro area. The RTMC replaced the downtown Minneapolis facility in 2002. Mn/DOT also operates regional centers in Duluth, Virginia, Bemidji, Crookston, Baxter, St. Cloud, Detroit Lakes, Morris, Owatonna, Windom, Willmar, Marshall, Hutchinson, Mankato, and Rochester. In addition, the cities of Minneapolis, St. Paul, some counties, and Metro Transit (in the Twin Cities) operate centers with focuses ranging from managing arterial streets and traffic signal systems to transit operations.

The purpose of the metro RTMC is to optimize traffic flow, reduce the potential for the occurrence of traffic incidents, and minimize the safety and congestion problems associated with those incidents that do occur. In addition to ramp metering, the RTMC addresses its purpose by monitoring traffic, operating systems, and carrying out tasks and operations as follows:

- Traffic surveillance via closed circuit television and vehicle detection apparatus in the highway pavement

## DID YOU KNOW

Traffic management facilities similar to Mn/DOT's RTMC exist in many of the major metro areas in the United States and abroad. Two that are comparable in size and function are located in Houston, Texas, and San Diego, California, and were constructed at about the same time as the building in Roseville. A major difference, however, is the cost. Both the Houston and San Diego facilities cost $215 per square foot to construct. The Mn/DOT building cost only $138 per square foot. One of the major factors in the cost differential was that Mn/DOT designed the building layout with input from experienced personnel who staffed the previous building in downtown Minneapolis. Staff also developed their own operations software.

- Variable message signs
- Lane control signals
- Traveler information
- MnPass
- High-occupancy vehicle lanes
- Incident management
- Freeway service patrols

Some of the benefits of traffic management accruing to urban freeway travelers include the following:

- Integrated communications between the State Patrol, Mn/DOT maintenance operations, and Mn/DOT traffic operations working together in the same room, as well as between other affected agencies and emergency services
- Reduced numbers of crashes and congestion
- Increased freeway speeds during peak periods
- Timely traffic information
- Expedited responses to traffic incidents and removal of stalled vehicles

Regarding the last item, it is generally recognized that each minute duration of an incident during peak traffic periods results in four to five minutes of delay. Therefore, if an incident takes 15 minutes to be cleared, congestion directly caused by the incident will last at least one hour before traffic flow returns to normal. In the meantime, the potential for secondary incidents increases dramatically, due to increased congestion and inattention of drivers as they gawk at the incident or are surprised by unexpectedly slowed or stopped traffic.

The primary means of determining the status of traffic flow on the freeways is achieved via inductive loops (coils of wire) located at approximately 1/2-mile intervals in each lane of freeway pavement and on entrance and exit ramps. Information on the number of vehicles and traffic speed (both measures of congestion or lack thereof) is forwarded from these detectors over fiber optic cable to the RTMC computers. The computers process the data, and then regulate the meter operation via the ramp meter algorithm. The data is also used to produce the traffic flow map. Detector loops also give RTMC operating personnel information regarding the possible detection of traffic incidents. Red lines on the map at anytime other than weekday peak periods indicate a possible incident.

Via the Internet at www.511mn.org (click on Traffic Cams on the menu bar and then on Traffic), anyone can directly view the traffic flow map for 260 miles of the Twin Cities freeway system. The map is updated every 45 seconds throughout the day. Yellow, diamond-shaped icons representing incidents or roadwork can be clicked to bring up incident information, including vehicle collisions or stalls, construction, maintenance, and detours, along with their anticipated duration. Checking the map before starting a trip can help avoid unanticipated delays.

### Closed Circuit Video

The closed circuit video system is comprised of 450 color cameras mounted on 50-foot poles located at approximately one-mile intervals along the freeways.

The video data is transmitted to the RTMC using the same fiber optic cable that carries the loop detector data. The primary function of the video system is the confirmation of possible incidents suggested by the detector data or incident reports by citizen cell phone 911 calls. (All mobile 911 calls in the metro area go directly to the State Patrol desks in the operations room at the RTMC. The first notice of an incident is only rarely picked up by video observations made by RTMC operating personnel.) The freeway service patrols also report a considerable number of incidents in the course of patrolling.

With pan, tilt, and zoom features that are controlled for each camera in the RTMC operations room, the video images are used to determine details of an incident, including the exact location and severity, in order to provide the most appropriate responses. In addition to video displayed for Mn/DOT and State Patrol dispatchers in the operations room, video images are transmitted to metro area cities, counties, and Metro Transit, as freeway incidents can often affect their roadway operations and require mitigating measures.

A direct video feed is provided to the University of Minnesota Department of Civil Engineering's Traffic Observatory as support for ongoing studies and projects dealing with the improvement of traffic management system components and ITS initiatives, as well as highway engineering students. Live feeds are also provided to local television stations that occasionally broadcast video images as background support for news reports on major incidents, storm-related news, or other news events that occur near a freeway.

Camera images are also available to anyone, anywhere, who has access to the Internet. At www.511mn.org, clicking on the Traffic Cams link brings up a map of the metro area freeway system with dots representing the locations of most freeway cameras. Clicking on one of the dots brings up an image of the highway. The images are refreshed every 10 seconds. Clicking on Reference Images brings up images that show what direction the camera is facing. There is also a note that identifies the nearest lane (e.g., southbound, northbound, etc.) to the camera to assist the viewer in orientation.

Of course, a viewer sitting at home has no access to the camera pan, tilt, and zoom controls. So, if a viewer is interested in seeing the opposite direction, he or she will be disappointed. However, given that the primary purpose of home viewing is to determine congestion levels at any given time, one or two more clicks on the dots to view images up or downstream is usually sufficient.


Mn/DOT Camera Image

Highway 280 as seen by a surveillance camera, late evening in June 2009. Images from most of the freeway cameras are available at any time on the Internet (www.511mn.org). The camera that transmitted this image, located near Energy Park Drive, is one of the newer ones in the system. It was installed as part of the emergency traffic control plan when Highway 280 was designated as the primary detour route after the collapse of the I-35W Bridge over the Mississippi River in 2007.

Cameras have also been installed at strategic locations outside the metro area, with video fed back to the other regional management centers and the Internet.

## Communication

Communication is an essential part of traffic management. Traffic detection and the video surveillance data is of little use if pertinent information cannot be relayed to highway users and emergency responders.

Recently, the state of Minnesota deployed an 800 mHz radio system that enables law enforcement personnel, emergency services personnel, road maintenance forces, and all other local and regional critical public agency personnel to maintain direct contact with one another as needed, with minimally discernable airtime delays — even during the most severe and widespread incidents. This system easily passed its most arduous test during the hours and days after the collapse of the I-35W bridge over the Mississippi River in August 2007. The RTMC operators, along with their co-located partners in the operations room — the State Patrol and Mn/DOT maintenance — directly benefit from this state-of-the-art radio system. It is the envy of individuals throughout the country who are responsible for disaster recovery efforts and day-to-day operations of roads and other public infrastructure.

## Traveler Information

Just as important as the communication between public agencies afforded by the 800 mHz radio system are communications with highway road users. The more drivers that can be reached quickly while they are on the road or even before they begin their trips, the less impact an incident will have on traffic movement. It also mitigates the potential for secondary incidents. For an individual, such communication can help assure arriving on time for appointments, avoiding delays, or limiting commuter stress.

The RTMC provides one of the most comprehensive, up-to-the-minute traveler information programs in the United States. By collaborating to provide information via radio and television stations, the Internet, telephone, and highway signs, the RTMC delivers timely and accurate information during peak traffic periods and major incidents. Mn/DOT tries to reach as many drivers as possible regarding driving conditions, and more than 50 percent of metro area drivers make use of some form of traveler information before starting out each day. The safety level of all concerned is therefore improved.

## Variable Message Signs

One of the most obvious communication devices is the variable message sign that informs drivers about traffic incidents or congestion on the road ahead. There are 85 of these RTMC-operated signs strategically located on the Twin Cities metro area freeway system. Others are located on freeways in Duluth and Rochester, as well as a few locations on highways around the state where anticipated conditions have warranted their installation.

The signs have been placed in locations, and provide preprogrammed messages, that give drivers sufficient time to decide whether to divert at upcoming highway exits. In the event an incident cannot be adequately described by a preprogrammed message, a custom message can be composed by RTMC operations personnel. In many instances, drivers feel better by simply receiving information about what's causing delays or congestion. Others are happy because they were given enough information to avoid getting involved in the delay.

Many of the variable message signs are used to communicate freeway travel times to highway users. The anticipated travel times in minutes from one of the signs to one or two major junctions on the road ahead are displayed during peak travel times. A driver might elect to divert from the freeway if the estimated travel time is much

longer than usual. The travel times, based on information that is collected by the roadway traffic detectors, are automatically updated via the RTMC computer systems. Of course, messages regarding incidents necessarily preempt travel time information.

As timely and useful as the variable message signs are, they do present something of a dilemma: As incidents are a relatively rare phenomenon, the signs are blank most of the time. When a message is flashed, the sign, itself, becomes an incident. This can cause drivers approaching the sign to brake, creating slowdowns.

The braking reaction isn't entirely unreasonable, since sign messages often suggest that caution is appropriate. But sudden braking can be an invitation to rear-end collisions. As many drivers apply their brakes, their eyes almost instantly go to their rear-view mirrors. Some states have attempted to solve this problem by constantly displaying messages such as "DRIVE SAFELY," "BUCKLE UP," "SCHOOLS ARE OPEN," "HAVE A NICE DAY," time and temperature, or estimated travel times.

The one drawback of constantly displayed messages is that drivers can become complacent about their presence. The signs quickly become part of the background environment and can be ignored even when they are announcing an actual incident. The travel time messages might not be as susceptible to disregard, since most drivers will at least glance at them. However, due to these concerns, Mn/DOT has shied away from pressure to display "public service" messages on its variable message signs.

One service message that Mn/DOT does participate in is the "Amber Alert," a means for locating a vehicle involved in a kidnapping. This message broadcast is particularly appropriate on the highways, as the vehicle described in the message might be seen by an alert driver.

### METRO TRAFFIC MANAGEMENT BY THE NUMBERS

| | |
|---|---|
| 340 | Miles of freeway under surveillance |
| 4,500 | Vehicle detection units |
| 450 | Closed circuit TV cameras |
| 419 | Metered entrance ramps |
| 120 | Electronic variable message signs |
| 18 | Miles of freeway high-occupancy bus lanes |
| 300 | Miles of freeway shoulder bus lanes |
| 23 | Lane control signals |
| 220 | Miles served by freeway service patrols |

## Traffic Radio

Traffic radio allows drivers to check conditions before and during a trip. Since an incident can occur at any time and because traffic conditions can change rapidly on roads that are operating near capacity, frequent checking during longer trips can be very helpful. The RTMC has been broadcasting with its own reporters on KBEM – 88.5 FM, a non-commercial facility operated by the Minneapolis public schools since the mid-1990s. At that time, pavement detectors and video covered only a few segments of the metro area freeway system. In those days, great reliance was placed on reports from the State Patrol helicopter whose pilot troopers spent considerable time in the air during peak traffic periods.

Now, most of the freeway system is covered electronically, but keeping up with the status of all the freeways and the possibility of several concurrent incidents is quite a challenge. Summarizing and reporting on it in two-minute broadcasts every ten minutes during the morning, noon, and evening peak traffic periods is an additional challenge in itself. The listener must also be alert; it can be easy to miss desired information during the rapid-fire reports. However, regular listeners soon learn that there is a regular sequence to the metro area roads that are identified, the particular hot spots on those roads, and the jargon that identifies the conditions. ("Slow and go" is one of the terms that was introduced during the broadcasts.)

Traffic information and video from the RTMC is made available to other local radio and television stations, so listeners and viewers have a choice about which media supplies their information. In the past, one or two of these stations provided their traffic reports from airplanes in the sky. But commercial media only broadcast infrequently and the information is generally less in-depth than that offered by KBEM.

## The Internet

The Internet is a more recent venue for communicating traffic conditions. Two of its advantages are that it can be personalized, i.e., it can be tailored to cover just the roads of interest to an individual, and it is available at any time. It is also statewide in its application. (As noted earlier in this chapter, the Internet address is www.511mn.org.)

Two of the most popular Internet items are the traffic flow maps and the closed circuit television images. Also, camera images are available for a few of the larger city freeways. Selecting 511 User Guide or About 511 on the menu bar leads to a wealth of additional information, including real-time traffic updates, roadwork, weather conditions, and critical incidents.

## Telephone

Much of the information on the website is available on an automated telephone service by dialing 511 from a cellular or land-line phone. The service is automated and can be activated by voice commands or keypad. Instructions on how to use the service can be accessed by saying, "Help" or pressing * at any time. Specific information can be accessed by stating, for example, a highway number, such as "Highway 61," or pressing 61# on the keypad. Responses to such requests, such as the traffic flow map, are then specifically formatted for a small phone screen or a pda.

## FIRST (Freeway Incident Response Safety Team)

One of the RTMC's key objectives is to identify and respond to highway incidents through the Freeway Incident Response Safety Team (FIRST), a freeway service patrol in the Twin Cities metro area. A secondary purpose is to aid stranded motorists.

About half of the traffic congestion on Twin Cities' freeways is caused by incidents such as crashes, stalled vehicles, or debris in the roadway. (The other half is caused by daily recurring congestion — "bottlenecks," resulting from more vehicles on the road than can be physically accommodated.) These incidents also cause about 15 percent of all freeway crashes, including secondary collisions caused by congestion from an earlier crash. Furthermore, for each minute duration of a peak-period incident, an average of four to five minutes of congestion delay can be expected to occur. That's over and above any delay caused by daily recurring congestion at the incident site. An incident blocking one lane of a three-lane freeway reduces the freeway capacity by 50 percent, and an incident blocking one lane of a two-lane freeway reduces the freeway capacity by

### FIRST FACTS

- FIRST makes approximately 19,000 stops per year (75 per day on weekdays)
- 8% of stops are for crashes, 88% are for stalls, 4% are for debris removal and miscellaneous
- 85% of stops are for incidents that FIRST drivers have discovered; the remainder are those requested by the State Patrol or directed from the RTMC
- The FIRST Program costs $1.3 million per year; its benefit cost ratio is 15.8:1, defined in terms of reduced delay and fuel savings


Mn/DOT

FIRST Coverage. Roadways shown with heavy lines are covered by FIRST. Remaining freeways may be covered in the future as congestion and incident levels warrant.

65 percent. Even a crash located on the shoulder can reduce the freeway capacity by up to 17 percent, while a stalled vehicle on the shoulder can reduce capacity by 5 percent. Therefore, it is clearly in the public interest to deal with traffic incidents as quickly as possible.

The FIRST program was initiated in 1987 with three routes covering 40 miles. Originally identified as the "Highway Helper Program," it has expanded gradually over the years. By 2005, there were 11 routes covering 220 miles of metro area freeways. Most of these routes are in a loop that covers six different highways, but not all of the metro freeway system is covered. At the request of the State Patrol, however, a FIRST unit may respond to an incident outside the FIRST route system.

FIRST units are dispatched by the RTMC. For fast response, the dispatcher uses a global positioning system to locate and dispatch the vehicle closest to an incident. The FIRST units consist of brightly colored OSHA-green pickup trucks that patrol the freeways from 3:30 a.m. to 9:00 p.m., Monday through Friday, and 9:00 a.m. to 7:00 p.m. on weekends. FIRST personnel have been through a rigorous training program aimed at speedy recovery from an incident. Responders can perform minor repairs necessary to get vehicles back on the road, implement safety procedures to protect drivers and those involved in an incident from passing traffic, and provide first aid for individuals sustaining injury. The truck is equipped with tools, warning signs, and supplies necessary to efficiently perform these tasks.

Although State Patrol troopers appreciate the opportunity to assist stranded motorists (it is more satisfying than writing citations for traffic law violations), there are too few of them to fully meet the RTMC's desired level of service for incident removal, and the Patrol does not carry the necessary equipment to perform quick repairs or set up temporary traffic control devices. Furthermore, the state trooper complement is about the same as it was in the 1980s, despite that annual vehicle miles traveled on Minnesota's roads have nearly doubled since that time. Therefore, the State Patrol must concentrate on law enforcement duties, while FIRST's efforts provide complementary and cooperative service with the Patrol.

## Interagency Coordination

Incident management is, in fact, a multi-agency effort. Toward that end, the RTMC collaborates with an Incident Management Coordination Team, a group of several public and private organizations working together to provide the best and fastest response and recovery to incidents. Some of the member agencies include

- Mn/DOT maintenance
- Minnesota State Patrol
- Emergency management providers
- Towing providers

- Local police and fire services
- Hazardous materials responders
- Local and Mn/DOT traffic engineering offices

A few of the team's ongoing activities include sponsoring incident management workshops, providing incident management interagency training, developing joint operating policies and procedures, and conducting major incident debriefings.

## HOV and HOT Lanes, Shoulder Transit Lanes

Major components of traffic management, by definition, are strategies to maximize the traffic-carrying capacity of existing highway facilities. One way this effort is carried out in Minnesota is by providing advantages to using transit and carpooling. High-occupancy vehicle (HOV) lanes have been a part of the metro area's freeways since the early 1990s. The left lane of I-35W through Burnsville, Bloomington, and Richfield is restricted to carpools vehicles with one or more passengers, buses, and motorcycles during the a.m. and p.m. peak traffic periods. The State Patrol and local police enforce the restriction.

At the time of this writing, the HOV lanes were being extended into south Minneapolis as part of the I-35W/Highway 62 reconstruction. A project was also underway in 2009 to convert the HOV lanes to a high-occupancy toll (HOT) system, as described in the following paragraphs.

Similar to I-35W, Highway 12 and I-394, which provided a temporary HOV roadway to assist in the management of traffic during its reconstruction in the late 1980s, has restricted lanes through Wayzata, Minnetonka, Golden Valley, and St. Louis Park. In addition, the segment of the highway from Highway 100 to I-94 into Minneapolis was constructed with a separate, reversible, two-lane HOV roadway between the east- and westbound lanes.

In 2005, the I-394 HOV lanes were modified to accommodate an HOT system called "MnPass." The system provides for use of the HOT lanes by buses, carpools, and motorcycles, as before. But it also provides for use of the lanes by drivers of single-occupant vehicles who have installed a registered transponder in their vehicle and are willing to pay a variable toll. Fees are assessed against the account of the registrant upon passing under antennae located over the HOT lanes. The amount of the toll at any given time is displayed on signs over the HOT lanes at strategic intervals, and tolls are automatically raised or lowered during peak periods according to the level of congestion on the freeway, as determined from data transmitted by RTMC detectors in the pavement.

The rationale for the toll variability is that some drivers are willing to pay a threshold amount to avoid a certain level of traffic congestion. In so doing, congestion is reduced somewhat on the regular lanes, while congestion is still avoided on the HOT lane. The top toll is $8 — an amount that might be charged during very bad weather, or when an incident has blocked traffic in the regular lanes. The lowest toll is 25 cents, which is charged when traffic conditions are very light. Outside of peak periods, all traffic may use the HOT lanes except for the reversible roadway between Highway 100 and I-94.

Drivers can save considerable time using the HOV or HOT lanes; but, generally, drivers perceive a greater savings than is actually achieved. Nonetheless, the prospect of avoiding aggravation and congestion on the freeways may be enough incentive to encourage commuters to use transit service, carpools, or pay the toll.

High-occupancy vehicles are also given an advantage at many of the ramp meters. At those locations, a bypass lane permits buses and carpool vehicles carrying one or more passengers to avoid the queues waiting at the meters. This incentive is consistent with the traffic management goal of reducing traffic congestion. Similarly, an advan-

tage for transit has been provided on nearly 300 miles of the Twin Cities area freeways and other highways by permitting buses to use the shoulder as a traffic lane during congested periods.

## The RTMC Building

The RTMC building is a shared facility of the Minnesota Departments of Public Safety and Transportation, located adjacent to the Mn/DOT Metro District headquarters in Roseville. It is a 53,000-square-foot facility competed in 2002 at a cost of $7.3 million. The building includes a 10,000-square-foot operations center staffed by Mn/DOT traffic operations, Mn/DOT maintenance dispatch, and State Patrol dispatch personnel. The operations center also provides the broadcasting facilities for Mn/DOT traffic radio. The remainder of the building houses the RTMC's support staff and Mn/DOT's Metro District and Central Office traffic engineering personnel.

## ITS

As indicated at the beginning of this chapter, Mn/DOT and the RTMC along with the University of Minnesota have been at the forefront in the development of ITS initiatives and their practical implementation. As an example, prototypes of the dashboard navigation display devices, including their traffic condition information components, which became available as factory-installed equipment in automobiles at the beginning of the twenty-first century, were given trials by RTMC personnel in the 1990s. Another example is use of a global positioning system for tracking and dispatching FIRST units. Another initiative was the installation of fiber optic cable for RTMC data transmission from cameras and vehicle detection devices to the variable message signs. New methods for vehicle detection — including video, infrared, and other methods — were extensively tested by the RTMC. Video has since become one of the preferred methods for detection of vehicles to control the operation of intersection traffic signal systems. An experimental system was also tested to determine the number of vehicle occupants for enforcement on the I-394 HOV lanes. Although the project produced a heat-sensing system sufficient to distinguish between dummy passengers and living human beings, a phase II that might have developed a working model adequate for operational use was never pursued.

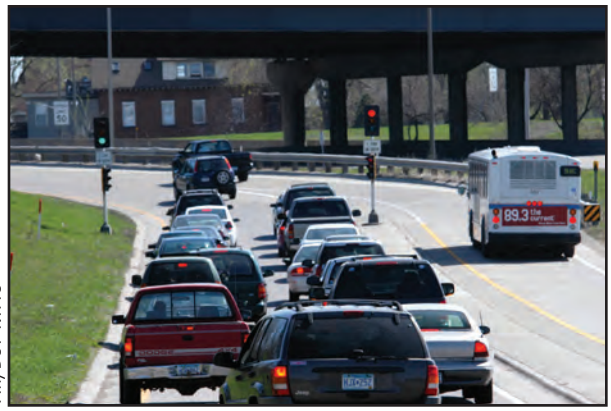
Mn/DOT's Regional Transportation Management Center (RTMC) occupies the building in the foreground to the right and is attached to the Metro District headquarters building (back and left in the photo). It includes a state-of-the-art operations center where State Patrol Dispatch, Maintenance Dispatch, and Traffic Operations personnel work together to maintain the safety and operational integrity of the Twin Cities' freeway system. The center is located in Roseville. Tours can be arranged by calling 651-234-7035.

Mn/DOT RTMC

KBEM Traffic Radio announcer, Mike Moran, at his broadcasting desk in the RTMC control room.

J. Katz

A closeup of a closed circuit TV camera on I-394.



Mn/DOT RTMC

Ramp metering significantly increases the carrying capacity of a freeway by easing the conflicts caused by many vehicles trying to merge with mainline freeway traffic.

Mn/DOT RTMC

The "nerve center" in the RTMC basement where fiber optic communication cables from all over the metro area connect to computers that control cameras, ramp meters, and variable message signs.


Mn/DOT RTMC

The Regional Traffic Management Center computers continuously sample traffic speed and density through wire loops buried in the pavement and transmit that data to the center via fiber optic cable. Another fiber optic cable transmits data from the computers to the freeway signs to alert drivers to upcoming congestion. Operators at the center can also preempt travel time messages to post warnings about a crash or stalled vehicle.

J. Katz

Mn/DOT's Freeway Operations Unit, Metro District Traffic Signal Operations Units, and Metro District Maintenance Dispatch, as well as the Department of Public Safety State Patrol Metro Districts Dispatch, all work together in this 10,000-square-foot operations room. The KBEM 88.5 Traffic Radio broadcasts are also made from a desk in this room.

## TRAFFIC CONTROL DEVICES

Imagine the chaos we would experience on Minnesota's roads and highways today without traffic control devices, those appurtenances that consist primarily of signs, traffic signals, and pavement markings. Our major downtown areas, our rush-hour drive to work, our favorite shopping centers, and our local intersections would be hazardous — and deadly — without traffic control devices.

St. Paul Dispatch, Minnesota Historical Society

Traffic policeman on an unidentified St. Paul street, 1918.

Traffic control devices have been with us nearly as long as the automobile has been around — in some cases, even longer. Perhaps the most common device is the standard, eight-sided, red stop sign. This passive device, installed at several-hundred-thousand locations in Minnesota, is sufficient to provide for the smooth flow of traffic on a vast majority of the arterial road mileage in the state. (Your grandmother might have referred to the arrangement as a "through stop." In fact, before the 1950s, when stop signs were yellow with black letters, some of them had the words "THRU HIGHWAY" printed on the sign.) Where two arterials with approximately equivalent traffic volumes intersect, the usual installation is an all-way stop that provides for an orderly taking of turns by drivers approaching the intersection.


Minnesota Historical Society

The Minnesota Historical Society titles this photo, "Policeman at stop and go signal, St. Paul, 1919." (The location within the city is not identified.) The title may give some credence to the claim that St. Paul had the nation's first traffic signal.

Before the all-way (or the "four-way," as it was more commonly known) stop became commonplace, an "active" device — the traffic cop — become a regular feature of some urban intersections. Armed with a uniform, white gloves (the bright orange or yellow safety vests were not used by police officers until the 1960s), and a whistle, the traffic officer directed the flow of traffic at many intersections in downtown Minneapolis and St. Paul and other congested locations early in the twentieth century. Controlling traffic was a regular beat for many officers, and many of them were instantly able to communicate their intent to even the most uninitiated drivers. The directing motions of

Minnesota Historical Society

Police Officer Nolan, possibly contemplating his replacement in 1923, at Fourth Street and Marquette Avenue in Minneapolis. The "bobby" traffic signal was commonly seen in Minneapolis and St. Paul until the early 1950s, usually in the middle of an intersection.

some officers seemed to be individually choreographed, almost likened to a ballet dance.

Today, traffic officers or auxiliary police personnel are still used at some intersections controlled by traffic signals. Given that most of today's signal systems can far out-perform a police officer in terms of signal cycle timing, grid coordination, and overall optimization of traffic flow, you might wonder why traffic officers would be necessary at all. Generally, officers reinforce the assignment of right-of-way according to the signal system rather than pre-empt it. Only when the traffic volume exceeds the intersection's capacity do traffic officers pre-empt the system.

Of course, intersections that exceed capacity are quite common these days; so, the primary purpose of officer control at signalized intersections is to encourage traffic to move more quickly in the crowded environments. Officer control is also extremely beneficial in preventing drivers from pulling into an intersection as their signal is turning red. And, of course, officer control is also very helpful before and after special events that draw large crowds (sports, fairs, parades, etc.) or during emergency situations that unexpectedly reduce road capacity or require road closures.

## The Debut of the Traffic Signal

Just like the great number of repetitive procedures that led to automation in the last century, the control of traffic was a prime candidate for mechanical assistance and, later, electro-mechanical devices. Let's face it: the all-way stop is not a very efficient way to move traffic. On higher-volume roads, an all-way stop can back up traffic for several blocks in each direction. Imagine how a grid of multi-lane streets in a major central business


Minnesota Historical Society

Both of these photos were taken at the intersection of Nicollet Avenue and Sixth Street in Minneapolis in 1923. Note the traffic congestion and the number of people in the street and on the sidewalks.

district would operate with all-way stop control on each corner.

The first traffic signal on record was installed at an intersection in London in 1868 — long before the invention of the automobile. It consisted of an elaborately decorated post, quite befitting the Victorian age, with two semaphore arms designed by a railroad engineer. When extended horizontally, the arms signified "stop"; when dropped to 45 degrees, the arms signified "caution" — today merely interpreted as "go." A lever attached to the post provided for the manual rotation of the signal so the semaphore could be displayed to each cross road, in turn. The top of the post featured a lantern with red and green faces for nighttime use. The faces were illuminated by gas, presumably provided by the same system used for the streetlights of the time. During the year following its installation, however, the lantern exploded, injuring the police officer who operated it. Nonetheless, the mishap did not stop the continued evolvement of signal devices.

There is some evidence that the first traffic signal in the United States was installed in St. Paul. The following sentence is taken from the *Historical Dictionary of Law Enforcement:* "Although Salt Lake City, Utah, and **St. Paul, Minnesota** [Emphasis added], claim to have introduced the first automobile traffic control signal, Cleveland, Ohio, has been credited with introducing the now familiar green-red signal in 1914." The sentence does not specify, however, whether the signal was electric; it could be referring to a hand-operated signal. On the other hand, as this book went to press, no further sources — either written or local — could be found to reference St. Paul's use of traffic signals.

Sources do confirm, however, that Salt Lake City installed its first electric traffic signal in 1912. It was invented — and operated — by a police officer. It featured a hand-made wooden box with a slanted roof to protect it from the weather, and red and green lights that shone through circular openings. The box was mounted on a pole, and the wires were attached to overhead trolley and lighting wires.

Minnesota Historical Society

Sixth and Nicollet, 1924. The semaphore in the middle of the street has been supplemented with a traffic light mounted on a pole, shown above the awning at right. There are only two small (perhaps four inch) lenses – presumably red and green – with the lower one lit at the moment. (Most lenses are 12 inches in diameter today.)


Minnesota Historical Society

By the later 1920s, the portable semaphore is gone and the signal poles (the one in the photo is located beneath the "A" in "CHRISTMAS") on the corners have been supplemented with a "bobby" in the center of the intersection.

Minnesota Historical Society

Traffic control tower at the intersection of Nicollet Avenue at Sixth Street, ca, 1924. The camera was facing south. An officer in the tower could observe traffic conditions for some distance in both directions on the avenue. It is conjectured that he was able to visually communicate via the lights atop the tower with traffic officers as to when semaphores should be rotated.

As for Cleveland, the American Traffic Signal Company installed red and green electric traffic lights at each corner of the intersection of 105th Street and Euclid Avenue in 1914. The design provided for wiring to a manually operated switch with an interlock that prevented the display of conflicting signals. The system also provided for communication between the signal operator and the police and fire departments and featured a warning bell that alerted drivers to the signal's color change. (Older readers may recall that some traffic signals in Minnesota featured a bell until about the early 1950s.)

By 1920, the first traffic signals similar to those seen today (with round red, yellow, and green lenses adapted from railroad signal configurations) were installed at fifteen locations in Detroit. The first installation used $37-worth of electrical controls and wiring. Some of the signals were included as part of police officer-operated traffic towers. Others were suspended on cable and were comparable to today's temporary installations. In 1924, some of the early Detroit signals became part of the first-ever, coordinated traffic signal system, which was put into operation on several Woodward Avenue intersections and was controlled manually from one of the towers.

At the time of the Detroit installations, green meant "go"; red meant "stop"; and yellow (also identified as "amber" by some) meant "clear the intersection." As in London, the definitions were derived from railroad usage. American railroads began using colored signals as early as 1900 when the colors meant "all clear," "stop," and "caution," respectively.

## What Does Green Really Mean?

The Minnesota State Legislature has clarified the meaning of traffic signal colors over the years. Minnesota Statute §169.06, stating the purpose of each color, is reproduced here in part:

> (1) Green indication:
>
> (i) Vehicular traffic facing a circular green signal may proceed straight through or turn right or left unless a sign at such place prohibits either turn. But vehicular traffic, including vehicles turning right or left, shall yield the right-of-way to other vehicles and to pedestrians lawfully within the intersection or adjacent crosswalk at the time this signal is exhibited. . . .
>
> (2) Steady yellow indication:
>
> (i) Vehicular traffic facing a circular yellow signal is thereby warned that the related immediately thereafter when vehicular traffic must not enter the intersection, except for the continued movement allowed by any green arrow indication simultaneously exhibited. . . .

(3) Steady red indication:

(i) Vehicular traffic facing a circular red signal alone must stop at a clearly marked stop line but, if none, before entering the crosswalk on the near side of the intersection or, if none, then before entering the intersection and shall remain standing until a green indication is shown, except as follows: (A) the driver of a vehicle stopped as close as practicable at the entrance to the crosswalk on the near side of the intersection or, if none, then at the entrance to the intersection in obedience to a red or stop signal, and with the intention of making a right turn may make the right turn, after stopping, unless an official sign has been erected prohibiting such movement, but shall yield the right-of-way to pedestrians and other traffic lawfully proceeding as directed by the signal at that intersection; or (B) the driver of a vehicle on a one-way street intersecting another one-way street on which traffic moves to the left shall stop in obedience to a red or stop signal and may then make a left turn into the one-way street, unless an official sign has been erected prohibiting the movement, but shall yield the right-of-way to pedestrians and other traffic lawfully proceeding as directed by the signal at that intersection.

Not unlike many other institutions, traffic control definitions were a little less complicated 80 years ago. (Note that the word "go" does not appear in the statute. Likewise, under (1, i) there is no discussion on yielding the right-of-way when another vehicle or pedestrian is within the intersection *un*lawfully.)

## Minnesota Signals

Uniformity did not seem to be a high priority in the early years of the traffic signal. In Minnesota, there was considerable variety in the types in use up until the early 1950s, as can be seen in the accompanying photos. Of course, the lack of standards did provide an experimentation period for determining what type of signal was most effective. However, in driving across jurisdictional lines, and even within jurisdictional boundaries, a motorist was almost certain to encounter a wide variety of traffic control signals. For example, in the 1930s, both Minneapolis and St. Paul used the "bobbie," a bollard-like device installed in the center of an intersection. Several versions of this device existed, including those with a hinged mounting that minimized damage to the signal if it was hit by a passing vehicle. (Its location in the middle of an intersection made it quite vulnerable to traffic impacts.) None of the versions had provisions for a yellow phase. In fact, some of the bobbies were little more than an electrically operated semaphore, similar to those operated manually by police officers.

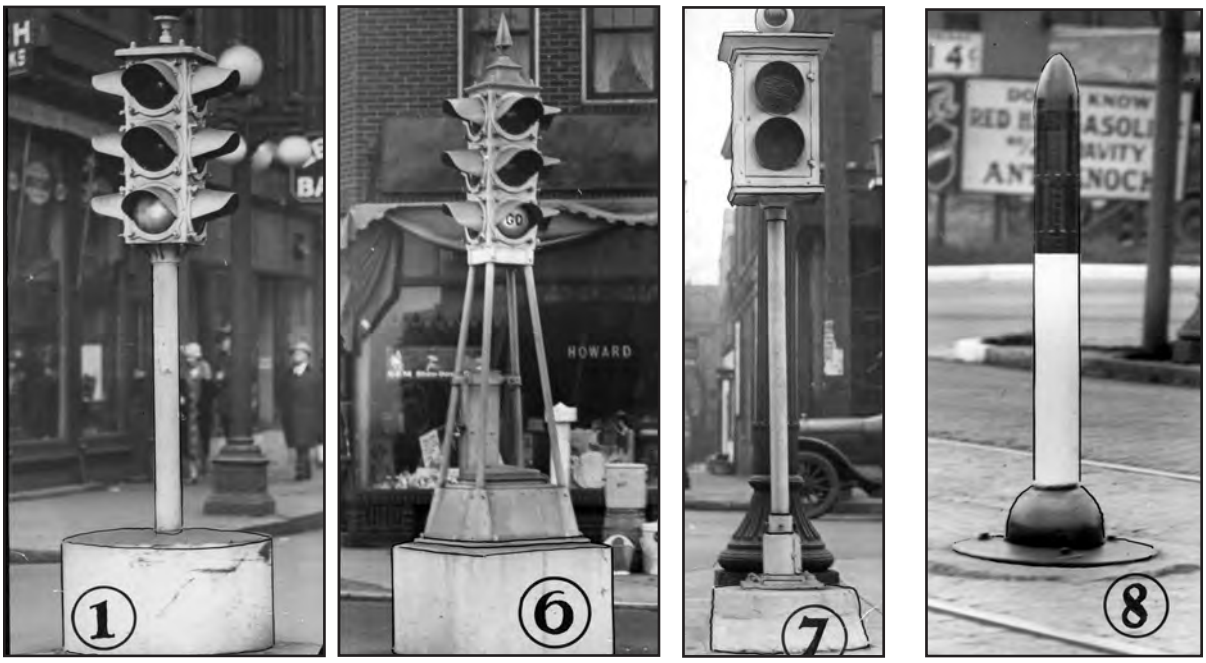
Although the circular red, yellow, and green traffic indications as we know them today began to gain in popularity around the nation in the 1920s, relatively few of them were seen in Minnesota until after 1930. That was the publication date of the *Manual on Street Traffic Signs, Signals and Markings,* prepared by the National Council on Street and Highway Safety, wherein the circular configuration was written up as a standard. However, many of the bobbie-style signals were still located in the center of some Minneapolis intersections until the late 1940s.

The three-color progression of green–yellow–red eventually became the standard in the United States, but many variations were tried. Some jurisdictions used a phasing sequence of green–yellow–red–yellow–green, where yellow indicated that green was about to change to red, or vice versa. This sequencing is still standard practice in some countries. However, the sequence fell into disfavor in the United States because there was a tendency to "jack-rabbit" starts (as in:

"get ready . . . get set . . . GO!") that led some to believe crashes were increasing at intersections. Another variation featured a flashing green toward the end of the green phase to indicate that yellow was about to be displayed. This was used at some intersections in St. Paul, as well as elsewhere in the country, until around 1950. However, this operation was eliminated when too many drivers used it as a cue to speed up to "beat the light." Some years later, a one- or two-second display of an all-way red was added to the cycle to provide greater assurance that an intersection would be clear before the green was displayed.

The "WALK" indication for pedestrians was approved for use in the 1935 national edition of the *Manual on Uniform Traffic Control Devices.* The original installations in Minnesota featured a white word on a black background, mounted below the red, yellow, and green lenses in the traffic signal head. When pedestrian crossing was not permitted, the "WALK" lamp would be extinguished, thus presenting a totally black indication. To at least some degree, the blanking out of the "WALK" indication (as well as today's flashing "DONT WALK") caused the same problem as the flashing green indication referred to earlier (i.e., it encouraged drivers to speed up). Today's pedestrian indications are mounted in a separate configuration not immediately contiguous to the vehicular indications, which might mitigate the tendency for drivers to speed up.

While the outward appearance of signal systems has been more or less standardized since the early 1950s, signal technology has continued to improve. One of most obvious external improvements is the implementation of overhead signal indications on mast-arm poles, along with more indications facing traffic on multi-lane streets and highways. Although some overhead installations were mount-




Dan Brannan, Mn/DOT; and the Minnesota Historical Society

Uniformity for traffic control devices was not a great concern in St. Paul, ca. 1930. However, there is some uniformity in that all of these devices were located in the middle of the intersections. It seems as though someone thought it was necessary to outline some of the features in pen and ink. The crack in the concrete foundation in the photo at left might have resulted from a vehicle colliding with it. Objects in the roadway during the earlier days of the twentieth century were not very forgiving. The "bobby"-type device in the photo is identified as a "stop sign" in the Minnesota Historical Society photo collection.


Kenneth Melvin Wright, Minnesota Historical Society

One of the earliest signal systems in Minnesota approximating the current-day standard (with the red, yellow, and green circular lenses) is shown in this 1932 photo taken at the intersection of Summit Avenue and Dale Street (the road with the streetcar tracks.) However, the poles were painted dark green rather than the yellow we see today at most signalized intersections. Note the word "stop" in the middle of the upper lens at right.

ed on span wire in the traffic signals' early days in Minnesota, few overhead signal faces were seen in the state in the 1930s through the 1950s. The Highway Department began mast-arm signal installations in the 1960s, along with 12-inch signal indication face lenses. (That is the size of an LP phonograph record, or close to three times the diameter of a CD.) For most of those prior years, the standard lens size was 8 inches. (The lenses used in Detroit in the 1920s were only 4 inches in diameter.) The overhead and larger lenses were developed in response to competition from urban lighting, particularly on commercial streets, and the blocking of sight lines to corner-mounted signals by larger vehicles on multi-lane roads.

Towards the end of the 1990s, light-emitting diodes (LEDs) began replacing incandescent lamps in signal faces. (The LED face can be discerned by the slightly bluer cast of the green light or, upon close inspection, by the many-faceted appearance — or "pixels" — that make up the light face of most LED brands.) The LED uses considerably less electrical power and has a significantly longer useful life — not inconsequential when considering that a typical intersection of two four-lane roads with left-turn lanes would otherwise use 56 lamps (including the "WALK/DONT WALK" indications). And, of course, these lamps are never turned off, day or night.

A, perhaps, not-as-obvious technical improvement was the conversion of electro-mechanical control

equipment to solid-state systems. Instead of a combination of gears and relays, run by an electric clock, today's controllers are sophisticated computer systems that allot green time according to the arrival of traffic on each leg of the intersection. (The clicks and thumps that used to be audible when walking by a signal controller cabinet are rarely heard today.) Video vehicle detection systems (or the older wire loop detection systems buried in the pavement) transmit electrical impulses to the controller to inform it of the number of vehicles arriving or waiting in each lane; then green times are allotted accordingly. In coordinated systems, a master controller "talks" to each individual signal controller. Thus, luck now plays a much smaller role in determining how many consecutive signalized intersections a driver may pass through without stopping. Effective coordination of both grid (city) and arterial systems provide significant savings in time, fuel, and pollution emissions, while also reducing congestion, aggravation, and the potential for collisions.

Many Minnesota cities and counties, and Mn/DOT have centralized systems that program signal timing to account for the time of day, the day of the week, special events and holidays, daylight savings time changes, weather conditions, detour traffic, and other special circumstances. Operating personnel can actually observe the operation of individual signal systems on monitoring equipment at the central location and make changes as needed. Malfunction alerts are directed electronically to the monitors in the control room where "repairs" can often be made without dispatching service personnel.

It should be quite obvious by now that without the 5,000 signal systems operating in Minnesota, our cities and other heavily traveled routes would have long ago degenerated into traffic chaos. But, although they can be credited with imposing order on the flow of vehicular traffic, even the most sophisticated signal systems cannot cope with the over-capacity traffic loads that so many of our roads are forced to carry every day. There are practical limitations on the number of lanes and new arterials that can be provided to meet our current and future capacity demands. And no one has yet figured out how to pack more seconds into a minute (a traffic engineer's dream for providing more green time).

Dan Brannan, Mn/DOT; and the Minnesota Historical Society

One of the earliest pedestrian-activated signals was located on Portland Avenue at East 24th Street in Minneapolis, as shown in this 1931 photo. However, there were no "WALK" or "DONT WALK" signal faces in those days.

## Traffic Signals as a Traffic Safety Device

One more note regarding traffic signals: Even though their absence would create a most difficult situation, it would be inappropriate to consider them solely as a safety improvement. In fact, the number of crashes at an intersection might actually increase after a signal is placed in operation. Before-and-after studies have shown that signals might have a positive effect on the number of right-angle collisions; however, rear-end collisions are likely to increase.


A Hennepin County-style signal pole and mast arm at the intersection of I-35W and 66th Street (County Road 53) in Richfield.

J. Katz

A few lucky old traffic signal mast arms are called upon to take up a second life in retirement. This one has become a signpost for a sign warning drivers on westbound Highway 60 near Wabasha that they are approaching a stop sign at Highway 61. Perhaps Mn/DOT could be persuaded to give the signpost a fresh coat of paint.


J. Katz

And right-angle and turning collisions still occur at a signalized intersection sooner or later. Furthermore, the number of crashes required to meet the crash warrant for the installation of a traffic signal, as specified in the MUTCD, is usually well above the crash experience at most intersections. Signal warrants that are given more credence include traffic volumes and delay times, which are much more likely to be met.

With regard to safety, it can be documented that the 100 worst intersections in the state of Minnesota in terms of 1) the number of collisions per year, 2) the crash rate (the number of collisions as compared to the average number of vehicles using an intersection per year), or 3) the severity rate (an index taking into account the number of fatalities, the number and seriousness of injuries, and the number of property damage collisions only at an intersection) already have signal systems in place. Clearly, the signal system at these intersections are not preventing as many crashes as one might expect.

## TRAFFIC SIGNS AND MARKINGS

The traffic signs and markings we see on roads and highways today look pretty much the same no matter where we drive in the United States. That was not always the case. During the earliest days of the automobile, each state — and even each political jurisdiction (counties, cities, and townships) with responsibilities for roads and highways — could design and install its own signs as it saw fit. The lack of signing and marking uniformity was confusing and dangerous for travelers making trips through several jurisdictions in those early days, but the experimentation and innovation did help determine what worked and what didn't.

As more and more people used the roads and as the highway network spread and interconnected over the country during in the early twentieth century, however, it became imperative that traffic signing and road markings become more uniform nationwide. The fledging American Association of State Highway Officials (AASHO) and the then-recently formed Joint Committee on Uniform Traffic Control Devices agreed to undertake the daunting uniformity task. By 1935, the two organizations published the first edition of the *Manual on Uniform Traffic Control Devices* (MUTCD). Since then, the manual has been revised and upgraded regularly, and every state has either adopted the federal manual or published a nearly identical manual of its own. Almost all road and highway agencies in the United States use the Federal Highway Administration's MUTCD as a guide and standard for the design and installation of traffic signs. In more recent decades, compliance with the manual has been essentially universal. Of course, before the manual was accepted, it was common for every road jurisdiction to decide for itself how to sign their roads and highways, and early on, Minnesota was no exception. Shapes, sizes, and colors varied and so did the location of the signs with respect to how they were placed in intersection areas and in advance of places to which they referred. But as the limitations to longer distance travel melted away — particularly as the Interstate System was reaching completion — dissimilarities in traffic laws and signing were increasingly seen as not in the public interest. A discussion of the changes that evolved over the years could easily fill an entire book. So, just a few of the Minnesota signs involved in this evolution to uniformity are covered here.


Minnesota Historical Society

A Minneapolis version of the stop sign, ca. 1950.


Minnesota Historical Society

This "KEEP RIGHT" installation was located somewhere in St. Paul, ca. 1930. Today, it would clearly violate the implied rule that any device installed on the road should do less harm (if anything were to collide with it) than whatever it is warning drivers about or protecting them from. Note that "SLOW" signs are not provided for in today's MUTCD.

## ROUTE NUMBERING

You may wonder whether there is any rhyme or reason to the way major routes are numbered across the nation. Well, in fact, there is. The system for numbering Interstate highways and US numbered routes is quite logical and easily understood.

East-west routes are given even numbers, and north-south routes have odd numbers. On the Interstate System, the numbers start on the west, with I-5 running through California, Oregon, and Washington, ending with I-95 following close to the Atlantic Ocean for much of its distance from Florida to Maine. Even numbers start in the south near the Mexican border, with I-8 in California and Arizona and I-4 in Florida. However, I-10 is the first east/west freeway to make it all the way from one ocean to the other in the south. I-96 is the highest number in the north, but it is located entirely within the state of Michigan. I-94 is generally the most northerly Interstate route in the west; it runs only from Montana to Michigan. I-90, the longest of all the freeway routes, extends from Washington to Massachusetts. The only route numbers that extend across the entire country are those that end in "0" or "5," but not all of them do. (Minnesota has one of each: I-35, which ends short of the Canadian border by approximately 105 miles, and I-90, which begins and ends near salt water. However, don't expect to find a boat ramp at either end.)

The three-digit route numbers designate a short spur or loop route from their "parent" route. Those that begin with an even number are either beltways that go around a city, such as I-494 and I-694, or freeways that go through a medium-sized city (none in Minnesota). Three-digit routes starting with an odd number are branches off the main route, including I-394 between I-94 and I-494, and I-535 in Duluth and Superior.

A directional letter is added to a main route that splits on the approach to two destinations (I-35E and I-35W through the Twin Cities, and Dallas and Fort Worth in Texas). Although seen elsewhere in the country at one time, most of those split routes were given separate two-digit numbers early in the Interstate construction era.

The original Interstate authorization limited the system to the "continental" states. However, when Hawaii became a state in 1959, four freeway routes were designated there: H-1, H-2, H-3, and H-201. Interstate funding was also later designated for routes in Alaska and Puerto Rico, although freeway design standards were not required. Only the Hawaiian highways carry the red, white, and blue route markers.

As noted elsewhere in this book, US route numbering is similar to Interstate numbering in that north-south routes are generally odd, and east-west routes are generally even. However, the numbering ascends in the opposite directions from the Interstate. US 1 closely follows the East Coast, and US 101 follows the West Coast. US 2 is the northernmost US route, extending from Washington to Michigan's Upper Peninsula. It takes a break over the Great Lakes, but reappears on New York's border with Vermont, ending in Maine. US 90 is routed through southern portions of the Gulf States.

## Route Markers

In the early days of Minnesota's highway development, numbered route markers were nearly nonexistent. Furthermore, the few road maps that did exist were not always accurate, and they were soon out of date, given the rapid expansion of the road networks. Even if a road on a map had some identification, it was often impossible to find such identification on the road itself. A popular, but short-lived, form of directions to guide highway travelers were publications that provided turn-by-turn sets of direction that employed landmarks at decision points. These direc-

tions were fine as long as a farmer did not repaint his "white barn" red, a blacksmith did not convert his shop to a gas station, and a logger did not fell a grove of tall pines for lumber after the publication was distributed. Obviously, travelers in unfamiliar areas could have considerable difficulty trying to follow such directions, especially when driving after dark.

The Minnesota Legislature assigned route numbers to the Trunk Highway System when it was established by the constitutional amendment of 1920, and markers began to appear on some of those routes soon thereafter. The original Minnesota route marker was not the current blue-and-gold design. As with most of the other signs on our highways, the route marker has evolved over time. Among the earliest standardized markers was one featuring a black circle around a star, with a black numeral on a yellow background. In spite of the bright yellow color and the embossed outline of the star, night visibility was quite limited. The sign face was painted since the retroreflective surface used on all traffic signs today was not invented until 1939. A later version of the route marker in use until the mid-1950s featured the same design with a white background instead of yellow. Its night visibility was only slightly improved.


This is a sign in the collection of Robert Edgar of Bakersfield, CA. It probably dates from the mid-1920s.

Highway improvements after World War II allowed for higher speed limits, making it necessary to increase the size of traffic sign letters and numerals. Because the route marker star design could not accommodate larger numerals unless the sign panel was enlarged, the Minnesota Highway Department decided to change the design. The new design resembled the marker used by several other state highway departments at the time. If the route marker was overlaid on a green guide sign — a practice that evolved with the appearance of the Interstate freeways after 1956 — the borders and the word "Minnesota" were eliminated; when three-digit route numbers were required, the square shape was elongated into a rectangle.

The late 1960s brought the now-familiar marker in blue and gold — Minnesota's official colors (not maroon and gold, as many believe). The signs are the only state route marker in the country with a blue background and, as such, they are sometimes confused with blue county route markers, in spite of the fact that county markers have a pentagon shape. (Cases in point: The county route markers overlaid on the green guide signs for the I-494 Minnetonka Boulevard exit [Hennepin County Road 5] were removed when it was observed that southbound truck drivers were using that exit when they intended to get off the freeway at Minnesota Highway 5, several miles further south. Highway 47 has similarily been identified as "County 47" in addition to other similar misidentifications in newspapers and advertisements.) When first introduced, both the route numbers and the border were gold. However, both the day and night visibility proved to be inadequate, and the design was soon modified to provide for white numerals.

## Regulatory Signs


J. Katz

Here is how Rock County deals with the high winds that regularly cross the prairies: two posts and two back braces. Note that the county is using a single installation for three purposes: the county route marker, and two public service messages.

The stop sign, as we know it today, has been adopted in many places around the world. In 1915, the first stop sign appeared in Detroit — interestingly enough, one year *after* the first electric traffic signal was installed in Cleveland. In some countries where many languages are commonly spoken, the sign has the familiar red color and octagonal shape, but the word "STOP" is replaced with an open, white hand, as though it were a raised, gloved hand of a police officer. By the mid-1930s, the stop sign used in most jurisdictions, including Minnesota, was the standard octagonal shape; however, the colors were black letters on a yellow background. (Yellow letters on a red background were seen in a few other places around the nation.) But the style of the letters varied: some were squared, and some contained marble-shaped or prismatic retroreflectors to make them visible after dark. Of course, at night, a driver could only see the letters, not the octagonal shape. However, if the city/county/state was willing to pay a little more, signs with reflective borders, as well as lettering, could be purchased.)

After WWII, a few states began experimenting with white letters on a red background for stop signs, and by the early 1950s, jurisdictions in Minnesota began installing them. Interestingly, drivers seemed to give the red signs more respect than they paid to the yellow stop signs; i.e., they were more likely to come to a full stop as required by statute. However, the effect was short-lived. As the red signs became more prevalent, "rolling" stops became about as common as they were with the yellow signs.

A sign closely related to the stop sign made its first appearance in Minnesota in the mid-1950s. Traffic engineers recognized that, at some locations, a full stop was not always necessary or desirable. This was sometimes borne out in the high incidence of rolling stops at these locations. In response, the Highway Department introduced the yield sign. In initial installations in Minnesota, yield signs replaced stop signs at merge points for highway interchange ramps. The original design for this sign was the familiar triangular shape, but the colors were black on yellow, with a rather wordy message: "YIELD RIGHT OF WAY." The triangular shape was not yet universal, and some manufacturers cut off the bottom of the triangle, creating a four-sided figure with a wide top parallel to a narrow bottom. Eventually, the long-worded message was shortened to "YIELD," but curiously, the black border on the sign was extended to the edge of the sign face, even though that was inconsistent with the practice of leaving a yellow margin beyond the border. (To provide better contrast with the surrounding environment, white, yellow, and orange signs generally have a margin beyond the black border, whereas red, green, blue, brown, and black signs usually do not have a margin beyond their white border.) In its latest incarnation, the yield sign remains a triangle, but

## A LIGHT IN THE DARK: SCOTCHLITE

Prior to 1940, most highway signs were relatively invisible after dark. Even new signs with their bright-yellow or white-painted backgrounds were difficult to see at night — especially with low-beam headlights. High beams were somewhat helpful, but it was still necessary for drivers to seek out signs, rather than the signs, themselves, drawing motorists' attention. Furthermore, traffic in urban areas in the 1930s was already heavy enough to limit the opportunities to use high beams. Further complicating the problem, street lighting, background lighting in commercial areas with electric signs and storefront windows, oncoming vehicle headlights, and/or lighted billboards — and the distractions created by them — usually made traffic sign visibility worse.

In situations where signs were clearly critical to the safety of road users, a few signs were lighted with lamps attached either above or below. But this was not always effective, as the glare from the lamps on some installations could obscure the signs' message. And sooner or later, the incandescent bulbs used in those lamps would burn out. In addition, a cost was incurred supplying the power to these lights.

In other instances, larger signs with garish checkerboard or diagonal-striped borders were installed to attract attention; but, again, their night visibility was poor. Some visibility improvement was obtained with raised legends and borders on metal signs manufactured with a stamping process, but few of those signs are still in place today.

A popular solution for addressing the night visibility problem used reflective glass spheres or "buttons" for the sign legend. The latter had a prismatic backing much like the reflective portion of automobile taillights or reflectors attached to bicycle wheel spokes. While this early solution was certainly a big improvement over signs with no reflectorization, it was far from perfect. Two major deficiencies were associated with the reflective elements: 1) The sign image as seen at night had only a minimal resemblance to its daytime counterpart. Color and shape were not discernible, affecting immediate sign recognition for drivers. 2) The spherical or button elements added substantial cost to the signs — not a minor consideration when applied to the thousands of signs on each roadway, especially if the borders were reflectorized. Furthermore, the reflective elements were subject to deterioration from weather conditions.

Some Minnesota innovators thought a better solution could be developed.

In the 1930s, Harry Heltzer and his associates at 3M Company (it was formally known as the "Minnesota Mining and Manufacturing Company" until as late as 2002) developed a reflective sheeting material comprised of a plastic base, a layer of microscopic glass beads, and a transparent plastic top layer.

In 1939, the sheeting was applied in the form of tape strips that served as a reflective centerline marking for highway lanes. (Centerline paint in those days could not return a bright nighttime image.) However, the tape would not stay stuck to the road surface. As it waved about in the breeze, passing motorists dubbed it "3M's friendly tape."

Although it would be another 26 years before 3M put an effective pavement marking tape on the market, engineers did not give up on the product in hand. If it wouldn't work on the road surface, they wondered if it would work *beside* the road. So, on September 1, 1939, the first sign with 3M™ Reflective Sheeting (also commonly referred to as "Scotchlite") went up on a Minneapolis street. Soon thereafter, signs covered with 3M sheeting were installed all over Minnesota. (Ironically, street name signs in Minneapolis were not equipped with reflectorized material until the 1960s. St. Paul was at least ten years ahead of Minneapolis in that respect.)

The product was marketed quite successfully. However, 3M engineers soon realized that a better product would be needed. Older drivers were becoming a larger proportion of drivers. Yet, research showed that night visual acuity peaked around age 19. (It's all downhill from that age on, and rather precipitously for some drivers.) City driving in Minnesota, which had in almost all situations been limited to 30 or 35 miles per hour, was suddenly raised to 50 mph and higher as the freeways came to town in the 1960s. Larger and brighter signs would be needed to give all drivers sufficient time to see, comprehend, and properly respond to information transmitted via the signs at faster speeds. It was also observed that the effective life of the reflective sheeting, both in terms of retaining its level of reflectivity and its durability, was significantly shorter than the life of the metal blanks to which it was applied. Even though the blanks could be refurbished, it was a less-than-satisfactory economic circumstance for the company's customers.

By 1948, 3M introduced an improved grade of reflective sheeting with greater flexibility, improved weather resistance, and better reflectivity. The new product allowed for sign legends to be applied to white or yellow sheeting through a silk screening process using black or transparent colored inks. Conversely, red, blue, or green inks could also be screened onto white sheeting. As an alternative, rolls of sheeting were manufactured in red, yellow, green, blue, and brown in addition to white. Letters and borders could be cut from white sheeting and applied over the colored sheeting, using the same heat or pressure processes used to apply the sheeting material to metal or wood sign blanks.

By the late 1950s, roads adjacent to the Chemolite plant in Cottage Grove were being used to test the new product. A grade of reflective sheeting had been developed for commercial advertising purposes, and diesel locomotive engineers using the nearby Soo Line tracks were greeted with a puzzling billboard that welcomed them to "Alabama, the Heart of Dixie." Another city limit-type sign indicated that drivers were entering Moscow (presumably Idaho rather than Russia).

Some years later, 3M built roads on the Chemolite property expressly for testing reflective products. A large Mn/DOT-type overhead sign structure was installed over one roadway of the test track, and freeway-type continuous street lighting was installed adjacent to the road so that sign reflectivity could be observed both in lighted and unlighted conditions. The facility was likely instrumental in demonstrating that sign lighting on overhead structures could be eliminated. As a result, not long after the 1990s debut of the improved sheeting grades, Mn/DOT gradually began to remove lighting units from overhead sign structures, as well as the catwalks to which the units were attached.

3M continued to be innovative in the development of its sign facing products over the years. In 1989, it perfected a durable "fluorescent" red-orange sheeting for work zone signs, and in 1992, it introduced a fluorescent yellow-green for pedestrian and school zone signing.

Shortly after the beginning of the current century, 3M introduced fluorescent yellow, a color that replaced the standard yellow in use over the last 40 years for warning signs. Its brilliant color stands out when placed next to the former signs.

3M reflective sheeting can now be seen just about any place automotive traffic is common. In addition to signs, some of the most common applications are license plates, red and white markings on trucks, safety vests and coveralls, and logo-type markings on police vehicles. With such a huge worldwide market, competitors are after a piece of the pie. But with 3M's rate of innovation, it is quite difficult for competitors to keep up.

it now has a wide red border and red letters on a white background. It is conceivable that, at some future date, the word "YIELD" will disappear from the sign, as it already has in some countries.

Minnesota used to have a rather unique sign to identify the beginning of a zone where passing another vehicle traveling in the same direction was not permitted. The rectangular (long dimension vertical) white sign featured a black square in each of the four corners with the words "NO PASSING," in two lines, placed in the upper and middle portions of the white cross defined by the black squares. No other sign in the manual featured a similar design. The design might have been an attempt to mark the extreme hazard ahead with a clearly recognized symbol, i.e., one that would make it unnecessary for a driver to read the message on the sign every time it was encountered. That principle has proved to be sound as many symbol-type signs have become a standard design over the last several decades.


Minnesota Highways

We can be reasonably assured that this homemade sign would not get past a project inspector today. It was installed ca 1924 to mark a detour for Trunk Highway 1 (later signed US Highway 61, and today as Pine County Road 61), perhaps in the vicinity of Hinckley.

The 1950s saw the last of Minnesota's unique "NO PASSING" sign. It was replaced by a standard rectangular, black on white "DO NOT PASS" sign, as recommended by the national MUTCD of the time. By the late 1960s, Minnesota adopted the black on yellow "NO PASSING ZONE" pennant that was pioneered in Iowa and South Dakota. However, before it could be legally utilized as a regulatory sign (almost all regulatory signs are black on white rectangles), legislation had to be passed.

## Continuing Modifications

As signing across the nation has become increasingly uniform, and as the standards practiced in traffic engineering are now generally accepted, the need for major changes in signing and markings are not nearly as apparent. However, in continuing efforts to improve road safety, the Federal Highway Administration often approves requests to permit experimentation, and positive results from many such experiments have led to changes in the MUTCD and signing practices in Minnesota. For example, in spite of what would seem to have been adequate curve warning signs, there was evidence that drivers were leaving the road more often at some curves. Experimental installations of what is now the standard black on yellow chevron marker proved effective at keeping more of these drivers from leaving the road. This marker has thus been used in Minnesota since the mid-1970s.

However, most changes in today's signing and marking practices are usually subtler. For instance, in 2005, Minnesota stopped specifying the installation of "RIGHT (or LEFT) TURN LANE" signs in favor of the national manual's "RIGHT (or LEFT) LANE MUST TURN RIGHT (or LEFT)."

The "KEEP RIGHT" sign is one of the more common signs that we see on the road today. However, the older word-message sign with an arrow is still permitted by the MUTCD.

## Guide Signs

By far the largest and, perhaps, most recognized signs on Minnesota roads are the large green guide signs on freeways and other highways. Guide signs are an essential element for assisting drivers in safely reaching their destinations.

A few of Minnesota's highway guide signs are nearly 40 feet wide, and some are 10 feet or more high. To enhance their effectiveness, especially on multilane highways, more than 2,000 overhead cantilever and bridge truss structural mountings for guide signs have been installed on Minnesota roads since the first segment of I-35W in Bloomington and Richfield was completed in 1959.

## Work Zone Signs

Orange signs have been used in construction and maintenance work zones since the early 1970s. Prior to that time, work zone regulatory signs were black on white, and warning signs were black on yellow, as they are in non-work zone locations. The change to orange was mandated in the MUTCD to alert drivers to a changed road environment. Most recently, sign panels covered with a brighter, more eye-catching orange sheeting developed by the 3M Company have been deployed to accentuate the hazards in these zones, giving drivers an extra measure of warning and workers an extra measure of protection.

## Motorist Services Signs

Motorist services signs are characterized by their blue color. If you need gas, a motel, or food, blue signs on the freeways and expressways can give you the information you need in a uniform fashion. These signs are located much closer to the road than billboards advertising the same services.

Signs are definitely necessary to assist drivers in safely reaching their destinations. But it must be acknowledged that traffic signs can also distract a driver's attention from the road. Knowing certain signs by their color and shape can reduce the number of distractions that confront drivers. For example, there is no need to read the blue signs if you are not looking for a service identified by these signs. (If logos are provided on the blue signs, rather than using road-user taxes, the entity offering the services must pay for them.)

## Parks and Recreational Area Signs

Similar to the blue signs, it is not necessary to bother yourself with reading brown signs unless you are looking for a park or a recreational facility. Symbols identifying available activities at these facilities that can be changed to reflect seasonal offerings are sometimes placed below the main sign.

## Warning Signs

Warning signs are just as important as regulatory signs because they inform drivers of what to expect or what might be encountered on the roadway ahead. Unlike the blue and brown signs, it is quite inadvisable to ignore these signs. Warning signs are recognizable by their color and shape: all of them have black legends on a yellow background, and most of them are diamond-shaped. An exception, already noted above, are work zone warning signs, which have orange backgrounds. Another exception applies to pedestrian-, playground-, bicycle-crossing, and similarly related signs. Since the late 1990s, the MUCTD has permitted such signs to have bright yellow-green backgrounds.

# TRAFFIC SAFETY

## A Dramatic Improvement Over the Years – and a Long Way to Go

It's been a long haul here in Minnesota — a long haul with incremental changes so subtle that they have hardly been noticed since the state began tallying motor vehicle-related fatalities in 1910. But in the last several decades, driving on our roads and highways has, by any measure, become much safer than it was in the mid-1960s. In terms of the most widely publicized data, i.e., the number of traffic fatalities per year, there were less than half as many in 2007 (510) as there were in the record year, 1968 (1060). In terms of the number of crashes — a figure not given much public notice — the 2007 total was the lowest since 1965 and only 66% of the 1975 figure.

Although these improvements might be considered impressive, crash *rates* must be analyzed to gain a more accurate assessment of changes over the past several years. Crash rates relate the total number of crashes to other variables, including the total population, the number of vehicles in use, and the number of miles traveled. The table at the bottom of this page makes those comparisons.

From the table, it can be seen that the number of crashes increased by 2.2% over the 42 years since 1965 – not surprising considering the significant increase in the number of drivers, vehicles, population, and miles driven. Even more surprising is the fact that the 2007 crash total decreased by 34% compared to what it was in 1975. The number of fatalities was less than two-thirds of the 1965 number, and the number of injuries was reduced to less than three-quarters. Given the increase in the number of crashes, one might expect the latter two figures to have increased. But the biggest reduction was in the crash and fatality rates — particularly in the rates per miles driven. The number of crashes per 100 million miles traveled was less than one-third of what they had been, and the rate for fatalities was less than one-fifth compared to 42 years ago — or one-sixth compared to the record year!

What could account for such a great change? If there had been no changes in the driving environment except for the increases in the number of drivers and miles traveled, one might expect the actual numbers of crashes and fatalities to have increased accordingly and the crash and fatality rates to have remained essentially the same over the 42 years, i.e., 280,000 crashes and nearly 3,000 deaths per year! But it is obvious that there have been significant positive factors that led to the drastic decline in rates. The people influencing those numbers must have done something right. Namely, they've implemented the "Four Es": Engineering, Education, Enforcement, and Emergency Services. Several elements under each of these categories are explored below.

## Engineering

Minnesota's roads and highways are safer than they were in 1965. Implementation of the following

**MINNESOTA TRAFFIC CRASH COMPARISONS, 1965 TO 2007**

| | | Total Crashes | Persons | | Licensed Drivers (Millions) | Motor Vehicles (MV) (Millions) | Population (Millions) | Vehicle Miles Traveled (VMT) (Billions) | Crash Rates | | | Fatality Rates | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Killed | Injured | | | | | Per 100,000 MV | Per 100,000 Population | Per 100 Million VMT | Per 100,000 MV | Per 100,000 Population | Per 100 Million VMT |
| Year | 1965 | 83,329* | 875 | 50,847 | 1.85 | 1.86 | 3.57 | 16.8 | 4,480 | 2,334 | 496 | 47.0 | 24.5 | 5.20 |
| | 2007 | 81,505 | 510 | 35,318 | 3.91 | 4.82 | 5.26 | 57.4 | 1,691 | 1,548 | 142 | 10.6 | 9.7 | 0.89 |
| | | – 1,824 | – 365 | – 15,529 | + 2.06 | + 2.96 | + 1.69 | + 40.6 | – 2,789 | – 786 | – 354 | – 36.4 | – 14.8 | – 4.31 |
| % Change | | – 2.2 | – 41.7 | – 30.5 | + 111 | + 159 | + 47.3 | + 242 | – 62.3 | – 33.7 | – 71.4 | – 77.4 | – 60.4 | – 83.0 |

*Note that the highest total number of crashes was 123,206 in 1975.
Source: Minnesota Department of Public Safety, *Minnesota Motor Vehicle Crash Facts, 2007.*

safety features on all types of roads — from township roads to freeways — have contributed significantly to the downward trend in crash statistics:

- Elimination of (or protection from) roadside hazards
- Breakaway designs for sign posts and light poles
- Railroad crossing signals, gates, and grade separations
- Uniformity in traffic control devices
- Wider and paved shoulders
- Flatter curves
- Street and highway lighting
- Wider traffic lanes
- Flatter shoulder slopes
- Larger and brighter signs
- Better work zone protection
- Median barriers
- Increased sight distance
- Better lane markings
- Turn lanes
- Traffic signals

Traffic surveillance by means of TV cameras and other types of electronic detection in heavily traveled corridors permits activation of variable message signs to warn drivers of traffic congestion and/or incidents ahead, thus avoiding surprises and the potential for secondary collisions. Surveillance and improved communication systems have aided in quicker dispatch of the appropriate type of response to highway incidents, thus providing for faster removal of the vehicles involved and a quicker return to normal conditions.

Upgrading of roads has occurred over these same years. In heavily traveled corridors, several hundred miles of two-lane highways as well as many urban streets have been upgraded with divided roadways carrying four and sometimes more lanes, greatly reducing the potential for head-on and opposing direction side-swipe collisions.

Some roads have been upgraded to freeways — by far, the safest type of road. Consider that the fatality rate for Minnesota freeways on the Interstate System was 0.523 per 100 million vehicle miles traveled (VMT) in 2005 compared to 1.123 fatalities per 100 million VMT for all other roads. Similarly, there were 93.0 crashes on Interstate freeways per 100 million VMT vs. 173.3 per 100 million VMT on all other roads, or close to half the rate in either case.

Limited access, which by definition is a feature of all freeways, has also been applied to many miles of other highways in Minnesota. Limiting access to controlled intersections, i.e., eliminating driveways and local cross streets, has proven to be one of the most effective ways to reduce the number

## DID YOU KNOW

During an autopsy on a driver involved in what had been reported as a fatal crash in St. Paul in 2000, a bullet was discovered in his head. Given the circumstances, the total number of traffic fatalities reported for that year was listed as 625 rather than 626.

Standard operating procedure in the Department of Public Safety's collecting of crash data led to another unusual revelation in 1998. A fatal crash report had been filed, but the required blood alcohol toxicology report for the victim could not be located. An investigation eventually revealed that the "victim" was alive and well. It was concluded that the crash report was in error.

*– Alan Rodgers, DPS*

*(It should be noted here that DPS is very serious about maintaining the integrity of crash records. Particularly with fatal crashes, thorough checking is carried out to assure that all of the pertinent factors have been accurately and completely reported.)*

J. Katz

Transverse depressions have been ground into the pavement on this two-lane segment of Highway 60 west of St. James to create a centerline "rumble strip." While rumble strips on shoulder pavement are quite common, centerline usage is relatively uncommon. In this case, a two-lane segment of Highway 60 is located between two long stretches of four-lane divided highway. The strip is intended to remind drivers that they are pulling into a lane with opposing traffic.

and severity of crashes. To maintain access to adjacent properties, frontage roads have been provided, or where a frontage road is not feasible or practical, the right to the access has been purchased from the property owner by the agency having jurisdiction over the road.

Some of the busiest and most crash-prone intersections have been upgraded by the construction of grade separations and/or interchanges in both urban and rural areas. While not always intended as part of an eventual upgrading of a road to freeway standards, the separation of conflicting traffic movements has resulted in very significant reductions in crashes — particularly right-angle collisions, which are among the most severe.

The highway bypass is another type of upgrading improvement that has been used across the state since the 1930s and before. Although ostensibly implemented for the convenience of motorists and sometimes to address severe traffic congestion within a town or city, bypasses generally have had a significant safety benefit. By avoiding conflicts inherent in the mixing of local traffic with through traffic, pedestrian safety has been enhanced and the number of crashes that are a byproduct of traffic congestion have been reduced.

Incidentally, the highway bypass concept has not been limited to constructing roads around towns; some have been built around resort and lake home areas, environmentally sensitive areas, and mining locations — rugged terrain that did not readily lend itself to straightening curves and easing grades. Safety benefits were realized with many of these relocations.

Technology has provided for increased accuracy in identifying the development of hazardous conditions, and improved communications has enhanced the ability to address conditions in a timely manner. There is greater uniformity in snow and ice control standards and the measures taken to deal with bad weather.

Motor vehicles are safer. Crashes caused by equipment failure or malfunctions have become increasingly rare in the last several decades. Automobiles have become more dependable and their potential for safe service has increased by several years. Seat belts and airbags have reduced injury severity and fatality totals. Other vehicle equipment, such as anti-lock braking systems, improved tires, interior design, structural framing, and front-wheel drive, have provided for easier handling, better control, and improved occupant protection.

Devices such as cell phones and interagency emergency communication systems have reduced the time it takes to respond to life-threatening injuries suffered in crashes.

## Education

Classroom and behind-the-wheel driver training has become more universal and accepted as a necessity in public school programs. Education at this level is presumed to be influential in reducing the tendency toward youthful recklessness and promoting responsible driving.

Training for older drivers specializes in teaching students how to compensate for age-related changes, such as increased reaction time and vision and hearing loss. A Minnesota statute mandating a discount in the cost of auto insurance for drivers aged 55 or older who have completed a driver safety course has provided a great incentive for attendance at these classes.

A continuing public service message has, to a great degree, enhanced a general attitude that driving while under the influence of alcohol and/or drugs is no longer acceptable behavior.

## Enforcement

Statutes regarding driving while intoxicated have been stiffened over the years. Minnesota was among the first states to provide for the revocation of a driver's license upon refusal to submit to a breathalyzer test. However, it was the last of all the states to lower the legal blood alcohol content limit to 0.08 percent.

The State Legislature has amended the driver licensing statute more than 20 times since 1965. In addition to several specific clauses that identify conditions under which a person can be denied licensure, one very broad amendment provides for denial ". . . to any person when the commissioner [of the Department of Public Safety] has good cause to believe that the operation of a motor vehicle on the highways by the person would be inimical to public safety or welfare."

Minnesota seatbelt usage has remained at a relatively high rate (80% +) during recent years. However, it is thought that figure could be raised significantly if failure to use them were designated as a primary offense, i.e., an officer could stop and cite a driver for this offense, alone. A bill that so amended the existing statute was signed into law in 2009.

## Emergency Services

One of the guiding principals of road and highway emergency services is the emphasis on providing medical attention to injured crash victims as quickly as possible. It is well known that getting a severely injured person to a trauma center within what has been dubbed the "Golden Hour" is often the difference between life and death. Such speed may also be a factor in reducing the severi-

## WHAT ARE OUR PRIORITIES?

Tom Vanderbilt, in his book, *Traffic – Why We Drive the Way We Do (and What It Says About Us),** writes the following:

Grimly tally the number of people who have been killed by terrorism in the United States since the State Department began keeping records in the 1960s, and you'll get a total of less than 5,000 – roughly the same number, it has been pointed out, as those who have been struck by lightning. But each year, with some fluctuation, the number of people killed in car crashes in the United States tops 40,000. More people are killed on the roads each month than were killed in the September 11 attacks. In the wake of those attacks, polls found that many citizens thought it was acceptable to curtail civil liberties to help counter the threat of terrorism, to help preserve our "way of life." Those same citizens, meanwhile, in polls and in personal behavior, have routinely resisted traffic measures designed to reduce the annual death toll (e.g., lowering speed limits, introducing more red-light cameras, stiffer blood alcohol limits, stricter cell phone laws). . . .

It might be precisely because of all the vigilance that no further deaths due to terrorism have occurred in the United States since 9/11 – even as more than 200,000 people have died on the roads. This raises the question of why we do not mount a similarly concerted effort to improve the "security" of the nation's roads; instead, in the wake of 9/11, newspapers have been filled with stories of traffic police being taken off the roads and assigned to counterterrorism.

In the 1990s, the United Kingdom dropped its road fatalities by 34 percent. The United States managed a 6.5 percent reduction. Why the difference? Better air bags, safer cars? It was mostly speed, one study concluded (although U.S. drivers also rack up many more miles each year). While the United Kingdom was introducing speed cameras, the United States was resisting cameras and raising speed limits. Had the United States pulled off what the United Kingdom did, it is suggested, 10,000 fewer people [per year] would have been killed.

[The latter number in terms of Minnesota traffic fatalities could be assumed to be roughly 200 fewer deaths per year.]

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**Tom Vanderbuilt,* Traffic – Why We Drive the Way We Do (and What It Says About Us), *Alfred A. Knopf, 2008, Page 271.*

ty of permanent disabilities and injuries to vital organs. These concerns have often been sufficiently grave as to justify the dispatch of a helicopter to get crash victims to a hospital. Speedy response coupled with the high levels of training for emergency medical responders, improved communications systems, and on-board life-saving equipment have clearly prevented numerous traffic deaths and mitigated some of the effects of injury in more recent years.

## Good News – and Bad News

So, considering all of the above mitigating factors, it should not come as much of a surprise that the number of traffic crashes and fatalities, and their associated rates of occurrence have enjoyed a steady and most welcome decline in the last forty years. That is the good news. However, there still is some not-so-good news lurking in the background — news that is constantly put before the public, but, nonetheless, is received with a perplexing lack of concern. How



The amber beacon and sign pictured on the right is a rather common feature on highways in western Minnesota. The flasher installation is followed a few-hundred feet down the road by the gate arm, pictured in the center, that is lowered when the road is closed due to high winds and drifting snow. The left photo is an enlargement of the sign warning potential violators of fines for going around the gate. This installation is on Highway 60, near the south limits of Windom.

J. Katz

can it be explained that an average of 600 deaths per year over the last several years in Minnesota does not raise the same level of concern as a few deaths from the flu or a few hundred from murder?

The following paragraph is reproduced from the Minnesota Department of Public Safety's 2005 edition of the *Minnesota Motor Vehicle Crash Facts*:

> In the past two decades, approximately 600 people have been killed and 45,000 people have been injured on our roadways each and every year. We must acknowledge the fact that Minnesota is experiencing an "epidemic" concerning traffic crashes. In a public health sense, epidemics that kill and injure fewer people are usually attacked vigorously until they are no longer a threat to public safety.

## Toward Zero Deaths

In an effort to address the situation, Mn/DOT, DPS, the State Patrol, the Federal Highway Administration, and the University of Minnesota's Center for Transportation Studies embarked within the last few years on a campaign designated as "Toward Zero Deaths (TZD)." The ambitious goal of the program is to move toward zero deaths on Minnesota roads using the "Four Es" described earlier to raise awareness of traffic safety issues and develop additional strategies to address them.

An example of one new strategy is an enforcement and education program named "HEAT" (Highway Enforcement of Aggressive Traffic). This federally funded initiative included a $2.5-million, one-year component of nearly 1,400 hours of state and local speeding enforcement on road segments where surveys indicated unusually excessive speeds by time of day and day of the week. The enforcement component was accompanied by a statewide marketing effort that targeted the age group (16- to 30-year-olds) most prone to speeding. The project resulted in nearly 34,000 speeding citations and several thousand other enforcement actions.

As indicated, the TZD goal is zero deaths from traffic crashes. A first impression might be that such a goal is unreasonable, let alone unreachable! However,

who would have thought that the 1968, record-high number of traffic fatalities (1,060) could have dropped to (492) by 2006, or that fatality rates would be less than one-fifth of what they had been? Many more vehicles, many more drivers, and many more miles driven would certainly seem to be a recipe for significantly more fatal crashes. But while present trends indicate that there will continue to be more vehicles, drivers, and miles driven in the foreseeable future, the fatality trend is definitely downward.

The TZD goal is certainly ambitious. But, it is usually true that you must think big to achieve big results. The last forty years proves that dramatic traffic safety results are possible, and that efforts in each of the "Four Es" can pay off. It is clear that those who are involved in the TZD effort are not at all satisfied with the status quo. These same people also realize there is a long way to go; however, they are convinced the goal is appropriate, and pursuing it is the only option.

## A BRIEF HISTORY OF THE MINNESOTA STATE PATROL

The Minnesota State Patrol has been the major statewide organization devoted to road safety and enforcement since 1929. There can be no more welcome sight than an approaching trooper, deputy, or officer in uniform when a motorist needs help on the road. Without their traffic regulation enforcement activities, our roads would certainly be more dangerous.

The Patrol's stated mission is to "Protect and serve all people in the state through assistance, education, and enforcement; provide support to allied agencies; and provide for the safe, efficient movement of traffic on Minnesota's roadways." To carry out that mission, the Patrol assists stranded motorists, provides educational forums on traffic regulations and statutes relating to the use of highway right-of-way, and enforces traffic regulations; supports local enforcement agencies in those instances when temporary assistance is needed; and responds to traffic incidents and provides for their expedient amelioration and direction of traffic to avoid secondary incidents while, at the same time, looking after the safety of those involved.

Although this chapter is about the State Patrol, it should be noted that the trunk highway system served by the Patrol accounts for only 9 percent of the state's total road mileage. The county sheriff

Minnesota Historical Society

Unidentified Minnesota Highway Patrol officer with patrol car and motorcycle, ca. 1930.

departments and local police departments patrol all other roads. Similar to the Patrol, these departments also play a key role in the safe operation of the roads and streets within their jurisdictions — including the state highways. And comparable to the Patrol, the men and women who staff these agencies take pride in what they do and how they do it. All of these agencies are quick to assist one another when needed. Obviously, there are far too many local enforcement organizations to mention in this book; however, it is interesting to note that most local agencies predate the Patrol by many years.

Minnesota State Patrol Troopers' Association Website

Minnesota Highway Patrol Chief Earl Brown, left center with the first five officers. It is presumed that this photo was taken on Brown's farm in Brooklyn Center where the Patrol's first training school took place starting on January 18, 1930.

As the number of automobiles and the distances they traveled on Minnesota roads dramatically increased during the first quarter of the twentieth century, the need for a statewide traffic law enforcement agency become readily apparent. The considerable number of jurisdictional lines that were crossed by the state's roads created an impediment to efficient enforcement of traffic regulations. The need for an overriding agency was brought up during the 1925 session of the State Legislature, although the discussion did not lead to the introduction of a bill at that time. In 1927, a bill that would have established a state highway patrol organization was opposed by several organizations and did not pass.

Finally, in the Legislature's 1929 session, a bill creating the Minnesota Highway Patrol was passed. The bill established the Patrol as an organizational unit within the Minnesota Department of Highways and authorized the Commissioner of Highways to hire not more than 35 officers with pay not to exceed $150 per month. In June of that year, Commissioner Charles M. Babcock appointed Hennepin County Sheriff Earle Brown as Chief of the Highway Patrol. Shortly thereafter, nine officers joined the force. Two of the appointees then attended the Pennsylvania State Police School and another two were sent to the Massachusetts Highway Patrol School.

Following are some highlights of the history of the Minnesota Highway Patrol, which was later renamed the Minnesota State Patrol.

- The first Minnesota Highway Patrol training school session took place in a barn on Chief Brown's farm in Brooklyn Center during the first three months of 1930. The four men Brown had sent to study in Pennsylvania and Massachusetts served as instructors for 50 enrollees that included the five other men appointed in 1929. After two weeks of intensive physical training, classes covered traffic laws, pistol practice, first aid, motorcycle riding, and courtesy. Brown placed particular stress on courteous service.

  Of the 50 men who attended training, 35 graduates were assigned as officers at $120

per month. The men worked twelve hours per day and seven days per week, with one day off each month. Their uniform consisted of oxford gray breeches and a matching blouse.

- By 1931, the Legislature increased the Patrol to seventy officers and five supervisors, established the officers' salary at $130 per month, and provided expense accounts. The state was divided into three districts, each supervised by a lieutenant who was appointed from the original group of nine officers.

  Officers filed daily reports, including mileage traveled, time on duty, highways traveled, and highways they expected to travel the following day. Patrolmen arrested numerous drivers for driving under the influence of alcohol (an offense classified as careless driving) and drunk driving (a gross misdemeanor). It is pertinent to note that the United States was "dry" at the time as prescribed by the short-lived Eighteenth Amendment to the Constitution.

- In 1934, the Highway Patrol changed its colors to maroon and gold and adopted the new colors for their uniform. Instead of the expense account, officers now received a subsistence account of 60 cents per day. Also in that year, the first two Patrol officers to die on duty were involved in separate motorcycle collisions. At least five other officers have died while on duty since that time.

- During the remainder of the 1930s, the Legislature identified conditions under which officers would have specified rights before they could be suspended, demoted, or dismissed. Officers were exempted from Civil Service, and a bill was passed prohibiting the Highway Patrol from "becoming involved in any strikes or industrial disputes."

- The Minnesota Highway Patrol Officers Association was organized during the 1930s. Early on, the association moved to prevent political firing and decided to decline an invitation to join a labor union. Today, this organization continues as the Minnesota State Patrol Trooper's Association.

- By the end of the 1930s, Patrol officers were using radios for communications. However, reception was provided through local police stations. In 1943, the Highway Commissioner was given permission to acquire land for radio towers. The first towers were placed near North Snelling Avenue in St. Paul and in Redwood Falls.

  Also in 1943, the Legislature established a retirement fund for Highway Patrol officers, separate from the general Minnesota State Retirement System. This significant departure from the general retirement fund permitted patrolmen to retire after only 20 years of service and to draw an annuity at age 58.

- Like many Americans, World War II affected officers of the Highway Patrol. Many Patrol officers served in the military during World War II, making it necessary to close several patrol stations; a number of others were limited to one man. Two officers died overseas, and a third died after returning to a stateside camp.

  For the first full year after the war, the Legislature authorized the Commissioner of Highways to appoint between 126 and 151 officers to the Highway Patrol. Starting salary increased to $160 per month, with a $5 annual increase, until reaching a $200 per month maximum. A cost of living adjustment of $24 per month was also provided for existing officers.

- The first shooting of an officer on duty occurred in 1953 in west central Minnesota near Parkers Prairie. A youth was arrested several days later and convicted.

- Airplane patrolling was inaugurated in 1957 for speed limit enforcement. The Patrol offi-

cers flying the airplanes were licensed aviators. The Patrol eventually took on the responsibility for flying state officials, including the governor, to appointments around the state when needed.

Minnesota Historical Society

Minnesota Highway Patrol officers with their motorcycles on the State Fairgrounds, ca. 1935. Up until the 1980s, Mn/DOT's central equipment shop was housed in the building in the background. This is where new motorcycles were outfitted for Patrol duty, and, later on, the special equipment, sirens, red lights, bumpers, etc., were mounted on the squad cars.

- Starting salary for patrolmen was raised to $506 per month in 1968 and $667 per month in 1969, when the authorized complement was increased to 458 officers. The year 1969 also saw the reassignment of the Highway Patrol from the Department of Highways to the newly established Department of Public Safety. Another big boost in the size of the organization occurred the following year when the number of authorized officers was raised to 504. At that time, the Highway Patrol took over security for the Minnesota Capitol complex and the governor's mansion, and a helicopter was acquired. The helicopter was used to assist in the search for fugitives and other enforcement activity that could benefit from aerial observations. Eventually, aerial surveillance of morning and evening traffic conditions on the freeways in the Twin Cities metro area was reported by the Patrol to participating radio stations for their listeners. This was in the days before video surveillance coverage of the freeway system was installed.

- In 1974, the Highway Patrol was reorganized and renamed as the "Minnesota State Patrol." The legislation permitted the Patrol to carry out enforcement activity throughout the state as needed and assigned it police powers, in addition to traffic law enforcement. Personnel, formerly hired as an "officer," were re-designated as "Trooper I." In line with the new title, the military-type visored cap was retired in favor of the now-familiar "Smokey Bear" hat. Along with the reorganization came another raise in the trooper starting salary to $870 per month — more than doubling the salary paid ten years before — and the promotional category of "corporal" was created.

- The twenty-fifth training school was held in 1976, graduating the first three women to become members of the Patrol. One of them, Anne L. Beers, would later become chief of the Patrol in 1997.

- By 1986, starting salaries had more than doubled again from the 1974 level to $1,808 per month.

- In 1997, State Trooper Timothy J. Bowe was killed in the line of duty in a gun battle near Highway 95. A 14-mile section of the highway between Cambridge and North Branch was named in his memory and in honor of his dedication.

- The first canines joined the State Patrol in 1999. The dogs, named Shadow, Lightning,


Minnesota Department of Public Safety

As of 2008, this was the "new look" for State Patrol squad cars. It is a reversion to the markings used from 1960 to 1991. Vehicles during the 1992 to 2007 period were maroon with gold striping running the length of the squad, about midway between the windows and the bottom of the doors, with a much smaller outline of the state.

Nikki, and Asta, were European-bred Belgian Malinois trained to aggressively respond to illegal drugs. That year also marked the first offering of the "Experienced/Licensed" Officer Academy. It was the forty-forth training class the Patrol conducted, graduating twelve former officers from police and sheriff departments from around the state, as well as three from other states. All twelve inductees received trooper appointments upon graduation. The following year, trooper starting salary was increased to $3,283 per month — more than four times the salary offered 26 years earlier.

- In 2000, Corporal Theodore Foss was fatally injured after stopping a van for a speeding violation on I-90 in southeastern Minnesota. He was talking with the occupants of the van when a semi-trailer truck veered off the roadway, striking the squad car, the van, and Corporal Foss. In memoriam, a 42-mile section of I-90 from Highway 74 to the Wisconsin state line was named the State Trooper Theodore "Ted" Foss Memorial Highway. A large, full-color sign with his portrait is located at the Dresbach Rest Area, adjacent to the Mississippi River. A memorial fund was also established in his name to create scholarships for potential law enforcement students in the Winona area.

  Another tribute to Corporal Foss is Minnesota Statute §169.18 sub. 11, known as the "Ted Foss Law," passed in 2001 to protect enforcement officers, emergency services providers, and other individuals involved in attending to roadway incidents. The statute states that, "When approaching and before passing an authorized emergency vehicle that is parked or otherwise stopped on or next to a street or highway having two or more lanes in the same direction, the driver of a vehicle shall safely move the vehicle to a lane away from the emergency vehicle." Drivers failing to do so can be cited and fined. The statute was amended in 2008 to include vehicles involved in road maintenance.

- Since 1929, more than 1,000 Minnesotans have served as officers in service to the State Patrol. Each of them is identified by name in a history of the Patrol compiled by the Minnesota State Patrol Troopers Association. The history can be found on the MSPTA website (www.mspta.com/msphistory.htm at the time of this writing).

# Unique Bridges 12

## UNIQUE BRIDGES

Over the years, many unique bridges have been built in Minnesota. A small sample of them is pictured here. Obviously, a few pages are not nearly enough room to do justice to the topic. A rather large book would be needed to cover the number of bridges that could appear under this title. The intent of this chapter is merely an attempt to briefly identify a few of them in a photo-essay format. Some, such as the Hennepin Avenue bridges, the Oliver Bridge, and the "Outlaw Bridge" are featured in their own sections of this chapter. More in-depth information about most of the bridges mentioned here can be found in other sources, including the Internet.

Minnesota Historical Society

Although most present-day Minnesotans were born to late to have seen this bridge, it might very well be the one long-gone bridge that is better known by state residents than any other. This is the Hastings Spiral Bridge over the Mississippi River. The bridge was completed in 1895. Only three bridges with similar spirals are known to have been constructed in the United States. The view is from the upstream side and west (south) bank of the river.


Minnesota Historical Society

This ca. 1920 colorized postcard clearly shows a very narrow, raised – though low-level – median divider between opposing traffic lanes. Such a median would have almost no value as a means to prevent errant vehicles from crossing into the opposing lane.

Minnesota Historical Society

In this 1951 photo, the "new" Highway 61 Bridge is already in use, and the Spiral Bridge is in the process of being removed. A community effort to save it in recognition of its historical significance was not successful.

An 1867 photo of the Wabasha Street Bridge over the Mississippi River, south of downtown St. Paul. The superstructure was composed of wood timber trusses resting on stone piers. The housings on top of the trusses were installed to provide some protection from the weather. The pointed shape on the lower portion of the piers was intended to ease the flow of ice and, perhaps, stray logs.

Minnesota Historical Society

Minnesota Historical Society

By the time of this 1885 photo, the wooden superstructure of the Wabasha Street Bridge had been removed and replaced with iron trusses placed on the piers left in place from the wooden bridge. This time, however, the deck trusses' top and bottom chords were parallel to the roadway grade, while the through-truss, like before, was horizontal with an inclined roadway.

Minnesota Historical Society

J. Katz - with thanks to Cecilia Ahrry Martin

The Lakeland-Hudson Toll Bridge over the St. Croix River was built in 1911 and was dismantled in 1951 when a new, free bridge was constructed less than one mile downstream. The bridge carried Highway 12 from the high bank on the Minnesota side (left) down to the tollhouse (right) and a causeway into the business district in Hudson, Wisconsin. The grade was so steep that Model T Fords would sometimes take the grade in reverse gear to avoid slippage. During the winter, trucks sometimes needed an assisting push on the slippery grade.

The 1911 bridge was not completely dismantled. Piers were left in place on the steep western slope down to the river. The pier shown in the photo supported the west end of the through truss deck that was perched 80 feet above the channel to reach the bank on the Minnesota side.

Minnesota Historical Society

In 1889, a third bridge was completed. This time, the entire structure was built as an iron deck truss, and the bottom chord of the truss (except for a curving haunch over the piers) was parallel to the grade of the roadway. This photo from 1955 shows some deck repairs underway.

The current (and fourth) Wabasha Street Bridge is actually two separate concrete box girder structures that were completed in 1998. It is a pedestrian-friendly bridge with wide sidewalks and spiral-like staircases.

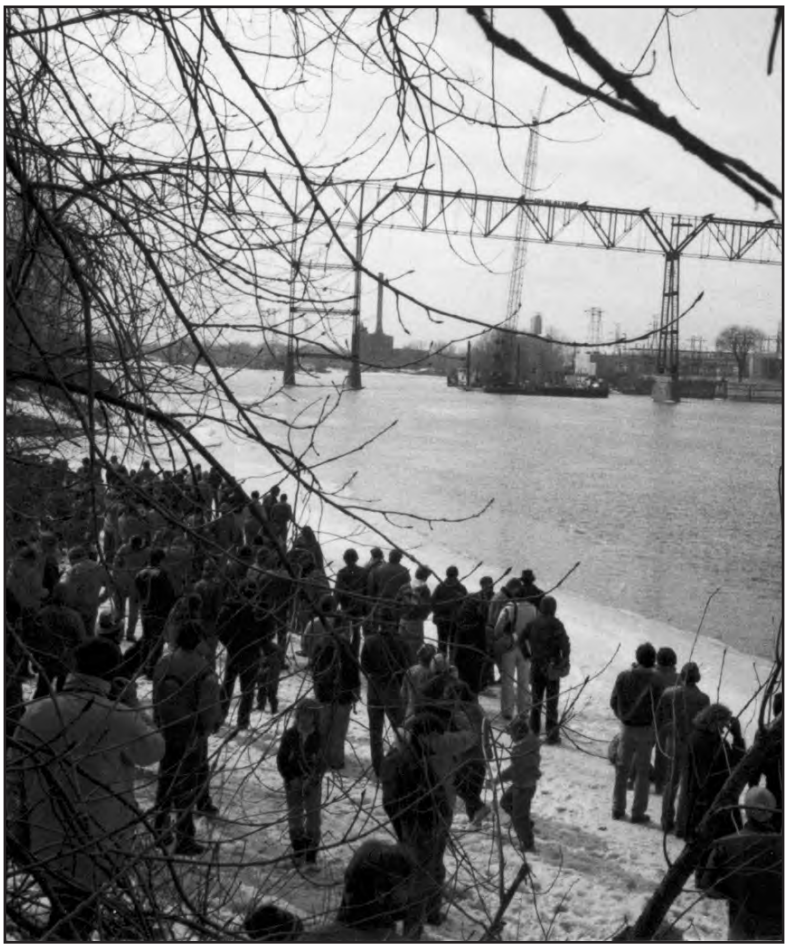


The replacement High Bridge was completed in 1987. The railings from the old bridge (inset) were re-installed on the new, linking it to the past 100 years.

Inset: Minnesota Historical Society

Charles W. Burback, Minnesota Historical Society

The "High Bridge" is another of Minnesota's most remembered bridges. This photo (apparently, two photos pasted together) was taken in 1889, the year the bridge was completed. The south end (right) was 160 feet above the water.



Charles W. Burback, Minnesota Historical Society

Deterioration of the High Bridge led to its closing in 1984. It was demolished by explosive charges in February of the following year before a crowd numbering 25,000 people, some of whom are shown here just before the blast.

Minnesota Historical Society

The Mendota Bridge pictured one year after its completion in 1926. It was billed as "The Mile-Long Bridge"; however, its actual length is short of 0.8 mile by about 105 feet. That was still long enough to make it the longest concrete arch bridge in the United States in its early years. There are 14 arches.

Jim Frazier, ©2008. All rights reserved.

The Richard I. Bong Memorial Bridge, completed in 1985, carries Highway 2 from I-35 at 46th Avenue West in Duluth over the St. Louis River to Belknap Street in Superior Wisconsin. At 2.25 miles (including the approaches shown in the foreground), it is the longest bridge in either state. The 500-foot main span over the navigation channel is 120 feet above the water.

MapQuest.com

One of the more unique aspects of the Bong Bridge, shown in this aerial view (left), is its curvilinear horizontal alignment. The only tangent (straight) sections are a very short one next to the industrial island at the end of Front Street and one through the main span over the navigation channel to the north of the open Burlington Northern Santa Fe Railway Bridge.

In 1985, the completion of the Bong Bridge signaled the closure of the 1927 Arrowhead Bridge (foreground), pictured here in October 1984. It was a narrow, wooden bridge with two bascule draw spans that were frequently opened for navigation in the channel. Tolls were collected until 1963. Its construction cost $500,000; the contract to tear it down was bid at $700,000.

Joey McLeister, Duluth News-Tribune

Ross Reinhold and Superior Trails.com

No listing of unique bridges in Minnesota would be complete without highlighting Duluth's famous Aerial Lift Bridge. The bridge, originally constructed in 1905 and extensively modified in 1929, spans the ship canal that brings ocean-going ships and lake freighters from Lake Superior to the Duluth Harbor Basin. The bridge is the only road link connecting Minnesota Point (Park Point) to the mainland. It has been on the National Register of Historic Places for more than 35 years.


City of Zumbrota

Covered bridges are not particularly unique; however, this is the last one remaining in Minnesota. It crosses the Zumbro River one block west of its original location where it was constructed for $5,800 in 1869. In 1932, the covered bridge was moved to the Goodhue County Fairgrounds. In 1970, it was moved to Covered Bridge Park. In 1997, it was moved once again to its present location where steel beams and a center concrete support pier were added and traffic was limited to pedestrians and bicycles.

J. Katz

Old Crystal Bay Road over new Highway 12 and the Burlington Northern Santa Fe Railway in Orono. Mn/DOT has made a concerted effort to work with local communities to develop bridge designs that reflect a sense of place and provide integration with the immediate surroundings. In this case, the colors, railings, street lighting, and faux stonework are not duplicated elsewhere in Minnesota except on other bridges and walls on this five-mile project that was completed in 2008.

Neil Kveberg, Mn/DOT

Skyline Parkway over Piedmont Avenue (Highway 53) in Duluth. The appearance of the "stonework" is consistent with walls and bridges built with stone from the Lake Superior area early in the twentieth century.

Minneapolis Journal, Minnesota Historical Society

The Mendota Bridge under construction in 1925 over the Minnesota River near Fort Snelling. A major rehabilitation of the deck was completed in 1969. In 1993, the deck was replaced and widened to provide shoulders, protected sidewalks, a median barrier, and a bikeway, while much of the superstructure above the arches was replaced. That project, and one at the Highway 55 juncions with Highways 13 and 110, extended the freeway system in the Fort Snelling area to the south side of the Minnesota River.

J. Katz

This steel arch structure carrying Highway 61 over the Gooseberry River is located 40 miles from Duluth up the North Shore of Lake Superior. (One of the river's falls is located at bottom center.) As a modern steel arch, there wouldn't be much reason to include this bridge in a chapter entitled "Unique Bridges." However, the suspension of the pedestrian structure underneath the roadway deck is rather unique.

J. Katz

A prefabricated pedestrian bridge crossing the Gooseberry River. Prefabricated pedestrian bridges are not unique. However, more than 5,000 of these bridges have been manufactured in Alexandria since 1972 and shipped to locations throughout the nation.

## THE HENNEPIN AVENUE BRIDGES

There is certainly no doubt about the uniqueness of the Hennepin Avenue crossing of the Mississippi River in Minneapolis. The bridge was the first to be constructed across the Mississippi River anywhere along its entire length from Lake Itasca to the Gulf of Mexico.

In 1852, the Territorial Legislature incorporated the Mississippi River Bridge Company and authorized it to build a toll bridge near St. Anthony Falls in Minneapolis. Capital stock for the company was set at $25,000, in $100 shares, with a charter term of 20 years. The legislation provided that the charter was to be forfeited if construction of the bridge was not begun within two years and completed within five.

One year later, engineering surveys were underway, and by spring of 1854, construction was begun on a 17-foot-wide suspension bridge with a 620-foot span. Although earlier planning called for a less-costly frame abutment-type bridge, the construction engineer had persuaded the company that a suspension span could be built with the capital that had been invested.

On December 5, 1854, the bridge was opened to pedestrians, and after a total expenditure of $36,000 (approximately $850,000 in 2005 dollars), the completed bridge was opened to traffic on a cold January 23. More than 500 people joined the opening celebration, and 100 sleighs lined up to cross the bridge during the festivities. Addressing the celebrants, Territorial Governor Willis A. Gorman noted that this important "new gateway to the West" would link the commerce of the East and West Coasts. An account of the celebration in the *St. Anthony Express* a few days later nearly filled that edition of the newspaper.

The original span did not endure for very long. Two months after the opening, on March 25, 1855, the bridge collapsed during a violent windstorm. However, the bridge company set out immediately to repair it, and by July 4, the bridge reopened to traffic. On that day, it was reported that $70 in tolls were collected; receipts for the remainder of the month totaled $1,482, exceeding expectations. Tolls at that time were 5 cents (approximately $1 in 2009 dollars) for pedestrians and 2 cents per head for sheep and pigs. Later that year, a 24 percent dividend was declared for investors, and toll collections in 1856 approached $19,000.

Not long after the first suspension bridge was completed, it became evident that the bridge would soon be inadequate to meet the rapidly growing traffic demands of the city. The narrow bridge may very well have given rise to one of the first traffic bottlenecks in Minnesota. By 1876, construction was underway on a replacement for the historic first bridge over the Mississippi. The new bridge was 32 feet wide — almost twice as wide as its predecessor. With its impressive stone towers on the skyline, it had an aura of sturdiness and massive ruggedness that proclaimed it was here to stay!

Minnesota Historical Society

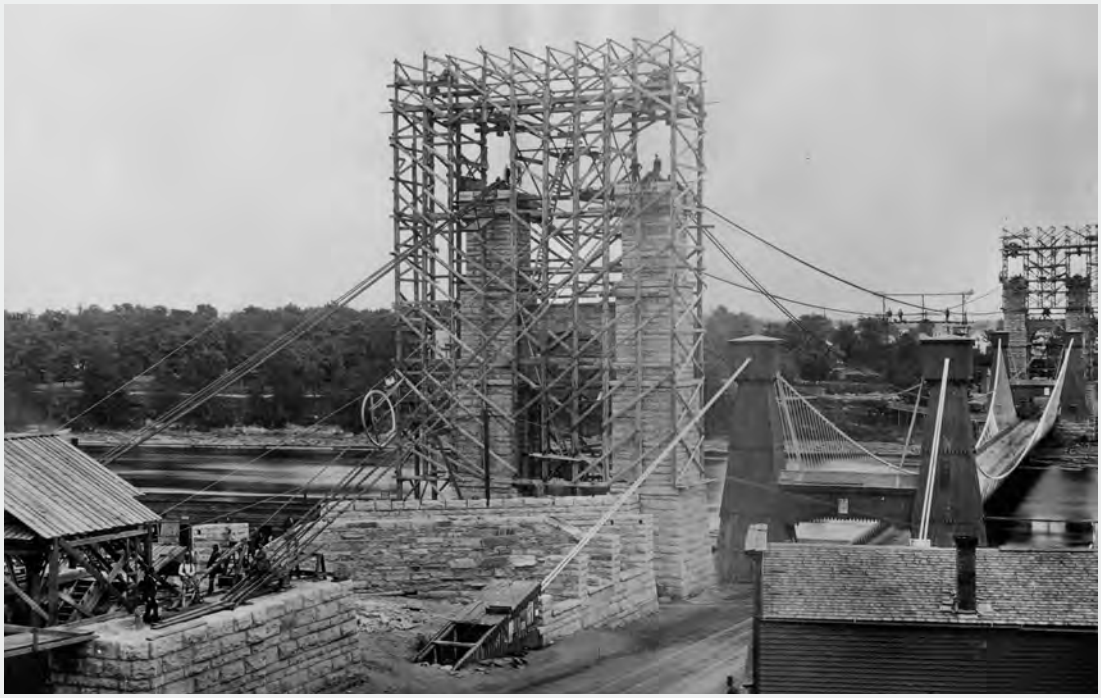
The first bridge over the Mississippi River, ca. 1865. The bridge connected Hennepin Avenue on the Minneapolis side of the river in the foreground to Nicollet Island in what was then the Village of St. Anthony.

But it was not to be. A second replacement bridge was soon built. The photo on this page shows three partially completed piers for the third bridge to be built at this location. As with the second bridge, the new structure was constructed slightly upstream from its predecessor to permit traffic to cross during construction. It appears from the photo that planners intended to complete part of the new structure with a temporary railing on the south side, switch traffic from the old bridge to the partially completed deck of the new bridge, tear down the old bridge, finish construction on the south side of the new bridge, and open the full width to traffic.

That such a construction sequence was even considered feasible in such close proximity to the old bridge can be seen in the above below: The third Hennepin Avenue Bridge did not follow the precedent set by the previous spans. It was not a suspension bridge, but was constructed of several parallel steel arches in

Minnesota Historical Society

The first suspension bridge looking east toward Nicollet Island, ca. 1860. The photographer quite purposely framed the far towers in the opening between the near towers. The bridge engineer was Thomas Griffith who had been an assistant engineer during construction of the Niagara Falls Suspension Bridge.



Minnesota Historical Society

The second suspension bridge under construction in 1876. It was constructed slightly upstream from the original bridge so it could continue to carry traffic during construction of the new bridge. Notice how the new bridge dwarfs the once-prominent 1855 structure.


William H. Jacoby, Minnesota Historical Society

The second suspension bridge in 1889. As with the first suspension bridge, photographers were interested in composition.

two spans. Not all of the side-by-side arches had to be placed before it could be readied to carry one lane of traffic in each direction. In recent years, builders have used similar procedures in renovating or replacing large and small bridges in Minnesota. Thus, it has become unnecessary to close the road or provide a temporary structure while bridge work is underway.

The third bridge was completed in 1891. It carried horses and wagons, streetcars, and motor vehicles for almost 100 years — more than twice as long as its two predecessors combined. Given that the first gasoline-powered automobile in America was invented in the same year, considerable credit must be given to the planners and designers who had the foresight to build a bridge wide enough to carry four traffic lanes and structurally adequate to support the heavier vehicles that would eventually be in service. The bridge was competed as electrification of the Twin Cities' streetcar lines was just getting underway, and larger streetcars would soon be using the rails.

One-hundred years is a long time for any bridge to remain in service — especially in Minnesota's harsh climate. (Many bridges on the Interstate Highway System, all constructed since 1956 and with less than 50 years of service, were replaced in recent times. Of course, deterioration was not the only reason that some of them were replaced.) So, with its long working life, it was not much of a surprise when the third Hennepin Avenue Bridge needed to be replaced as the twentieth century came to a close.

Hennepin County constructed a fourth bridge at this location in 1990. This time, the county board agreed that historic precedent should be honored

Charles J Hibbard, Minnesota Historical Society

The third Hennepin Avenue Bridge, a two-span, steel-arch structure, as photographed from Nicollet Island in 1911. Steel had just begun to replace iron as a preferred bridge building material by the time the bridge was under construction in 1889. The deck was 56 feet wide between curbs with a 12-foot sidewalk on each side.

National Park Service Photo

The 1990 Hennepin Avenue Bridge with the Third Avenue Bridge and the Stone Arch Bridge in the background. The Burlington Northern Santa Fe Railroad Bridge is in the foreground, and the Mississippi River east channel is to the left of Nicollet Island.

and a suspension span reminiscent of the two nineteenth-century bridges should be built, even though it would cost several million dollars more than a conventional bridge of the same length.* Of course, the board received some criticism for the additional expenditure as well as its decision to provide three traffic lanes in each direction. Opponents of the additional capacity suggested that with the six lanes instead of four, the road would become a freeway — an unacceptable intrusion on their neighborhood.

Certainly, the wider bridge and related projects did make for a major change in the way traffic was carried across the river — in particular, over the east channel between Nicollet Island and the east bank. Where there had been just one bridge, two were constructed: one in place of the existing East Hennepin Avenue structure, and one angling a bit further upstream connecting to First Avenue Northeast. Hennepin and First became a pair of one-way streets, one block apart, through the East Hennepin commercial district, as can be seen in the accompanying photo.

The fourth Hennepin Avenue Bridge was the only structure that was built without keeping the in-place bridge open to traffic during construction. In 1990, there were nearby bridges to provide convenient detour routes.



The most recent Hennepin Avenue Bridge viewed from downstream. Nicollet Island is to the right. This bridge is more than seven times as wide as the first bridge constructed at this location, yet it is only five feet longer.

** It should be noted that the bridge is not actually a true suspension span. Most of the weight of the bridge and the traffic it carries is born by the deck girders rather than the suspension cables. Similarly, a replacement bridge on nearby Washington Avenue over the BNSF Railroad tracks has a false, steel through-truss attached to it that closely resembles the old truss bridge that was replaced in the 1990s. Thus, the new bridge maintains some connection with the past, in keeping with the renovated buildings in its commercial neighborhood.*

## THE OLIVER BRIDGE

The double-deck Oliver Bridge, constructed in 1916, carries Minnesota Highway 39 and Wisconsin Highway 105 over the St. Louis River between the southwestern end of Duluth (the Gary/New Duluth and Morgan Park neighborhoods) and the tiny town of Oliver, Wisconsin. It is sometimes referred to locally as the "Third Bridge," the first and second being the John A. Blatnik and Richard I. Bong Bridges that connect the Twin Port cities of Duluth and Superior. On its upper deck, the bridge carries a track for the bridge's current owner, the Canadian National Railway. The need for a railroad crossing of the river was the primary reason for its construction.


Steve Stearns, Duluth News Tribune

Jacob Norlund http://tinypic.com

Top: The Oliver Bridge in 1992 showing the wooden plank deck, the cast iron railings, the wood curb (lower right), and the warning of the right-angle bends at the Wisconsin end. Bottom: A view of the concrete lower deck constructed in 2001 from the Wisconsin approach to the bridge.

The Interstate Transfer Railway Company, a Wisconsin corporation, built the 1,889-foot structure under federal authorization from the 60th Congress (Session I, Chapter 31, February 20, 1908). The legislation included a proviso specifically stating the following:

> That said bridge shall be constructed with two through decks, one of which shall provide for the passage of wagons and vehicles, for all kinds of street railway and motor cars and road travel and one of which shall also have two passageways, one on either side, for the exclusive use of pedestrians, each passageway to be not less than three and one-half feet in width and to be separated from the roadway or railway on said deck by suitable guard railings, and all parts of said bridge shall be forever maintained in accessible and serviceable condition and the use thereof shall be forever free and without toll or compensation therefor to all pedestrians and vehicles, but not free for steam or electric railroad cars and locomotives or street cars.

### OLIVER BRIDGE TIDBITS

The agreement with the railroads provided for the DM & IR to assume all maintenance for the bridge after its rehabilitation. Consequently, Mn/DOT has considered turning back Highway 39 to local control.

The bridge appeared in the 1993 movie, *Iron Will*, a story about the World War I-era dog sled race from Winnipeg to St. Paul. Viewers were led to believe that the bridge was on the Canadian border.

Given the usual meaning of the term "through" with respect to bridge trusses (i.e., the decks are located within the truss rather than on top of it), it is apparent that the bridge that was constructed did not strictly meet the letter of the law regarding the location of its decks. As can be seen in the following recent photo, the placement of the roadway certainly conforms to the common definition of a through truss; however, the railroad is clearly on the top of the structure. If it were not for the roadway below, the bridge would usually be identified as a "deck truss" rather than a "through truss." As a hybrid, perhaps the correct, but somewhat awkward, description would be a "through/deck truss."

The upper deck of the bridge was designed and constructed to carry a pair of railroad tracks. However, only one track was installed, located on the bridge's north side. Two plate girder spans at each end of the bridge that would have carried the second track on the south side were removed many years ago. They became the structural members for the DM & IR Railroad's overpass of Highway 53 for the track that serves the Minorca Mine, north of Virginia, Minnesota.

Jacob Norlund http://tinypic.com


Steve Burmeister/Duluth Budgeteer News

Top: The Minnesota approach to the Oliver Bridge. Note the space between the abutment on the left and the overhead-mounted bridge clearance warning sign where a pair of plate girders was removed. The girders were intended to support a second track if rail operations warranted it. Bottom: Heading toward Wisconsin on the wood planks about one year before the roadway rehabilitation project of 2001. Note the wood curb and railings.

In accord with the legislation, the lower deck was designed to accommodate streetcar tracks. Although a streetcar line was eventually extended on Commonwealth Avenue as far as its intersection with McCuen Street (Highway 39), the line was never extended across the Oliver Bridge. It is also believed that the two exclusive pedestrian "passageways" required by the legislation were never installed. However, pedestrians and bicyclists are often seen using the roadway today.

The roadway deck, not unlike many bridges of this era, was constructed of wooden planking that was durable but noisy. Its riding quality was not always the best, either. The deck was only 23-feet wide, with no shoulders, and featured a wooden curb that was meant to redirect or stop errant vehicles before they made contact with the cast iron or wooden railings that can be seen in the accompanying photos. The threat of such contact loomed large for many drivers, especially when trucks approached from the opposite direction on the narrow roadway. Very tight "S" curves at each end of the bridge added to the anxiety. Some residents remember that traffic signs warned drivers to refrain from passing on those bends.

Despite the hazards, the bridge has not had a serious crash history — perhaps because the threatening environment has exacted a heightened degree of driver caution. It has been rumored that some crashes may have occurred when drivers returning from a night on the town in Superior decided to take the "Third Bridge" to avoid sobriety checks at the Blatnik and Bong Bridges on the Duluth side.

### OLIVER BRIDGE FACTS

- **Year Built:** 1916 (The bridge was opened to wagon, pedestrian, and auto traffic in January 1917.)
- **Year Rehabilitated:** 2001 (The wood plank deck was removed and replaced with concrete; concrete railings were installed.)
- **Span:** As originally constructed, the bridge had a movable span to accommodate shipping on the St. Louis River. However, that span was fixed in place a few years after the bridge was placed in service.
- **Length:** 1,989 ft.; 1,900 ft.; 1,905 ft.; 2,000 ft. (depending on the source of the information)
- **Original Roadway Width:** 23 ft.; Width after 2001 Rehabilitation: 24 ft.
- **Roadway Load Limit:** 10 tons per axle. (Prior to rehabilitation, the limit was 5 tons, due to the deteriorating deck condition.)
- **Speed Limit:** 25 mph. (Prior to rehabilitation, the speed limit was 10 mph.)
- **Average Daily Traffic:** 1,900, 2004 data. Compare to: Bong Bridge – 19,400 in 2004; Blatnik Bridge – 28,100 in 2002.
- **Original Owner:** Interstate Transfer Railway Company
- **Subsequent Owners:** Duluth Missabe and Iron Range Railroad Company, Canadian National Railway
- **Railroads Currently Using the Bridge:** Canadian National Railway, Burlington Northern Santa Fe, Wisconsin Central, Union Pacific, Duluth Winnipeg and Pacific.
- **Designation:** The local Duluth approach (McCuen Street) was added to the Minnesota Trunk Highway System by the Legislature in 1943; it was designated as Minnesota Highway 39 in 1944. The Wisconsin approach is State Highway 105.

## Renewal

Not withstanding the wooden planking and its age, the Oliver Bridge has always been structurally sound. However, the narrow deck, the lack of shoulders, and the right-angle bends at the ends fall far short of standards for Minnesota highways, let alone an Interstate bridge. To address these deficiencies, the Minnesota Department of Transportation seriously considered replacing the highway portion of the bridge in the early 1990s. Although a precise location and other details were never worked out, had funding been available, a new structure would likely be in place today.

Instead of constructing a new highway bridge, Mn/DOT carried out a project to rehabilitate the Oliver Bridge's roadway deck in 2001. The roadway was closed for a year while the wooden planking was replaced with a concrete deck and a concrete barrier rail. The results can be seen in the accompanying color photo. Although the new deck is only 1-foot wider than the one it replaced, the deck does appear less threatening to drivers and has improved both the perceived and actual comfort level of drivers. The rehabilitated "Third Bridge" will likely serve motorists for many years to come.

## An Unanticipated Function

In 1916, when it was built, there was no hint of the most significant role the Oliver Bridge would play in Minnesota's road history. Had this railroad crossing of the St. Louis River not been in place, the award-winning extension of I-35 past downtown Duluth and the Superior lakefront could not have been built as it exists today.

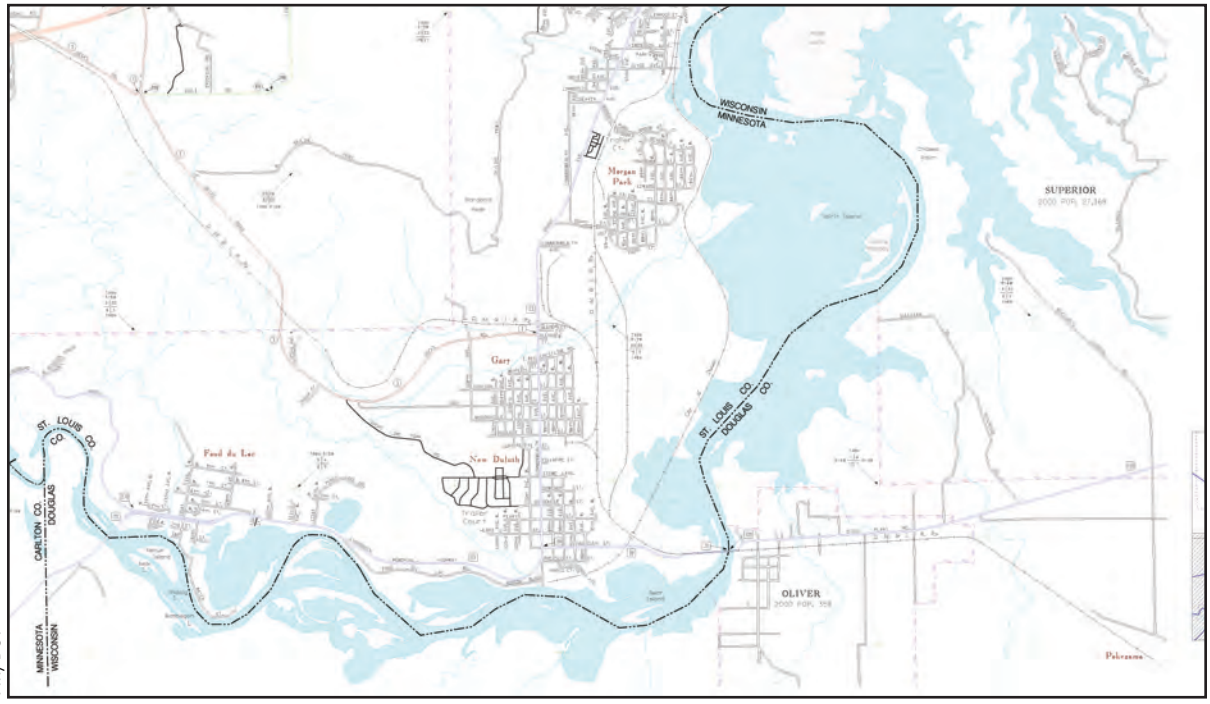
At the time the freeway was being planned, five railroad companies depended on the Duluth Downtown Bridge Yard, which was located squarely in the middle of the most desirable alignment for the highway. The preferred plan was thus contingent upon relocating the yard. However, with highly concentrated urban devel-

opment on one side of the Downtown Duluth Bridge Yard and grand plans for redevelopment on the lakefront side, a feasible nearby relocation site did not exist. Furthermore, constructing a major new rail yard in an urban area would have been politically untenable. A location outside the city had to be found. Eventually, Mn/DOT found a suitable site a short distance southeast of Oliver, Wisconsin. But what made the site feasible was the existence of the Oliver Bridge. The bridge provided the only viable connection to the five railroads' operations in Minnesota.

Of course, dealing with five railroads, and getting the myriad approvals necessary to build a full-service railroad switching station — not the least of which were the expenditure of $45,000,000 by a Minnesota state agency in the State of Wisconsin and a looming deadline to complete the Interstate highway construction program — presented all concerned with a monumental, unprecedented task. It all took several years, but agreements were reached, the rail facility was built, and I-35 in Duluth was completed by the deadline. But how it was done is another fine story.

## A Second Life

As noted earlier in this chapter, the upper deck of the Oliver Bridge was constructed with two pairs of plate girders to support two tracks. Ties and rails were installed only on the north side of the bridge, with the expectation that the second track would be laid when railroad traffic growth demanded it. Although five different railroad companies are now using the bridge, modern communication and control systems permit the efficient routing of trains in both directions by the strategic location of intermittent sidings. In fact, there are heavily traveled railroad mainlines in Minnesota (such as the Canadian Pacific Railway System on the west bank of the Mississippi River between Hastings and Dresbach) where remaining segments of a second track now serve as sidings for passing purposes. Therefore, the installation of the Oliver Bridge's second track never came to pass. The absence of a second track is particularly noticeable to drivers approaching the bridge from the Minnesota side of the river. Plate girders that would have sup-




Mn/DOT

Location of the Canadian National Railway's Oliver Bridge Between Duluth, Minnesota, and Oliver, Wisconsin.

Roger Edstrom, Mn/DOT District 1

Girders that were removed from the Oliver Bridge in Duluth were used to construct this Duluth Missabe and Iron Range Railroad Bridge over Highways 53 and 169 north of Virginia. The railroad serves the Minorca taconite mine located approximately one mile to the east. The view is from the northbound roadway.

ported the second track have been removed over the road approach to the bridge. The girders, however, were not cut up and sent to a scrap heap. As it turns out, bridge builders were recycling parts of structures (and even entire bridges!) long before the term "recycling" became part of our vernacular. The Oliver Bridge girders were hauled up to a location on Highway 53 north of Virginia to become part of a railroad overpass for the DM & IR Railroad tracks into the Minorca taconite mine. A photo of the Oliver girders in their second life appears at left.

## THE OUTLAW BRIDGE

Cook County Historical Society

The Outlaw Bridge, showing the steep ramps as originally constructed.

*The following article originally appeared in* The Rotarian *magazine in June 1971. The reporter speaking in the first person in the third paragraph was not identified. That paragraph also explains the situation that gave rise to the name "Outlaw Bridge." The article was reprinted in its entirety in the October 7, 1971, edition of* The Cook County News-Herald *and was provided from the files of the Cook County Historical Society. It is reprinted here by permission with no further editing.*

During the strenuous times of World War I, there were plenty of opportunities for service for the new Rotary Club of Fort William and Port Arthur [now combined as Thunder Bay, Ontario] — and it lost no time in getting to work. Notable in effort and heroic in size was the building of the road to Duluth.

The need for more and better roads in the district had been pressing on the minds of the citizens for some time. The increasing number of automobiles was a great factor. Overtures had been made to Cook County, Minnesota, and progress had been

## PIGEON RIVER GOING GHOST TOWN ROUTE

*The following August 30, 1961, article appeared in the Minneapolis Star and was provided from the Cook County Historical Society files.*

# Pigeon River going Ghost town Route

**PIGEON RIVER, Minn.—**

This thriving village at the American-Canadian port of entry in northeastern Minnesota may be a ghost town in another few months.

Hwy. 61, whose hills and curves turn northeast from the Reservation River on Lake Superior to this frontier point is being diverted.

The new cutoff at Mineral Center will take a tourist through Grand Portage and across Mount Josephine to a new bridge seven miles downstream on the Pigeon River near the river's mouth.

The old bridge here is scheduled to be dismantled, which will make the present highway a dead-end street on both sides of the border.

Customs and immigration staffs on both sides of the boundary will move their offices seven miles downriver next spring.

A new $300,000 bridge, just below High Falls, is under construction by the Ontario Highway Department on a 50-50 cost split with Minnesota.

Opening of the Lake Superior Circle Route, which takes a motorist completely around the lake, this year created the worst traffic jam in history at the Pigeon River bridge here.

It has boomed the resort business on the North Shore between Duluth, Minn., and the border.

Two Hardest Hit

Immigration officials said 126,000 vehicles entered the United States here since Jan. 1, an increase of more than 15,000 compared with a year ago.

Two who will be the most adversely affected by the bridge closing are Ed Ryden, a Minnesotan, and Max Hertig, a Canadian, whose families have operated the hotel, cabin, café and other concessions across the river from each other almost since the time the bridge was opened to traffic in 1917.

Both hope to open at the new bridge.

Richard Anderson, president of Grand Marais State bank, said Circle Route travel has provided a boost to all businesses along the North Shore.

His bank's deposits are up 20 per cent over a year ago and are expected to reach an all-time high of three million dollars this year.

Anderson said the tourist business, which is the backbone of Cook County's and Grand Marais' economy, has never been better.

With the Circle Route open and fall scenery at its best between Sept. 15 and Oct. 30, Anderson said, area businesses are expecting to break all records this year.

But Pigeon River businesses and residents may have to move seven miles downstream to keep up this record next year when the old bridge is dismantled.

made, but this Canadian Rotary Club, anxious to secure connections with sister clubs in the USA, spurred the road to completion.

Cook County Historical Society

Outlaw Bridge spanning the Pigeon River, which forms the boundary line netween Northeastern Minnesota and Canada.

Realizing the futility of awaiting the agreement pending from the two governments and disregarding all international law, the Rotarians decided to go ahead and build a bridge over the Pigeon River. Let me tell it in the words of Dr. Crawford C. McCullough, Past President of Rotary International (1921-22):

> Until the summer of 1917, the only means of transportation across the international boundary to and from Fort William-Port Arthur, Ontario, and Duluth, Minnesota, and Superior, Wisconsin, was by small, chartered boats once or twice weekly.
>
> The Pigeon River Timber Co., with a mill at Port Arthur, had lumbered the area beyond Slate River reaching to Pigeon River. A devious, partly dismantled bush trail, used in the earlier timber operations still existed. Through the combined efforts of prominent citizens on each side of the border, and the financial assistance of the Ontario Government's Department of Lands and Forests on the one hand, and Cook County and Minnesota State authorities on the other, the Canadian road through Slate River was by 1916 extended southward via the old trail to the Pigeon River, and the existing Minnesota road northward through the town of Grand Marais was brought to the river's edge also. In early 1916, the Rotary Club of Fort William and Port Arthur was founded under the aegis of the Rotary Club of Duluth. William Scott was one of the twenty-three charter members of the new Club. He soon convinced the members of the club that it should take the lead in promoting ways and means to link the two dead-end roads by a bridge across the Pigeon River.

The Pigeon River, being an international waterway, could be permanently bridged only by joint action of the USA and Canadian Federal Governments. It was soon apparent to the Rotary Club that this would be a prolonged and tedious process.

Here was an emergency which could be met only by taking urgent and unorthodox measures. It was decided to raise funds locally to build forthwith a wooden bridge to span the gap. Here, again, William Scott showed his virtuosity as a leader. The Rotary Club of Duluth raised $2,000. Cook County, Minnesota, granted $2,000. Fort William and Port Arthur through the efforts of the Rotary Club raised still another $2,000. A charter member of the Club did the necessary engineering work free of charge and his firm awarded the contract to construct the bridge at cost.

During the winter of 1916-17, materials and supplies were hauled to the site, and by early

Summer, the structure was completed. During the construction period, plans were already in the making for a suitable opening of the new highway and bridge on an international scale. Dr. McCullough of Fort William, then President of the joint Rotary Club, headed a committee which included the entire membership of the Club to complete and carry out these plans.

Complete cooperation of all interested organizations and citizens, and particularly of the village of Grand Marais, was attained. To represent the Government of Ontario, the Minister of Lands and Forests, the Hon. G. Howard Ferguson (later Canada's Prime Minister), agreed to be present. Because of a previous acceptance, the Governor of Minnesota could not be present. For obvious reasons, since the bridge was international in fact but not in law, no invitations to participate in the celebrations were extended beyond the borders of the State and Province, except only to the city of Superior, Wisconsin. It was a case of presenting federal authorities with a *fait accompli*.

On August 18, 1917, a motorcade of 65 cars carrying 240 people, accompanied by a pipe band and a highly necessary mobile motor and tire repair shop, set out from Fort William-Port Arthur, navigated the primitive highway crossed the gaily decorated bridge, and made its way over the connecting new road through the Indian Reserve to the outskirts of Grand Marais where a triumphal arch had been erected. Here the motorcade was met by a welcoming committee of Cook County and Grand Marais citizens and 75 Rotarians from Duluth and, with this enthusiastic escort, made its way to the grounds of Cook County Courthouse. Here amid lavish decorations, and with dais and seating already installed, the formal ceremony of opening the road took place. The assembly comprised about 500 persons.

Exactly on the international boundary line, midway across the bridge, a large sign read "Pigeon River Bridge – International Boundary – Scott Highway – Erected by the Rotary Club."

Cook County Historical Society

The replacement Pigeon River Bridge shown in both photos under construction adjacent to the Outlaw Bridge in 1930 by the Ontario Department of Highways. The new bridge had a fully legal status as an international bridge under Minnesota and Ontario legislation and was funded accordingly.

Cook County Historical Society


MN Official Highway Map

The Outlaw Bridge and its 1930 replacement were located at the town of Pigeon River on Old Highway 61. The old highway followed what is now labeled as Cook County Road 17. On the Ontario side, it followed the road next to the river to its present junction with Ontario Highway 61.

The present bridge on Highway 61 over the Pigeon River was built in 1963, seven miles downstream from the location of the earlier bridges, by the Ontario Highway Department. The $300,000 cost was split equally by Minnesota and Ontario.

The hospitality extended by the citizens of Grand Marais could not have been greater. As hotel accommodations were limited, many residents threw open their homes to the visitors. Indeed, some actually vacated their homes to their guests and took off for their summer cottages. Following the formal ceremonies, there was a dinner, a dance, and entertainment. It was indeed a great day.

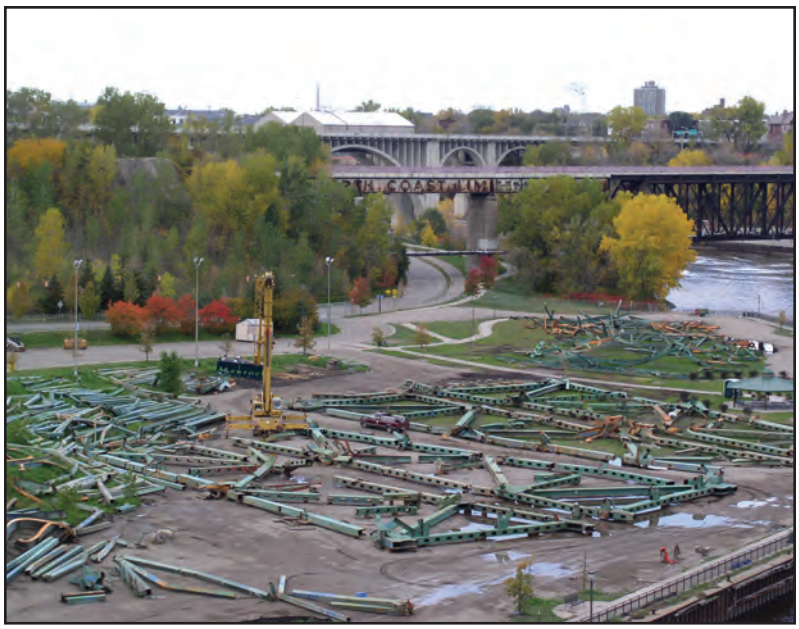
On the return journey next day, at an informal meeting which took place on the Pigeon River Bridge itself, the Minister of Lands and Forests was informed that the construction of the bridge had cost the Rotary Club $768 more than the amount of funds raised for the purpose. Consequently the Club was that much in debt to the contractor. Moreover, the timberwork still had to be painted and funds for this work would have to be raised by the Club. On behalf of his administrative department, Mr. Ferguson therewith assumed payment of the debt of $768.

In due course the respective federal governments got around to authorizing the construction of a bridge across the international waterway of the Pigeon River. It is not recorded whether the Rotary bridge was known to them or not, but at any rate, it must have been accepted and designated as an international bridge for it was not until 13 years after its construction that it was replaced by the present steel bridge under joint federal authority.

Only at or about the time when a joint federal authorization for an international bridge was issued did the Rotary Club's wooden structure come to be known, quite appropriately, as "Outlaw Bridge.["] "Scott Highway" perpetuates the name of the man who, among the pioneers of the enterprise, did the most to insure the successful outcome, thus giving the Canadian Lakehead cities their first outlet, by highway, in any direction. This provided the beginning of what is today the magnificently scenic and all-weather North Shore Highway.

## THE I-35W BRIDGE COLLAPSE

Since the tragedy of Wednesday, August 1, 2007, for Minnesotans, the word "bridge" will forever trigger memories of the I-35W bridge collapse over the Mississippi River. At 6:05 p.m. that day, the 40-year-old bridge tumbled down, taking the lives of 13 people and injuring — some quite severely — 135 others. Thousands of Minnesotans had crossed the bridge that day, and when it went down, 100 vehicles were still on it. But before that day, few worried about the bridge's safety. More likely, people were concerned with the bridge's traffic capacity deficiencies rather than its structural integrity.



J. Katz

Critical structural members of the collapsed I-35W Bridge, some of which had been arranged according to their positions in the trusses. Re-assembling the trusses was a major feature of the NTSB's investigation into the causes of the bridge's collapse.

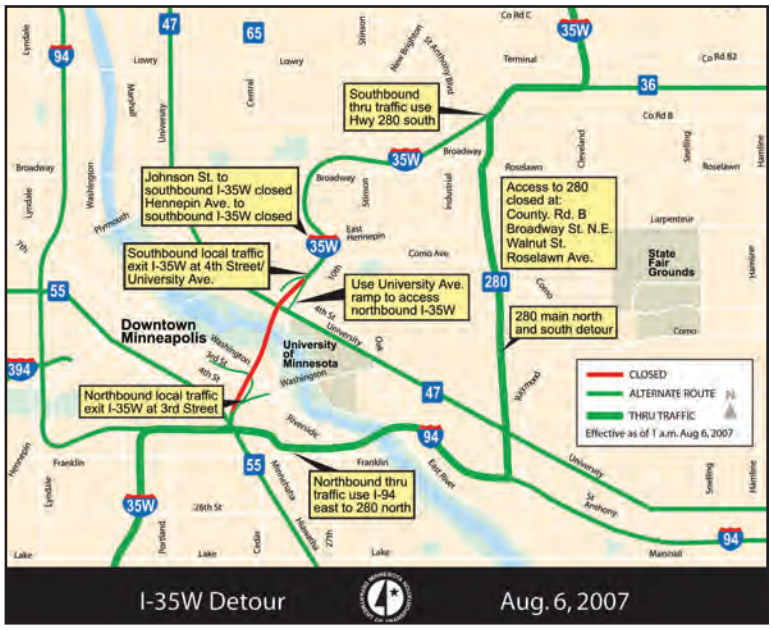
The toll could have been considerably worse. Because four of the bridge's eight lanes were closed for deck repair, only about half as many vehicles occupied the roadway as might have otherwise. Also, the Mississippi's water level was about two feet lower than normal because of drought conditions throughout the summer. The lower level might have kept some vehicles from being submerged, and both the lower level and the resultant reduced current aided rescue operations.

When the bridge fell, shock and disbelief were universally felt by Mn/DOT engineers and technicians. With good reason, nearly all of them believed the quality of Mn/DOT design, specifications, construction, and maintenance was top notch. The very idea that a major structure in Minnesota could fail so completely was difficult to comprehend. Further chilling was the realization that hundreds of bridges in Minnesota — and thousands, nationally — had structural ratings lower than the I-35W bridge had at the time.

### Emergency Response

Despite the magnitude of the disaster, there was one factor that, to some extent, mitigated the pall that hung over the entire situation: both the immediate and longer-term responses to the disaster were nothing less than outstanding. As for the short term, Minneapolis Fire Department Chief James Clack summed it up best, saying, "It's a disaster that is going to be studied by Homeland Security to figure out what we did *right*." For the first 24 hours, according to an article in the *University of Minnesota News*, the Minneapolis Fire Department was the lead agency of the unified command team, making Clack the primary commander of the rescue effort. Clack, featured as a graduate of the U of M in the article, said he was struck by how well people worked together, not just firefighters, but also police, Sheriff's Department personnel, Red Cross staff, and even volunteer citizens.

Masses of television images and wrenching individual accounts brought the horror of that




Mn/DOT's detour map for the I-35W closure.

Mn/DOT

evening home to most Minnesotans and people around the globe for days afterward. Extensive summaries were also covered in newspaper and television features around the anniversary date in 2008.

Lesser known is Minnesota's highly prepared infrastructure that sprang into action to deal with the emergency situation. In addition to the Fire Department, the Minnesota State Patrol and Mn/DOT's FIRST (Freeway Incident Response and Safety Team) arrived immediately on the scene. Mn/DOT had barricades set up across all the lanes of the freeway within 15 minutes. A detour map was up on the department's Internet site by 7:30 that evening.

The first half hour of the disaster — believe it or not — was business as usual at the Mn/DOT Regional Traffic Management Center (RTMC) in Roseville. Operating units vital to emergency response, including Mn/DOT's freeway and arterial surveillance units, its Metro District maintenance dispatch, and the Minnesota State Patrol Metro Districts' dispatch unit — all four co-located in the RTMC control room — immediately reacted as they do whenever an incident causes or necessitates the closure of some or all lanes of a freeway. They notified the media, began continuous broadcasting on KBEM 88.5 FM Traffic Radio, and activated 20 of the RTMC's overhead variable message signs on freeway segments that were most likely to be impacted by the bridge's closure. Several portable changeable message signs were also deployed to supplement the stationary signs. The major emergency operations center adjacent to the RTMC's control room, as always, was ready for an extraordinary event.

The Statewide Interoperable Public Service 800 MHz Radio Communications System, operating since 2003, aided greatly in coordinating all of the emergency services needed for the initial response and optimized communications between them. The lack of direct intercommunication ability between emergency services providers has been one of the primary problems in effectively responding to disasters around the United States. The 800 MHz system completely avoided such problems, despite call volumes that were nearly twice the normal level.

In preparations for the following day, Mn/DOT and Minneapolis city officials worked together to mitigate the expected surge of traffic on local streets. The city closed off areas immediately adjacent to the site of the collapse to avoid an anticipated onslaught of sightseers. Traffic signal timings were adjusted to provide an additional ten seconds of green time on the affected north-south streets. Traffic control officers were assigned to key intersections. The RTMC continued to provide media updates. Metro transit arranged to have additional buses for the morning commuting period in the area most affected by the loss of the I-35W river crossing.

Although the average daily traffic on the bridge is 140,000 vehicles,* Thursday morning traffic after the collapse turned out to be lighter than normal. This was not a great surprise. Drivers usually stay away from major traffic disruptions in the Twin Cities area — at least for the first few days — when they have been notified in advance.

## Temporary Recovery Projects

After completing the initial response tasks, Mn/DOT set guidelines for implementing temporary recovery projects to serve traffic while a replacement bridge was under construction. Two of the guidelines stated that work on temporary projects would only be permitted at night and on weekends and that such work was to be completed by the end of September 2007.

Three recent traffic-capacity improvement projects served as examples for the temporary work that had to be completed: the auxiliary lane construction on westbound I-394 between Louisiana Avenue South and Highway 169 in Golden Valley; the third lane addition in each direction on I-94 between McKnight Road and Century Avenue in Maplewood; and the third lane addition in each direction on Highway 100 between Highway 7 and Cedar Lake Road in St. Louis Park. All three projects were completed under traffic and within existing highway right-of-way. The I-394 and Highway 100 projects were each completed within one construction season.

Initially, 180 potential temporary projects to ease traffic congestion and reduce delay were identified within the zone impacted by the closure of I-35W. The number of candidate projects was quickly reduced to a consensus list of 15 with the greatest likelihood of satisfying the stated objectives, including the completion date.

Some of the projects with greater beneficial impact included the following:

Designating Highway 280, the north-south parallel highway to the east of I-35W, as part of the official detour and closing its three at-grade intersections to provide for freeway-type operating characteristics.

Lengthening acceleration lanes; modifying the East Hennepin/Larpenteur Avenues interchange to eliminate the loops; and installing closed-circuit surveillance cameras, overhead changeable message signs, and fiber-optic communication cables to provide traffic management capabilities, all on Highway 280.

Adding a fourth lane, a full-width asphalt pavement overlay, emergency pull-offs, and vehicle detection equipment on I-94 between I-35W and Highway 280 (designated as the east-west portion of the official detour) to accommodate additional traffic and maintain the existing traffic surveillance capability.

Restriping of lane line markings on a portion of eastbound I-694 to accommodate the additional traffic choosing to use I-94 west of the river and I-694 north of Minneapolis as an unmarked detour route.

Mn/DOT and its contractors completed the work on I-94 during a single weekend in August. That happened to be the weekend when the metro area's drought conditions ended with heavy rainstorms.

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* *Curiously, only 90,000 of those vehicles were accounted for as additional traffic on other river crossings in the vicinity. Possible explanations include trips that were not made; trips that were shortened; trips that were made to alternate destinations not requiring a river crossing; diversions to routes that did not require a river crossing (this possibility is not as illogical as it may seem at first glance); and increased use of transit and carpooling. Investigations of traffic diversions for major freeway reconstruction projects have shown a similar significant reduction in total traffic volumes being served.*

Even the lane striping was completed under extremely wet conditions. (A second marking application had to be made a few days after the pavement surface had dried.) Hundreds of people were involved in that weekend's work. It was a remarkable accomplishment. However, some public grumbling was heard as people wondered why other needed highway improvements in Minnesota could not be accomplished in a similarly quick fashion.

The addition of the fourth lane to accommodate the detour traffic on I-94 left much of the road without adequate shoulders, due to width limitations under bridges, storm drainage requirements, and steep slopes adjacent to the freeway. The width limitation also made it necessary to reduce each traffic lane from the standard 12 feet to 11 feet.

Inadequate shoulders and narrow lanes are inconsistent with freeway design standards. The additional lane also eliminated some of the area needed for snow storage. Therefore, federal participation in the widening was accomplished with the understanding that Mn/DOT would restore the freeway to its original condition (i.e., remove the additional lane) when the emergency situation was resolved. The opening of the I-35W replacement bridge to traffic would be the end of the emergency.

All major work to complete the temporary detour construction was completed within a month of the bridge's collapse and one month ahead of Mn/DOT's self-imposed deadline. By that time, Highway 280 was carrying about 150% of its former traffic volume. Significant increases also were noted on I-694, I-94, and Highway 100. However, with the added capacity, congestion levels by September 10 on those highways were comparable to what they had been before August 1.

Letters to the editor published in newspapers and online Internet communications indicated considerable satisfaction among road users, many of whom noted that congestion on the widened portion of I-94 was even less than before I-35W was closed. Some also declared that Mn/DOT should resist any requirement to restore I-94 to its previous lane configuration. By December 1, there were some indications that Mn/DOT might be permitted to leave the widening in place. It also seemed reasonable to retain the traffic surveillance equipment that was installed on Highway 280.

Although the additional lane was left in place on eastbound I-94, the temporary two-lane exit to Highway 280 was reduced to one lane. Also, a section of the additional lane was removed on the westbound roadway between Riverside Avenue and the exit to Fifth Street after the new bridge was completed. However, the three at-grade intersections on Highway 280, shown in red on the detour map, page 222, were reopened to traffic.

Mn/DOT

Work continued every night - even during a fireworks display in early July, 2008.

Mn/DOT

Aerial view facing south on August 4, 2008. Span 4 over Second Street Southeast, in the foreground, is structurally independent of the completed system of precast box girder segments comprising Spans 1, 2, and 3. Span 4 concrete was cast in place over the green epoxy-coated reinforcing bars.

Mn/DOT

The gap nearing closure in early July. The application of the white finish was already underway at left.

## The New Bridge

By the middle of October of 2007, Mn/DOT had approved a contract with Flatiron-Manson Joint Venture and FIGG Bridge to design and construct a ten-lane replacement bridge over the Mississippi River, despite the objections of two unsuccessful bidders regarding the winner's higher bid ($233,763,000) and the longest proposed construction time (437 days). The contract award was upheld, and construction activity started as soon as the demolition work on the old structure was completed. The design-build contract stated that the new bridge would be completed by the end of December 2008.

Favorable weather conditions during the 2007-08 winter allowed work to proceed well ahead of schedule. In May 2008, it was announced that the bridge would be completed in September of that year — only 13 months after the collapse. Because of incentives identified in the contract, the contractor was expected to earn as much as $27 million in additional compensation — $200,000 for each day ahead of the scheduled completion date, half the estimated $400,000 extra cost per day that those dependent on the crossing were losing while the bridge was out of service.

After working 24 hours per day, seven days per week, with only a couple holiday breaks since November 1, 2007, Mn/DOT and its contractors opened the replacement I-35W bridge to traffic on September 18, 2008, more than three months ahead of schedule and only $13^{1}/_{2}$ months after the fateful collapse. This was a truly remarkable and unprecedented engineering accomplishment. It was also a tremendous cooperative effort that included subcontractors, hundreds of workers, the Federal Highway Administration, the Army Corps of Engineers, the Coast Guard, the Minnesota Department of Natural Resources, the city of Minneapolis, Hennepin County, and many others.

The new bridge has several up-to-date features, including a winter-weather detection system that responds to ice formation from moisture condensation due to nearby St. Anthony Falls. The system activates the distribution of deicing liquid from sprinklers imbedded in the roadway and

Mn/DOT

A nearly completed precast concrete box girder segment for the main span in the casting yard on I-35W's closed roadway south of the river.

Richard Sennott, Star Tribune

The new, ten-lane I-35W Bridge over the Mississippi River as it appeared shortly after it was opened to traffic on the morning of September 18, 2008.

Mn/DOT was working on the bridge lighting system when this photo was taken. The colored lighting was intended for special occasions, according to the construction project manager. However, there were so many favorable comments that the blue lighting has been the night mode ever since

David Brewster, Star Tribune

triggers warning signs at each end of the bridge to alert drivers when spraying is underway.* Sensors have been installed to monitor the interior temperature of the bridge's segmented box girders, to detect strain and movement, and to provide performance data of the bridge's structural elements throughout the bridge's life. In addition to keeping Mn/DOT informed of the bridge's functioning, the data will also be used by the University of Minnesota's Department of Civil Engineering to refine factors used in structural analysis and design.

A surveillance and alarm system, monitored at Mn/DOT's Regional Traffic Management Center, has been installed at critical locations to detect attempts at unauthorized entry into the bridge's interior and nearby environs. And, of course, the regional traffic management system with its cameras, traffic detection, and fiber-optic communication systems has been extended across the bridge.

One of the "firsts" for the bridge is the use of light-emitting diode (LED) lamps for roadway lighting — the first installation of such lamps in the United States. Advantages of these lamps include more economical operation, more natural color, long life, and a distinct reduction in the amount of light that is "lost to the sky"; i.e., most of the light is directed to the road surface. At the time of the bridge opening, several Minnesota cities were investigating the possibility of replacing their street lighting with LEDs to reduce costs.

Enhancement of the bridge's structural elements includes multiple levels of structural redundancy — a feature regrettably lacking in the former bridge. Such redundancy, incorporated into the design of major bridges over the last thirty years, provides for the continued support of a structure in the event that a critical load-bearing member fails. Bridges lacking redundancy, although designed with a very high factor of safety, are classified as "fracture critical." The former bridge and a considerable number of older bridges throughout the country continue to be listed under this classification.

Another structural enhancement was the use of high-performance concrete to provide superior durability, longer life, and maintenance economy. It is expected that the new I-35W bridge will serve for at least 100 years.

## The Memorial

As the new bridge was being readied for its opening, Governor Tim Pawlenty and Minneapolis Mayor R. T. Rybak announced details of a "Remembrance Garden" memorial for the victims, survivors, family members, and others whose lives were affected by the collapse. The memorial was to be located on the south side of the river in Gold Medal Park — a fitting location, as the park was a gathering place for many people in the hours and days following the disaster, and the bridge could be seen from the park.

The Remembrance Garden included 13 upright metal I-beams surrounded by an 81-foot rock square. Within the square, a 65-foot wide circle plaza surrounded a 13-foot-wide, black-granite table fountain. Thirteen stainless steel bands emanated from the center of the fountain, each ending at the base of an individual I-beam.

The features of the Remembrance Garden were symbolic of the lives affected by the bridge collapse. The names of the 13 people who died were engraved on opaque glass faces on the inside of the 13 I-beams. The 81-foot dimension of the rock square referred to August 1, the date of the bridge. The 65-foot diameter of the circular plaza referred to the time of the collapse, 6:05 p.m.

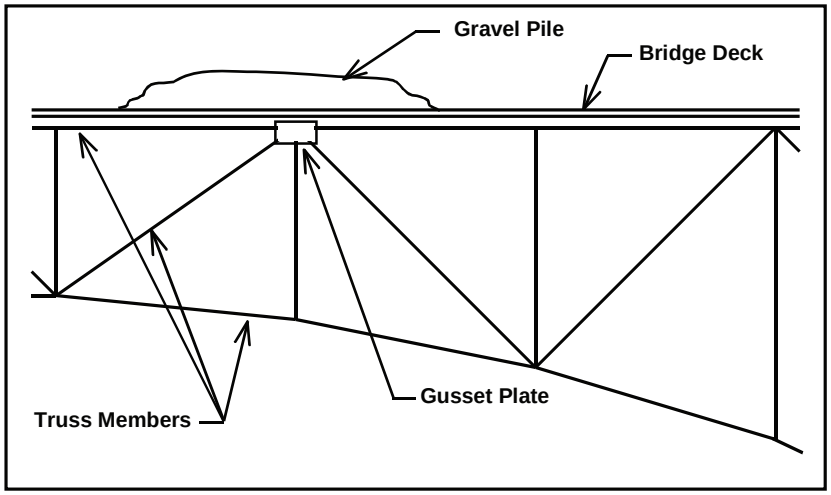
## The Investigation

The National Transportation Safety Board (NTSB) began its investigation into the cause of the bridge's

structural failure the day after it occurred. A full report of its conclusions was released in November 2008. As suggested early in the investigation, the key to the failure was determined to be several gusset plates (the steel sections that connect individual structural members at their junction points) that, through a design error, were fabricated only half as thick as they should have been. Furthermore, at the time of the collapse, gravel for a deck-surfacing repair project on the bridge was centered over one of the under-designed gusset plates on the closed, northbound roadway, as shown in the illustration, below. The estimated weight of the pile was reported to be equivalent to more than one fully loaded Boeing 747 airliner.

Mn/DOT

Workers Inside the northbound box girder during the concrete pour for the closure of the center span over the river on July 22, 2008.




Schematic of the I-35W truss members showing how gusset plates connected the structural steel members of the structure. The gravel pile centered over one pair of the plates was determined to be a contributing factor in the collapse.

** A similar system had been installed on the former I-35W bridge a few years before it collapsed.*

# The Beauty of the Road 13

## FANCY INTERCHANGES

Many states feature photos of "fancy interchanges" in their Department of Transportation and tourist information literature and website galleries. A case in point is the famous four-level interchange built in 1949 on the edge of downtown Los Angeles. There are more than a few fancy interchanges in Minnesota, most of which are impossible to visualize as a whole from a driver's eye level. Drivers — especially strangers — would be well advised to depend on freeway signage to negotiate their way through some of these complex junctions, each of which is one of a kind. It is definitely not the same as exiting at a common, ordinary diamond or cloverleaf-type interchange. A few of the more interesting interchanges in Minnesota are presented here, in an aerial image format, to show readers what they have been missing as they drive on the state's highways.



This interchange at the junction of I-494 and highway 5 is less than two miles to the southwest of the airport interchange. It was originally envisioned as a very simple "Y" intersection with no connection from the northeast leg (Highway 5, upper right) to the east leg (I-494, right) and vice versa. Soon thereafter, it was determined that a full interchange would be necessary at this location, rather than the simple "Y" to provide access to airport users from the southeast and to avoid overloading the Mendota Bridge across the Minnesota River.



Minneapolis/St. Paul International Airport entrance on Highway 5. This was one of the first three-level interchanges in Minnesota. It was built to serve the new airline terminal that was constructed in the late 1950s and as part of the relocation of Highway 5.



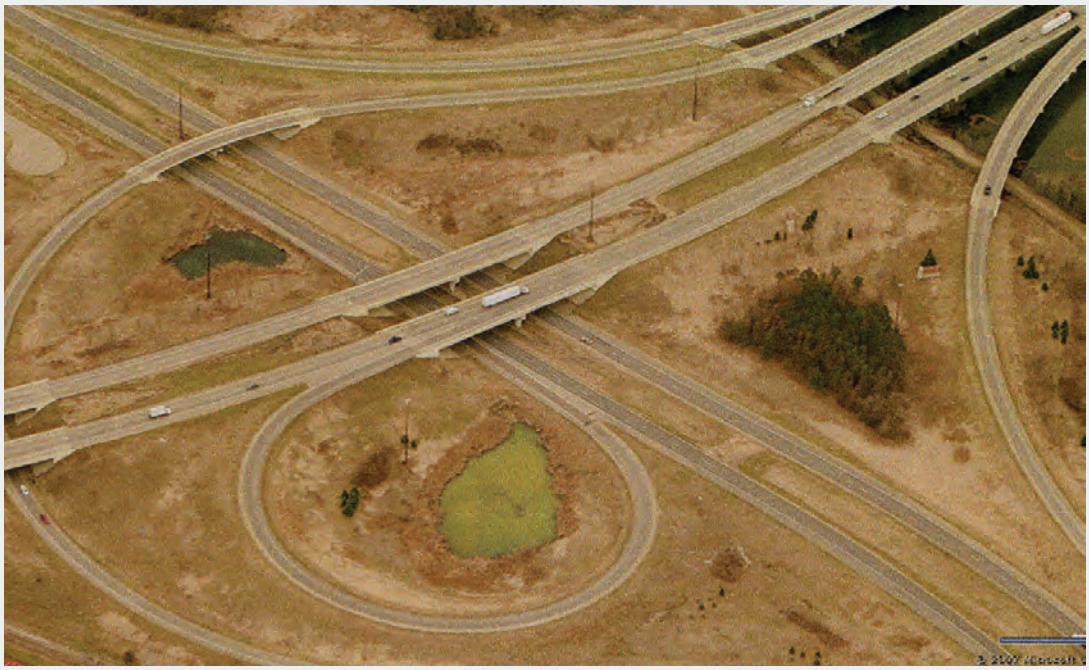
Three of the four interchanges serving the Mall of America in Bloomington are located on Highway 77. I-494 is the east-west freeway at the top.



From left to right, Shingle Creek Parkway, Highway 100 and Humboldt Avenue North ramps, Dupont Avenue North, and I-94/Highway 252 crossings of I-94/I-694 in Brooklyn Center. The freeway between this series of interchanges has been rebuilt twice (1982, 1988) since the original construction in 1965. Some widening was also completed in 2004.



A close-up view of the curved bridges at the north end of Highway 100 and the ramps to Humboldt Avenue North. In an effort to minimize highway noise levels, Mn/DOT made a point of placing the low-volume, northbound Humboldt Avenue ramp at the highest level.





An enlarged view of the curves at the south end of the Highway 169 river bridge



The junction of I-35 (lower left to upper right), I-535 (lower right), and Highway 53 (upper left and following I-535 to Superior, lower right) in Duluth. Poor load-bearing capacity of the soils on a considerable length of the Duluth freeway system necessitated the use of bridge structures to provide adequate support for the roadways. This junction is a conversation piece, even today – nearly 40 years after its construction – because of a traffic signal at an elevated ramp intersection in the middle of the interchange, shown in the enlargement, right. Another photo of this interchange can be found in the I-35 Duluth section of Chapter 6.

Minneapolis Star Journal,
Minnesota Historical Society

This is what the corner of Franklin and Cedar Avenues looked like in 1946 before Cedar Avenue was moved a half block in the early 1950s to the east as part of a railroad grade separation and interchange construction. That interchange is now part of the Hiawatha complex pictured below. The camera was facing southeast.



The Hiawatha Interchange in Minneapolis is one of the more complex freeway intersections in Minnesota. Popularly known as "Spaghetti Junction," it is the intersection of I-35W (top and left), I-94 (the curving horizontal freeway extending to both the left and right edges), and Highway 55 (the diagonal freeway – also known as Hiawatha Avenue – extending from the bottom of the photo to the left center). A major factor in the complexity of this interchange is the mixing of freeway-to-freeway ramps and access to local streets.

## THE "ROUNDABOUT" WAY

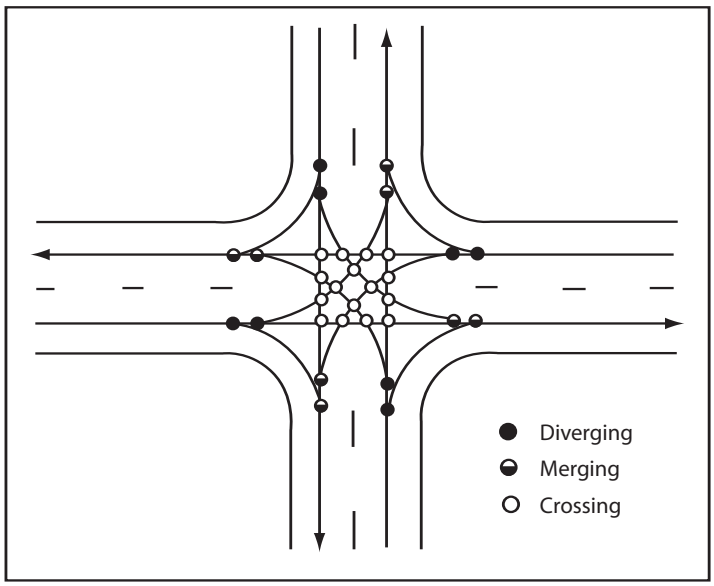
Roundabouts have been popping up all over the country in the last few years, and they have been catching on as a highly efficient and effective means to deal with traffic at intersections. The concept is not really new; roundabouts have been widely accepted as a traffic control device for years in many countries around the world. Even more years ago, a somewhat similar design referred to as a "traffic circle" was quite popular in Europe and the United State (mostly east of the Mississippi River), and some of those circles still exist today. However, there are relatively few traffic circles compared to the 1,000 roundabouts that have been constructed in the United States since 1990. Hundreds more are under construction, under design, or in the planning stage, and Minnesota is in the thick of the growing numbers.

Roundabouts generally have a smaller diameter than traffic circles, ranging between 70 and 160 feet. All roundabouts, by definition, require entering traffic to yield to traffic already on the circle. Traffic circles have had a history in this country of yielding the right-of-way to vehicles on the circle or to those entering the circle — depending in which state the traffic circle is located.

Given the size and operating characteristics of a modern roundabout, layouts with three or four legs are the only practical designs that permit sufficiently long merging areas. (Some traffic circles have as many as twice that number of legs.) Roundabouts have "splitter" islands on each leg to clearly demark vehicle paths, as shown on the accompanying illustrations, a feature lacking in most traffic circles. Roundabouts also have prescribed design criteria that make them uniform from one to the next for ease of navigation.

But why are roundabouts being constructed at intersections that could otherwise be controlled by traffic signals or stop signs? The cost to construct a typical roundabout can be more than twice the $200,000 needed to install a typical traffic signal. (Installation of a stop sign at an intersection costs only a few thousand dollars.) Furthermore, it is likely that the construction of a roundabout might require the acquisition of additional property not necessary for a conventional intersection.

In spite of the cost, recent experience has shown that roundabouts can be the best choice for upgrading intersections under a wide range of traffic conditions. One of the most important advantages of roundabouts is their comparative safety record. A conventional, four-legged intersection, even with the best design features, has at least 24 points of potential conflict — places where collisions can occur, as shown in the illustration below. The number of conflict points and




Conflict points at typical two-lane, two-way crossroads.

the potential for collisions increases greatly if there is more than one lane in each direction on either street.

However, a roundabout has only four conflict points: the merge points. These conflicts are generally low-speed; thus, if a rear-end or sideswipe collision occurs, its severity is usually low. The curvature of a roundabout tends to keep speeds quite low, so collisions are more easily avoided. Additionally, the one-way travel and the elimination of cross traffic essentially eliminate the possibility of the most serious types of crashes: head-on and right-angle collisions. Furthermore, there are no left turns at a roundabout; all turns are right turns. Therefore, the overall safety record of roundabout traffic operations is superior to conventional intersections, a conclusion that has been borne out by numerous studies.

Roundabouts are also a highly efficient way to move traffic through an intersection. At any given moment, it is highly likely that traffic on at least one approach to a typical intersection of arterial streets controlled by stop signs or traffic signals will be waiting to get through the intersection. On busier streets, this is particularly true for drivers attempting to make left turns. Even on lower-volume intersections where a complete cycle of the signal might be as short as 40 to 60 seconds, some turning drivers arriving just after the signal has turned red will have to wait for at least half of that cycle time before proceeding. Adding up 30-second waits for hundreds of cars stopped at red lights throughout the day equals a considerable amount of lost time.

In those locations where a roundabout might be an appropriate alternative for traffic control (moderate and approximately equal traffic volumes on each leg), delays are minimal. Given the relatively low speeds, merging is not difficult; entering vehicles rarely need to stop. Stops, if they do occur, are of very short duration. Reducing delay significantly improves fuel economy as well as lowers the emission of pollutants.

Finally, roundabouts offer an opportunity for an aesthetic break point in what otherwise might be a rather monotonous continuum — a sense of place in a neighborhood; a place for greenery and landscaping.

Courtesy of WSB & Associates, Inc.

The first two-lane roundabout in Minnesota was completed in Monticello in 2006 on Wright County Road 18, just south of its new interchange with I-94 that was completed at the same time.

## *THE* TRAFFIC CIRCLE

A few traffic circles existed at one time in Minnesota. So, invariably, when a roundabout is proposed as possible solution to an intersection problem, someone will pipe up, "Oh, you're talking about a traffic circle. Right?"

Courtesy of U of M-John R. Borchert Map Library

The Broadway traffic circle on the Minneapolis/Robbinsdale city limits in 1947. The diameter of the circle was approximately 125 feet. All vehicles except streetcars had to go around the circle. Streetcars went across the circle on the gray, slightly curved strip between Broadway in Minneapolis and Oakdale Avenue in Robbinsdale.

Before 1961, if you asked anyone in Minneapolis where the traffic circle was located, they would have told you, "It's up there at the end of Broadway — where the parkway is . . . . You know, the city limits at Robbinsdale." Nobody would have said, "Which traffic circle?" because *THE* traffic circle was — if not the only one in Minnesota — the only in Minneapolis that most people knew about. It was at the junction of West Broadway Avenue (Highway 52 back in those days; Hennepin County Road 81 today), Memorial Parkway (not so long ago better known as Victory Memorial Drive), Theodore Wirth Parkway (sometimes referred to as Glenwood-Camden Parkway), Lowry Avenue North, and Oakdale Avenue. It actually was a circle, and it had eight, unequally spaced legs entering it. Clearly, it did not conform to today's roundabout criteria.

The circle served as a point of reference: many travelers on Highway 52 knew that they had reached the Minneapolis city limits when they passed through the traffic circle. It also served as a demarcation point for two distinctly different but connected segments of the Minneapolis "Grand Rounds" parkway system. One with curvilinear alignment and lush vegetation; the other with an overly-wide, formal boulevard, lined with multiple rows of perfectly spaced elm trees and frontage roads extending in a straight line as far as the eye could see.

The circle itself was nothing to write home about. It was about 125 feet across and landscaped with grass and, probably, a few weeds. It had some traffic signs to suggest that those approaching the circle should move around it counter-clockwise, and there were a few strategically located directional signs in advance of most of the legs to help drivers leave the circle before they might unintentionally have to make another round of the circle. The circle, and others like it around the country, could be disorienting to strangers as well as to some local drivers — especially since drivers at the Broadway circle had eight legs to choose from, including the one from which they entered the circle. However, a traffic circle was a rather popular way to deal with diagonal arterial streets that passed through what would otherwise have been typical, four-legged intersections.

The Broadway traffic circle did not seem to generate much controversy, and it was probably generally agreed that it did a better job of efficiently moving a lot of traffic with fewer serious collisions than a conventional multi-leg intersection either with stop signs on some of the legs, stop signs on all the legs, or a traffic signal system. However, since most of Minneapolis and St. Paul streets were built on a grid system with few diagonal arterials, there were not very many intersections with more than four legs with which to make a comparison. However, the few that did exist did not operate very well. So, there was little opposition, some approval, and a lot of indifference when the Highway Department proposed to eliminate the circle and replace it with three bridges and a few ramps. The construction took place in 1961, as scheduled, with rather dramatic results.

## STREET LIGHTING

As high-rise building dwellers and window-seat airline passengers well know, street and highway lighting defines large cities and small towns after dark. At high altitudes, tiny points of light form a bewitching landscape that hot air balloonists discovered in the nineteenth century. Street lighting has been around since long before people realized how their towns' lights brightened the night sky, even before electricity. Lamplighters were once an everyday sight, walking the streets at dusk to fire up the gas streetlights and returning at dawn to extinguish them.

Street lighting, as we know it today, was one of the earliest public applications of electricity, and it proliferated near the beginning of the twentieth century. It also came to be recognized as a safety improvement when early before-and-after studies showed reductions in nighttime collisions at lighted intersections. Similar benefits were also being realized for continuous lighting on major arterial streets and urban highways.

Your great grandparents might have called streetlights "arc lights." This rather archaic-sounding term was applied to lamps that passed electricity through a gas or vapor, causing it to glow. The gas, sealed in the lamp, conducted the electricity (the arc) between two electrodes instead of a coiled metal filament, as today's incandescent lightbulbs do. In fact, low-pressure sodium vapor lamps served at a few Minnesota highway intersections as late as 1950. Some readers might recall how the lamps' eerie, orange glow made red items look black and other colors turn muddy. The term "arc light" hung on for many years even though incandescent lighting was the most common form of street lighting for the first half of the century. Ironically, the lamps used in most street lighting today can correctly be identified as arc lamps.

With the 1950s, the mercury vapor lamp came to Minnesota. It made its first large-scale debut on University Avenue in St. Paul from the state capitol

Art Collection, Minnesota Historical Society

Artist's view of street lighting on Michigan Street in Duluth in 1889.

Minnesota Histocial Society

Gas lamp on Summit Avenue at Lawton Street, St. Paul, 1887.

building to the Minneapolis city limits. This type of lamp, characterized by its bluish-green light, soon became the dominant form of highway lighting. By that time, a multitude of decorative lamp and pole styles was giving way to a generally uniform, sleek, and functionally "modern" look. (Some would say "lackluster" and "ordinary.") There were choices, however: metal, wood, or concrete poles. Metal poles were round or octangular. Pole bases were installed on some city streets. And lamps were initially the "cobra head" and later, "shoe box" or minor variations thereof.

Shortly after mercury lamps began to be installed, fluorescent street lighting was introduced, showing up first on Hennepin Avenue in downtown Minneapolis and Lake Street, and eventually in towns all across the state. One downside of fluorescent lighting, however, was the tendency for the lighting intensity to fade as air temperatures dropped toward –20° F.

During that mid-century era in downtown St. Paul, a rather unique type of street lighting fixture was mounted on the sides of buildings rather than on poles. Perhaps no one thought of it as a safety improvement at the time, but it did eliminate roadside

## DID YOU KNOW

It is estimated that there are 60 million streetlights in the United States. If that figure is correct, it can be assumed that about 1.2 million lights are located on Minnesota streets and highways: one light for every 4.3 residents of the state. Streetlights account for more than 15 percent of all domestic electricity usage.

Norton & Peel, Minnesota Historical Society

Some of the first mercury vapor streetlights in Minnesota were installed on University Avenue in St. Paul, shown here near Vandalia Street in 1954. The lamp's bluish-green light was a very noticeable departure from that of the incandescent lamps that were in use at the time.


Norton & Peel, Minnesota Historical Society

Not long after St. Paul began to install mercury vapor streetlights, Minneapolis made its first installations of fluorescent lamps. These lights on Lyndale Avenue South at Lake Street were installed at the same time as those installed on several miles of Lake Street.

J. Katz

This photo was taken about 1:00 a.m. and the location is not in the land of the midnight sun. It was actually taken 3 1/2 miles directly west of I-494. The glow in the sky is from I-494's concentration of high-pressure sodium lighting. The light was reflected off of a fresh snow covering on the ground that, in turn, was reflected off the clouds.

J. Katz

Superior Street in downtown Duluth.

objects that had a history of attracting errant vehicles. However, the building-mounted lighting in St. Paul is long gone.

A major change in street lighting was the introduction of *high*-pressure sodium lamps — an improved version of the low-pressure lamp used many years before. An early implementation was on the segment of I-94 between the downtowns of Minneapolis and St. Paul in the mid-1970s when a difficult-to-maintain cable and chain-link fence barrier in the median was replaced with the current concrete barrier. New light poles with double davits (the arms upon which the lamps are attached) were mounted on the barrier. The barrier mounting permitted the removal of the original lighting from the outside edges of the roadways thereby eliminating a hazard for vehicles leaving the road and reducing the required number of poles. (Somehow, however, poles mounted on the barrier are occasionally knocked down. Power failures due to problems with the electrical conduit buried in the concrete can be difficult to find and repair. Therefore, the use of median barrier for the placement of roadway lighting has fallen into disfavor in recent years.)

By the end of the last century, most of the mercury, fluorescent, and incandescent lighting was phased out in favor of high-pressure sodium, although many isolated examples of each are still easy to find. Justification for the phase-out included environmental pollution problems associated with mercury and fluorescent lamp disposal, and incandescent lamps' inferior energy efficiency and service life.

As with low-pressure sodium, high-pressure lamps give off an orange glow, but the hue is not as deep and the color of objects underneath the lamps remains discernable to a greater degree. On

a cloudy winter night, street lighting reflecting off the snow and clouds makes for a bright orange glow hanging over cities.

As the twentieth century drew to a close, a trend was underway to revert street lighting to the decorative poles and globes of the past. The trend got started on streets like the Nicollet Mall in Minneapolis, Superior Street in Duluth, and other places where urban renaissances started to take hold at the street level. That trend and the terms "street furniture," "urban environment," "cityscape," and "livable communities" seem to have developed hand-in-hand in an effort to identify and unify cities and even unique neighborhoods within cities. In contrast, the "modern" poles, described earlier, tended to promote an element of sameness throughout the state.

One of the major manufacturers of retro street lighting poles and globes now names some of their styles after older cities, such as "the Vienna" or "the Prague." New styles are named after modern cities, such as "the Princeton" and "the Plymouth." (Neither happens to be named after the Minnesota cities of the same names.)

Some of the more popular old-style globes available today include the generic "lantern" that somehow never went out of style in St. Paul neighborhoods. Recently installed single- and twin-globe lighting reminiscent of that seen on downtown Nicollet Avenue (before it became the Mall in 1967) can be seen in many locations around the state. The lamps lining streets on Nicollet Island in Minneapolis are copies of gas lamps similar to those noted in some of the historic photos that follow.

The latest light poles on the market feature flutes and ornaments reminiscent of Victorian designs, and while the decorative elements contribute little to the poles' functionality, they add beauty to function and make streetlights worth a second look.

One of the interesting aspects of recent trends in roadway lighting is the mixing of roadway and pedestrian-type lighting, i.e., long poles and short poles, on the same stretch of road. In many instances, this has been done with no apparent coordination of style, as can be seen in some of the accompanying photos. The taller poles designed for roadway lighting are superior to decorative types (such as lanterns, for example) at efficiently throwing a uniform level of lighting


Minnesota Historical Society

J. Katz

Left: Twin-globe streetlights in St. Paul on University Avenue at Marion Street in 1932. The extension of the pole above the lamps served as a support for streetcar trolley wires.
Right: A current version of the double-globe street lamp. This one is located on Fourth Street SE near the University of Minnesota Minneapolis campus.

J. Katz

The latest in freeway lighting is shown here on I-494 south of Excelsior Boulevard in Minnetonka. The installation was part of the complete reconstruction of the highway in 2006. Note that there is no davit arm extending toward the traffic lane at the top of the pole. Instead, the lamp is mounted on the top of the pole at an angle of approximately 45° to throw light onto the roadway surface. In so doing, the poles can be set further away from the traffic lanes, thus significantly reducing the potential for the pole to be struck by a vehicle leaving the roadway.

on the road surface; but, they surely lack the inviting quality of the decorative lamps for pedestrians, whether they be for neighborhoods or commercial districts.

A downside in decorative lighting came to light (no pun intended) with the Nicollet Mall installations. All roadway elements require maintenance — including streetlights — and poles are particularly vulnerable to vehicular collisions. The manufacturer of the lights on the Mall went out of business several years ago, so replacement parts are no longer available. Thus, a walk down the Mall reveals several makeshift and unsightly repairs that give the Mall a shabby appearance, reflects poorly on the city, and detracts from the sparkling image originally intended. The city may have to replace the lighting completely (it has already been replaced once during a Mall renovation) or pay a steep price for a contractor to manufacture identical hardware.

The last forty years has brought continuing innovation in roadway lighting. Back in the early 1970s, Mn/DOT converted all existing lighting installations on highways with speeds greater than 40 miles per hour to pole bases with break-away designs that minimize harm to passengers in vehicles that collide with a pole. All new installations since that time have incorporated the break-away features.

More recently, Mn/DOT has been installing a lighting unit known as a "vertical mount." It is placed at the top of a straight pole (there is no davit arm extending horizontally from the pole) and aimed at a 45° angle down toward the road. The angle allows the pole to be located at a greater distance from the edge of the pavement, thus minimizing the likelihood of a collision with a vehicle that has strayed from the road. A recent major installation of this type of lighting is along several miles of I-494 in Eden Prairie and

Minnetonka. Vertical-mounted lighting has also been installed on several highway interchanges around the state.

Another recent innovation is the development of tubular steel foundations drilled into the ground instead of placing concrete in six- to nine-foot deep foundations. The steel installation is less labor intensive and time consuming.

High-mast tower lighting is another lighting system that has gained favor in Minnesota in recent years. Yet, this is not a new concept in the Twin Cities, as noted in some of the accompanying historic photos. The current version of the towers range in height from 100 to 140 feet (compared to 40 or 49 feet for standard highway lighting poles) with a cluster of high-output lamps mounted on a ring that can be lowered with a cable and pulley system for maintenance. Tower lighting holds many advantages over conventional streetlights, from significantly reducing the required number of poles, to more uniformly lighting the road between each pole, and nearly eliminating the potential for vehicle collisions with lighting units, as the towers are located far from the roadway.

Although high-mast tower lighting has usually been limited to highway interchanges, using as few as two, three, or four poles, it has been installed as continuous lighting on a few freeway segments. A major example is the east-west stretch of I-494 through Richfield, Bloomington, Edina, and Eden Prairie.

A disadvantage of the towers is that installations can throw too much light on nearby residential property. Therefore, tower lighting is generally not installed in such areas. Also, the towers cannot be maintained from the highway shoulder as conventional lights are.

As noted in the above paragraph, a significant portion of the light output associated with roadway lighting is lost to the sky. This is phenomenon is sometimes referred to as "lighting pollution" and is one of the reasons why not nearly as many stars are visible today as were during our great grandparents' time in the early twentieth century — particularly in urban areas. Likewise, displays of Northern Lights in the northern area of the United States, though sometimes quite brilliant, are more difficult to see.

J. Katz

Typical lighting on urban freeways: "Cobra head" lamps on 49-foot poles. There are literally thousands of such poles on Minnesota highways. These are on Highway 100 in New Hope. Before the highway was reconstructed in 2003, light poles were mounted atop a median barrier.


Minnesota Historical Society

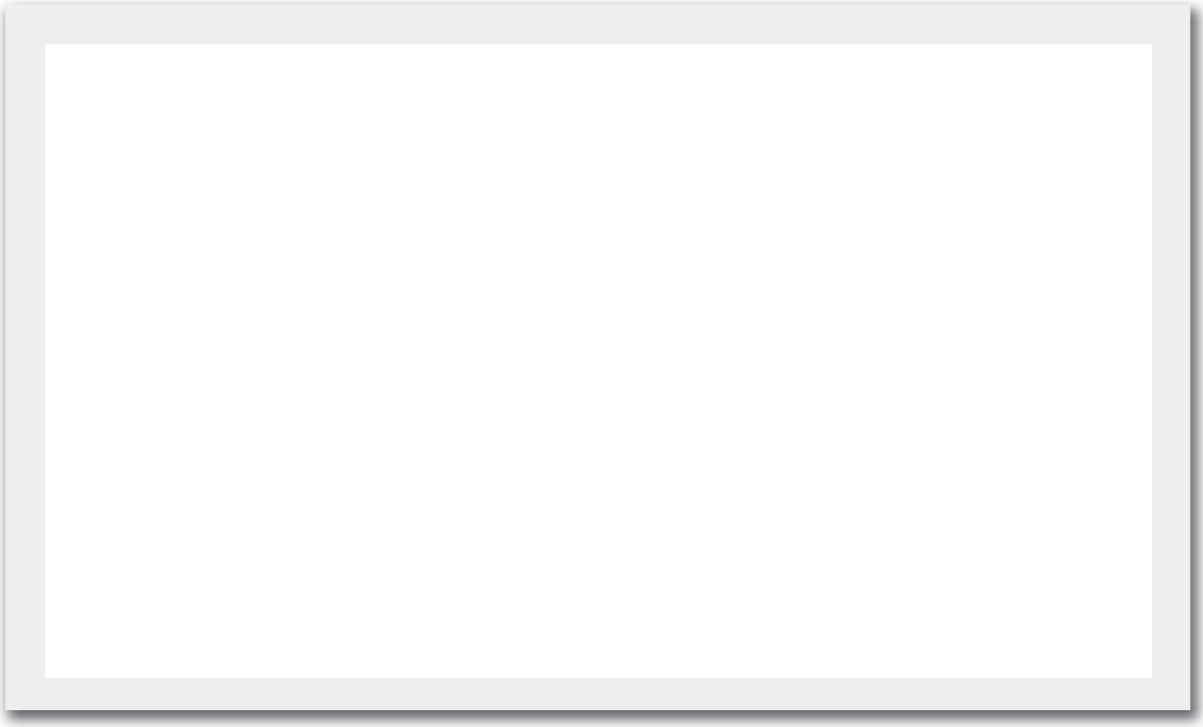
Although high-mast tower lighting is usually thought of as an innovation of the later twentieth century, here is such a tower being demonstrated in bridge square in downtown Minneapolis in 1883.

J. Katz

Tower lighting on Highway 212 in Eden Prairie contrasts with the decorative lighting on this bridge at the Mitchell Road interchange.

One of the most recent innovations in street lighting, the light emitting diode (LED) lamp, addresses lighting pollution. In addition to directing most of the light to the road, LED lamp advantages include more economical operation, a more natural color, and a longer life. The first installation in the United States was on the new I-35W bridge in Minneapolis over the Mississippi River. At the time of the bridge opening, several Minnesota cities were investigating the possibility of re-lamping their street lighting with LEDs to reduce costs.

The following photographs give some insight into the past and present of roadway lighting.



W. H. Jacoby & Son, Minnesota Historical Society

Nicollet Avenue in Minneapolis facing south from Washington Avenue in 1887. Although this was not normal street lighting (it was installed for Exposition Week), the photo does give a good indication of what was technically feasible in electric lighting more than 120 years ago.

Five-globe lampposts were not limited to the big cities. This is Sleepy Eye in 1935. Most lighting of this style started to disappear in the middle of the twentieth century.

Minnesota Historical Society

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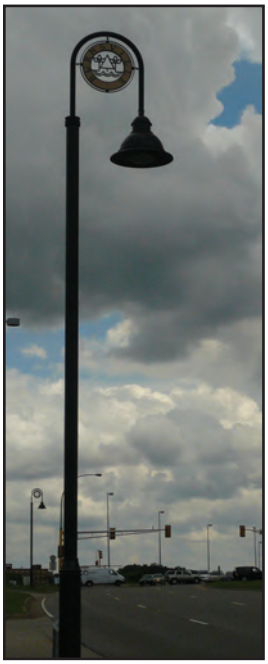
An electric reproduction of the classic gas lamps that were in place in towns and cities throughout Minnesota by 1900. Some versions even have a glass chimney to lend a higher degree of authenticity. This lamp is located on historic Nicollet Island in Minneapolis.

Twin globes on Mississippi Street Northeast in Fridley at University Avenue Northeast. Spherical globes are reminiscent of early twentieth century lights; however, they are not often seen in a modern setting such this.

J. Katz

These silhouetted poles are located on County Road 42 in Burnsville. High, modern roadway lighting has been deliberately mixed with low-level, decorative poles.



J. Katz

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This type of lamppost was installed by the Minneapolis Park Board on the city parkways as early as the 1940s. There are not very many of them left, although this one is still standing on Memorial Parkway.

J. Katz

This is the current version of the Minneapolis Park Board streetlight. It is located on St. Anthony Parkway. Others are located on Wirth Parkway.

## MINNESOTA SCENIC BYWAYS

Minnesotans who have had a chance to do some recreational driving are aware that many miles of state roads are noted for their scenic qualities. Over the years, Minnesota's road departments have done quite well to serve roads' primary purpose (i.e., getting people, goods, and services to where they need to go, safely and within a reasonable period of time under most conditions) in spite of traffic congestion and scarcity of funds. But the state has also done very well incorporating scenic elements into its road systems, too.

Two of the best-known scenic routes are Highway 61 along the north shore of Lake Superior and the Great River Road on the segment of Highway 61 that follows the Mississippi River in the southeast corner of the state. The Highway 61 routes and twenty other scenic routes were designated as "Scenic Byways" in a program launched in 1992 as a cooperative effort between Mn/DOT, the Minnesota Department of Natural Resources, the Minnesota Office of Tourism, and the Minnesota Historical Society.

Most of the byways were officially designated by 1994, although several were in existence long before that date. Their total length today covers 2,860 miles, with individual lengths ranging between 9 and 575 miles. That mileage is nearly equivalent to one-quarter of the total length of the state's 12,000-mile trunk highway system. Indeed, the majority of the Scenic Byways System is routed over state highways; however, a significant portion of the mileage also follows county roads and city parkways.

The Scenic Byways are easy to find. Almost all of them are identified on the official state highway map (www.dot.state.mn.us/statemap/) with a pale-green series of small dots adjacent to the numbered routes. (Using the zoom tool is helpful in enhancing the visibility of the dotted lines, as shown in the illustration below.) The routes are also identified on other maps and on the roads with distinctive markers on signposts at appropriate intervals. A detailed brochure identifying each scenic byway and its attributes is available from Explore Minnesota Tourism at 888-868-7476 or www.exploreminnesota.com. Most of the byways also have their own website.

The designated scenic byways are listed below and keyed to the map at right:

1. North Shore Scenic Drive*
2. Gunflint Trail
3. Superior National Forest Scenic Byway
4. Skyline Parkway
5. Edge of the Wilderness Scenic Byway*
6. Rushing Rapids Parkway
7. Veterans Evergreen Memorial Scenic Drive
8. Waters of the Dancing Sky Scenic Byway
9. Lake Country Scenic Byway
10. Ladyslipper Scenic Byway
11. Avenue of Pines
12. Paul Bunyan Scenic Byway*
13. Otter Trail Scenic Byway
14. Great River Road*
15. Grand Rounds Scenic Byway*
16. St. Croix Scenic Byway
17. Glacial Ridge Trail
18. Minnesota River Valley Scenic Byway*
19. Apple Blossom Scenic Drive
20. Shooting Star Scenic Byway
21. Historic Bluff Country Scenic Byway*
22. International Highway 75 King of Trails

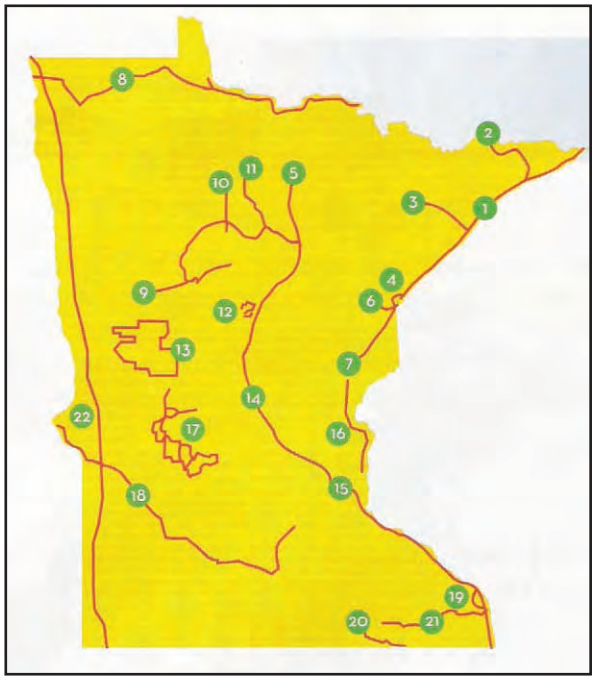
**National Scenic Byway*

The Minnesota Scenic Byways Program was designed to establish partnerships with communities, organizations, and government agencies to match resources with grassroots marketing and economic development efforts. The program exists to do the following:

- Identify highway routes of exceptional interest
- Promote travel and recreation on those routes
- Enhance and provide stewardship for the features that distinguish those routes

Exceptional scenery is a major focus of the Scenic Byway designation, but the presence of excellent natural, cultural, historical, archaeological, and/or recreational resources is also a major emphasis. Scenic byways highlight the state's best-known scenic drives and focus attention on lesser-known routes and regions. The byways have the potential to be a catalyst for tourism, but also provide an incentive for preserving and enhancing the resources that make particular landscapes and roadways so attractive.

Local byway groups have achieved success by integrating byway goals and values with other initiatives and programs along byway corridors. For example, the Edge of the Wilderness byway group




Minnesota Scenic Byways, 2007-2009

Scenic byways are located in all areas of the state.

completed a multi-year capital improvement plan that incorporated byway projects and highway projects to find joint funding sources. Some other examples of projects include the following:

- Interpretive signing on the Historic Bluff Country National Scenic Byway
- Stabilization of Reads Landing, a WPA-era wayside rest on the Great River Road
- Conceptual design for communities and recreational facilities on the North Shore All-American Road
- An upgrade of the visitor interpretation and wayfinding facilities on the Grand Rounds Scenic Byway
- Eight Corridor Management Plans that provide guidance for future scenic byway projects
- A five-agency collaboration to market cultural/heritage tourism activities on all 22 scenic byways

Federal and local funds for scenic byways are allocated for the following categories:

- Scenic overlooks
- Rest areas
- Landscaping
- Land acquisition
- Interpretive materials
- Recreational accesses
- Renovations of historical sites
- Bike trails

All public roadways in Minnesota are eligible for nomination as a scenic byway, including township roads, municipal routes, county highways, trunk highways, Interstate highways, low-maintenance routes, and roads on federal lands and Indian reservations. A proposed byway must include two or more communities or major destinations, and both urban and rural roadways may be nominated. Roads with pre-existing scenic designations are good byway candidates. Nominated routes or route segments must comply with federal billboard regulations: No new billboards may be erected on designated scenic byways that are part of the Interstate system or the old Federal-aid Primary System (as it existed in 1991). Nominating periods are opened on five-year intervals.

If there were unlimited space in this publication, it certainly would be appropriate to include some descriptions and highlights regarding each of the 22 scenic byways in Minnesota. However, only a few have been selected to provide a brief overview of the variety of scenic roadways that Minnesota offers. In deference to their age as a designated byway, some of the earliest have been selected. Photos from a few others help to provide some more illumination about the program and its diversity.


## The Gunflint Trail

The 57-mile road extending north from Grand Marais and then northwesterly near lakes adjacent to the Canadian border most likely had its beginnings as a footpath for native tribe peoples several hundred years ago. Today, the Gunflint Trail is designated as a Minnesota State Aid Highway (Cook County Road 12). The county is responsible for its maintenance and improvements. The trail, also designated as a National Forest Highway, is by far the most famous of four roadway "trails" heading north from Highway 61 adjacent to Lake Superior in Cook County. (The others are the Sawbill Trail, The Caribou Trail, and the Arrowhead Trail.) The trail is apparently named after Gunflint Lake, a Canadian border lake visible from the trail approximately seven miles from its end. The lake had been known by French explorers as *Lac des Pierres a' Fusil* because of the flint-like rock found along its shore and used in their rifles.

The trail was originally an overland footpath used to travel from the inland lakes to the shore of Lake Superior. No one knows precisely when the path was established, but it was probably first used by the native Ojibwe that called this area home for

Monroe P. Killy, Minnesota Historical Society

The Gunflint Trail as it appeared in 1932. What was then a gravel road is now paved for its total 57-mile length, and the alignment has been improved.

The Gunflint Trail (Cook County Road 12) extends for 57 miles to the northwest of Grand Marais. Cook County is located in the tip of the Minnesota "Arrowhead."


Minnesota Official State Highway

thousands of years. As more people discovered the recreational possibilities and natural resources of the area, especially as automobiles roared into the twentieth century, the path was widened in stages to become a road. By the 1870s, the road existed from Grand Marais to the eastern end of Rove Lake, where a trading post operated. What was then known as the Rove Lake Road was extended from Hungry Jack Lake to Poplar Lake to Gunflint Lake and the Cross River in the early 1890s. For decades, it was a primitive dirt road. Eventually, it was surfaced with gravel that had to be navigated rather slowly so as not to damage one's car.*

Today, the trail is a paved road that is well maintained throughout the year. The speed limit is 50 miles per hour, and it is best to stick to (or stay below) this limit because wildlife sightings and encounters can be frequent. Pines have also been known to fall across the road during windy conditions.

* *Willis H. Raff,* Pioneers in the Wilderness, *Cook County Historical Society, 1981.*

The Gunflint Trail was rerouted over a newly constructed alignment in the 1990s (in red) to provide a considerably less steep descent into Grand Marais. The old route (in turquoise) is still available, however, for people who want a climbing challenge and bicyclists who believe that their brakes will not fade.


Mn/DOT Base Map

Except for several intersections within a few miles of Grand Marais at the southern end of the trail, nearly its entire length can be considered a dead-end road. Trail users must return to Grand Marais if they intend to travel to any destination other than several side roads branching out from the trail (all of which are also dead ends). Although gasoline is available at a few locations along the trail, there are no service stations. Stores that might sell gasoline close at 9:00 or 10:00 p.m.; therefore, it is advisable to fill up before heading up the trail.

The trail serves only a few more than 200 year-round residents of the area. Some of them are children who must travel all the way to Grand Marais to go to school. Those children who live near the end of the trail have to get up quite early to take a 1½-hour bus ride to school each day.

Up until the late 1990s, the descent into Grand Marais on the trail was via Fifth Avenue West, with a 1-mile, six percent grade that ended at the intersection with Highway 61. Despite the placement of warning signs, there had been a history of brake failures — some with serious results — on heavy lumber trucks and other vehicles as their drivers attempted to slow down on the grade. The problem was addressed by the construction of a graveled runaway truck ramp near the top of the grade; however, it was of no help for a vehicle whose failure was not discovered until after it passed the entrance to the runaway ramp.

In 199X, construction was completed on an east-west roadway that started with a curve near the beginning of the descent with a much flatter grade that ended up at a new intersection, nearly one mile to the northeast of the trail's former intersection on Highway 61. It has been suggested that the rerouting was promoted by the Grand Marais business community to make it necessary for tourists coming from the southwest on Highway 61 to pass through town. However, the former location of the trail on the steep downgrade on Fifth Avenue West is still available for those whose destinations are to the southwest on Highway 61. That former route of the trail is now marked as Cook County Road 15. Southbound drivers on the old location are advised to use lower transmission gears on that street rather than rely solely on their brakes.

On either the old or new road up from Grand Marais, there are stunning views of Lake Superior and the Grand Marais harbor that can be seen from the road's ascent, several hundred feet above the water level. A parking area near the top of the grade provides a convenient viewing location for photographers and sightseers.

Speaking of sights, the fall colors are a special attraction on the trail. The moose maple in the forest understory and the mature maple trees take on brilliant color early in the fall, during the first part of September. In the latter part of September, the birch, aspen, and tamarack trees turn various shades of gold. Note that lodging is easier to find midweek rather than weekends at that time of year, and the trail is less crowded. More information on the Gunflint Trail's history and attractions can be found on the Internet.


## Veterans Evergreen Memorial Drive

The Veterans Evergreen Memorial Drive is the portion of Highway 23 from I-35 at Sandstone to Highway 39 in Duluth near the city limits at Fond du Lac. It was dedicated in 1947 as a memorial to the veterans of World Wars I and II from Carlton, Pine, and St. Louis counties. A later rededication added the soldiers of Douglas County in Wisconsin to the previously named counties, as well as veterans of the Korean War, the Vietnam War, and of "all future conflicts."

The drive is a scenic alternative to I-35 that, for the most part, follows forested hills on a northeasterly bearing. It passes through a few very small towns on the 43 miles from I-35 to the St. Louis River, where

it enters Duluth on a bridge built in 1919. Except for short segments through the towns, advertising signs have been prohibited by the drive's enabling legislation in 1947 — long before most highway beautification efforts became popular.

Most travelers using this low-traffic, slightly shorter alternative road to Duluth from the Twin Cities are probably unaware that a piece of it runs through a small corner of northwest Wisconsin because no signs indicate that state lines have been crossed. Moreover, the only route markers drivers see on this road clearly have "MINNESOTA" printed across the top. The actual distance of Highway 23 through Wisconsin is only 0.41 miles from the east Minnesota state line to the south end of a 1919 bridge over the St. Louis River that carries the highway back into Minnesota. This never would have occurred if a better place to construct a bridge had been found a short distance upstream.

The origins of Minnesota Highway 23's foray into Wisconsin remain a mystery. It is known that the road was originally constructed by Carlton County at least 25 years before the road was taken under the state's authority. Interestingly enough, the following statute allows for the construction and maintenance of a trunk highway in an adjoining state, but this legislation was not passed until 1959.

### §161.26 HIGHWAY MAINTAINED ACROSS PORTION OF ADJOINING STATE

When a state trunk highway route is so located that in order to properly connect the designated objectives it is advisable to construct and maintain the highway across a portion of an adjoining state, the commissioner is authorized to expend trunk highway funds therefor in the same manner as other expenditures for trunk highway purposes are made. No such highway or portion thereof shall be established or constructed in any adjoining state until the adjoining state shall first pass legislation consenting thereto and granting the commissioner necessary jurisdiction over the portion of the highway located in the adjoining state.


## The Grand Rounds

The Grand Rounds is the name given to the system of parkways in Minneapolis that encircle the city, winding around its lakes, the Mississippi River, Minnehaha Creek, Shingle Creek, and a few scenic connecting areas, most of which are close to the city limits. The parkways also connect many of the city's major parks to one another. The Grand Rounds is the product of a very far-sighted Minneapolis Parks Superintendent, Theodore Wirth, and the Minneapolis Park Board members who in the late 1800s sought to preserve the lakeshores and the river and creek banks for the citizens' use and recreation. Such preservation has been rather rare, as much of the waterfronts in urban areas throughout the United States, including Minnesota, has been taken over by industrial development, harbor activities, or upscale residential neighborhoods. In contrast, the parkways in Minneapolis are located between the waters' edge and the private homes, providing public access to a continuous strip of parkland. Even in recent times, the Park and Recreation Board has condemned industrial land adjacent to the Mississippi River so that the parkway system could be extended on the eastern edge of downtown.

Although the Grand Rounds is comprised of most of the city's parkways, each is individually named, and each has its own characteristics. One is named in memory of Theodore Wirth, who is considered the father of the Minneapolis park system as well as the parkways. Others have enticing names such as West River Road, Minnehaha Parkway, Lake Harriet Boulevard, Lake of the Isles Parkway, Memorial Parkway, Stinson

J. Katz

Memorial Parkway, part of the Grand Rounds Scenic Byway, in Minneapolis and Robbinsdale. The original trees, planted 90 years ago, are American elms. However, many of them – including the one in the foreground at the far left – have been replaced with other shade tree varieties in the wake of Dutch Elm Disease.

Boulevard, and St. Anthony Parkway. As for the individual characteristics, some are curved around residential lakeshore, although some lakeshore has been left in a forested state. Others are curvilinear roads through rolling parkland. Still others are rectilinear roadways through residential areas.

One of the roads in the latter category, Memorial Parkway, was constructed in 1919-1921. It is an unusually wide, formal boulevard with several rows of stately trees on either side (all American elms at one time, but increasingly other replacement shade tree varieties since the onslaught of Dutch elm disease). The trees nearest the roadway were planted in memory of the Minneapolis military service personnel who perished in World War I. Plaques next to the trees identify the persons for whom they are planted. Frontage roads are located on the outside edges of the parkway to provide access to modest homes.

All of the Minneapolis parkways include paved bicycle and walking paths. After a fatal collision between a pedestrian and a bicycle, most of the paths were divided in the 1970s into separate paths, one limited to pedestrians and joggers, and another to bicyclists and rollerbladers. Summer evenings and weekends bring large crowds on wheel and foot to much of the parkway system.

## Other Scenic Roads

The twenty-two Scenic Byways listed in this chapter are not the only scenic roads in Minnesota. There are many undesignated scenic roadways in the state, and many can be found within the city limits of Minneapolis and St. Paul.

St. Paul has Summit Avenue, a 4.5-mile stretch of road extending from near downtown to the Mississippi River, lined with spacious churches and stately mansions built by some of the city's entrepreneurs from the late nineteenth and early twentieth centuries. It is one of the longest such roads of any city in the country. St. Paul's Mississippi River Parkway complements its Minneapolis counterpart on the opposite bank, with an equally scenic drive and exquisite homes with large front lawns.

J. Katz

Summit Avenue in St. Paul.

Minnesota Historical Society

Victory Memorial Drive (Memorial Parkway's original name) under construction in Minneapolis in 1920.

Minnesota Historical Society

Opening dedication parade, Victory Memorial Drive, June 11, 1921.

The King of Trails Scenic Byway's history goes back to 1917 when the name was applied to a road extending from the Gulf of Mexico to Winnipeg, Manitoba. By 1926, the road was designated as US Highway 75 by the American Association of State Highway Officials. Seventy-five years later, the State Legislature officially designated the Minnesota portion of US Highway75 as "The Historic King of Trails." In 2004, the King of Trails became the newest and longest of the 22 Minnesota Scenic Byways. This photo was taken south of Lake Benton in southwestern Minnesota.

J. Katz


J. Katz

The Minnesota River Valley Scenic Byway crosses the Minnesota River just beyond the bottom of this hill where Yellow Medicine County Road 21 becomes Renville County Road 10.

The Minnesota River Valley Scenic Byway and alternates follows several state highways and county roads in southwestern Minnesota. This photo was taken at the Granite Falls city limits.


J. Katz

J. Katz

This view of the Minnesota River Valley in the Upper Sioux Agency State Park can be seen by travelers on Highway 67. Roads adjacent to both sides of the river are designated as National as well as Minnesota Scenic Byways.

## A SHORT LIST OF MINNESOTA'S SCENIC ROADS

There are too many scenic Minnesota roads to mention them all in this space. Most are not very well known outside their communities. However, seeking them out can provide a pleasant diversion on a long trip across the state. The list below will help get you started.

• Even though the Interstate Freeway System was designed to move large volumes of traffic at high speeds, its designers were not blind to aesthetic and scenic considerations. One of the most spectacular examples of such consideration in Minnesota is the segment of I-90 through the Hiawatha Valley in the southeast corner of the state. Beginning at the eastern end of the valley at I-90's north junction with Highway 61, the freeway's westbound roadway turns to the west from its routing over the Great River Road on the Mississippi. From there, it follows the heavily wooded north side of the valley as it climbs more than 500 hundred feet over 4 miles to a plateau of typically southeastern Minnesota cornfields. An interchange with County Road 12 at that point (Exit 266) permits turning around to take the eastbound roadway as it splits away from the westbound to wind its way down the south side of the valley, where it is located as much as 1,500 feet from the other roadway. After this segment of I-90 was completed in 1972, vistas formerly seen by only a few area residents opened up to travelers crossing the nation. The view from the upper elevations of the valley extends for several miles beyond the Wisconsin banks of the river.

The I-90 freeway "median" is so wide that some farmland, buildings, and access roads were left essentially intact when the highway right-of-way was acquired. Construction of underpasses on both directions of the freeway (Winona County Road 101 under the westbound and Township Road 31 under the eastbound) has maintained access to the median, where farming continues to this day.

• Several sections of I-35 between Pine City and Duluth are also fine examples of scenic interstate highway. The freeway passes through hardwood and pine-forested hills, beside small lakes, and across several rivers and streams as the width of the median varies to as much as several hundred feet. From hillcrests, travelers can see for miles to the horizon. The most spectacular is the view of Duluth and the bridges over its harbor, while descending over sweeping curves into the city. The scenery serves to soften — at least to some extent — the frustrations of heavy summer weekend traffic that regularly slows travel from the south. However, as opposed to the outright ban on billboards on nearby Highway 23 (the "scenic route"), billboards on I-35, playing mostly to the tourist industry, are in no short supply. Nevertheless, some limited control of advertising has been in effect due to the Highway Beautification Act championed by Lady Bird Johnson and signed by President Lyndon Johnson in 1965.

• Similar to I-90, Highway 14 climbs a valley west of Winona near the Mississippi River. The road is immediately adjacent to some of the bluffs that can be seen from the Great River Road (Highway 61). Although the I-90 and Highway 14 valley ascents are rather short, they are definitely worth a side trip from the Great River Road. A very scenic alternative to Highway 61 is Highway 14 west to St. Charles and north on Highway 74 back to Highway 61. Highway 74 passes through Whitewater State Park. The northernmost segment of Highway 74 is the only remaining state highway surfaced with gravel.

• Speaking of the Great River Road, Barn Bluff in Red Wing is another scenic vista that is rated among the best on the Mississippi. Spectacular views of the river and the city lie directly below. There is a catch, however: the bluff is only accessible on foot. However, it is immediately adjacent to Highway 61.

• Impressive scenery of a quite different sort greets travelers on Highway 169 as it traverses parts of the Iron Range. The highway, sometimes referred to as the Iron Range Expressway, occasionally skirts or crosses topography that is very familiar to those who live in the area but looks rather foreign to most other Minnesotans. Vistas of man- and machine-made badlands (otherwise known as open pit mines) extending for miles were created primarily in the first half of the twentieth century.

# Mystery Picture

# 14

## MYSTERY

This is not really a "mystery picture" — at least not to me. I know the exact location of the photo. However, I'm curious whether any of you readers know where it is. If so, I'd appreciate hearing from you. Please contact me at jandhkatz@comcast.net.

Clues: Despite the white-on-black signs and their span wire mounting (both quite rare in Minnesota), the location is in Minnesota. However, the signs are gone and the road, as pictured here, is gone as well. The date of the photo is ca. 1964. (Don't bother looking up the photo credit. The photo wasn't identified.)

Does anyone remember "tail fins"? Take a look at the Cadillac (center).


Highway Capacity Manual, 1965, Highway Research Board, Special Report 87

## BIBLIOGRAPHY


Andersen, Elmer L., *A Man's Reach,* Edited by Lori Sturdevant, University of Minnesota Press, Minneapolis, 2,000.

Burnquist, Joseph A. A., ed., *Minnesota and its People*, S. J. Clarke Publishing Co., Chicago, 1924.

*Collections of the Minnesota Historical Society*, reprint of 1850-1856 issues, Minnesota Historical Society, St. Paul, Minnesota, 1872.

Diers, John W., and Aaron Isaacs, *Twin Cities by Trolley, the Streetcar Era in Minneapolis and St. Paul,* University of Minnesota Press, Minneapolis, 2007.

"DOT Scene," Minnesota Department of Transportation, In-House Periodical, November 1976 to September/October 1987.

Gilman, Rhoda R., Carolyn Gilman, and Deborah M Stultz, *The Red River Trails, Oxcart Routes Between St. Paul and the Selkirk Settlement, 1820-1870,* Minnesota Historical Society, St. Paul, Minnesota, 1979.

Hipp, Debra M., *Building on a Strong Foundation, The History of State Aid for Local Transportation,* Minnesota Department of Transportation, St. Paul, Minnesota, 1999.

*History and Organization of the Department of Highways, State of Minnesota,* Minnesota Highway Planning Survey, Minnesota Department of Highways, Public Roads Administration of the Federal Works Agency, 1948.

Larsen, Arthur J., *The Development of the Minnesota Road System,* Minnesota Historical Society, St. Paul, Minnesota, 1966.

Mason, Philip P. "The Plank Road Craze: A Chapter in the History of Michigan's Highways," Wayne State University, Copyright © 2001-2007 State of Michigan, http://www.michigan.gov/hal/0,1607,7-160-17451_18670_18793-52863—,00.html (as of March 4, 2007).

Minnesota Department of Highways, Edwards and Kelcey (Consultant), *Interstate Routes in Minneapolis – Preliminary Engineering Report,* St. Paul, 1959.

Minnesota Department of Transportation, Official State Highway Map, http://www.dot.state.mn.us/statemap/.

Minnesota Department of Transportation Web Site, http://www.dot.state.mn.us/.

"Minnesota Highways," Minnesota Highway Department, In-House Periodical, November 1951 through October 1976.

"Minnesota Highways and the Babcock Good Roads Plan," Riverside Press.

"Mn/DOT Express," Minnesota Department of Transportation, In-House Periodical, December 1987 to Summer 1995.

"Mn/DOT News," Minnesota Department of Transportation, In-House Periodical, September 1995 to January/February 2001.

Morris, Michael "Mickey" T., *History of the Minnesota Highway Department,* through 1976, unpublished manuscript, ~ 1978.

Olsenius, Richard, *Minnesota Travel Companion – A Unique Guide to the History Along Minnesota's Highways,* Bluestem Productions, Wayzata, Minnesota, 1982.

Pawlak, John T., *Minnesota Department of Highways Stories – July 23, 1940 to September 12, 1961,* Transcribed by Jean M. Rozeske, Unpublished, 2007.

Raff, Willis H., *Pioneers in the Wilderness, Minnesota's Cook County, Grand Marais and the Gunflint in the 19th Century,* Cook County Historical Society, Grand Marais, Minnesota, 1981.

"Ramsey County History Magazine," Fall 1971.

Singley, Grover, *Tracing Minnesota's Old Government Roads,* Minnesota Historical Society, St. Paul, 1974.

St. Paul Pioneer Press, Sunday, January 19, 1930, and Tuesday, November 24, 1936, (Reference: Charles M. Babcock).

*The Most Scenic Drives in America, 120 Spectacular Road Trips,* The Reader's Digest Association, Inc., Pleasantville, New York, 1997.

Vanderbilt, Tom, *Traffic, Why We Drive the Way We Do (and What It Says About Us),* Alfred A. Knopf, New York, 2008.

Wurzer, Cathy, *Tales of the Road, Highway 61,* Minnesota Historical Society Press, St. Paul, 2008.

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