


Interstate Operations Study (IOS) Report for the FM Metropolitan Area

Phase II

January 2011

Prepared for
the Fargo-Moorhead
Metropolitan Council of Governments (Metro COG)

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the Metro COG Policy Board:
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Executive Summary

Introduction

The Fargo-Moorhead metropolitan area has seen significant growth over the past decades. As a result of this growth, traffic volumes have increased on the interstate system which includes I-29 and I-94. To date, the Fargo-Moorhead Metropolitan Council of Governments (Metro COG) in cooperation with the North Dakota Department of Transportation and Minnesota Department of Transportation has done well in addressing the operational needs of the interstate system that result from increased traffic volumes. To address upcoming future needs on the interstate system, Metro COG has developed the Interstate Operations Study (IOS) for the FM metropolitan area.

Phase I evaluated and documented existing and future year traffic operations on the interstate system, which resulted in a list of improvements agreed to by project participants for implementation by year 2025. Phase II is intended to result in a set of preferred action that will provide acceptable operations on the Fargo-Moorhead interstate system through year 2025. This executive summary documents the analysis results and decisions during Phase II of the IOS. Phase II expanded upon the future year operations modeling performed in Phase I by considering the impacts of strategies that reduce peak period traffic demand on the interstate as well as traditional capacity expansion.

Metro COG has provided a framework that connects the Visions, Goals, Objectives, and Issues identified in Phase I with the analysis performed in Phase II. Appendices A and B are key guidance documents for the development and implementation of recommendations of the IOS.

Study Process

The study process followed the four basic steps shown below. It also used information developed as part of Phase I study. This phase was completed by Metro COG and Advanced Traffic Analysis Center (ATAC) at NDSU. Phase II identified Themed Alternatives or courses of action to address operational deficiencies on the interstate system in the Fargo-Moorhead area. These alternatives were tested using the regional forecasting model and a more detailed operations model.

1. **Linking Issues to Strategies**: Problem locations and their causes were identified on the Interstate System. Tools and strategies that could address problem locations were identified for evaluation in Step 2.
2. **Development and Screening of Themed Alternatives**: A series of Themed Alternatives were developed and screened. These Themed Alternatives were applied across the entire system and evaluated for effectiveness.
3. **Analysis of Hybrid Alternatives**: The effective elements of the Themed Alternatives were combined into Hybrid Alternatives. These Hybrid Alternatives were evaluated with respect to operational performance.
4. **Selection of Preferred Alternative**: Evaluation results and cost estimates were used to select the preferred actions as well as to guide future planning and implementation.

Recommendations

Several key finding were identified throughout the Interstate Operations Study. Analysis and screening was used to identify actions that were shown to be effective in improving operations on the Interstate System. All of the key findings listed here are valuable strategies in addressing congestion on the Interstate, and in many cases combinations of strategies can increase effectiveness of the results.

1. Transportation Demand Management (TDM) strategies that reduce peak demand on the Interstate System by five percent.

   TDM efforts include transit, carpools, park and rides, ridesharing, flex-schedules, among others.

   Land use modifications, transit improvements, and transportation demand management (TDM) strategies can be implemented in an effort to reduce traffic congestion by influencing travel behavior (e.g., reduce vehicle miles traveled (VMT) and increase vehicle occupancy).

   An effective means to accomplish this is through a transportation management organization (TMO) for the FM metropolitan area. Leadership and funding support for the TMA from Mn/DOT and NDDOT would be beneficial, as would the pursuit of innovative funding sources including the Surface Transportation Program (STP) and the Congestion Mitigation and Air Quality (CMAQ) program.

2. Intelligent Transportation Systems (ITS)/Incident Management strategies that provide improved travel information and coordinated responses to emergency situations.

   The 2008 ITS Plan for the FM Metropolitan area provides a framework for ITS deployment in the region.

   Critical features leading to the benefits of ITS deployments include communications infrastructure and technologies and the development of coordinated responses to freeway incidents as well as weather emergencies and event conditions are key components of a comprehensive ITS strategy.

   ITS investments can be maximized by the development of a regional traffic operations (TOC) center. This would increase overall system performance by collecting and processing traffic data, provide opportunity to manage the system through ramp meters and traffic signal operations, provide traveler information on dynamic message signs other means, and dispatch coordinated responses to emergency situations.

3. Capacity/Physical Improvements to the interstate that address problem locations identified in Phase I and locations identified in Phase II that cannot be solved through other approaches. Improvements identified in Phase I include:

   - Rebuild I-94 interchange at TH 75 (as per the TH 75 Corridor Study), including the extension of the existing EB auxiliary lane through TH 75 interchange
   - Rebuild the 20th St interchange
   - Auxiliary lane additions on I-94 between 45th St and 9th St
   - Two lane existing I-29/I-94 tri-level (I-29 SB to I-94 EB) ramp; addition of auxiliary lane I-94 EB from tri-level to 25th St
   - Rebuilt 25th St interchange at I-94 (addition of EB access revision)
   - Modified 32nd Ave at I-29 (addition of NW loop ramp)

   Improvements identified in Phase II in locations that cannot be addressed by other approaches include:

   - Westbound I-94: Auxiliary lane from University Drive to 25th Street and two from 25th Street to Northbound I-29
   - Eastbound I-94: Auxiliary lane from 25th Street to University Drive
   - Northbound I-29: Auxiliary lane from Westbound I-94 to 13th Avenue
   - Tri-Level Interchange: Two-lane ramp from Westbound I-94 to Northbound I-29
   - TH 75 Interchange: Combine Northeast Loop and Northwest Ramp to single entrance to Westbound I-94

4. Ramp metering that allows for increased management of the Interstate System and improves mainline operations.

   First, ramp metering provides a tool to roadway system operators to directly manage the Interstate at entrance ramp locations.

   Second, ramp meters can help reduce peak period traffic volumes on the Interstate by shifting some short trips to the arterial system.

   Third, ramp metering at entrance ramps improves traffic flow by breaking up platoons entering the Interstate.

Prioritization and Steps to Implementation

The implementation of recommendations in the Interstate Operations Study Phase II is intended to guide the Metropolitan Planning Process as described in the vision, goals, and objectives identified in Phase I. This guidance will help ensure that the interstate system operates at cooperatively developed level of service standards, provide balanced bi-state operations, and ensure the entire roadway network is being maximized to its fullest potential. Metro COG, NDDOT, Mn/DOT, and all local partners will implement a regional mobility strategy that balances travel demand between interstate system and local and regional arterial roadways, and applies appropriate transportation and land use principles to ensure the interstate system carries out its function as the primary limited access arterial system in the regional transportation network. Improvement and modifications to the interstate system within the FM metropolitan area will be done in cooperation between Metro COG, NDDOT, and Mn/DOT, and local partners.

1. Establish a Transportation Management Organization (TMO) to oversee efforts to improve land use planning, transit service expansion, and travel demand management.

2. Initiate efforts to develop a regional traffic operations center (TOC), deploy ITS infrastructure, and develop incident management plans.

3. Construct capacity and physical improvements on the Interstate System as operational conditions indicate needs.

4. Perform more detailed study of ramp meter implementation and develop implementation plan for installation and operation of ramp meters.

I. Introduction

The Fargo-Moorhead metropolitan area has seen significant growth over the past decades. As a result of this growth, traffic volumes have increased on the interstate system which includes I-29 and I-94. To date, the Fargo-Moorhead Metropolitan Council of Governments (Metro COG) in cooperation with the North Dakota Department of Transportation and Minnesota Department of Transportation have done well to address the operational needs of the interstate system that result from increased traffic volumes. To address upcoming future needs on the interstate system, Metro COG has developed The Interstate Operations Study (IOS).

Phase I evaluated and documented existing and future year traffic operations on the interstate system. This effort resulted in a set of improvements to the interstate system agreed to by project participants. Phase II is intended to result in a set of preferred actions that will provide acceptable operations on the Fargo-Moorhead interstate system through year 2025. This report documents the analysis results and decisions during Phase II of the IOS. Phase II expanded upon the future year operations modeling performed in Phase I by considering the impacts of strategies that reduce peak period traffic demand on the interstate as well as traditional capacity expansion.

Metro COG has provided a framework that connects the analysis performed in Phase II to the outcomes of Phase I of the IOS. This information outlines Visions, Goals, Objectives, and Issues identified in Phase I. Appendix A provides this important context linking Phase I and Phase II of the IOS. Appendix B outlines an analysis of the issues identified in Phase I linking interstate operations to the Metropolitan Planning Process. These references are key guidance documents for the development and implementation of recommendations of the IOS.

II. Study Process

The study process followed the four basic steps shown below. It also used information developed as part of Phase I study. This phase was completed by Metro COG and Advanced Traffic Analysis Center (ATAC) at NDSU. Phase II identified Themed Alternatives or courses of action to address operational deficiencies on the interstate system in the Fargo-Moorhead area. These alternatives were tested using the regional forecasting model and a more detailed operations model. Modeling assumptions were developed early in the study process and are outlined in Appendix C. These assumptions were approved by the SRC and the modeling work was performed by ATAC throughout both phases of work.

A. **Linking Issues to Strategies**: Problem locations and their causes were identified on the interstate system. Tools and strategies that could address problem locations were identified for evaluation in Step 2.
B. **Development and Screening of Themed Alternatives**: A series of Themed Alternatives were developed and screened. These Themed Alternatives were applied across the entire system and evaluated for effectiveness.
C. **Analysis of Hybrid Alternatives**: The effective elements of the Themed Alternatives were combined into Hybrid Alternatives. These Hybrid Alternatives were evaluated with respect to operational performance.
D. **Selection of Preferred Alternative**: Evaluation results and cost estimates were used to select the preferred actions as well as to guide future planning and implementation.

Phase I of this study identified a number of issues to be investigated in subsequent analysis. A number of these issues constituted a core focus of the Phase II analysis. The results of the Phase II analysis provided a number of important conclusions about these issues and led to the key findings of the study.

A. Linking Issues to Strategies

Operational deficiencies on the regional interstate system were identified through a number of sources. The first was an exercise performed by meeting participants at the SRC meeting held on October 22, 2009. Meeting participants were asked to identify locations where they perceived the most serious traffic problems, either now or in the future. Following the meeting, the locations were summarized to identify which locations were considered most serious by a majority of meeting participants.

Technical memoranda prepared by the Advanced Traffic Analysis Center (ATAC) for the Phase I study were also used to identify problem locations. These memoranda document the development and results of the VISSIM simulation models of the regional interstate system. The models developed by ATAC included horizon years of 2015 and 2035. Locations in the models that were identified as experiencing operational deficiencies were included in the list of problem locations.

In addition, local input from project stakeholders was taken into account to add to the problems identified at the SRC meeting and the ATAC analysis. This information includes non-recurring congestion resulting from severe weather events, such as flooding and snowstorms; large entertainment events, including sports and concerts near the North Dakota State University (NDSU) campus; and construction activities. The locations identified through this process are summarized in Table 2.

Table 2
Problem Locations Identified at SRC Meeting #1

Facility	Location	Description
Tri-level Interchange	I-94 weave area between I-29 and 25th Street	High ramp volumes, heavy weave area, queuing onto upstream facilities
	I-29 southbound north of I-94	Right lane congestion, high ramp volumes
	Southeast Loop	High link density, low speeds, heavy weave with northeast loop
	Northeast Ramp	High a.m. peak volumes, high link density
	Flyover/Southeast Ramp Merge	Frequent stop-and-go traffic, queuing back on flyover, high link densities
I-94 Red River Crossing/ Moorhead Interchanges	University Drive to 20th Street	Right lane congestion, high ramp volumes, queuing onto upstream freeway, limited ramp terminal capacity
Arterial Roadway/ Intersection Deficiencies	Main Avenue between 25th Street and University Drive	Access control Capacity restrictions
	52nd Avenue between I-29 and 25th Street	Recently reconstructed Parallel facility capacity deficiencies
	Main Avenue between 9th Street and 45th Street	Access control Capacity restrictions
	45th Street between 32nd Avenue and 50th Avenue	Access control I-94 (parallel facility) capacity deficiencies
	13th Avenue & 45th Street intersection	Built out to maximum performance design Potential future capacity deficiencies
Local Interchange Deficiencies	I-29/76th Avenue	No existing freeway crossing or access Potential new corridor and/or interchange Potential new river crossing alignment
	I-29/13th Avenue	Right lane congestion High ramp volumes to I-94 exit
	I-29/32nd Avenue	Arterial capacity deficiencies Heavy ramp volumes Driver expectation problems
	I-29/52nd Avenue	Potential future capacity concerns Lack of nearby freeway crossings Potential new river crossing alignment
	I-29/64th Avenue	No existing freeway crossing or access Potential new river crossing alignment
	I-94/Sheyenne Street (CR 17)	Arterial capacity deficiencies Obsolete interchange design
	I-94/8th Street	Intersection deficiencies at ramp termini Access spacing issues
	I-94/20th Street	Arterial capacity deficiencies No freeway access to/from east

Priority problem locations were identified based on input from study participants and Phase I modeling efforts. The severity of congestion predicted in these locations provides a good indication of the magnitude of the operational problems anticipated and the order in which problems are expected to occur.

A toolset was developed that should be used to address congestion issues on the interstate as they arise. Tools are not limited to freeway capacity expansion, but can include travel demand management techniques, ramp metering, off-system improvements, and new Red River Crossing capacity. This set of tools demonstrates the needs for solutions jointly agreed upon and supported by transportation agencies across all levels and jurisdictions.

Updated Year 2025 Model Development

The models developed in Phase I represented years 2015 and 2025 conditions. To evaluate year 2025 conditions in Phase II, updated travel demand and operations models were developed by ATAC. The key components of the year 2025 modeling conditions include year 2035 land uses and year 2025 roadway network assumptions. This approach, developed with input from the Study Review Committee, was intended to provide a realistic representation of travel patterns expected to occur beyond the 2015 timeframe. This was also intended to limit the influence of roadway improvements assumed as part of the 2035 modeling, but are not planned or programmed in any officially adopted planning documentation. A complete description of the development of the updated year 2025 models has been prepared by Advanced Traffic Analysis Center and is provided in Appendix D.

Phase I resulted in an agreement that Mn/DOT and NDDOT will use different level of service (LOS) thresholds to identify transportation needs within the FM metropolitan area. Mn/DOT will accept a LOS D, and would not consider a capacity improvement (need) until conditions would reach LOS E or lower. NDDOT has indicated that it will strive to maintain a LOS C or better, and would not consider capacity improvement until conditions reach LOS D or lower.

The results of Phase I were applied as base assumptions for the modeling performed in Phase II. This includes the set of improvements agreed to by project participants. The agreed to improvements are described in the following list and additional detail is provided in Appendix C.

- Rebuild I-94 interchange at TH 75 (as per the TH 75 Corridor Study), including the extension of the existing EB auxiliary lane through TH 75 interchange
- Rebuild the 20th St interchange
- Auxiliary lane additions on I-94 between 45th St and 9th St
- Two lane existing I-29/I-94 tri-level (I-29 SB to I-94 EB) ramp; addition of auxiliary lane I-94 EB from tri-level to 25th St
- Rebuilt 25th St interchange at I-94 (addition of NB to EB entrance ramp)
- Modified 32nd Ave at I-29 (addition of NW loop ramp)

As a result of the updated year 2025 base conditions modeling, a revised list of locations on the interstate with unacceptable level of service was identified. These locations are shown in Table 3. The 15 locations shown here represent the primary focus throughout the analysis performed for the Interstate Operations Study.

Table 3
Year 2025 Base Condition Interstate Problem Locations

Location	Direction/ Peak Period	Base Condition
I-94: I-29 to 25th St	Westbound AM	F
	Eastbound PM	E
I-94: 25th St to University Dr	Westbound AM	F
	Eastbound PM	E
I-94: University Dr to 8th St	Westbound AM	D
	Eastbound PM	D
I-94: 8th St to 20th St	Westbound AM	F
	Eastbound PM	E
I-94: 20th St to 34th St	Westbound AM	D
	Eastbound PM	D
I-94 EB to I-29 NB (SE) Loop	AM	E
I-94 WB to I-29 SB (NW) Loop	AM	E
I-94 WB to I-29 NB (NE) Ramp	AM	D
Tri-Level Combined Entrance to Eastbound I-94 (from I-29)	PM	E
Tri-Level Combined Exit from Southbound I-29 (to I-94)	PM	D

B. Development and Screening of Themed Alternatives

Six Themed Alternatives were developed based on input from the SRC. Each of the alternatives employs a different approach to addressing congestion issues on the interstate system.

The results of the Themed Alternative screening were presented to the Study Review Committee at meeting #3. Based on the results and input from the committee, each Themed Alternative was either selected for analysis in the Hybrid Alternative Analysis or removed from further consideration. The list below includes the Themed Alternatives and the screening decision from SRC meeting #3.

1. Land Use/Transit/TDM
2. ITS/Incident Management
3. Ramp Metering
4. Arterial/Off-System Improvements*
5. New Red River Crossing near I-94
6. Capacity/Physical Improvements

*A Red River crossing along the 76th Avenue corridor was included in Themed Alternative 4: Arterial/Off-System Improvements. Themed Alternative 5: New Red River Crossing near I-94 included river crossing locations only at 13th Avenue/12th Avenue and 32nd Avenue/40th Avenue.

The following section provides the rationale, goals, and screening criteria for each of the Themed Alternatives. Appendix E includes additional descriptions of the specific scenarios that were tested as well as the modeling techniques implemented by ATAC to complete the analysis. Then the analysis results for each alternative are summarized. Detailed results of the modeling performed for the Themed Alternatives is provided in Appendix G. Finally, a more detailed description of the screening decision is provided.

1. Land Use Modifications/Transit/Travel Demand Management (TDM)

Background and Approach

Themed Alternative 1 considered land use modifications, transit improvements, and transportation demand management (TDM) strategies to be implemented in an effort to reduce traffic congestion by influencing travel behavior (e.g., reduce vehicle miles traveled (VMT) and increase vehicle occupancy). Typical strategies of this nature include implementing higher density land use policies conducive to transit use, encouraging alternatives to single occupancy vehicles (i.e., carpools, transit, bicycles, etc.), and implementing alternative work hour programs such as flex-time and telecommuting.

Specific transit/TDM improvements were not fully investigated as part of this study, but instead the magnitude of travel behavior shifts that may be achieved was pursued through a qualitative analysis, including a review of related case studies and research. Based on this review, it is reasonable to conclude that transit/TDM improvements in the Fargo-Moorhead area will result in a reduction of peak period vehicle trips. For example, according to a Transportation Research Board (TRB) study, a vehicle trip reduction of up to five percent is possible for implementation of a system wide transit/TDM improvement program and vehicle trip reductions as high as 40 percent have been achieved at the site specific level.[1] The actual achievable results in the Fargo-Moorhead area will vary based on the extent of the strategies pursued (i.e., more aggressive strategies applied system-wide would likely generate greater benefits).

The simulation model was used to evaluate the effects of the transit and TDM measures considered for the region. The peak origin-destination tables for the model were reduced by factors of five, 10, and 20 percent (based on the research described above) and the models updated and re-run.

Analysis Results

Comprehensive TDM measures were tested using the simulation model with traffic reductions of five percent, 10 percent and 20 percent throughout the system. The greater level of reduction resulted in improved operations on the interstate system. It was determined by the Study Review Committee that a five percent reduction in travel demand was the highest level that would be realistic to achieve by year 2025. As a result, this was the only scenario of Themed Alternative 1 that was carried forward.

[1] Winters, P. L. *Transportation Demand Management.* Transportation Research Board (TRB).

The results of the simulation model demonstrated that a five percent reduction in traffic demand on the interstate during peak periods led to improved traffic operations conditions. While some locations remained congested, the severity and duration of congestion was decreased. At a minimum, a TDM approach would be expected to limit the magnitude of capacity expansion required to meet level of service targets by year 2025. A level of service summary at problem locations is given in Table 4.

Table 4
LOS Summary in Problem Locations – Themed Alternative 1

Location	Direction/ Peak Period	Base Condition	Themed Alt 1
I-94: I-29 to 25th St	Westbound AM	F	**F**
	Eastbound PM	E	**D**
I-94: 25th St to University Dr	Westbound AM	F	F
	Eastbound PM	E	E
I-94: University Dr to 8th St	Westbound AM	D	D
	Eastbound PM	D	D
I-94: 8th St to 20th St	Westbound AM	F	**E**
	Eastbound PM	E	E
I-94: 20th St to 34th St	Westbound AM	D	D
	Eastbound PM	D	D
I-94 EB to I-29 NB (SE) Loop	AM	E	E
I-94 WB to I-29 SB (NW) Loop	AM	E	E
I-94 WB to I-29 NB (NE) Ramp	AM	D	D
Tri-Level Combined Entrance to Eastbound I-94 (from I-29)	PM	E	**D**
Tri-Level Combined Exit from Southbound I-29 (to I-94)	PM	D	**C**

2. ITS/Incident Management

Background and Approach

Intelligent Transportation Systems (ITS) and incident management strategies can be pursued as a means to reduce congestion (both recurring and non-recurring). Typical ITS strategies include variable message signs, traveler information resources (i.e., 511 and web resources), roadway cameras and sensors, signal coordination/optimization, and programmed responses to freeway incidents, all of which are usually administered by a traffic operation center (TOC).

Specific ITS/incident management strategies were investigated in this study using a qualitative analysis approach. A comparison of studies from peer metropolitan areas was considered to evaluate the potential impacts of this approach on interstate operations. Based on this review, it was determined that ITS/Incident management improvements in the Fargo-Moorhead area will benefit interstate operations.

A review of case studies demonstrated that coordination between freeway and arterial management systems has the potential to reduce travel time by as much as 18 percent and increase vehicular speeds by 5 to 20 percent, signal coordination can reduce delay by 14 to 19 percent, and system wide traveler information systems have resulted in a crash reduction of 2.5 percent[2]. As such, it is reasonable to conclude that the implementation of ITS/incident management strategies in the Fargo-Moorhead Area will achieve similar results. Actual benefits will vary based on the extent of the strategies pursued (i.e., more aggressive strategies applied system-wide would likely generate greater benefits).

No specific reduction in travel demand was assumed for this Themed Alternative, however it was assumed that deployment of additional ITS infrastructure, increased operability of signal systems, and implementation of a traffic operations center by year 2025 would be needed to facilitate implementation of other Themed Alternatives, such as ramp metering and arterial improvements.

Analysis Results

The goal of deployment of Intelligent Transportation Systems and Incident Management is to employ technology to improve traffic operations on the interstate system through improved flow of real-time information and coordinated responses to emergencies. This would ideally include application of state-of-the-practice technologies to address recurring and non-recurring congestion issues. This would be expected to result in improved travel time expectation, more real-time information available to drivers, and more rapid clearance of freeway incidents and operational recovery.

Deployment of communications infrastructure and technologies and the development of coordinated responses to freeway incidents as well as weather emergencies and event conditions are key components of a comprehensive ITS strategy. Implementation of a comprehensive ITS strategy would involve installation of cameras and loop detector systems, and increased coordination with public safety agencies.

The Fargo-Moorhead Metro ITS Plan includes a number of concrete steps required to accomplish the goals of an ITS strategy throughout the region:

- Network Infrastructure
- Traffic Operations Center (TOC) and Data Management
- Closed Circuit Television (CCTV) Surveillance
- Traveler Information
- Signal Systems Control and Integration

[2] TIGER Grant Application, Center for Transportation Studies, Traffic Operations Center, Metropolitan Signal Systems Interconnect. (2009, September). North Dakota Department of Transportation, Fargo-Moorhead COG, North Dakota State University.

Congestion on the interstate system can generally be classified into two broad categories: recurring congestion and non-recurring congestion. Different ITS solutions can have positive impacts on one or the other of these types congestion, or both. Solutions that target recurring congestion include real-time traffic data for communicating traveler information, traffic signal priority for improved parallel routes, and improved mainline traffic flow through management techniques. ITS solutions targeting non-recurring congestion include improved incident response and clearance times and improved traveler information and notification of incidents or conditions.

3. Ramp Metering

Background and Approach

Themed Alternative 3 evaluated the addition of ramp meters to freeway on-ramps which were intended to accomplish two goals. The first is breaking up platoons. When traffic signals at a ramp terminal intersection release a stream of traffic, the sudden entry of a line of vehicles can be disruptive to freeway traffic flow resulting in congestion and slower speeds. Ramp meters can be used to break up these platoons such that individual vehicles may merge into the traffic stream more smoothly.

The second goal is to divert short trips off of the interstate to arterial roadways. If an on-ramp is utilized excessively by drivers making very short trips on the freeway, i.e. getting off within one or two exits from where they entered the freeway, there may be a benefit to shifting these trips to non-freeway routes. Ramp meters will increase the travel time of a short trip on the interstate by creating additional delay before entering. The additional delay will deter some drivers making short trips from using the freeway and encourage them to use alternate routes. Drivers making longer trips will still experience a faster trip on the freeway as the delay caused by the meters is a smaller percentage of the overall trip time. The first goal of platoon break-up remains a positive result of this second goal.

To determine the impacts of trip diversion, the travel demand model was first used to evaluate the magnitude and locations of trips diverted from the interstate. Then, the origin-destination tables in the simulation model were updated and the model re-run.

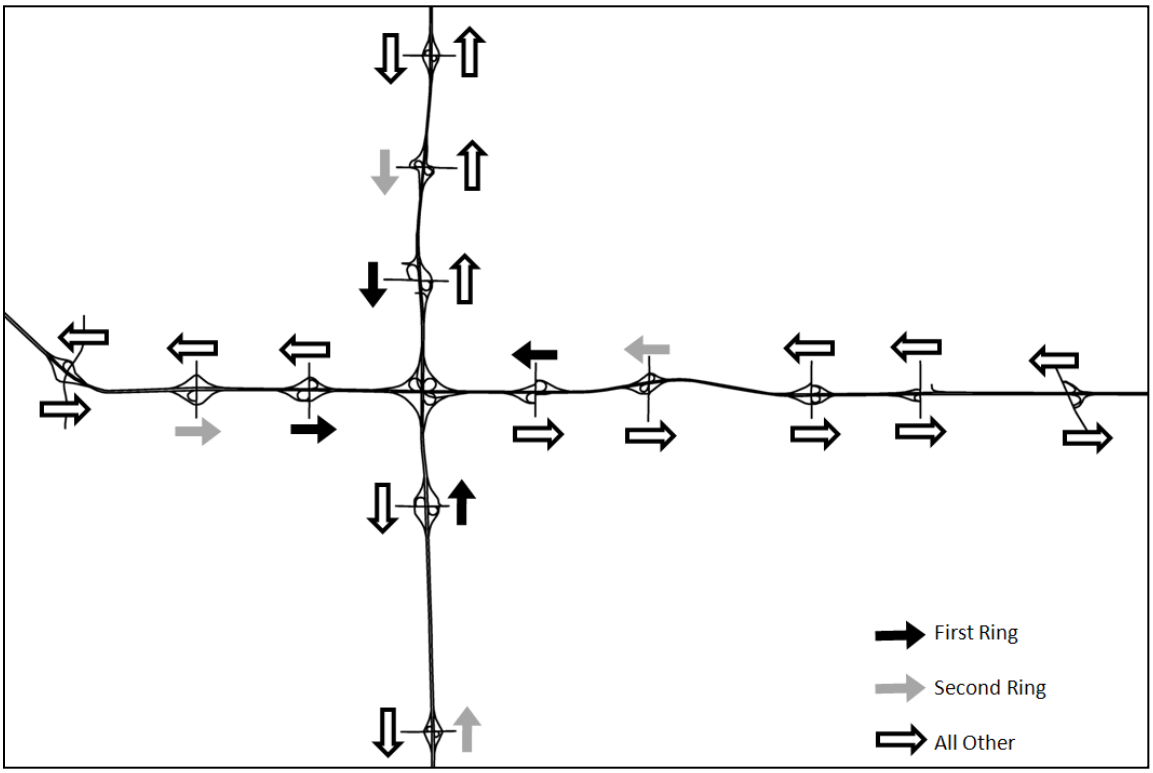
Analysis Results

Ramp metering was tested using the travel demand model to estimate changes in traffic volumes accessing the interstate system. Additional travel time was added to the freeway entrance ramps in locations that were to be metered. This was expected to influence traffic patterns, shifting some trips from the interstate to the arterial system.

Numerous combinations of entrance ramp locations and travel time increases were considered in the screening process. The first ramps to be considered were the ramps at the local interchanges adjacent to the tri-level interchange leading towards the tri-level interchange (first ring). In a subsequent scenario the ramps leading towards the tri-level interchange at the next closest interchanges to the tri-level interchange were considered (second ring). Travel time increases at the ramps were considered at levels of 30, 60, 120, and 240 seconds. A maximum of 240 seconds was assumed based on ramp meter policies used by Mn/DOT on the Twin Cities freeway system. Finally, a scenario was considered with ramp meters at all local entrance ramp locations throughout the system, leading both toward and away from the tri-level interchange. Ramp meters were not considered on system ramps at the tri-level interchange.

Travel time increases on the entrance ramps in the range of 60 to 120 seconds were found to achieve desirable reductions in traffic using the interstate system, a reduction of approximately 15 percent of peak hour traffic in most locations. The scenario that was selected for subsequent modeling and analysis included ramp meters at all entrance ramp locations throughout the region. Travel time increases of 120 seconds were used at entrances leading towards the tri-level interchange at the first ring interchanges, 60 seconds at entrances leading towards the tri-level interchange at the second ring interchanges, and 30 seconds at all other entrance ramp locations. Figure 1 depicts the first and second ring ramps and all locations where ramp meters were assumed in the modeling.

Figure 1
Ramp Meter Locations



A level of service summary at problem locations is given in Table 5.

Table 5
LOS Summary in Problem Locations – Themed Alternative 3

Location	Direction/ Peak Period	Base Condition	Themed Alt 3
I-94: I-29 to 25th St	Westbound AM	F	**E**
	Eastbound PM	E	**C**
I-94: 25th St to University Dr	Westbound AM	F	F
	Eastbound PM	E	**D**
I-94: University Dr to 8th St	Westbound AM	D	E
	Eastbound PM	D	D
I-94: 8th St to 20th St	Westbound AM	F	**E**
	Eastbound PM	E	**D**
I-94: 20th St to 34th St	Westbound AM	D	**C**
	Eastbound PM	D	**C**
I-94 EB to I-29 NB (SE) Loop	AM	E	**D**
I-94 WB to I-29 SB (NW) Loop	AM	E	**D**
I-94 WB to I-29 NB (NE) Ramp	AM	D	D
Tri-Level Combined Entrance to Eastbound I-94 (from I-29)	PM	E	**C**
Tri-Level Combined Exit from Southbound I-29 (to I-94)	PM	D	**C**

4. Arterial/Off-System Improvements

Background and Approach

Themed Alternative 4 focused on off-system improvements intended to make arterial (non-interstate) facilities more attractive to drivers. These efforts may include signal coordination, intersection improvements, capacity improvements, or development of new facilities. The specific improvements to the arterial system will not be fully investigated as part of this study, but the magnitude of traffic shifts that may be achieved will be pursued through the analysis. Strong positive results from this study may lead to the recommendation of further analysis of specific improvements in future studies.

The analysis of the off-system improvements involved a two-step process of first evaluating traffic shifts using the travel demand model and then adjusting the peak period origin-destination tables in the simulation model.

Analysis Results

Improvements to arterial and off-system (non-interstate) roadways were considered as a means to provide an attractive alternative and reduce traffic volumes on the interstate. The volume of traffic shifting from the interstate to the parallel arterials was estimated using the travel demand model. Travel times were improved on parallel arterial roadways at rates of 10 and 15 percent, depending on location and local knowledge of the roadways' ability to be improved.

Various combinations of arterial facilities were considered, but a scenario including all of the candidate corridors was selected for final analysis in the simulation model. The following list shows the roadways and assumed travel time improvements:

- Fargo
  - 45th Street: Travel time reduction of 10%
  - 25th Street: Travel time reduction of 10%
  - Main Avenue: Travel time reduction of 10%
  - 13th Avenue: Travel time reduction of 10% east of I-29, 15% west of I-29
  - 52nd Avenue and Red River crossing: Travel time reduction of 10%
  - 76th Avenue, new Red River crossing, I-29 interchange: high speed/limited access facility
- Moorhead
  - 8th Street: Travel time reduction of 15%
  - 20th Street: Travel time reduction of 15%

Changes in traffic volumes on arterials with improved travel times are expected to be significant, in some cases up to a 50 percent increase in daily traffic. The volume shifting from the interstate, however, makes up a small proportion of the total interstate traffic. This results in a limited ability to improve operations and level of service.

The inclusion of the 76th Avenue corridor is an important feature in this Themed Alternative. This corridor, from 38th St in Fargo to TH 75 in Moorhead, was assumed to include a Red River crossing and an interchange at I-29. Furthermore, this corridor was envisioned as a higher-functioning roadway, with highway speeds throughout and access provided only at intersections with adequate spacing.

A new corridor and river crossing along 76th Avenue would be expected to serve approximately 10,000 to 15,000 vehicles per day (vpd). Traffic volumes on I-94 and 52nd Avenue would each be expected to decrease by 1,000 to 2,000 vpd due to traffic shifting to 76th Avenue. The remaining traffic would be expected to shift from other Red River crossing locations, or represent new traffic resulting from a redistribution of travel patterns. A level of service summary at problem locations is given in Table 6.

Table 6
LOS Summary in Problem Locations – Themed Alternative 4

Location	Direction/ Peak Period	Base Condition	Themed Alt 4
I-94: I-29 to 25th St	Westbound AM	F	**E**
	Eastbound PM	E	**D**
I-94: 25th St to University Dr	Westbound AM	F	F
	Eastbound PM	E	**D**
I-94: University Dr to 8th St	Westbound AM	D	D
	Eastbound PM	D	D
I-94: 8th St to 20th St	Westbound AM	F	**E**
	Eastbound PM	E	E
I-94: 20th St to 34th St	Westbound AM	D	D
	Eastbound PM	D	**C**
I-94 EB to I-29 NB (SE) Loop	AM	E	E
I-94 WB to I-29 SB (NW) Loop	AM	E	E
I-94 WB to I-29 NB (NE) Ramp	AM	D	D
Tri-Level Combined Entrance to Eastbound I-94 (from I-29)	PM	E	**D**
Tri-Level Combined Exit from Southbound I-29 (to I-94)	PM	D	**C**

5. New Red River Crossing near I-94

Background and Approach

Themed Alternative 5 considered new Red River Crossing locations intended to provide drivers with additional alternatives to I-94 for crossing the Red River. This additional capacity is expected to attract trips that would otherwise use I-94 and provide relief to the interstate system.

The analysis of the new Red River Crossing alternatives employed a two-step process of first evaluating traffic shifts using the travel demand model and then adjusting the peak period origin-destination tables in the simulation model.

Analysis Results

New Red River crossing capacity near I-94 was considered to provide alternatives to the interstate. New river crossings were evaluated connecting to the 13th Ave/12th Ave corridor and the 32nd Ave/40th Ave corridor. The travel demand model was used to estimate the shift in traffic from I-94 to these new crossing locations.

The updated travel patterns were tested in the simulation model. The results showed that operations on I-94 were not expected to improve compared to the base condition. This was due to increased traffic volumes entering the interstate at interchanges past the river crossing. The travel patterns predicted by the travel demand model indicated that traffic shifting off of the interstate to use the new crossings was expected to enter the interstate again after crossing. As a result, overall traffic volumes on the interstate were not expected to decrease significantly. In addition, the higher concentrations of traffic entering the interstate at the interchange adjacent to the Red River resulted in increased congestion in these locations.

The addition of new Red River crossing capacity at the 13th/12th Avenue and 32nd/40th Avenue alignments was screened from further analysis, the addition of a new Red River crossing south of I-94 was supported by the findings in the Arterial/Off-System Improvements Themed Alternative. Provision of a crossing along the 76th Avenue corridor would be expected to provide relief to I-94 and 52nd Avenue, but would be less challenging to implement due to established land uses along the corridors closer to I-94. A level of service summary at problem locations is given in Table 7.

Table 7
LOS Summary in Problem Locations – Themed Alternative 5

Location	Direction/ Peak Period	Base Condition	Themed Alt 5
I-94: I-29 to 25th St	Westbound AM	F	**E**
	Eastbound PM	E	**D**
I-94: 25th St to University Dr	Westbound AM	F	F
	Eastbound PM	E	E
I-94: University Dr to 8th St	Westbound AM	D	**E**
	Eastbound PM	D	D
I-94: 8th St to 20th St	Westbound AM	F	**E**
	Eastbound PM	E	E
I-94: 20th St to 34th St	Westbound AM	D	D
	Eastbound PM	D	D
I-94 EB to I-29 NB (SE) Loop	AM	E	E
I-94 WB to I-29 SB (NW) Loop	AM	E	E
I-94 WB to I-29 NB (NE) Ramp	AM	D	D
Tri-Level Combined Entrance to Eastbound I-94 (from I-29)	PM	E	E
Tri-Level Combined Exit from Southbound I-29 (to I-94)	PM	D	D

6. Capacity/Physical Improvements

Background and Approach

Capacity and physical improvements to the interstate system, in addition to those agreed upon in Phase I, were considered in Themed Alternative 6. These improvements, which may include additional freeway lanes and/or interchange modifications are typically the most established approach to interstate congestion relief, but are often the most expensive. This Themed Alternative included capacity and physical improvements that are necessary to achieve a congestion-free interstate system in 2025. An iterative process was used to evaluate the effects of proposed improvements, throughout which the scope of the improvements was expanded until all congestion had been eliminated.

The simulation model was the primary tool used to analyze the expected operations of this Themed Alternative. This is because major traffic shifts are not expected as a result of these improvements. The travel demand model was used in a limited capacity when proposed improvements resulted in modified access to the interstate, such as adding, removing, or braiding ramps.

It should be noted that all of the improvements considered as part of Themed Alternative 6 are not included in the Long Range Transportation Plan. Any of the improvements identified for implementation in this study will need to be adopted through Metropolitan Planning Process.

Analysis Results

Improvements to the interstate system were evaluated to provide a benchmark for the level of investment required to resolve congestion issues through capacity and physical improvements. Three scenarios were considered, ranging from traditional capacity expansions, to low-cost innovative solutions and high-cost innovative solutions.

Themed Alternative 6.1 is a traditional capacity expansion scenario that was intended to address all of the congested locations throughout the system. This resulted in over nine miles of new freeway lanes, modifications to two interchanges, and the addition of another tri-level ramp at the I-29/I-94 interchange.

Themed Alternative 6.2 considered a low-cost innovative solution in which the ramps leading to and from the tri-level interchange at the local interchanges adjacent to it were closed. This was an attempt to limit traffic volumes and reduce weaving conflicts in the congested segments near the tri-level interchange. The results of this scenario did not demonstrate improved operations on the interstate as increased traffic volumes were expected to use the local interchange ramps at the interchanges adjacent to the tri-level interchange. The higher concentrations of traffic in these locations resulted in increased congestion on the system, despite the reduced conflicts in the weaving areas.

Themed Alternative 6.3 was a higher-cost innovative solution where access to the tri-level interchange was restricted for adjacent interchanges. Specifically, 25th Street and 45th Street traffic was allowed to access I-94 only and not I-29, and 13th Avenue and 32nd Avenue traffic was allowed to access I-29 only and not I-94. In addition, grade separations were provided for the weaving movements between the tri-level and adjacent interchanges. The results of this scenario showed dramatic improvements in operation at the tri-level interchange and the weaving segments adjacent to it. The segments between the first ring and second ring interchanges became more congested due to increased weaving conflicts. Similar to the previous alternative, where traffic was expected to attempt to exit the interstate at the interchange prior to the tri-level interchange, these travel pattern changes were expected to result in increased congestion at the first ring interchanges.

While Themed Alternatives 6.1 and 6.2 considered here did not result in overall operational improvement throughout the interstate system, these do demonstrate that grade separation and access closure can be effective in reducing congestion through heavy weaving segments. These approaches may be required if other approaches are unable to mitigate congestion in this type of environment. A level of service summary at problem locations is given in Table 8.

Table 8
LOS Summary in Problem Locations – Themed Alternative 6

Location	Direction/ Peak Period	Base Condition	Themed Alt 6.1	Themed Alt 6.2	Themed Alt 6.3
I-94: I-29 to 25th St	Westbound AM	F	**B**	F	**C**
	Eastbound PM	E	**D**	F	**C**
I-94: 25th St to University Dr	Westbound AM	F	F	F	**E**
	Eastbound PM	E	**C**	F	E
I-94: University Dr to 8th St	Westbound AM	D	D	D	D
	Eastbound PM	D	D	**C**	D
I-94: 8th St to 20th St	Westbound AM	F	**D**	**D**	**E**
	Eastbound PM	E	**C**	**C**	E
I-94: 20th St to 34th St	Westbound AM	D	**B**	**C**	D
	Eastbound PM	D	**C**	**C**	D
I-94 EB to I-29 NB (SE) Loop	AM	E	E	**B**	**B**
I-94 WB to I-29 SB (NW) Loop	AM	E	F	**C**	**C**
I-94 WB to I-29 NB (NE) Ramp	AM	D	**B**	D	**B**
Tri-Level Combined Entrance to Eastbound I-94 (from I-29)	PM	E	**D**	**D**	**C**
Tri-Level Combined Exit from Southbound I-29 (to I-94)	PM	D	**C**	**C**	**C**

Appendix E provides more detailed descriptions of the Themed Alternatives that were evaluated in the screening process.

C. Hybrid Alternative Analysis

Hybrid Alternatives were developed at SRC Meeting #3 based on input from its members. Three Hybrid Alternatives were established that range from an aggressive approach to reduction of traffic volumes on the interstate system requiring minimal capacity expansion to more moderate and passive strategies relying more heavily on capacity expansion to achieve desired interstate operations. Through the strategies that reduce peak traffic demand and the capacity expansion on the interstate, all three Hybrid Alternatives are expected to provide acceptable operations on the interstate through year 2025.

Table 9 illustrates the Themed Alternatives that are included in each of the three Hybrid Alternatives.

Table 9
Hybrid Alternative Strategies

Themed Alternative	Hybrid Alternative 1	Hybrid Alternative 2	Hybrid Alternative 3
1. Land Use/Transit/TDM	✓	✓	✓
2. ITS/Incident Management	✓	✓	✓
3. Ramp Metering	✓	✓	
4. Arterial/Off-System Improvements	✓		
5. New Red River Crossing near I-94			
6. Capacity/Physical Improvements*	Minimal As Needed	Moderate As Needed	Significant As Needed

*The improvements agreed to in Phase I were also assumed in all Hybrid Alternatives (see Appendix C)

The following section provides a summary of the elements included in each Hybrid Alternative and a discussion of the results. More detailed information on the approaches and assumptions used in the modeling is provided in Appendix F. Detailed results of the modeling performed for the Hybrid Alternative analysis is provided in Appendix G.

Hybrid Alternative 1

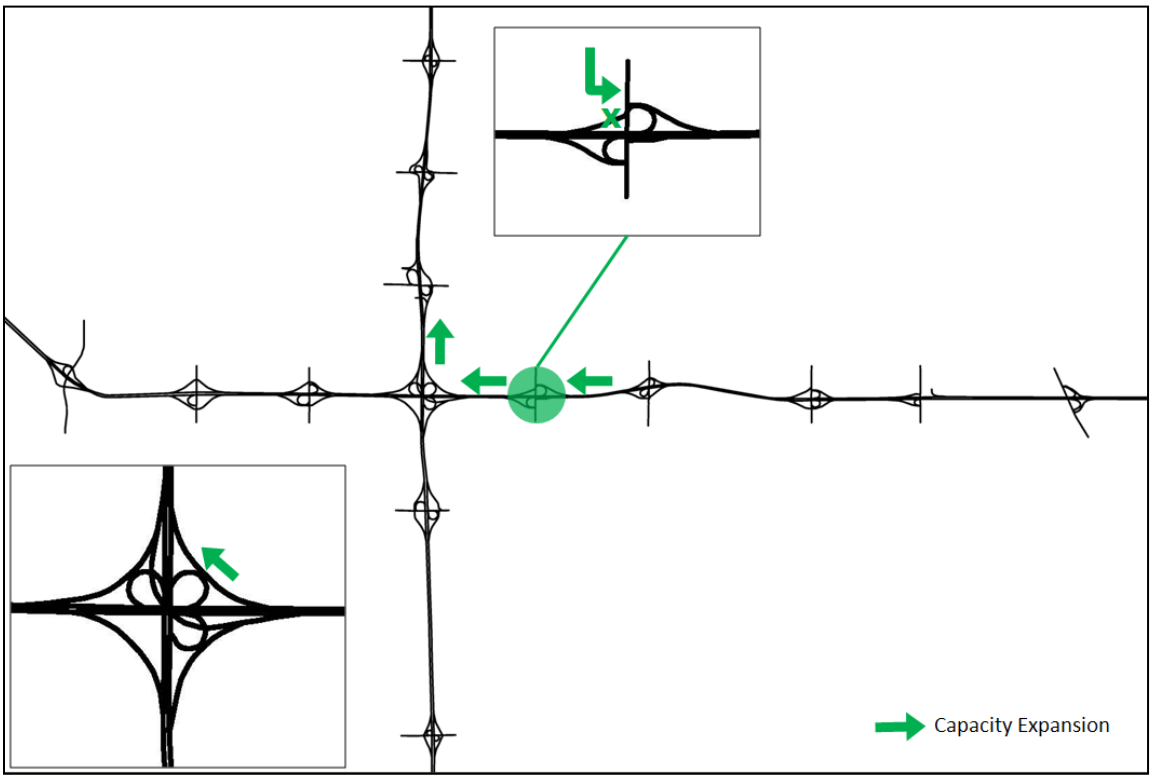
Background and Approach

Hybrid Alternative 1 was designed to reduce traffic demand on the interstate system through all means found effective in the Themed Alternative screening. This includes TDM measures, ramp metering, and arterial improvements. ITS deployment is also assumed in this Hybrid Alternative which will both aid in management of the ramp meter system and provide travel information to system users and managers under recurring and non-recurring conditions.

Analysis Results

The combination of approaches used in this Hybrid Alternative were found to have a synergistic effect resulting in reduced traffic volumes and improved operations on the interstate system. Of the 15 locations identified in the base condition operations analysis, 11 had been improved to acceptable level of service without any capacity expansion. Traditional capacity expansions were then developed to mitigate remaining congested locations. The capacity improvements required included auxiliary lanes, and ramp and intersection modifications.

Figure 1
Physical Improvements Required for Hybrid Alternative 1



It should be noted that the removal of the southbound to westbound ramp at 25th Street and I-94 was developed as a less expensive method to mitigate weaving issues along westbound I-94. Other solutions allowing this ramp to remain in place are also available.

Hybrid Alternative 2

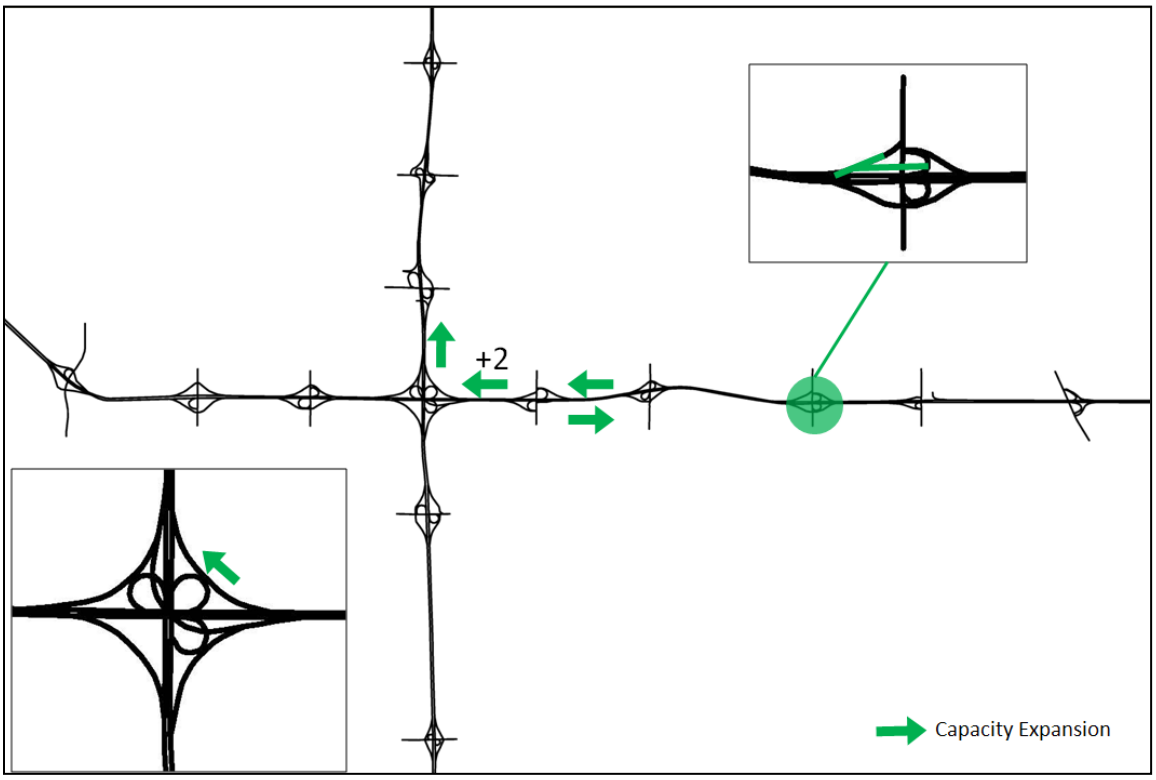
Background and Approach

Hybrid Alternative 2 was similar to Hybrid Alternative 1, but did not include arterial improvements as a means to reduce traffic demand on the interstate. As a result, TDM measures and ramp metering were not as effective in reducing traffic volumes or improving operations. Without the travel time improvements on the arterial system, the influence of ramps meters on travel patterns was not as significant.

Analysis Results

An initial analysis of this Hybrid Alternative without any additional physical improvements showed that seven of the 15 congested locations had been improved to acceptable level of service. The remaining segments were addressed though capacity expansions. The required improvements included auxiliary lanes and ramp modifications.

Figure 2
Physical Improvements Required for Hybrid Alternative 2



A sensitivity test was additionally performed for Hybrid Alternative 2. This test was intended to avoid the need for an additional (fifth) lane on northbound I-29 between the westbound I-94 entrance and the exit to 13th Avenue. This was accomplished by reducing northbound I-29 to two lanes after the exit loop to westbound I-94. The two lanes entering from westbound I-94 would add on the right to form the four lanes assumed in the base condition. Results of the simulation modeling show that this change would not be expected to result in acceptable level of service. Therefore, this modification could be considered for implementation in concurrence with the two-lane ramp from westbound I-94 to northbound I-29.

Hybrid Alternative 3

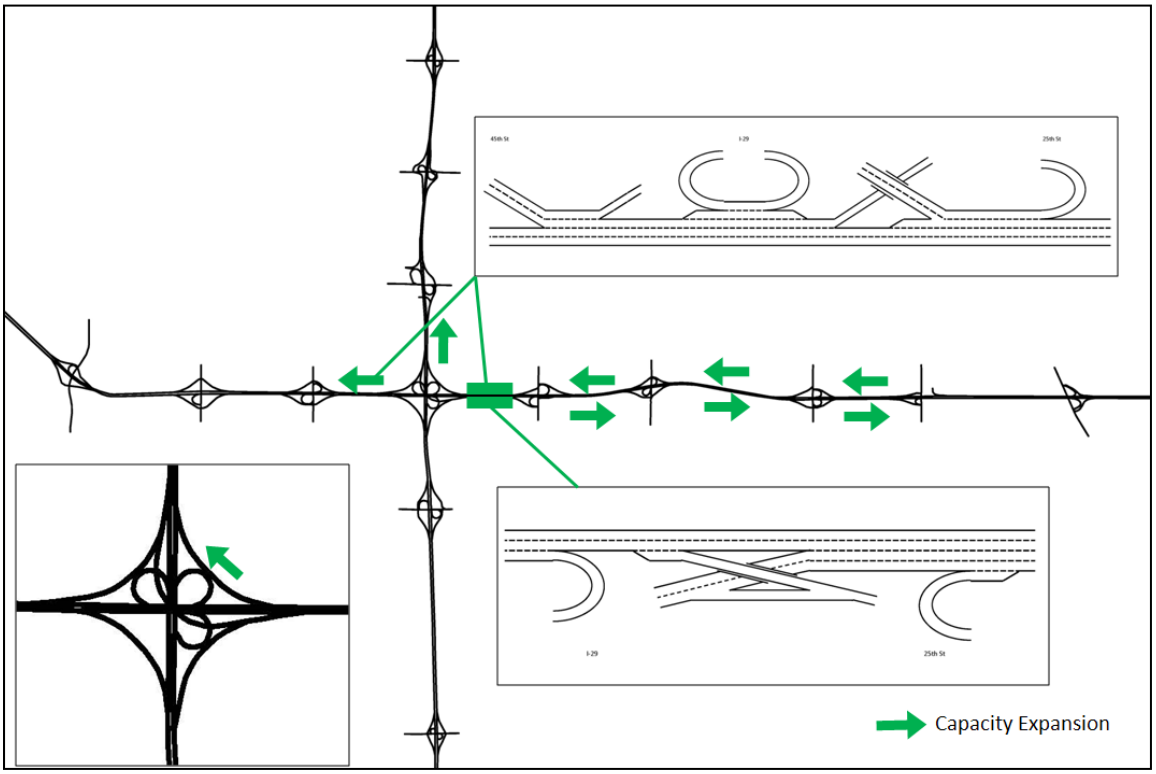
Background and Approach

Hybrid Alternative 3 included only TDM measures as a means of reducing traffic demands on the interstate system. While a five percent reduction in traffic on the interstate does help to reduce the severity of congestion in problem locations, very few were improved to acceptable level of service. To mitigate congestion in these locations, capacity expansions were evaluated.

Analysis Results

These capacity improvements were far more extensive than those considered in Hybrid Alternatives 1 and 2, and included elements that may be considered non-traditional. Addressing all of these locations required auxiliary lanes ramp modifications, grade separations, and additional lanes on the I-94 Red River bridge.

Figure 3
Physical Improvements Required for Hybrid Alternative 3



Summary of Capacity/Physical Improvements

All of the capacity improvements identified in the three Hybrid Alternatives analyses are summarized in Table 10.

Table 10
Capacity Improvements Required for Acceptable Interstate Operations*

Facility	Location	Description	Improvements		
			Hybrid Alt 1	Hybrid Alt 2	Hybrid Alt 3
I-94 WB	I-29 to 45th St	Auxiliary Lane			X
	25th St to I-29	Auxiliary Lane	X	2X	
		Bridge Braid 25th St SB Ramp to I-94 WB and I-94 WB Ramp to I-29 NB			X
	University Dr to 25th St	Auxiliary Lane	X	X	X
	TH 75 to University Dr	Auxiliary Lane over Red River			X
	20th St to TH 75	Auxiliary Lane			X
I-94 EB	I-29 to 25th St	Bridge Braid Tri-Level Ramp to I-94 EB and I-94 EB Ramp to 25th St and Provide Slip Ramp			X
	Through 25th St	Additional Lane			X
	25th St to University Dr	Auxiliary Lane		X	X
	University Dr to TH 75	Auxiliary Lane over Red River			X
	TH 75 to 20th St	Auxiliary Lane			X
I-29 NB	I-29 to 13th Ave	Auxiliary Lane	X	X	X
Tri-Level Int'chg	I-94 WB to I-29 NB	Additional Lane	X	X	X
	I-94 WB Weave Area	Buffer Lane			X
25th St Int'chg	North Intersection	Southbound Left Turn to I-94 WB Remove Northwest Ramp	X		
TH 75 Int'chg	I-94 WB	Combine Northeast Loop and Northwest Ramp to single entrance to I-94 WB		X	

*The improvements agreed to in Phase I were also assumed in all Hybrid Alternatives (see Appendix C)

D. Selection of Preferred Alternative

By design, all Hybrid Alternatives were able to satisfy the goals of the study of maintaining acceptable operations on the interstate system through year 2025. To distinguish between the Hybrid Alternatives, a cost comparison was performed for the unique elements of each alternative.

Cost Comparisons

Cost estimates were developed for the unique elements of each Hybrid Alternative. This information is intended to provide a high-level comparison between the types and magnitude of investment required to achieve acceptable level of service on the interstate by year 2025.

Arterial improvements were assumed to include costs for traffic signal optimization studies and implementation, and minor geometric improvements at some intersections. System-wide, 40 miles of arterial improvements were included in Hybrid Alternative 1. In addition, a new arterial corridor was assumed along the 76th Avenue corridor from I-29 to TH 75. This included an interchange at I-29 and a Red River bridge. Estimates for new roadway construction include 15 percent engineering and 10 percent contingency in addition to unit costs. The following cost estimate assumptions were used:

- Signal optimization study and implementation: $3,500 per intersection (five per mile)
- Minor geometric improvements: $250,000 per location (one per mile)
- New roadway construction (5-lane arterial): $5,000,000 per mile
- New diamond interchange: $20,000,000
- New river crossing bridge: $200 per sqft

Ramp meter deployment throughout the interstate system included 52 ramp meter locations. Cost estimate assumptions include communications systems connecting the ramp meter controllers to a potential future traffic operations center. Costs for the development and maintenance of a traffic operations center as this would be associated with the ITS component included in all Hybrid Alternatives.

- Ramp meter deployment and communications: $50,000 per ramp

Capacity expansion and physical improvements were assigned costs based on unit cost estimates for the Fargo-Moorhead area. These were applied to the specific improvements identified in the Hybrid Alternative modeling as required to achieve acceptable level of service along all segments of the interstate. Estimates for interstate construction include 15 percent engineering and 10 percent contingency in addition to unit costs. The following costs were used in developing the estimates:

- New freeway lane (through-lane or auxiliary): $1,000,000 per mile
- New interchange ramps: $700,000 per ramp
- New bridge: $200 per sqft

A comparison of costs for each element of the Hybrid Alternatives is shown in Table 11.

Table 11
Cost Comparison Summary for Elements of Hybrid Alternatives

Element	Hybrid Alternative 1 (w/o 76th St)	Hybrid Alternative 2	Hybrid Alternative 3
Land Use/Transit/TDM	Included in all Hybrid Alternatives		
ITS/Incident Management	Included in all Hybrid Alternatives		
Arterial Improvements*	$65,000,000 ($11,000,000)	-	-
Ramp Metering	$3,000,000	$3,000,000	-
Capacity Improvements**	$3,500,000	$5,500,000	$23,000,000
Total	*$71,500,000 ($17,500,000)*	*$8,500,000*	*$23,000,000*

* Arterial Improvements include travel time improvements to existing corridors as well as development of a new corridor along 76th Avenue. The portion of the cost estimate for travel time improvements is $11,000,000 and for 76th Avenue is $54,000,000.

**The improvements agreed to in Phase I were also assumed in all Hybrid Alternatives (see Appendix C)

Preferred Alternative

The intent of the Hybrid Alternatives was to achieve acceptable operations on the interstate system. All of the Hybrids achieved this goal; however, some achieved it at less cost. Costs are becoming more of factor in decisions as revenues for transportation decline compared to vehicle miles driven (demand). Metropolitan areas throughout the country and world are looking at ways to more efficiently accommodate peak travel without costly expansion (use current infrastructure more efficiently). This usually requires more aggressive management strategies.

Based on the results of this study, national trends, and the advancement of technology in general, we believe that Hybrid 2 is a balanced approach to meeting the overall interstate operation objectives. This course of action focuses on the specific goal of maintaining interstate operations. As such, there are likely other goals and needs in the region that may warrant consideration of improvements in the region that were not considered or recommended in this study.

III. Recommendations

The purpose of Phase II of the IOS is to identify and recommend actions to provide acceptable operations on the interstate system through year 2025. Based on the study process presented in this report, the following actions are recommended for implementation over the next 15 years in order to maintain desirable level of service through year 2025:

1. Transportation Demand Management (TDM) strategies should be implemented that reduce peak demand on the interstate system by five percent. TDM efforts include transit, carpools, park and rides, ridesharing, flex-schedules, among others. Land use modifications, transit improvements, and transportation demand management (TDM) strategies can be implemented in an effort to reduce traffic congestion by influencing travel behavior (e.g., reduce vehicle miles traveled (VMT) and increase vehicle occupancy). An effective means to accomplish this is through a transportation management organization (TMO) for the FM metropolitan area. Leadership and funding support for the TMA from Mn/DOT and NDDOT would be beneficial, as would the pursuit of innovative funding sources including STP and CMAQ. In addition, metropolitan areas with population over 200,000 are required to establish a congestion management system (CMS) which includes providing information on system performance, providing alternative strategies to alleviate congestion, and enhancing mobility of persons and goods. Metro COG needs to develop or implement a CMS to assist in interstate operations and other regional mobility efforts.

2. ITS infrastructure should be deployed and incident management strategies should be developed that provide improved travel information and coordinated responses to emergency situations. The 2008 ITS Plan for the FM Metropolitan area provides a framework for ITS deployment in the region. Critical features leading to the benefits of ITS deployments include communications infrastructure and technologies and the development of coordinated responses to freeway incidents as well as weather emergencies and event conditions are key components of a comprehensive ITS strategy. ITS investments can be maximized by the development of a regional traffic operations (TOC) center. This would increase overall system performance by collecting and processing traffic data, provide opportunity to manage the system through ramp meters and traffic signal operations, provide traveler information on dynamic message signs other means, and dispatch coordinated responses to emergency situations.

3. Capacity and physical improvements to the interstate should be constructed to address problem locations that cannot be solved through other approaches. The following specific improvements were identified in the preferred alternative to address remaining problem locations:

    - Base assumptions from “agreed to” network from Phase I (see Appendix C)

    - Westbound I-94: Auxiliary lane from University Drive to 25th Street and two auxiliary lanes from 25th Street to Northbound I-29

- Eastbound I-94: Auxiliary lane from 25th Street to University Drive
- Northbound I-29: Auxiliary lane from Westbound I-94 to 13th Avenue
- Tri-Level Interchange: Two-lane ramp from Westbound I-94 to Northbound I-29
- TH 75 Interchange: Combine Northeast Loop and Northwest Ramp to single entrance to Westbound I-94

4. Ramp meters should be installed and operated to allow increased management of the interstate system and improve mainline operations. Additional study of ramp meter deployment and operations is recommended prior to implementation. Many benefits are expected to be realized through implementation of ramp metering. First, ramp metering provides a tool to roadway system operators to directly manage the interstate at entrance ramp locations. Second, ramp meters can help reduce peak period traffic volumes on the interstate by shifting some short trips to the arterial system. Third, ramp metering at entrance ramps improves traffic flow by breaking up platoons entering the interstate. The analysis performed for this study did not indicate that arterial improvements are necessary for successful deployment of a ramp meter system by 2025; however arterial roadway performance and future corridor improvements should be studied in greater detail before implementation and monitored and evaluated following implementation.

IV. Prioritization/Steps to Implementation

The implementation of recommendations in the Interstate Operations Study Phase II is intended to guide the Metropolitan Planning Process as described in the vision, goals, and objectives identified in Phase I (see Appendix A). This guidance will help ensure that the interstate system operates at cooperatively developed level of service standards, provide balanced bi-state operations, and ensure the entire roadway network is being maximized to its fullest potential. Metro COG, NDDOT, Mn/DOT, and all local partners will implement a regional mobility strategy that balances travel demand within the FM metropolitan area between interstate system and local and regional arterial roadways. Appropriate transportation and land use principles will be applied in relation to the interstate system to ensure it carries out its function as the primary limited access arterial system in the regional transportation network. Affected agencies will work proactively to implement strategies that preserve current and future operations of the interstate system. Improvement and modifications to the interstate system within the FM metropolitan area will be done in cooperation between Metro COG, NDDOT, and Mn/DOT, and local partners.

A. Land Use/Transit/Transportation Demand Management

To achieve effective reductions in traffic demand on the interstate system during peak periods a comprehensive approach would be required. An effective means to accomplish this would be through a transportation management organization (TMO) for the Fargo-Moorhead metropolitan area. Leadership and funding support for the TMA from Mn/DOT and NDDOT would be beneficial, as would the pursuit of innovative funding sources including STP and CMAQ.

The TMO should initiate further study of strategies to achieve a five percent reduction in peak travel on the interstate by year 2025. One component is supporting land uses that encourage higher densities and support increased transit use. Improved transit service should be investigated to evaluate approaches that increase use such as the development of park-and-ride facilities and high-speed routes. Major employers in the region should be engaged regarding participation in programs that encourage reduced peak travel, including telecommuting and flexible scheduling.

B. Intelligent Transportation Systems (ITS)/Incident Management

The first step to deployment of ITS solution is development of a regional traffic operations center (TOC). A facility of this type would increase overall system performance by collecting and processing traffic data, managing the system through ramp meters and traffic signal operations, providing traveler information on dynamic message signs other means, and dispatching coordinated responses to emergency situations.

ITS infrastructure should be deployed on the interstate system and routed through a future TOC. This will provide system operators with increased information, allow them to manage the system based on real-time conditions, and provide additional travel information to system users. In addition to information flow, this communications infrastructure is critical to regional operations of ramp meter system.

Incident management plans should be developed for non-recurring conditions such as crashes on the interstate, large event traffic, and emergency weather conditions. These types of incidents may still result in poor operations on the interstate system, but established management plans and dispatch protocols can help alleviate congestion and return to safer operations in a timely fashion.

C. Capacity/Physical Improvements

Capacity improvements identified in Hybrid Alternative 2 are expected to be required to provide acceptable operation on the interstate system by year 2025. These improvements will need to be implemented to avoid development of congested conditions as operational conditions approach unacceptable levels. To avoid this congestion, ongoing monitoring of system operations must be performed. Metro COG, Mn/DOT, and NDDOT must be committed to these investments such that they are implemented within the timeframes that operational conditions require.

These physical improvements to the interstate must be supported by the jurisdictions responsible for the operations of the roadways. The specific improvements identified in the preferred alternative that are required to maintain acceptable operations are in addition to the base improvements that have been assumed to be in place by year 2025. The improvements recommended as part of IOS Phase II are listed in Table 12.

Table 12
Physical Improvements on Interstate System by Jurisdiction*

Location	Description	Mn/DOT	NDDOT
Westbound I-94: University Dr to 25th St	Auxiliary Lane		X
Westbound I-94: 25th St to Northbound I-29	2 Auxiliary Lanes		X
Eastbound I-94: 25th St to University Dr	Auxiliary Lane		X
Northbound I-29: Westbound I-94 to 13th Ave	Auxiliary Lane		X
Tri-Level Interchange: Westbound I-94 to Northbound I-29	Additional Lane		X
TH 75 Interchange: Entrance to Westbound I-94	Combine Loop and Ramp	X	

*The improvements agreed to in Phase I were also assumed in all Hybrid Alternatives (see Appendix C)

D. Ramp Metering

More detailed study of ramp meter implementation along the interstate system should be initiated. The IOS assumed that ramp meters would be installed on all local entrance ramps throughout the system by year 2025. Further study will provide additional detail on the locations that should be prioritized for initial installations, and a sequence of implementation fur future deployments. Future study of ramp meter deployment should also include careful evaluation of adjacent arterial roadways to identify and mitigate any impacts to arterial operations. Details of TOC operations will require further investigation to support the implementation and operation of a ramp meter system.

The public should be engaged to build support for the operation of ramp meters in the Fargo-Moorhead metropolitan area. The introduction of a ramp metering strategy may be met with resistance and education can help build support for this technique.

Appendix A

Context Provided by Metro COG

Appendix A

Interstate Operations Study – Context Provided by Metro COG

Vision Statement

The following vision statements have been developed as part of this plan and will guide future initiatives to provide acceptable operations on the freeway system in the Fargo-Moorhead region.

1. The interstate system in the Fargo-Moorhead metropolitan area will operate at the level of service (LOS) standards that have been cooperatively developed between Metro COG, NDDOT, and Mn/DOT.

2. To ensure balanced bi-state operations, a system of cooperatively developed interstate operations performance measures will be implemented within the FM metropolitan area.

3. To ensure the entire roadway network is being maximized to its fullest potential, Metro COG, NDDOT, Mn/DOT, and all local partners will implement a regional mobility strategy that balances travel demand within the FM metropolitan area between interstate system and local and regional arterial roadways.

4. Appropriate transportation and land use principles will be applied in relation to the interstate system to ensure it carries out its function as the primary limited access arterial system in the regional transportation network.

5. Affected agencies will work proactively to implement strategies that preserve current and future operations of the interstate system. Improvement and modifications to the interstate system within the FM metropolitan area will be done in cooperation between Metro COG, NDDOT, and Mn/DOT, and local partners.

Goals and Objectives

Goal 1: To ensure the Safe and Efficient Operations of the Interstate System

Objective 1: Ensure the interstate highway systems operates safely

- *Establish safety and crash reduction performance measures*
- *Deploy necessary field devices to reduce crashes and improve safety*
- *Ensure timely and comprehensive roadway maintenance practices during the winter to reduce weather related incidents*

Objective 2: Implement appropriate land use and traffic/transportation engineering principles to ensure the interstate system operates efficiently

- *Critique land use plans, subdivision plats, and zoning changes in proximity to the interstate system*
- *Be cognizant of metropolitan land use trends which perpetuate the jobs-household mismatch*
- *Develop a clearer understanding (and monitoring program) of the how exurban growth patterns impact interstate operations*
- *Review extra-territorial/rural land use patterns and transportation corridors to ensure adequate rights of way are preserved for the development of major regional arterial roadways*
- *Review access management and spacing guidelines on roadways adjacent to the interstate system*
- *Develop an agreed to perimeter or bypass roadway system that can be used in the event of incidents or special events to relieve non-recurring congestion on the interstate system; and develop thresholds and agreement for the use of alternate routes schemes*

Objective 3: Develop system-wide operational performance measures for both the mainline and interchange ramps; as necessary developing specific performance measures for segments or sub areas

- *Working through the Metropolitan Planning process, Metro COG, Mn/DOT, and NDDOT should work to develop performance based planning program for the Interstate Highway System in the FM Metropolitan area*

- *Develop a cooperative performance based program that evaluates the effectiveness of proposed improvements on the interstate system, consider all reasonable alternatives to address identified deficiencies*

Objective 4: Encourage timely and coordinated implementation of ITS solutions under a regionally adopted framework for deployment

- *Deploy Signal Coordination techniques and signal timing strategies on roadways which influence the interstate system*

- *Implement in-road detection techniques to assist in providing real time traffic information to travelers on the interstate system (by advance warning signs, dynamic messaging signs, etc)*

- *Increase the usefulness of CCTV technology (and other field devices) for emergency responders and incident management entities*

Goal 2: To ensure the Preservation of Existing and Future Investments on the Interstate System

Objective 1: Deploy timely and efficient ITS strategies within and adjacent to the Interstate Highway System that assist in maximizing system operations

- *Collect and analyze transportation data both in real-time and periodically to identify trends or deficiencies in the regional transportation network*

- *Use traffic data to make predictions about recurring and non-recurring congestion and safety problems on the regional transportation network*

- *Connect data collection and management tools, including ramp meters and message signs, to actively manage the roadway system and maximize performance*

Objective 2: Encourage the efficient movement of goods into and out of the region on the Interstate Highway System

- *Ensure the interstate system is supported through the development of complimentary arterial roadways which facilitate the movement of freight on and off the interstate system*

- *Ensure that development of land uses which generate large amounts freight or freight haulers is positioned so as not to adversely impact the roadway system adjacent to the interstate system*

- *Be cognizant of national and international policy changes which have the ability to impact freight movements on the interstate system*

Objective 3: Deploy a comprehensive transportation demand management (TDM) program

- *Development of peak hour transit system operations which address cross-town commuting patterns that may influence interstate operations*

- *Development of sub-area transit system operations which reduce single occupancy vehicle use in areas adjacent to the interstate system*

- *Development of a regional Park-n- Ride Plan which outlines the deployment of park-n-ride facilities throughout the region*

- *Facilitate the implementation of specific TDM strategies such as ride sharing and flex scheduling by the region's largest employers and peak hour traffic generators*

- *Include interstate travel demand reduction strategies in travel demand strategies for the FM region. Make Intestate travel demand reduction strategies a part of future efforts effort aimed at travel demand management in the FM metropolitan area*

Objective 4: Develop a proactive regional approach to understanding and responding to changes which impact the interstate system

- *Follow Federal policy and legislation which impact the Funding available for the interstate system and its supporting infrastructure*

- *Utilize traffic modeling tools to test and critique land use and transportation changes in relation to the interstate system*

- *Periodically reevaluate past planning and programming assumptions with the most recent data sets and growth projections to ensure projected demands on the interstate system and related infrastructure is accurately portrayed*

- *Maintain a list of operational hot spots or trouble areas on the interstate system and its related infrastructure and monitor on an ongoing basis*

- *Annually convene a meeting involving Metro COG, NDDOT, Mn/DOT, and all local partners to ensure greater coordination between the Metropolitan Transportation Improvement Program (TIP) and the State TIP regarding the development of candidate projects on the interstates in the FM metropolitan area for the use in TIP development*

Objective 5: Establish a cooperative approach to preserve the operational integrity of the interstate system across jurisdictions

- *Achieve understanding that Interstate operations have impacts that impact all roadways on the regional transportation system across jurisdictions*

- *Coordinate investments on the Interstate and local arterial system that seek to improve and maintain the operational integrity of the Interstate system*

Objective 6: Identify candidate physical improvements on the interstate system to address operational deficiencies

- *Maintain a catalog of candidate projects in locations expected to experience operations deficiencies to be reviewed as needs arise*

- *Identify performance measures and benchmarks that will indicate the need for investments to be made in the form of physical improvements on the interstate*

<u>Goal 3: To improve the Management of Interstate System</u>

Objective 1: Implement a regionally significant and influential traffic operations center (TOC) to assist in the operations and management of the interstate highway system and supporting local arterial system

- *Improve policies, procedures and practices for overseeing the management and coordination of the interstate system*

- *Improve coordination of available systems and resources among local, state, and federal entities*

- *Develop a comprehensive strategy for traffic operations incident management for the FM metropolitan area*

Objective 2: Deploy technologies to allow for the collection of data on the operations of the interstate system and adjacent roadways.

- *Deploy in-road censors and camera detection systems which allow for the collection of real time traffic information and the compilation of system traffic operations data*

Objective 3: Actively manage the interstate system using technology and information to improve and preserve performance for all users.

- *Deploy ramp meters and associated detector and signal connectivity to provide additional flexibility and management under recurring and non-recurring conditions.*

Appendix B

Linking Interstate Operations to the Metropolitan Planning Process

Appendix B

Issues Analysis – Linking Interstate Operations to the Metropolitan Planning Process

The interstate operations study (IOS) for the FM Metropolitan area marks the first time interstate operations have been addressed at the metropolitan level by Metro COG, NDDOT, and Mn/DOT. The outcome of the IOS sets the stage for a continuing, cooperative and comprehensive process for addressing interstate operations within the FM Metropolitan area. The Long Range Transportation Plan (LRTP) for the FM Metropolitan area needs to account for the issues, findings, and recommendations developed through the IOS.

The completion of the IOS does not end the planning process regarding interstate operations and other planning efforts to address the broad range of interrelated mobility needs within the FM Metropolitan area that tie back to intestate operations. It will be imperative that Metro COG, NDDOT, and Mn/DOT, in cooperation with local units of government, remain committed to addressing interstate operations in other elements of the required metropolitan planning process developed by Metro COG.

After looking at existing and future projected operations of the interstate system during Phase I of the IOS a host of emerging planning level issues were identified. The identified list of emerging issues allowed Metro COG and the Study Review Committee (SRC) an opportunity to better understand the matrix of challenges and opportunities regarding the future operations of the interstate system through the FM metropolitan area.

At the onset of Phase II of the Interstate Operation Study, the emerging issues were cooperatively prioritized by the SRC to determine which should be looked at more closely during Phase II of the Interstate Operations Study. Those issues that were given the highest priority underwent both quantitative and qualitative analysis to assist in the development of alternatives that would be most effective in managing interstate operations within the FM metropolitan area.

Those issues identified during Phase I of the Interstate Operations Study were as follows:

- Issues of Significance Prioritized for Additional Analysis
    - Operations
    - Transportation Funding (and Project Prioritization)
    - Lack of Adequate Red River Bridge Crossings
    - Corridor Identification and Preservation
    - Intelligent Transportation (ITS) Deployment/Regional Traffic Operations
    - Transportation Demand Management (TDM)

The remainder of the issues that were not highly prioritized by SRC are still pertinent to interstate operations, and need to be monitored through Metro COG's ongoing metropolitan planning program. However, these issues were not analyzed in depth during Phase II of the Interstate Operations Study.

- Issues of Significance Not Prioritized for Additional Analysis
    - Relationship of Existing Traffic Generators
    - Increase in Freight Movement and Truck Traffic
    - Exurban Growth
    - Job and Household Mismatch

Having completed Phase II of the IOS, Metro COG and the SRC revisited the planning level issues identified during Phase I. Metropolitan planning program recommendations were developed to ensure the findings and recommendations of the IOS are considered when developing other plans and programs within Metro COG's adopted Unified Planning Work Program (UPWP).

Issues of Significance Prioritized for Additional Analysis

Operations

Through much discussion, it has been acknowledged that Mn/DOT and NDDOT will use different level of service (LOS) thresholds to identify transportation needs within the FM metropolitan area. Mn/DOT it will accept a LOS D, and would not consider a capacity improvement (need) until conditions would reach LOS E or lower. NDDOT has indicated that it will strive to maintain a LOS C or better, and would not consider capacity improvement until conditions reach LOS D or lower.

Data collection, management, and analysis techniques need to be developed to ensure that Metro COG, Mn/DOT, and NDDOT are able monitor changing conditions on a regular basis and in respect to accurate and recent data. Metro COG needs to hasten the development of a metropolitan wide data collection and monitoring program; and ensure the program is used to evaluate and justify investments in the metropolitan transportation system.

Transportation Funding (and Project Prioritization)

The current surface transportation authorization act (STAA), SAFETEA-LU, has expired and is pending reauthorization. Future Federal funding levels and policy initiatives under the next STAA are uncertain. Rising construction costs over the past several years further comprise the buying power of future transportation dollars. Improvements to the Interstate Highway System depend on a stable and dependable allocation of local, state, and Federal funding allocations.

The lack of a reliable transportation funding has impacted needed investments in the interstate system in Minnesota. NDDOT has informally expressed the need for a new "philosophy" regarding investments in North Dakota's interstates, specifically within the FM metropolitan area. Local priorities for interstate investments have tended to be askew of State priorities.

Metro COG, NDDOT, and Mn/DOT need to establish and maintain formalized ongoing communications and discussions regarding interstate operations. Discussions regarding interstate funding need to be elevated within TIP/STIP development process.

Lack of Adequate Red River Crossings (South of I-94)

A major transportation issue for the FM Metropolitan area is the lack of east-west bridge capacity across the Red River, specifically south of I-94. Aside from 52nd Avenue South no new bridge capacity has been identified south of I-94. As development continues south of I-94 (in Fargo and Moorhead) demand on I-94 (and 52nd Avenue South) between I-29 and TH 75 is projected to grow.

The 76th Avenue South Corridor was identified as a preservation corridor for a high-functioning east-west connection including a Red River bridge and an interchange at I-29. This corridor was tested using the travel demand model and found to provide minor relief for both the I-94 and 52nd Avenue Red River crossings. Metro COG needs to continue to ensure adequate preservation activities take place regarding the 76th Avenue corridor.

Corridor Identification and Preservation

It does appear the interstate system will be able to meet the region's future transportation needs within its existing alignment (and right of way) through at least 2025. However, overall regional mobility may benefit from the identification of corridors of regional significance to serve a specific function or purpose such as a bypass or perimeter system in the event of emergencies, disasters, or other incidents, which constrict the operations of the interstate system. Corridor identification and preservation is aimed at balancing the capacity on the interstate system with the region's existing and future major arterial roadways.

Use the pending development of a Traffic Operations Incident Management Strategy for the FM Metropolitan area to review and agree to a network of Regionally Significant Transportation Infrastructure (RSTI) to support interstate operations during incidents. Use the Strategy development process to foster a dialogue and process that ensures greater coordination regarding incident management protocols to support interstate operations.

The IOS developed a hybrid alternative early in the development of Phase II that looked closely at the ability of improved off system (arterial roadway) improvements to assist in taking demand off the interstate system. This alternative did not make it into the preferred alternative. It is paramount that Metro COG continues to lead local units of government, NDDOT, and Mn/DOT into a process that looks closely at existing and future arterial operations. The intent is to analyze opportunities and limitations to maximizing the operational capacity of existing (and future) major arterial roadways in the FM Metropolitan area to address metropolitan travel demand.

Inherent in the discussion regarding the management of the overall metropolitan transportation system is the need for Metro COG, NDDOT, and Mn/DOT to develop a congestion management program (CMP). The CMP, pursuant to 23 CFR 450 should be used to ensure the full range of transportation system alternatives are being utilized when addressing operational or capacity issues on the interstate and major arterial roadways. The development and implementation of CMP will ensure that Metro COG, NDDOT, and Mn/DOT are developing and implementing a transportation system weighing all the alternatives available for meeting future transportation needs, both on the interstate system, and throughout the FM Metropolitan area. Along those lines, new interstate access and/or revisions to existing interstate access need to follow closely the justifications process required by FHWA.

The next long range transportation plan (LRTP) update process should look closely at the preliminary identification of an interstate bypass route that would serve to meet long range needs (>30 years) for the FM Metropolitan area.

Intelligent Transportation Systems (ITS) Deployment/Regional Traffic Operations

Deployment of ITS technologies is a key recommendation of the IOS. Future interstate operations are dependent upon the continued deployment and utilization of intelligent transportation system (ITS) to assist in improving the efficiency of interstate highway system and arterial system within the FM Metropolitan area. Recently completed work regarding ITS and traffic operations have the ability to positively influence the operations of the regions interstate system, particularly regarding incident management and traffic operations.

The 2008 ITS Plan for the FM metropolitan area provides a framework for ITS deployment in the region. In 2009 Metro COG adopted the FM metropolitan Area Traffic Operations Action Plan. Both efforts have solidified a coordinated deployment strategy for ITS, and made such ITS deployment as a regional priority. Both Plans have developed consensus for increased investments to allow for the evolution to a centralized and interoperable traffic system within the FM metropolitan area. The deployment of ITS is viewed as a cost effective means to increase the capacity of the existing transportation system, including the interstate system.

The update of the FM Metropolitan ITS Plan in 2012 needs to include within it a focus on how ITS (and related traffic operations initiatives) can specifically serve to meet projected needs on the interstate system. The update of the FM Metropolitan ITS Plan needs to establish cooperatively developed priorities within the FM Metropolitan area for ITS deployments that improve both arterial and interstate operations.

Metro COG needs to cooperate with NDDOT on the update of the statewide ITS Strategic Plan (2010/2011) and use the Plan update as an opportunity to continue to discuss how ITS can be used to improve arterial and interstate operations within the FM Metropolitan area. The NDDOT ITS Strategic Plan should establish cooperatively developed priorities within the FM Metropolitan area for ITS deployments that improve both arterial and interstate operations.

Transportation Demand Management

A meaningful and comprehensive Transportation Demand Management (TDM) strategy for the FM Metropolitan area is worth exploring, and reduced travel demand has a direct benefit on interstate operations. One of the overarching themes discussed through the IOS is the need to develop a commitment to the development of realistic implementation of transportation demand management principles. The update of the next transit development Plan (TDP) for the FM Metropolitan in 2011 needs to look closely at how transit (and other TDM initiatives) can specifically assist in meeting interstate operations issues.

The update of the TDP for the FM Metropolitan area should develop realistic strategies that aim at reducing single occupancy vehicle travel by 5% by 2025. An emphasis should focus on transit routing alternatives that can assist in reducing demand for interstate travel within the FM Metropolitan area; including the development of transit service that reduces travel demand along major arterials (13th, University 25th, etc.) and serve to attract automobile trips away from the interstate system**.**

Continue implementation of prioritized transit improvements from the 2008 Southwest Metro Transit Study, with an aim to reduce travel demand along major arterials in southwest Fargo, including 25th Street, University Drive, and 45th Street, etc, that may reduce travel demand on the interstate system.

Ramp metering was found to be beneficial to interstate operations. As discussed in the Final Report, Metro COG, NDDOT, and Mn/DOT need to more closely analyze the cost/benefit of ramp metering within the FM Metropolitan area. The analysis needs to study how metering would be specifically implemented within the FM Metropolitan area.

Issues of Significance Not Prioritized for Further Analysis

The following issues that were identified during Phase I of the IOS as having an impact on interstate operations were not highly prioritized by the SRC at the onset of Phase II. Therefore no additional quantitative or qualitative analysis was conducted regarding these issues during Phase II. None the less, it is important that regional mobility efforts within the FM metropolitan area remain cognizant of these issues in the years ahead as they have the likelihood to influence interstate operations within the study area.

Relationship of Existing Traffic Generators

The FM metropolitan area has grown by 35% since 1990, adding a total of 42,000 residents. Part of this population growth has resulted in (and been the result of) the development and expansion of a number of significant traffic generators. The generators include a number of major employers, colleges, public/private institutions, as well as special event generators. A number of these generators are positioned such that they have an immediate and direct impact on the operations of the interstate system. In the coming decade or more a number of these generators are anticipated to continue to grow and expand. A large number of these traffic generators rely on inbound commuters to the region. In addition, these generators cause internal commuting trends which have become dependent on the interstate system.

Metro COG and local units of government should develop an increased awareness of the development of new traffic generators that may impact interstate operations and ensure new traffic generation that may negatively impacts the interstate system is mitigated during the plan development stages.

Increase in Freight Movement and Truck traffic

Currently, between 7 and 14% of the traffic on the interstate highways in the FM metropolitan area is commercial truck traffic. The recently completed Western MN Freight Study has pointed towards the FM metropolitan Area as an emerging *freight bottle neck*. Between 1996 and 2008, total land area developed in industrial uses increased by 35%, from 2,289 acres in 1996, to 3,150 acres in 2008. Increased truck volumes on the interstate system directly impact traffic operations both on and adjacent to the interstate highways. Major truck facilities have developed adjacent to I-29 at 32nd Avenue South and 12th Avenue North. Another major truck facility has developed at I-94 and 45th Street. The location of these facilities and other major industrial uses directly impact how adjacent roadways are designed and eventually operate; and also have operational considerations on interstates themselves.

Metro COG and local units of government need to remain cognizant of existing and changing land use patterns related to freight and freight related development. Metro COG should continue implementation of strategies outlined with the 2007 Metro COG Freight Profile; and work cooperatively with both NDDOT and Mn/DOT on the implementation of statewide freight related plans and studies.

Additional data collection of large truck traffic in the FM metropolitan area is recommended as a means to understanding the trends and demands placed on the regional transportation system. Deployment of detection technologies that can provide detailed and ongoing reporting of demands from truck traffic can produce information about geographic and temporal patterns impacting the interstate system. Additional information on the heavy truck movement trends and demands should lead to increased coordination between Mn/DOT, NDDOT, and Metro COG to serve these movements as well as manage the roadway system efficiently.

Exurban Growth

The rural communities adjacent to the FM Metropolitan area have grown substantially in recent years. There is a niche in the regional housing market for rural and/or low density single family residential housing which has also influenced these exurban development patterns. The growth experienced in these communities depends heavily on the job production of the FM Metropolitan area. The FM Metropolitan area produces more jobs than employable persons, and is projected to do so at least through 2035. As these exurban or *bedroom communities* continue to grow, the result will be expected to contribute to operational issues on the regions interstate system.

Metro COG needs to coordinate with local unites of government to better track and monitor rural development patterns and evaluate trends that may impact transportation patterns within the FM Metropolitan area.

Jobs and Household Mismatch

The FM Metropolitan area has developed major employment centers which in some cases are geographically distant (relatively speaking) from residential growth areas. An example of the job-household mismatch is demonstrated by the development of the Fargo Industrial Park and NDSU (and adjacent development) in North Fargo. At the same time, the majority of new residential development in the FM metropolitan area has occurred predominantly south of I-94. Jobs-household mismatch are common in larger metropolitan areas. However, as the job-household mismatch perpetuates in the FM metropolitan Area it creates longer commutes for residents. Existing and projected development patterns in the FM metropolitan area generate a distinct AM Peak westbound to northbound and PM Peak southbound to eastbound travel pattern on the interstate system.

The job-household mismatch also elevates the demand for interstate highway infrastructure to support cross-town commutes which are not efficiently accommodated by the local arterial system. Metro COG in cooperation with local units of government should monitor land use and development patterns and develop an awareness regarding the impact of development patterns within the FM Metropolitan on interstate operations.

Appendix C

Background Assumptions

Appendix C

Background Assumptions

Based on Phase I for year 2025 conditions, interstate operations within the FM metropolitan area are dependent upon several mid-to-long term projects. The Study Review Committee (SRC) cooperatively developed planning level assumptions for the development of a 2025 operations model of the interstate system in the FM metropolitan area. The 2025 model assumed the following base network improvements. The improvements assumed to be in place by year 2025 are shown in Table 1.

Table 1
Assumed Interstate Improvements for Year 2025 Operations Analysis

Improvement	Facility	State	Included in Metropolitan Transportation Improvement Program (TIP)	Included in Metropolitan Long Range Plan*	Included in Statewide Plan	Cost Estimate
Rebuild TH 75 Interchange	I-94	MN	No	2016-2020	Yes**	$16,000,000
Rebuild 20th Street Interchange	I-94	MN	No	2021-2035	No**	$15,000,000
Auxiliary Lane (45th St – Veteran's Blvd.)	I-94	ND	No	2016-2020	*Information Pending*	$600,000
Two Lane 29/94 Tri-Level Ramp	I-29/94	ND	No	2016-2020	*Information Pending*	$250,000
Auxiliary Lane (29/94 Tri-level to 25th Street; including dual off ramp at 25th Street)	I-94	ND	No	2016-2020	*Information Pending*	$750,000
Rebuild 25th Street Interchange (incl. EB access revision)	I-94	ND	Yes (2014)	2016-2020	*Information Pending*	$16,000,000
Modify 32nd Avenue South (addition of NW Loop ramp)	I-29	ND	No	2021-2035	*Information Pending*	$700,000

* The year listed indicates that the project is included in the LRTP and denotes timeframe in which the project is anticipated for construction

**Mn/DOT 10 Year Highway Improvement Plan (HIP)

The entire interstate system was analyzed by Advanced Traffic Analysis Center (ATAC) using a VISSIM operations model. Based on model results, the Interstate System currently operates at an overall level of service (LOS) C or higher. However there are existing and emerging areas of deficiency. The primary area of concern is along I-94 between TH 75 (8th Street in Moorhead) and 45th Street SW (Fargo), including I-29/I-94 Tri-level System Interchange area. By year 2025 even with assumed improvements to the Interstate System shown in Table 1, operations in these segments of the I-94 corridor are projected to deteriorate to LOS D, E, and F (depending upon the location).

Appendix D

Peak-Hour Traffic Methodology for F-M IOS Phase II

To: Study Review Committee: Interstate Operations Study

From: Jason Baker, UGPTI/ATAC

Re: Peak-Hour Traffic Methodology for F-M IOS Phase II

Date: July 26, 2010

This memorandum addresses the summary information relating to the methodology of using the regional model, and development of the VISSIM networks for Phase II of the IOS.

The F-M regional model was not used to its full potential in Phase I of the F-M IOS for several reasons, which primarily related to the fact that the IOS planning horizon (2025) was different than those of the Long Range Transportation Plan (2015 and 2035) and that the regional model does not accurately reflect the peak-hour conditions of the interstate system. With that being said, it was important to use the regional model for Phase II since almost all of the themed alternatives rely on the regional model and manually manipulating the VISSIM trip tables to reflect the regional model's results would have been a very tedious and time consuming process.

METHODOLOGY

We have developed and tested a methodology for using the F-M regional model to provide more reasonable peak-hour traffic. Although our process was not perfect, it seemed to be the most appropriate option based on our available resources. Our process for using the regional travel demand model was as follows:

1. Select the most appropriate regional model planning horizon
   a. 2035 was proposed since it should better represent future long-term growth and traffic patterns due to the available socio-economic data
   b. Identify and incorporate reasonable arterial improvements that would be implemented by 2025
2. Modify the regional model to include the 2025 freeway geometry
   a. Use 2025 geometry from IOS Phase I
3. Select target location and volume growth (i.e., Red River Bridge)
   a. Modify key regional model parameters that would affect when the peak-hour traffic would be distributed to match the target location
      1. AM and PM peak percent of daily trip matrix
      2. External growth factor
4. Perform several regional model iterations to achieve reasonable AM and PM traffic volume and traffic patterns
5. Select best regional model iteration, which was used for Phase II peak-hour traffic
6. Perform the regional model runs for the various themed alternatives and incorporate the AM and PM trip tables (freeway subarea) into VISSIM

TRAFFIC GROWTH

To account for a fairly conservative growth in peak-hour traffic for Phase I, an average growth rate of 1.75% was used for the 2015 and 2025 simulation scenarios. Therefore, the peak-hour volume increase from the 2008 base case was 12% for the 2015 scenarios and approximately 30% for the

2025 scenarios. As discussed in the past, using the 1.75% average growth per year for the long-term (2025/2035) planning horizon can be excessive for some areas and insufficient for other areas.

When we compared the 2005 and 2035 modeled average daily traffic (ADT) for the freeway segments, a wide range of traffic growth was realized. Daily traffic volume growth along I-29 ranged from 9% to 132%, while I-94 traffic volume growth ranged from 43% to 104% (Table 1). The core sections of both freeways (based on 2008 peak-hour volume) are outlined in red. It is very difficult to forecast the level of growth and the exact location of future developments, therefore, we recommended using the average growth rate per year between the 2005 and 2035 planning horizon to estimate the 2025 planning horizon (17 yr. growth). The methodology also implies that the locations of the future developments are based on the 2035 socio-economic data. It should be noted that the 30% increase to the 2008 peak-hour traffic to estimate the 2025 peak-hour traffic is similar to the ADT growth rate along the core portion of I-94.

Table 1. Average Daily Traffic (ADT) Comparison.

Interstate 29	**Combined Mainline Traffic (Northbound and Southbound)**				
Freeway Segment	**2005**	**2035**	**Growth**	**Avg. Growth/yr**	**17 yr. Growth***
CR 20 - 19th Ave. N	17,847	35,454	99%	3.29%	56%
19th Ave. N - 12th Ave. N	21,880	33,575	53%	1.78%	30%
12th Ave. N - Main Ave.	33,088	46,957	42%	1.40%	24%
Main Ave. - 13th Ave. S	**41,569**	**51,440**	**24%**	**0.79%**	**13%**
13th Ave. S - I-94	**58,436**	**63,495**	**9%**	**0.29%**	**5%**
I-94 – 32nd Ave. S	**37,297**	**50,229**	**35%**	**1.16%**	**20%**
32nd Ave. S – 52nd Ave. S	22,575	52,412	132%	4.41%	75%
Interstate 94	**Combined Mainline Traffic (Eastbound and Westbound)**				
Freeway Segment	**2,005**	**2035**	**Growth**	**Avg. Growth/yr**	**17 yr. Growth***
Main Ave. - Sheyenne St.	17,781	36,267	104%	3.47%	59%
Sheyenne St. – 9th St./57th St.	-	32,963	-	-	-
9th St./57th St. – 45th St.	26,512	38,761	46%	1.54%	26%
45th St. - I-29	**38,650**	**67,254**	**74%**	**2.47%**	**42%**
I-29 – 25th St.	**59,277**	**86,062**	**45%**	**1.51%**	**26%**
25th St. - University Dr.	**58,442**	**83,661**	**43%**	**1.44%**	**24%**
University Dr. – 8th St. (TH 75)	**54,919**	**79,385**	**45%**	**1.48%**	**25%**
8th St. (TH 75) – 20th St.	**35,950**	**65,130**	**81%**	**2.71%**	**46%**
20th St. – 34th St.	**25,003**	**50,754**	**103%**	**3.43%**	**58%**
34th St. - MN 336	26,389	48,501	84%	2.79%	47%

* Estimated growth from 2008 to 2025

REGIONAL MODEL MODIFICATIONS

The 2035 long-range planning model not only has estimates of the socio-economic data but the network geometry as well. Since the 2035 network contains several additional geometric changes that were not included in the 2025 network (e.g., northbound to westbound flyover ramp at the I-29 and I-94 Interchange), the regional model was modified to reflect those of the Phase I 2025 network, as well as implementing proposed 2025 arterial improvements.

The regional model was calibrated using various measures (e.g., ADT, VMT, trip length, etc.), however, none of the measures are related to peak-hour volume. A few parameters were adjusted to provide more reasonable 2025 peak-hour volume. External growth factors are used to estimate the external-external, external-internal, and internal-external trips for the external nodes. Currently, the

model uses an average growth of 2.0% for the external nodes between the planning horizons. It should be noted that other parameters, such as the trip length distribution, could have been modified in the regional model; however, this would have affected the integrity of the calibrated model and would have required recalibrating the model.

The most significant parameters for adjusting peak-hour traffic related to the AM and PM peak-hour factors. These two factors influence the percentage of the daily trips that occur in each peak period, which are global parameters. Currently, the regional model factors the trip distribution matrix using 7.53% for the AM, 8.52% for the PM, and 6.00% for 14 off-peak hours. These factors are used in the trip distribution module, which equates to having 8.9% of the daily trips occurring in the AM peak and 7.9% of the daily trips during the PM peak.

PEAK-HOUR TARGET

Given the fact that we could modify the 2035 regional model to produce more realistic estimates of 2025 peak-hour traffic, we needed to identify appropriate sets of targets. This was not a straight forward process since it was difficult to estimate the location and level of growth for an undeveloped area. The socio-economic data suggest that the cities of Fargo and West Fargo will continue to grow to the south and west, while the City of Moorhead will primarily grow to the south and east. The freeway mainline selected as the target location was the section between University Dr. and 8th St. (TH 75), which will be referred to as the Red River Bridge. This mainline section connects Fargo-Moorhead and has one of the highest ADT values in the metro area.

MODIFIED 2025 PEAK-HOUR TRAFFIC

By adjusting the peak-hour and external growth factors of the regional model, the combined traffic for each peak hour was compared to the 2025 peak-hour traffic at the Red River Bridge. Several iterations of model adjustments were performed, which tried to have the new 2025 peak-hour traffic (Modified 2025) match the original 2025 traffic. Once the percent difference between the two 2025 scenarios was very low at the Red River Bridge, the other mainline links were evaluated. Table 2 illustrates the peak-hour traffic data for the Red River Bridge, which also provided reasonable results for adjacent freeway mainline sections.

Table 2. 2025 and Modified 2025 Peak-Hour Comparison (Red River Bridge)

Scenario	AM EB	AM EB % Change	AM WB	AM WB % Change	AM Combined	AM Combined % Change
2025	2,939	-	4,879	-	7,818	-
Mod. 2025	2,775	-6%	4,594	-6%	7369	-6%
Scenario	**PM EB**	**PM EB % Change**	**PM WB**	**PM WB % Change**	**PM Combined**	**PM Combined % Change**
2025	5,029	-	3,855	-	8,884	-
Mod. 2025	5,093	1%	3,745	-3%	8,838	-1%

Note: Current Mod. 2025 network does not include 2025 arterial geometry. This will need to be addressed in the near future.

As discussed in Phase I of the IOS, the regional model underestimates peak-hour traffic. For comparison purposes, the 2035 Base AM and PM peak-hour traffic typically were significantly lower than the estimated 2025 peak-hour traffic. The volume at the Red River Bridge needed to be lower than the 2025 AM traffic to produce peak-hour traffic that was similar to the 2025 AM scenario for other core I-94 mainline sections, specifically between 25th St. and 34th St. (Table 3). Trends in the AM peak-hour traffic included substantial increases in mainline sections towards the southern and western parts of the metro area. In addition, all of the external freeway links had substantial

increases, which are caused by the regional model balancing productions and attraction. This was also evident during the PM peak period.

Table 3. AM Peak-Hour Mainline Volume Comparison.

Interstate 29	**Combined Mainline Traffic (Northbound and Southbound)**				
Freeway Segment	**2025 AM**	**2035 AM Base**	**Mod. 2025 AM**	**2035 Base Diff.**	**Mod. 2025 Diff.**
CR 20 - 19th Ave. N	1,847	2,659	3,006	44%	63%
19th Ave. N - 12th Ave. N	3,272	3,049	3,666	-7%	12%
12th Ave. N - Main Ave.	4,912	4,060	4,659	-17%	-5%
Main Ave. - 13th Ave. S	**6,083**	**4,922**	**5,631**	**-19%**	**-7%**
13th Ave. S - I-94	**7,310**	**5,687**	**7,050**	**-22%**	**-4%**
I-94 – 32nd Ave. S	**5,210**	**6,391**	**6,172**	**23%**	**18%**
32nd Ave. S – 52nd Ave. S	4,075	5,754	5,224	41%	28%
Interstate 94	**Combined Mainline Traffic (Eastbound and Westbound)**				
Freeway Segment	**2025 AM**	**2035 AM Base**	**Mod. 2025 AM**	**2035 Base Diff.**	**Mod. 2025 Diff.**
Main Ave. - Sheyenne St.	1,345	2,514	3,081	87%	129%
Sheyenne St. – 9th St./57th St.	1,778	2,809	3,107	58%	75%
9th St./57th St. – 45th St.	3,103	3,597	4,395	16%	42%
45th St. - I-29	**5,674**	**5,295**	**6,869**	**-7%**	**21%**
I-29 – 25th St.	**7,682**	**7,776**	**9,167**	**1%**	**19%**
25th St. - University Dr.	**8,109**	**7,315**	**8,507**	**-10%**	**5%**
University Dr. – 8th St. (TH 75)	**7,818**	**6,392**	**7,633**	**-18%**	**-2%**
8th St. (TH 75) – 20th St.	**5,339**	**4,420**	**5,736**	**-17%**	**7%**
20th St. – 34th St.	**4,191**	**3,757**	**4,748**	**-10%**	**13%**
34th St. - MN 336	2,715	3,431	4,148	26%	53%

Note: The "Diff." is compared to the 2025 peak-hour traffic.

For the PM peak-hour period, adjusting the PM peak factor in the regional model to replicate the PM peak-hour traffic at the Red River Bridge also produced reasonable peak-hour traffic for several I-94 mainline sections, primarily between I-29 and 34th St. (Table 4). Similar to the AM peak-hour traffic, the PM peak-hour traffic included substantial increases in mainline sections towards the southern and western parts of the metro area. In addition, several mainline sections of I-29 were lower than the 2025 PM traffic. This may be attributed to the new 9th St./Veterans Blvd. and I-94 Interchange since more trips may take the arterial system rather than the interstate.

Table 4. PM Peak-Hour Mainline Volume Comparison.

Interstate 29	Combined Mainline Traffic (Northbound and Southbound)				
Freeway Segment	**2025 PM**	**2035 PM Base**	**Mod. 2025 PM**	**2035 Base Diff.**	**Mod. 2025 Diff.**
CR 20 - 19th Ave. N	2,532	3,218	3,697	27%	46%
19th Ave. N - 12th Ave. N	3,908	3,161	3,975	-19%	2%
12th Ave. N - Main Ave.	5,932	4,044	5,120	-32%	-14%
Main Ave. - 13th Ave. S	**7,268**	**4,754**	**6,303**	**-35%**	**-13%**
13th Ave. S - I-94	**8,299**	**5,673**	**7,283**	**-32%**	**-12%**
I-94 – 32nd Ave. S	**5,164**	**5,725**	**5,801**	**11%**	**12%**
32nd Ave. S – 52nd Ave. S	4,363	5,706	5,618	31%	29%
Interstate 94	**Combined Mainline Traffic (Eastbound and Westbound)**				
Freeway Segment	**2025 PM**	**2035 PM Base**	**Mod. 2025 AM**	**2035 Base Diff.**	**Mod. 2025 Diff.**
Main Ave. - Sheyenne St.	1,131	2,765	2,536	144%	124%
Sheyenne St. – 9th St./57th St.	1,698	2,984	3,375	76%	99%
9th St./57th St. – 45th St.	2,847	3,437	4,939	21%	73%
45th St. - I-29	**5,093**	**4,921**	**7,414**	**-3%**	**46%**
I-29 – 25th St.	**9,003**	**7,321**	**10,175**	**-19%**	**13%**
25th St. - University Dr.	**8,810**	**6,904**	**9,218**	**-22%**	**5%**
University Dr. – 8th St. (TH 75)	**8,884**	**6,581**	**8,742**	**-26%**	**-2%**
8th St. (TH 75) – 20th St.	**5,495**	**4,821**	**6,477**	**-12%**	**18%**
20th St. – 34th St.	**4,298**	**3,859**	**5,432**	**-10%**	**26%**
34th St. - MN 336	2,504	3,919	4,957	57%	98%

Note: the "Diff." is compared to the 2025 peak-hour traffic.

PEAK-HOUR PERCENTAGE OF ADT

The Modified 2025 peak-hour traffic as it relates to the 2035 ADT was similar to that of the 2025 traffic (Table 5). The AM peak-hour traffic represented between 5.2% and 11.8% of the ADT along I-29 and between 3.7% and 9.7% along I-94. The PM peak-hour traffic represented between 7.1% and 14.1% of the ADT along I-29 and between 3.1% and 11.2% along I-94.

Table 5. Peak-Hour Percentage of Average Daily Traffic.

Interstate 29	Combined Mainline Traffic (Northbound and Southbound)				
Freeway Segment	**2035 ADT**	**2025 AM % of 2035 ADT**	**Mod. 2025 AM % of 2035 ADT**	**2025 PM % of 2035 ADT**	**Mod. 2025 PM % of 2035 ADT**
CR 20 - 19th Ave. N	35,454	5.2%	8.4%	7.1%	10.4%
19th Ave. N - 12th Ave. N	33,575	9.7%	10.9%	11.6%	11.9%
12th Ave. N - Main Ave.	46,957	10.5%	10.0%	12.6%	10.9%
Main Ave. - 13th Ave. S	51,440	11.8%	11.0%	14.1%	12.3%
13th Ave. S - I-94	63,495	11.5%	11.1%	13.1%	11.5%
I-94 – 32nd Ave. S	50,229	10.4%	12.4%	10.3%	11.6%
32nd Ave. S – 52nd Ave. S	52,412	7.8%	10.1%	8.3%	10.8%
Interstate 94	**Combined Mainline Traffic (Eastbound and Westbound)**				
Freeway Segment	**2035 ADT**	**2025 AM % of 2035 ADT**	**Mod. 2025 AM % of 2035 ADT**	**2025 PM % of 2035 ADT**	**Mod. 2025 PM % of 2035 ADT**
Main Ave. - Sheyenne St.	36,267	3.7%	8.5%	3.1%	9.7%
Sheyenne St. – 9th St./57th St.	32,963	5.4%	9.6%	5.2%	10.3%
9th St./57th St. – 45th St.	38,761	8.0%	11.7%	7.3%	12.9%
45th St. - I-29	67,254	8.4%	10.5%	7.6%	11.1%
I-29 – 25th St.	86,062	8.9%	10.9%	10.5%	11.8%
25th St. - University Dr.	83,661	9.7%	10.5%	10.5%	11.2%
University Dr. – 8th St. (TH 75)	79,385	9.8%	9.8%	11.2%	11.1%
8th St. (TH 75) – 20th St.	65,130	8.2%	8.9%	8.4%	9.9%
20th St. – 34th St.	50,754	8.3%	9.4%	8.5%	10.7%
34th St. – MN 336	48,501	5.6%	8.6%	5.2%	10.2%

Network Calibration

Once the 2025 arterial conditions were selected, several iterations were performed by adjusting the regional model to produce acceptable AM and PM peak-hour traffic at the target location. In addition to analyzing the total traffic, comparisons/analyses were performed to ensure that the direction split in traffic was reasonable for each peak hour. Once we identified the best set of regional model parameters, they were used to provide modified 2025 traffic and were used as a baseline for Phase II.

It should be noted that the modified 2025 traffic was significantly different from the Phase I 2025 traffic since the Phase I applied the same growth to the freeway links. The modified 2025 traffic will account for changes in traffic patterns as a result of future growth in the metro area, which was a more realistic estimation of 2025 traffic conditions.

Due to significant volume differences between the 2025 Phase I and 2025 Modified, some simulation recalibration was performed. Although calibration was performed during Phase I to replicate the 2008 conditions and provide reasonable capacities for various facilities, the 2025 Modified traffic was significantly higher than the Phase 1 2025 traffic. Therefore, significant congestion develops along portions of the network. While the congestion is justified, sometimes the location and severity may not be the most appropriate. As we know, driver behavior may change as the level of congestion increases. Therefore, we adjusted some of the driver behavior parameters (look-ahead distances, and headways) to assist in allowing traffic to access its off-ramp without stopping prior to the ramp, as well as merging onto the freeway from the on-ramps without having to stop (which causes significant queues).

For example, the westbound direction of I-94 between 25th St. and I-29 has approximately 6,600 vehicles during the AM peak. Approximately 2,000 of these vehicles are taking the northeast ramp of the I-29 and I-94 interchange. The Phase 1 scenarios used a look ahead distance of 1 mile (for the most part) to start making the necessary lane changes to take an off-ramp. Due to the close proximity of the I-29 and I-94 interchange to 25th St., the look ahead distance of 5,280 feet would place a significant number of vehicles in the right lane before arriving at the two 25th St. ramps, which have a decent amount of traffic (northeast loop with 540 vehicles and northwest on-ramp with 1,075 vehicles). This occurrence significantly restricts the on-ramp traffic from merging onto the westbound travel lanes and cause significant queuing to develop several thousand feet upstream on 25th St. In reality, motorists would change their traffic pattern and stay on the arterial rather than wait several minutes to get on a congested portion of the freeway. To assist in reducing this occurrence, we shortened the look-ahead distance for several interchanges to 3,000 feet which allowed more traffic from the on-ramp to enter the freeway and still provide vehicle enough time to exit the freeway. In addition, we made some adjustments to the link headways (by link type) and lane changing behavior for the on-ramps.

There are two approaches to follow for calibrating the new base cases and we don't have enough traffic in the F-M area to know which one is the most accurate/realistic. The first approach is that motorists on the freeway mainlines will not move over (willingly) to let on-ramp traffic merge. This will cause significant congestion on the on-ramp and upstream on the arterial, while the freeway may operate fairly well overall. The second approach is that motorists on the on-ramp will force their way onto the freeway mainline which will make the mainline traffic slow down and/or make a lane change. This approach will cause significant congestion on the mainline sections but the on-ramps and arterials will flow rather well.

Per the meeting on Feb. 11th, it was discussed that the 2025 base networks should use the same parameters as those used for calibrating the 2008 AM and PM networks (IOS Phase I). However, due to additional VISSIM calibration knowledge since calibrating the 2008 networks and performing another literature review related to the matter, the headway time (CC1) of the Onramp Merge (.8 to 1.2) and Short Weave (.8 to 1.1) segments were increased. The Freeway (basic) segments were left unchanged (1.09). In addition, two other changes were made to networks:

- I-94 & Sheyenne St. Interchange (South Ramp): Incorporated a NB right-turn lane of ~450 ft (currently the shoulder is used as a turn lane)
- I-29 & Co. Rd. 20 Interchange: Incorporated traffic signals at both ramps (W. Ramp had significant queues for the ramp traffic under stop control)

Appendix E

Modeling Assumptions for Themed Alternatives

Appendix E

Modeling Assumptions for Themed Alternatives

Themed Alternative 1

Transit/TDM/Land Use changes will be modeled based on reductions in the peak period origin-destination trip tables used in the VISSIM models. Reductions of 5, 10, and 20 percents should be tested.

Themed Alternative 2

Intelligent Transportation Systems (ITS) will be considered in addressing congestion on the Fargo-Moorhead Interstate system. ITS improvements may include a broad range of elements from infrastructure investments to technology and communications to coordinated response programs. The types of ITS improvements that may be considered in the Metro COG Interstate Operations Study may include, but are not limited to:

1. Service Patrols
    a. Circulating helper vehicles
    b. Incident response trailers
2. Dynamic Message Signs
3. Traffic Operations Center
    a. Camera/Loop Detector observation
    b. Signal coordination
    c. Information sharing with state patrol
4. Additional sub-mile postings on interstates
5. Programmed Incident Response
    a. Alternate route designations
    b. Agency coordination by incident location

Themed Alternative 3 Assumptions

Ramp metering will be evaluated to determine the potential improvements to operations on the Interstate System. This will be approached by increasing the delay to discourage short trips from using the freeway. First, the regional model will be used to evaluate the reduction in traffic volumes entering the freeway at specific on ramp locations. A maximum ramp delay of 4 minutes may be used in the regional model. Next, the adjusted traffic demand volumes will be simulated in the VISSIM model. Depending on the shifts in traffic volumes, the ramp metering rates in VISSIM will need to be customized to produce reasonable travel time delays.

A volume reduction target of approximately 15 percent is desired for each of the on ramp locations listed below. The descriptions below show the initial metering locations and delay times. Following an initial regional model run, volumes will be reviewed to evaluate the impact of the delay times on the traffic volumes. Additional model run iterations may be performed to balance the ramp meter delay time with desirable reductions in volume.

a. Adjacent to Tri-Level Scenario – AM Peak Hour
    i. 25th St to westbound I-94 (loop): 3 min
    ii. 25th St to westbound I-94 (ramp): 3 min
    iii. 45th St to eastbound I-94 (loop): 3 min
    iv. 45th St to eastbound I-94 (ramp): 3 min
    v. 13th Ave to southbound I-29: 3 min
    vi. 32nd Ave to northbound I-29 (loop): 3 min
    vii. 32nd Ave to northbound I-29 (ramp): 3 min

b. Adjacent to Tri-Level Scenario – PM Peak Hour
    i. 25th St to westbound I-94 (loop): 3 min
    ii. 25th St to westbound I-94 (ramp): 3 min
    iii. 45th St to eastbound I-94 (loop): 3 min
    iv. 45th St to eastbound I-94 (ramp): 3 min
    v. 13th Ave to southbound I-29: 3 min
    vi. 32nd Ave to northbound I-29 (loop): 3 min
    vii. 32nd Ave to northbound I-29 (ramp): 3 min

c. Adjacent + Second Ring to Tri-Level Scenario – PM Peak Hour
    i. 25th St to westbound I-94 (loop): 2.5 min
    ii. 25th St to westbound I-94 (ramp): 2.5 min
    iii. 45th St to eastbound I-94 (loop): 2.5 min
    iv. 45th St to eastbound I-94 (ramp): 2.5 min
    v. 13th Ave to southbound I-29: 2.5 min
    vi. 32nd Ave to northbound I-29 (loop): 2.5 min
    vii. 32nd Ave to northbound I-29 (ramp): 2.5 min
    viii. University Dr to westbound I-94 (loop): 2.5 min
    ix. University Dr to westbound I-94 (ramp): 2.5 min
    x. 9th St to eastbound I-94 (loop): 2.5 min
    xi. 9th St to eastbound I-94 (ramp): 2.5 min
    xii. Main Ave to southbound I-29 (loop): 2.5 min
    xiii. Main Ave to southbound I-29 (ramp): 2.5 min
    xiv. 52nd Ave to northbound I-29 (loop): 2.5 min
    xv. 52nd Ave to northbound I-29 (ramp): 2.5 min

d. Adjacent + Second Ring to Tri-Level Scenario – PM Peak Hour
    i. 25th St to westbound I-94 (loop): 2.5 min
    ii. 25th St to westbound I-94 (ramp): 2.5 min
    iii. 45th St to eastbound I-94 (loop): 2.5 min
    iv. 45th St to eastbound I-94 (ramp): 2.5 min
    v. 13th Ave to southbound I-94: 2.5 min
    vi. 32nd Ave to northbound I-29 (loop): 2.5 min
    vii. 32nd Ave to northbound I-29 (ramp): 2.5 min
    viii. University Dr to westbound I-94 (loop): 2.5 min
    ix. University Dr to westbound I-94 (ramp): 2.5 min
    x. 9th St to eastbound I-94 (loop): 2.5 min
    xi. 9th St to eastbound I-94 (ramp): 2.5 min
    xii. Main Ave to southbound I-29 (loop): 2.5 min
    xiii. Main Ave to southbound I-29 (ramp): 2.5 min
    xiv. 52nd Ave to northbound I-29 (loop): 2.5 min
    xv. 52nd Ave to northbound I-29 (ramp): 2.5 min

e. Moorhead Interchanges Scenario – AM Peak Hour
    i. 34th Ave to westbound I-94: 2 min
    ii. 20th Ave to westbound I-94: 2 min
    iii. 8th St to westbound I-94 (loop): 2 min
    iv. 8th St to westbound I-94 (ramp): 2 min

f. Moorhead Interchanges Scenario – PM Peak Hour
    i. University Dr to eastbound I-94: 2 min
    ii. 8th St to eastbound I-94: 2 min
    iii. 20th Ave to eastbound I-94: 2 min
    iv. 34th Ave to eastbound I-94: 2 min

Ramp metering initial headway methodology

The travel demand model was used to develop modified traffic volumes for use in the VISSIM model for Themed Alternative 3 (Ramp Metering). Additional delays were applied to interstate on ramps to increase travel time for trips using the interstate system. Table 1 shows the schedule that was applied for the link delay increases.

Table 1
Ramp Metering Schedule by Location

Ramp Location	Delay Increase
First Ring Interchanges, on ramps/loops leading towards tri-level interchange	120 sec
Second Ring Interchanges, on ramps/loops leading towards tri-level interchange	60 sec
All other on ramps/loops on local interchanges in Fargo and Moorhead city limits	30 sec

The a.m. and p.m. peak period volumes developed using the travel demand model will be used in the VISSIM model for traffic operations analysis. The delays specified in the travel demand model are desired to be reproduced by the VISSIM model. Doing so will require selection of a ramp metering headway that will result in queues upstream of the ramp causing average delays approximately equal to those defined in Table 1. At the same time, the traffic volumes should be served by the ramp meters during the peak hours. Upper and lower limits are defined based on the ramp meter phasing plan and the ability to serve peak hour traffic. These are defined in Table 2.

Table 2
Upper and Lower Bounds of Ramp Metering Headways

Bound	Headway (sec/veh)
Upper Bound	3600 sec / peak hour volume
Lower Bound	1 sec green, 1 sec all red = 2 sec headway

In addition to serving the peak hour volume, the peak 15-minute volume should also be served without queuing extensively into upstream intersections. Therefore the peak hour factor, defined as 0.92 for year 2025 conditions, is applied to the upper bound for entrance ramp metering headways.

Finally, low volume ramps should not endure excessive delays calculated from the upper bound calculation. A maximum headway of 12 seconds per vehicle is assumed for ramps with peak hour factor adjusted upper bound headways exceeding this value.

<u>Themed Alternative 4 Assumptions</u>

A previous study of arterial improvements was identified in developing reasonable travel time reductions for the Metro COG Interstate Operations Study. This study is a signal retiming project along TH 55 in the Minneapolis-St. Paul metropolitan area. This corridor is a four-lane, expressway facility with roughly one-half mile signal spacing. A before-and-after travel time study was performed and documented as part of the signal retiming study. Table 3 shows the reductions in travel times through the corridor during peak, off-peak, and daily time periods.

Table 3
Average Travel Time Reduction for TH 55 Signal Timing Improvements

Time Period/Direction	Travel Time Change
Peak Period, Peak Direction	-27%
Peak Period, Reverse Direction	-7%
Peak Period, Both Directions	-17%
Off Peak Period, Both Directions	-16%
All Day, Both Directions	-17%

The results of this study show that signal retiming efforts are capable of achieving meaningful improvements in corridor travel times. Applying this to arterial facilities in the Fargo-Moorhead region requires and understanding of the existing conditions along the target corridors. In some locations, the signal timing may be optimized to the extent that substantial travel time improvements cannot be obtained through additional retiming. In others, there may be opportunities for great improvement through signal timing efforts. The following travel time improvements are proposed for the facilities to be tested under Themed Alternative 4. The attached map provides an illustration of the endpoints of the improvements along each corridor.

The travel time reductions proposed for the Themed Alternative 4 analysis are considered conservative compared to the results of the signal timing projects provided in Table 1. This reflects an awareness of the level of improvement that would be reasonably expected through signal retiming efforts along these corridors. The corridors proposed as 15 percent travel time reductions are understood to provide greater opportunities for signal retiming than those with 10 percent improvement.

a. North-south arterials near I-29
    i. 45th Street: Travel time reduction of 10%
    ii. 25th Street: Travel time reduction of 10%
b. East-west arterials near I-94
    i. Main Avenue: Travel time reduction of 10%
    ii. 13th Avenue: Travel time reduction of 10% east of I-29, 15% west of I-29
c. North-south and east-west arterials along I-94 and I-29
    i. All corridors described in 4.a and 4.b
d. Other corridors to be considered and combined with 4.a and 4.b
    i. 52nd Avenue and Red River crossing: Travel time reduction of 10%
    ii. 76th Avenue, new Red River crossing, I-29 interchange: high speed/limited access facility
e. Moorhead North-South Corridors
    i. 8th Street: Travel time reduction of 15%
    ii. 20th Street: Travel time reduction of 15%

The 76th Avenue corridor improvement assumptions are more flexible due to no existing constraints. Currently, no Red River crossing is provided along this alignment, and no access is provided at I-29. Therefore, general design characteristics are proposed rather than improvement assumptions. In an effort to serve traffic demand with a high quality connection, this corridor is envisioned as a four-lane expressway facility. Intersections would be signalized and at-grade, but would be limited to one-mile spacing. A robust interchange design would be provided at I-29, resulting in minimal delays on 76th Avenue. The extent of this design is assumed to be from CR 17 near Horace to CR 11 near Sabin.

The analysis of an additional corridor is also proposed for consideration under Themed Alternative 4. The facility is 17th Avenue in Fargo between 45th Street and 25th Street. This roadway currently has a number of four-way stop controlled intersections, which result in high delays under heavy traffic conditions. Improvements to be considered for this facility would involve replacing four-way stop controlled intersections with traffic signals, as well as minor geometric improvements at those intersections. These improvements would be expected to yield a 15 percent improvement in travel time through the corridor.

Themed Alternative 5 Assumptions

New Red River crossing locations will be tested at the 13th Avenue/12th Avenue corridor and the 32nd Avenue/40th Avenue corridor. The travel demand model should be used to evaluate the changes in travel patterns for each river crossing location individually, and both together. The updated trip tables from the travel demand model will then be tested in the VISSIM model for each scenario.

Themed Alternative 6 Assumptions

Capacity and physical improvements proposed for Themed Alternative 6 are intended to eliminate all locations with unacceptable levels of service on the Fargo-Moorhead Interstate System. An iterative approach will be used to evaluate the minimum requirements in each location to achieve acceptable levels of service.

Different approaches may be used in developing each of the alternatives. The first approach will include traditional, capacity improvements exclusively. These types of improvements include additional freeway lanes, auxiliary lanes, entrance/exit ramps, or interchange improvements. No access or movements that are currently provided will be eliminated.

The second approach will introduce innovative treatments to reduce congestion. These types of physical changes may include ramp closures, access restrictions, ramp braiding, and collector-distributor roads. These will be generally considered in two separate scenarios; a low-cost approach including ramp closures and access restrictions, and a higher-cost approach including bridge-braids and other structures.

a. Traditional Capacity Improvements (attached map illustrates lane geometry)
    i. Through lanes: Westbound I-94 to northbound I-29, add a second lane to the ramp. The second lane will be fed by an option lane on I-94. Both lanes will end at 13th Avenue with an escape lane for the left lane. Possibly add an additional lane on westbound I-94 between I-29 and 45th St.
    ii. Auxiliary lanes: Add auxiliary lanes on westbound I-94 between 34th St. and 20th St., between 20th St. and TH 75 and between 25th St and I-29. Extend the eastbound I-94 auxiliary lane between I-29 and 25th St. to University Dr. Add auxiliary lanes on eastbound I-94 between TH 75 and 20th St. and 20th St. and 34th St.
    iii. New ramps: Northbound I-29 to Westbound I-94 flyover
    iv. C/D Roads: None at this time

b. Low-Cost Innovative Physical Improvements
    i. Removal of “Interior” Ramps adjacent to Tri-Level interchange.

c. Higher-Cost Innovative Improvements
    i. NB I-29 to WB I-94 flyover
    ii. “Big-Box” design near Tri-Level interchange. Limit access at 25th St and 45th St to I-94 only (restrict movements exiting after entering from I-29 or entering movements from exiting to I-29). Limit access at 32nd Ave and 13th Ave to I-29 only (restrict movements exiting after entering from I-94 or entering movements from exiting to I-94). See attachment.

Appendix F

Modeling Assumptions for Hybrid Alternatives

Appendix F

Hybrid Alternative Assumptions

Three Hybrid Alternatives were agreed upon by the Study Review Committee at Meeting #3 held on 4/29/2010. This is intended to provide documentation of those hybrid alternatives and the methodologies to be used in the operational analysis.

For each of the hybrid alternatives, new or revised origin-destination tables will be developed for the a.m. and p.m. models. Refinement of the Interstate geometry following the development of the origin-destination tables is not expected to require revisions to the origin-destination tables. (Access changes that restrict certain movements will be evaluated on a case-by-case basis.) Each of the hybrid alternatives includes a 5% reduction in volume for Land Use/Transit/TDM improvements. This is to be applied to the origin-destination tables after they have been obtained from the travel demand model and before they are entered in the simulation model.

I. Least Impact to Interstate System

- 1A. Land Use/Transit/TDM (5% Reduction)
- 2. ITS/Incident Management
- 3. Ramp Metering
- 4. Off-System Improvements
- 6. Capacity/Physical Improvements (Minimum Required)

New travel demand model run required including all improvements assumed in Themed Alternatives 3 and 4. The 5% reduction to be applied to the origin-destination tables after extraction from the travel demand model.

II. Medium Impact to Interstate System

- 1A. Land Use/Transit/TDM (5% Reduction)
- 2. ITS/Incident Management
- 3. Ramp Metering
- 6. Capacity/Physical Improvements (Minimum Required)

No new travel demand model run is required. The 5% reduction to be applied to the origin-destination tables developed for Themed Alternative 3.

III. Greatest Impact to Interstate System

- 1A. Land Use/Transit/TDM (5% Reduction)
- 2. ITS/Incident Management
- 6. Capacity/Physical Improvements (Minimum Required)

No new travel demand model run is required. The origin-destination tables developed for Themed Alternative 1A may be used without further modification.

The simulation modeling will be performed as an iterative process in order to determine the minimum physical improvements required to achieve acceptable level of service in all locations. Following development of the updated origin-destination tables, SRF will provide recommended physical improvements for an initial simulation run. Two to three additional runs may be necessary to identify all physical improvements required to achieve acceptable level of service throughout the network.

Recommended Physical Improvements for Hybrid Alternatives

Physical improvements below are intended to provide acceptable level of service with minimal capacity expansion on the interstate system. An attached lane schematic is provided to display improvements recommended for westbound I-94. The following improvements are recommended:

Hybrid Alternative 1

- AM Congestion Improvements
    - Construct an auxiliary lane on westbound I-94 between the southbound University Dr on ramp and the 25th St off ramp
    - Eliminate the ramp from southbound 25th St to westbound I-94; provide dual left-turn lanes to allow southbound 25th St traffic to use the northbound 25th St loop ramp to access westbound I-94
    - Construct an auxiliary lane on westbound I-94 between the 25th St on ramp and the northbound I-29 exit ramp
    - Expand the westbound I-94 to northbound I-29 ramp from 1 to 2 lanes. The 2 lane ramp will be developed from the auxiliary lane from 25th Street and the right most through lane (option lane).
    - Construct an additional lane on northbound I-29 between the westbound I-94 on ramp and the 13th Ave off ramp. This will result in a 5-lane section (3 through lanes with 2 full auxiliary lanes), the current option lane will be eliminated. Construct an escape lane following the 2-lane exit from northbound I-29 to 13th Avenue.

- PM Congestion Improvements
    - None

Hybrid Alternative 2

- AM Congestion Improvements
    - Construct an auxiliary lane on westbound I-94 between the southbound University Dr on ramp and the 25th St off ramp
    - Construct two auxiliary lanes on westbound I-94 between the 25th St on ramps (northbound and southbound) and the northbound I-29 exit ramp

- Expand the westbound I-94 to northbound I-29 ramp from 1 to 2 lanes. The 2 lane ramp will be developed from the two auxiliary lanes from 25th Street on ramps.
- Construct an escape lane following the 2-lane exit from westbound I-94 to northbound I-29
- Construct an additional lane on northbound I-29 between the westbound I-94 on ramp and the 13th Ave off ramp. This will result in a 5-lane section (3 through lanes with 2 full auxiliary lanes), the current option lane will be eliminated. Construct an escape lane following the 2-lane exit from northbound I-29 to 13th Avenue.

- PM Congestion Improvements
  - Construct an auxiliary lane on eastbound I-94 between 25th St on ramp and University Dr off ramp

<u>Hybrid Alternative 3</u>

- AM Congestion Improvements
  - Construct an auxiliary lane on westbound I-94 between the southbound University Dr on ramp and the 25th St off ramp
  - Construct an auxiliary lane on westbound I-94 between the northbound 25th St on ramp and the northbound I-29 exit ramp
  - Expand the westbound I-94 to northbound I-29 ramp from 1 to 2 lanes. The 2 lane ramp will be developed from the auxiliary lane from 25th Street and the right most through lane (option lane).
  - Bridge braid southbound 25th St westbound on ramp with northbound I-29 off ramp
  - Extend the third lane on westbound I-94 from the lane drop location just west of the southbound I-29 off ramp to the two-lane exit at 45th St
  - Construct an additional lane on northbound I-29 between the westbound I-94 on ramp and the 13th Ave off ramp. This will result in a 5-lane section (3 through lanes with 2 full auxiliary lanes), the current option lane will be eliminated. Construct an escape lane following the 2-lane exit from northbound I-29 to 13th Avenue.

- PM Congestion Improvements
  - Extend right lane from I-29 combined entrance to eastbound I-94 to University Dr off ramp
  - Construct an auxiliary lane on eastbound I-94 between TH 75 on ramp and 20th St off ramp

Appendix G

Modeling Results

Appendix G

Modeling Results

Base Network

The base 2025 network included several modifications which were agreed on by the Study Review Committee (SRC). These modifications are listed as follows:

Minnesota

- Rebuild I-94 interchange at TH 75 (as per the TH 75 Corridor Study), including the extension of the existing EB auxiliary lane through TH 75 interchange
- Rebuild the 20th St interchange

North Dakota

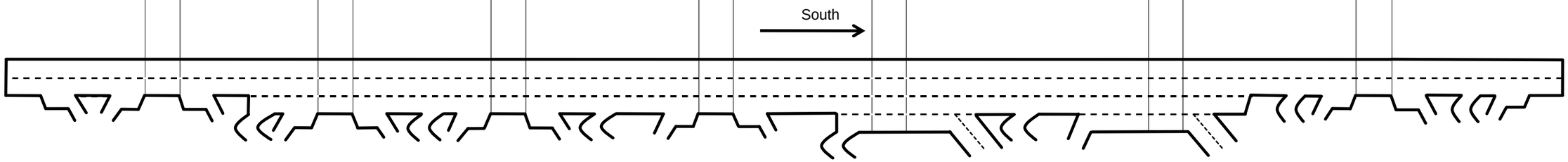
- Auxiliary lane additions on I-94 between 45th St and 9th St
- Two lane existing I-29/I-94 tri-level (I-29 SB to I-94 EB) ramp; addition of auxiliary lane I-94 EB from tri-level to 25th St
- Rebuilt 25th St interchange at I-94 (addition of EB access revision)
- Modified 32nd Ave at I-29 (addition of NW loop ramp)

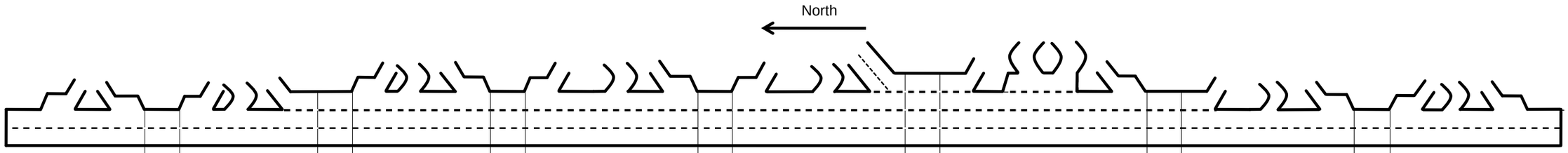
The summary of the VISSIM output (Level of Service) results for the AM and PM networks are provided on the following pages.

I-29 Data Collection: 2025 AM Peak Hour - Base Condition

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S					I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895			815	1050	1270	625	7200	620	670	960	510	1900
2025 Target (vph)					1707					1889					1686						1513				1582						2488							2138					
2025 Sim. Vol. (vph)					1735					1913					1712						1534				1603						2022							1862					
Volume % Difference					2%					1%					2%						1%				1%						-19%							-13%					
Speed (mph)					73.1					59					58.9						56.9				58.9						59.2							73					
# of Lanes					2					3					3						3				4						4							2					
Density (pc/mi/ln)					13					12					11						10				8						9							14					
Level of Service					B					B					B						A				A						A							B					





Northbound

	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S					I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310	2100			910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Target (vph)					1278					1766					2990						4162					5492								3735					3157					
2025 Sim. Vol. (vph)					1257					1689					2793						3821					4905								3749					3172					
Volume % Difference					-2%					-4%					-7%						-8%					-11%								0%					0%					
Speed (mph)					74.1					58.8					58						56.5					57.2								57					70.7					
# of Lanes					2					3					3						3					4								3					2					
Density (pc/mi/ln)					9					11					18						25					24								24					25					
Level of Service					A					B					B						C					C								C					C					

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

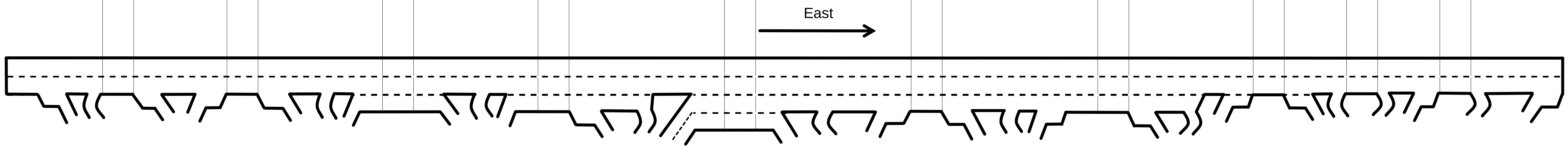
I-94 Data Collection: 2025 AM Peak Hour - Base Condition

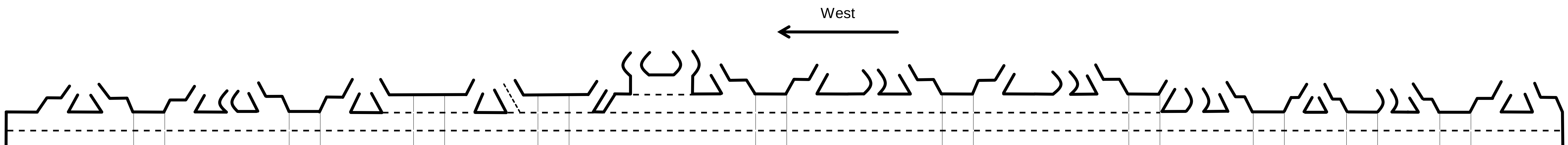
Eastbound

Main Ave. Sheyenne St. 9th St. 45th St. I-29 25th St. University Dr. TH 75 20th St. 34th St. MN 336

Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185	760	465	1345	1365	1805
2025 Target (vph)				1662				1906					2551				2959					2762
2025 Sim. Vol. (vph)				1683				1930					2574				2984					2725
Volume % Difference				1%				-					1%				1%					-1%
Speed (mph)				73.3				58.1					58.7				57.5					54.2
# of Lanes				2				2					3				3					4
Density (pc/mi/ln)				13				18					16				19					14
Level of Service				B				B					B				B					B

Distance (ft.)	910	730	1465	515	870	960	740	1050	1125	4225	520	1445	790	2315	1665	5910	2110	575	14825	710	1365	1080
2025 Target (vph)					2928					2755				2124		1756			1572			
2025 Sim. Vol. (vph)					2540					2050				1703		1394			1283			
Volume % Difference					-13%					-26%				-20%		-21%			-18%			
Speed (mph)					58.5					58.9				58.2		58.8			70			
# of Lanes					3					3				2		2			2			
Density (pc/mi/ln)					16					13				16		13			10			
Level of Service					B					B				B		B			B			





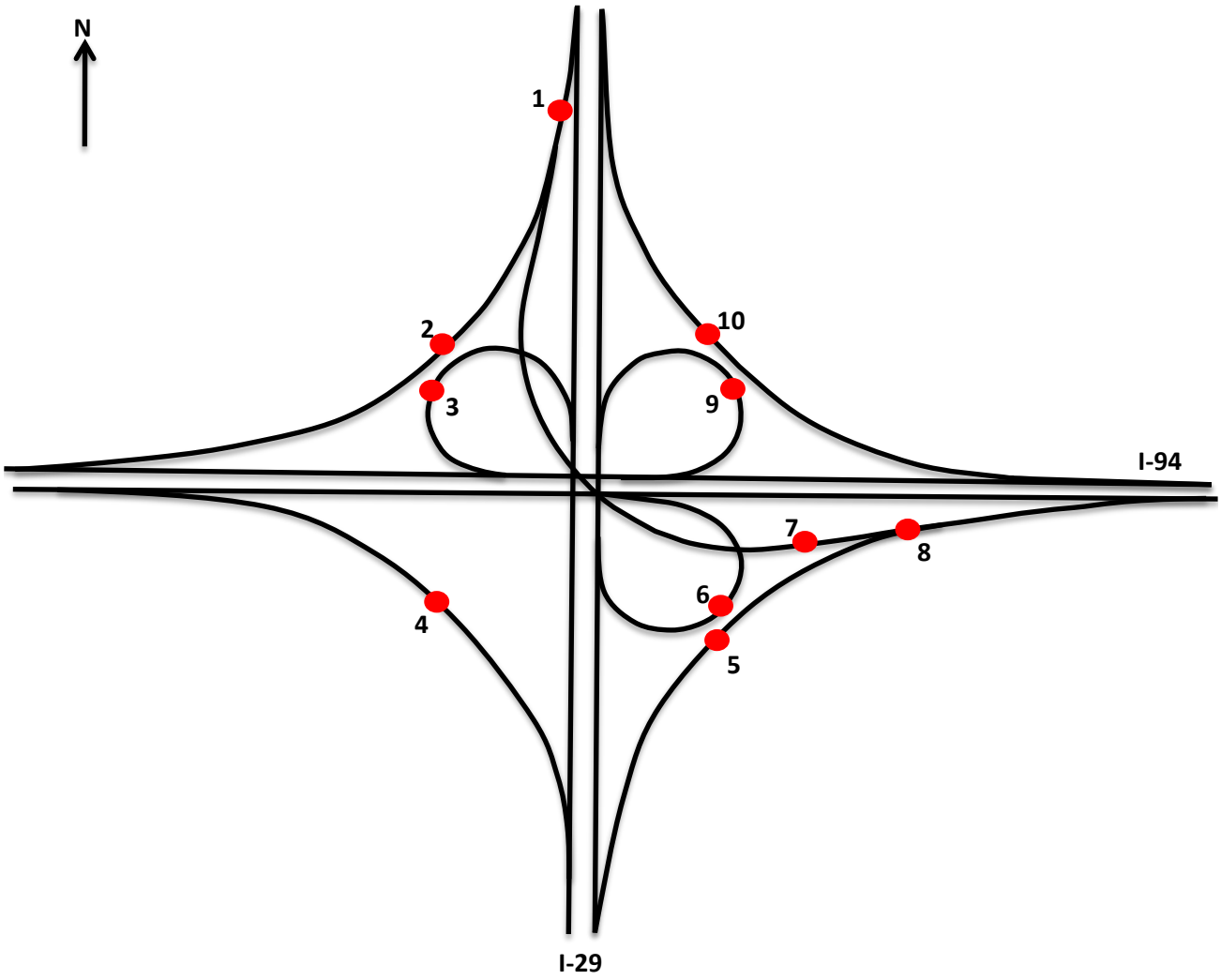
Westbound

Main Ave. Sheyenne St. 9th St. 45th St. I-29 25th St. University Dr. TH 75 20th St. 34th St. MN 336

Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375	1490	975	945	650	1555	770
2025 Target (vph)					1418					1254				1979			4134					6601	
2025 Sim. Vol. (vph)					1299					1067				1536			2872					4224	
Volume % Difference					-8%					-				-22%			-31%					-36%	
Speed (mph)					72.5					59.2				58.8			59					35.7	
# of Lanes					2					2				3			3					3	
Density (pc/mi/ln)					10					10				10			18					44	
Level of Service					A					B				A			B					F	

Distance (ft.)	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425	5400	1365	585	12850	965	2195	465
2025 Target (vph)					5844						5015				3677		3031			2583			
2025 Sim. Vol. (vph)					4327						4832				3629		3049			2594			
Volume % Difference					-26%						-4%				-1%		1%			0%			
Speed (mph)					21.2						53.3				46.2		57.1			69.7			
# of Lanes					3						3				2		2			2			
Density (pc/mi/ln)					76						34				44		30			21			
Level of Service					F						D				F		D			C			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 AM - Base Condition: Data Collection Points (I-29/I-94 Interchange

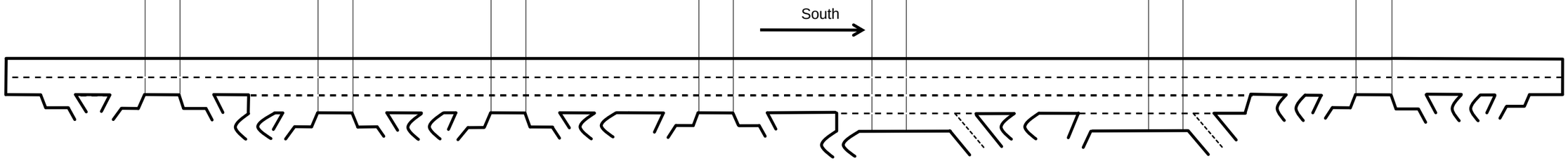
	1	2	3	4	5	6	7	8	9	10
2025 Target (vph)	768	242	1267	407	587	903	526	1113	585	2027
2025 Sim. Vol. (vph)	785	260	793	410	585	922	526	1100	586	1404
Volume % Difference	2%	7%	-37%	1%	0%	2%	0%	-1%	0%	-31%
Speed (mph)	59	54	24	54	53	24	55	54	25	53
# of Lanes	2	1	1	1	1	1	2	2	1	1
Density (pc/mi/ln)	7	5	36	8	12	43	5	11	26	30

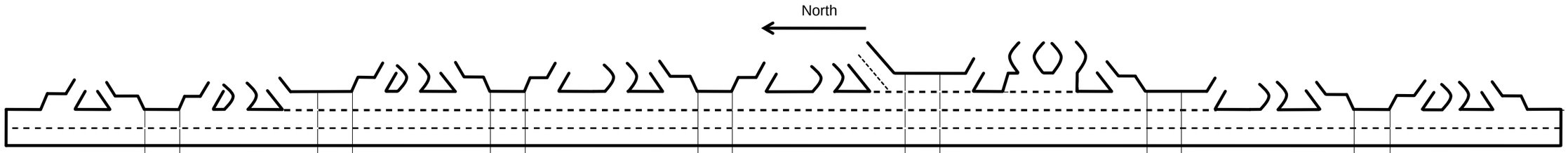
This data increased the original density by 10%.

I-29 Data Collection: 2025 PM Peak Hour - Base Condition

Southbound

	CR20					19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895			815	1050	1270	625	7200	620	670	960	510	1900
2025 Target (vph)					1422					1859					2859						3928				4837						3380							3321					
2025 Sim. Vol. (vph)					1445					1886					2890						3947				4758						3371							3317					
Volume % Difference					2%					1%					1%						0%				-2%						0%							0%					
Speed (mph)					73.6					59.3					58						55.6				53.9						58.3							68.2					
# of Lanes					2					3					3						3				4						4							2					
Density (pc/mi/ln)					11					12					18						26				25						16							27					
Level of Service					B					B					B						C				C						B							C					





Northbound

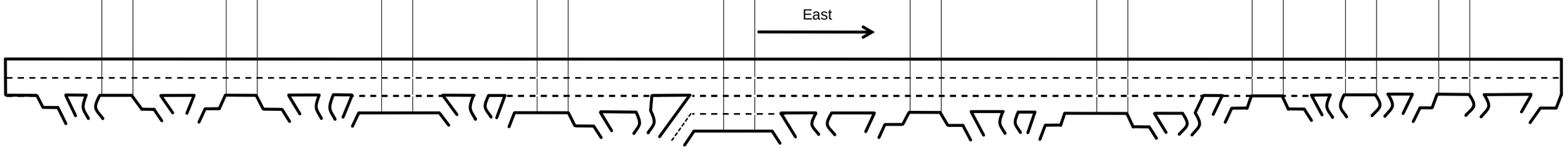
	CR 20					19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310		2100		910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Target (vph)					2251					2138					2280						2392					2482							2471						2339					
2025 Sim. Vol. (vph)					2274					2161					2298						2410					2505							2442						2352					
Volume % Difference					1%					1%					1%						1%					1%							-1%						1%					
Speed (mph)					72.9					59.1					58.9						58.5					59							54.7						72.2					
# of Lanes					2					3					3						3					4							3						2					
Density (pc/mi/ln)					17					14					14						15					12							17						18					
Level of Service					B					B					B						B					B							B						B					

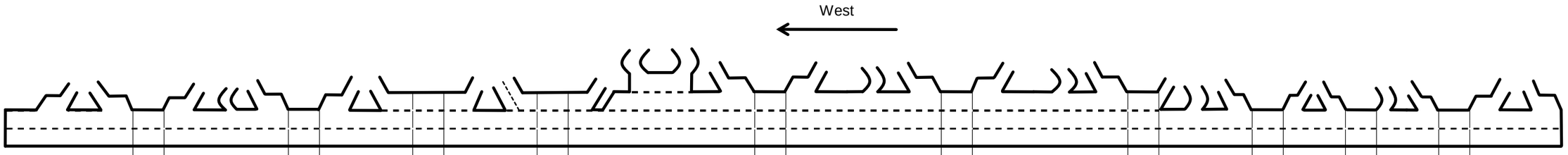
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 PM Peak Hour - Base Condition

Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.				I-29					25th St.					University Dr.					TH 75				20th St.				34th St.				MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185		760	465	1345	1365	1805		910	730	1465	515	870	960	740	1050	1125	4225		520	1445	790	2315		1665	5910	2110	575	14825	710	1365	1080
2025 Target (vph)				1568				1590					2199					3819						5894						5494					4988					3581				3042				2995			
2025 Sim. Vol. (vph)				1589				1612					2226					3847						5660						5295					4858					3562				2983				2959			
Volume % Difference				1%				-					1%					1%						-4%						-4%					-3%					-1%				-2%				-1%			
Speed (mph)				73.4				58.5					59.1					57.7						43.9						54.1					56.3					54.6				56.9				69.7			
# of Lanes				2				2					3					3						4						3					3					2				2				2			
Density (pc/mi/ln)				12				15					14					25						36						36					32					36				29				24			
Level of Service				B				B					B					C						E						E					D					E				D				C			

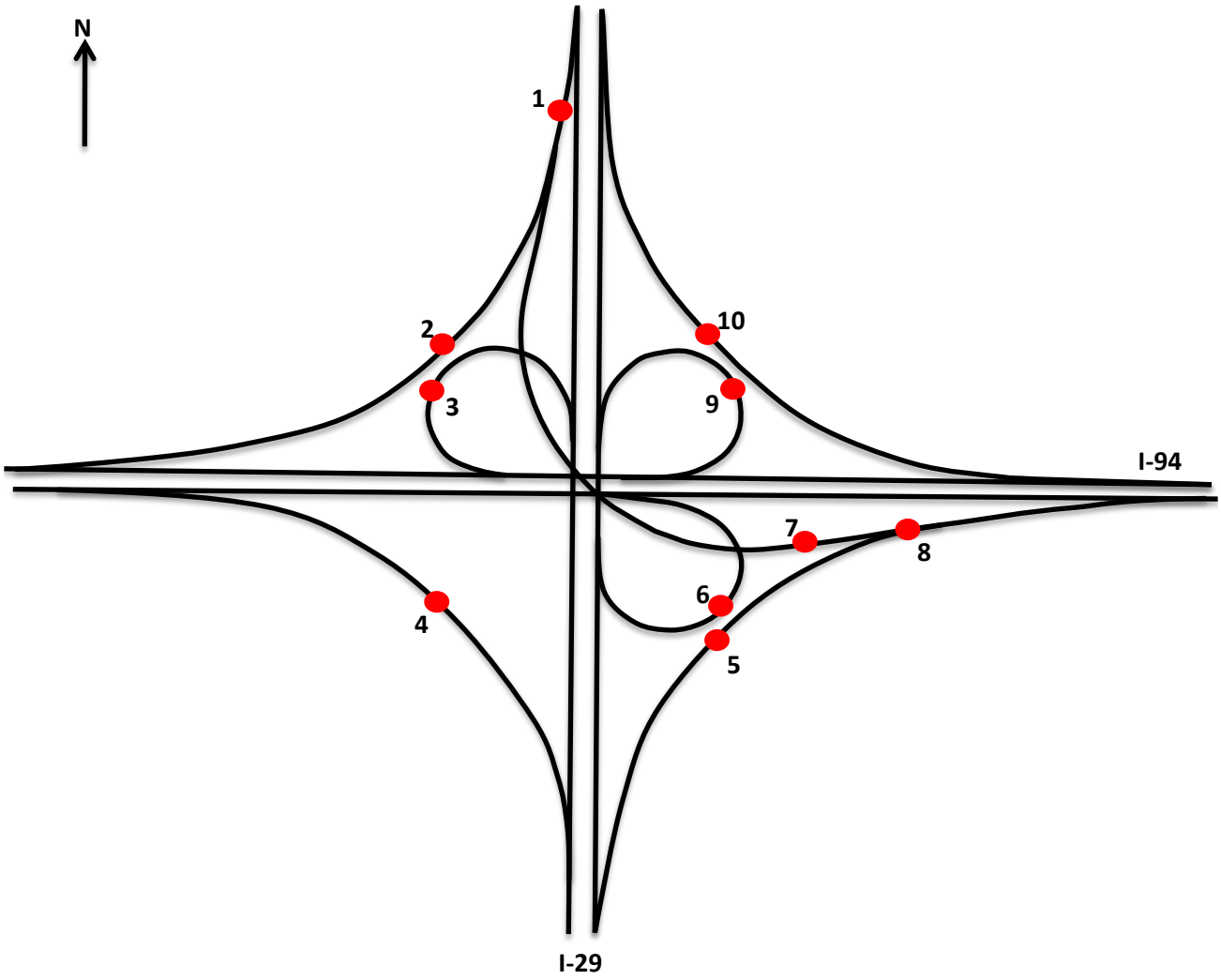




Westbound

	Main Ave.				Sheyenne St.					9th St.					45th St.				I-29									25th St.									University Dr.									TH 75						20th St.								34th St.								MN 336			
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375				1490	975			945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425			5400	1365	585	12850	965	2195	465
2025 Target (vph)					1967					1790				2787				3659									4287						3900						3787				2878				2386				1955			
2025 Sim. Vol. (vph)					1991					1810				2804				3671									4317						3927						3811				2961				2399				1964			
Volume % Difference					1%					-				1%				0%									1%						1%						1%				3%				1%				0%			
Speed (mph)					70.7					58.4				57.6				58.3									56.1						57.3						57.9				57.2				57.8				69.9			
# of Lanes					2					2				3				3									3						3						3				2				2				2			
Density (pc/mi/ln)					16					17				18				23									29						25						24				29				23				16			
Level of Service					B					B				B				C									D						C						C				D				C				B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 PM - Base Condition: Data Collection Points (I-29/I-94 Interchange

	1	2	3	4	5	6	7	8	9	10
2025 Target (vph)	2828	716	785	585	931	382	2112	3043	441	1001
2025 Sim. Vol. (vph)	2756	711	791	589	878	399	1986	2830	436	1010
Volume % Difference	-3%	-1%	1%	1%	-6%	5%	-6%	-7%	-1%	1%
Speed (mph)	51	54	24	54	46	25	43	38	25	54
# of Lanes	2	1	1	1	1	1	2	2	1	1
Density (pc/mi/ln)	30	15	36	12	21	18	26	41	19	21

This data increased the original density by 10%.

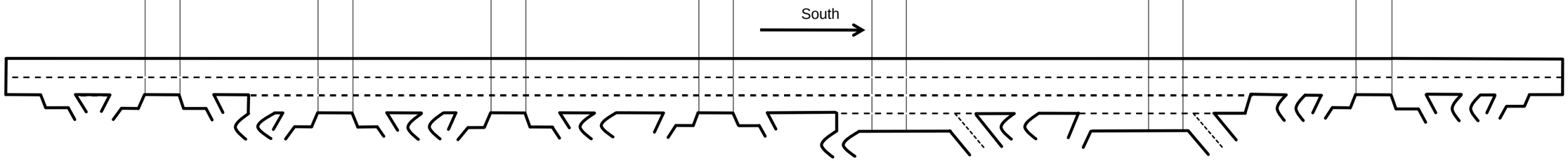
Themed Alternative 1

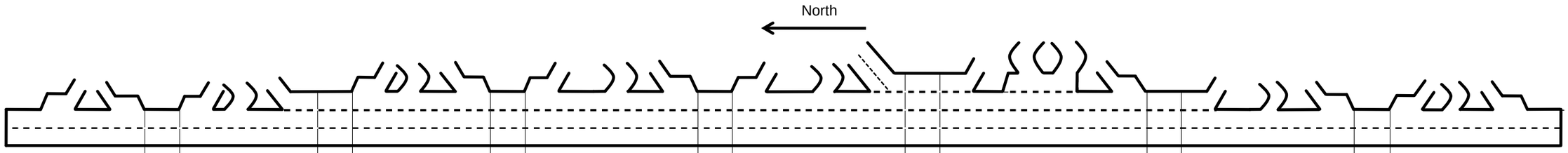
This scenario applied volume reductions of 5%, 10%, and 20% to the VISSIM model. The network that was used was the base-case scenario. No other modifications were done to the network. The summary of the VISSIM output (Level of Service) results for the AM and PM networks are provided on the following pages.

I-29 Data Collection: 2025 AM Peak Hour - Themed Alternative 1: 5% Reduction

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895			815	1050	1270	625	7200	620	670	960	510	1900
2025 Original (vph)					1707					1889					1686						1513				1582						2488							2138					
2025 Sim. Vol. (vph)					1647					1820					1629						1462				1526						1967							1795					
Volume % Difference					-4%					-4%					-3%						-3%				-4%						-21%							-16%					
Speed (mph)					73.2					59					59						57				59						59.2							73.1					
# of Lanes					2					3					3						3				4						4							2					
Density (pc/mi/ln)					12					11					10						9				7						9							14					
Level of Service					B					B					B						A				A						A							B					





Northbound

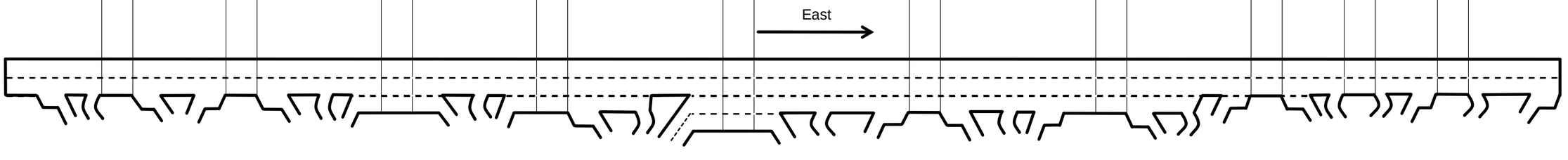
	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310		2100		910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Original (vph)					1278					1766					2990						4162					5492							3735						3157					
2025 Sim. Vol. (vph)					1199					1613					2676						3658					4721							3565						3014					
Volume % Difference					-6%					-9%					-11%						-12%					-14%							-5%						-5%					
Speed (mph)					74.2					58.8					58.2						56.9					57.6							57.7						71.1					
# of Lanes					2					3					3						3					4							3						2					
Density (pc/mi/ln)					9					10					17						24					23							23						24					
Level of Service					A					B					B						C					C							C						C					

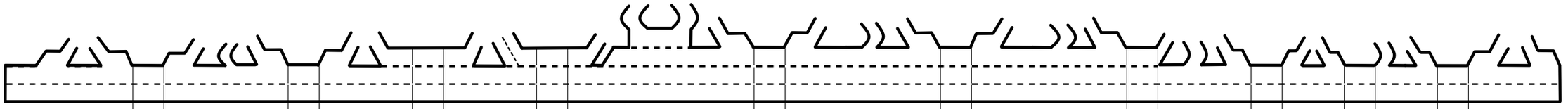
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 AM Peak Hour - Themed Alternative 1: 5% Reduction

Eastbound

	Main Ave.				Sheyenne St.				9th St.				45th St.				I-29									25th St.						University Dr.								TH 75				20th St.				34th St.				MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185		760	465	1345	1365	1805		910	730	1465	515	870	960	740	1050	1125	4225		520	1445	790	2315		1665	5910	2110	575	14825	710	1365	1080
2025 Original (vph)				1662				1906					2551					2959					2762						2928					2755					2124			1756			1572			
2025 Sim. Vol. (vph)				1596				1829					2445					2839					2630						2456					2044					1687			1379			1265			
Volume % Difference				-4%				-					-4%					-4%					-5%						-16%					-26%					-21%			-21%			-20%			
Speed (mph)				73.4				58.3					58.8					57.7					57.1						58.6					59					58.4			58.8			70			
# of Lanes				2				2					3					3					4						3					3					2			2			2			
Density (pc/mi/ln)				12				17					15					18					13						16					13					16			13			10			
Level of Service				B				B					B					B					B						B					B					B			B			B			

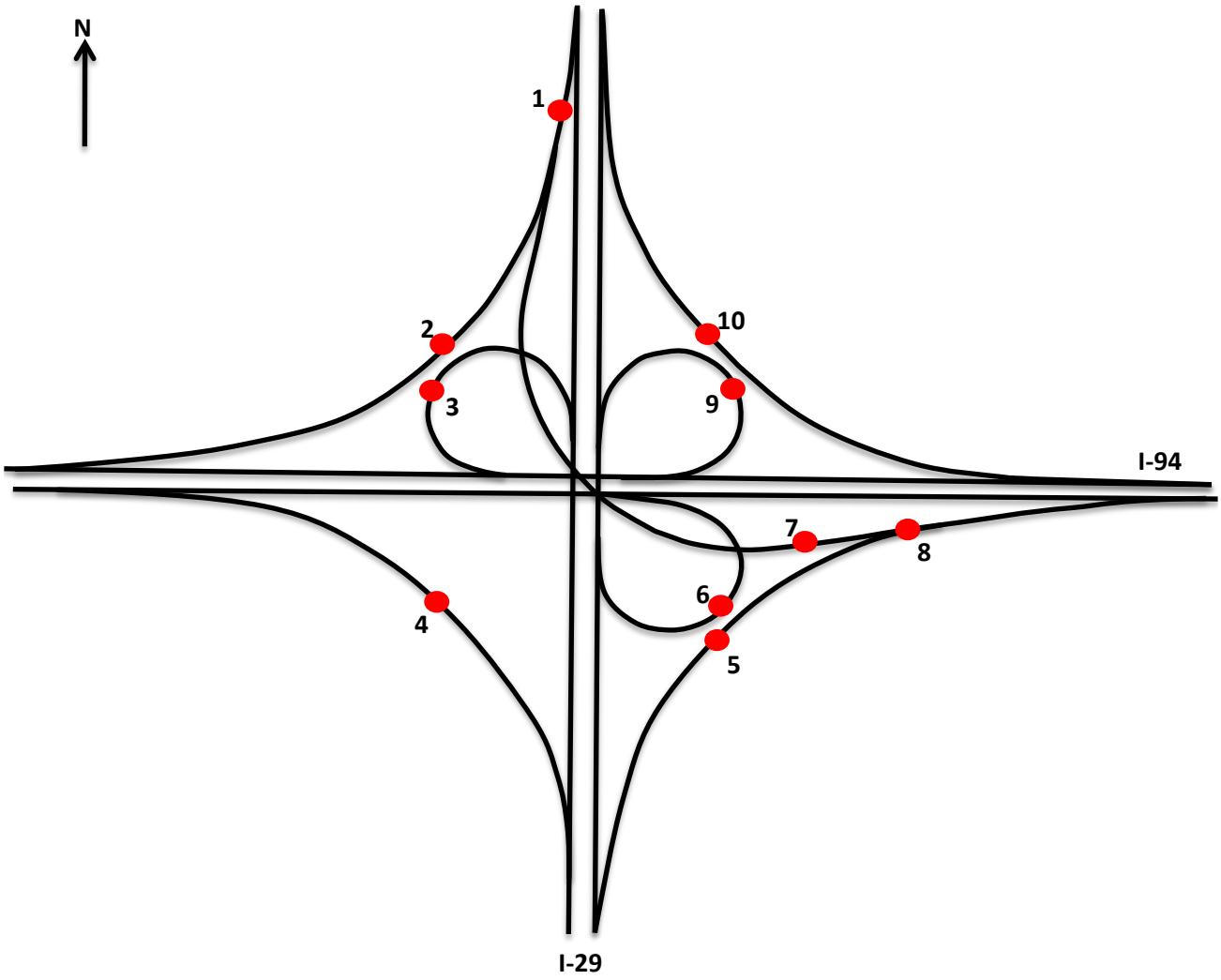




Westbound

	Main Ave.				Sheyenne St.				9th St.				45th St.				I-29									25th St.						University Dr.								TH 75				20th St.				34th St.				MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375		1490	975		945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425		5400	1365	585	12850	965	2195	465
2025 Original (vph)					1418					1254				1979				4134						6601						5844						5015				3677			3031			2583			
2025 Sim. Vol. (vph)					1243					1026				1493				2828						4206						4323						4750				3550			2896			2462			
Volume % Difference					-12%					-				-25%				-32%						-36%						-26%						-5%				-3%			-4%			-5%			
Speed (mph)					72.6					59.2				58.8				59						35.8						20.9						55.1				54.4			57.4			69.8			
# of Lanes					2					2				3				3						3						3						3				2			2			2			
Density (pc/mi/ln)					10					10				9				18						44						77						32				36			28			20			
Level of Service					A					A				A				B						F						F						D				E			D			B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 AM - Themed Alternative 1: 5% Reduction - Data Collection Points (I-29/I-94 Interchange)

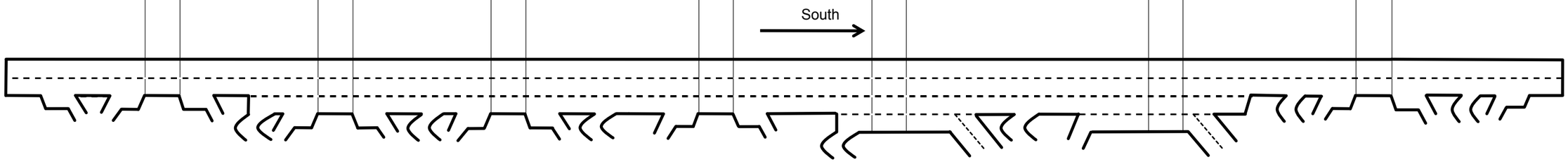
	1	2	3	4	5	6	7	8	9	10
2025 Original (vph)	768	242	1267	407	587	903	526	1113	585	2027
2025 Sim. Vol. (vph)	747	248	795	392	561	878	500	1062	556	1393
Volume % Difference	-3%	2%	-37%	-4%	-4%	-3%	-5%	-5%	-5%	-31%
Speed (mph)	59	55	24	55	54	24	55	56	25	53
# of Lanes	2	1	1	1	1	1	2	2	1	1
Density (pc/mi/ln)	7	5	36	8	12	41	5	10	25	29

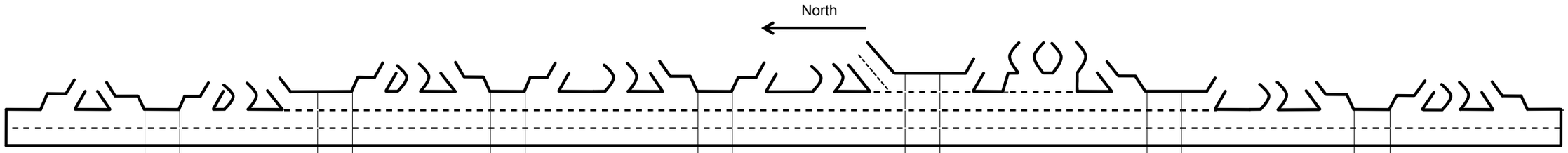
This data increased the original density by 10%.

I-29 Data Collection: 2025 PM Peak Hour - Themed Alternative 1: 5% Reduction

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94							32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895			815	1050	1270	625	7200	620	670	960	510	1900
2025 Original (vph)					1422					1859					2859						3928				4837						3380							3321					
2025 Sim. Vol. (vph)					1374					1785					2735						3754				4634						3236							3182					
Volume % Difference					-3%					-4%					-4%						-4%				-4%						-4%							-4%					
Speed (mph)					73.7					59.3					58.1						56.1				57						58.4							69.9					
# of Lanes					2					3					3						3				4						4							2					
Density (pc/mi/ln)					10					11					17						25				23						15							25					
Level of Service					B					B					B						C				C						B							C					





Northbound

	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94							32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310		2100		910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Original (vph)					2251					2138					2280						2392					2482							2471						2339					
2025 Sim. Vol. (vph)					2160					2058					2191						2300					2392							2361						2234					
Volume % Difference					-4%					-4%					-4%						-4%					-4%							-4%						-4%					
Speed (mph)					73					59.1					58.9						58.6					59							57.3						72.3					
# of Lanes					2					3					3						3					4							3						2					
Density (pc/mi/ln)					16					13					14						15					11							15						17					
Level of Service					B					B					B						B					B							B						B					

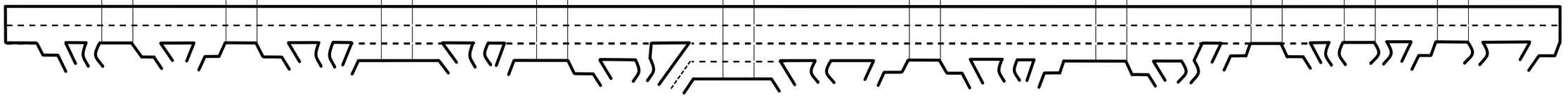
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 PM Peak Hour - Themed Alternative 1: 5% Reduction

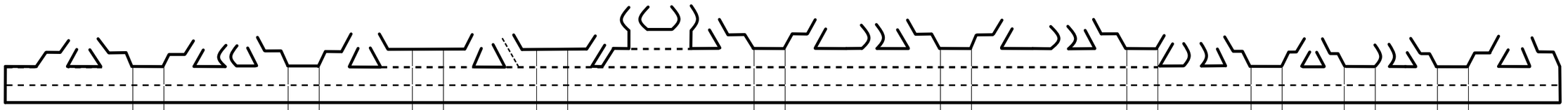
Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.				I-29					25th St.					University Dr.					TH 75			20th St.			34th St.			MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185	760	465	1345	1365	1805	910	730	1465	515	870	960	740	1050	1125	4225	520	1445	790	2315	1665	5910	2110	575	14825	710	1365	1080
2025 Original (vph)				1568				1590					2199				3819					5894					5494					4988				3581			3042			2995			
2025 Sim. Vol. (vph)				1509				1533					2117				3660					5624					5247					4768				3486			2904			2861			
Volume % Difference				-4%				-					-4%				-4%					-5%					-5%					-4%				-3%			-5%			-4%			
Speed (mph)				73.6				58.6					59.1				57.9					53.1					54.7					56.3				55.2			57.3			69.8			
# of Lanes				2				2					3				3					4					3					3				2			2			2			
Density (pc/mi/ln)				11				15					13				23					29					36					31				35			28			23			
Level of Service				B				B					B				C					D					E					D				E			D			C			

East



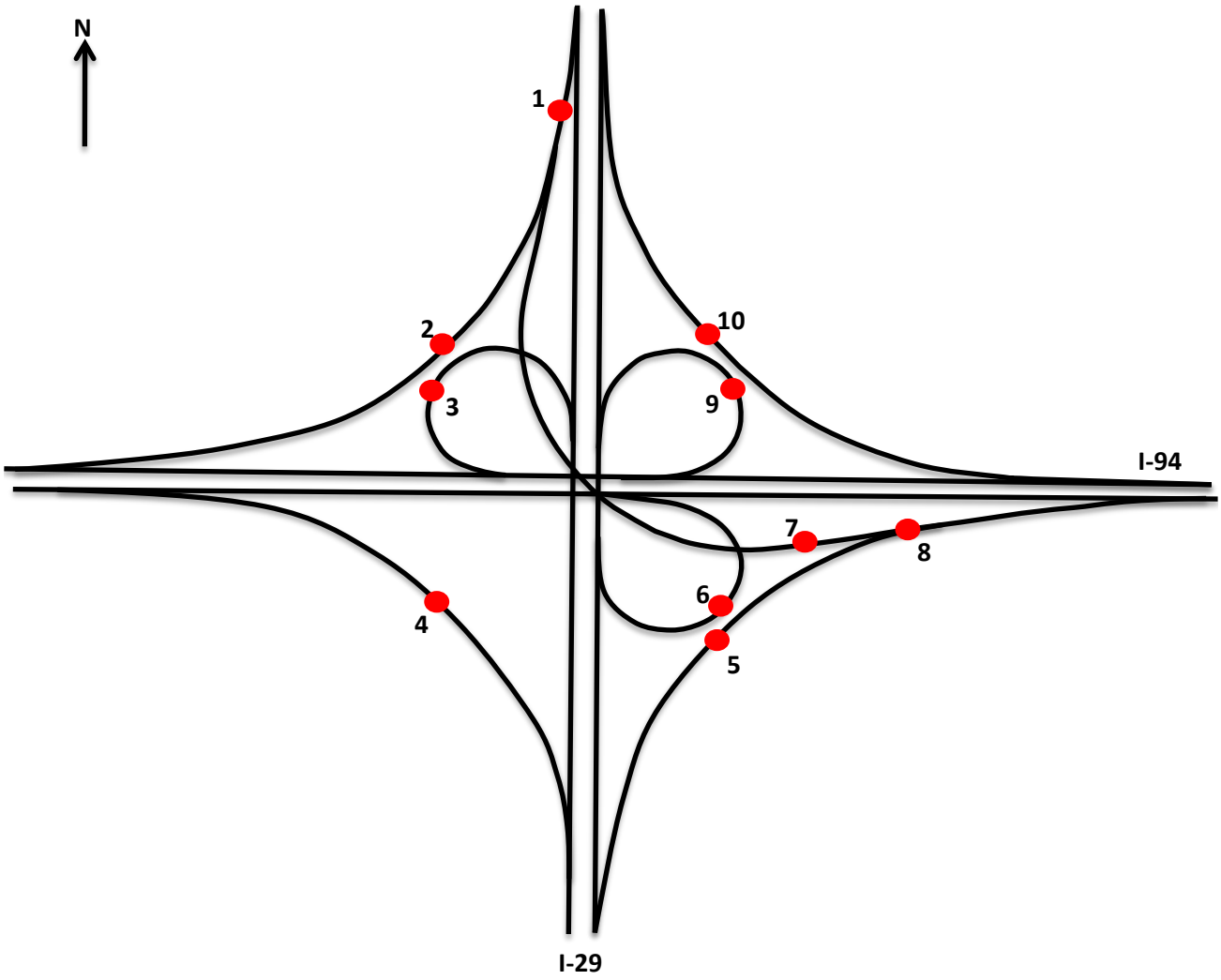
West



Westbound

	Main Ave.				Sheyenne St.					9th St.					45th St.				I-29									25th St.								University Dr.								TH 75			20th St.				34th St.				MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375	1490	975	945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425	5400	1365	585	12850	965	2195	465
2025 Original (vph)					1967					1790				2787			3659					4287						3900						3787				2878		2386			1955			
2025 Sim. Vol. (vph)					1897					1727				2682			3515					4097						3726						3622				2818		2281			1862			
Volume % Difference					-4%					-				-4%			-4%					-4%						-4%						-4%				-2%		-4%			-5%			
Speed (mph)					71					58.5				57.7			58.4					56.6						57.6						57.9				57.4		58			69.9			
# of Lanes					2					2				3			3					3						3						3				2		2			2			
Density (pc/mi/ln)					15					16				17			22					27						24						23				27		22			15			
Level of Service					B					B				B			C					C						C						C				C		C			B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 PM - Themed Alternative 1: 5% Reduction: Data Collection Points (I-29/I-94 Interchange)

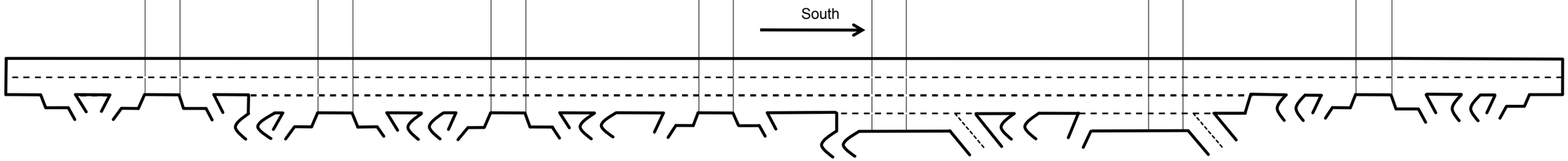
	1	2	3	4	5	6	7	8	9	10
2025 Original (vph)	2828	716	785	585	931	382	2112	3043	441	1001
2025 Sim. Vol. (vph)	2720	698	752	560	888	380	2015	2901	421	958
Volume % Difference	-4%	-2%	-4%	-4%	-5%	-1%	-5%	-5%	-5%	-4%
Speed (mph)	56	54	24	54	52	25	52	49	25	54
# of Lanes	2	1	1	1	1	1	2	2	1	1
Density (pc/mi/ln)	27	14	34	11	19	17	21	33	19	20

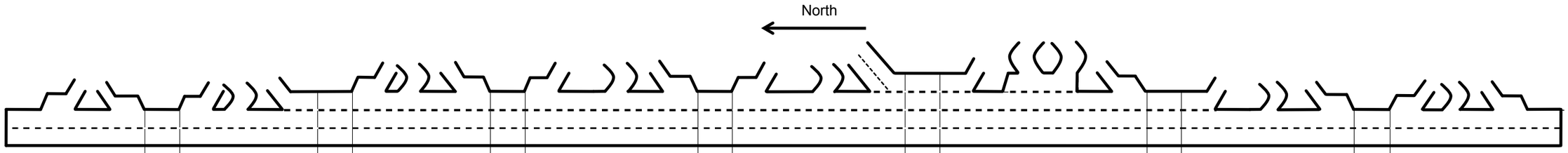
This data increased the original density by 10%.

I-29 Data Collection: 2025 AM Peak Hour - Themed Alternative 1: 10% Reduction

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94						32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895			815	1050	1270	625	7200	620	670	960	510	1900
2025 Original (vph)					1707					1889					1686						1513				1582						2488							2138					
2025 Sim. Vol. (vph)					1560					1724					1543						1386				1445						1916							1727					
Volume % Difference					-9%					-9%					-9%						-8%				-9%						-23%							-19%					
Speed (mph)					73.3					59.1					59.1						57.1				59						59.3							73.2					
# of Lanes					2					3					3						3				4						4							2					
Density (pc/mi/ln)					12					11					10						9				7						9							13					
Level of Service					B					B					A						A				A						A							B					





Northbound

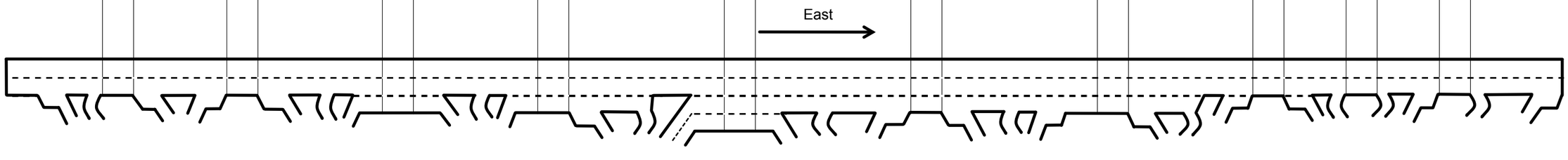
	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94						32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310		2100		910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Original (vph)					1278					1766					2990						4162					5492						3735							3157					
2025 Sim. Vol. (vph)					1145					1541					2560						3504					4527						3378							2857					
Volume % Difference					-10%					-13%					-14%						-16%					-18%						-10%							-10%					
Speed (mph)					74.2					58.8					58.2						57.2					57.8						57.9							71.5					
# of Lanes					2					3					3						3					4						3							2					
Density (pc/mi/ln)					9					10					16						23					22						22							22					
Level of Service					A					A					B						C					C						C							C					

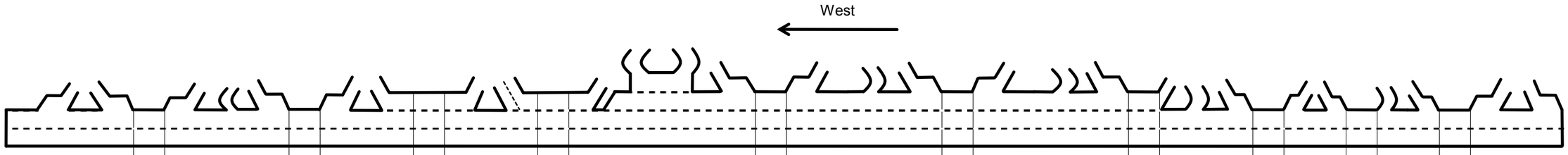
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 AM Peak Hour - Themed Alternative 1: 10% Reduction

Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.				I-29					25th St.					University Dr.					TH 75			20th St.			34th St.					MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185		760	465	1345	1365	1805		910	730	1465	515	870	960	740	1050	1125	4225		520	1445	790	2315		1665	5910	2110	575	14825	710	1365	1080
2025 Original (vph)				1662				1906					2551				2959						2762						2928					2755					2124			1756			1572			
2025 Sim. Vol. (vph)				1512				1734					2314				2687						2490						2336					2044					1669			1364			1250			
Volume % Difference				-9%				-					-9%				-9%						-10%						-20%					-26%					-21%			-22%			-21%			
Speed (mph)				73.6				58.4					58.8				57.8						57.5						58.6					59					58.4			58.9			70			
# of Lanes				2				2					3				3						4						3					3					2			2			2			
Density (pc/mi/ln)				11				16					15				17						12						15					13					16			13			10			
Level of Service				B				B					B				B						B						B					B					B			B			A			

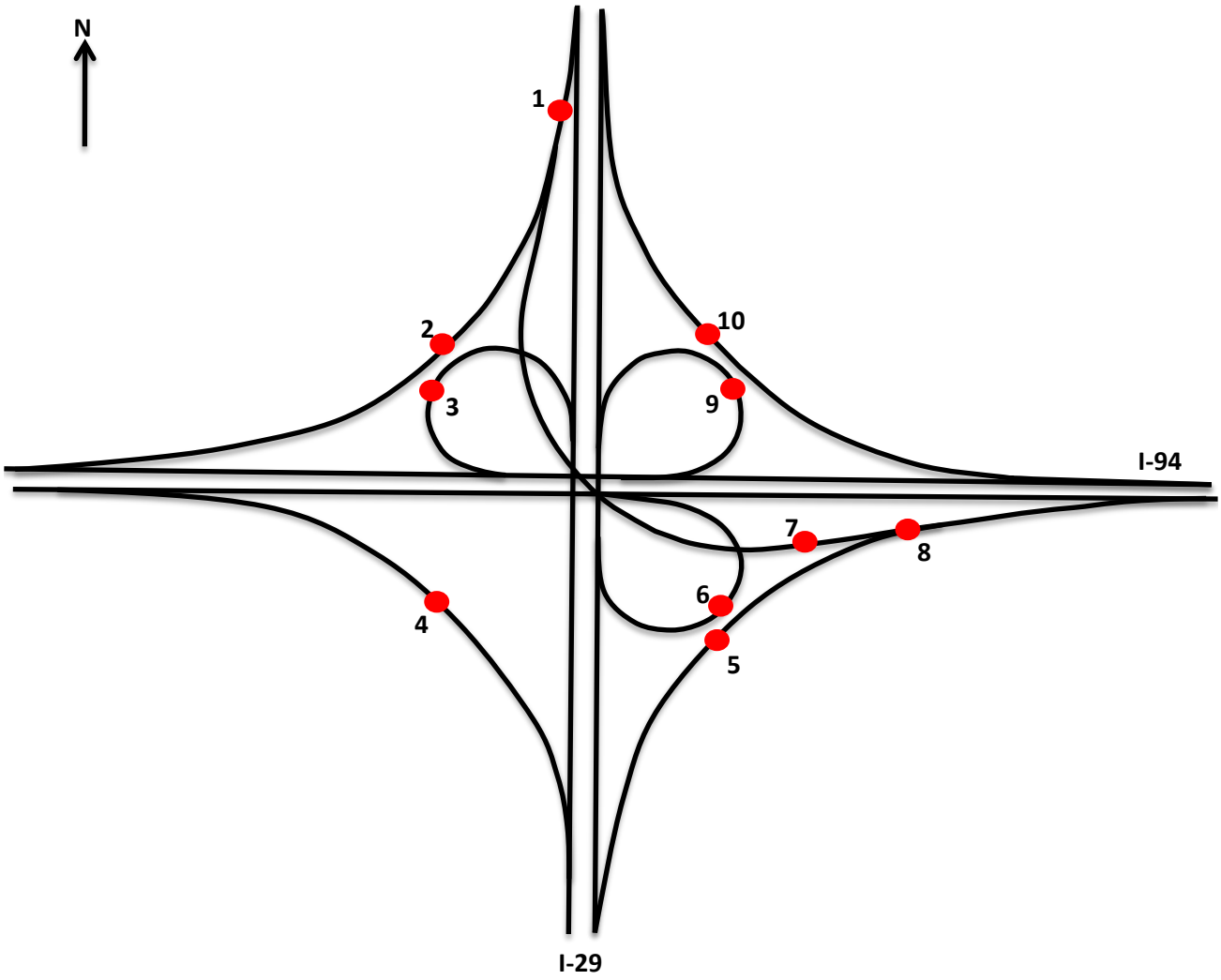




Westbound

	Main Ave.				Sheyenne St.					9th St.				45th St.				I-29									25th St.								University Dr.								TH 75			20th St.				34th St.				MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375			1490	975		945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425		5400	1365	585	12850	965	2195	465
2025 Original (vph)					1418					1254				1979			4134						6601						5844					5015					3677			3031			2583			
2025 Sim. Vol. (vph)					1192					991				1455			2798						4224						4339					4547					3361			2748			2333			
Volume % Difference					-16%					-				-26%			-32%						-36%						-26%					-9%					-9%			-9%			-10%			
Speed (mph)					72.7					59.3				58.9			59						35.4						20.6					57.6					56.1			57.5			69.8			
# of Lanes					2					2				3			3						3						3					3					2			2			2			
Density (pc/mi/ln)					9					9				9			18						44						78					29					33			27			19			
Level of Service					A					A				A			B						F						F					D					D			C			B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 AM - Themed Alternative 1: 10% Reduction - Data Collection Points (I-29/I-94 Interchange)

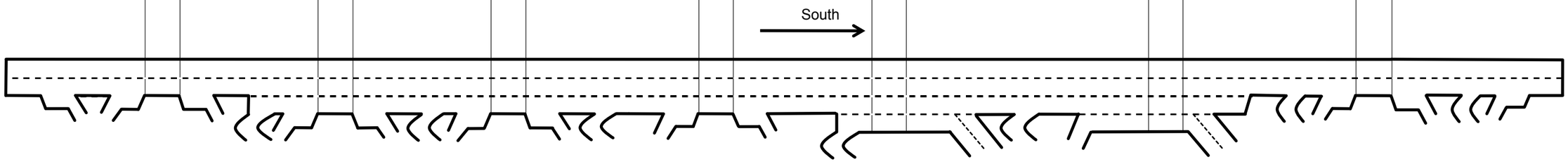
	1	2	3	4	5	6	7	8	9	10
2025 Original (vph)	768	242	1267	407	587	903	526	1113	585	2027
2025 Sim. Vol. (vph)	709	234	806	371	532	826	474	1005	529	1382
Volume % Difference	-8%	-3%	-36%	-9%	-9%	-9%	-10%	-10%	-10%	-32%
Speed (mph)	59	55	24	55	54	24	55	56	25	53
# of Lanes	2	1	1	1	1	1	2	2	1	1
Density (pc/mi/ln)	7	5	37	8	11	38	5	10	24	29

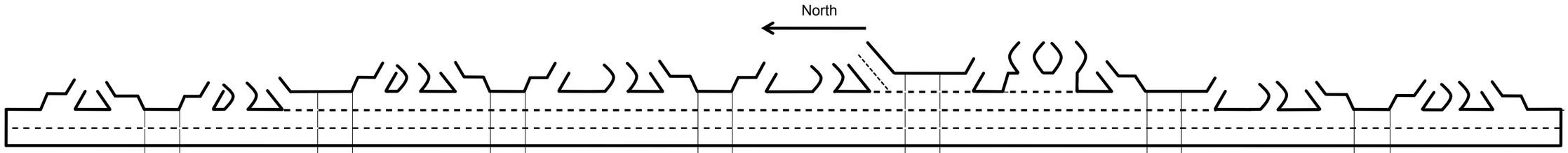
This data increased the original density by 10%.

I-29 Data Collection: 2025 PM Peak Hour - Themed Alternative 1: 10% Reduction

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94						32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895			815	1050	1270	625	7200	620	670	960	510	1900
2025 Original (vph)					1422					1859					2859						3928				4837						3380						3321					
2025 Sim. Vol. (vph)					1300					1695					2594						3557				4391						3067						3012					
Volume % Difference					-9%					-9%					-9%						-9%				-9%						-9%						-9%					
Speed (mph)					73.8					59.3					58.2						56.4				57						58.5						70.7					
# of Lanes					2					3					3						3				4						4						2					
Density (pc/mi/ln)					10					11					16						23				21						15						24					
Level of Service					A					B					B						C				C						B						C					





Northbound

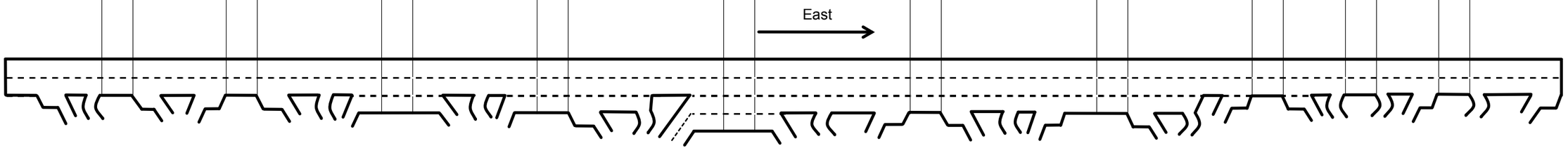
	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94						32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310	2100			910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Original (vph)					2251					2138					2280						2392					2482							2471						2339					
2025 Sim. Vol. (vph)					2053					1949					2081						2183					2267							2233						2112					
Volume % Difference					-9%					-9%					-9%						-9%					-9%							-10%						-10%					
Speed (mph)					73.1					59.2					58.9						58.7					59.1							57.5						72.5					
# of Lanes					2					3					3						3					4							3						2					
Density (pc/mi/ln)					16					12					13						14					11							14						16					
Level of Service					B					B					B						B					B							B						B					

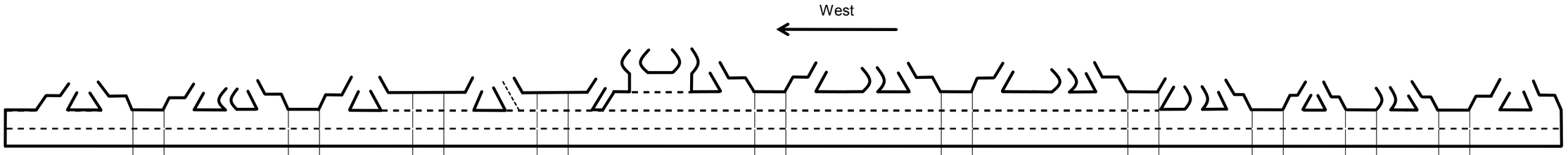
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 PM Peak Hour - Themed Alternative 1: 10% Reduction

Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.				I-29					25th St.					University Dr.					TH 75			20th St.			34th St.			MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185	760	465	1345	1365	1805	910	730	1465	515	870	960	740	1050	1125	4225	520	1445	790	2315	1665	5910	2110	575	14825	710	1365	1080
2025 Original (vph)				1568				1590					2199				3819					5894					5494					4988				3581			3042			2995			
2025 Sim. Vol. (vph)				1431				1455					2004				3464					5332					4968					4520				3306			2760			2714			
Volume % Difference				-9%				-					-9%				-9%					-10%					-10%					-9%				-8%			-9%			-9%			
Speed (mph)				73.7				58.7					59.2				58					55.3					55.2					56.9				55.8			57.3			69.8			
# of Lanes				2				2					3				3					4					3					3				2			2			2			
Density (pc/mi/ln)				11				14					13				22					27					33					29				33			27			22			
Level of Service				B				B					B				C					C					D					D				D			C			C			

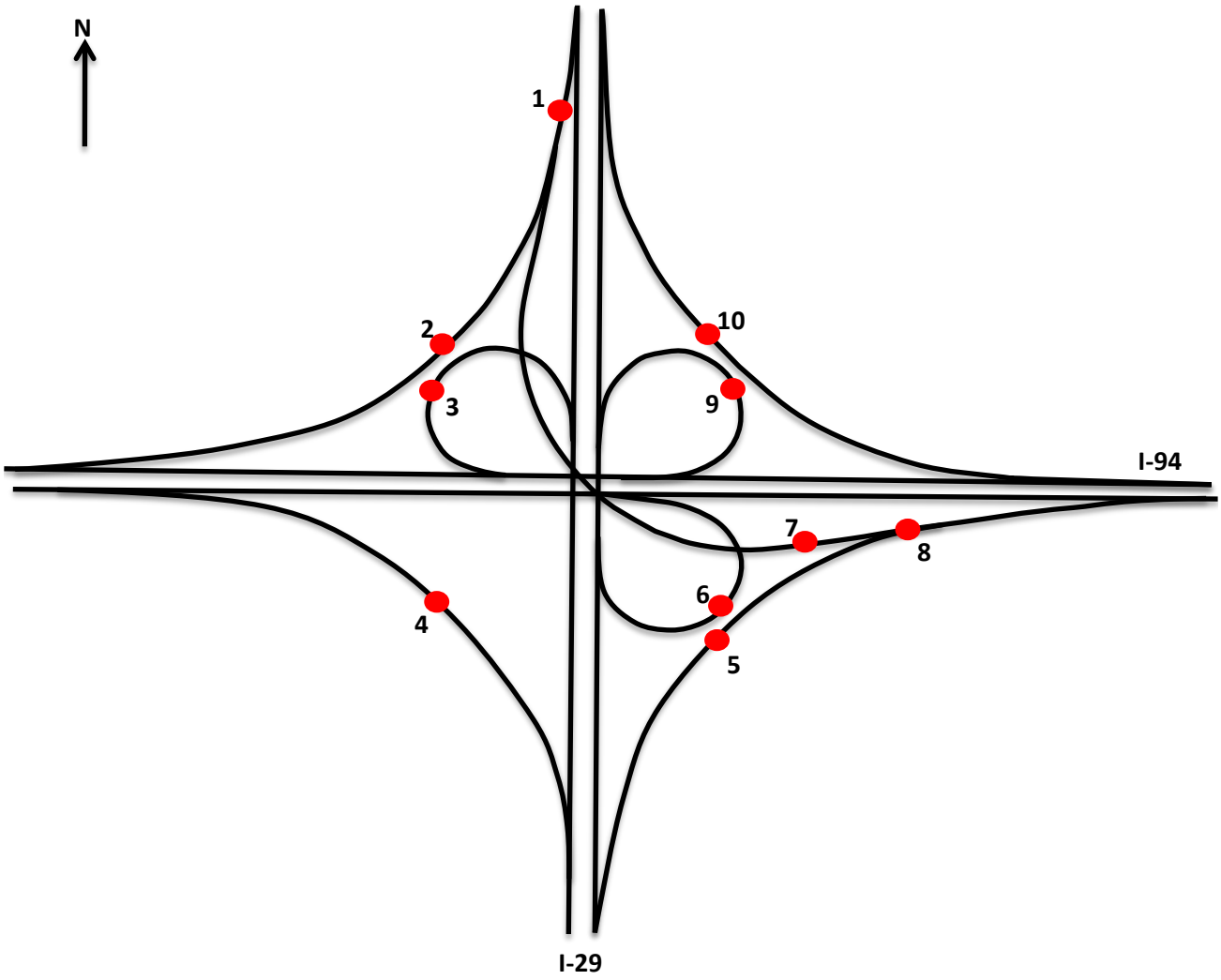




Westbound

	Main Ave.				Sheyenne St.					9th St.				45th St.					I-29							25th St.						University Dr.							TH 75			20th St.				34th St.				MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375			1490	975			945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425		5400	1365	585	12850	965	2195	465
2025 Original (vph)					1967					1790				2787			3659									4287						3900						3787				2878			2386			1955			
2025 Sim. Vol. (vph)					1795					1638				2541			3329									3889						3535						3432				2669			2163			1768			
Volume % Difference					-9%					-				-9%			-9%									-9%						-9%						-9%				-7%			-9%			-10%			
Speed (mph)					71.2					58.6				57.8			58.5									56.9						57.8						58				57.5			58.1			69.9			
# of Lanes					2					2				3			3									3						3						3				2			2			2			
Density (pc/mi/ln)					14					16				16			21									25						23						22				26			21			14			
Level of Service					B					B				B			C									C						C						C				C			C			B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 PM - Themed Alternative 1: 10% Reduction: Data Collection Points (I-29/I-94 Interchange)

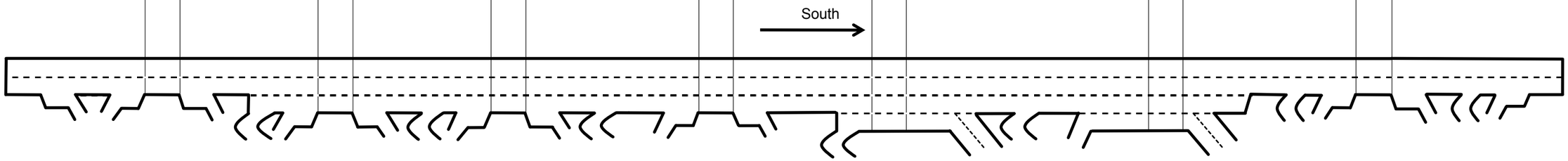
	1	2	3	4	5	6	7	8	9	10
2025 Original (vph)	2828	716	785	585	931	382	2112	3043	441	1001
2025 Sim. Vol. (vph)	2573	661	712	532	838	360	1909	2748	399	912
Volume % Difference	-9%	-8%	-9%	-9%	-10%	-6%	-10%	-10%	-9%	-9%
Speed (mph)	56	54	24	54	53	25	54	51	25	54
# of Lanes	2	1	1	1	1	1	2	2	1	1
Density (pc/mi/ln)	25	14	33	11	18	16	20	30	18	19

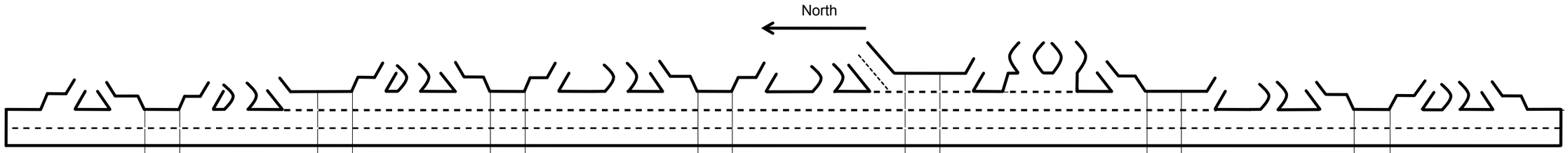
This data increased the original density by 10%.

I-29 Data Collection: 2025 AM Peak Hour - Themed Alternative 1: 20% Reduction

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895				815	1050	1270	625	7200	620	670	960	510	1900
2025 Original (vph)					1707					1889					1686						1513				1582						2488							2138					
2025 Sim. Vol. (vph)					1387					1532					1370						1231				1285						1826							1609					
Volume % Difference					-19%					-19%					-19%						-19%				-19%						-27%							-25%					
Speed (mph)					73.6					59.2					59.2						57.4				59.1						59.3							73.4					
# of Lanes					2					3					3						3				4						4							2					
Density (pc/mi/ln)					10					10					9						8				6						9							12					
Level of Service					B					A					A						A				A						A							B					





Northbound

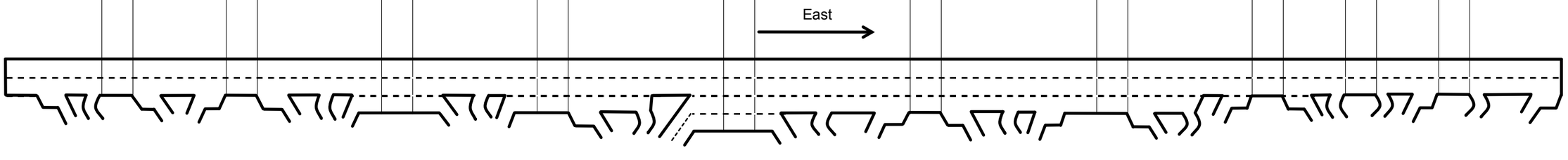
	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310	2100			910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Original (vph)					1278					1766					2990						4162					5492								3735						3157					
2025 Sim. Vol. (vph)					1023					1389					2324						3201					4172								3002						2539					
Volume % Difference					-20%					-21%					-22%						-23%					-24%								-20%						-20%					
Speed (mph)					74.4					59					58.4						57.5					58								58.1						72.1					
# of Lanes					2					3					3						3					4								3						2					
Density (pc/mi/ln)					8					9					15						21					20								19						20					
Level of Service					A					A					B						C					B								B						B					

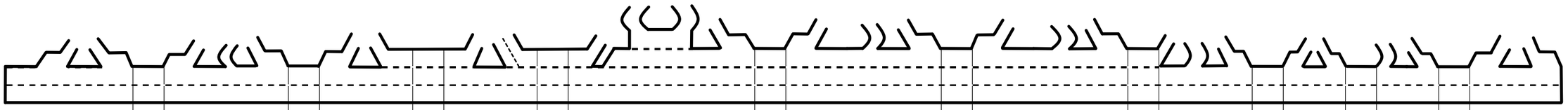
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 AM Peak Hour - Themed Alternative 1: 20% Reduction

Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.				I-29					25th St.					University Dr.					TH 75			20th St.			34th St.			MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185	760	465	1345	1365	1805	910	730	1465	515	870	960	740	1050	1125	4225	520	1445	790	2315	1665	5910	2110	575	14825	710	1365	1080
2025 Original (vph)				1662				1906					2551				2959					2762					2928					2755				2124		1756			1572			
2025 Sim. Vol. (vph)				1344				1542					2055				2389					2222					2129					2051				1644		1343			1211			
Volume % Difference				-19%				-					-19%				-19%					-20%					-27%					-26%				-23%		-24%			-23%			
Speed (mph)				73.9				58.6					59				58.1					59.2					58.7					59				58.5		58.9			70			
# of Lanes				2				2					3				3					4					3					3				2		2			2			
Density (pc/mi/ln)				10				15					13				15					10					13					13				16		13			10			
Level of Service				B				B					B				B					B					B					B				B		B			A			

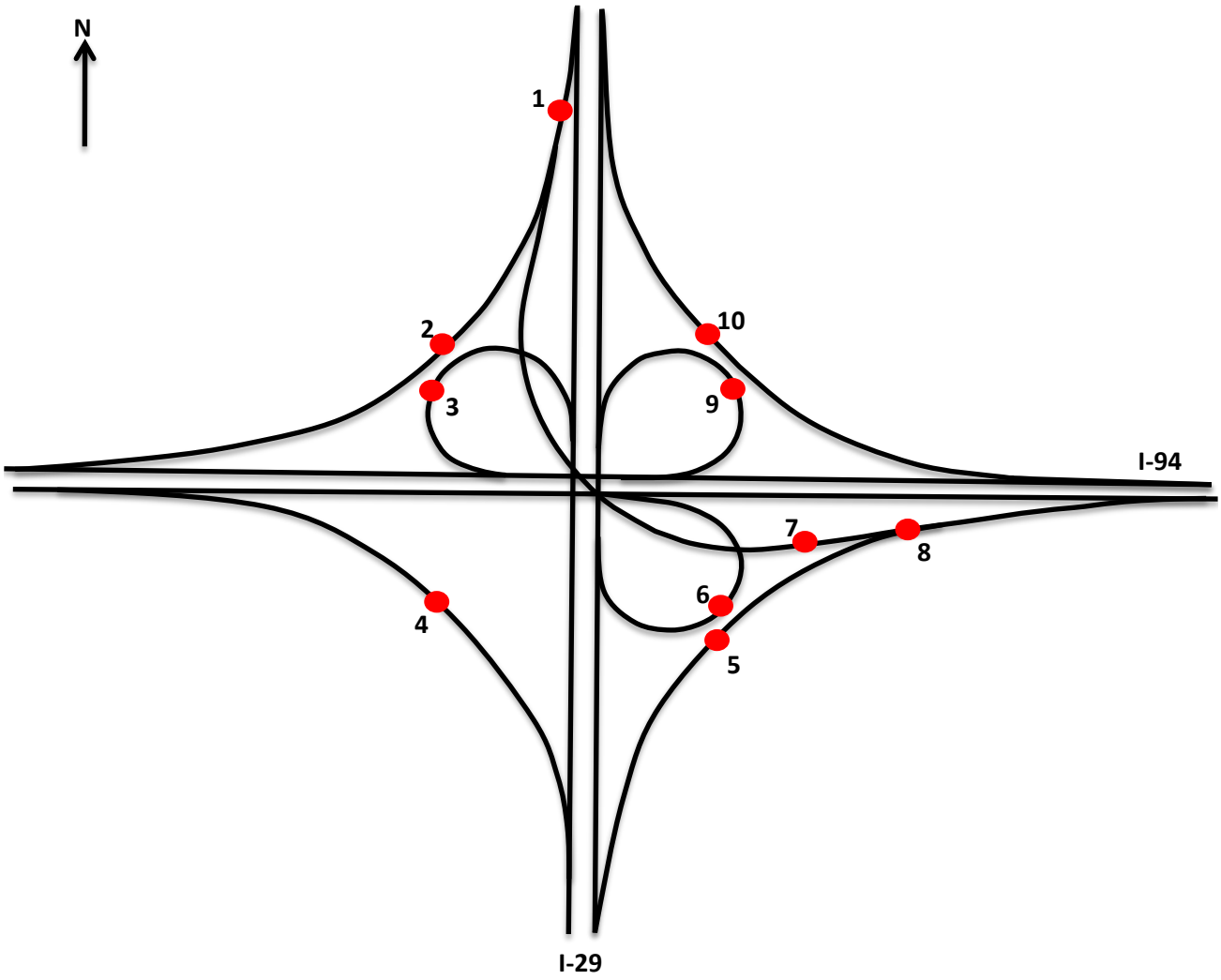




Westbound

	Main Ave.				Sheyenne St.					9th St.				45th St.					I-29									25th St.								University Dr.									TH 75				20th St.					34th St.					MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375				1490	975			945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425		5400	1365	585	12850	965	2195	465
2025 Original (vph)					1418					1254				1979			4134										6601						5844						5015				3677			3031			2583			
2025 Sim. Vol. (vph)					1095					935				1413			2803										4341						4498						4030				2981			2434			2070			
Volume % Difference					-23%					-				-29%			-32%										-34%						-23%						-20%				-19%			-20%			-20%			
Speed (mph)					72.9					59.3				58.8			59										38.1						36.3						57.9				57.2			57.8			69.9			
# of Lanes					2					2				3			3										3						3						3				2			2			2			
Density (pc/mi/ln)					8					9				9			18										42						46						26				29			23			16			
Level of Service					A					A				A			B										E						F						C				D			C			B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 AM - Themed Alternative 1: 20% Reduction - Data Collection Points (I-29/I-94 Interchange)

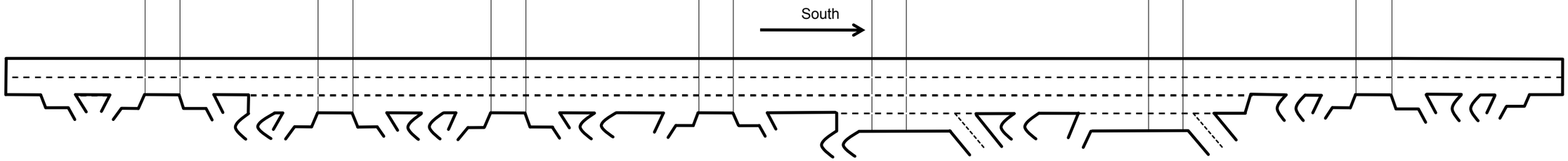
	1	2	3	4	5	6	7	8	9	10
2025 Original (vph)	768	242	1267	407	587	903	526	1113	585	2027
2025 Sim. Vol. (vph)	629	208	838	330	475	736	421	897	469	1373
Volume % Difference	-18%	-14%	-34%	-19%	-19%	-19%	-20%	-19%	-20%	-32%
Speed (mph)	59	55	24	55	54	24	55	57	25	53
# of Lanes	2	1	1	1	1	1	2	2	1	1
Density (pc/mi/ln)	6	4	38	7	10	34	4	9	21	29

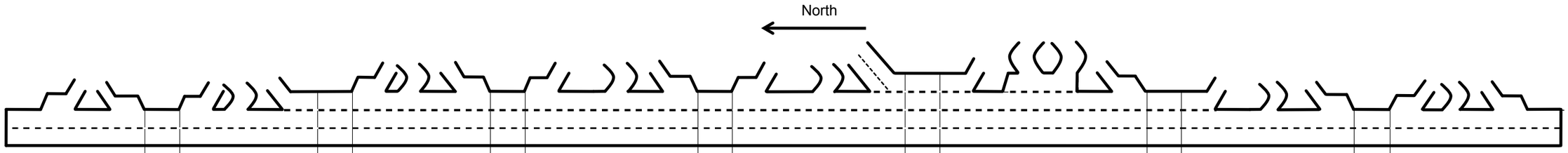
This data increased the original density by 10%.

I-29 Data Collection: 2025 PM Peak Hour - Themed Alternative 1: 20% Reduction

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94						32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895			815	1050	1270	625	7200	620	670	960	510	1900
2025 Original (vph)					1422					1859					2859						3928				4837						3380							3321					
2025 Sim. Vol. (vph)					1155					1505					2306						3162				3901						2722							2675					
Volume % Difference					-19%					-19%					-19%						-20%				-19%						-19%							-19%					
Speed (mph)					74					59.4					58.5						56.9				57.4						58.7							71.7					
# of Lanes					2					3					3						3				4						4							2					
Density (pc/mi/ln)					9					9					15						21				19						13							21					
Level of Service					A					A					B						C				B						B							C					





Northbound

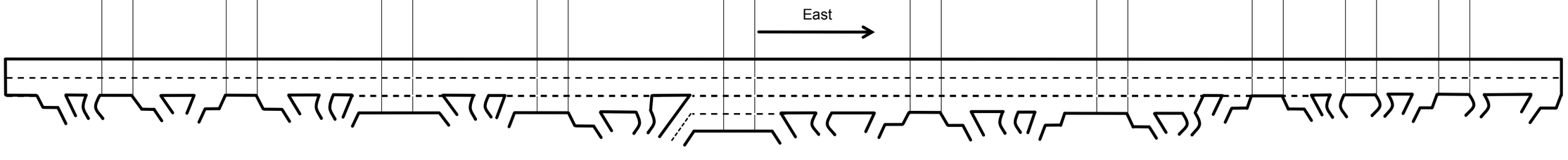
	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94						32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310		2100		910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Original (vph)					2251					2138					2280						2392						2482						2471							2339					
2025 Sim. Vol. (vph)					1823					1733					1846						1935						2013						1981							1873					
Volume % Difference					-19%					-19%					-19%						-19%						-19%						-20%							-20%					
Speed (mph)					73.5					59.3					59.1						58.8						59.2						57.9							73					
# of Lanes					2					3					3						3						4						3							2					
Density (pc/mi/ln)					14					11					12						12						9						13							14					
Level of Service					B					B					B						B						A						B							B					

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

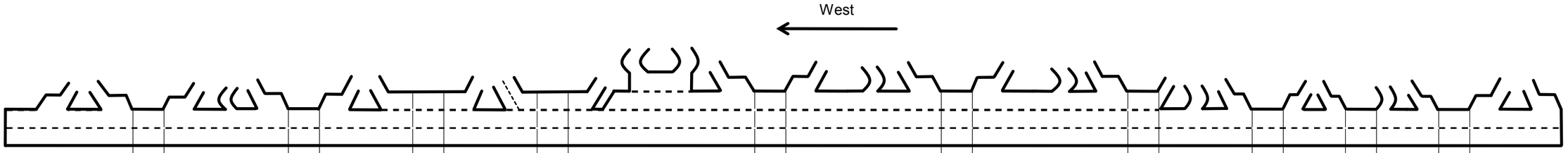
I-94 Data Collection: 2025 PM Peak Hour - Themed Alternative 1: 20% Reduction

Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.				I-29					25th St.					University Dr.					TH 75			20th St.			34th St.			MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185	760	465	1345	1365	1805	910	730	1465	515	870	960	740	1050	1125	4225	520	1445	790	2315	1665	5910	2110	575	14825	710	1365	1080
2025 Original (vph)				1568				1590					2199				3819					5894					5494					4988				3581			3042			2995			
2025 Sim. Vol. (vph)				1271				1291					1779				3086					4747					4422					4022				2945			2457			2418			
Volume % Difference				-19%				-					-19%				-19%					-19%					-20%					-19%				-18%			-19%			-19%			
Speed (mph)				74				58.9					59.3				58.4					57.4					56.5					57.5				56.8			57.7			69.8			
# of Lanes				2				2					3				3					4					3					3				2			2			2			
Density (pc/mi/ln)				10				12					11				20					23					29					26				29			24			19			
Level of Service				A				B					B				B					C					D					C				D			C			B			

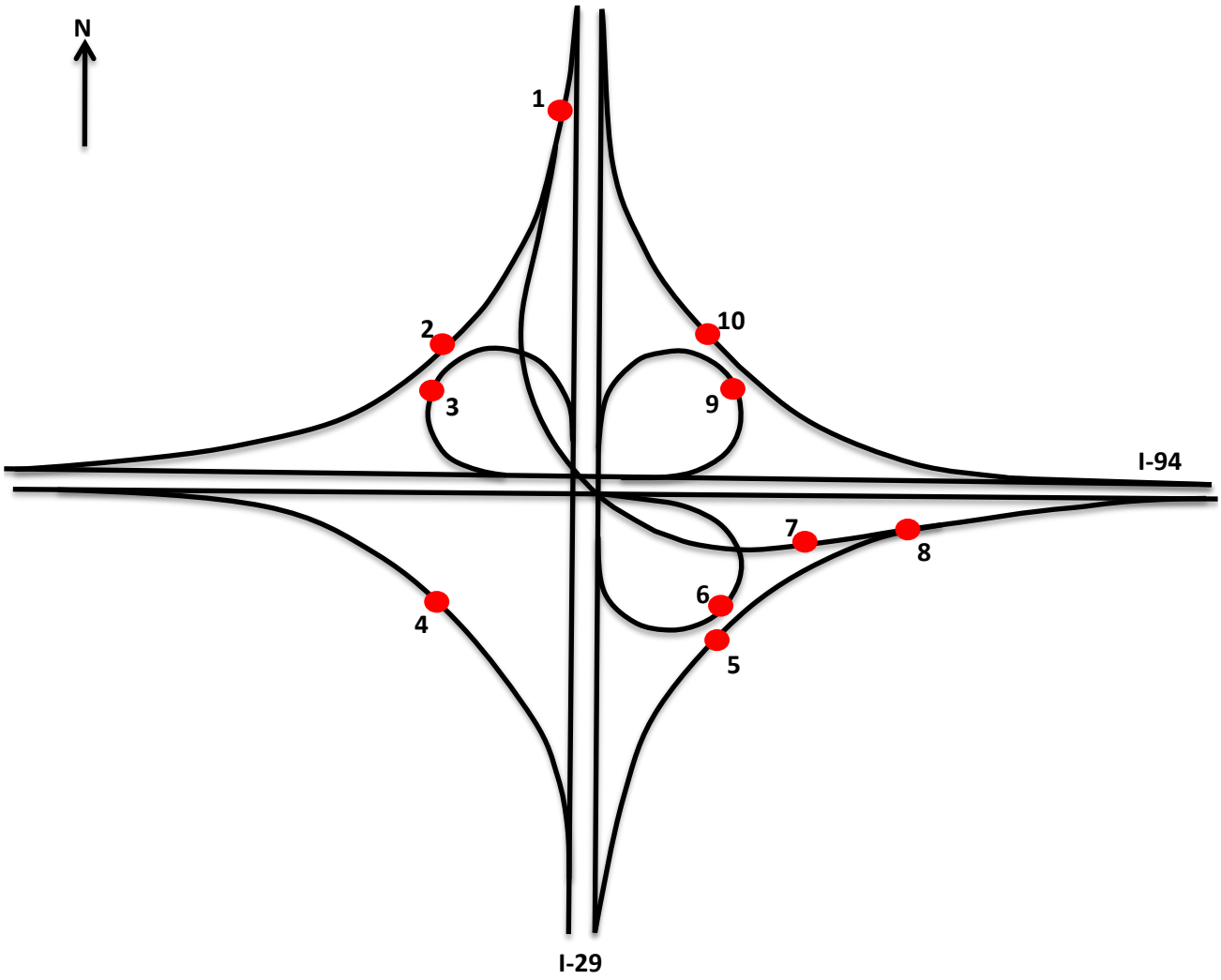


Westbound



	Main Ave.				Sheyenne St.					9th St.					45th St.					I-29											25th St.									University Dr.										TH 75			20th St.					34th St.				MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375	1490	975	945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425	5400	1365	585	12850	965	2195	465
2025 Original (vph)					1967					1790				2787			3659					4287						3900					3787				2878		2386			1955			
2025 Sim. Vol. (vph)					1598					1453				2260			2959					3453						3140					3047				2369		1921			1571			
Volume % Difference					-19%					-				-19%			-19%					-19%						-19%					-20%				-18%		-19%			-20%			
Speed (mph)					71.7					58.8				58.1			58.7					57.6						58.2					58.3				57.9		58.3			69.9			
# of Lanes					2					2				3			3					3						3					3				2		2			2			
Density (pc/mi/ln)					12					14				14			19					22						20					19				23		18			12			
Level of Service					B					B				B			B					C						B					B				C		B			B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 PM - Themed Alternative 1: 20% Reduction: Data Collection Points (I-29/I-94 Interchange)

	1	2	3	4	5	6	7	8	9	10
2025 Original (vph)	2828	716	785	585	931	382	2112	3043	441	1001
2025 Sim. Vol. (vph)	2290	588	632	474	743	319	1699	2444	356	810
Volume % Difference	-19%	-18%	-19%	-19%	-20%	-16%	-20%	-20%	-19%	-19%
Speed (mph)	57	54	24	54	53	25	54	53	25	54
# of Lanes	2	1	1	1	1	1	2	2	1	1
Density (pc/mi/ln)	22	12	29	10	16	14	17	26	16	17

This data increased the original density by 10%.

Themed Alternative 3

This scenario applied ramp meters to the network. The travel demand model was used to evaluate the impacts of ramp meters on traffic patterns and demand volumes on the interstate system. One scenario considered in the travel demand modeling was selected for analysis in the VISSIM simulation model.

Travel Demand Modeling

A volume reduction target of approximately 15% for each ramp was desirable for all the ramps that were modeled. To achieve this target, an iterative process with different travel time delays were modeled for alternatives 3 A through 3E using the travel demand model. Travel time delays of 30, 60 and 120 seconds were modeled for each of these alternatives. Below is a detailed description of the ramp meter alternatives:

Themed Alternative 3 A and B (AM and PM Peak Hours), Tri-Level (First Ring)

- 25th St to westbound I-94 (ramp)
- 45th St to eastbound I-94 (loop)
- 45th St to eastbound I-94 (ramp)
- 13th Ave to southbound I-29
- 32nd Ave to northbound I-29 (loop)
- 32nd Ave to northbound I-29 (ramp)

Themed Alternative 3 D and E (AM and PM Peak Hours), Adjacent + Seconds Ring to Tri-level Scenario

- 25th St to westbound I-94 (loop)
- 25th St to westbound I-94 (ramp)
- 45th St to eastbound I-94 (loop)
- 45th St to eastbound I-94 (ramp)
- 13th Ave to southbound I-94
- 32nd Ave to northbound I-29 (loop)
- 32nd Ave to northbound I-29 (ramp)
- University Dr to westbound I-94 (loop)
- University Dr to westbound I-94 (ramp)
- 9th St to eastbound I-94 (loop)
- 9th St to eastbound I-94 (ramp)
- Main Ave to southbound I-29 (loop)
- Main Ave to southbound I-29 (ramp)
- 52nd Ave to northbound I-29 (loop)
- 52nd Ave to northbound I-29 (ramp)

Themed Alternative 3 E (AM and PM Peak Hours), Moorhead Interchanges

- 34th Ave to westbound I-94
- 20th Ave to westbound I-94
- 8th St to westbound I-94 (loop)
- 8th St to westbound I-94 (ramp)

Themed Alternative 3 F (AM and PM Peak Hours), Moorhead Interchanges

- University Dr to eastbound I-94
- 8th St to eastbound I-94
- 20th Ave to eastbound I-94
- 34th Ave to eastbound I-94

Themed Alternative 3 G, H and I, all ramps in metro area

These scenarios modeled ramp meters for every on-ramp and loop ramp for the metro area, including interchanges along I-94 from Main Ave (West Fargo) to Highway 336 and along I-29 from Co. Rd 20 to 52nd Ave S. Node delays of 30, 60 and 120 seconds were used for themed alternatives 3 G, H and I respectively.

Themed Alternative 3 J, all ramps in metro area

This alternative modeled ramp meters for every on-ramp and loop ramp in the metro area which included interchanges along I-94 from Main Ave (West Fargo) to Highway 336 and along I-29 from Co. Rd 20 to 52nd Ave S. Three rings of ramps were developed for this scenario. First ring which included all the ramps adjacent to the tri-level, the second ring included the ramps adjacent to the first ring and the third ring which included all the other ramps on the interstate system. Node delays of 30, 60, and 120 seconds were used respectively for the first, second and third rings respectively for this alternative.

Simulation Modeling

The results of the travel demand modeling for scenario 3 J were selected for analysis in the VISSIM simulation model. The following information describes the changes made to the VISSIM model for this Themed Alternative.

There were a total of 52 signal installations for this scenario (25 along I-29 and 27 along I-94). Ramp meters were coded into the network by applying travel time delays to reflect ramp meters on several ramps entering the interstate.

After the results from the Travel Demand Model were acceptable to the SRC, the Origin-Destination (O-D) matrices were used in the corresponding VISSIM networks. The ramp metering was coded into VISSIM using the following methodology:

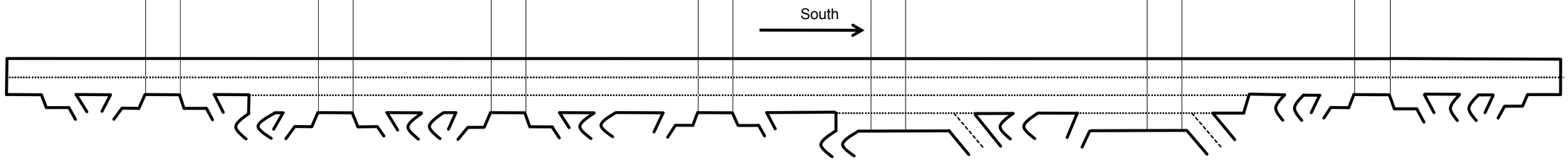
- Split the existing on-ramp links in the VISSIM network (to increase capacity to 2 lanes on the on-ramps)
- Determine the unique on-ramp components
    - Back-of-queue stopping sight distance
        - The stopping sight distance was calculated as 90 ft for a vehicle approaching the back of queue with an approach speed of 17mph
    - Storage length for design vehicles
        - Based on research conducted by the Texas Department of Transportation (DOT), the storage length for 2 lanes of storage and 1,600 vehicles would be 400 ft
    - Acceleration distance
        - According to research done by the Texas DOT, the travel distance from the ramp meter to the freeway merge point for an entry speed of 55mph is 814 ft for a -3% grade, and 1,060 ft for a 0% grade
- Determine overall on-ramp length
    - Assuming two-lane storage (demand greater than 1,200 vph), the required on-ramp distance is approximately 1,550 ft (sum of previous link components).
- Determine ramp-meter cycle length
    - The ramp meters consisted of 3 phases (one per lane, and one for an all-red time)
    - The required headway (red time) was calculated for each ramp based on the respective volumes at each location
    - Queue detectors were placed at each ramp meter installation to prevent spillback onto the surface network

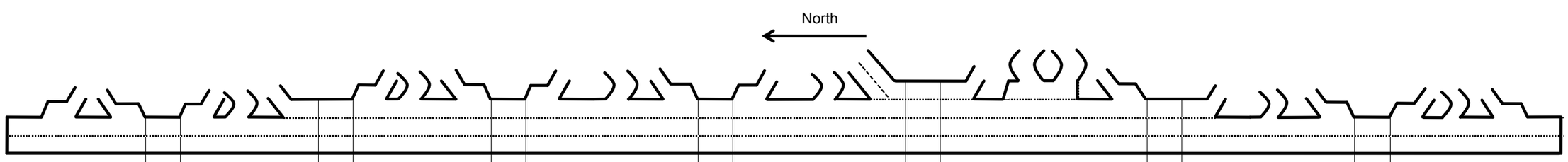
The summary of the VISSIM output (Level of Service) results for the AM and PM networks are provided on the following pages.

I-29 Data Collection: 2025 AM Themed Alternative 3

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895				815	1050	1270	625	7200	620	670	960	510	1900
2025 Target (vph)					1816					1814					1574						1388				1118						1881							1763						
2025 Sim. Vol. (vph)					1842					1840					1583						1399				1120						1581							1550						
Volume % Difference					1%					1%					1%						1%				0%						-16%							-12%						
Speed (mph)					73					59.1					59.1						57.4				59.3						59.4							73.4						
# of Lanes					2					3					3						3				4						4							2						
Density (pc/mi/ln)					14					12					10						9				5						7							12						
Level of Service					B					B					A						A				A						A							B						





Northbound

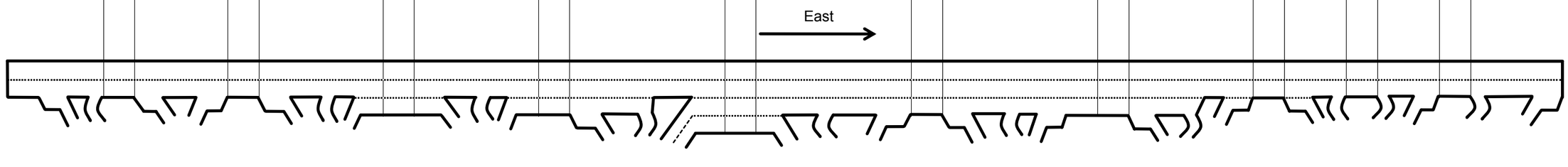
	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310	2100		910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Target (vph)					1136					1558					2674						3683					4927						3253						2799						
2025 Sim. Vol. (vph)					1112					1486					2481						3372					4381						3266						2807						
Volume % Difference					-2%					-5%					-7%						-8%					-11%						0%						0%						
Speed (mph)					74.4					59					58.4						57.9					57.8						58						71.8						
# of Lanes					2					3					3						3					4						3						2						
Density (pc/mi/ln)					8					9					16						22					21						21						22						
Level of Service					A					A					B						C					C						C						C						

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 AM Themed Alternative 3

Eastbound

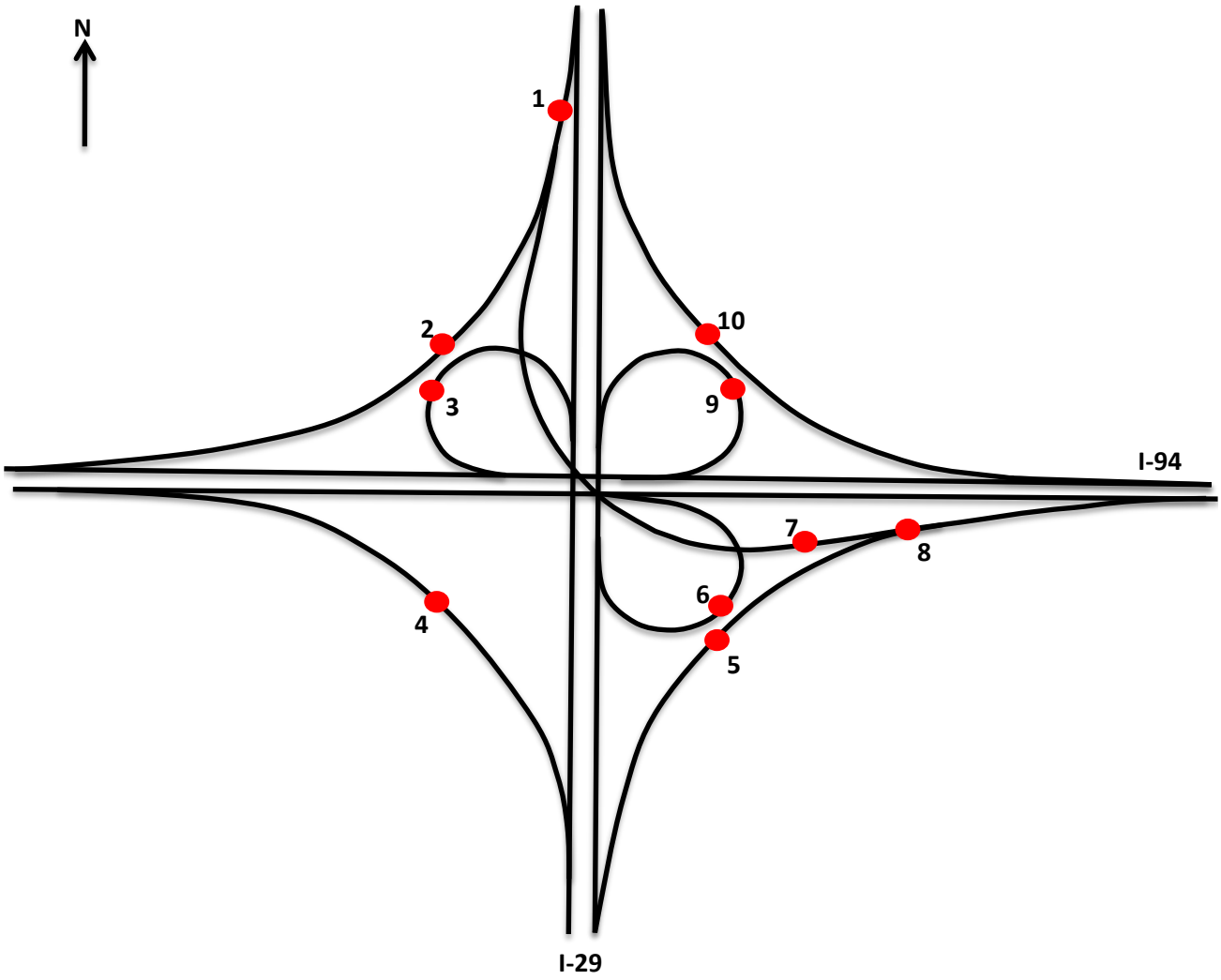
	Main Ave.			Sheyenne St.				9th St.					45th St.				I-29					25th St.					University Dr.					TH 75			20th St.			34th St.			MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185		760	465	1345	1365	1805		910	730	1465	515	870	960	740	1050	1125	4225		520	1445	790	2315		1665	5910	2110	575	14825	710	1365	1080
2025 Target (vph)				1668				1907					2281				2267						2232						2385					2501					1895			1534			1415			
2025 Sim. Vol. (vph)				1688				2149					2296				2260						2215						2185					1970					1584			1273			1206			
Volume % Difference				1%				-					1%				0%						-1%						-8%					-21%					-16%			-17%			-15%			
Speed (mph)				73.1				58					59				58.5						59.2						58.8					59.1					58.7			59			70			
# of Lanes				2				2					3				3						4						3					3					2			2			2			
Density (pc/mi/ln)				13				21					14				14						10						14					12					15			12			10			
Level of Service				B				C					B				B						B						B					B					B			B			A			



Westbound

	Main Ave.				Sheyenne St.					9th St.				45th St.					I-29						25th St.						University Dr.						TH 75			20th St.				34th St.				MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375		1490	975		945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425		5400	1365	585	12850	965	2195	465
2025 Target (vph)					1361					1145				1636			3604						6005						5562					4786					3601			2984			2635			
2025 Sim. Vol. (vph)					1203					1178				1298			2594						4120						4098					4598					3506			2848			2483			
Volume % Difference					-12%					-				-21%			-28%						-31%						-26%					-4%					-3%			-5%			-6%			
Speed (mph)					73					59				59.1			59.2						37.4						19.8					47.7					55.6			57.5			69.8			
# of Lanes					2					2				3			3						3						3					3					2			2			2			
Density (pc/mi/ln)					9					11				8			16						41						77					36					35			28			20			
Level of Service					A					B				A			B						E						F					E					E			C			B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 AM - Themed Alternative 3: Data Collection Points (I-29/I-94 Interchange)

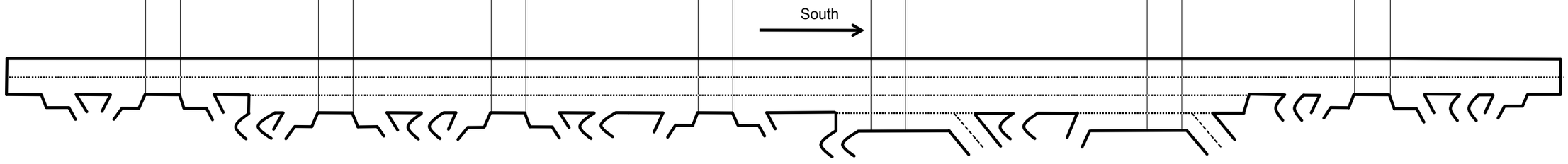
	1	2	3	4	5	6	7	8	9	10
2025 Target (vph)	558	138	993	328	549	676	420	969	471	2016
2025 Sim. Vol. (vph)	567	152	699	328	551	685	415	965	475	1450
Volume % Difference	2%	10%	-30%	0%	0%	1%	-1%	0%	1%	-28%
Speed (mph)	59	55	24	55	54	24	55	57	25	53
# of Lanes	2	1	1	1	1	1	2	2	1	1
Density (pc/mi/ln)	5	3	32	7	11	32	4	9	21	31

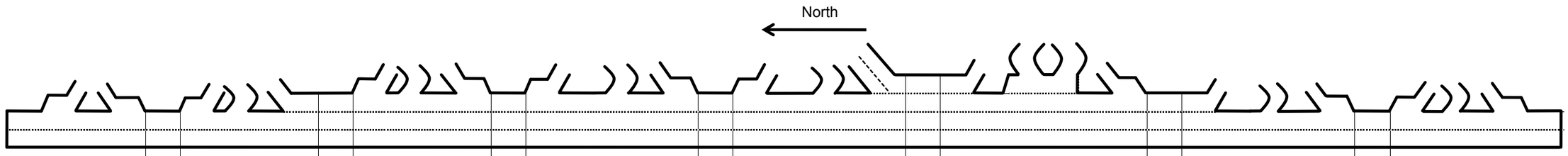
This data increased the original density by 10%.

I-29 Data Collection: 2025 PM Themed Alternative 3

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S							I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895				815	1050	1270	625	7200	620	670	960	510	1900
2025 Target (vph)					1406					1853					2769						3600				3997						2884							3061						
2025 Sim. Vol. (vph)					1427					1854					2757						3393				3803						2822							3008						
Volume % Difference					2%					0%					0%						-6%				-5%						-2%							-2%						
Speed (mph)					73.7					59.3					58.2						48.6				57.8						58.5							70.3						
# of Lanes					2					3					3						3				4						4							2						
Density (pc/mi/ln)					11					12					18						26				18						13							24						
Level of Service					B					B					B						C				B						B							C						





Northbound

	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S							I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310		2100		910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Target (vph)					1792					1981					1974						1857						1827						2049						2020						
2025 Sim. Vol. (vph)					1752					1930					1953						1868						1828						1991						2018						
Volume % Difference					-2%					-3%					-1%						1%						0%						-3%						0%						
Speed (mph)					73.5					54.5					59.1						59.2						59.3						57.9						73						
# of Lanes					2					3					3						3						4						3						2						
Density (pc/mi/ln)					13					13					12						12						9						13						15						
Level of Service					B					B					B						B						A						B						B						

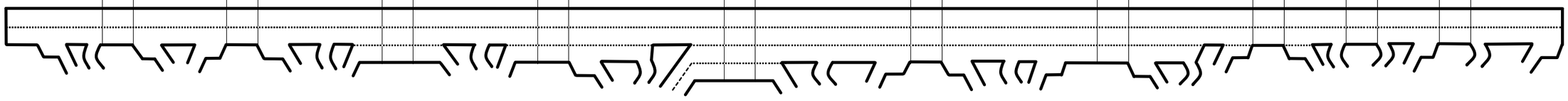
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 PM Themed Alternative 3

Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.				I-29					25th St.					University Dr.					TH 75			20th St.			34th St.			MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185		760	465	1345	1365	1805		910	730	1465	515	870	960	740	1050	1125	4225		520	1445	790	2315		1665	5910	2110	575	14825	710	1365	1080
2025 Target (vph)				1581				1652					2168				3113						5208						4862					4597					3503			2895			2813			
2025 Sim. Vol. (vph)				1602				1956					2187				3134						5054						4703					4476					3482			2837			2728			
Volume % Difference				1%				-					1%				1%						-3%						-3%					-3%					-1%			-2%			-3%			
Speed (mph)				72.1				58.3					59.2				58.5						56.6						56.1					57.1					55.7			57.3			69.8			
# of Lanes				2				2					3				3						4						3					3					2			2			2			
Density (pc/mi/ln)				12				19					14				20						25						31					29					35			28			22			
Level of Service				B				B					B				B						C						D					D					D			C			C			

East

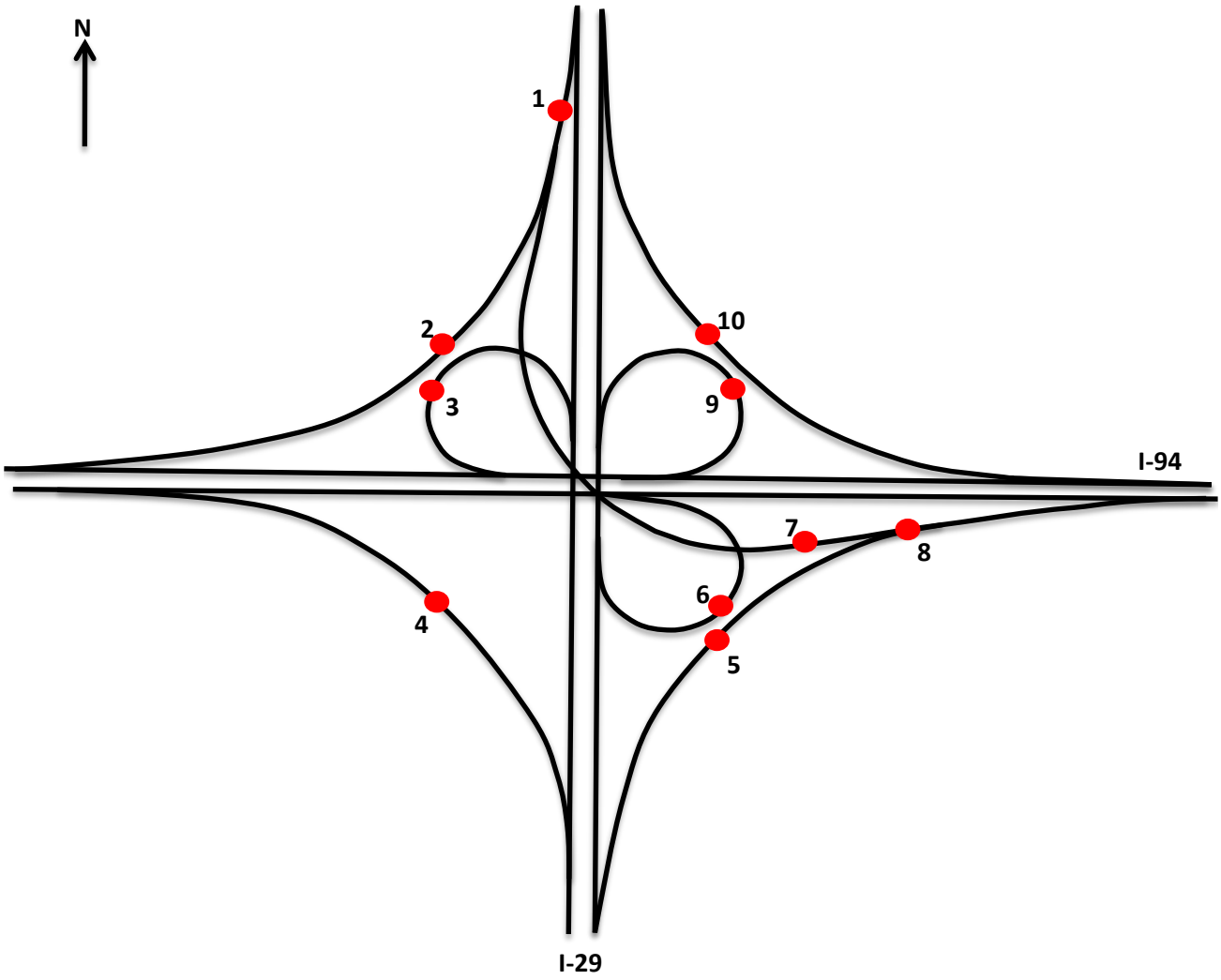


West

Westbound

	Main Ave.				Sheyenne St.					9th St.				45th St.				I-29								25th St.					University Dr.							TH 75			20th St.			34th St.			MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375		1490	975		945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425		5400	1365	585	12850	965	2195	465
2025 Target (vph)					1917					1692				2390			2863							3624						3594					3517					2682			2248			1962			
2025 Sim. Vol. (vph)					1891					1958				2379			2863							3639						3606					3524					2747			2245			1968			
Volume % Difference					-1%					-				0%			0%							0%						0%					0%					2%			0%			0%			
Speed (mph)					71.1					58				58.4			58.8							56.9						58					58					57.6			58.1			69.9			
# of Lanes					2					2				3			3							3						3					3					2			2			2			
Density (pc/mi/ln)					15					19				15			18							24						23					22					26			21			16			
Level of Service					B					B				B			B							C						C					C					C			C			B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 PM - Themed Alternative 3: Data Collection Points (I-29/I-94 Interchange)

	1	2	3	4	5	6	7	8	9	10
2025 Target (vph)	2287	371	705	469	864	216	1916	2780	383	810
2025 Sim. Vol. (vph)	2158	366	709	469	832	232	1793	2624	374	808
Volume % Difference	-6%	-1%	1%	0%	-4%	8%	-6%	-6%	-2%	0%
Speed (mph)	58	54	24	54	53	25	54	53	25	54
# of Lanes	2	1	1	1	1	1	2	2	1	1
Density (pc/mi/ln)	21	7	32	10	17	10	18	28	17	17

This data increased the original density by 10%.

Themed Alternative 4

This scenario developed off-system improvements to corridors parallel to the interstate system. The travel demand model was used to evaluate the impacts of these improvements on traffic patterns and demand volumes on the interstate system. One scenario considered in the travel demand modeling was selected for analysis in the VISSIM simulation model.

Travel Demand Modeling

The off-system improvements were modeled in the TDM by reducing travel time on the affected corridors. The following scenarios were modeled.

Themed Alternative 4 A (North-south arterials near I-29)

- 45th Street: Travel time reduction of 10%
- 25th Street: Travel time reduction of 10%

Themed Alternative 4 B (East-west arterials near I-94)

- Main Avenue: Travel time reduction of 10%
- 13th Avenue S.: Travel time reduction of 10% east of I-29, 15% west of I-29
- 32nd Avenue S.: Travel time reduction of 10%

Themed Alternative 4 C (North-south and east-west arterials along I-94 and I-29)

- All corridors described in 4.a and 4.b

Themed Alternative 4 D (Other corridors to be considered and combined with 4 A and 4 B)

- 52nd Avenue S: Travel time reduction of 10%
- Included an overpass at 64th Avenue S.
- Included overpass at 76th Avenue S. and I-29 and Red River Bridge crossing at 76th Ave. S.

Themed Alternative 4 E (Moorhead north-south corridors)

- 8th Street: Travel time reduction of 10%
- 20th Street: Travel time reduction of 10%

Themed Alternative 4 F (All corridors parallel to the interstate system)

- 45th Street: Travel time reduction of 10%
- 25th Street: Travel time reduction of 10%
- Main Avenue: Travel time reduction of 10%
- 13th Avenue S.: Travel time reduction of 10% east of I-29, 15% west of I-29
- 32nd Avenue S.: Travel time reduction of 10%
- 52nd Avenue S.: Travel time reduction of 10%
- Included an overpass at 64th Avenue S.
- Included and overpass and Red River Bridge crossing at 76th Ave. S.
- 8th Street: Travel time reduction of 10%
- 20th Street: Travel time reduction of 10%

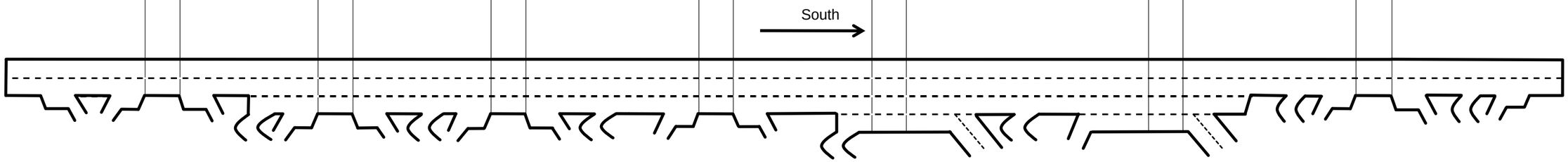
Simulation Modeling

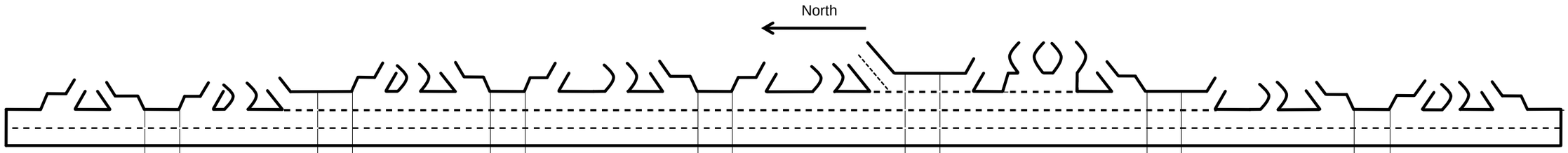
The VISSIM network that was used was the base network, with the OD matrix and vehicle volumes produced from the TDM for Themed Alternative 4F. The summary of the VISSIM output (Level of Service) results for the AM and PM networks are provided on the following pages.

I-29 Data Collection: 2025 AM Themed Alternative 4

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94									32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895			815	1050	1270	625	7200	620	670	960	510	1900
2025 Target (vph)					1707					1889					1686						1513				1582						2488							2138						
2025 Sim. Vol. (vph)					1692					1901					1723						1605				1709						2310							2461						
Volume % Difference					-1%					1%					2%						6%				8%						-7%							15%						
Speed (mph)					73.2					59					58.9						56.9				59						59.1							72.5						
# of Lanes					2					3					3						3				4						4							2						
Density (pc/mi/ln)					13					12					11						10				8						11							19						
Level of Service					B					B					B						B				A						B							B						





Northbound

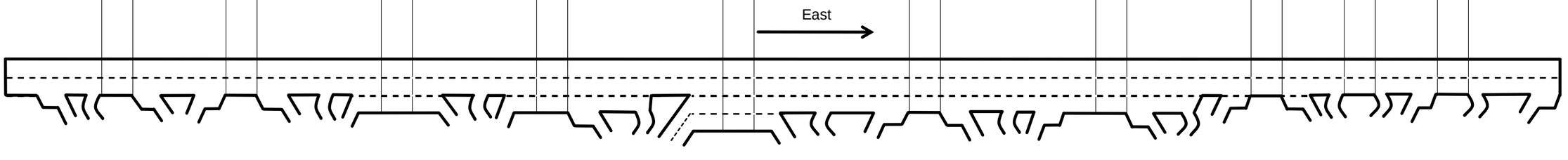
	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94									32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310		2100		910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Target (vph)					1278					1766					2990						4162						5492							3735					3157						
2025 Sim. Vol. (vph)					1255					1746					2871						3906						5059							3951					3413						
Volume % Difference					-2%					-1%					-4%						-6%						-8%							6%					8%						
Speed (mph)					74.1					58.7					58						56.6						57.1							57.4					70						
# of Lanes					2					3					3						3						4							3					2						
Density (pc/mi/ln)					9					11					18						26						25							26					27						
Level of Service					A					B					B						C						C							C					C						

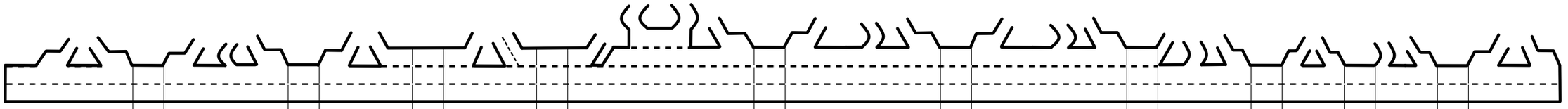
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 AM Themed Alternative 4

Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.					I-29						25th St.					University Dr.						TH 75			20th St.				34th St.				MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185		760	465	1345	1365	1805		910	730	1465	515	870	960	740	1050	1125	4225		520	1445	790	2315		1665	5910	2110	575	14825	710	1365	1080
2025 Target (vph)				1662				1906					2551					2959					2762						2928					2755					2124			1756			1572			
2025 Sim. Vol. (vph)				1683				1976					2571					3040					2702						2365					1899					1633			1332			1245			
Volume % Difference				1%				-					1%					3%					-2%						-19%					-31%					-23%			-24%			-21%			
Speed (mph)				73.3				58					58.7					57.2					50.1						58.5					59.1					58.4			58.9			70			
# of Lanes				2				2					3					3					4						3					3					2			2			2			
Density (pc/mi/ln)				13				19					16					20					15						15					12					16			13			10			
Level of Service				B				B					B					B					B						B					B					B			B			A			

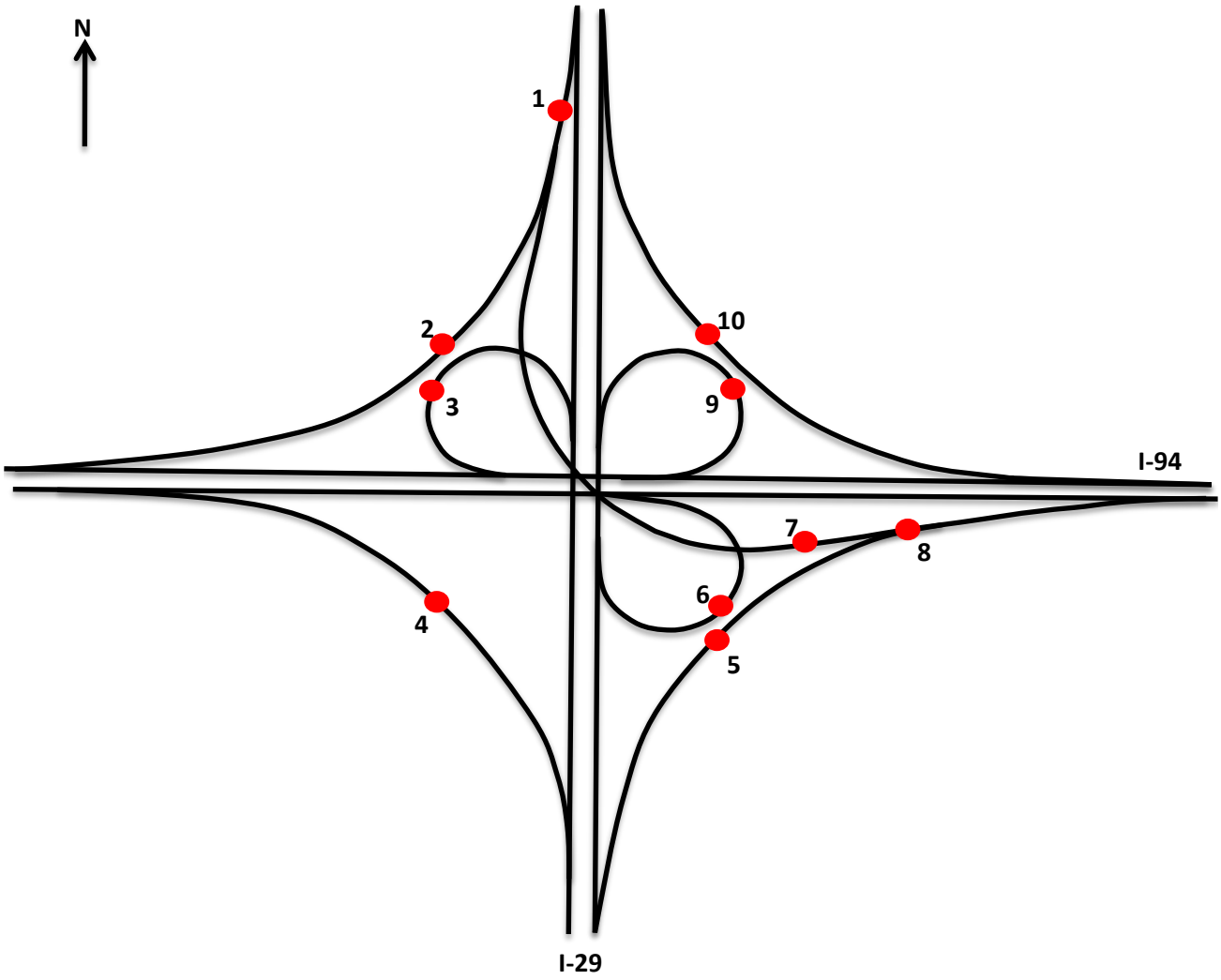




Westbound

	Main Ave.				Sheyenne St.					9th St.					45th St.						I-29								25th St.							University Dr.								TH 75				20th St.					34th St.					MN 336			
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375			1490	975		945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425		5400	1365	585	12850	965	2195	465
2025 Target (vph)					1418					1254				1979			4134							6601						5844						5015				3677			3031			2583			
2025 Sim. Vol. (vph)					1314					1061				1386			2649							4059						3926						4600				3594			2934			2536			
Volume % Difference					-7%					-				-30%			-36%							-39%						-33%						-8%				-2%			-3%			-2%			
Speed (mph)					72.5					59.2				59.1			59.1							36.7						20						51.5				54.7			57.3			69.8			
# of Lanes					2					2				3			3							3						3						3				2			2			2			
Density (pc/mi/ln)					10					10				9			17							41						73						33				37			28			20			
Level of Service					B					A				A			B							E						F						D				E			D			C			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 AM - Themed Alternative 4: Data Collection Points (I-29/I-94 Interchange)

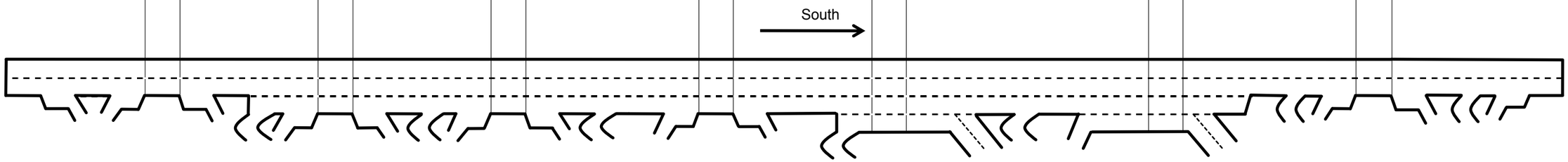
	1	2	3	4	5	6	7	8	9	10
2025 Target (vph)	768	242	1267	407	587	903	526	1113	585	2027
2025 Sim. Vol. (vph)	748	211	773	571	595	844	537	1114	528	1392
Volume % Difference	-3%	-13%	-39%	40%	1%	-6%	2%	0%	-10%	-31%
Speed (mph)	59	55	24	54	53	24	55	52	25	53
# of Lanes	2	1	1	1	1	1	2	2	1	1
Density (pc/mi/ln)	7	4	35	12	13	39	5	12	24	29

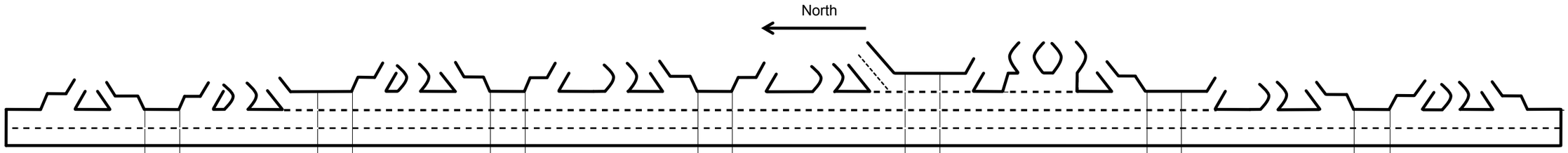
This data increased the original density by 10%.

I-29 Data Collection: 2025 PM Themed Alternative 4

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895				815	1050	1270	625	7200	620	670	960	510	1900
2025 Target (vph)					1422					1859					2859						3928				4837						3380							3321					
2025 Sim. Vol. (vph)					1442					1879					2930						4001				4934						3642							3643					
Volume % Difference					1%					1%					2%						2%				2%						8%							10%					
Speed (mph)					73.5					59.2					57.8						55.7				57						58.1							67.4					
# of Lanes					2					3					3						3				4						4							2					
Density (pc/mi/ln)					11					12					19						27				24						17							30					
Level of Service					B					B					B						C				C						B							D					





Northbound

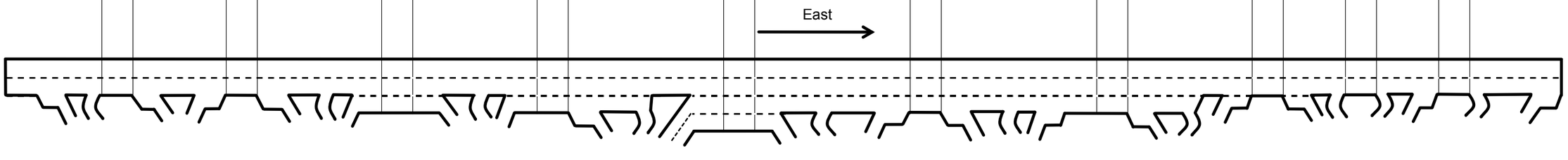
	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310		2100		910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Target (vph)					2251					2138					2280						2392						2482							2471					2339					
2025 Sim. Vol. (vph)					2302					2163					2313						2394						2662							2730					2600					
Volume % Difference					2%					1%					1%						0%						7%							10%					11%					
Speed (mph)					72.8					59.1					58.8						58.6						58.9							57.3					71.8					
# of Lanes					2					3					3						3						4							3					2					
Density (pc/mi/ln)					18					14					15						15						13							18					20					
Level of Service					B					B					B						B						B							B					C					

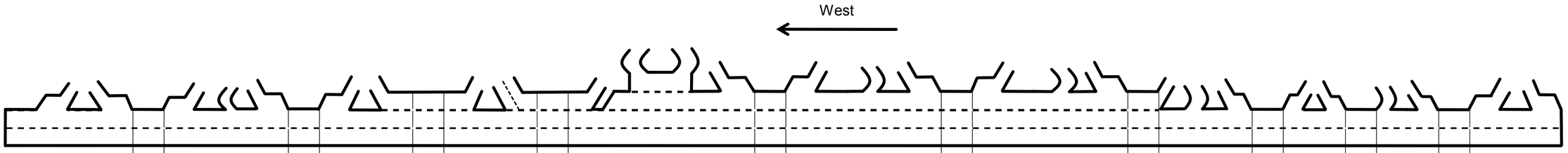
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 PM Themed Alternative 4

Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.				I-29					25th St.					University Dr.					TH 75			20th St.			34th St.				MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185	760	465	1345	1365	1805	910	730	1465	515	870	960	740	1050	1125	4225	520	1445	790	2315	1665	5910	2110	575	14825	710	1365	1080
2025 Target (vph)				1568				1590					2199				3819					5894					5494					4988				3581			3042			2995			
2025 Sim. Vol. (vph)				1589				1711					2087				3561					5604					5136					4720				3484			2869			2908			
Volume % Difference				1%				-					-5%				-7%					-5%					-7%					-5%				-3%			-6%			-3%			
Speed (mph)				73.4				58.3					59.1				58					53.5					54.4					56.3				55			57.3			69.8			
# of Lanes				2				2					3				3					4					3					3				2			2			2			
Density (pc/mi/ln)				12				16					13				23					29					35					31				35			28			23			
Level of Service				B				B					B				C					D					D					D				E			C			C			

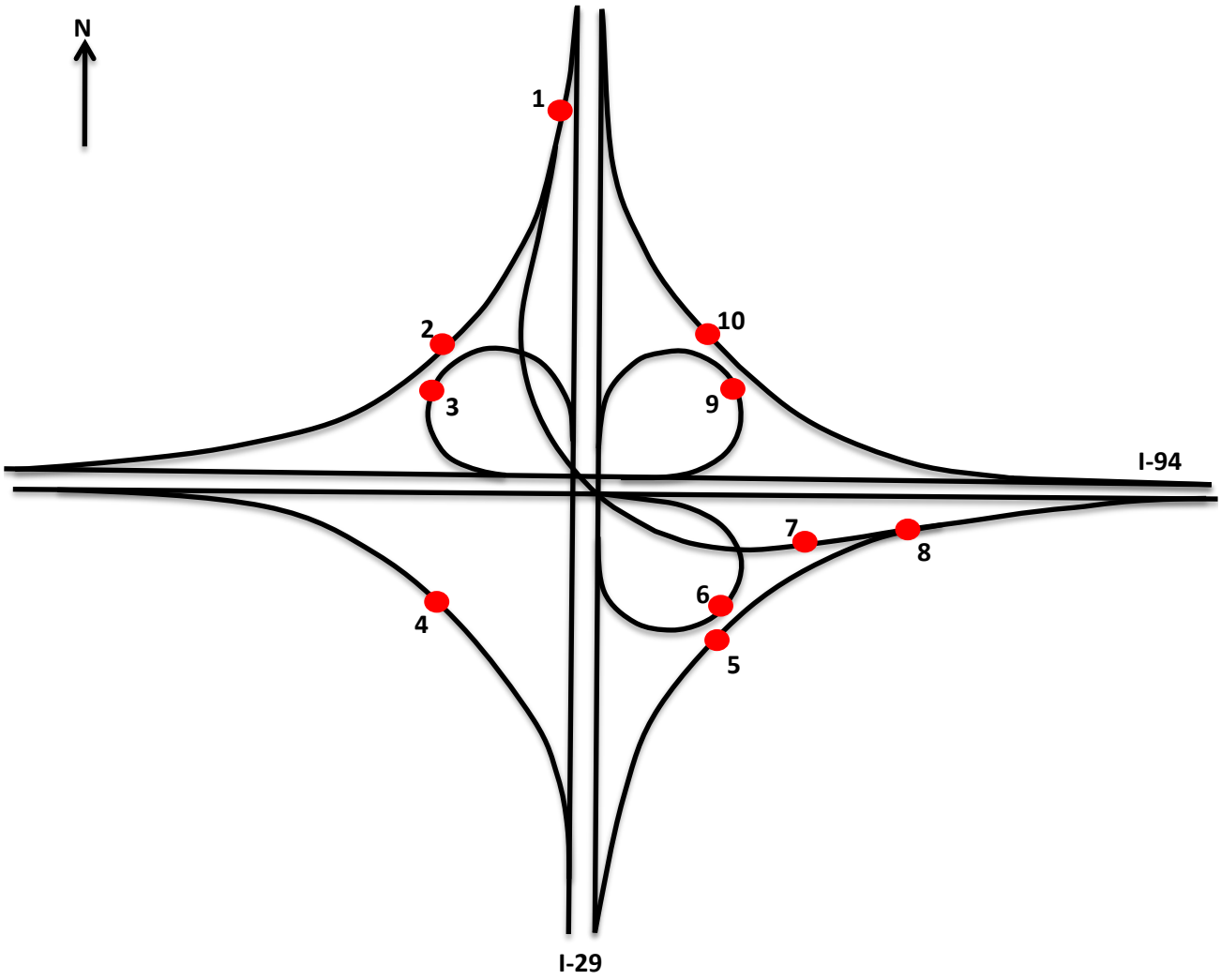




Westbound

	Main Ave.				Sheyenne St.					9th St.				45th St.				I-29									25th St.								University Dr.							TH 75			20th St.				34th St.				MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375	1490	975	945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425	5400	1365	585	12850	965	2195	465
2025 Target (vph)					1967					1790				2787			3659					4287						3900						3787				2878		2386			1955			
2025 Sim. Vol. (vph)					1987					1865				2685			3477					4163						3737						3625				2848		2285			1894			
Volume % Difference					1%					-				-4%			-5%					-3%						-4%						-4%				-1%		-4%			-3%			
Speed (mph)					70.7					58.3				58			58.4					56.2						57.6						57.9				57.4		57.9			69.9			
# of Lanes					2					2				3			3					3						3						3				2		2			2			
Density (pc/mi/ln)					16					18				17			22					27						24						23				28		22			15			
Level of Service					B					B				B			C					C						C						C				C		C			B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 PM - Themed Alternative 4: Data Collection Points (I-29/I-94 Interchange)

	1	2	3	4	5	6	7	8	9	10
2025 Target (vph)	2828	716	785	585	931	382	2112	3043	441	1001
2025 Sim. Vol. (vph)	2669	626	787	585	902	304	2033	2932	478	1012
Volume % Difference	-6%	-13%	0%	0%	-3%	-20%	-4%	-4%	8%	1%
Speed (mph)	57	54	24	54	53	25	52	49	25	54
# of Lanes	2	1	1	1	1	1	2	2	1	1
Density (pc/mi/ln)	26	13	36	12	19	14	22	33	21	21

This data increased the original density by 10%.

Themed Alternative 5

This scenario involved the addition of additional bridges on the Red River. The travel demand model was used to evaluate the impacts of these improvements on traffic patterns and demand volumes on the interstate system. One scenario considered in the travel demand modeling was selected for analysis in the VISSIM simulation model.

Travel Demand Modeling

Three TDM scenarios were modeled including:

Themed Alternative 5 A

- 13th Ave. S./12th Ave. S. Red River Bridge

Themed Alternative 5 B

- 32nd Ave. S/40th Ave. S. Red River Bridge

Themed Alternative 5 C

- Combination of themed alternatives 5 A and B

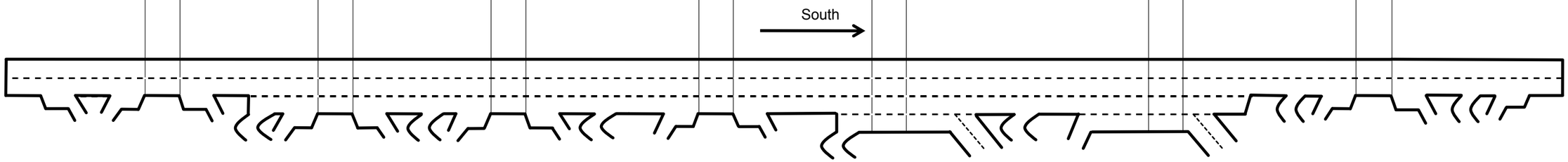
Simulation Modeling

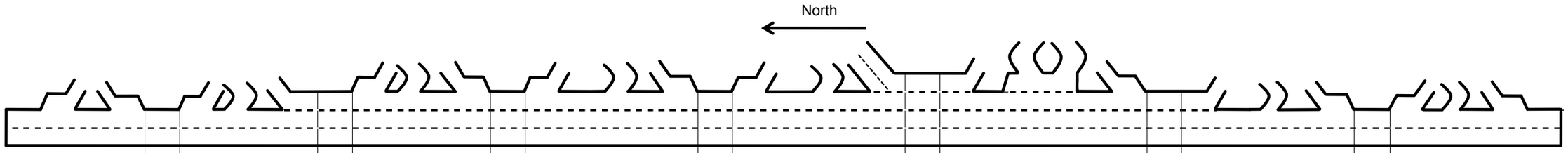
Scenario 5C was selected to analysis using the VISSIM simulation model. The O-D matrices were entered into the base condition VISSIM network, and the simulations were conducted. The summary of the VISSIM output (Level of Service) results for the AM and PM networks are provided on the following pages.

I-29 Data Collection: 2025 AM Peak Hour - Themed Alternative 5

Southbound

	CR20					19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94							32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895			815	1050	1270	625	7200	620	670	960	510	1900
2025 Original (vph)					1707					1889					1686						1513				1582						2488							2138					
2025 Sim. Vol. (vph)					1738					1910					1720						1538				1625						2031							1852					
Volume % Difference					2%					1%					2%						2%				3%						-18%							-13%					
Speed (mph)					73.1					59					58.9						57				59						59.2							73					
# of Lanes					2					3					3						3				4						4							2					
Density (pc/mi/ln)					13					12					11						10				8						10							14					
Level of Service					B					B					B						A				A						A							B					





Northbound

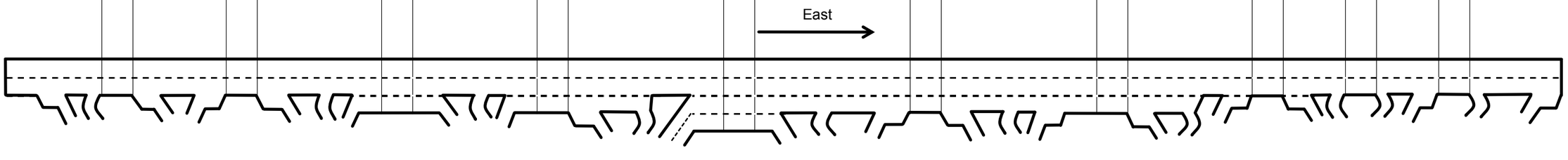
	CR 20					19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94							32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310	2100			910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Original (vph)					1278					1766					2990						4162					5492								3735					3157					
2025 Sim. Vol. (vph)					1253					1670					2767						3790					4873								3700					3133					
Volume % Difference					-2%					-5%					-7%						-9%					-11%								-1%					-1%					
Speed (mph)					74.2					58.8					58.1						56.8					57.5								57.5					70.9					
# of Lanes					2					3					3						3					4								3					2					
Density (pc/mi/ln)					9					11					18						25					24								24					25					
Level of Service					A					B					B						C					C								C					C					

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

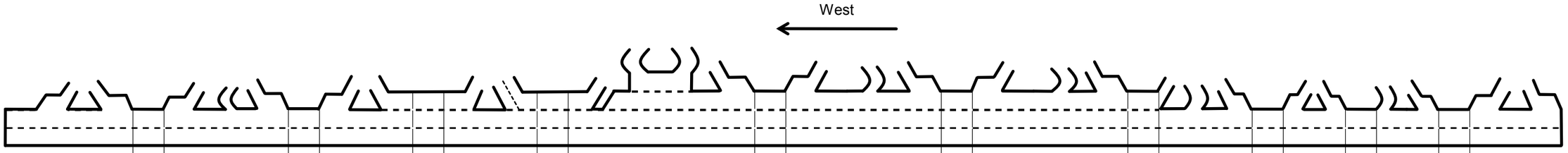
I-94 Data Collection: 2025 AM Peak Hour - Themed Alternative 5

Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.				I-29					25th St.					University Dr.					TH 75			20th St.			34th St.			MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185		760	465	1345	1365	1805		910	730	1465	515	870	960	740	1050	1125	4225		520	1445	790	2315		1665	5910	2110	575	14825	710	1365	1080
2025 Original (vph)				1662				1906					2551					2959					2762						2928					2755					2124			1756			1572			
2025 Sim. Vol. (vph)				1678				1903					2508					2892					2673						2367					1840					1645			1378			1279			
Volume % Difference				1%				-					-2%					-2%					-3%						-19%					-33%					-23%			-22%			-19%			
Speed (mph)				73.3				58.1					58.7					57.6					55.8						58.5					59					58.4			58.8			69.9			
# of Lanes				2				2					3					3					4						3					3					2			2			2			
Density (pc/mi/ln)				13				18					16					19					13						15					12					16			13			10			
Level of Service				B				B					B					B					B						B					B					B			B			B			

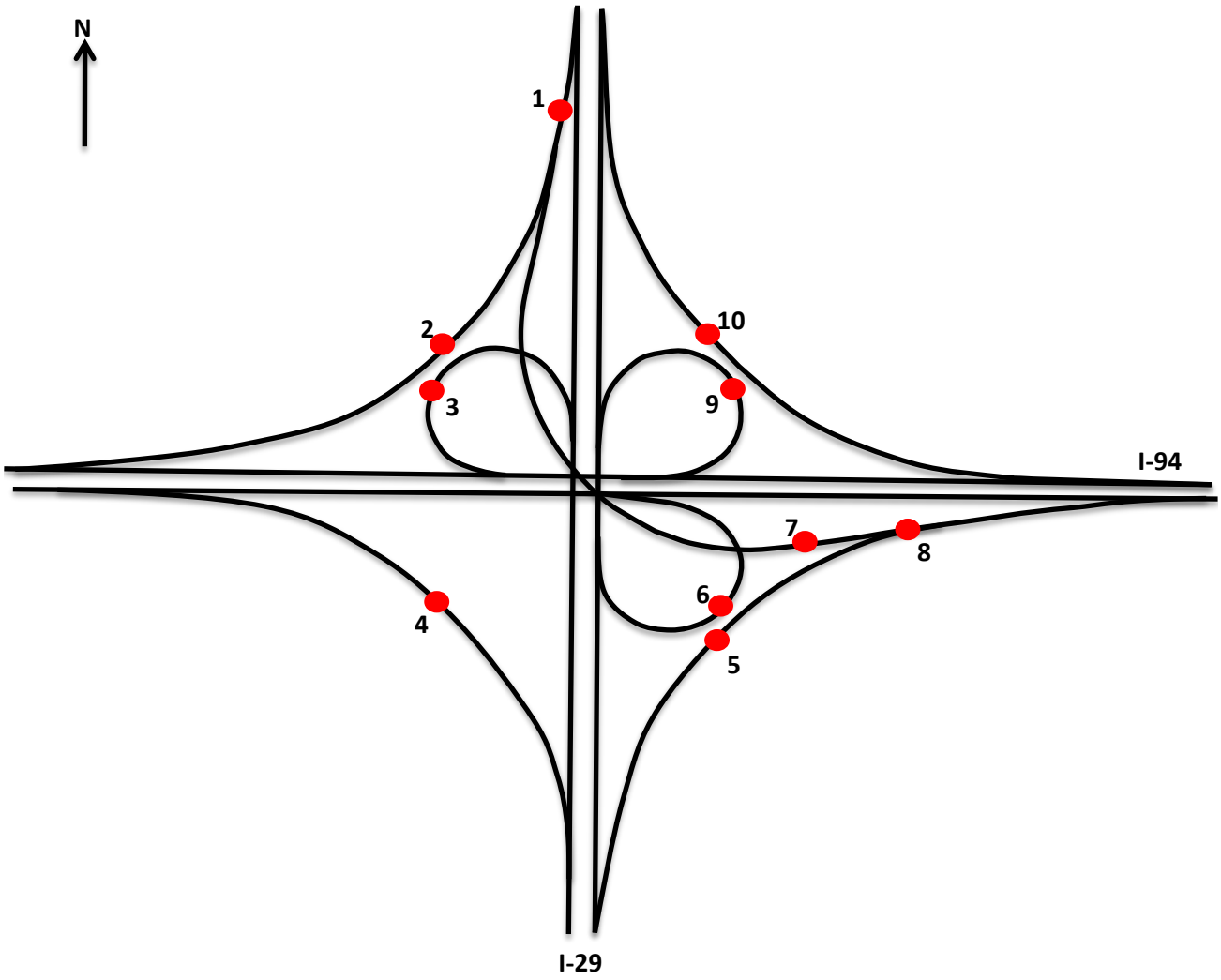


Westbound



	Main Ave.				Sheyenne St.					9th St.					45th St.					I-29											25th St.						University Dr.							TH 75				20th St.					34th St.					MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375				1490	975		945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425		5400	1365	585	12850	965	2195	465
2025 Original (vph)					1418					1254				1979			4134								6601						5844						5015				3677			3031			2583			
2025 Sim. Vol. (vph)					1299					1062				1495			2796								4165						4208						4524				3680			3028			2601			
Volume % Difference					-8%					-				-24%			-32%								-37%						-28%						-10%				0%			0%			1%			
Speed (mph)					72.5					59.2				58.9			59								35.9						20.3						46.8				54.9			57.2			69.7			
# of Lanes					2					2				3			3								3						3						3				2			2			2			
Density (pc/mi/ln)					10					10				9			18								43						77						36				37			29			21			
Level of Service					A					A				A			B								E						F						E				E			D			C			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 AM - Themed Alternative 5 - Data Collection Points (I-29/I-94 Interchange)

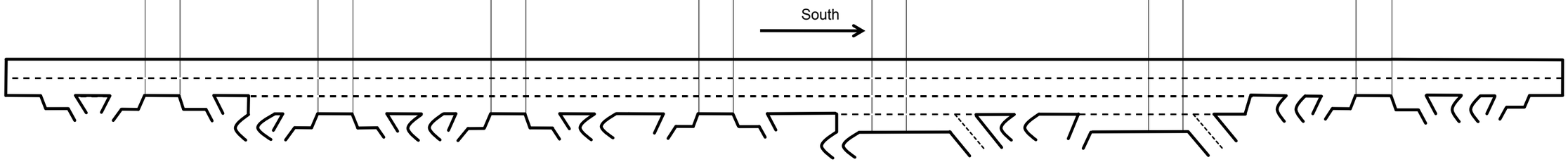
	1	2	3	4	5	6	7	8	9	10
2025 Original (vph)	768	242	1267	407	587	903	526	1113	585	2027
2025 Sim. Vol. (vph)	775	256	777	401	577	893	519	1091	566	1417
Volume % Difference	1%	6%	-39%	-1%	-2%	-1%	-1%	-2%	-3%	-30%
Speed (mph)	59	54	24	55	53	24	55	55	25	53
# of Lanes	2	1	1	1	1	1	2	2	1	1
Density (pc/mi/ln)	7	5	35	8	12	41	5	11	25	30

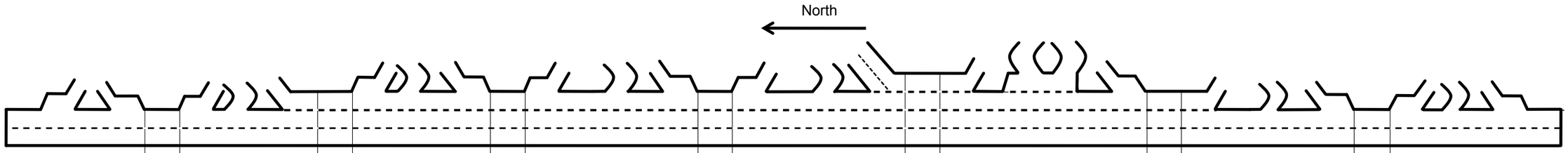
This data increased the original density by 10%.

I-29 Data Collection: 2025 PM Peak Hour - Themed Alternative 5

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94							32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895			815	1050	1270	625	7200	620	670	960	510	1900
2025 Original (vph)					1422					1859					2859						3928				4837						3380							3321					
2025 Sim. Vol. (vph)					1446					1866					2885						3941				4807						3358							3330					
Volume % Difference					2%					0%					1%						0%				-1%						-1%							0%					
Speed (mph)					73.5					59.3					57.9						55.4				55.4						58.4							68.8					
# of Lanes					2					3					3						3				4						4							2					
Density (pc/mi/ln)					11					12					18						26				24						16							27					
Level of Service					B					B					B						C				C						B							C					





Northbound

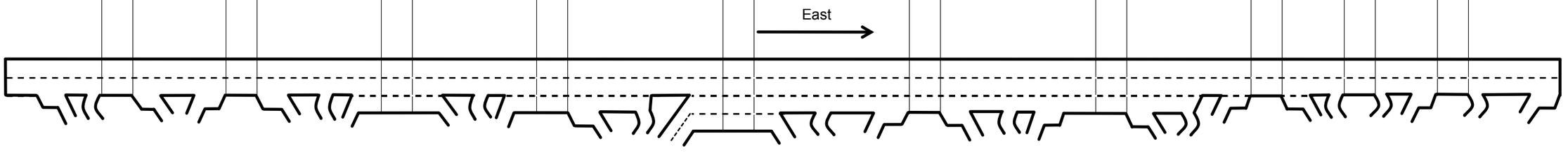
	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94							32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310		2100		910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Original (vph)					2251					2138					2280						2392					2482							2471						2339					
2025 Sim. Vol. (vph)					2304					2159					2288						2414					2514							2451						2328					
Volume % Difference					2%					1%					0%						1%					1%							-1%						0%					
Speed (mph)					72.7					59.1					58.8						58.5					59							55.8						72.2					
# of Lanes					2					3					3						3					4							3						2					
Density (pc/mi/ln)					18					14					14						15					12							16						18					
Level of Service					B					B					B						B					B							B						B					

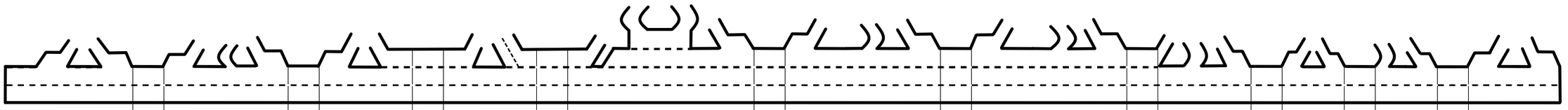
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 PM Peak Hour - Themed Alternative 5

Eastbound

	Main Ave.			Sheyenne St.				9th St.				45th St.				I-29					25th St.					University Dr.					TH 75			20th St.		34th St.			MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185		760	465	1345	1365	1805		910	730	1465	515	870	960	740	1050	1125	4225		520	1445	790	2315		1665	5910	2110	575	14825	710	1365	1080
2025 Original (vph)				1568				1590					2199				3819						5894						5494					4988					3581			3042			2995			
2025 Sim. Vol. (vph)				1582				1609					2207				3837						5842						5249					4582					3627			3042			3006			
Volume % Difference				1%				-					0%				0%						-1%						-4%					-8%					1%			0%			0%			
Speed (mph)				73.5				58.5					59.1				57.7						48.2						54.7					56.7					54.1			57.1			69.7			
# of Lanes				2				2					3				3						4						3					3					2			2			2			
Density (pc/mi/ln)				12				15					14				25						34						36					30					37			30			24			
Level of Service				B				B					B				C						D						E					D					E			D			C			

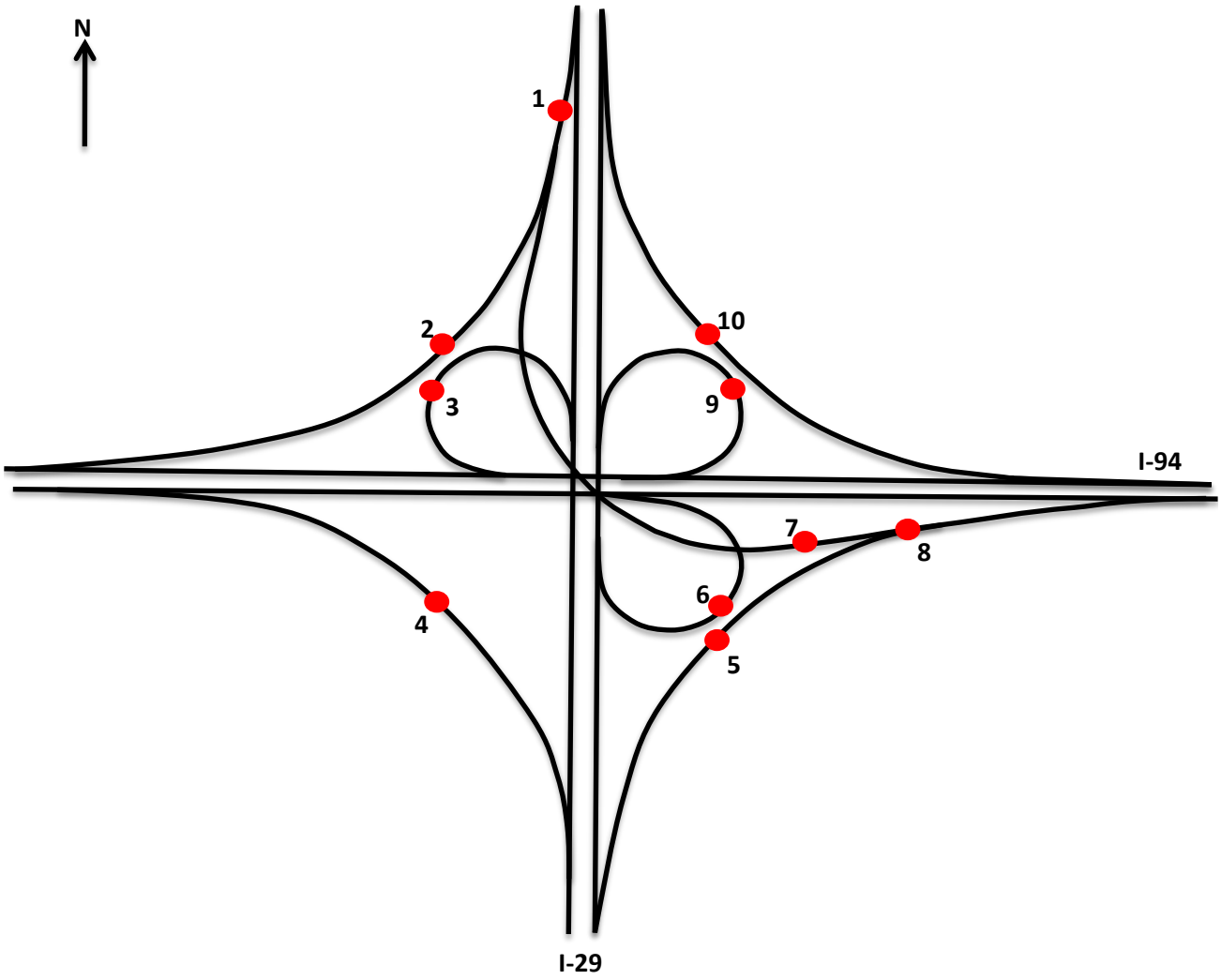




Westbound

	Main Ave.				Sheyenne St.					9th St.				45th St.					I-29								25th St.						University Dr.								TH 75				20th St.				34th St.				MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375			1490	975		945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425		5400	1365	585	12850	965	2195	465
2025 Original (vph)					1967					1790				2787			3659						4287						3900					3787					2878			2386			1955			
2025 Sim. Vol. (vph)					1998					1817				2803			3663						4315						3834					3338					2896			2390			1991			
Volume % Difference					2%					-				1%			0%						1%						-2%					-12%					1%			0%			2%			
Speed (mph)					70.7					58.4				57.7			58.3						55.9						57.5					58.3					56.9			57.9			69.9			
# of Lanes					2					2				3			3						3						3					3					2			2			2			
Density (pc/mi/ln)					16					17				18			23						29						25					21					28			23			16			
Level of Service					B					B				B			C						D						C					C					D			C			B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 PM - Themed Alternative 5: Data Collection Points (I-29/I-94 Interchange)

	1	2	3	4	5	6	7	8	9	10
2025 Original (vph)	2828	716	785	585	931	382	2112	3043	441	1001
2025 Sim. Vol. (vph)	2827	731	791	587	926	394	2071	2989	435	1038
Volume % Difference	0%	2%	1%	0%	-1%	3%	-2%	-2%	-1%	4%
Speed (mph)	54	54	24	54	49	25	44	40	25	54
# of Lanes	2	1	1	1	1	1	2	2	1	1
Density (pc/mi/ln)	29	15	36	12	21	18	26	42	19	22

This data increased the original density by 10%.

Themed Alternative 6

Themed Alternative 6 scenarios involved capacity and physical improvements to the interstate system, requiring a significant VISSIM modeling effort. Generally, only the VISSIM simulation model was used to analyze these scenarios. In some cases, access modifications were considered on the interstate system and the travel demand model was used to evaluate changes in travel patterns.

Themed Alternative 6A

Themed Alternative 6A involved traditional capacity improvements, which are outlined as follows:

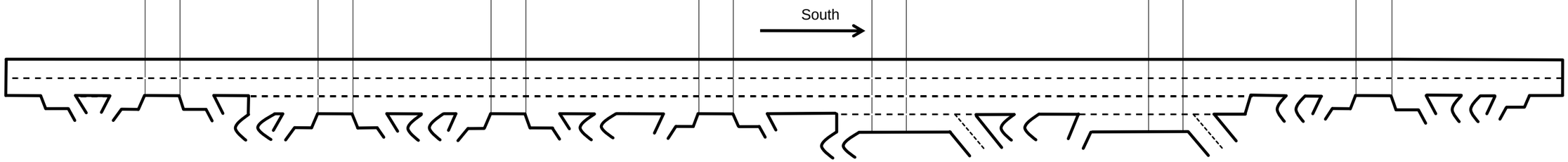
- Addition of a lane on the ramp serving westbound I-94 to northbound I-29 traffic. The second lane was fed by an option lane on I-94. Both lanes end at 13th Ave with an escape lane for the left lane.
- Addition of a lane on westbound I-94 between I-29 and 45th St
- An auxiliary lane was added on westbound I-94 between 34th St and 20th St
- Auxiliary lane added between 20th St and TH 75
- Bridge braid on westbound I-94 grade separating the southbound 25th Street entrance and the northbound I-29 exit
- Extended the eastbound I-94 auxiliary lane between I-29 and 25th St to University Dr
- Added auxiliary lanes on eastbound I-94 between TH 75 and 20th St, and between 20th St and 34th St
- New flyover ramp was added for northbound I-29 to westbound I-94 at the tri-level interchange

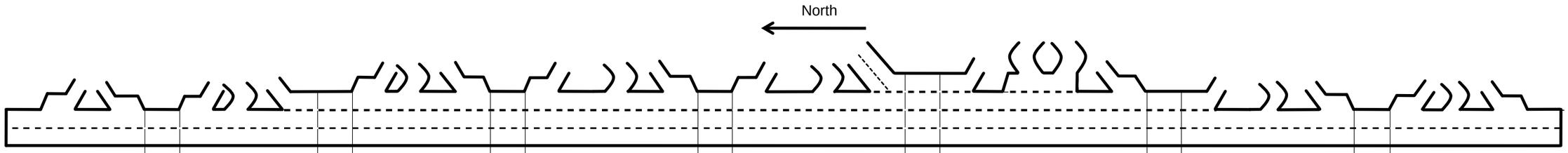
No travel demand model run was implemented for this scenario. However, the bridge braid design on westbound I-94 did require modifications to the OD tables. Traffic entering I-94 from the southbound to westbound ramp at 25th Street does not have the option to travel north on I-29. Instead, these vehicles were manually rerouted to other entry points along northbound I-29. The summary of the VISSIM output (Level of Service) results for the AM and PM networks are provided on the following pages.

I-29 Data Collection: 2025 AM Themed Alternative 6A

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94									32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895			815	1050	1270	625	7200	620	670	960	510	1900
2025 Target (vph)					1707					1889					1686						1513				1582						2488							2138						
2025 Sim. Vol. (vph)					1735					1916					1712						1535				1627						2269							2025						
Volume % Difference					2%					1%					2%						1%				3%						-9%							-5%						
Speed (mph)					73.1					59					58.9						56.9				59						59.2							72.7						
# of Lanes					2					3					3						3				4						4							2						
Density (pc/mi/ln)					13					12					11						10				8						11							15						
Level of Service					B					B					B						A				A						B							B						





Northbound

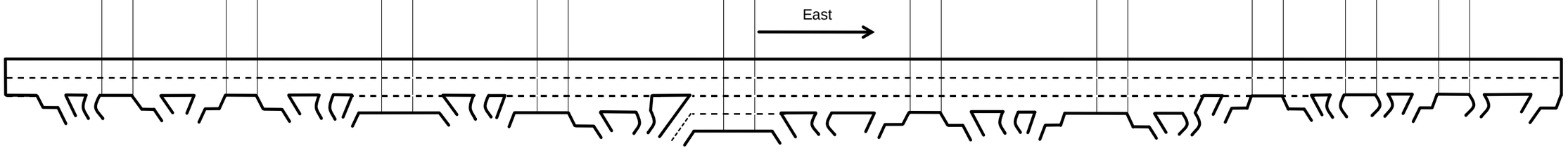
	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94									32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310		2100		910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Target (vph)					1278					1766					2990						4162						5492							3735					3157						
2025 Sim. Vol. (vph)					1274					1745					2911						4004						5104							3750					3169						
Volume % Difference					0%					-1%					-3%						-4%						-7%							0%					0%						
Speed (mph)					74.1					58.7					58						55.8						55.9							57.1					70.6						
# of Lanes					2					3					3						3						5							3					2						
Density (pc/mi/ln)					10					11					19						27						20							24					25						
Level of Service					A					B					B						C						C							C					C						

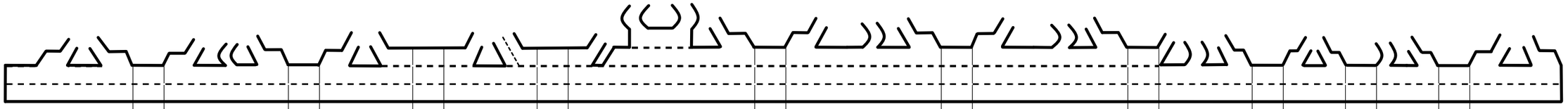
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 AM Themed Alternative 6A

Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.					I-29						25th St.					University Dr.						TH 75			20th St.				34th St.				MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185		760	465	1345	1365	1805		910	730	1465	515	870	960	740	1050	1125	4225		520	1445	790	2315		1665	5910	2110	575	14825	710	1365	1080
2025 Target (vph)				1662				1906					2551					2959						2762						2928					2755					2124			1756			1572			
2025 Sim. Vol. (vph)				1680				1928					2572					2983						2805						2929					2520					1941			1596			1455			
Volume % Difference				1%				-					1%					1%						2%						0%					-9%					-9%			-9%			-7%			
Speed (mph)				73.3				58.1					58.7					57.5						59.2						58.3					58.8					59			59.3			70			
# of Lanes				2				2					3					3						4						4					3					3			3			2			
Density (pc/mi/ln)				13				18					16					19						13						14					16					12			10			12			
Level of Service				B				B					B					B						B						B					B					B			A			B			

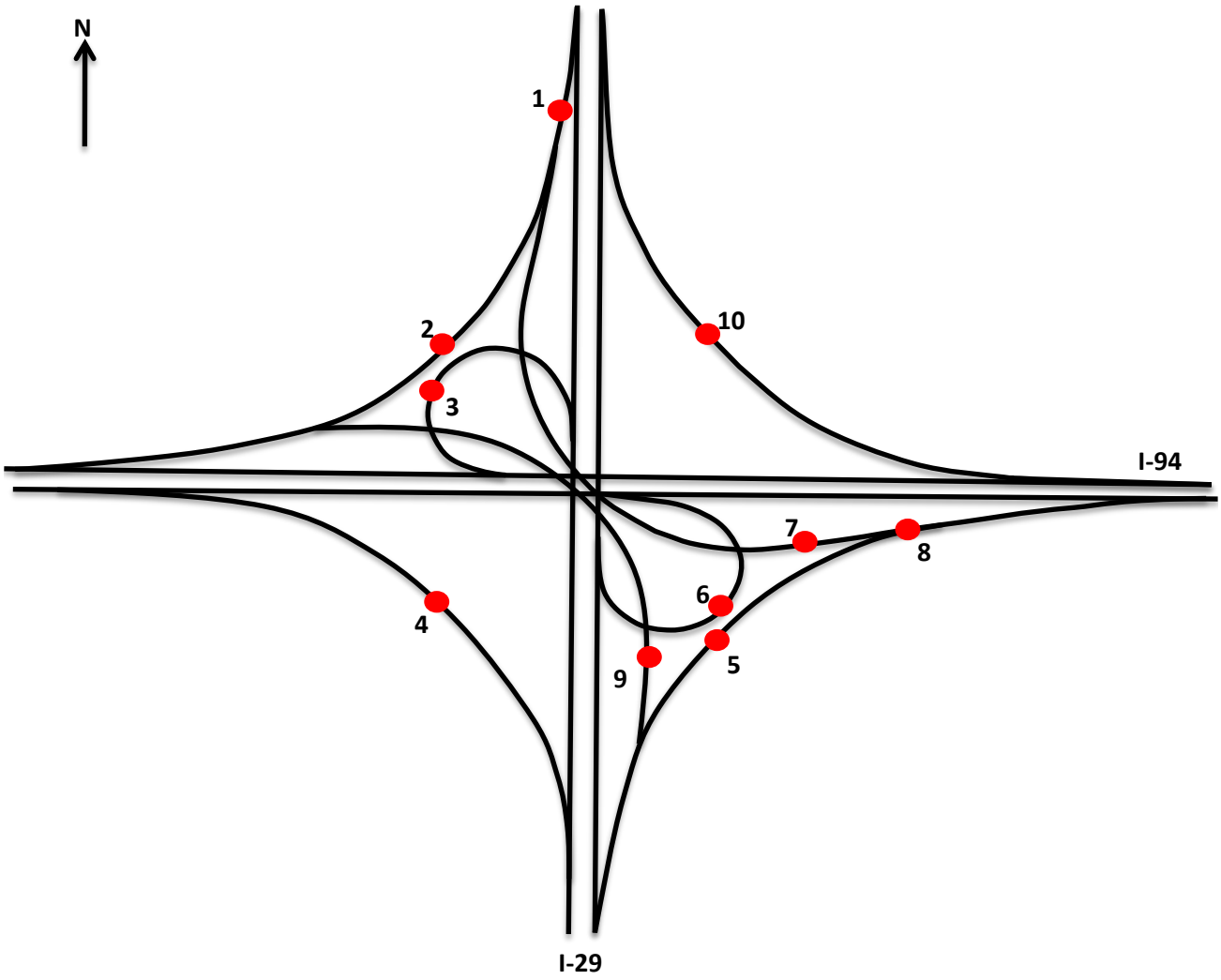




Westbound

	Main Ave.				Sheyenne St.					9th St.				45th St.				I-29																																
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375				1490	975			945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425		5400	1365	585	12850	965	2195	465
2025 Target (vph)					1418					1254				1979				4134									6601						5844						5015				3677			3031			2583			
2025 Sim. Vol. (vph)					1368					1169				1782				3569									3753						4615						4689				3600			3042			2593			
Volume % Difference					-4%					-				-10%				-14%									-43%						-21%						-6%				-2%			0%			0%			
Speed (mph)					72.3					59.1				58.6				59									57.6						22.5						52.1				38.7			58.2			69.7			
# of Lanes					2					2				3				4									4						4						3				3			3			2			
Density (pc/mi/ln)					11					11				11				17									18						57						33				34			19			21			
Level of Service					B					B				B				B									B						F						D				D			B			C			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 AM - Themed Alternative 6A: Data Collection Points (I-29/I-94 Interchange)

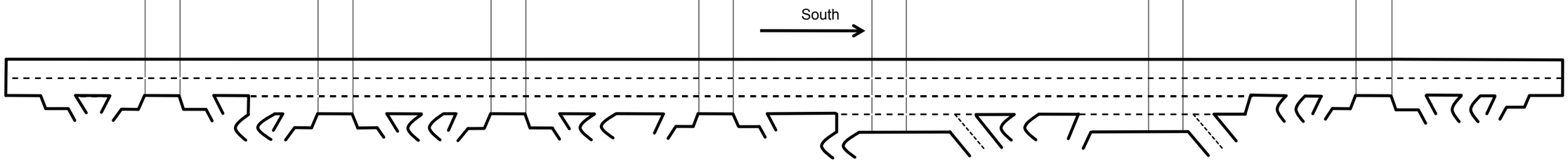
	1	2	3	4	5	6	7	8	9	10
2025 Target (vph)	768	242	1267	407	587	903	526	1113	585	2027
2025 Sim. Vol. (vph)	812	259	1039	411	594	921	553	1148	588	1606
Volume % Difference	6%	7%	-18%	1%	1%	2%	5%	3%	0%	-21%
Speed (mph)	59	54	24	55	54	24	55	56	54	54
# of Lanes	2	1	1	1	1	1	2	2	1	2
Density (pc/mi/ln)	8	5	48	8	12	43	6	11	12	17

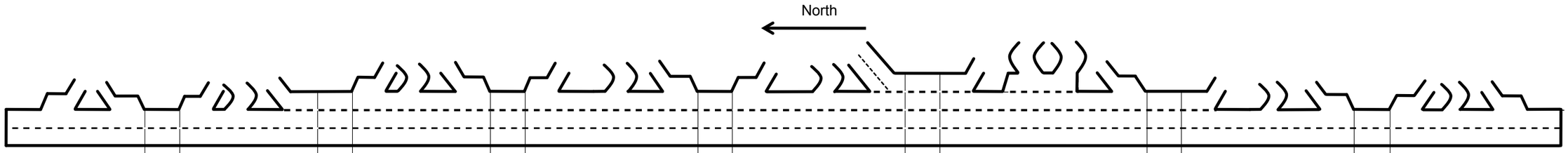
This data increased the original density by 10%.

I-94 Data Collection: 2025 PM Themed Alternative 6A

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895				815	1050	1270	625	7200	620	670	960	510	1900
2025 Target (vph)					1422					1859					2859						3928				4837						3380							3321					
2025 Sim. Vol. (vph)					1444					1885					2889						3386				4298						3158							3153					
Volume % Difference					2%					1%					1%						-14%				-11%						-7%							-5%					
Speed (mph)					73.6					59.2					57.9						43.3				56.7						58.6							69.6					
# of Lanes					2					3					3						3				4						4							2					
Density (pc/mi/ln)					11					12					18						29				21						15							25					
Level of Service					B					B					B						D				C						B							C					





Northbound

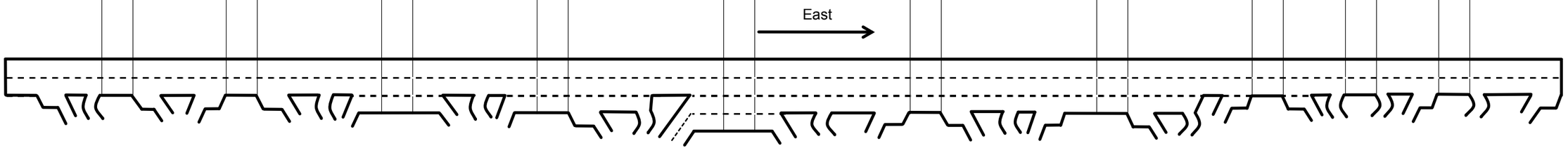
	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310		2100		910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Target (vph)					2251					2138					2280						2392						2482							2471					2339					
2025 Sim. Vol. (vph)					2159					2021					2125						2399						2442							2369					2326					
Volume % Difference					-4%					-5%					-7%						0%						-2%							-4%					-1%					
Speed (mph)					73					59.1					58.9						58.5						59.1							52.7					70.8					
# of Lanes					2					3					3						3						5							3					2					
Density (pc/mi/ln)					16					13					13						15						9							17					18					
Level of Service					B					B					B						B						A							B					B					

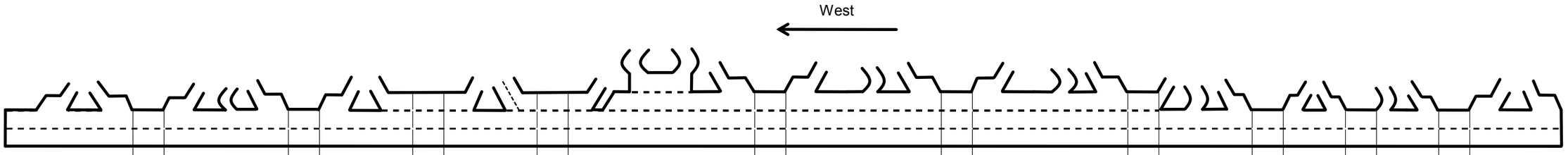
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 PM Themed Alternative 6A

Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.				I-29					25th St.					University Dr.					TH 75			20th St.			34th St.			MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185	760	465	1345	1365	1805	910	730	1465	515	870	960	740	1050	1125	4225	520	1445	790	2315	1665	5910	2110	575	14825	710	1365	1080
2025 Target (vph)				1568				1590					2199				3819					5894					5494					4988				3581			3042			2995			
2025 Sim. Vol. (vph)				1589				1613					2224				3849					5556					5219					4808				3522			2944			2922			
Volume % Difference				1%				-					1%				1%					-6%					-5%					-4%				-2%			-3%			-2%			
Speed (mph)				73.4				58.4					59				57.1					46.8					55.7					56.3				58.1			58.6			69.7			
# of Lanes				2				2					3				3					4					4					3				3			3			2			
Density (pc/mi/ln)				12				15					14				25					33					26					32				22			19			23			
Level of Service				B				B					B				C					D					C					D				C			C			C			

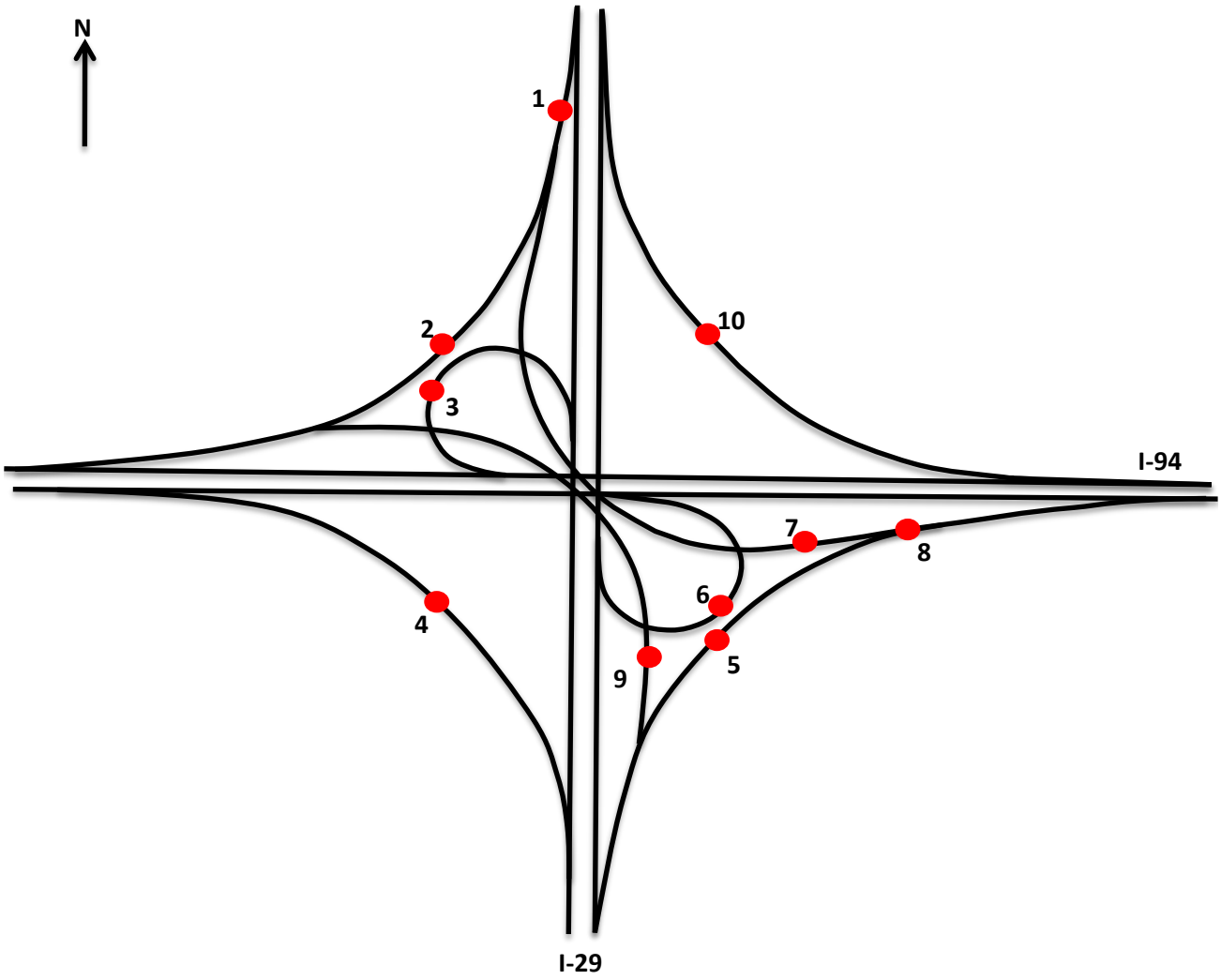




Westbound

	Main Ave.				Sheyenne St.					9th St.					45th St.					I-29									25th St.									University Dr.									TH 75				20th St.					34th St.				MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375	1490	975	945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425	5400	1365	585	12850	965	2195	465
2025 Target (vph)					1967					1790				2787			3659					4287						3900						3787				2878			2386			1955			
2025 Sim. Vol. (vph)					1985					1794				2749			3574					3307						3924						3810				2960			2395			1963			
Volume % Difference					1%					-				-1%			-2%					-23%						1%						1%				3%			0%			0%			
Speed (mph)					70.8					58.5				57.8			59					57.9						58.4						57.9				58.6			58.9			69.9			
# of Lanes					2					2				3			4					4						4						3				3			3			2			
Density (pc/mi/ln)					16					17				18			17					16						19						24				19			15			16			
Level of Service					B					B				B			B					B						B						C				B			B			B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 PM - Themed Alternative 6A: Data Collection Points (I-29/I-94 Interchange)

	1	2	3	4	5	6	7	8	9	10
2025 Target (vph)	2828	716	785	585	931	382	2112	3043	441	1001
2025 Sim. Vol. (vph)	2513	637	789	587	859	398	1862	2707	415	977
Volume % Difference	-11%	-11%	1%	0%	-8%	4%	-12%	-11%	-6%	-2%
Speed (mph)	55	54	24	54	47	25	49	44	54	55
# of Lanes	2	1	1	1	1	1	2	2	1	2
Density (pc/mi/ln)	25	13	36	12	20	18	21	35	9	10

This data increased the original density by 10%.

Themed Alternative 6B

The goal of this themed alternative was to eliminate ramp-to-ramp weaving occurring between the tri-level interchange and the adjacent local interchanges. To accomplish this, only the on-ramps going towards and off-ramps coming away from the tri-level interchange were removed. The ramps that were removed in this scenario are listed as follows:

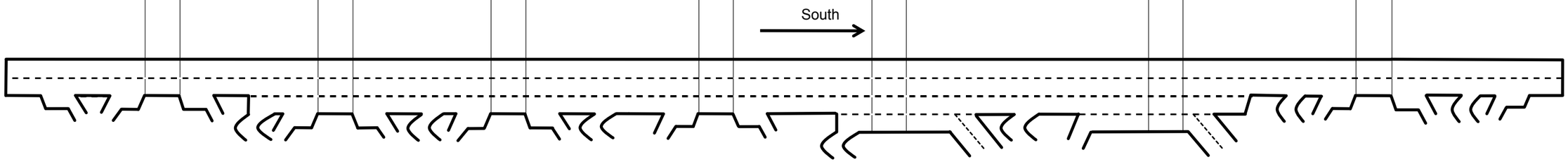
- I-29 southbound on ramp loop at 13th Ave
- I-29 northbound off ramp at 13th Ave
- I-29 southbound off ramp at 32nd Ave
- I-29 northbound on ramp loop at 32nd Ave
- I-29 northbound on ramp loop at 32nd Ave
- I-94 eastbound on ramp loop at 45th St
- I-94 eastbound on ramp at 45th St
- I-94 westbound off ramp at 45th St
- I-94 eastbound off ramp at 25th St
- I-94 westbound on ramp at 25th St
- I-94 westbound on ramp loop at 25th St

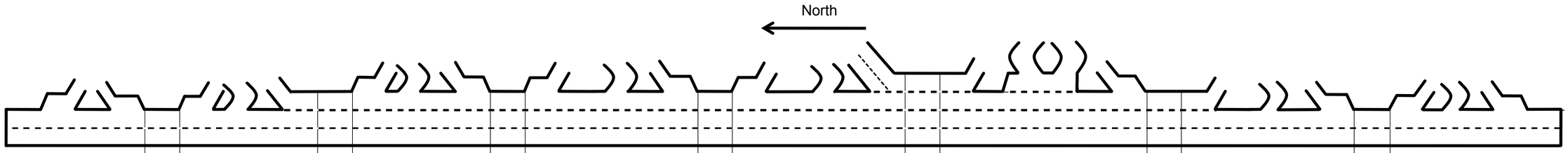
A travel demand model run was performed to evaluate the travel pattern shifts resulting from these ramp closures. The updated OD tables were then used in the VISSIM simulation model, along with the network changes listed above. The summary of the VISSIM output (Level of Service) results for the AM and PM networks are provided on the following pages.

I-29 Data Collection: 2025 AM Peak Hour - Themed Alternative 6B

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94							32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895			815	1050	1270	625	7200	620	670	960	510	1900
2025 Original (vph)					1728					1834					1632						1817				808						1357							2044					
2025 Sim. Vol. (vph)					1755					1863					1653						1593				829						1175							1864					
Volume % Difference					2%					2%					1%						-12%				3%						-13%							-9%					
Speed (mph)					73					59					59						55.9				59.2						59.2							72.9					
# of Lanes					2					3					3						3				4						4							2					
Density (pc/mi/ln)					13					12					10						11				4						6							14					
Level of Service					B					B					B						B				A						A							B					





Northbound

	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94							32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310	2100			910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Original (vph)					1214					1787					2948						4521					3753								2192					2691					
2025 Sim. Vol. (vph)					1203					1715					2765						3895					3324								2205					2699					
Volume % Difference					-1%					-4%					-6%						-14%					-11%								1%					0%					
Speed (mph)					74.2					58.7					58.2						56.6					58.3								58.7					71.9					
# of Lanes					2					3					3						3					4								3					2					
Density (pc/mi/ln)					9					11					18						25					16								14					21					
Level of Service					A					B					B						C					B								B					C					

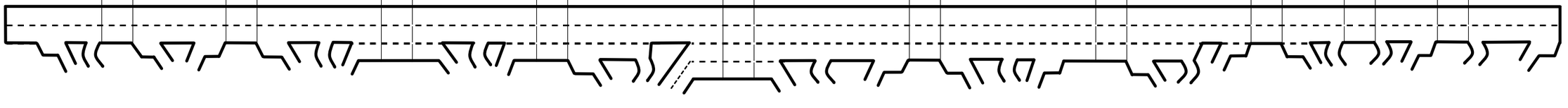
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 AM Peak Hour - Themed Alternative 6B

Eastbound

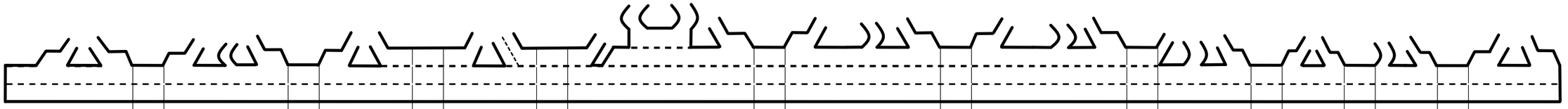
	Main Ave.			Sheyenne St.				9th St.					45th St.					I-29						25th St.					University Dr.						TH 75			20th St.			34th St.			MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185		760	465	1345	1365	1805		910	730	1465	515	870	960	740	1050	1125	4225		520	1445	790	2315		1665	5910	2110	575	14825	710	1365	1080
2025 Original (vph)				1523				1565					2606					1565					1927						3001						2651					2021			1616			1496			
2025 Sim. Vol. (vph)				1543				1576					2583					1583					1938						3017						2321					1846			1450			1369			
Volume % Difference				1%				-					-1%					1%					1%						1%						-12%					-9%			-10%			-8%			
Speed (mph)				73.3				58.6					57.8					59.3					59						56.5						58.9					58.1			58.7			69.9			
# of Lanes				2				2					3					3					4						3						3					2			2			2			
Density (pc/mi/ln)				12				15					17					10					9						20						15					18			14			11			
Level of Service				B				B					B					A					A						B						B					B			B			B			

East



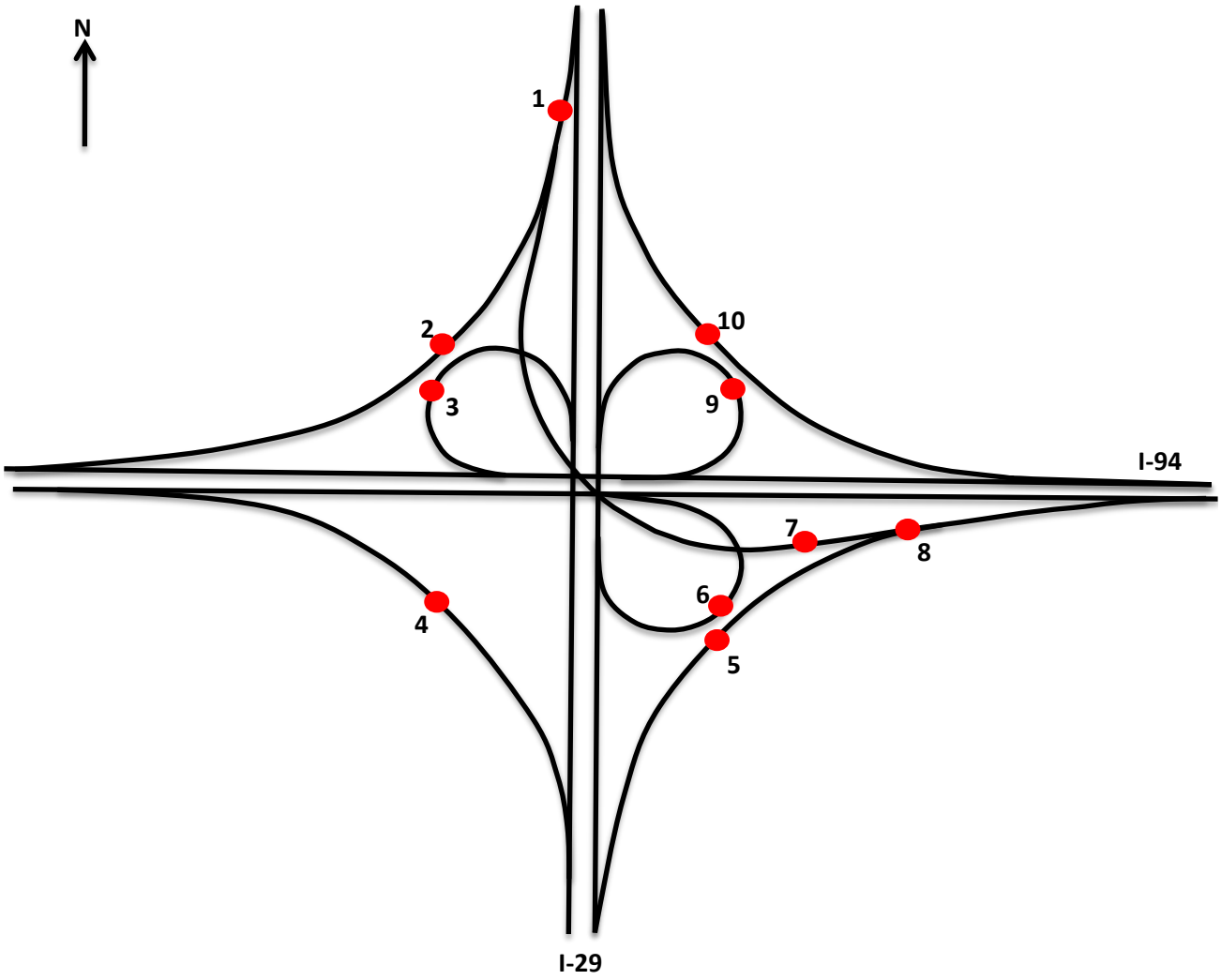
West

Westbound



	Main Ave.				Sheyenne St.					9th St.				45th St.					I-29								25th St.							University Dr.								TH 75			20th St.				34th St.			MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375			1490	975		945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425		5400	1365	585	12850	965	2195	465
2025 Original (vph)					1390					1267				2708				2436							4909						5580						4571				3414			2814			2470			
2025 Sim. Vol. (vph)					1289					1106				2191				1916							3732						4410						4601				3473			2831			2480			
Volume % Difference					-7%					-				-19%				-21%							-24%						-21%						1%				2%			1%			0%			
Speed (mph)					72.5					59				56.9				58.4							30.5						21.5						57.4				56.3			57.4			69.8			
# of Lanes					2					2				3				3							3						3						3				2			2			2			
Density (pc/mi/ln)					10					10				14				12							45						76						30				34			27			20			
Level of Service					A					B				B				B							F						F						D				D			C			B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 AM - Themed Alternative 6B - Data Collection Points (I-29/I-94 Interchange)

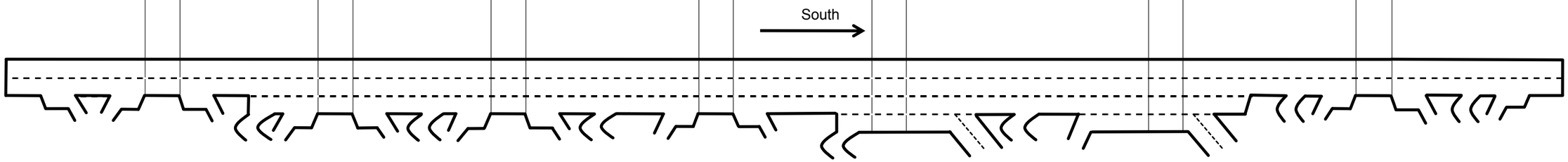
	1	2	3	4	5	6	7	8	9	10
2025 Original (vph)	403	65	734	218	542	300	338	880	252	2055
2025 Sim. Vol. (vph)	422	80	545	221	547	317	342	889	251	1598
Volume % Difference	5%	22%	-26%	2%	1%	6%	1%	1%	0%	-22%
Speed (mph)	60	55	25	55	53	25	55	57	25	52
# of Lanes	2	1	1	1	1	1	2	2	1	1
Density (pc/mi/ln)	4	2	25	4	11	14	3	9	11	34

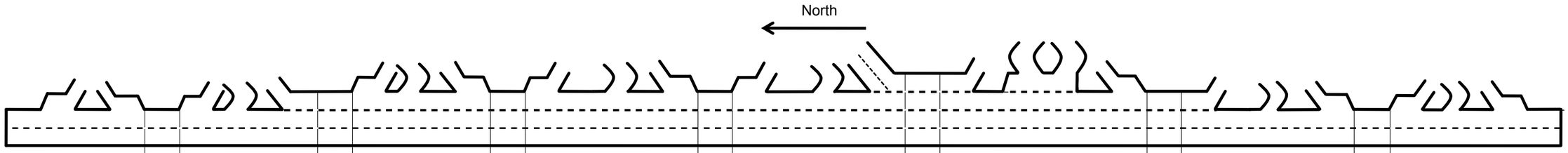
This data increased the original density by 10%.

I-29 Data Collection: 2025 PM Peak Hour - Themed Alternative 6B

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94							32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895			815	1050	1270	625	7200	620	670	960	510	1900
2025 Original (vph)					1365					1726					2703						4005				3377						2221							3185					
2025 Sim. Vol. (vph)					1386					1751					2732						3968				3171						2216							3192					
Volume % Difference					2%					1%					1%						-1%				-6%						0%							0%					
Speed (mph)					73.7					59.3					58.1						54.7				47.4						58.3							69.3					
# of Lanes					2					3					3						3				4						4							2					
Density (pc/mi/ln)					10					11					17						27				19						11							26					
Level of Service					B					B					B						C				B						B							C					





Northbound

	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94							32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310		2100		910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Original (vph)					2245					2073					2179						2620					1396							1501						2222					
2025 Sim. Vol. (vph)					2252					2069					2158						2486					1313							1055						2201					
Volume % Difference					0%					0%					-1%						-5%					-6%							-30%						-1%					
Speed (mph)					72.9					59.1					58.9						58.1					59.3							44.8						71					
# of Lanes					2					3					3						3					4							3						2					
Density (pc/mi/ln)					17					13					14						16					6							9						17					
Level of Service					B					B					B						B					A							A						B					

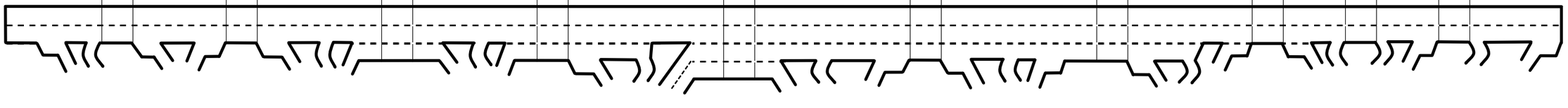
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 PM Peak Hour - Themed Alternative 6B

Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.				I-29					25th St.					University Dr.					TH 75			20th St.			34th St.			MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185	760	465	1345	1365	1805	910	730	1465	515	870	960	740	1050	1125	4225	520	1445	790	2315	1665	5910	2110	575	14825	710	1365	1080
2025 Original (vph)				1552				1413					2696				2313					4336					5180					4660				3435		2903			2873			
2025 Sim. Vol. (vph)				1573				1436					2722				2340					3359					3506					3458				2673		2268			2370			
Volume % Difference				1%				-					1%				1%					-23%					-32%					-26%				-22%		-22%			-17%			
Speed (mph)				73.4				58.7					58.8				59.1					21					24.2					58				56.8		57.7			69.8			
# of Lanes				2				2					3				3					4					3					3				2		2			2			
Density (pc/mi/ln)				12				14					17				15					44					54					22				26		22			19			
Level of Service				B				B					B				B					F					F					C				C		C			B			

East



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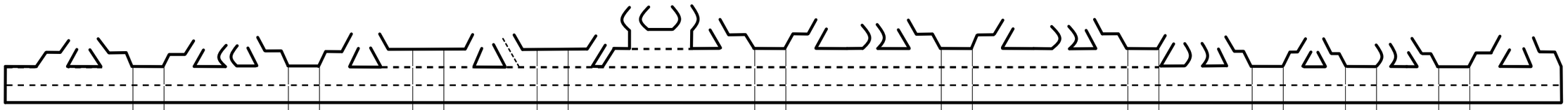
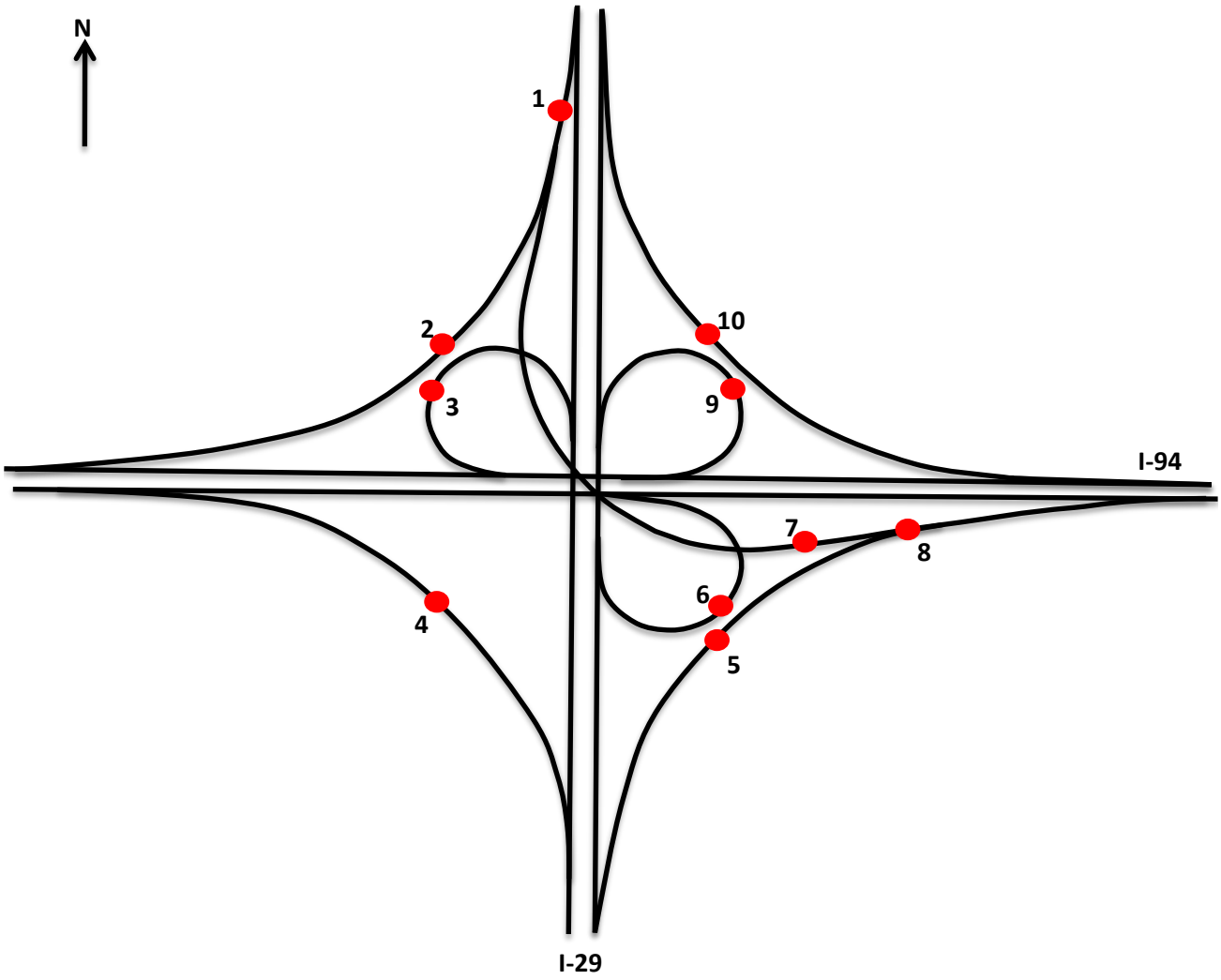


Westbound

	Main Ave.				Sheyenne St.					9th St.					45th St.				I-29									25th St.									University Dr.									TH 75			20th St.					34th St.				MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375	1490	975	945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425	5400	1365	585	12850	965	2195	465
2025 Original (vph)					1907					1837				3175			2186					2949						3709						3445				2690		2234			1878			
2025 Sim. Vol. (vph)					1896					1802				3083			2087					2939						3679						3460				2772		2245			1882			
Volume % Difference					-1%					-				-3%			-5%					0%						-1%						0%				3%		0%			0%			
Speed (mph)					71.1					58.3				56.7			58.3					57.8						56.5						58				57.4		58			69.9			
# of Lanes					2					2				3			3					3						3						3				2		2			2			
Density (pc/mi/ln)					15					17				20			13					19						24						22				27		21			15			
Level of Service					B					B				C			B					B						C						C				C		C			B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 PM - Themed Alternative 6B: Data Collection Points (I-29/I-94 Interchange)

	1	2	3	4	5	6	7	8	9	10
2025 Original (vph)	2036	333	620	260	738	158	1703	2441	221	696
2025 Sim. Vol. (vph)	1779	292	625	262	270	175	1348	1527	159	696
Volume % Difference	-13%	-12%	1%	1%	-63%	10%	-21%	-37%	-28%	0%
Speed (mph)	39	54	24	55	46	25	31	28	25	54
# of Lanes	2	1	1	1	1	1	2	2	1	1
Density (pc/mi/ln)	25	6	29	5	7	8	24	31	7	14

This data increased the original density by 10%.

Themed Alternative 6C

This alternative was projected to impose the highest prospective cost of all of the Themed Alternative 6 scenarios. Themed Alternative 6C involved the modeling of a "big box" interchange in place of the existing tri-level interchange. All of the local interchanges adjacent to the tri-level interchange were braided into the mainline. Doing so limited access at 25th St and 45th St to I-94 only (restricted movements exiting after entering from I-29 or entering movements from exiting for I-29). It also limited access at 32nd Ave and 13th Ave to I-29 only (restricted movements exiting after entering from I-94 or entering movements from exiting to I-94).

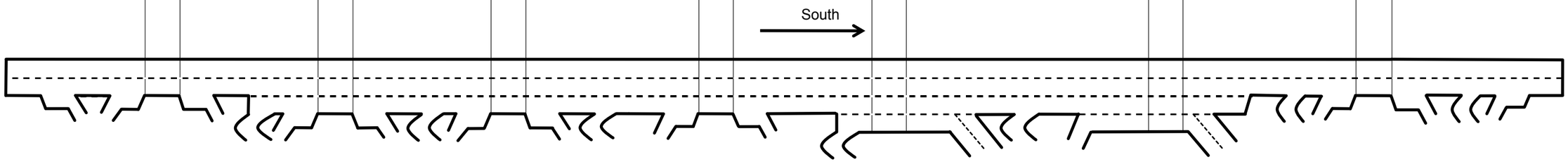
This scenario required the greatest amount of modeling effort in VISSIM because of the significant changes in geometry. In addition, several of the data collection parameters (data collectors, travel time section markers, speed decision markers, etc.) had to be added or modified so that the model output would be comparable to other scenarios.

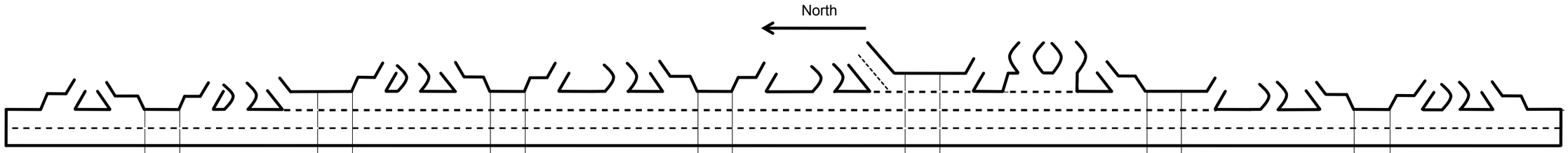
A travel demand model run was performed to evaluate the travel pattern shifts resulting from these ramp closures. The updated OD tables were then used in the VISSIM simulation model, along with the network changes described above. The summary of the VISSIM output (Level of Service) results for the AM and PM networks are provided on the following pages.

I-29 Data Collection: 2025 AM Peak Hour - Themed Alternative 6C

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94							32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895			815	1050	1270	625	7200	620	670	960	510	1900
2025 Original (vph)					1712					1879					1680						1809				1046							1022						2060					
2025 Sim. Vol. (vph)					1737					1906					1706						1834				1027							1030						2013					
Volume % Difference					1%					1%					2%						1%				-2%							1%						-2%					
Speed (mph)					73					59					59						57.2				58.9							58						72.5					
# of Lanes					2					3					3						3				4							4						2					
Density (pc/mi/ln)					13					12					11						12				5							5						15					
Level of Service					B					B					B						B				A							A						B					





Northbound

	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94							32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310		2100		910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Original (vph)					1274					1733					2918						4186					3008							2617						3185					
2025 Sim. Vol. (vph)					1286					1738					2905						4122					3029							3025						3205					
Volume % Difference					1%					0%					0%						-2%					1%							16%						1%					
Speed (mph)					74.1					58.2					57						54.7					56							58.7						70.2					
# of Lanes					2					3					3						3					4							3						2					
Density (pc/mi/ln)					10					11					19						28					15							19						25					
Level of Service					A					B					B						C					B							B						C					

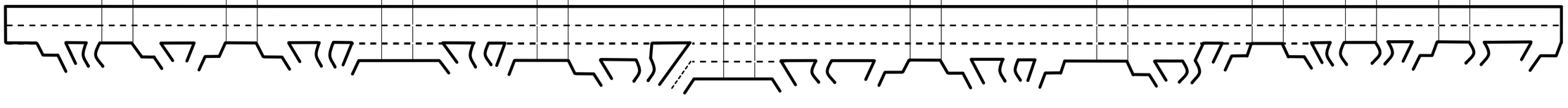
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 AM Peak Hour - Themed Alternative 6C

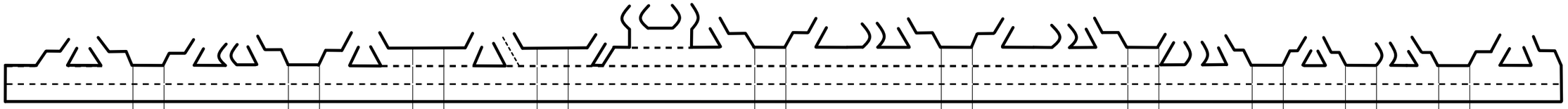
Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.					I-29						25th St.						University Dr.						TH 75			20th St.				34th St.			MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185		760	465	1345	1365	1805		910	730	1465	515	870	960	740	1050	1125	4225		520	1445	790	2315		1665	5910	2110	575	14825	710	1365	1080
2025 Original (vph)				1547				1715					2309					1653					1822						2809					2688					2085			1733			1566			
2025 Sim. Vol. (vph)				1569				1740					2333					1832					2159						2828					2582					2053			1674			1517			
Volume % Difference				1%				-					1%					11%					18%						1%					-4%					-2%			-3%			-3%			
Speed (mph)				73.4				58.3					58.6					57.5					59						57.7					58.7					57.9			58.5			69.9			
# of Lanes				2				2					3					3					4						3					3					2			2			2			
Density (pc/mi/ln)				12				17					15					12					10						18					16					20			16			12			
Level of Service				B				B					B					B					B						B					B					B			B			B			

East



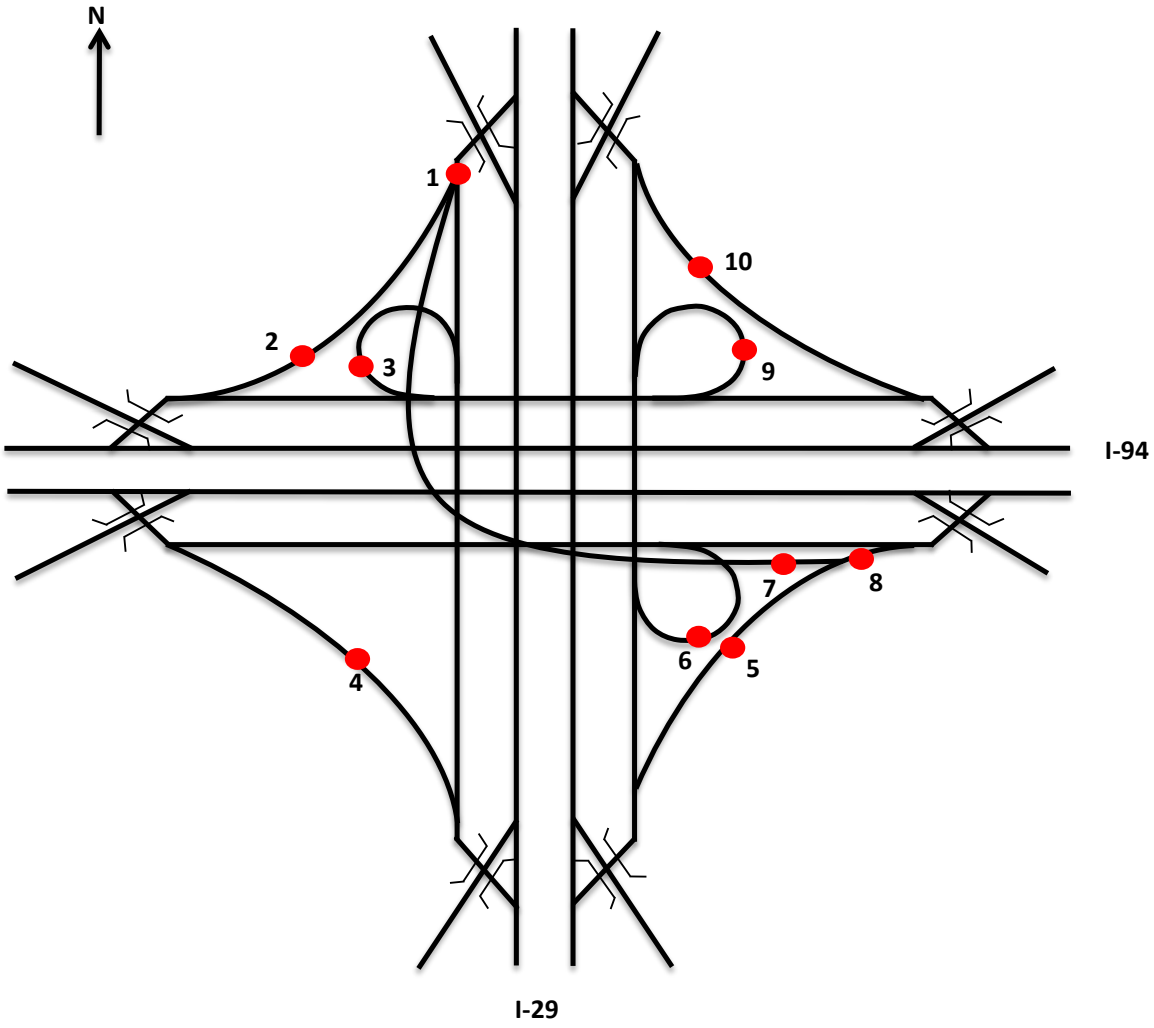
West



Westbound

	Main Ave.				Sheyenne St.					9th St.				45th St.					I-29									25th St.								University Dr.									TH 75			20th St.				34th St.			MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375			1490	975		945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425		5400	1365	585	12850	965	2195	465
2025 Original (vph)					1412					1224				1997				1321							3860						5858						4927				3623			2988			2574			
2025 Sim. Vol. (vph)					1403					1198				1920				1579							3603						5443						4896				3678			3004			2584			
Volume % Difference					-1%					-				-4%				20%							-7%						-7%						-1%				2%			1%			0%			
Speed (mph)					72.4					59.1				58.4				59.3							57.4						52.9						57.3				53.1			57.2			69.7			
# of Lanes					2					2				3				3							3						3						3				2			2			2			
Density (pc/mi/ln)					11					11				12				10							23						38						32				39			29			21			
Level of Service					B					B				B				A							C						E						D				E			D			C			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 AM - Themed Alternative 6C - Data Collection Points (I-29/I-94 Interchange)

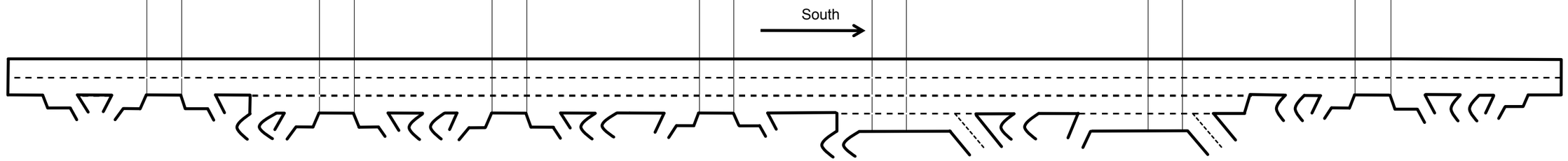
	1	2	3	4	5	6	7	8	9	10
Count Volume (vph)	2217	609	376	212	548	384	1608	2156	143	1118
2025 Original (vph)	461	106	621	261	410	271	354	765	230	1555
2025 Sim. Vol. (vph)	478	122	567	262	414	283	357	771	234	1460
Volume % Difference	4%	15%	-9%	0%	1%	4%	1%	1%	2%	-6%
Speed (mph)	59	55	24	55	54	25	55	57	25	55
# of Lanes	2	1	1	1	1	1	2	2	1	2
Density (pc/mi/ln)	5	2	26	5	9	13	4	8	10	15

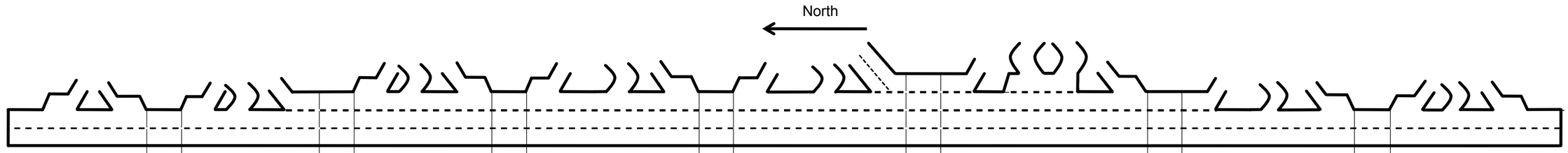
This data increased the original density by 10%.

I-29 Data Collection: 2025 PM Peak Hour - Themed Alternative 6C

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895				815	1050	1270	625	7200	620	670	960	510	1900
2025 Original (vph)					1404					1795					2819						4132				2477						2477								3312					
2025 Sim. Vol. (vph)					1425					1816					2842						4157				2489						2490								3332					
Volume % Difference					2%					1%					1%						1%				0%						1%								1%					
Speed (mph)					73.6					59.3					57.9						53.6				57.2						56.1								67.8					
# of Lanes					2					3					3						3				4						4								2					
Density (pc/mi/ln)					11					11					18						29				12						12								27					
Level of Service					B					B					B						D				B						B								C					





Northbound

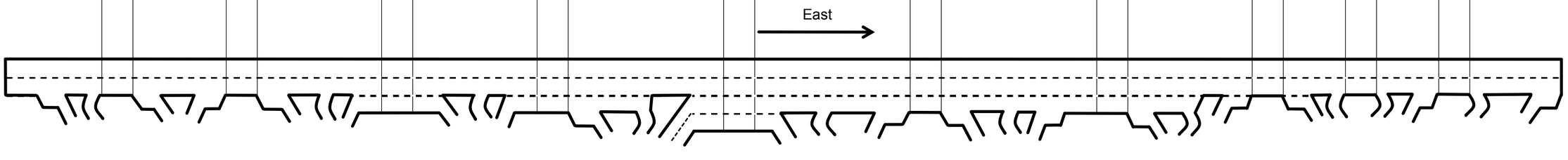
	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310		2100		910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Original (vph)					2266					2107					2253						2410					1297						1297								2409					
2025 Sim. Vol. (vph)					2297					2136					2281						2437					1304						1304								2416					
Volume % Difference					1%					1%					1%						1%					1%						1%								0%					
Speed (mph)					72.8					58.7					58.2						57.5					59						59.6								71.5					
# of Lanes					2					3					3						3					4						3								2					
Density (pc/mi/ln)					18					13					15						16					6						8								19					
Level of Service					B					B					B						B					A						A								B					

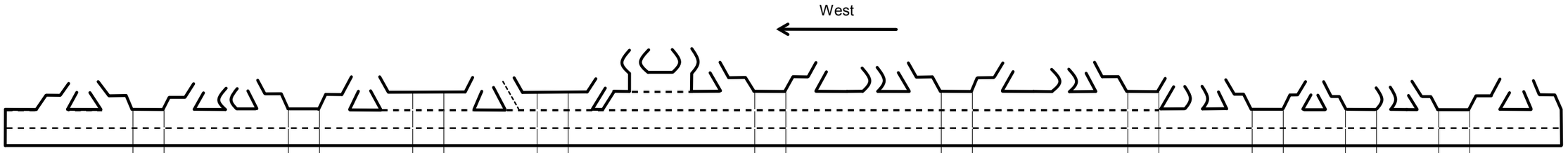
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 PM Peak Hour - Themed Alternative 6C

Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.				I-29					25th St.					University Dr.					TH 75			20th St.			34th St.			MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185	760	465	1345	1365	1805	910	730	1465	515	870	960	740	1050	1125	4225	520	1445	790	2315	1665	5910	2110	575	14825	710	1365	1080
2025 Original (vph)				1579				1633					2485				2905					4674					5162					4864				3522			3011			2991			
2025 Sim. Vol. (vph)				1601				1656					2487				2955					4378					5201					4906				3618			3036			3020			
Volume % Difference				1%				-					0%				2%					-6%					1%					1%				3%			1%			1%			
Speed (mph)				73.4				58.4					58.9				51.9					56.5					54.2					56.2				54.6			57.1			69.7			
# of Lanes				2				2					3				3					4					3					3				2			2			2			
Density (pc/mi/ln)				12				16					16				21					22					36					32				37			30			24			
Level of Service				B				B					B				C					C					E					D				E			D			C			

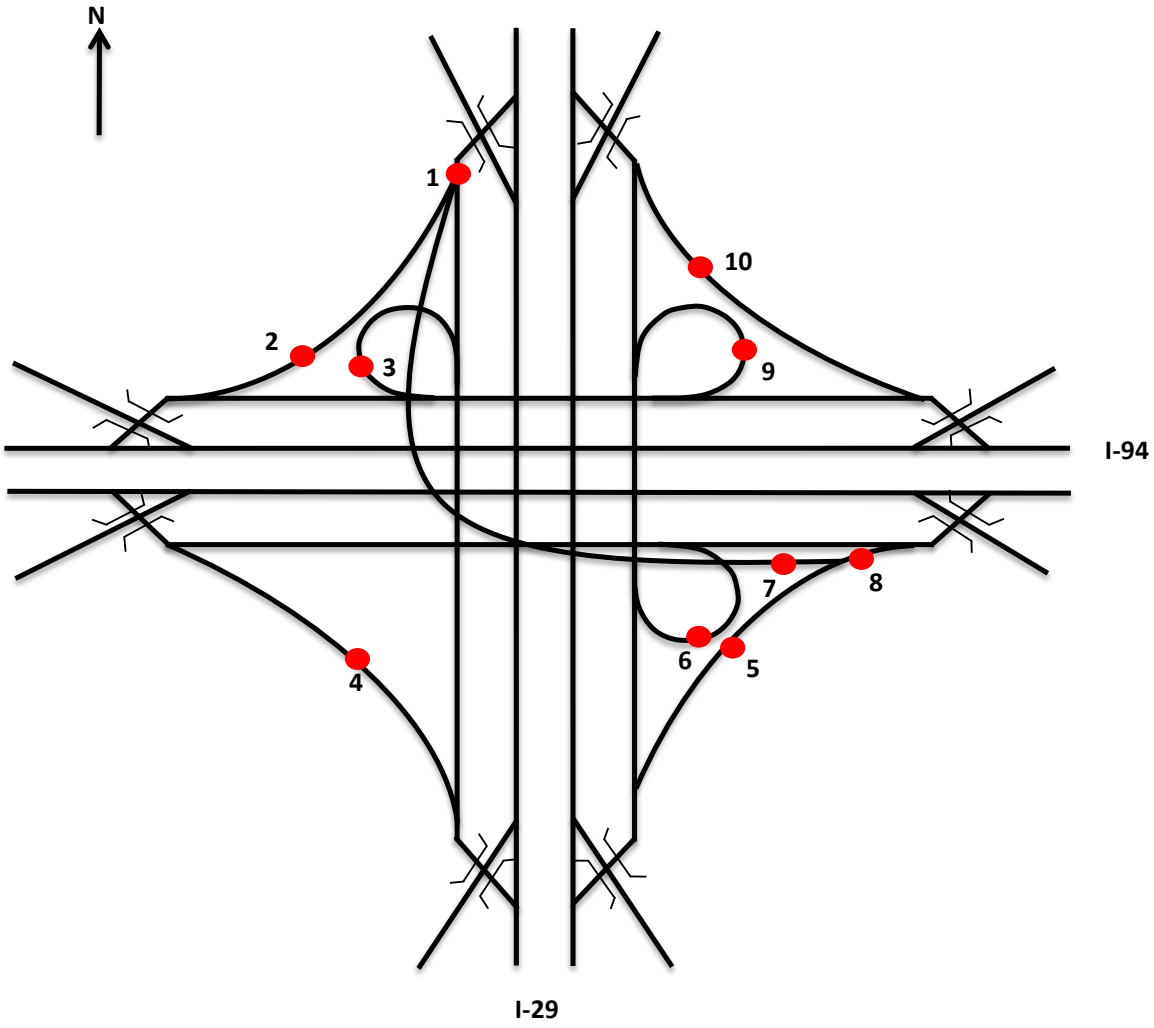




Westbound

	Main Ave.				Sheyenne St.					9th St.					45th St.					I-29									25th St.								University Dr.								TH 75			20th St.				34th St.				MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375				1490	975			945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425		5400	1365	585	12850	965	2195	465
2025 Original (vph)					2045					1866				2887			1981										3206						3845						3685				2831			2362			1958			
2025 Sim. Vol. (vph)					2076					1893				2893			2008										2916						3864						3707				2916			2376			1963			
Volume % Difference					1%					-				0%			1%										-9%						1%						1%				3%			1%			0%			
Speed (mph)					70.6					58.5				57			59										58.1						56.5						57.9				57.3			57.8			69.9			
# of Lanes					2					2				3			3										3						3						3				2			2			2			
Density (pc/mi/ln)					16					18				19			13										19						25						24				28			23			16			
Level of Service					B					B				B			B										B						C						C				D			C			B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 PM - Themed Alternative 6C - Data Collection Points (I-29/I-94 Interchange)

	1	2	3	4	5	6	7	8	9	10
Count Volume (vph)	2217	609	376	212	548	384	1608	2156	143	1118
2025 Original (vph)	2055	398	445	285	765	121	1657	2422	206	550
2025 Sim. Vol. (vph)	2079	414	447	285	770	134	1662	2434	207	555
Volume % Difference	1%	4%	1%	0%	1%	11%	0%	1%	1%	1%
Speed (mph)	57	54	24	55	53	25	54	50	25	55
# of Lanes	2	1	1	1	1	1	2	2	1	2
Density (pc/mi/ln)	20	8	20	6	16	6	17	27	9	6

This data increased the original density by 10%.

Hybrid Alternative 1

Hybrid Alternative 1 required the fewest capacity and physical improvements to the interstate system to achieve acceptable level of service. This scenario was a combination of the following strategies:

- 1A-Land use/Transit/TDM (5% reduction)
- 2-ITS/Incident Management
- 3-Ramp Metering
- 4-Off-system improvements
- 6-Capacity/Physical Improvements (minimum required)

A new travel demand model run was required, which included all improvements assumed in Themed Alternatives 3 and 4. The 5% reduction in volumes was applied to the origin-destination tables after extraction from the travel demand model. The following changes were made to the network:

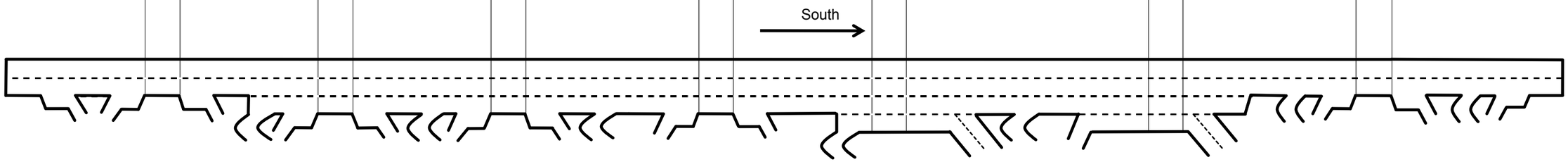
- Constructed an auxiliary lane on westbound I-94 between the southbound University Dr on ramp and the 25th St off ramp
- Eliminated the ramp from southbound 25th St to westbound I-94; and provided dual left-turn lanes to allow southbound 25th St traffic to use the northbound 25th St loop ramp to access westbound I-94
- Constructed an auxiliary lane on westbound I-94 between the 25th St on ramp and the northbound I-29 exit ramp
- Expanded the westbound I-94 to northbound I-29 ramp from 1 to 2 lanes. The 2 lane ramp was developed from the auxiliary lane from 25th St and the right-most through lane (option lane).
- Constructed an additional lane on northbound I-29 between the westbound I-94 on ramp and the 13th Ave off ramp. This resulted in a 5-lane section (3 through lanes with 2 full auxiliary lanes), and the current option lane was eliminated.
- Constructed an escape lane following the 2-lane exit from northbound I-29 to 13th Ave

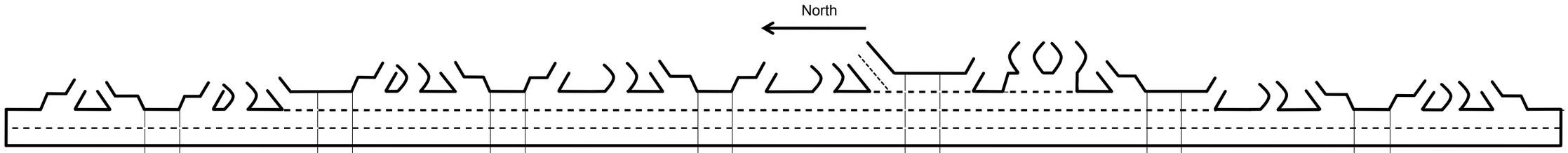
The summary of the VISSIM output (Level of Service) results for the AM and PM networks are provided on the following pages.

I-29 Data Collection: 2025 AM Hybird Alternative 1

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895				815	1050	1270	625	7200	620	670	960	510	1900
2025 Target (vph)					1643					1616					1404						1207				933						1583								1525					
2025 Sim. Vol. (vph)					1656					1628					1410						1209				931						1609								1548					
Volume % Difference					1%					1%					0%						0%				0%						2%								1%					
Speed (mph)					73.2					59.2					59.2						57.7				59.4						59.4								74					
# of Lanes					2					3					3						3				4						4								2					
Density (pc/mi/ln)					13					10					9						8				4						8								12					
Level of Service					B					B					A						A				A						A								B					





Northbound

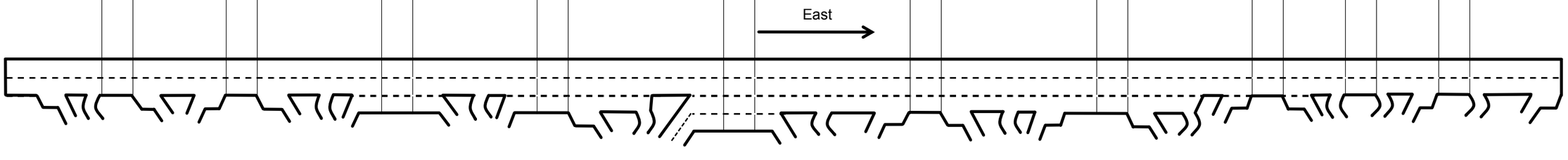
	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310	2100			910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Target (vph)					1003					1337					2416						3122					4373								2362					2074					
2025 Sim. Vol. (vph)					1028					1361					2449						3160					4420								2389					2099					
Volume % Difference					2%					2%					1%						1%					1%								1%					1%					
Speed (mph)					74.5					59.1					58.3						58.1					57.7								58.8					72.8					
# of Lanes					2					3					3						3					4								3					2					
Density (pc/mi/ln)					8					9					16						20					21								15					16					
Level of Service					A					A					B						C					C								B					B					

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

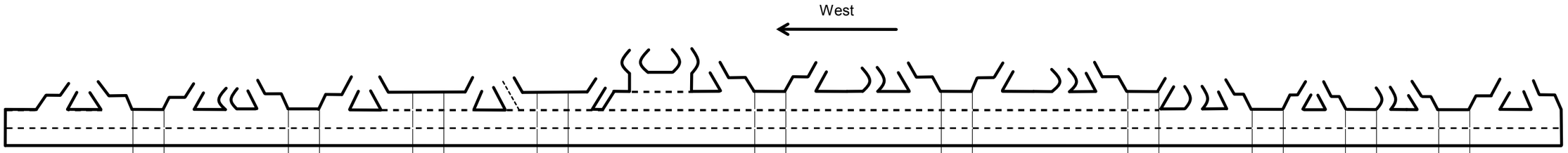
I-94 Data Collection: 2025 AM Hybird Alternative 1

Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.					I-29					25th St.					University Dr.						TH 75			20th St.			34th St.			MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185		760	465	1345	1365	1805		910	730	1465	515	870	960	740	1050	1125	4225		520	1445	790	2315		1665	5910	2110	575	14825	710	1365	1080
2025 Target (vph)				1494				1631					2115					2082					1722						1870					2043					1576			1225			1146			
2025 Sim. Vol. (vph)				1380				1821					2360					2110					1747						1896					2071					1633			1248			1169			
Volume % Difference				-8%				-					12%					1%					1%						1%					1%					4%			2%			2%			
Speed (mph)				73.5				58.4					58.9					58.6					59.5						58.7					59.1					58.7			59			70			
# of Lanes				2				2					3					3					4						3					3					2			2			2			
Density (pc/mi/ln)				10				17					15					13					8						12					13					15			12			9			
Level of Service				B				B					B					B					A						B					B					B			B			A			

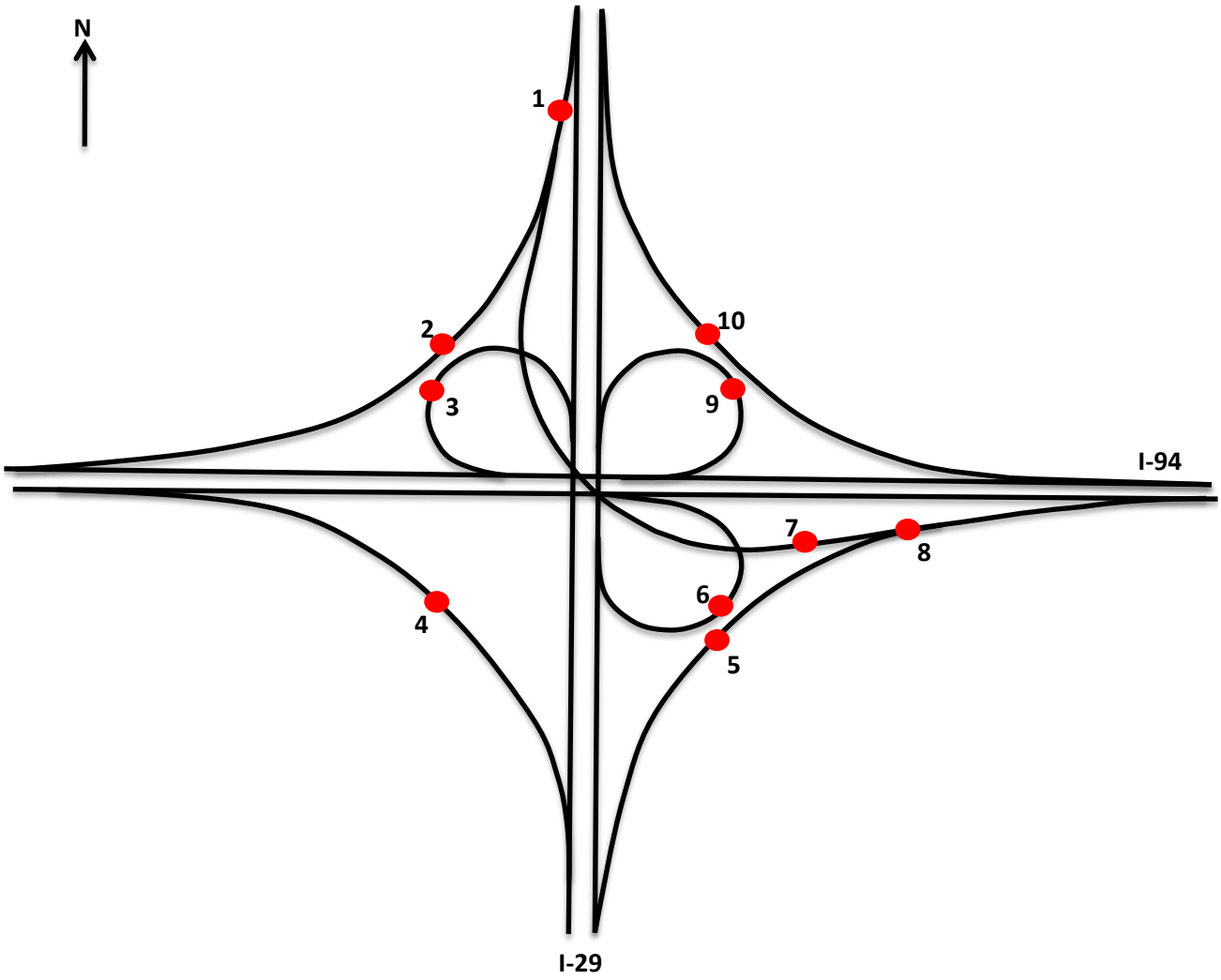


Westbound



	Main Ave.				Sheyenne St.					9th St.					45th St.					I-29									25th St.							University Dr.								TH 75				20th St.					34th St.				MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375			1490	975		945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425		5400	1365	585	12850	965	2195	465
2025 Target (vph)					1321					1049				1290			2901								5201						4811						4071				3125			2546			2235			
2025 Sim. Vol. (vph)					1341					1380				1221			2149								4478						4218						3756				2985			2450			2147			
Volume % Difference					1%					-				-5%			-26%								-14%						-12%						-8%				-4%			-4%			-4%			
Speed (mph)					72.7					58.9				59.5			59.4								57.2						58.8						58.1				57.4			57.9			69.9			
# of Lanes					2					2				3			3								4						3						3				2			2			2			
Density (pc/mi/ln)					10					13				8			13								22						27						24				29			24			17			
Level of Service					B					B				A			B								C						C						C				D			C			B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 AM - Hybird Alternative 1: Data Collection Points (I-29/I-94 Interchange)

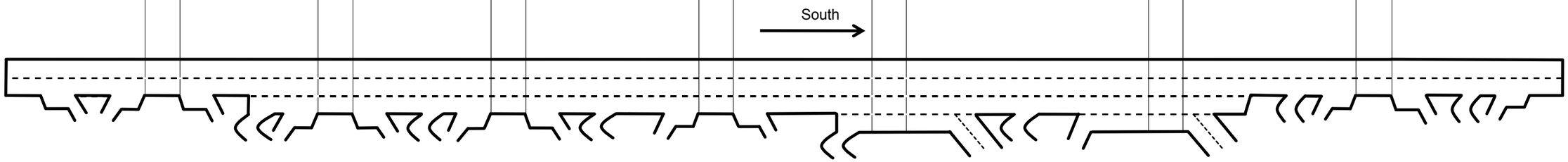
	1	2	3	4	5	6	7	8	9	10
2025 Target (vph)	391	53	748	294	204	609	338	542	248	1854
2025 Sim. Vol. (vph)	384	47	765	297	221	628	338	559	248	1865
Volume % Difference	-2%	-12%	2%	1%	8%	3%	0%	3%	0%	1%
Speed (mph)	60	55	24	55	55	24	55	56	25	54
# of Lanes	2	1	1	1	1	1	2	2	1	2
Density (pc/mi/ln)	4	1	35	6	4	29	3	6	11	19

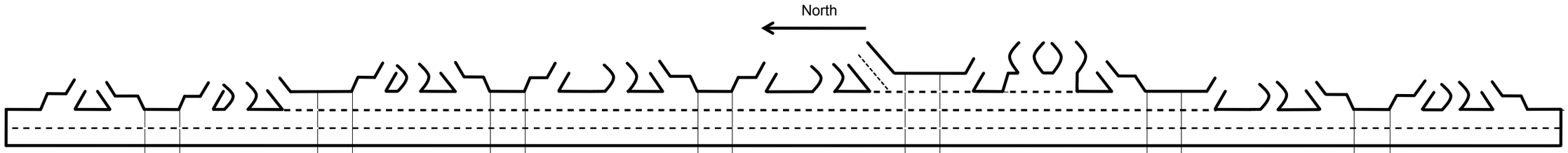
This data increased the original density by 10%.

I-29 Data Collection: 2025 PM Hybrid Alternative 1

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895				815	1050	1270	625	7200	620	670	960	510	1900
2025 Target (vph)					1279					1667					2461						3193				3493						2339							2442					
2025 Sim. Vol. (vph)					1299					1681					2472						3210				3509						2364							2465					
Volume % Difference					2%					1%					0%						1%				0%						1%							1%					
Speed (mph)					73.9					59.4					58.7						51.3				58.1						58.7							72.6					
# of Lanes					2					3					3						3				4						4							2					
Density (pc/mi/ln)					10					10					16						23				17						11							19					
Level of Service					A					B					B						C				B						B							B					





Northbound

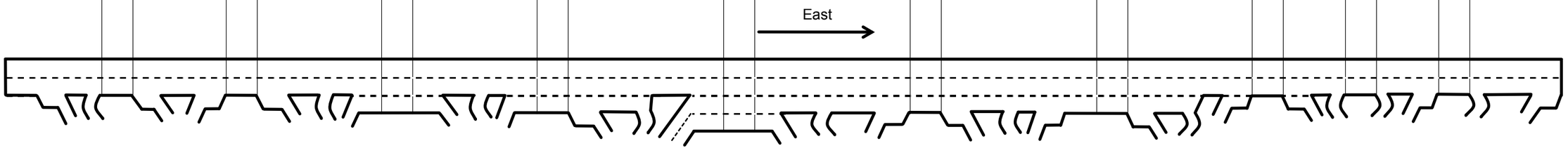
	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310		2100		910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Target (vph)					1510					1697					1692						1412						1520						1221						1379					
2025 Sim. Vol. (vph)					1519					1698					1689						1408						1550						1248						1401					
Volume % Difference					1%					0%					0%						0%						2%						2%						2%					
Speed (mph)					73.8					54.4					59.3						59.5						59.5						59.1						73.7					
# of Lanes					2					3					3						3						4						3						2					
Density (pc/mi/ln)					11					12					11						9						7						8						11					
Level of Service					B					B					B						A						A						A						B					

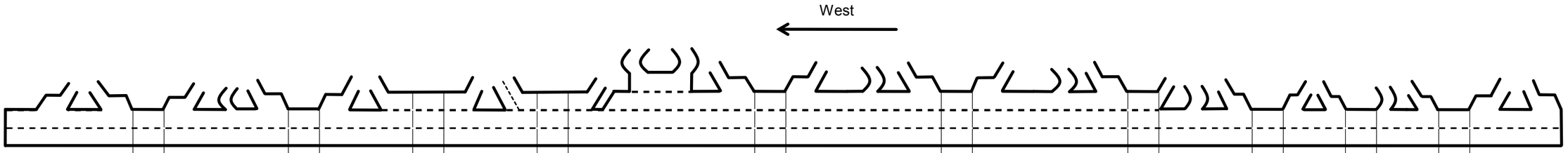
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 PM Hybrid Alternative 1

Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.				I-29					25th St.					University Dr.						TH 75			20th St.			34th St.			MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185		760	465	1345	1365	1805		910	730	1465	515	870	960	740	1050	1125	4225		520	1445	790	2315		1665	5910	2110	575	14825	710	1365	1080
2025 Target (vph)				1460				1424					1815					2492						4074					3839						3718				2930			2418			2330			
2025 Sim. Vol. (vph)				1481				1811					1840					2517						4110					3867						3738				3020			2439			2353			
Volume % Difference				1%				-					1%					1%						1%					1%						1%				3%			1%			1%			
Speed (mph)				72.4				58.4					59.3					59.1						58.4					57.2						57.9				56.7			57.8			69.9			
# of Lanes				2				2					3					3						4					3						3				2			2			2			
Density (pc/mi/ln)				11				17					11					16						20					25						24				30			23			19			
Level of Service				B				B					B					B						B					C						C				D			C			B			

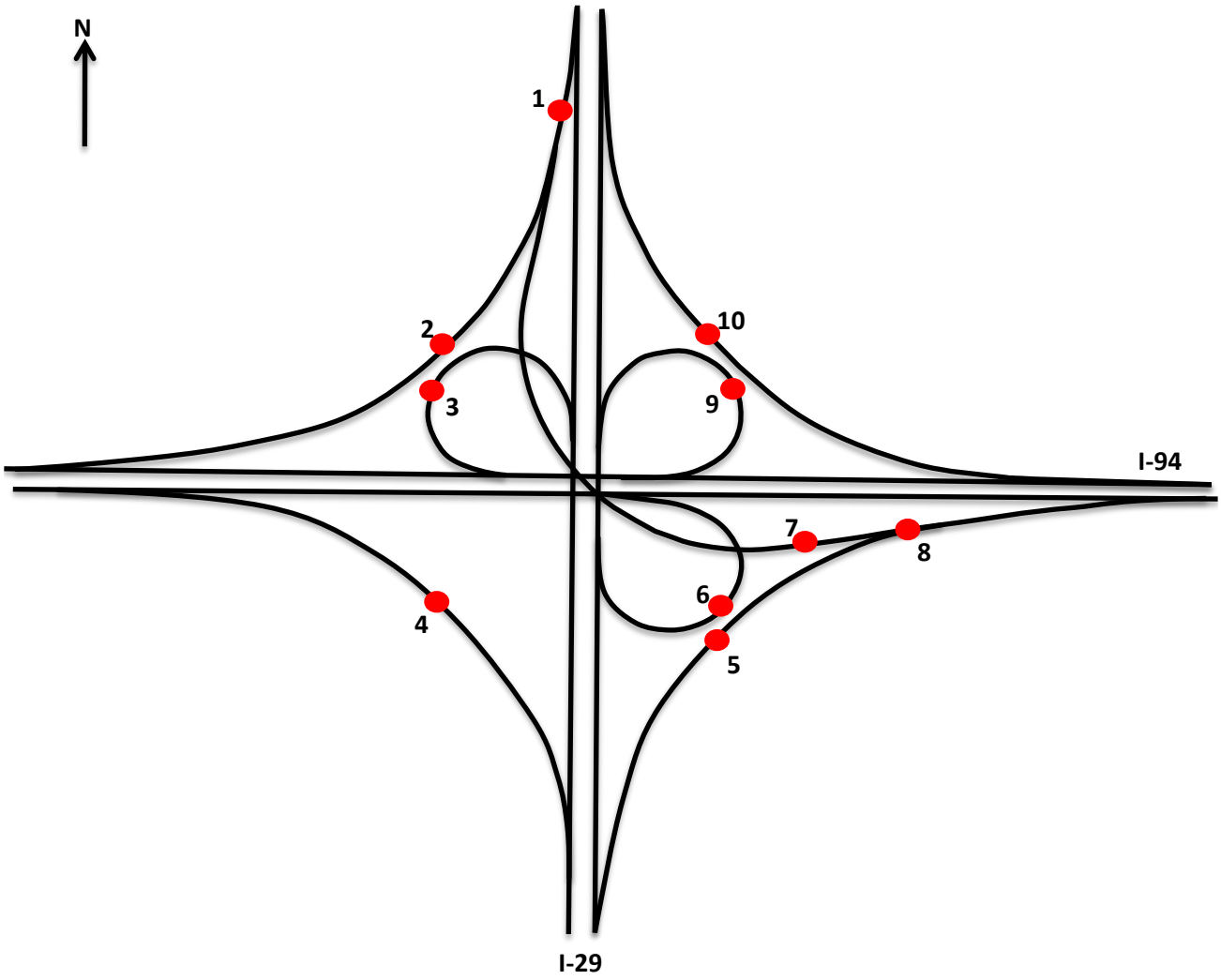




Westbound

	Main Ave.				Sheyenne St.					9th St.				45th St.				I-29									25th St.						University Dr.							TH 75				20th St.				34th St.				MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375			1490	975		945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425		5400	1365	585	12850	965	2195	465
2025 Target (vph)					1775					1533				2042				2127							2855						2812						2801				2166			1804			1607			
2025 Sim. Vol. (vph)					1785					1847				2059				2143							2875						2837						2814				2250			1815			1618			
Volume % Difference					1%					-				1%				1%							1%						1%						0%				4%			1%			1%			
Speed (mph)					71.6					58.4				58.8				59.1							58.8						59.2						58.5				58.2			58.5			69.9			
# of Lanes					2					2				3				3							3						3						3				2			2			2			
Density (pc/mi/ln)					14					18				13				13							18						18						18				21			17			13			
Level of Service					B					B				B				B							B						B						B				C			B			B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 PM - Hybrid Alternative 1: Data Collection Points (I-29/I-94 Interchange)

	1	2	3	4	5	6	7	8	9	10
2025 Target (vph)	1874	242	438	282	366	133	1631	1997	198	728
2025 Sim. Vol. (vph)	1890	256	454	285	385	150	1636	2021	198	734
Volume % Difference	1%	6%	4%	1%	5%	12%	0%	1%	0%	1%
Speed (mph)	58	55	25	54	54	25	54	53	25	55
# of Lanes	2	1	1	1	1	1	2	2	1	1
Density (pc/mi/ln)	18	5	20	6	8	7	17	21	9	15

This data increased the original density by 10%.

Hybrid Alternative 2

Hybrid Alternative 2 required a moderate amount capacity and physical improvements to the interstate system to achieve acceptable level of service. This alternative was a combination of the following strategies:

- 1A-Land use/Transit/TDM (5% reduction)
- 2-ITS/Incident Management
- 3-Ramp Metering
- 6-Capacity/Physical Improvements (minimum required)

No new travel demand model run was required for this alternative. The 5% reduction was applied to the origin-destination tables developed for Themed Alternative 3. The changes made to the network (based on Themed Alternative 3) are listed as follows:

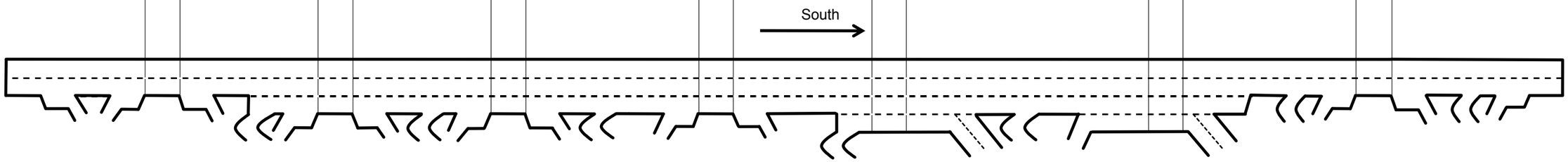
- Constructed an auxiliary lane on westbound I-94 between the southbound University Dr on ramp and the 25th St off ramp
- Constructed two auxiliary lanes on westbound I-94 between the 25th St on ramps (northbound and southbound) and the northbound I-29 exit ramp
- Expanded the westbound I-94 to northbound I-29 ramp from 1 to 2 lanes. The 2 lane ramp was developed from the two auxiliary lanes from 25th St on ramps.
- Constructed an escape lane following the 2-lane exit from westbound I-94 to northbound I-29
- Constructed an additional lane on northbound I-29 between the westbound I-94 on ramp and the 13th Ave off ramp. This resulted in a 5-lane section (3 through lanes with 2 full auxiliary lanes), and the current option lane was eliminated.
- Constructed an escape lane following the 2-lane exit from northbound I-29 to 13th Ave
- Constructed an auxiliary lane on eastbound I-94 between 25th St on ramp and University Dr off ramp

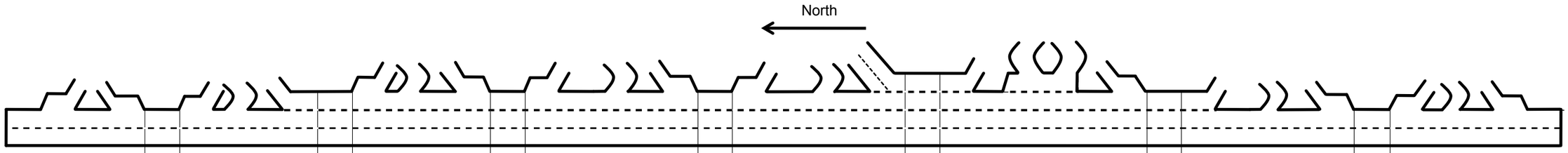
The summary of the VISSIM output (Level of Service) results for the AM and PM networks are provided on the following pages.

I-29 Data Collection: 2025 AM Hybrid Alternative 2

Southbound

	CR20					19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895				815	1050	1270	625	7200	620	670	960	510	1900
2025 Target (vph)					1725					1723					1495						1319				1062						1787								1675					
2025 Sim. Vol. (vph)					1749					1748					1509						1336				1069						1703								1619					
Volume % Difference					1%					1%					1%						1%				1%						-5%								-3%					
Speed (mph)					73.1					59.2					59.1						57.5				59.3						59.3								73.4					
# of Lanes					2					3					3						3				4						4								2					
Density (pc/mi/ln)					13					11					9						9				5						8								12					
Level of Service					B					B					A						A				A						A								B					





Northbound

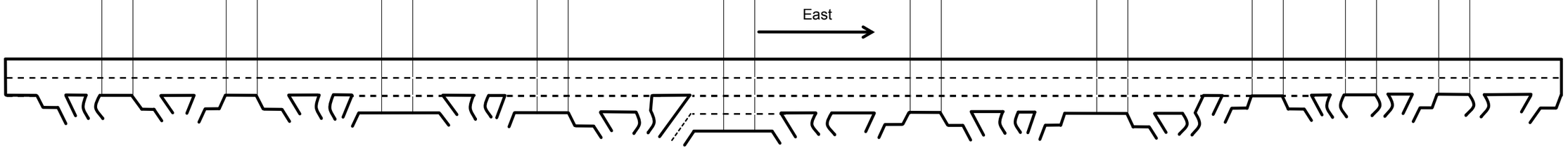
	CR 20					19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310	2100			910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Target (vph)					1079					1480					2540						3499					4681								3090					2659					
2025 Sim. Vol. (vph)					1094					1481					2519						3457					4611								3101					2669					
Volume % Difference					1%					0%					-1%						-1%					-1%								0%					0%					
Speed (mph)					74.4					59					58.3						57.7					58								58.2					72.1					
# of Lanes					2					3					3						3					5								3					2					
Density (pc/mi/ln)					8					9					16						22					18								20					21					
Level of Service					A					A					B						C					B								B					C					

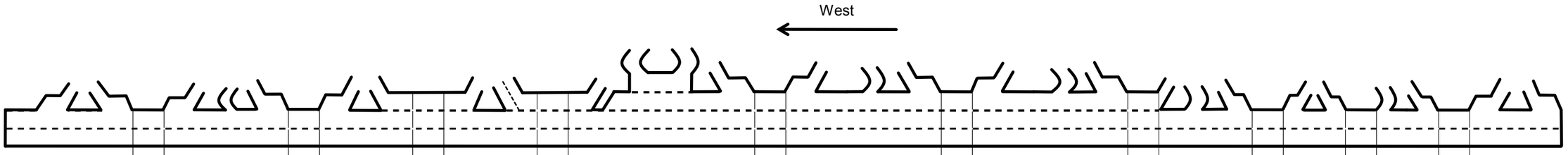
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 AM Hybrid Alternative 2

Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.				I-29					25th St.					University Dr.					TH 75			20th St.			34th St.			MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185	760	465	1345	1365	1805	910	730	1465	515	870	960	740	1050	1125	4225	520	1445	790	2315	1665	5910	2110	575	14825	710	1365	1080
2025 Target (vph)				1585				1812					2167				2154					2120					2266					2376				1800		1457			1344			
2025 Sim. Vol. (vph)				1603				2037					2169				2151					2112					2240					2058				1446		1205			1164			
Volume % Difference				1%				-					0%				0%					0%					-1%					-13%				-20%		-17%			-13%			
Speed (mph)				73.2				58.1					59.1				58.5					59.3					59.1					46.9				58.6		58.9			69.9			
# of Lanes				2				2					3				3					4					4					3				2		2			2			
Density (pc/mi/ln)				12				19					14				14					10					11					16				14		11			9			
Level of Service				B				B					B				B					A					B					B				B		B			A			

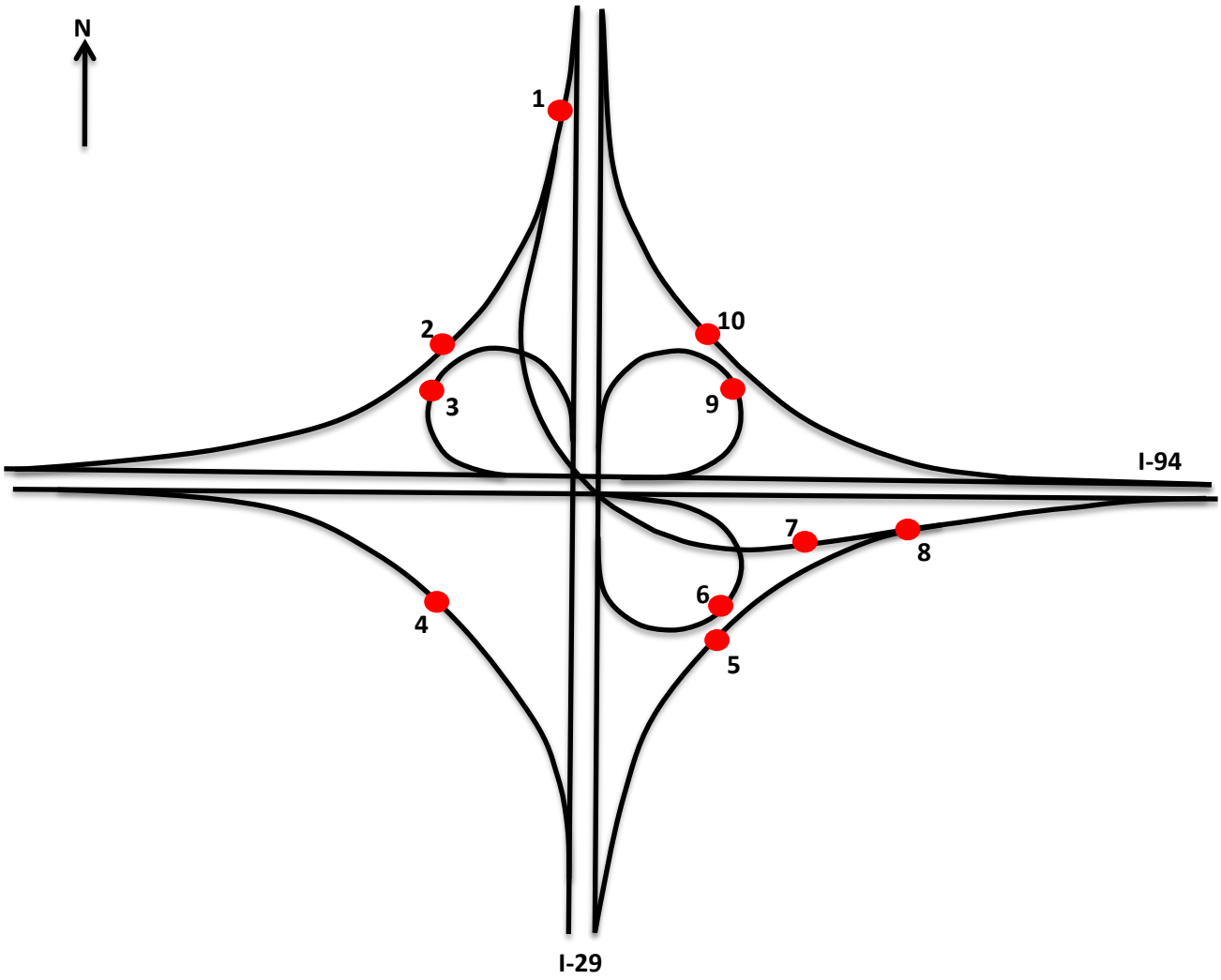




Westbound

	Main Ave.				Sheyenne St.					9th St.					45th St.					I-29									25th St.									University Dr.									TH 75					20th St.							34th St.					MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375					1490	975			945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425			5400	1365	585	12850	965	2195	465
2025 Target (vph)					1293					1088				1554			3424											5705						5284						4547				3421				2835			2503			
2025 Sim. Vol. (vph)					1233					1253				1510			3256											5432						4982						4269				3369				2739			2409			
Volume % Difference					-5%					-				-3%			-5%											-5%						-6%						-6%				-2%				-3%			-4%			
Speed (mph)					72.8					58.9				58.9			58.9											57.7						58.5						57.7				56.4				57.6			69.8			
# of Lanes					2					2				3			3											5						4						3				2				2			2			
Density (pc/mi/ln)					9					12				9			20											21						24						27				33				26			19			
Level of Service					A					B				A			C											C						C						C				D				C			B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 AM - Hybrid Alternative 2: Data Collection Points (I-29/I-94 Interchange)

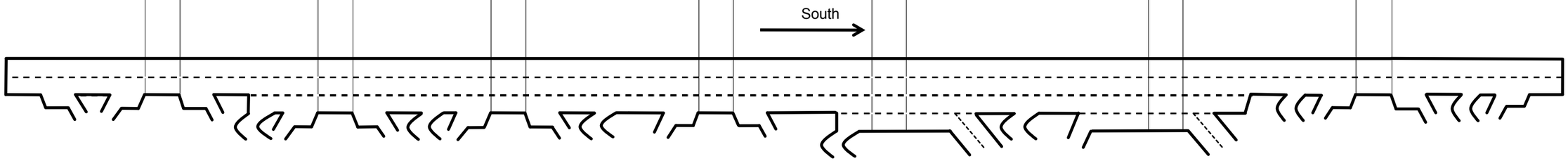
	1	2	3	4	5	6	7	8	9	10
2025 Target (vph)	530	131	943	312	522	642	399	921	447	1915
2025 Sim. Vol. (vph)	541	145	863	311	524	655	396	921	450	1822
Volume % Difference	2%	11%	-8%	0%	0%	2%	-1%	0%	1%	-5%
Speed (mph)	59	55	24	55	54	24	55	57	25	54
# of Lanes	2	1	1	1	1	1	2	2	1	2
Density (pc/mi/ln)	5	3	40	6	11	30	4	9	20	19

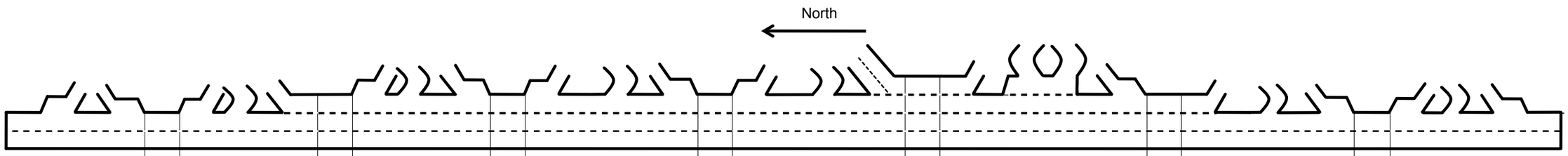
This data increased the original density by 10%.

I-29 Data Collection: 2025 PM Hybrid Alternative 2

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895				815	1050	1270	625	7200	620	670	960	510	1900
2025 Target (vph)					1336					1760					2631						3420				3797						2740							2908						
2025 Sim. Vol. (vph)					1361					1784					2634						3315				3700						2674							2830						
Volume % Difference					2%					1%					0%						-3%				-3%						-2%							-3%						
Speed (mph)					73.8					59.3					58.4						50.2				57.9						58.6							71						
# of Lanes					2					3					3						3				4						4							2						
Density (pc/mi/ln)					10					11					17						24				18						13							22						
Level of Service					B					B					B						C				B						B							C						





Northbound

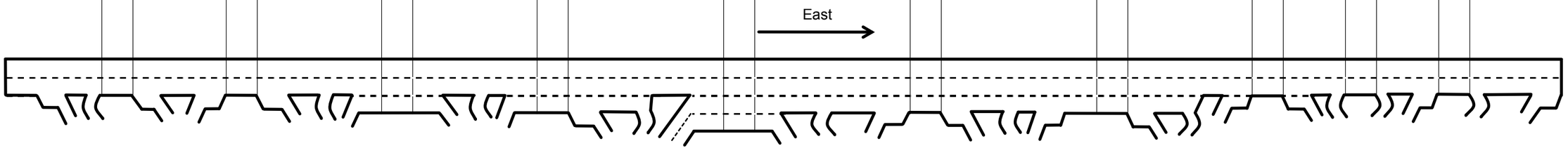
	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310	2100			910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Target (vph)					1702					1882					1875						1764					1736								1947						1919						
2025 Sim. Vol. (vph)					1685					1864					1863						1756					1689								1902						1917						
Volume % Difference					-1%					-1%					-1%						0%					-3%								-2%						0%						
Speed (mph)					73.6					54.4					59.2						59.2					59.5								58						73.2						
# of Lanes					2					3					3						3					5								3						2						
Density (pc/mi/ln)					13					13					12						11					6								12						15						
Level of Service					B					B					B						B					A								B						B						

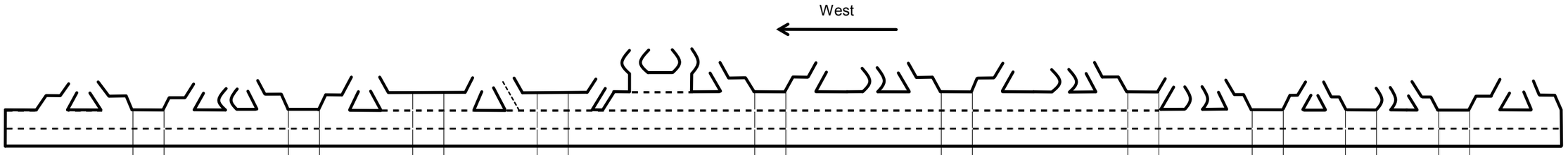
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 PM Hybrid Alternative 2

Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.					I-29						25th St.					University Dr.						TH 75			20th St.			34th St.			MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185		760	465	1345	1365	1805		910	730	1465	515	870	960	740	1050	1125	4225		520	1445	790	2315		1665	5910	2110	575	14825	710	1365	1080
2025 Target (vph)				1502				1569					2060				2957						4948						4619					4367					3328			2750			2672			
2025 Sim. Vol. (vph)				1520				1853					2058				2952						4828						4509					4281					3286			2669			2575			
Volume % Difference				1%				-					0%				0%						-2%						-2%					-2%					-1%			-3%			-4%			
Speed (mph)				72.4				58.3					59.2				58.7						57.4						58.4					57.3					56.3			57.5			69.8			
# of Lanes				2				2					3				3						4						4					3					2			2			2			
Density (pc/mi/ln)				12				18					13				19						23						21					28					32			26			20			
Level of Service				B				B					B				B						C						C					C					D			C			C			

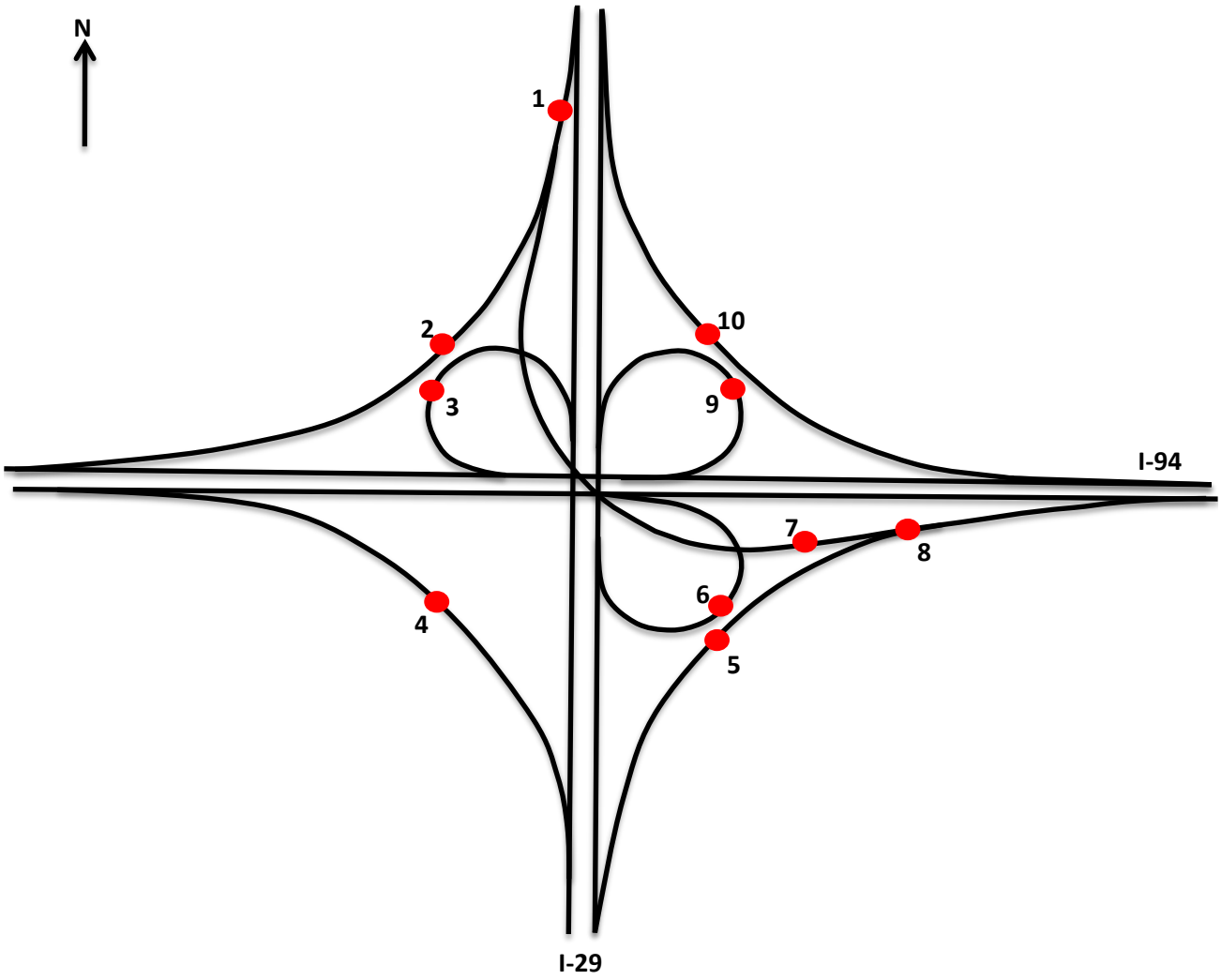




Westbound

	Main Ave.				Sheyenne St.					9th St.				45th St.				I-29											25th St.									University Dr.										TH 75				20th St.					34th St.				MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375				1490	975			945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425			5400	1365	585	12850	965	2195	465
2025 Target (vph)					1821					1607				2271			2720										3443						3414						3341				2548				2136				1864			
2025 Sim. Vol. (vph)					1742					1817				2173			2599										3234						3159						3012				2601				2123				1867			
Volume % Difference					-4%					-				-4%			-4%										-6%						-7%						####				2%				-1%				0%			
Speed (mph)					71.6					58.1				58.6			58.9										59.3						59.1						58.4				57.7				58.2				69.9			
# of Lanes					2					2				3			3										5						4						3				2				2				2			
Density (pc/mi/ln)					14					17				14			16										12						15						19				25				20				15			
Level of Service					B					B				B			B										B						B						B				C				C				B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 PM - Hybrid Alternative 2: Data Collection Points (I-29/I-94 Interchange)

	1	2	3	4	5	6	7	8	9	10
2025 Target (vph)	2173	352	670	446	821	205	1820	2641	364	770
2025 Sim. Vol. (vph)	2103	357	632	443	795	217	1744	2540	356	719
Volume % Difference	-3%	2%	-6%	-1%	-3%	6%	-4%	-4%	-2%	-7%
Speed (mph)	58	54	24	54	53	25	54	53	25	55
# of Lanes	2	1	1	1	1	1	2	2	1	2
Density (pc/mi/ln)	20	7	29	9	17	10	18	27	16	7

This data increased the original density by 10%.

Hybrid Alternative 3

Hybrid Alternative 3 required significant capacity and physical improvements to the interstate system to achieve acceptable level of service. This alternative was a combination of the following themed alternatives:

- 1A-Land use/Transit/TDM (5% reduction)
- 2-ITS/Incident Management
- 6-Capacity/Physical Improvements (minimum required)

No new travel demand model run was required. The origin-destination tables developed for Themed Alternative 1A were used (along with the corresponding VISSIM network). The modifications made in the VISSIM network are listed as follows:

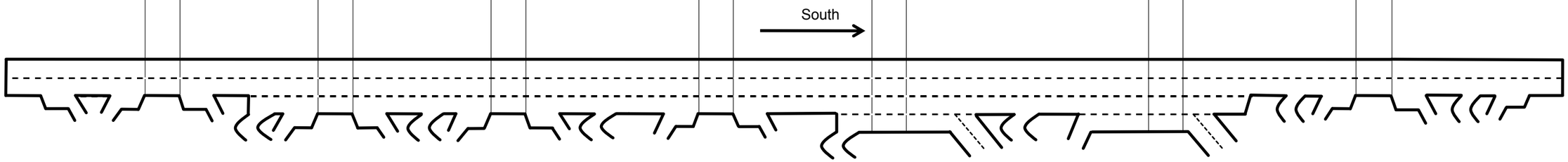
- Constructed an auxiliary lane on westbound I-94 between the southbound University Dr on ramp and the 25th St off ramp
- Constructed an auxiliary lane on westbound I-94 between the northbound 25th St on ramp and the northbound I-29 exit ramp
- Expanded the westbound I-94 to northbound I-29 ramp from 1 to 2 lanes. The 2 lane ramp was developed from the auxiliary lane from 25th St and the right most through lane (option lane).
- Constructed a bridge braid for southbound 25th St westbound on ramp and northbound I-29 off ramp
- Extended the third lane on westbound I-94 from the lane drop location just west of the southbound I-29 off ramp to the two-lane exit at 45th St
- Constructed an additional lane on northbound I-29 between the westbound I-94 on ramp and the 13th Ave off ramp. This resulted in a 5-lane section (3 through lanes with 2 full auxiliary lanes), the current option lane was eliminated.
- Constructed an escape lane following the 2-lane exit from northbound I-29 to 13th Ave
- Extended right lane from I-29 combined entrance to eastbound I-94 to University Dr off ramp
- Constructed an auxiliary lane on eastbound I-94 between TH 75 on ramp and 20th St off ramp

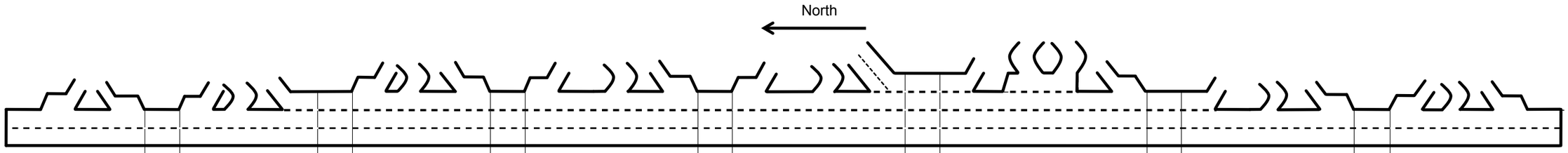
The summary of the VISSIM output (Level of Service) results for the AM and PM networks are provided on the following pages.

I-29 Data Collection: 2025 AM Peak Hour - Hybrid Alternative 3

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895			815	1050	1270	625	7200	620	670	960	510	1900
2025 Original (vph)					1620					1795					1602						1437				1503						2364							2031					
2025 Sim. Vol. (vph)					1647					1820					1629						1463				1526						2360							2034					
Volume % Difference					2%					1%					2%						2%				2%						0%							0%					
Speed (mph)					73.2					59					59						57				59						59.2							72.6					
# of Lanes					2					3					3						3				4						4							2					
Density (pc/mi/ln)					12					11					10						9				7						11							16					
Level of Service					B					B					B						A				A						B							B					





Northbound

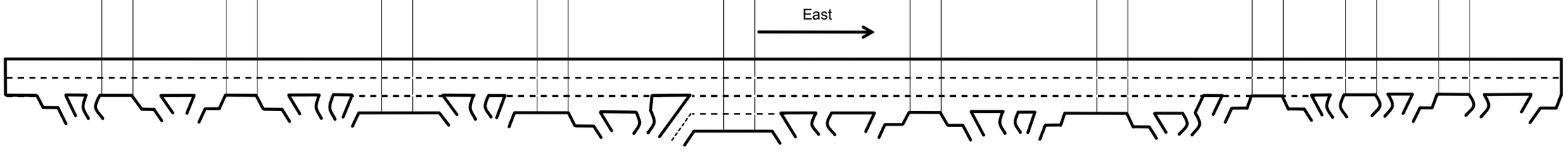
	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310		2100		910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Original (vph)					1214					1678					2841						3954					5217							3548						2999					
2025 Sim. Vol. (vph)					1238					1704					2873						3983					5252							3565						3014					
Volume % Difference					2%					2%					1%						1%					1%							0%						0%					
Speed (mph)					74.2					58.7					58						56.4					57.1							57.7						71.3					
# of Lanes					2					3					3						3					5							3						2					
Density (pc/mi/ln)					9					11					18						26					20							23						23					
Level of Service					A					B					B						C					C							C						C					

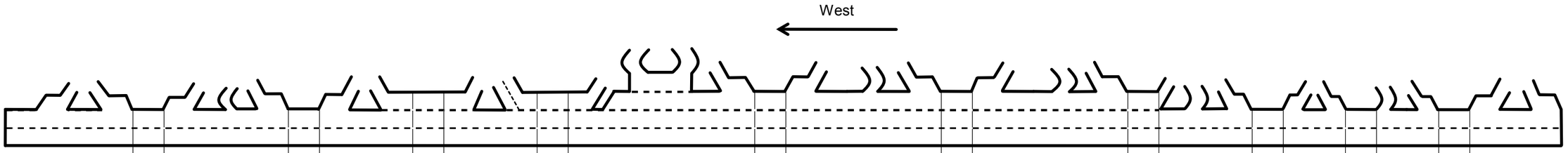
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 AM Peak Hour - Hybrid Alternative 3

Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.					I-29						25th St.					University Dr.						TH 75			20th St.			34th St.			MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185		760	465	1345	1365	1805		910	730	1465	515	870	960	740	1050	1125	4225		520	1445	790	2315		1665	5910	2110	575	14825	710	1365	1080
2025 Original (vph)				1579				1811					2423					2811					2158						2782					2617					2018			1668			1493			
2025 Sim. Vol. (vph)				1596				1829					2445					2839					2063						2912					2634					2067			1680			1507			
Volume % Difference				1%				-					1%					1%					-4%						5%					1%					2%			1%			1%			
Speed (mph)				73.4				58.3					58.8					57.7					59.3						58.2					58.9					59			58.6			70			
# of Lanes				2				2					3					3					4						4					4					3			2			2			
Density (pc/mi/ln)				12				17					15					18					10						14					12					13			16			12			
Level of Service				B				B					B					B					A						B					B					B			B			B			

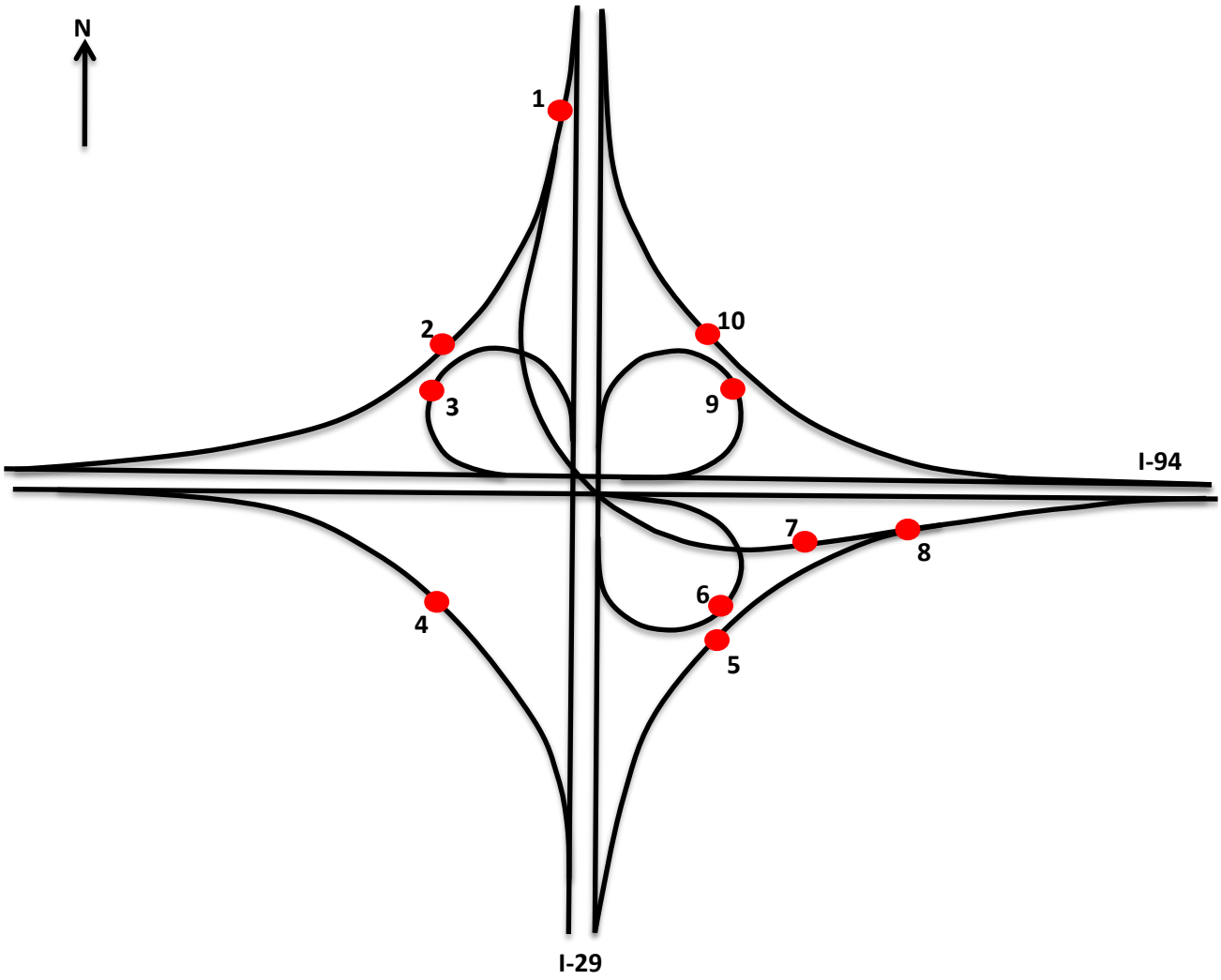




Westbound

	Main Ave.				Sheyenne St.					9th St.				45th St.				I-29										25th St.							University Dr.									TH 75				20th St.					34th St.				MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375				1490	975		945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425		5400	1365	585	12850	965	2195	465
2025 Original (vph)					1347					1191				1880			3927									4345						5551						4764				3493			2879			2454			
2025 Sim. Vol. (vph)					1363					1208				1892			3925									4343						5686						4796				3550			2897			2461			
Volume % Difference					1%					-				1%			0%									0%						2%						1%				2%			1%			0%			
Speed (mph)					72.2					59.1				58.4			57.5									54.5						53.3						58.2				58.4			57.4			69.8			
# of Lanes					2					2				3			4									3						4						4				3			2			2			
Density (pc/mi/ln)					10					11				12			19									29						30						23				23			28			20			
Level of Service					B					B				B			B									D						D						C				C			D			B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 AM - Hybrid Alternative 3 - Data Collection Points (I-29/I-94 Interchange)

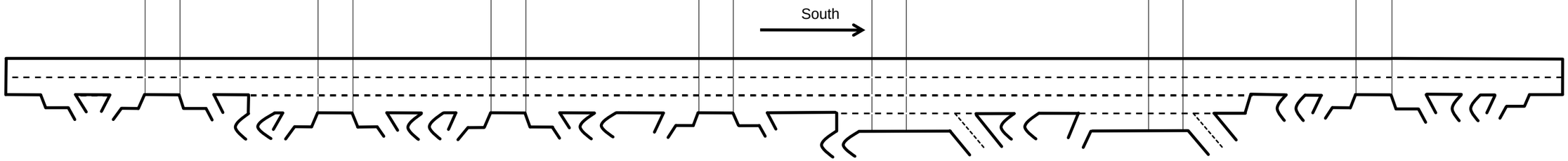
	1	2	3	4	5	6	7	8	9	10
2025 Original (vph)	730	230	1204	387	558	858	500	1057	556	1926
2025 Sim. Vol. (vph)	748	248	1190	392	561	878	500	1062	555	1928
Volume % Difference	2%	8%	-1%	1%	1%	2%	0%	0%	0%	0%
Speed (mph)	59	54	24	55	54	24	55	56	25	54
# of Lanes	2	1	1	1	1	1	2	2	1	2
Density (pc/mi/ln)	7	5	55	8	12	41	5	10	25	20

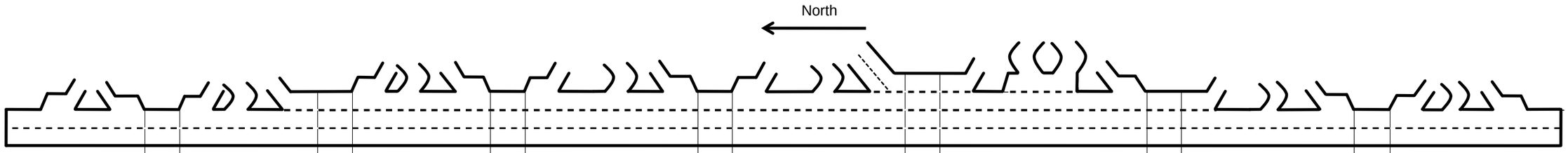
This data increased the original density by 10%.

I-29 Data Collection: 2025 PM Peak Hour - Hybrid Alternative 3

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895			815	1050	1270	625	7200	620	670	960	510	1900
2025 Original (vph)					1351					1766					2716						3732				4595						3211							3155					
2025 Sim. Vol. (vph)					1374					1786					2736						3754				4635						3236							3181					
Volume % Difference					2%					1%					1%						1%				1%						1%							1%					
Speed (mph)					73.6					59.3					58.1						56.1				57						58.4							69.9					
# of Lanes					2					3					3						3				4						4							2					
Density (pc/mi/ln)					10					11					17						25				23						15							25					
Level of Service					B					B					B						C				C						B							C					





Northbound

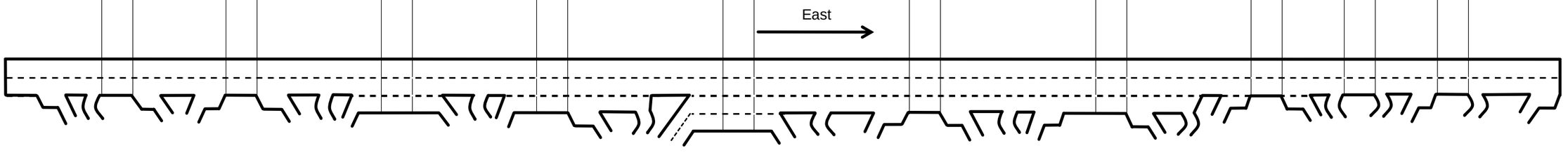
	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310		2100		910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Original (vph)					2138					2031					2166						2272					2358							2347						2222					
2025 Sim. Vol. (vph)					2163					2059					2192						2298					2390							2364						2235					
Volume % Difference					1%					1%					1%						1%					1%							1%						1%					
Speed (mph)					72.9					59.1					58.9						58.6					59.2							57.4						72.4					
# of Lanes					2					3					3						3					5							3						2					
Density (pc/mi/ln)					16					13					14						15					9							15						17					
Level of Service					B					B					B						B					A							B						B					

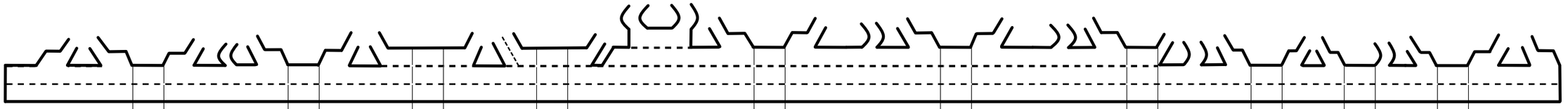
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 PM Peak Hour - Hybrid Alternative 3

Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.					I-29						25th St.					University Dr.						TH 75			20th St.			34th St.				MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185		760	465	1345	1365	1805		910	730	1465	515	870	960	740	1050	1125	4225		520	1445	790	2315		1665	5910	2110	575	14825	710	1365	1080
2025 Original (vph)				1490				1511					2089					3628						4588						5219					4739					3402			2890			2845			
2025 Sim. Vol. (vph)				1508				1532					2115					3660						4385						5290					4785					3503			2921			2874			
Volume % Difference				1%				-					1%					1%						-4%						1%					1%					3%			1%			1%			
Speed (mph)				73.6				58.6					59.1					57.9						57.9						55.5					57.3					58			57.1			69.7			
# of Lanes				2				2					3					3						4						4					4					3			2			2			
Density (pc/mi/ln)				11				15					13					23						21						26					23					22			28			23			
Level of Service				B				B					B					C						C						C					C					C			D			C			

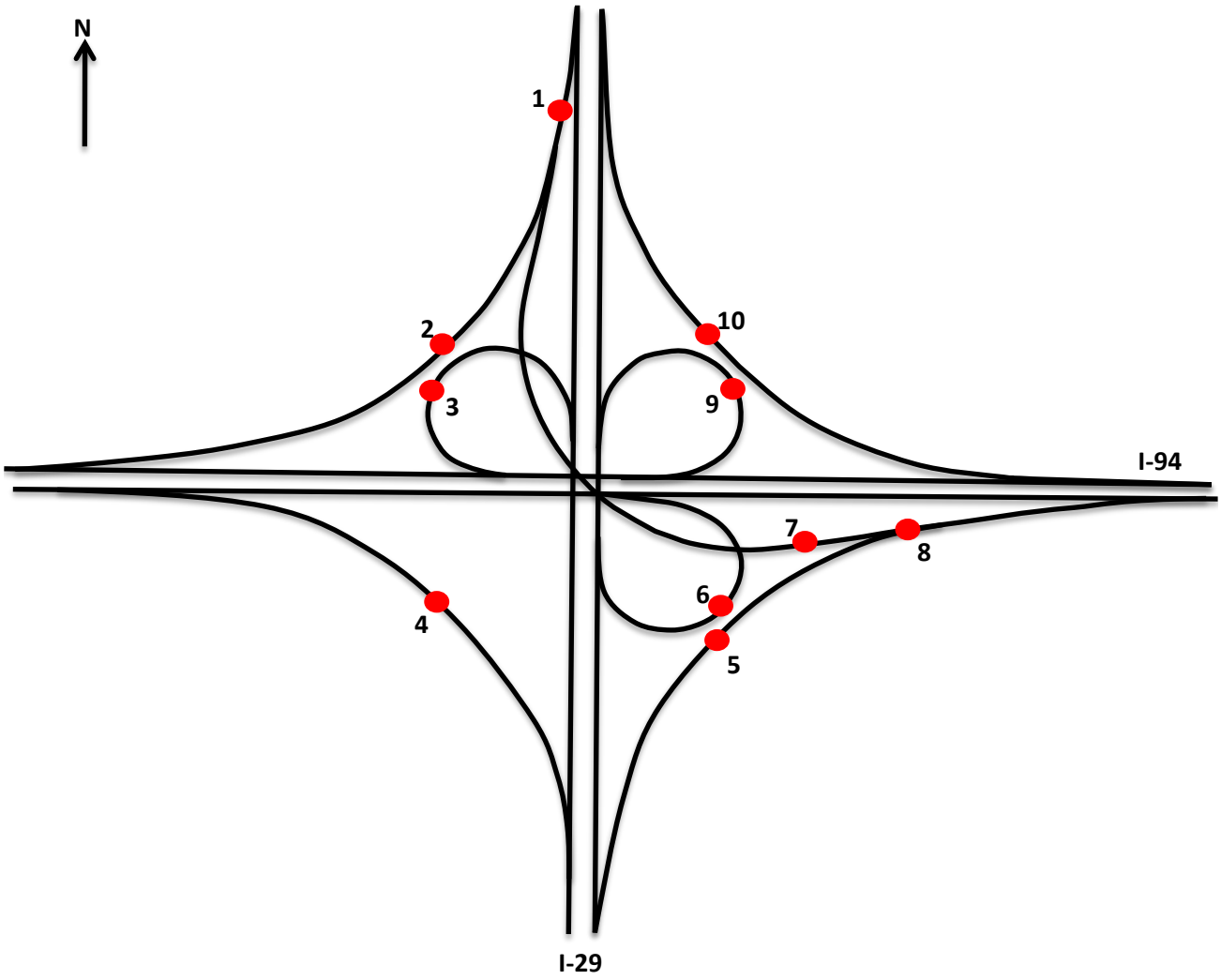




Westbound

	Main Ave.				Sheyenne St.					9th St.					45th St.					I-29											25th St.									University Dr.										TH 75						20th St.						34th St.						MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375				1490	975			945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425		5400	1365	585	12850	965	2195	465
2025 Original (vph)					1869					1701				2648			3476									3122						3705						3598				2734			2267			1857			
2025 Sim. Vol. (vph)					1899					1728				2682			3516									3141						3757						3623				2816			2280			1865			
Volume % Difference					2%					-				1%			1%									1%						1%						1%				3%			1%			0%			
Speed (mph)					71					58.5				57.8			59.1									58.3						58.4						58.5				58.6			58			69.9			
# of Lanes					2					2				3			4									3						4						4				3			2			2			
Density (pc/mi/ln)					15					16				17			17									20						18						17				18			22			15			
Level of Service					B					B				B			B									B						B						B				B			C			B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 PM - Hybrid Alternative 3: Data Collection Points (I-29/I-94 Interchange)

	1	2	3	4	5	6	7	8	9	10
2025 Original (vph)	2687	680	746	556	884	363	2006	2891	419	951
2025 Sim. Vol. (vph)	2720	699	752	561	889	379	2023	2913	421	956
Volume % Difference	1%	3%	1%	1%	1%	4%	1%	1%	0%	1%
Speed (mph)	56	54	24	54	53	25	54	52	25	55
# of Lanes	2	1	1	1	1	1	2	2	1	2
Density (pc/mi/ln)	27	14	34	12	19	17	21	31	19	10

This data increased the original density by 10%.

Appendix H

Additional Modeling

Appendix H

Results of Additional Model Runs

Additional model runs were performed by ATAC to evaluate the impact of modifications to interstate system under year 2025 conditions that were not part of the Themed or Hybrid Alternatives developed as part of IOS Phase II. These runs considered an alternative that removed the northbound to eastbound entrance ramp from 25th Street to I-94, and added the west ramps on I-94 at Southeast Main Avenue. ATAC provided the following description of the changes applied to the VISSIM simulation model, followed by the LOS output from the modeling effort. The final section is a summary of the results developed by SRF Consulting Group, Inc.

Additional Analysis

New travel demand model run required due to the addition of two new zones (as a result of the ramps at SE Main Ave). The network for the base-case scenario was used.

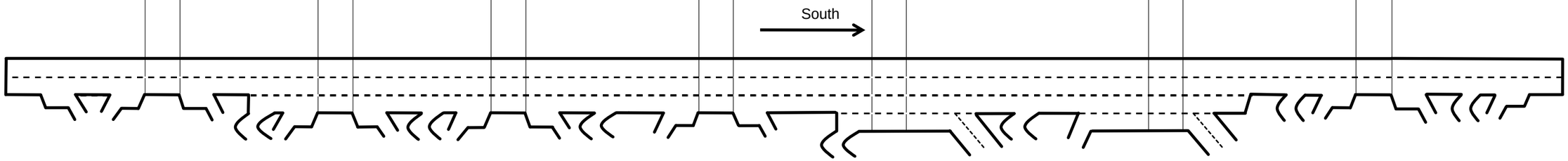
- Removed the northbound to eastbound ramp at the south intersection of the 25th St interchange, and re-configured the intersection to match existing geometry and operations (northbound traffic at the south ramp must make a left turn to access the loop ramp to travel westbound on I-94).
- Added the eastbound off ramp and westbound on ramp at SE Main Ave in Moorhead. These ramps were modeled in addition to the 34th St interchange.

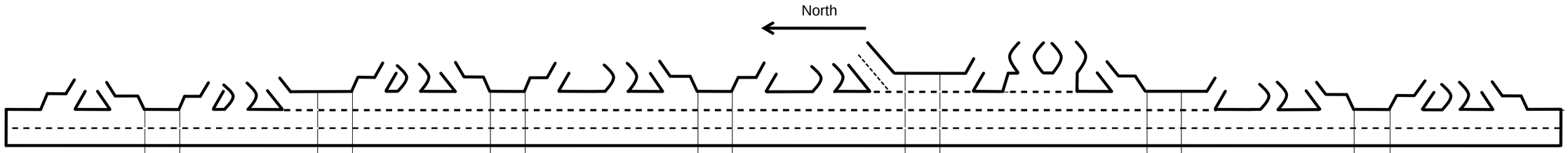
The summary of the VISSIM output (Level of Service) results for the AM and PM networks are provided on the following pages.

I-29 Data Collection: 2025 AM Peak Hour - Additional Run

Southbound

	CR20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S					I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895			815	1050	1270	625	7200	620	670	960	510	1900
2025 Target (vph)					1707					1889					1686						1513				1582						2488							2138					
2025 Sim. Vol. (vph)					1719					1913					1716						1536				1528						2001							1815					
Volume % Difference					1%					1%					2%						2%				-3%						-20%							-15%					
Speed (mph)					73.1					59					59						56.9				59.1						59.2							73.1					
# of Lanes					2					3					3						3				4						4							2					
Density (pc/mi/ln)					13					12					11						10				7						9							14					
Level of Service					B					B					B						B				A						A							B					





Northbound

	CR 20				19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S					I-94								32nd Ave. S					52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310	2100			910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Target (vph)					1278					1766					2990						4162					5492								3735					3157					
2025 Sim. Vol. (vph)					1217					1709					2736						3726					4754								3684					3109					
Volume % Difference					-5%					-3%					-8%						-10%					-13%								-1%					-2%					
Speed (mph)					74.2					58.7					58.2						56.9					57.5								57.6					71					
# of Lanes					2					3					3						3					4								3					2					
Density (pc/mi/ln)					9					11					17						24					23								24					24					
Level of Service					A					B					B						C					C								C					C					

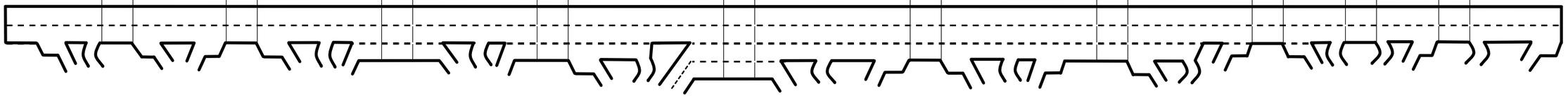
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 AM Peak Hour - Additional Run

Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.				I-29					25th St.					University Dr.					TH 75			20th St.			34th St.			MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185	760	465	1345	1365	1805	910	730	1465	515	870	960	740	1050	1125	4225	520	1445	790	2315	1665	5910	2110	575	14825	710	1365	1080
2025 Target (vph)				1662				1906					2551				2959					2762					2928					2755				2124		1756			1572			
2025 Sim. Vol. (vph)				1642				1701					2454				2836					2706					2330					1937				1617		1325			1211			
Volume % Difference				-1%				-					-4%				-4%					-2%					-20%					-30%				-24%		-25%			-23%			
Speed (mph)				73.2				58.5					58.7				57.8					58.9					58.7					59				58.4		58.9			70			
# of Lanes				2				2					3				3					4					3					3				2		2			2			
Density (pc/mi/ln)				12				16					15				18					13					15					12				15		12			10			
Level of Service				B				B					B				B					B					B					B				B		B			A			

East



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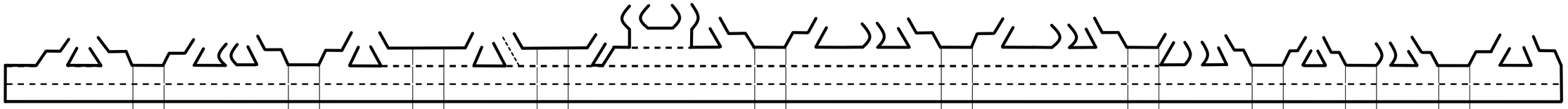
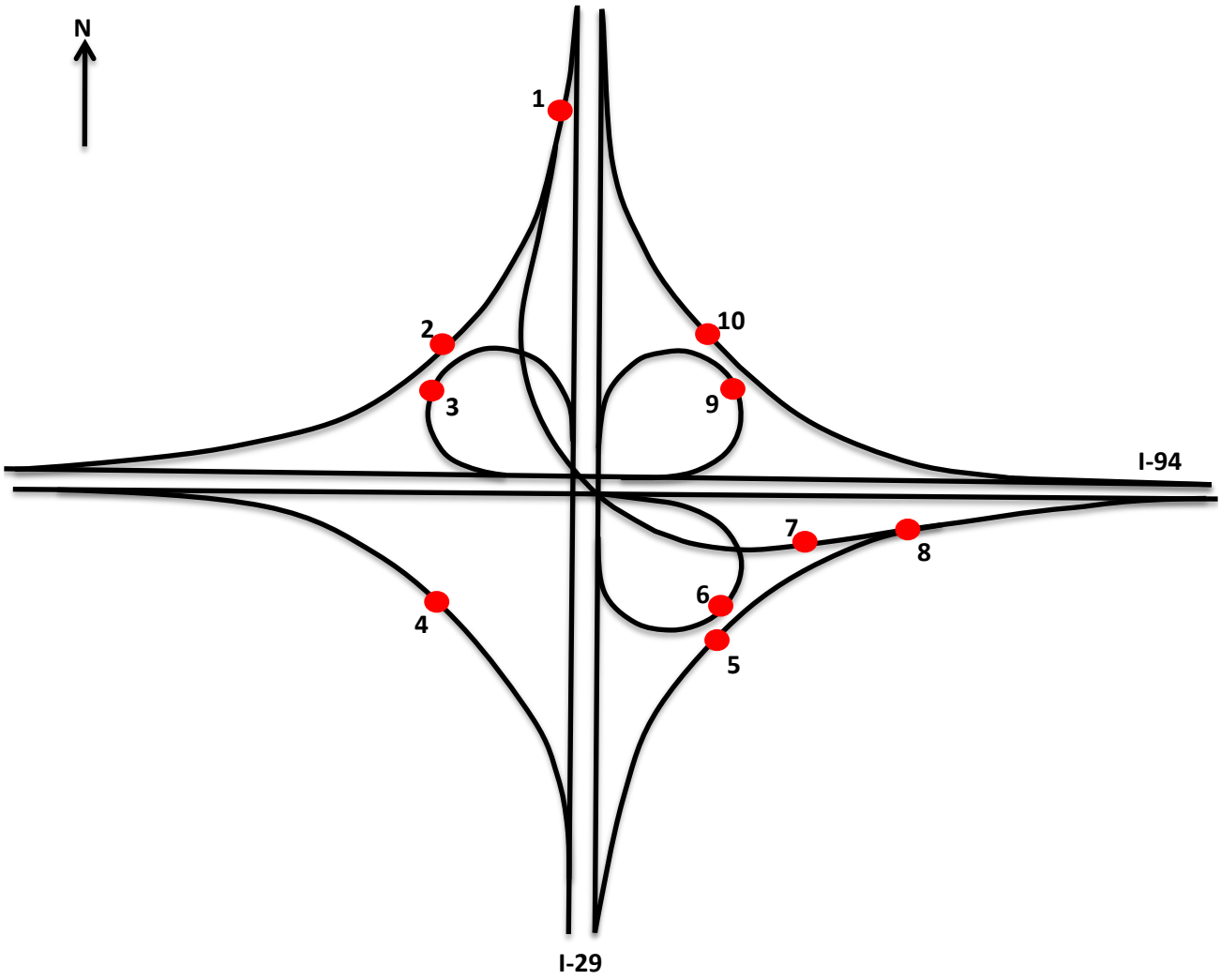


Westbound

	Main Ave.				Sheyenne St.					9th St.					45th St.				I-29									25th St.								University Dr.								TH 75			20th St.				34th St.				MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375	1490	975	945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425	5400	1365	585	12850	965	2195	465
2025 Target (vph)					1418					1254				1979			4134					6601						5844						5015				3677		3031			2583			
2025 Sim. Vol. (vph)					1259					1028				1454			2727					4117						4133						4657				3597		2966			2473			
Volume % Difference					-11%					-				-27%			-34%					-38%						-29%						-7%				-2%		-2%			-4%			
Speed (mph)					72.6					59.2				58.9			59.1					37.2						21.5						46.5				52.9		57.5			69.8			
# of Lanes					2					2				3			3					3						3						3				2		2			2			
Density (pc/mi/ln)					10					10				9			17					41						71						37				38		29			20			
Level of Service					A					A				A			B					E						F						E				E		D			B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 AM - Additional Run: Data Collection Points (I-29/I-94 Interchange)

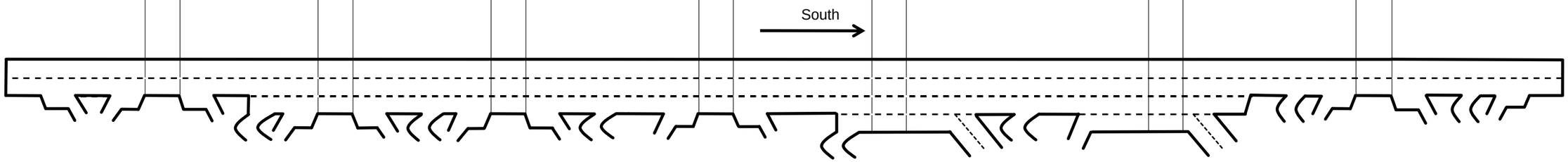
	1	2	3	4	5	6	7	8	9	10
2025 Target (vph)	768	242	1267	407	587	903	526	1113	585	2027
2025 Sim. Vol. (vph)	727	226	797	400	591	826	501	1092	563	1391
Volume % Difference	-5%	-7%	-37%	-2%	1%	-9%	-5%	-2%	-4%	-31%
Speed (mph)	59	55	24	54	54	24	55	57	25	53
# of Lanes	2	1	1	1	1	1	2	2	1	1
Density (pc/mi/ln)	7	5	36	8	12	38	5	11	25	29

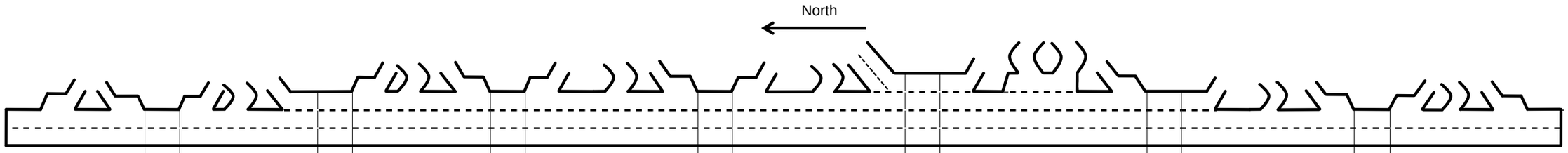
This data increased the original density by 10%.

I-94 Data Collection: 2025 PM Peak Hour - Additional Run

Southbound

	CR20					19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S						52nd Ave. S					
Distance (ft.)	8050	650	1885	1150	7550	570	1015	1030	1040	1715	680	835	840	765	2240	455	735	230	1215	740	1230	945	880		3840			1300	640	1150	2895			815	1050	1270	625	7200	620	670	960	510	1900
2025 Target (vph)					1422					1859					2859						3928				4837						3380							3321						
2025 Sim. Vol. (vph)					1423					1870					2876						3891				4616						3296							3274						
Volume % Difference					0%					1%					1%						-1%				-5%						-2%							-1%						
Speed (mph)					73.6					59.2					58						54.6				52.7						58.4							68.9						
# of Lanes					2					3					3						3				4						4							2						
Density (pc/mi/ln)					11					12					18						26				24						16							26						
Level of Service					B					B					B						C				C						B							C						





Northbound

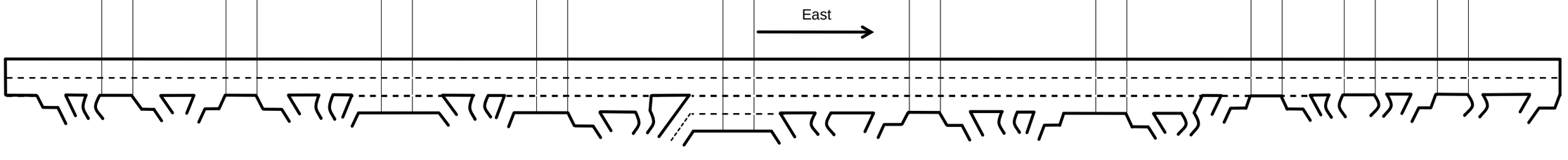
	CR 20					19th Ave. N					12th Ave. N					Main Ave.						13th Ave. S						I-94								32nd Ave. S						52nd Ave. S					
Distance (ft.)	8050	650	650	1885	7140	1165	1045	1015	665	1855	830	920	765	580	2190	525	745	570	655	760	1930	685	755	665	1310		2100		910	505	485	1260	990	1240	255	1145	305	860	720	7100	760	775	595	800	1675
2025 Target (vph)					2251					2138					2280						2392					2482								2471					2339						
2025 Sim. Vol. (vph)					2260					2144					2258						2328					2429								2379					2297						
Volume % Difference					0%					0%					-1%						-3%					-2%								-4%					-2%						
Speed (mph)					72.9					59.1					58.9						58.6					59								51.6					72.1						
# of Lanes					2					3					3						3					4								3					2						
Density (pc/mi/ln)					17					13					14						15					11								17					18						
Level of Service					B					B					B						B					B								B					B						

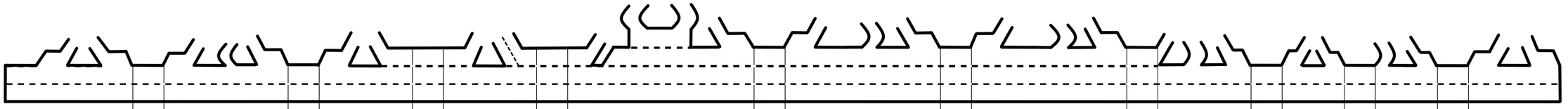
Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.

I-94 Data Collection: 2025 PM Peak Hour - Additional Run

Eastbound

	Main Ave.			Sheyenne St.				9th St.					45th St.				I-29					25th St.					University Dr.					TH 75				20th St.				34th St.				MN 336		
Distance (ft.)	2660	575	1590	11770	755	2050	1040	7520	765	1650	1800	635	1475	705	930	1450	2185		760	465	1345	1365	1805		910	730	1465	515	870	960	740	1050	1125	4225		520	1445	790	2315		1665	5910	2110	575	14825	710	1365	1080
2025 Target (vph)				1568				1590					2199					3819						5894						5494					4988					3581				3042				2995			
2025 Sim. Vol. (vph)				1587				1518					2208					3795						5646						4974					4741					3501				2929				2827			
Volume % Difference				1%				-					0%					-1%						-4%						-9%					-5%					-2%				-4%				-6%			
Speed (mph)				73.4				58.6					59.1					57.1						42.8						55.3					56.7					54.9				56.7				69.8			
# of Lanes				2				2					3					3						4						3					3					2				2				2			
Density (pc/mi/ln)				12				14					14					25						37						33					31					35				29				23			
Level of Service				B				B					B					C						E						D					D					E				D				C			

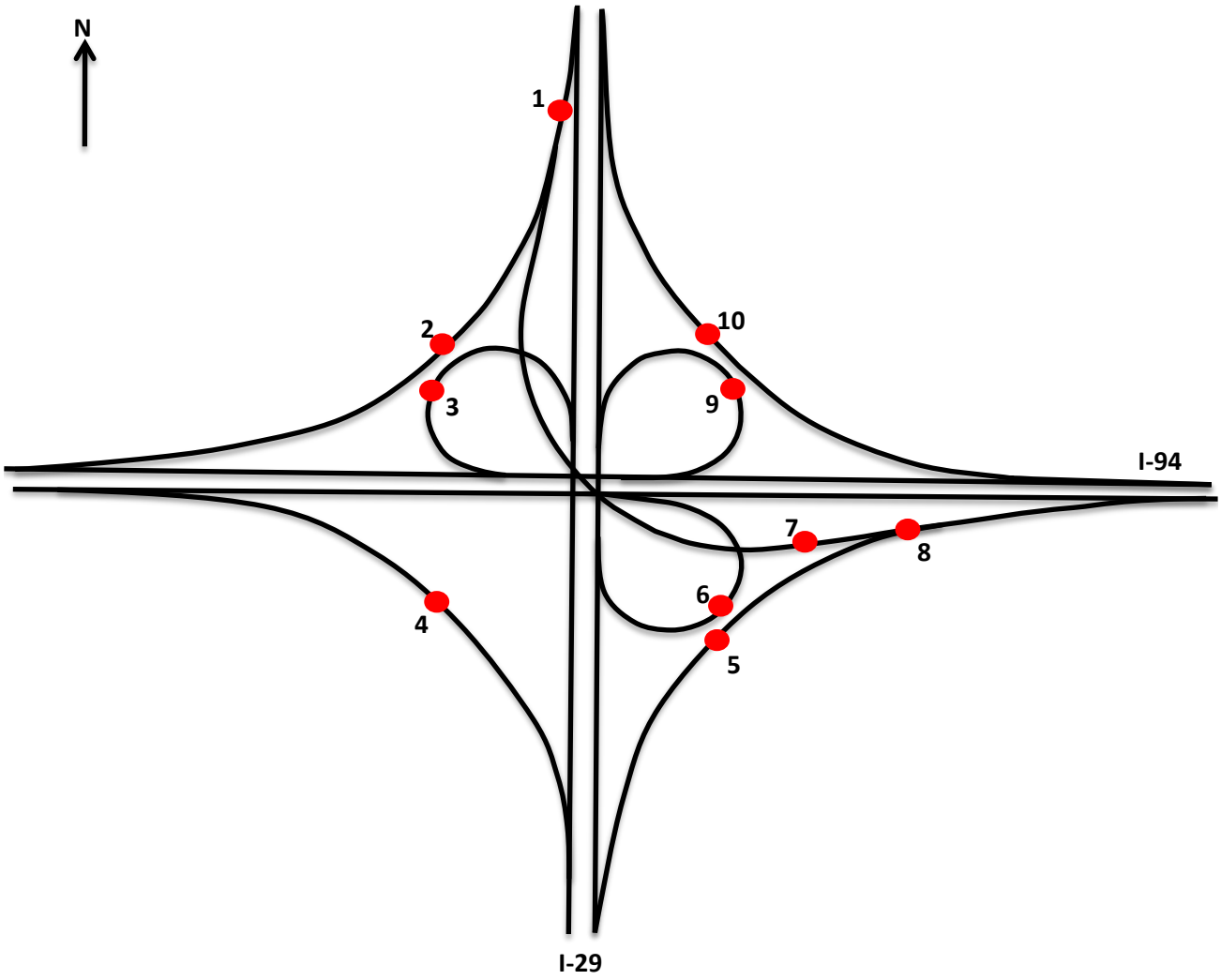




Westbound

	Main Ave.				Sheyenne St.					9th St.				45th St.				I-29									25th St.					University Dr.								TH 75				20th St.					34th St.				MN 336		
Distance (ft.)	2815	1215	2850	390	9790	1035	835	1130	785	8105	730	3045	845	1395	825	1900	2375			1490	975		945	650	1555	770	350	915	930	675	1930	700	470	490	505	1170	4750	980	810	550	1880	2425		5400	1365	585	12850	965	2195	465
2025 Target (vph)					1967					1790				2787				3659							4287						3900						3787				2878			2386			1955			
2025 Sim. Vol. (vph)					1980					1808				2787				3564							4286						3843						3705				2886			2323			1882			
Volume % Difference					1%					-				0%				-3%							0%						-1%						-2%				0%			-3%			-4%			
Speed (mph)					70.7					58.4				57.7				58.3							55.9						57.5						57.9				57.3			58.2			69.9			
# of Lanes					2					2				3				3							3						3						3				2			2			2			
Density (pc/mi/ln)					16					17				18				23							28						25						24				28			22			15			
Level of Service					B					B				B				C							D						C						C				D			C			B			

Note: Density values were adjusted using the following data:
Peak-hour factor = .92
Heavy vehicle percent = 5
This data increased the original density by 10%.



2025 PM - Additional Run: Data Collection Points (I-29/I-94 Interchange)

	1	2	3	4	5	6	7	8	9	10
2025 Target (vph)	2828	716	785	585	931	382	2112	3043	441	1001
2025 Sim. Vol. (vph)	2685	704	804	568	906	362	1928	2808	391	1022
Volume % Difference	-5%	-2%	2%	-3%	-3%	-5%	-9%	-8%	-11%	2%
Speed (mph)	50	54	24	54	43	25	40	35	25	54
# of Lanes	2	1	1	1	1	1	2	2	1	1
Density (pc/mi/ln)	30	14	37	12	24	16	27	44	17	21

This data increased the original density by 10%.

Summary of Results

Southeast Main Avenue – West Ramps Along I-94

During the a.m. peak, the addition of the westbound entrance at Southeast Main Avenue has a positive impact on operations on westbound I-94 between 20th Street and TH 75. This result is intuitive as some of the entering traffic from 20th Street is shifted east to the Southeast Main Avenue ramp, thereby reducing the concentration of traffic entering westbound I-94 at 20th Street. Changes in LOS were observed in a few other locations along I-94, but the changes in speeds and volumes are not significant.

During the p.m. peak, the addition of the west ramps at Southeast Main Avenue along I-94 had virtually no effect on volumes, speeds, or LOS along I-94.

Northbound 25th Street to Eastbound I-94 Ramp

No meaningful impacts to LOS results for this change were observed in the a.m. peak period.

During the p.m. peak period, the LOS on I-94 worsens from a D to an E on eastbound I-94 between 25th Street and University Drive. However, the speed in this segment changes by less than 1 mph and the volume is reduced by approximately 300 vph due to fewer vehicles entering eastbound I-94 from 25th Street. This change causes the change in the LOS grade, even though the change in operations is not significant. It does not appear that the construction of this ramp is a deciding factor in the potential need for an auxiliary lane between 25th Street and University Drive.

It is strongly recommended that additional detailed modeling and analysis is needed in both cases (25th Street/94 and SE Main/94) to address the issues, questions, and concerns which have surfaced in parallel planning/engineering processes related to interstate operations.

Appendix I

Public Involvement

AFFIDAVIT NO. MN #1143121
Classifieds – Public Notice

AFFIDAVIT OF PUBLICATION

Alexandra Larsen, being duly sworn, on oath she is and during all the times herein stated has been the Legal Advertising Clerk of the newspaper known as ***THE FORUM*** and has full knowledge of the facts herein stated as follows: (1) Said newspaper is printed in the English language in newspaper format and in column and sheet form equivalent in printed space to at least 900 square inches. (2) Said newspaper is a daily and is distributed at least five days each week, or four days in a week in which a legal holiday is included. (3) Said newspaper has 25% of its news columns devoted to news of local interest to the community which it purports to serve and does not wholly duplicate any other publication and is not made up entirely of patents, plate matter and advertisements. (4) Said newspaper is circulated in and near the municipality which it purports to serve, has at least 500 copies regularly delivered to paying subscribers, has an average of at least 75% of its total circulation currently paid or not more than three months in arrears and has entry as second-class matter in its local post office. (5) Said newspaper purports to serve the City of Moorhead in the County of Clay and it has its known office of issue in the City of Moorhead in said county, established and open during its regular business hours for the gathering of news, sale of advertisements and sale of subscriptions and maintained by the managing officer of said newspaper or persons in its employ and subject to his direction and control during all such regular business hours and devoted exclusively during such regular business hours to the business of the newspaper and business related thereto. (6) Said newspaper files a copy of each issue immediately with the State Historical Society. (7) Said newspaper is made available at single or subscription prices to any person, corporation, partnership or other unincorporated association requesting the newspaper and making the applicable payment. (8) Said newspaper has complied with all the foregoing conditions for at least one year preceding the day or dates of publication mentioned below. (9) Said newspaper has filed with the Secretary of State of Minnesota prior to January 1, 1966 and each January 1 thereafter an affidavit in the form prescribed by the Secretary of State and signed by the managing officer of said newspaper and sworn to before a notary public stating that the newspaper is a legal newspaper.

She further states on oath that **Metro COG Seeks Public..** attached as a part hereof was cut from the columns of said newspaper, and was printed and published therein in the English language, once each week, for **One (1)** week; that it was published on **Monday** the **20th** day of **September, 2010**, and that the following is a printed copy of the lower case alphabet from A to Z, both inclusive, and is hereby acknowledged as being the size and kind of type used in the composition and publication of said notice, to wit:

(abcdefghijklmnopqrstuvwxyz)

Alexandra Larsen

Subscribed and sworn to before me this 23 day of September, 2010

Jessica L Strang

JESSICA L. STRANG
NOTARY PUBLIC—MINNESOTA
My Commission Expires JAN. 31 2013

Metro COG Seeks Public Input on Draft Final Report on Interstate Operations for the FM Metropolitan area

The Fargo-Moorhead Metropolitan Council of Governments (Metro COG) announces the availability of the Final Draft Interstate Operations Study (IOS) Report for the FM Metropolitan area. The IOS outlines identified operational issues regarding the operations of both Interstate 29 and Interstate 94 through the FM Metropolitan area. The IOS outlines a series of needed transportation system improvements to ensure an acceptable level of service (LOS) of the interstate system in the FM Metropolitan area through the year 2025. The Final Draft IOS Report is available to view or download at the Metro COG website at www.fmmetrocog.org.

A public meeting will be held on October 5, 2010, from 6:00 to 7:30 pm in the Metro COG Conference Room, Case Plaza - One North Second Street, Suite 232, Fargo, ND, 58102. Individuals requiring special accommodations for the meeting are requested to contact Metro COG two days in advance of the scheduled meeting. Public comment will be accepted by Metro COG until 4:00 pm October 19th, 2010. Comments can be sent in writing (to the address listed above) or electronically to metrocog@fmmetrocog.org.

Pending public comment, the Metro COG Transportation Technical Committee (TTC) is expected to consider the Final IOS Report on November 10th, 2010 and will develop a final recommendation to the Metro COG Policy Board for consideration on November 18th, 2010. Once approved, the Final IOS Report will serve as the cooperatively developed plan to guide interstate operations within the FM Metropolitan area, as agreed to by Metro COG, the North Dakota Department of Transportation (NDDOT), and the Minnesota Department of Transportation (Mn/DOT). Members of the public or other interested persons with questions regarding the Final Draft IOS Report are encouraged to contact Wade E. Kline, Executive Director, at 701.232.3242, ext 32.

(September 20, 2010) 1143121

PUBLICATION FEES

48 lines straight composition
.....1.....time @.. .44.....$21.12

Total $21.12

AFFIDAVIT OF PUBLICATION
1143119

STATE OF NORTH DAKOTA,
COUNTY OF CASS

.....

Alexandra Larsen of said County and state, being first duly sworn, on oath says: That *THE FORUM* is a daily newspaper of general circulation printed and published in the City of Fargo, in said County and State by FORUM COMMUNICATIONS COMPANY, and that *THE FORUM* is the duly elected, qualified and acting official newspaper in and for Cass County according to the provisions of the statute covering official newspapers, and that I am the clerk of the publisher of *THE FORUM*, and during all of such time covering the publication of this notice have occupied such position on said newspaper, and have personal knowledge of all the facts stated in this affidavit; and that the advertisement headed... **Metro COG Seeks Public ...** a printed copy of which is hereunto attached, was printed and published in said newspaper **one** time to wit:
September 20, 2010.

.....Alexandra Larsen.....

Subscribed and sworn to before me this

23 day of September, 2010

.....Jessica L. Strang.....
Notary Public, Cass Co., N.D.

My commission expires.....

JESSICA L. STRANG
Notary Public
State of North Dakota
My Commission Expires May 6, 2015

Metro COG Seeks Public Input on Draft Final Report on Interstate Operations for the FM Metropolitan area

The Fargo-Moorhead Metropolitan Council of Governments (Metro COG) announces the availability of the Final Draft Interstate Operations Study (IOS) Report for the FM Metropolitan area. The IOS outlines identified operational issues regarding the operations of both Interstate 29 and Interstate 94 through the FM Metropolitan area. The IOS outlines a series of needed transportation system improvements to ensure an acceptable level of service (LOS) of the interstate system in the FM Metropolitan area through the year 2025. The Final Draft IOS Report is available to view or download at the Metro COG website at www.fmmetrocog.org.

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Pending public comment, the Metro COG Transportation Technical Committee (TTC) is expected to consider the Final IOS Report on November 10th, 2010 and will develop a final recommendation to the Metro COG Policy Board for consideration on November 18th, 2010. Once approved, the Final IOS Report will serve as the cooperatively developed plan to guide interstate operations within the FM Metropolitan area, as agreed to by Metro COG, the North Dakota Department of Transportation (NDDOT), and the Minnesota Department of Transportation (Mn/DOT). Members of the public or other interested persons with questions regarding the Final Draft IOS Report are encouraged to contact Wade E. Kline, Executive Director, at 701.232.3242, ext 32.

(September 20, 2010) 1143119

PUBLICATION FEES

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Email: metrocog@fmmetrocog.org http://www.fmmetrocog.org

Press Release

Date: September 28, 2010

Contact: Wade E. Kline, Executive Director
701.232.3242, Ext 32

Metro COG Seeks Public Input on Final Report on Interstate Operations for the FM Metropolitan area

The Fargo-Moorhead Metropolitan Council of Governments (Metro COG) announces the availability of the Final Draft Interstate Operations Study (IOS) Report for the FM Metropolitan area. The IOS outlines identified operational issues regarding the operations of both Interstate 29 and Interstate 94 through the FM Metropolitan area. The IOS outlines a series of needed transportation system improvements to ensure an acceptable level of service (LOS) of the interstate system in the FM Metropolitan area through the year 2025. The Final Draft IOS Report is available to view or download at the Metro COG website at www.fmmetrocog.org.

A public meeting will be held on October 5, 2010, from 6:00 to 7:30 pm in the Metro COG Conference Room, Case Plaza - One North Second Street, Suite 232, Fargo, ND, 58102. A formal presentation will take place at 6:30 pm. Public comment will be accepted by Metro COG until 4:00 pm October 19th, 2010. Comments can be sent in writing (to the address listed above) or electronically to metrocog@fmmetrocog.org.

Once approved, the Final IOS Report will serve as the cooperatively developed plan to guide interstate operations within the FM Metropolitan area, as agreed to by Metro COG, the North Dakota Department of Transportation (NDDOT), and the Minnesota Department of Transportation (Mn/DOT). Members of the public or other interested persons with questions regarding the Final Draft IOS Report are encouraged to contact Wade E. Kline, Executive Director, at 701.232.3242, ext 32.

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Fargo-Moorhead Metropolitan Council of Governments
701.232.3242 • FAX 701.232.5043 • Case Plaza Suite 232 • One 2nd Street North • Fargo, North Dakota 58102-4807
Email: metrocog@fmmetrocog.org http://www.fmmetrocog.org

September 13, 2010

Sara Aultman
MnDOT, Statewide Plng
MS 440, 395 John Ireland Blvd
St. Paul, MN 55155

Dear Sara,

The Fargo-Moorhead Metropolitan Council of Governments (Metro COG) is pleased to announce the release of the Final Draft Interstate Operations Study (IOS) Report for the for the FM Metropolitan area. The Final Draft IOS Report is now available for public comment, and can be viewed or downloaded from the Metro COG website at www.fmmetrocog.org.

The IOS was been developed cooperatively through the metropolitan planning process. To ensure additional deliberation from local units of government and other interested parties of the metropolitan planning process, Metro COG is directly notifying you of the public comment period on the Final Draft IOS Report, and schedule for final approval by Metro COG.

A public meeting will be held on October 5, 2010, from 6:00 to 7:30 p.m. in the Metro COG Conference Room, Case Plaza, One North Second Street, Suite 232, Fargo, ND, 58102. Individuals requiring special accommodations for the meeting are requested to contact Metro COG two days in advance of the scheduled meeting. Public comment will be accepted by Metro COG until 4:00 p.m. October 19th, 2010. Comments can be sent in writing (to the address listed above) or electronically to metrocog@fmmetrocog.org.

Pending public comment, Metro COGs Transportation Technical Committee (TTC) is expected to consider the Final IOS Report on November 10th, 2010 and will develop a final recommendation to the Metro COG Policy Board for consideration on November 18th, 2010. Once approved, the Final IOS Report will serve as the cooperatively developed plan to guide interstate operations within the FM Metropolitan area, as agreed to by Metro COG, the North Dakota Department of Transportation (NDDOT), and the Minnesota Department of Transportation (Mn/DOT).

Members of the public or other interested persons with questions regarding the Final Draft IOS Report are encouraged to contact Wade E. Kline, Executive Director, at 701.232.3242, ext 32.

Sincerely,

Wade E. Kline, Executive Director
Metro COG

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September 13, 2010

Keith Berndt
Cass County Highway Dept.
1201 Main Ave W
West Fargo, ND 58078-1301

Dear Keith,

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Sincerely,

Wade E. Kline, Executive Director
Metro COG

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A PLANNING ORGANIZATION SERVING
FARGO, WEST FARGO, CASS COUNTY, NORTH DAKOTA AND MOORHEAD, DILWORTH, CLAY COUNTY, MINNESOTA

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September 13, 2010

Julie Bommelman
Fargo Transit Office
650 23rd St N
Fargo, ND 58102

Dear Julie,

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September 13, 2010

Chris Brungardt
City of West Fargo
810 12th Ave NW
West Fargo, ND 58078

Dear Chris,

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September 13, 2010

Steve Busek
Federal Highway Admin
1471 Interstate Loop
Bismarck, ND 58503

Dear Steve,

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Sincerely,

Wade E. Kline, Executive Director
Metro COG

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September 13, 2010

Jim Gilmour
Fargo Planning
200 3rd St North
Fargo, ND 58102

Dear Jim,

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Sincerely,

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Metro COG

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September 13, 2010

Jeremy Gorden
City of Fargo Engineering
200 3rd Street North
Fargo, ND 58102

Dear Jeremy,

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September 13, 2010

Stacey Hanson
NDDOT – Local Gov Div
608 E Boulevard Ave
Bismarck, ND 58505-0700

Dear Stacey,

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September 13, 2010

Tim Magnusson
807 N 11th Street
Moorhead, MN 56560-0280

Dear Tim,

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Sincerely,

Wade E. Kline, Executive Director
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September 13, 2010

David Overbo
2951 41½ Street South
Moorhead, MN 56560

Dear David,

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September 13, 2010

Stan Thurlow
Dilworth City Hall
Box 187
Dilworth, MN 56529

Dear Stan,

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September 13, 2010

Lori VanBeek
Moorhead Transit
650 23rd Street N
Fargo, ND 58102

Dear Lori,

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September 13, 2010

Shiloh Wahl
Dist IV Mn/DOT
1000 HW 10 West
Detroit Lakes, MN 56501

Dear Shiloh,

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A public meeting will be held on October 5, 2010, from 6:00 to 7:30 p.m. in the Metro COG Conference Room, Case Plaza, One North Second Street, Suite 232, Fargo, ND, 58102. Individuals requiring special accommodations for the meeting are requested to contact Metro COG two days in advance of the scheduled meeting. Public comment will be accepted by Metro COG until 4:00 p.m. October 19th, 2010. Comments can be sent in writing (to the address listed above) or electronically to metrocog@fmmetrocog.org.

Pending public comment, Metro COGs Transportation Technical Committee (TTC) is expected to consider the Final IOS Report on November 10th, 2010 and will develop a final recommendation to the Metro COG Policy Board for consideration on November 18th, 2010. Once approved, the Final IOS Report will serve as the cooperatively developed plan to guide interstate operations within the FM Metropolitan area, as agreed to by Metro COG, the North Dakota Department of Transportation (NDDOT), and the Minnesota Department of Transportation (Mn/DOT).

Members of the public or other interested persons with questions regarding the Final Draft IOS Report are encouraged to contact Wade E. Kline, Executive Director, at 701.232.3242, ext 32.

Sincerely,

Wade E. Kline, Executive Director
Metro COG

M:\Pass Through\2009\1214 Interstate Op Study (08 carryover)\letter submitting final draft ph II Study.docx

Fargo-Moorhead Metropolitan Council of Governments
701.232.3242 • FAX 701.232.5043 • Case Plaza Suite 232 • One 2nd Street North • Fargo, North Dakota 58102-4807
Email: metrocog@fmmetrocog.org http://www.fmmetrocog.org

September 13, 2010

Larry Weil
West Fargo City Hall
800 4th Ave E – Ste 1
West Fargo, ND 58078

Dear Larry,

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Metro COG

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A PLANNING ORGANIZATION SERVING
FARGO, WEST FARGO, CASS COUNTY, NORTH DAKOTA AND MOORHEAD, DILWORTH, CLAY COUNTY, MINNESOTA

Fargo-Moorhead Metropolitan Council of Governments
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Email: metrocog@fmmetrocog.org http://www.fmmetrocog.org

September 13, 2010

Bob Zimmerman
PO Box 779
Moorhead, MN 56560

Dear Bob,

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September 13, 2010

Mark Flinner
Mn/DOT, Statewide Planning
Mail Stop 440, 395 John Ireland Blvd
St. Paul, MN 55155

Dear Mark,

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Email: metrocog@fmmetrocog.org http://www.fmmetrocog.org

September 13, 2010

Zimmerman; VanBeek; Wahl; Thurlow; Overbo; Magnusson; Flinner; Aultman; Gorden; Gilmour, Bommelman; Brungardt; Weil; Berndt; Hanson; Busek

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Sincerely,

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Metro COG

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North Dakota Department of Transportation

Francis G. Ziegler, P.E.
Director

John Hoeven
Governor

NOV 26 2010

November 23, 2010

2010 # 1214

Mr. Wade Kline
Executive Director
Fargo-Moorhead Council of Governments
Case Plaza, One 2nd Street North, Suite 232
Fargo, ND 58102

INTERSTATE OPERATIONS STUDY – PHASE II

On October 18, 2010, the Fargo-Moorhead Council of Governments (FMCOG) and SRF Consulting conducted a Management Presentation for the North Dakota Department of Transportation (NDDOT) regarding Phase II of the Interstate Operations Study. As requested during that presentation, NDDOT is providing comments on the outcome of the analysis/study.

Comments

1. The study recommends Hybrid Alternative 2 for implementation. This recommendation does not promote any arterial improvements. If the 76th Avenue corridor is not anticipated to be implemented within the planning horizon of the Interstate Operations Study, other city arterial improvements should be included along with the proposed interstate improvements.

2. Due to unknown levels of federal funding for the future, NDDOT is unable to commit to proposed improvements/timeframes at this time.

3. If the interstate improvements needed to be made over the course of several years, any input on specific interstate project prioritization would be a valuable result of the study, if available.

4. Clarification is needed as to the benefit of the southeast on-ramp at I-94/25th Street. This added ramp clearly is a benefit to the 25th Street corridor, but the benefit to I-94 is less discernable.

5. We see some contradiction with the inclusion of ramp metering, which controls or limits access to the interstate to improve flow, and the proposed improvements that add access to the interstate. We believe ramp metering will also have impacts to the arterial streets in the vicinity of the gated ramps. It is not clear if the arterial impacts were identified or quantified with the ramp metering options.

6. We have concerns of the operational impact for a NB I-29 lane drop south of the WB I-94 to NB I-29 on-ramp connection. The operation of NB I-29 and lane assignment/management should be further studied as future construction projects are programmed.

Please contact me at (701) 328-4469 or Denny Johnson at (701) 328-2194 if you have any questions.

Stacey M. Hanson

STACEY M. HANSON, P.E., INTERIM ASSISTANT LOCAL GOVERNMENT ENGINEER

38/smh
c: Bob Fode, Office of Transportation Programs
Bob Walton, Fargo District Engineer
Denny Johnson, Local Government Division

Attachment 7

To: Transportation Technical Committee (TTC)
From: Wade E. Kline, Metro COG
Date: December 2, 2010
Re: ***Consider Interstate Operations Study (IOS) Report for the FM Metropolitan area***

Please find attached the Final Interstate Operations Study (IOS) Report for the FM Metropolitan area. The Study Review Committee (SRC) which oversaw the development of the IOS Report is recommending the Transportation Technical Committee (TTC) consider the IOS Report and forward it to the Metro COG Policy Board for final approval.

The IOS Report recommends the implementation of *Hybrid Alternative 2* (*See pages 27-29 for a detailed discussion of the recommended Hybrid Alternative*). Hybrid Alternative 2 supports the implementation of the following recommendations to assist in improving and maintaining interstate operations with the FM Metropolitan area:

- Deployment of a meaningful Transportation Demand Management (TDM) program that can serve to reduce peak hour travel demand by 5% on the interstate system by 2025;
- Continued deployment and utilization of Intelligent Transportation Systems (ITS); and development of a Traffic Operations Center (TOC) to improve interstate and arterial operations within the FM Metropolitan area
- Additional analysis and deployment of a ramp metering program;
- Implementation of physical improvements to the interstate system, primarily in the form of auxiliary lanes additions (in addition to those physical improvements noted in Phase I, see Appendix C).

Phase I of the IOS developed and achieved a Vision Statement and a set of Goals and Objectives regarding interstate operations within the FM Metropolitan area. These items are restated in *Appendix A*. Successful implementation of the IOS Report is dependent on Metro COG, NDDOT, and Mn/DOT ensuring Interstate operations are clearly linked to the metropolitan transportation planning process. *Appendix B* outlines specific actions that will ensure greater coordination of future planning/programming regarding interstate operations within the FM Metropolitan area.

Metro COG provided management level presentations to both Mn/DOT and NDDOT after development of the Draft Final IOS Report. Mn/DOT and NDDOT will neither approve nor disapprove the IOS Report.

NDDOT has concerns regarding the level to which off-system/arterial improvements are being balanced against the need for new additional interstate capacity. NDDOT also has concerns regarding the overall systemic impact of ramp metering; and feels the IOS Report is a bit contradictory in that it points toward access (modifications) at 25th Street and I-94.

It is my opinion that we have done diligence to address all the concerns identified by project partners during the development of the IOS Report. As is clearly outlined in *Appendix B*, continued attention to interstate operations within the FM Metropolitan area must be continuous from this point forward.

Suggested Action:
Recommend the Metro COG Policy Board approve the Interstate Operations Study (IOS) Report for the FM Metropolitan area

Attachment RA-3

Suggested Motion:
"Approve the Interstate Operations Study (IOS) Report for the FM Metropolitan area."

To: Policy Board
From: Wade E. Kline, Metro COG
Date: January 13, 2011
Re: ***Consider Interstate Operations Study (IOS) Report for the FM Metropolitan area***

Please find attached the Final Interstate Operations Study (IOS) Report for the FM Metropolitan area. The Transportation Technical Committee (TTC) is recommending the Metro COG Policy Board approve IOS Report for the FM Metropolitan area. The attached report is fairly length and quite detailed. In addition to reviewing certain elements of the report at the Policy Board meeting, I will provide a formal PowerPoint presentation which summarizes the highlights, key findings, and primary recommendations of the report.

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