North/West Passage Transportation Pooled Fund Study

Phase I

Project 1.5

Concept of Operations for DMS Deployment on I-94 Eastbound in North Dakota and I-94 Westbound in Minnesota

and

Project 1.5 Summary

Prepared by:

URS

January 12, 2006

North/West Passage

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1.0 Introduction and Background

The focus of this document is the project summary for Project 1.5 of Phase I including a Concept of Operations for Dynamic Message Signs (DMS) on I-94 at the Minnesota-North Dakota border.

During Phase I project development, the North/West Passage Steering Committee agreed that to better focus and coordinate efforts they would refine the original focus of Project 1.5 Preliminary Design for DMS Deployment on I-94 Eastbound in North Dakota to develop a Concept of Operations for the DMS to be installed near the border in North Dakota and Minnesota. The project became the current **Project 1.5 Concept of Operations for DMS Deployment on I-94 Eastbound in North Dakota and I-94 Westbound in Minnesota**. This Concept of Operations document will serve as a reference as North Dakota and Minnesota develop system requirements, design, and deployment plans for the DMS on each side of the border.

History of the decision:
The original purpose of North/West Passage Project 1.5 Preliminary Design for DMS Deployment on I-94 Eastbound in North Dakota was to install a DMS to provide traveler information to travelers eastbound on I-94, as they approach the North Dakota/Minnesota border. The focus of Project 1.5 was to develop a preliminary design, including communication links to stakeholders responsible for system operations for deploying a DMS on I-94 eastbound to complement a DMS being installed I-94 westbound by the Minnesota Department of Transportation (DOT) near the border.

The kick-off meeting for North/West Passage Project 1.8 Develop a Communications Plan for the Anti-Icing System to be Installed on the I-94 Bridge at Red River was scheduled before work on Project 1.5 was started. The objective of Project 1.8 was to develop the communication plan associated with development and deployment of anti-icing technology on I-94 over the Red River Bridge located at the border of North Dakota and Minnesota. Due to location of the proposed DMS in Project 1.5 (eastbound prior to the Red River Bridge) it was agreed at the kick-off meeting to coordinate project efforts.

The anti-icing system and DMS communication plan was completed, however after considerable discussion it was agreed that the DMS communication would not be included in the Request for Proposals (RFP) for deployment of the anti-icing system and would be addressed separately.

During the planning of Project 1.5, Amber Alert Grand Funds became available and North Dakota DOT decided to use these funds to deploy DMS statewide and include the planned DMS along I-94 eastbound near the North Dakota/Minnesota border in the statewide DMS plan. Therefore, only one RFP needed be developed for deploying all of the DMS in North Dakota.

As a result of these revisions, the Project 1.5 Work Team agreed to shift the focus of the project from preliminary design of the DMS to developing a Concept of Operations for DMS deployment on I-94 eastbound in North Dakota and I-94 westbound in Minnesota. The title was revised to **Project 1.5 Concept of Operations for DMS Deployment on I-94 Eastbound in North Dakota and I-94 Westbound in Minnesota**. The plan is for this Concept of Operations document to serve as a reference as North Dakota and Minnesota develop system requirements, design, deployment, operations, and maintenance for the DMS on each side of the border. The following criteria was then established by the work team to include:

1.1 Purpose and Objectives of the Concept of Operations Document

The purpose of this document is to provide a high level perspective of the DMS System's Concept of Operations, including a definition of key elements and services of each system. A concept of operations is an iterative process of defining the system in non-technical terms so that multiple classes of stakeholders agree on the function and objectives of the system. This plays an invaluable role of accelerating buy-in among stakeholders. With this understanding as a baseline, engineering efforts evolving to design and implementation may commence.

The primary objectives for creating this Concept of Operations are:

- To define goals and objectives
- To clearly describe each DMS system and how it will be managed and operated
- To delineate responsibilities for operations and maintenance
- To identify how each DMS system will work and interface with existing systems
- To advance communication and cooperation among the stakeholders.

1.2 Reference Documents Used to Develop the Concept of Operation

The following documents were referenced for development of this Concept of Operations:

- Project 1.5 Work Team Meeting Minutes from various planning meetings as contained in the Draft North/West Passage Phase 1 Final Report
- North/West Passage Transportation Pooled Fundy Study Phase I – Project 1.6 Summary Document
- MN/DOT District 8 Concept of Operations Technical Memorandum Final Draft November 16, 2005
- Variable Message Sign (VMS) – Local Agency Users Manual, Illinois DOT & Iowa DOT
- Workshop on Changeable Message Sign Usage Sponsored by Illinois and Iowa DOT's 1998
- Mason City Maintenance Area Interstate I-35 Closure Plans 2003-2004
- Interstate Closure - The Procedures for closing the Interstate, Iowa & Minnesota DOT
- North/West Passage Project 1.5 Work Team Meeting minutes, Concept of Operations – DMS, Questions, November 2, 2005
- MN/DOT Message Sign Policy dated October 01, 2003
- MN/DOT Guidelines for Changeable Message Sign (CMS) Use Dated September 15, 2000

1.3 Document Organization

The Concept of Operations document is organized in the following sequence:

2.0 Project and System Overview for Project 1.5
3.0 Concept of Operations - Vision, Goals and Objectives
4.0 Field Devices – Types/Quantities/Locations

5.0 Roles and Responsibilities – Draft MOU & Draft Operations Guidelines
6.0 Outcomes and Benefits
7.0 Staffing, Training, Maintenance and On-going Costs

2.0 Project and System Overview

2.1 Issues and Needs

Eastbound travelers on I-94 in North Dakota and westbound travelers on I-94 in Minnesota lack a seamless, reliable and effective method of obtaining real-time traveler information prior to crossing the Red River Bridge located at the border. Currently in North Dakota and Minnesota, traveler information is available though each state's 511 system. This information is updated district wide a minimum of four times daily, potentially limiting the accuracy of the information presented. Plus drivers are likely to access 511 information only after travel conditions and traffic delays have already developed. This deficiency limits a drivers' ability to make informed route choice decisions as they approach the Red River Bridge.

Both North Dakota DOT and Minnesota DOT have determined they would like to use DMS to provide more seamless, accurate and real-time traveler information for travelers on I-94. The states have developed plans for DMS deployment at the site and have already deployed DMS at other locations along I-94. Filling this void in traveler information could help travelers along I-94 in North Dakota and Minnesota make better route choice decisions.

2.2 Purpose

The purpose of Project 1.5 is to develop a Concept of Operations that provides a high level perspective of the DMS operations. This document includes a Draft MOU that could be used to formalize an agreement between the states for controlling the DMS from each state. The Concept of Operations will help reduce or prevent questions and problems as each state strives to deploy DMS viewable by all vehicles passing through these locations.

2.3 Stakeholders

The primary stakeholders that have responsibility or shared responsibility to maintain and operate the DMS in Minnesota include:

- Minnesota DOT District 4 – Traffic
- Minnesota DOT District 4 – Maintenance
- Minnesota DOT District 4 – Information Technology
- Minnesota State Patrol
- Minnesota DOT Electrical Services Section

The primary stakeholders that have responsibility or shared responsibility to maintain and operate the DMS in North Dakota include:

- North Dakota DOT District 8 – Traffic
- North Dakota DOT District 8 – Maintenance
- North Dakota DOT District 8 – Information Technology
- North Dakota Highway Patrol

- North Dakota DOT Maintenance and Engineering Services Division (MESD)

Specific agency roles are discussed in *Section 5.0 Roles and Responsibilities* of this document.

3.0 Vision, Goals, and Objectives

The vision, goals, and objectives of the Concept of Operations relate specifically to the DMS included in the project. However, it is hoped they can be applied to future projects and to related projects.

3.1 Concept of Operations Vision

The vision of the Minnesota DOT and North Dakota DOT is to use DMS to provide travelers on I-94 seamless, accurate, and real-time traveler information so they can make informed route choice and travel decisions. This Concept of Operations document is being developed to provide a high level perspective of the coordination and operations, of DMS at the borders.

3.2 Concept of Operations Goals and Objectives

The goal of the Concept of Operations for Project 1.5 is to provide system operators and maintainers a high level perspective of the DMS operations, including a definition of key elements and services of each system, communications identification, and contact information resources.

The objective of the Concept of Operations is that it:

- Will facilitate travelers receiving coordinated, accurate, real time information so they can make informed route choice decisions as they approach the Red River Bridge.
- Will provide a clear operational plan for system operators and related information providers as they strive to operate and maintain the system.
- Can facilitate integrate the DMS operations from this project into other state, district and local DMS operational plans.
- Could be used to formalize an agreement between the states for controlling the DMS from each state.
- Can serve as an example and demonstration of multi-state cooperation along the North/West Passage Corridor.

4.0 DMS – Types/ Quantities / Locations

North/West Passage Project 1.5 focused on the deployment of only two DMS located along I-94 specifically for travelers approaching the Minnesota/North Dakota border at the Red River Bridge in Fargo North Dakota and Moorhead in Minnesota. These locations for DMS deployment along I-94 were selected because of the need to provide early warnings to drivers of potential problems and closings of I-94 at locations where they could make informed travel decisions.

In addition these sites were selected because they provide an excellent opportunity for North/West Passage Corridor states to cooperate on a project with mutual need and interest. Separately, two DMS can provide valuable information to motorists; however their value is maximized when they become part of a coordinated deployment and operations program along the entire I-94 corridor.

While North/West Passage Project 1.5 includes only two DMS, the location of these devices was selected so that they are integral parts of the North/West Passage I-94 corridor and integral parts of each states DMS deployment programs.

4.1 DMS Deployment

Eastbound on I-94 one DMS is to be deployed at 5th Street on the South side of I-94 in Fargo, North Dakota. The type, size and other specification details are currently under development and have not been established. This DMS will be owned, operated and maintained by the North Dakota DOT although its messages will primarily benefit travelers entering Minnesota.

Westbound on I-94 one DMS is to be deployed at milepost 1.0 east of the exit to TH-75.The type, size and other specification details are currently under development and have not been established. This DMS will be owned, operated and maintained by the Minnesota DOT although its messages will primarily benefit travelers entering North Dakota.

4.2 DMS Deployment along the I-94 Corridor in Minnesota and North Dakota

As part of their plans to provide drivers real-time travel information, both North Dakota and Minnesota have been and are continuing to deploy additional DMS plus other message and ITS devices.

The Minnesota DOT has DMS operational or in process at the following general locations along I-94:

- Existing westbound MP 6.7 near Moorhead, East of highway 336

The following DMS are listed to show that the DMS included in Project 1.5 are part of a system of DMS providing travelers information. They are activated by staff in the District 4 and District 3 TOCC's.

- Planned westbound at Fergus Falls
- Planned westbound a Alexandria
- Existing westbound MP 128.6, one mile east of highway 71 Sauk Center
- Existing westbound MP 171.7, East of St. Augusta
- Existing westbound MP 180.7, 2.4 miles east of highway 24 Clearwater

- Existing westbound MP 194.8, 1.4 mile east of highway 25 Monticello
- Existing westbound MP 201.5, 1.6 mile west CR 39 at Albertville

North Dakota DOT has portable (semi-permanent) DMS operational or in process at the following general locations in Fargo:

- Existing I-94 westbound near 42nd Street in Fargo
- Existing I-29 northbound between 7th and 12th Ave N. in Fargo.
- Existing I-29 southbound near 32nd Ave. S. in Fargo.

Other public DMS deployments in the Fargo or Moorhead area:

There are no known DMS deployments, including portable DMS deployments in the Fargo or Moorhead area by other public entities including cities or counties. However, on an emergency basis it's reasonable to expect that any of these entities, including Minnesota and North Dakota DOT's, would lease or purchase portable DMS to meet their needs.

4.3 Additional DMS Deployments in Minnesota and North Dakota

In North Dakota, deployment of DMS along I-29, and at various Interstate feeder roads, will be particularly important to the full functioning of the DMS on I-94 since I-29 is both a feeder system and an alternative route for travelers on I-94. North Dakota currently uses 13 portable DMS during winter operations in semi-permanent locations along the Interstate system. Statewide North Dakota has deployed or has plans for DMS deployment at approximately 48 locations.

In Minnesota, deployment of DMS in the Minneapolis/St Paul Metropolitan area and St. Cloud area can also provide travelers information on alternative routes when the DMS are part of a coordinated operational plan. Statewide, Minnesota has deployed or has plans for DMS at numerous locations

4.4 DMS Integration

During the development of this Concept of Operations, it was agreed by the Project 1.5 Work Team that the signs on each side of the border would not be integrated into the other states system at this time. Also that one state would not operate the other states DMS. The MOU developed as part of this document is intended to assist each state with coordination of the signs as needed.

4.5 Communications

In Minnesota the DMS on westbound I-94 at milepost 1 (east of exit to TH-75) will communicate over hardwire phone line.

In North Dakota the DMS on eastbound I-94 at 5th Street will communicate over hardwire phone line.

4.6 Other Systems Communications

North Dakota has deployed a DMS control software for their portable DMS called Intelligent Control provided by Intelligent Devices, Inc. This software was used to upgrade all 19 of North Dakota's portable DMS signs from five different manufacturers to NTCIP compliance. North Dakota is now able to use a single communication interface to communicate to all their DMS.

4.7 Architecture

In Minnesota District 4, as part of the District 4 ITS Scoping Study a Regional Architecture was developed. North Dakota has also developed a state regional architecture that is available at www.atacenter.org/regional/northdakota/). An architecture provides a common framework for planning, defining, and integrating ITS. The architecture defines functions, the physical entities of subsystems, where these functions reside, and the information flows and data flows that connect these functions and physical subsystems together into and integrated system.

5.0 Roles and Responsibilities - DRAFT MOU

The roles and responsibilities for the each DMS of each stakeholder organization are defined in this section. However, no amount of paper or planning can actually facilitate or manage the person-to-person respect, communication, trust, and responsibility that can occur between dedicated people who really want to make a difference. This document will serve as a foundation, but it cannot duplicate or replicate the ongoing arrangements and communication between participants from all the stakeholder organizations as they operate the system. This becomes especially important during emergency conditions when all organizations are stretched to their limit and are operating beyond normal anticipated capabilities. A major disadvantage of informal arrangements is that some stakeholders are left out at critical decisions, and that can become a major factor during emergency situations.

Currently an informal process is in place between North Dakota and Minnesota District Offices that includes calling each other when information is to be shared regarding the border. However, an MOU could be developed to formalize the agreement for controlling the DMS in each state including provisions for after hours or in case of emergencies. It was agreed that as part of Project 1.5 a draft MOU would be developed for use by stakeholders to formalize their operational arrangements (See Section 5.3 Draft MOU for DMS Operations on I-94 Between North Dakota and Minnesota).

A number of factors influence how each state views its roles and responsibilities for the DMS as installed as part of Project 1.5 including:

- An informal process is already in place.
- Future district or statewide DMS operational plans or messages requirements
- Participation by other stakeholders
- Perception and timing of severe weather conditions and emergencies
- Problems and special situations that affect operations and maintenance of the DMS
- Amber Alerts and how they are processed

5.1 Minnesota DOT District 4 & State Patrol

A Concept of Operations for the District 4 Transportation Operations and Communications Center (TOCC) is in draft form as part of on ongoing contract for Districts 2, 3A, 4 and 8. When completed it will formalize operational arrangements for the TOCC between Minnesota DOT District 4, the Minnesota State Patrol, and other stakeholders.

Any multi-state MOU for Project 1.5 will need to be coordinated with this project for development of the TOCC Concept of Operations in District 4.

The following are considered primary stakeholders that have responsibility or shared responsibility for the operations and maintenance of the DMS in Minnesota:

- Minnesota DOT District 4 – Traffic
- Minnesota DOT District 4 – Maintenance
- Minnesota DOT District 4 – Information Technology
- Minnesota State Patrol – Law enforcement and road closures
- Minnesota DOT Electrical Services Section

5.2 North Dakota DOT, District 8 & Highway Patrol

In North Dakota, most emergencies, i.e. road closures, Amber Alerts, etc. are coordinated by NDDOT MESD. They coordinate their operations with the North Dakota Highway Patrol and with the district offices. Non-emergency operations are coordinated though District 8.

The primary stakeholders that have responsibility or shared responsibility for the operations and maintenance of the DMS in North Dakota include:

- North Dakota DOT District 8 – Traffic
- North Dakota DOT District 8 – Maintenance
- North Dakota DOT District 8 – Information Technology
- North Dakota Highway Patrol – Law enforcement and road closures
- North Dakota DOT Maintenance and Engineering Services Division (MESD)

5.3 Draft MOU

The following draft MOU has been prepared as part of Project 1.5 to facilitate involvement of State DOT's, State and Highway Patrol, district offices, and other stakeholders in operations and maintenance of the DMS on I-94 near the Minnesota/North Dakota border. This MOU focuses on the DMS at this particular site, however it was developed so that it could be incorporated in other state operational plans and by other stakeholders as their future plans develop.

Final agreement and signature by key agencies will be an interactive process and while this is a draft MOU it is intended that it can also become a draft or concept document for additional multi-state DMS and other field devices among the North/West Passage Corridor states.

DRAFT DOCUMENT

MEMORANDUM OF UNDERSTANDING

FOR DYNAMIC MESSAGE SIGN OPERATIONS ON I-94

AT THE NORTH DAKOTA - MINNESOTA BORDER

JANUARY 16, 2006

MOU FOR DYNAMIC MESSAGE SIGN OPERATIONS ON I-94 AT THE NORTH DAKOTA – MINNESOTA BORDER

This Memorandum of Understanding is entered into this 16th day of January 2006 by and between the State of Minnesota, Department of Transportation, District 4, hereinafter referred to as MNDOT, the Minnesota State Patrol, hereinafter referred to as MSP, the State of North Dakota, Department of Transportation, Central Maintenance Office, hereinafter referred to as NDDOT, and the North Dakota Highway Patrol hereinafter referred to as NDHP

Whereas, as part of the North/West Passage Pooled Fund Study, Project 1.5, two Dynamic Message Signs (DMS) are to be deployed along I-94 near the border between North Dakota and Minnesota at the following general locations;

- Eastbound on I-94 one DMS on the South side of I-94 at 5th Street in Fargo (NDDOT owned and maintained DMS)

- Westbound on I-94 one DMS on the North side of I-94 at milepost 1, approximately 900 feet east of the TH-75 exit. (MNDOT owned and maintained DMS)

Whereas, as part of the North/West Passage Pooled Fund Study these DMS are to be deployed to advise travelers on I-94 with seamless, real time traveler information, road conditions, and Amber Alerts to the extent possible; and

Whereas, both states recognize that travelers on I-94 need seamless, real time, cross-boarder traveler information on road restrictions, travel conditions, maintenance operations and emergency conditions so they can make informed travel decisions; and

Whereas, westbound travelers on I-94 in Minnesota primarily need information about travel conditions in North Dakota and eastbound travelers on I-94 in North Dakota primarily need information about travel conditions in Minnesota so they can make informed decisions; and

Whereas, each state Department of Transportation (DOT) MSP and NDHP Office operates and maintain the DMS in its respective state independently; and

Whereas, it is recognized between the states that the public need for seamless traveler information, on I-94, can best be served through advanced planning, cooperation and communication between, NDDOT, NDHP, MNDOT, MSP and other stakeholders; and

Whereas, during severe weather conditions and for other public safety reasons, it may become necessary to partially close, fully close or detour traffic on I-94;

Now therefore, based upon mutual understanding, the parties enter into this Memorandum of Understanding (MOU) to establish and implement the following planning, communications and operations procedures for; operating and maintaining the DMS; for determining the need for closing or restricting travel on I-94; for release of public announcements on travel restrictions on I-94 and when necessary for closing or restricting travel on I-94:

1. Each state DOT is primarily responsible for operating and maintaining the above referenced DMS in their state.

2. Each state DOT is primarily responsible for communication between and coordination with their respective State and Highway Patrol Offices and with other stakeholders in their state.

3. Each state DOT is primarily responsible for messages on the DMS in their state. Shared messages i.e. states placing messages on the other states DMS are not planned at this time or included as options in this MOU.

4. FOR GENERAL INFORMATIONAL MESSAGES on the DMS, no multi-state coordination is necessary.

5. FOR ADVISORY MESSAGES, traffic management, information, maintenance operations, construction activities and other messages such as bridge icy, or bridge de-icing, the following will apply; MNDOT will, as soon as a message is determined necessary, communicate that message and timing of it, to NDDOT District 8 Offices at phone number (701) 239-8900, and NDDOT will communicate their advisory messages and their timing to MNDOT TOCC at phone number (218) 846-0450.

6. FOR AMBER ALERT MESSAGES they are coordinated through NDDOT MESD at phone number (701) 328-2545, alternate (701) 328-2517 evening and weekend phone (701) 391-0795, and Minnesota DOT at (218) 846-0450, alternate phone (218) 291-4350. Note: These offices are responsible for coordinating the posting of DMS amber alert messages with their 511 operations so they can be included in 511 phone message sets.

7. FOR I-94 CLOSING, TRAVEL RESTRICTIONS OR EMERGENCY OPERATIONS the first priority is safety and the following procedures will apply:

    A. In Minnesota, MNDOT District 4 Transportation Operations and Communication Center will coordinate discussions with appropriate stakeholders to determine the need to close or restrict travel on I-94.

    B. In North Dakota, NDDOT MESD will coordinate discussions with appropriate stakeholders to determine the need to close or restrict travel on I-94.

    C. Once a determination of need to close or restrict travel appears eminent in either state they will initiate communications with the other state over these conditions and the results of their discussions.

    D. In North Dakota the MESD contact phone numbers for these communications are: daytime phone (701) 328-2545, alternate daytime phone (701) 328-2517 evening and weekend phone (701) 391-0795.

    E. In Minnesota the District 4 Transportation Operations and Communications Center phone number is: (218) 846- 0450, alternate phone (218) 291-4350 These numbers are staffed 24 hours a day, 7 days a week.

F. Additional communications with other stakeholders will be made as appropriate, by each state DOT, so these stakeholders, including County Sheriffs, local police, School Districts, emergency management and the media can prepare for traffic diversion, and other emergency operations.

G. Once a determination, between the states, has been made to close or restrict travel on I-94, and a timeline for closing determined, each state will notify the other appropriate stakeholders of their plans. They will also notify other DOT Districts along I-94 so they can provide a coordinated DMS message to travelers, including 511 messages, and they will notify the appropriate media so that the public is informed of their plans.

H. At the time for closing each state will follow their established procedures for the actual closing, for barricades, traffic coordination, message signs, road maintenance and law enforcement.

I. State DOT's will coordinate messages to be displayed on the DMS so that motorists receive seamless travel information.

J. Finally, and equally important, the same procedures will be followed in reverse as the time for opening I-94 to travel approaches, except that any opening must also be coordinated with maintenance operations on the road.

This MOU is not a legally binding document, but is prepared for the purpose of facilitating DMS operations at the Minnesota – North Dakota border.

IN RECOGNITION OF THE MUTUAL UNDERSTANDINGS DISCUSSED HEREIN THE PARTIES HERETO AFFIX THEIR SIGNATURES ON THIS DOCUMENT, WHICH SHALL BECOME EFFECTIVE ON THE 16TH DAY OF JANUARY 2006

North Dakota Department of Transportation

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North Dakota Highway Patrol

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Minnesota Department of Transportation

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Minnesota State Patrol

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5.4 Draft Operations Guidelines for Coordinating DMS Messages When Closing I-94 Westbound at Fargo/Moorhead

In addition to the Draft MOU a one page quick reference OPERTIONS GUIDELINES FOR COORDINATING DMS MESSAGES WHEN CLOSING 1-94 WESTBOUND AT FARGO/MOORHEAD has been prepared in draft form. The purpose of this document is to provide a one-page set of directions for North Dakota MESD staff on who to call, and on messages to be displayed on the DMS across the border in Minnesota.

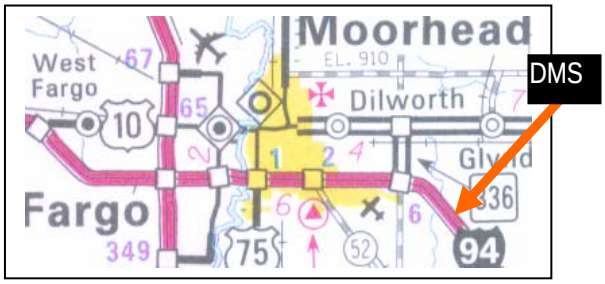
DRAFT DOCUMENT

OPERATIONS GUIDELINES FOR COORDINATING DMS MESSAGES WHEN CLOSING I-94 WESTBOUND AT FARGO/MOORHEAD

JANUARY 16, 2006

– NORTH DAKOTA DOT CENTRAL MAINTENANCE –

OPERATIONS GUIDELINES FOR COORDINATING DMS MESSAGES WHEN CLOSING I-94 WESTBOUND AT FARGO/MOORHEAD



These guidelines are intended to help dispatchers quickly choose and display appropriate messages on the I-94 westbound Dynamic Message Sign (DMS) at Fargo/Moorhead. The messages are used when North Dakota DOT determines it necessary to close I-94 westbound at Fargo/Moorhead because of severe weather conditions or for emergency purposes. They are general guidelines and therefore do not cover every possible situation, or special operational condition that may arise.

1. **Determine the need to close I-94 to all westbound traffic at Fargo, at which exit and at what time.**
2. **Call Minnesota State Patrol (District 4 TOCC) at (218) 846-0450 to request activation of the DMS with time and exit number.**
3. **Follow established procedures for closing of I-94.**
4. **The following DMS messages are considered appropriate to request:**

Note: The DMS on I-94 westbound at exit 6 (County Road 11) is a Dual Phase sign and can display two messages on 3 lines on an alternating basis.

For closings at westbound exit 6 the following messages can be used -

I-94 CLOSED AT EXIT 6 ONE MILE

ALL TRAFFIC MUST EXIT ONE MILE

For closing at westbound North Dakota exits 348, 349, 350 & 351, or at other exits further west, the following can be used (insert correct exit and mileage) -

I-94 CLOSED AT EXIT 349 NINE MILES

ALL TRAFFIC MUST EXIT NINE MILES

Key
Exit - Miles
1 - 5
351 - 7
350 - 8
349 - 9
346 - 12
342 - 16
340 - 18
338 - 20

In addition to closures, the sign can be used for other purposes, such as notifying drivers of upcoming lane closures, resulting from either road work or crashes, to warn of hazardous road conditions, and to post Amber Alerts.

5. **Log message and time displayed in log book**
6. **Coordinate opening of I-94 to traffic following established procedures.**

6.0 Outcomes and Benefits

There are two outcomes and benefits to be considered as part of this Concept of Operations.

6.1 Actual performance and operations of the DMS as a real-time, seamless traveler information system

This Concept of Operations document does not attempt to quantify or qualify actual performance and operations benefits of these DMS. Partially because these are new DMS and their specifications, operations and maintenance have not yet be specified.

In addition these signs will be individual DMS within statewide networks of DMS and other informational signing. Trying to determine the performance benefits of an individual DMS does not appear to be easy exercise, or provide valuable beneficial information. At this time the overall need, benefits and operations characteristics is based on a "judgment' and mutual determination of the participants in the program.

6.2 Usefulness of the coordination efforts, the project experiences and documentation for the overall North/West Passage Pooled Fund Study

The basic question here is are the experiences gained and documentation prepared in this project useful on other North/West Passage Corridor projects. On the experiences gained, each state has gained a better understanding of the others planning and operations plus numerous "contacts" between persons performing similar functions have been established. These contacts and better communications on planning, operations and maintenance will continue as each organization manages its future programs.

Preparing a totally new Concept of Operations for multi-state sharing of DMS has been a learning process for each state. Many of the informal communications links have been refined and documented for the future so that in emergency situations a firm line of communications has been established. It is also expected that as each state develops its future DMS operations plans that these cross-state communications links and this document will be valuable assets to the process.

With a Concept of Operations completed each state along the North/West Passage Corridor has a document format and example that can serve as a starting point for developing additional multi-state programs.

7.0 Staffing, Training, Maintenance, and On-going Costs

7.1 Staffing

At both the North Dakota DOT and the Minnesota DOT the DMS will be additional tools available for staff to perform their day-to-day activities. No additional staff requirements are anticipated as a result of Project 1.5 although they may be called in as part of regular preparations for severe weather or other emergency conditions.

7.2 Training

Both Minnesota and North Dakota already have operational DMS and their staff has experience in operating DMS. However, the following additional training is anticipated as appropriate:

- Training specific to the operational characteristics of the new DMS installed in each state will be provided by the field installation contractors.
- Additional staff training in coordination and operation DMS is anticipated as each state develops additional statewide standard procedures for DMS operations and or messages. Minnesota DOT currently has a Guidelines for CMS Use document dated September 15, 2000, that was used as a reference document in developing this Concept of Operations.
- At a time when a state, route, or site-specific operational plan for interstate closures is developed that affect I-94 at the Minnesota/North Dakota border additional training will be necessary.

7.3 On-Going Operation and Maintenance Costs

Although it is recognized that the messages on each sign will primarily benefit the traveler as they cross the border and travel in the other state, the operational and maintenance costs for each DMS will be born by the state owning the sign.

Individual DMS communications, operational and maintenance costs estimates will be determined as part of the detailed specifications for each DMS.

In Minnesota, MNDOT District 4 Traffic Operations will own and maintain the DMS.

In North Dakota, NDDOT District 8 Traffic will own the DMS, and they will maintain the DMS with support from the NDDOT IT Division.