Conceptual Regional Technology Plan

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Introduction

The Upper Midwest Freight Corridor Study, active since 2003, includes the states of Ohio, Indiana, Michigan, Wisconsin, Illinois, Minnesota, and Iowa, as well as the provinces of Ontario and Manitoba along with the Federal Highway Administration and researchers from the University of Wisconsin-Madison, the University of Illinois-Chicago, and the University of Toledo. The effort is coordinated by the Midwest Regional University Transportation Center.

Phase one of the study concluded that congestion was a major issue for our freeways, rails and waterways. It also concluded that the region lacks coordination in the implementation of traffic management technology.

Commercial vehicle operations (CVO)-related intelligent transportation systems (ITS) have the potential for improving the flow of truck freight through the region. Several states are moving ahead with some elements of it, but the region lacks a comprehensive plan of action.

In order to capitalize on the efficiency rewards of regional ITS deployment and management, the Upper Midwest Freight Corridor Coalition made the facilitation of a regional technology dialog a high priority for phase two of this study. One of the six primary tasks of phase two was to facilitate the beginning of a regional approach to deploying commercial vehicle-related intelligent transportation systems. This regional approach may ultimately result in the formation of a Multi-state Traffic Operations Program (MSTOP).

The task undertaken by the Upper Midwest Freight Corridor Coalition is divided into four sections:

1) Prepare a white paper outlining the current state of CVO-related ITS in the region.
2) Prepare white papers outlining the probable benefits of ITS implementation.
3) Facilitate a dialog within the region on ITS.
4) Draft a conceptual regional deployment plan.

Sections 1 and 2 have been completed and comprise the white paper *Using Highway Technology* (see Volume I of Final Report). Some additional information on the current state of CVO-related ITS in the region and the benefits of ITS implementation can be found in this report. This report also contains the results of the Coalition's successful effort to facilitate a dialog within the region on ITS and to draft a conceptual deployment plan (Sections 3 and 4 of task).

Interstate Corridor Characteristics

In an effort to identify specific areas which could benefit from regional ITS deployment, the Upper Midwest Freight Corridor Coalition researched characteristics of the interstate corridor. There are six major areas of focus:

- Traffic congestion
- Freight bottlenecks
- Key border crossings
- Critical travel decision points
- High incident areas affecting interstate travel
- Current CVO-related ITS within the Upper Midwest

Recurring and non-recurring congestion are the major challenges to efficient regional interstate operation. The first five areas of focus all relate to either recurring or non-recurring congestion. Identification of the points in the system that are congested is the first step in drafting a regional ITS deployment plan. The sixth area of focus identifies current CVO-related ITS within the Upper Midwest in order to identify potential areas of regional collaboration.

The hours of delay created by traffic is an important indicator of recurring congestion levels. Figure 1 displays hours of delay within the Upper Midwest, divided into groups based on population size. As expected, the largest delays occur within the very large population group average areas, namely Chicago and Detroit.

	Delay per Traveler (Hours)	Travel Time Index Total Delay	Total Delay (1000 Hours)	Total Cost ($ Million)	Delay per Traveler (Hours)	Total Delay (1000 Hours)
Very Large Average (13 areas)	61	1.48	194,317	325.1	38	154,841
Chicago, IL-IN	L	HH	HH	H	H	HH
Detroit, MI	L	LL	LL	L	0	LL
Large Average (26 areas)	37	1.28	33,647	42.9	28	30,784
Minneapolis-St. Paul, MN	H	H	HH	H	HH	HH
St. Louis, MO-IL	0	L	H	0	L	0
Cleveland, OH	LL	LL	LL	L	LL	LL
Cincinnati, OH-KY-IN	L	L	L	0	0	LL
Milwaukee, WI	LL	L	LL	L	LL	LL
Columbus, OH	LL	LL	LL	L	L	LL
Indianapolis, IN L	0	L	L	L	H	LL
Medium Average (30 areas)	25	1.18	9,598	7.8	20	8,263
Dayton, OH	LL	LL	LL	LL	LL	LL
Akron, OH	LL	LL	LL	LL	LL	LL
Grand Rapids, MI	LL	L	LL	LL	LL	LL
Toledo, OH-MI	LL	LL	LL	LL	LL	LL
Small Average (16 areas)	13	1.11	2,142	0.9	8	1,659
No cities in 7 state region						

O – Average congestion levels or average congestion growth (within 1 interval of population group average)
H – Higher congestion or faster increase in congestion (between 1 and 2 intervals)
L – Lower congestion or slower congestion increase (between 1 and 2 intervals)
LL or HH – Lower / Slower or Higher / Faster by more than 2 intervals.

Figure 1. Upper Midwest State Traffic Congestion (Source: 2005 Urban Mobility Study)

An estimated 40% of congestion is caused by bottlenecks. A bottleneck is defined as recurring congestion at locations where the volume of traffic routinely exceeds the capacity of the roadway, resulting in stop-and-go traffic flow and long backups (1). While there are several types of freight bottlenecks (steep grade, signalized intersection, lane drop), highway interchange bottlenecks cause the most problems. The direct user cost associated with interchange bottlenecks is about $4 billion per year (1). Based on a Cambridge Systematics, Inc. report prepared for FHWA, there are 60 highway interchange bottlenecks with the Upper Midwest 7-state region, displayed in Figure 2.

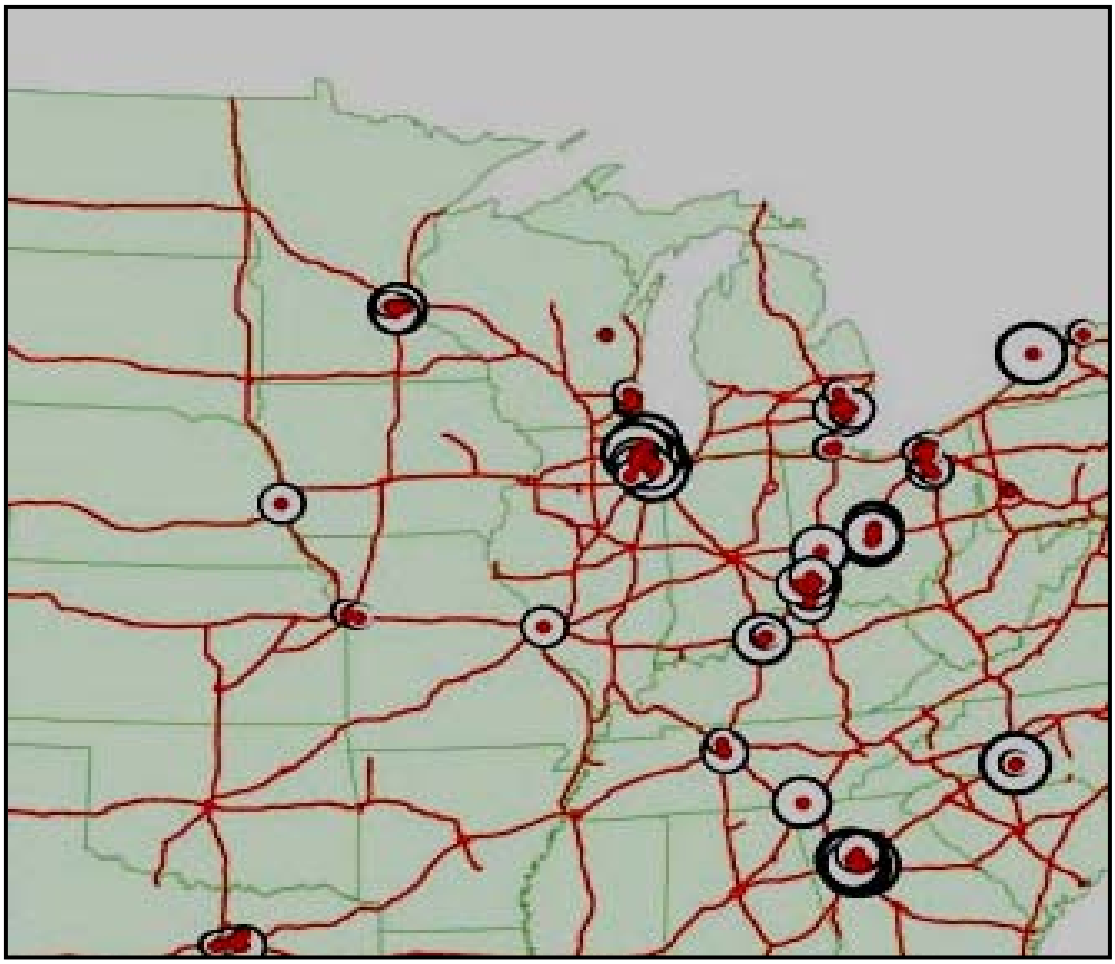

Figure 2. Freight Bottlenecks in Upper Midwest (Source: (Source: US DOT FHWA White Paper prepared by Cambridge Systematics, Inc.)

Freight movement across the U.S./Canadian border accounts for a significant portion of freight traffic within the Midwest. Due to capacity and regulatory constraints, there tends to be significant delay associated with the following key border crossings, displayed in Figure 3. This recurring congestion could be improved through a regional ITS strategy.

Figure 3. Critical Border Crossings in Upper Midwest (Source: US DOT FHWA Freight Analysis Framework)

Identifying critical Upper Midwest travel decision points can be beneficial for a regional ITS strategy. Use of dynamic signage and other traveler information resources can lead to effective rerouting of traffic off of congested interstate segments. Communication with shippers and the traveling public at or before critical decision points enables rerouting to occur. A regionally coordinated and timely traveler information system can thusly mitigate the scale and duration of non-recurring congestion. Figure 4 identifies several critical Midwest travel decision points. It should be noted that this graphic is the product of a sketch exercise occurring during an April Workshop discussed in the Regional Dialog section and the graphic needs further analysis to be considered comprehensive.

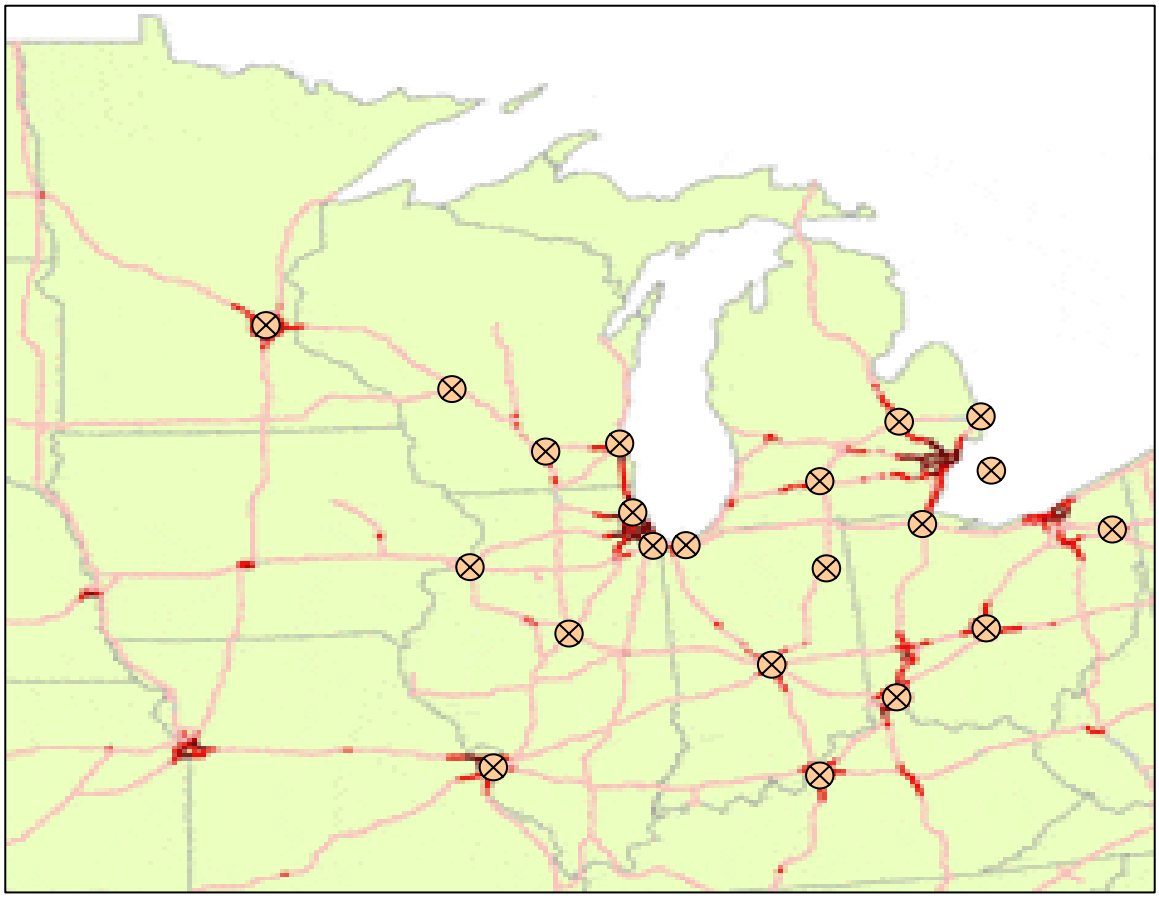

Figure 4. Travel Decision Points in Upper Midwest

As part of the assessment of the Midwest interstate corridor characteristics, participants in the April Workshop identified high incident areas affecting interstate travel. These points on the interstate highway system represent a significant portion of the non-recurring congestion that occurs within the Midwest. As with Figure 4, Figure 5 is the product of a sketch planning exercise and is not exhaustive.

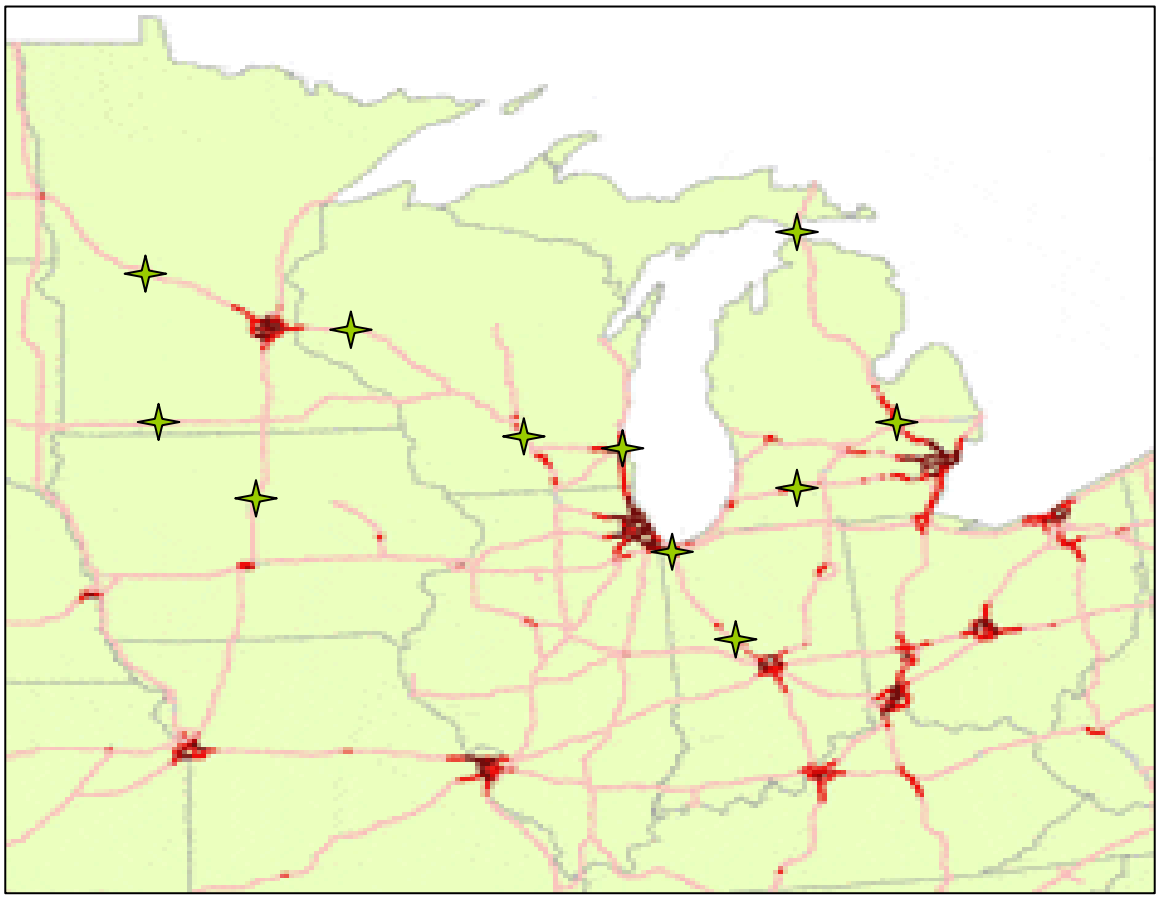

Figure 5. High Incident Areas Affecting Interstate Travel

In order to identify potential areas of regional collaboration, the Upper Midwest Freight Corridor Coalition then researched existing CVO-related ITS programs within the region. See Table 1 below for the results of a survey of ITS professionals within the 7-state study region.

State	TRAVELER INFORMATION	CONGESTION MANAGEMENT	WORK ZONE MANAGEMENT and CONSTRUCTION COORDINATION	FREIGHT COORDINATION including INSPECTION and SAFETY	Projects or Initiatives that would benefit from Midwest Traffic Operations Coalition
Illinois	Gateway Traveler Information System in the Gary-Chicago-Milwaukee (GCM) Corridor	GCM Corridor including the Traffic and Incident Management Work Group, the Transit Operations Work Group, and the CVO Work Group	GCM CAT	Proposal for One-Stop Shopping initiative	GCM projects
			Regular multi-state coordination activities within the Bureaus of Design and Construction	Pursuing CVISN Level 1	Illinois Statewide ITS Strategic Plan and Architecture projects
	Gateway Guide in the St. Louis metropolitan area	CAT developed under GCM	CAT being formed to address I-94 corridor	GCM CPP currently under development	Northeastern Illinois ITS Strategic Plan projects
Indiana	GCM Corridor planning on sharing DMS information between IN, IL, WI.	Communications between TMC in Indianapolis and TMC in Gary	GCM Corridor "information cards" on summer construction activities	Indiana State Police Commercial Vehicle Division works with the FMCSA and other states	New IDOT position for Commercial Vehicle & Freight Mobility issues
				GCM corridor freight coordination	
Iowa	CARS	IA/IL share DMS quad cities	Midwest Smart Work Zone Deployment Initiative (IA, KS, MO, NE)	PrePass / Safer & other CVISN compliant electronic credentialing, TRACS	
	511	Working on ITS Deployment Plan for quad cities		TRACS	
	LPFM (HAR), TMDD, ESS &1512 Standards			NAITC	
Michigan	MDOT and MTO coordinating to provide better, more accurate and timely information on the HAR at the Blue Water Bridge	MDOT and MTO coordinating to provide border delay times via web site		Discussions of partnering in the CVISN program	Study to improve border crossing efficiency, will likely include development of region-wide traffic management concept of operations with the intent of linking the MDOT Traffic Management System to the GCM, Compass, and Ohio systems to provide traveler information on regional basis
		Plans to provide border crossing delays at major decision points throughout MI and Ontario			
		Steering committee for the Intelligent Border Crossing study being performed by MTO and Transport Canada			
Minnesota	North/West Passage Corridor Coalition participation	Coordination with WI on design and control of I-94 cameras that are programmed to be installed adjacent Minneapolis/St.Paul metropolitan region		Reviewing and building dialogue with border states on Truck Size and Weight regulations	Designation of a national Interstate Oasis Program, allowing for one-stop rest areas to be recognized on the interstate system
	Interface control document outlining how Minn CARS will interface with the traveler information systems in the Dakotas (partially deployed)	North/West Passage Corridor Coalition efforts to improve cross-border center-to-center coordination for traffic operations			
Ohio	not available at time of printing				
Wisconsin	Coordinated CMS and HAR Messaging standards across GCM Corridor	Limited with exception of cross border traffic management associated with alternate routes along the WI-IL border.	Feeds information to Gateway Traveler Information System from MONITOR Freeway Management System through direct fiber connection	CVISN Level 1 Compliant	ITS Sketch Planning Projects (Corridor Planning Methodology for ITS, Ramp Control and Surveillance, Travel Warning and Information Systems, Traffic Signal Systems)
	Feed information to Gateway Traveler Information System from MONITOR Freeway Management System through direct fiber connection		Additional Programming Coordination required to limit number of regional work zones encountered	Participating in Upper Midwest Freight Corridor Study	TransPortal Transportation Operations Data Hub and Archived Data Management System Development
	Participant in GCM, North/West Passage				511 Traveler Information Preliminary Engineering

Acronyms

CAT	Corridor Action Team	GCM	Gary/Chicago/Milwaukee
CMS	Changeable Message Signs	HAR	Highway Advisory Radio
CPP	Corridor Program Plan	MTO	Ministry of Transportation-Ontario
CVISN	Commercial Vehicle Information Systems Network	NAITC	North American International Trade Corridor
CVO	Commercial Vehicle Operations	TMC	Traffic Management Center
DMS	Dynamic Message Signs	TMDD	Traffic Management Data Dictionary
ESS	Environmental Sensor Stations	TRACS	Traffic and Criminal Software
FMCSA	Federal Motor Carrier Safety Administration		

Table 1. Cross Border or Multi-state Transportation Operations Activities

The six areas of interstate corridor characteristic research detailed in this section were used as a base for a regional dialog about technology deployment.

Regional Dialog

In the first quarter of 2006, a series of exploratory meetings were held with a collection of Midwest-based organizations with an interest in enhancing interstate traffic and commercial vehicle operations and sharing of traveler information. The Midwest Regional University Transportation Center (MRUTC) and the Traffic Operations and Safety Laboratory (TOPS) at the University of Wisconsin-Madison worked together to explore the establishment of a Midwest Traffic Operations Coalition, using the participants, framework, and existing funding of the Upper Midwest Freight Corridor Coalition as a launching platform. The proposed Midwest Traffic Operations Coalition would also use the Gary-Chicago-Milwaukee (GCM) ITS Priority Corridor as a guide, drawing on the exemplary work done by GCM and expanding their efforts to a broader region.

The organizations represented in discussions about the Midwest Traffic Operations Coalition included eight Midwest Departments of Transportation:

- Illinois Department of Transportation
- Indiana Department of Transportation
- Iowa Department of Transportation
- Michigan Department of Transportation
- Minnesota Department of Transportation
- Ohio Department of Transportation
- Wisconsin Department of Transportation
- Federal Highway Administration-Division Offices

In addition to the public sector organizations, the Midwest-based Connected Vehicle Trade Association provided private industry perspectives during initial discussions.

Two teleconferences were held in February and March and a workshop in Columbus, Ohio focused on traffic and commercial vehicle operations was held in conjunction with the Upper Midwest Freight Corridor Study in late April. The initial teleconference included brief presentations from several existing Multi-state Traffic Operations Program (MSTOP) representatives including:

- Gary-Chicago-Milwaukee (GCM) ITS Priority Corridor
- I-95 Corridor Coalition
- I-10 Freight Study
- High Plains Coalitions
- North/West Passage
- AASHTO MSTOP Research Activities

In addition to the short presentations, each DOT was allowed an opportunity to provide an overview of current and/or planned interstate coordination activities related to traffic management, traveler information, work zones, and special

event management. After the initial teleconference, the group agreed there was enough momentum to meet in Columbus in late April. Therefore, the March teleconference was dedicated to planning the agenda for the April workshop.

The April Workshop held in Columbus was structured to investigate if there was interest in moving forward with a Midwest Traffic Operations Coalition with the specific objectives of:

- better understanding Midwest traffic operations characteristics,
- developing a Midwest Interstate corridors vision and needs,
- discussing what could be done with little, some and significant funding, and
- developing a plan and schedule for future dialog.

The Workshop resulted in the formation of a draft Concept Development Report for a Midwest Traffic Operations Coalition. The contents of the Concept Development Report are further described in the subsequent sections of this report.

Concept Development Report Uses

The Concept Development Report, based on the results of the April Workshop, serves to:

- provide a mechanism to understand what issues are critical to the Midwest Traffic Operations Coalition,
- provide an initial listing of activities that could significantly impact interstate traffic operations, and
- serve as a basis for guiding the start-up of the Midwest Traffic Operations Coalition.

This Concept Development Report contains:

- a Vision for the interstate corridor,
- a needs assessment for the interstate corridor, and
- the results of a sketch planning exercise to identify potential activities.

Vision

After significant deliberations, the Midwest Traffic Operations Coalition developed a Vision that supports a variety of traffic operations, safety and economic development activities throughout the region:

MIDWEST INTERSTATE CORRIDOR VISION STATEMENT

Develop and implement a regional transportation operations system in the Midwest with expected benefits of:

- Coordinating efforts to respond to and minimize non-recurring congestion and improve network reliability
- Sustain and encourage economic competitiveness of the region
- Reducing crashes, personal injuries, and fatalities
- Supporting national emergency preparedness

Interstate Corridor Needs

The Midwest Traffic Operations Coalition also developed a statement of the specific needs of the Midwest traffic and commercial vehicle operations community. It includes:

- Organizational and technical support to foster learning and information sharing
- Provide a source of long-distance travel information to shippers and the traveling public
- Development of a mobility-oriented Midwest Regional Concept of Transportation Operations
- Development and maintenance of strategic, performance-oriented business plans
- Creation of frameworks and guidelines that will:
    - Assist members with system management and operations
    - Support investment decisions
    - Select and define standards for information sharing
- Accelerate coordinated system management and operations by facilitating deployments of cross-jurisdictional programs and services

Potential Activities

The final portion of the Concept Development Report drafted by the Midwest Traffic Operations Coalition is a list of potential activities that could be performed by the organization if it were formed. The following activities were the result of a portion of the April Workshop, dedicated to developing ideas that support the Midwest Corridor Vision Statement and associated needs. To capture a wide array of solutions, workshop attendees offered several solutions based on the level of funding available:

- No / Low Funding (up to $100k)
- Limited Funding ($100k to $1m)
- Significant Funding (greater that $1m)

Nearly all of the solutions offered by the group were related to interagency data sharing and/or traveler information. Table 2 lists the solutions developed during the workshop.

NO COST / LOW FUNDING
▪ Catalog Existing Emergency Alternative Routes (local/state) ▪ Define Interstate Alternative Routes ▪ Phone List/Routing Requirements ▪ Equipment Asset Maps ▪ Share Road Closure Guidelines ▪ Develop Methods for Best and Approved Product Sharing/Peer Exchanges ▪ Publish Regional Clearance Laws, Dusting Legislation
LIMITED FUNDING
▪ Combine State Static Closure Information (i.e., More than Weekly) ▪ Develop Upper Midwest Concept of Transportation Operations ▪ Develop and Program Performance Measures
SIGNIFICANT FUNDING
▪ Connected Vehicle Pilot Program ▪ Real Time Traveler Information ▪ Traffic Technology Test-bed ▪ Upper Midwest Traffic Operations Center

Table 2. Initial Upper Midwest Traffic Operations Solutions

Summary

In order to capitalize on the efficiency rewards of regional ITS deployment and management, the Upper Midwest Freight Corridor Coalition made the facilitation of a regional technology dialog a high priority for phase two of this study. The meetings of the Midwest Traffic Operations Coalition and resulting Concept Development Report are significant stepping stones in this direction. The team formed through the coordination of the Upper Midwest Freight Corridor Coalition and TOPS Lab at the University of Wisconsin-Madison, using the GCM ITS Priority Corridor as a building block. The organization has the potential to put an effective Multi-state Traffic Operations Program into place in the Midwest.

Next Steps

The work of the traffic operations group will be presented to the Board of Directors of the Mississippi Valley region of AASHTO in July. The results of the Upper Midwest Freight Corridor Study's phase two and a draft MOU promoting regional solutions to meet freight demand in the Upper Midwest will also be

presented as part of the briefing. The Executive and Technical Committees created by the MOU will meet in the later summer or fall to plan and approve the next steps to be taken in the regional freight and technology efforts, which includes consideration of the formal establishment of the Midwest Traffic Operations Coalition.

Acknowledgements

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References

1 Cambridge Systematics. Inc. *An Initial Assessment of Freight Bottlenecks on Highways.* FHWA, U.S. Department of Transportation, 2005.