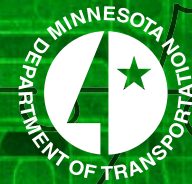
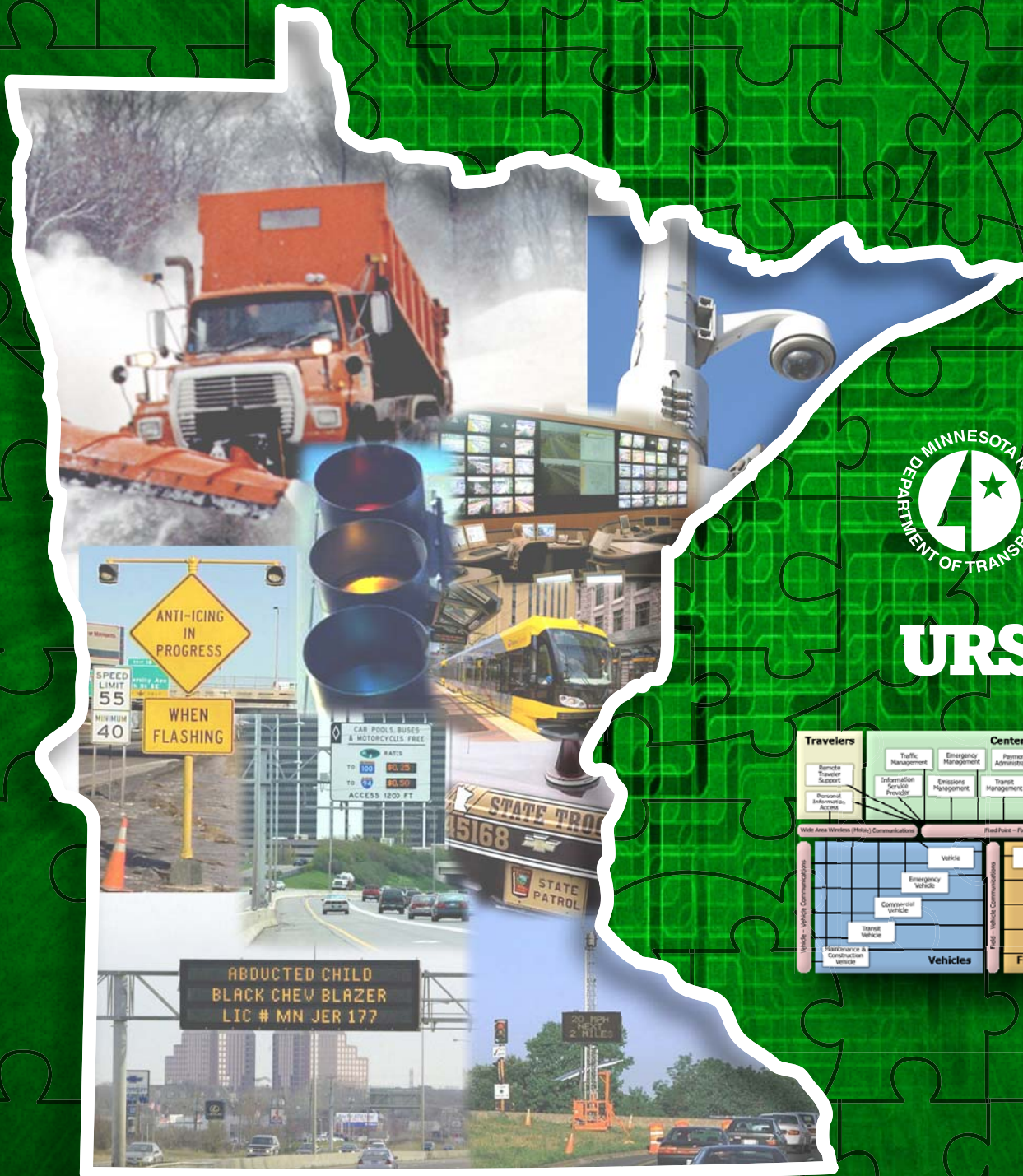


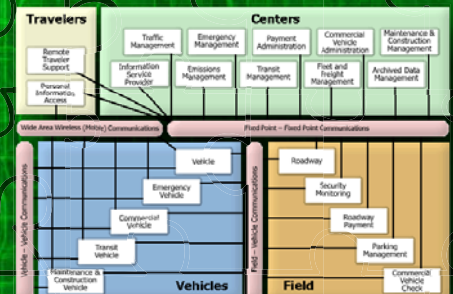
MINNESOTA STATEWIDE REGIONAL ITS ARCHITECTURE

Version 2014

Volume 5:
Commercial Vehicle Operations Service Package Bundle



URS



**Minnesota Statewide Regional ITS Architecture
Version 2014**

**Volume 5: Commercial Vehicle Operations
Service Package Bundle**



**Prepared by
URS Corporation**

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ACRONYMS

AD	Archived Data Management
ADMS	Archived Data Management System
APTS	Advanced Public Transportation System
ATIS	Advanced Traveler Information System
ATMS	Advanced Traffic Management System
ATR	Automatic Traffic Recorder
AVSS	Advanced Vehicle Safety System
CARS	Condition Acquisition and Reporting System
CCTV	Closed Circuit Television
CICAS	Cooperative Intersection Collision Avoidance System
CVIEW	Commercial Vehicle Information Exchange Window
CVISN	Commercial Vehicle Information Systems and Networks
CVO	Commercial Vehicle Operations
DPS	Department of Public Safety
EM	Emergency Management
EOC	Emergency Operations Center
FAST	Free and Secure Trade
FHWA	Federal Highway Administration
FMCSA	Federal Motor Carrier Safety Administration
FTA	Federal Transit Administration
GIS	Geographic Information System
GPS	Global Positioning System
HAZMAT	Hazardous Materials
ICC	Interstate Commerce Commission
ICS	Incident Command Structure
IFTA	International Fuel Tax Agreement
IRP	International Registration Plan
ISS	Inspection Selection System
ITS	Intelligent Transportation Systems
LOS	Level of Service
MCM	Maintenance and Construction Management
MCMIS	Motor Carrier Management Information System
MnDOT	Minnesota Department of Transportation
MSP	Minnesota State Patrol
NIMS	National Incident Management System
OS/OW	Oversize/Overweight
PRISM	Performance and Registration information Systems Management
RFID	Radio-Frequency Identification
SAFER	Safety and Fitness Electronic Records
STS	Special Transportation Services
USDOT	United States Department of Transportation
VMT	Vehicle-Miles Traveled
VWS	Virtual Weigh Station
WIM	Weigh-in-Motion
XML	Extensible Markup Language

1. Introduction

1.1 Statewide Regional ITS Architecture Update

The Minnesota Statewide Regional Intelligent Transportation Systems (ITS) Architecture Version 2014 is an update of the previous version that was developed in 2009. It conforms with the National ITS Architecture and the Federal Highway Administration (FHWA) Final Rule 940 and Federal Transit Administration (FTA) Final Policy on ITS Architecture and Standards. The Final Rule and the Final Policy ensure that ITS projects carried out using funds from the Highway Trust Fund including the Mass Transit Account conform to the National ITS Architecture and applicable ITS standards.

The Minnesota Statewide Regional ITS Architecture represents a shared vision of how each agency's systems work together by sharing information and resources to enhance transportation safety, efficiency, capacity, mobility and security. The information exchange among the many transportation stakeholders helps illustrate various integration options, gain consensus on cost-effective ITS technologies and systems to be considered prior to investing in design, development and deployment of ITS.

The Minnesota Statewide Regional ITS Architecture is a living document and will evolve as needs, technology, stakeholders and funding change. The National ITS Architecture is a resource to the Minnesota Statewide Regional Architecture providing framework for planning, defining and integrating ITS.

The Minnesota Statewide Regional ITS Architecture promotes deployment and integration of ITS systems and services that are compatible and interoperable with other ITS systems and services across jurisdictional boundaries. It facilitates coordination, cooperation, and information and resource sharing among State and local agencies. It guides systematic deployment and integration of regional ITS to improve the safety, efficiency, dependability, and cost effectiveness of the transportation system in Minnesota.

The Minnesota Statewide Regional ITS Architecture is organized as follows:

- **Overview:** The Overview document identifies the purpose/need, a general description of the region, development objectives, and performance measures for the Minnesota Statewide Regional ITS Architecture.
- **Volumes 1 thru 8 – Development and Documentation of Service Package Bundles:** Each volume is specific to the corresponding Service Package Bundle and includes: a description of the Service Package Bundle, ITS development objectives, a summary of needs and services, and a detailed description of needs and services (consisting of the operational concept, inventory, specific service packages to address needs and services, interconnects and architecture flows, and research and development needs).
- **Volume 9 – ITS Initiatives and Project Concepts for Implementation:** This volume serves as long-range guidance to systematically and cost-effectively implement the ITS initiatives and project concepts for the next 15 to 20 years in Minnesota based on funding availability. It lists specific ITS needs that are further prioritized into ITS initiatives and project concepts. It also provides the corresponding details for each

initiative or project concept which include project concept descriptions, agency involved, champion, implementation timeframe, technology readiness, dependencies, benefits, service packages, estimated costs, and agreements needed.

- **Volume 10 – Turbo Architecture Outputs of the Regional ITS Architecture:** Volume 10 consists of a Turbo Architecture generated report for the Minnesota Statewide Regional ITS Architecture.

The purpose for developing Volumes 1 through 8 was to identify and prioritize stakeholder needs; gather information on existing infrastructure, components and technology; and define stakeholder roles and responsibilities in planning, deploying, operating and maintaining existing and future ITS systems.

Data collection activities were conducted early in the study process and focused on two primary tasks:

1. The assemblage of an inventory of existing and planned transportation infrastructure and, facilities and services.
2. The assessment of statewide needs and opportunities for further deployment of ITS needs.

Previously published transportation plans were the main source of data about characteristics of the existing transportation system, planned improvements, transportation system needs and goals. Strategic and long-range planning studies, ITS deployment and safety plans, transit studies and transportation planning and policy documents were reviewed.

1.2 Volume 5 – Commercial Vehicle Operations

Commercial Vehicle Operations (CVO) includes ITS technologies that are uniquely able to support over-the-road trucking operations. CVO ITS technologies address ways to improve the regulation and enforcement of trucking industry law; provides improved communications between the truck and the shipper, the trucking company, and the regulatory agencies; provides technologies for roadside credential verification, weight and safety inspections, and reduces the number of incidents that involve commercial vehicles.

Development of Volume 5 - CVO entailed the Project Consultant to work closely with MnDOT and stakeholders to identify and prioritize stakeholder needs; gather information on existing and future ITS infrastructure, components and technology; and define the stakeholders roles and responsibilities in planning, deploying, operating and maintaining existing and future ITS systems.

Volume 5 summarizes the findings of data collection and analysis activities conducted to support development of the CVO Service Package Bundle. Volume 1 is organized with the following sections:

- **Section 1: Introduction** provides a brief project overview and the purpose of this volume.
- **Section 2: Identification of Existing CVO Systems** provides a brief overview of statewide CVO system deployments with a detailed listing of existing/planned systems in *Appendix A*.

- **Section 3: Development Objectives** provides an overview of the Minnesota ITS Development Objectives specific to CVO. These objectives are used to identify needs and gaps, which will then be used to identify services to address those needs.
- **Section 4: Identification of Needs and Services.** Based on the ITS Development Objectives, needs were identified and prioritized by the stakeholders. Services were identified to address those prioritized needs.
- **Section 5: Detail of CVO Needs and Services** describes, for each identified Need/Service, the following information:
 - **Operational Concept** - who is currently using the service and how they are using it. Users include both managers of a system and other users, like the traveling public, who use an end service.
 - **Existing Capabilities** - what systems are currently in place that are used to provide this service and who operates these services.
 - **Gaps and Planned Enhancements** - enhancements that can be made to better provide the service and address needs, who will use these enhancements, and what they will be used for. These enhancements can include expanding systems to geographic areas that currently do not have access to the service, enhancing an existing service to provide greater functionality or use by more groups, or implementing a new system to address a gap.
 - **Roles and Responsibilities** - what roles stakeholders need to fulfill to make the service operate successfully throughout a system's lifecycle (planning, design, implementation, operations, and maintenance).
 - **Interconnects** - the communications linkages between subsystems or stakeholders to provide the service.
 - **Data Archive Needs** - what data is generated for the service that should be archived, who is responsible for archiving, and any special needs or requirements for such archiving.
 - **Associated Service Packages** - other Service Packages that the service falls under. This includes both Service Packages within the CVO Service Package Bundle and those in other Service Package Bundles.
- **Section 6: CVO Research and Development Needs** describes general research that can be performed to help implement the identified services.

2. Identification of Existing CVO Systems

CVO systems are in place in Minnesota in order to improve the safety and efficiency of commercial vehicle operations throughout the state. The integration of safety inspection, licensing, permitting, and credentialing systems allows compliant commercial vehicles to avoid delays at inspection stations, while also increasing the efficiency of pre-trip administrative processes. Improvements in permanent and mobile weigh station equipment increase the flexibility of law enforcement to identify weight and safety violations. Real-time traveler information allows commercial vehicle dispatchers and drivers to better plan or change routes based on travel times, weather, or incidents.

An inventory of existing and planned CVO ITS systems (e.g. centers, devices and infrastructure) in Minnesota is described in *Appendix A*. This inventory summarizes a list of existing and programmed ITS systems in the state, their general description, associated stakeholder that are involved with their operations and management, and their current deployment. The systems

described in *Appendix A* are Minnesota-specific implementations of subsystems from the National ITS Architecture.

3. Development Objectives

Transportation needs identify the transportation problems that can be solved by ITS services. They also represent a link to transportation planning efforts that define the strategies and solutions to address various challenges. These strategies involve capital improvements as well as operational improvements. CVO ITS solutions involve services that improve the effectiveness and safety of maintenance and construction operations.

CVO addresses ways to improve the regulation and enforcement of trucking industry law. It provides improved communications between the truck and the shipper, the trucking company, and the regulatory agencies. It provides technologies for roadside credential verification, weight and safety inspections, and reducing the number of incidents that involve commercial vehicles. The goal of CVO is to improve the administration of regulatory functions, reduce costs and enhance commercial vehicle fleet mobility, safety, and security while safeguarding the existing infrastructure. The Minnesota ITS Development Objectives in Table 3-1, specific to CVO, are steps to determine and/or measure whether or not CVO goals are being achieved. A complete list of Minnesota ITS Development Objectives is included in *Appendix B*.

Table 3-1. CVO Specific Minnesota ITS Development Objectives

A. Improve the Safety of the State's Transportation System

A-1 Reduce crash frequency (ATIS, ATMS, APTS, CVO, EM, MCM & AVSS)

- A-1-06 Reduce number of crashes involving large trucks and buses
- A-1-07 Reduce number of crashes due to commercial vehicle safety violations

A-2 Reduce fatalities and life changing injuries (ATIS, ATMS, APTS, CVO, EM, MCM & AVSS)

- A-2-06 Reduce number of fatalities involving large trucks and buses
- A-2-07 Reduce number of fatalities due to commercial vehicle safety violations
- A-2-21 Reduce number of hazardous materials transportation incidents involving fatalities
- A-2-27 Reduce number of injuries involving large trucks and buses
- A-2-28 Reduce number of injuries due to commercial vehicle safety violations
- A-2-42 Reduce number of hazardous materials transportation incidents involving injuries

D. Improve the Security of the Transportation System

D-2 Safeguard the motoring public from homeland security and/or Hazmat incidents (ATIS, ATMS, APTS, CVO, EM, MCM & AVSS)

- D-2-01 Reduce the number of Hazmat incidents
- D-2-05 Reduce the Hazmat incident response time
- D-2-07 Increase the number of Hazmat shipments tracked in real-time

Table 3-1. (Continued)

E. Support Regional Economic Productivity and Development

E-1 Reduce travel time for freight, transit and businesses (ATIS, ATMS, APTS, CVO & AVSS)

- E-1-03 Decrease the annual average travel time index for selected freight-significant highways
- E-1-04 Decrease point-to-point travel times on selected freight-significant highways
- E-1-05 Decrease hours of delay per 1,000 vehicle miles traveled on selected freight-significant highways

E-2 Improve the efficiency of freight movement, permitting and credentials process (ATIS & CVO)

- E-2-01 Increase the percent (or number) of commercial vehicles tracked by trucking companies
- E-2-02 Increase the percent (or number) of freight shipment tracked
- E-2-03 Increase the percent of agencies involved in CVO inspection, administration, enforcement, and emergency management in the region with interoperable communications
- E-2-04 Increase the use of electronic credentialing at weigh stations and border crossings
- E-2-05 Increase the number of automated permits/credentials issued
- E-2-06 Reduce the frequency of delays per month at intermodal facilities
- E-2-07 Reduce the average duration of delays per month at intermodal facilities

E-3 Improve travel time reliability for freight, transit and businesses (ATMS, APTS, CVO & AVSS)

- E-1-08 Decrease the annual average travel time index for selected freight-significant highways
- E-2-04 Increase the use of electronic credentialing at weigh stations and border crossings
- E-3-01 Reduce average crossing times at international borders

E-4 Increase agency efficiency (ADMS, ATMS, APTS, CVO, EM & MCM)

- E-2-01 Increase the percent (or number) of commercial vehicles tracked by trucking companies
- E-2-03 Increase the percent of agencies involved in CVO inspection, administration, enforcement, and emergency management in the region with interoperable communications
- E-4-01 Increase the number of ITS-related assets tracked
- E-4-02 Reduce the number of pavement miles damaged by commercial vehicles

E-6 Enhance efficiency at borders (ATIS & CVO)

- E-2-04 Increase the use of electronic credentialing at weigh stations and border crossings
- E-3-11 Reduce average crossing times at international borders

Table 3-1. (Continued)

F. Preserve the Transportation System

F-1 Safeguard existing infrastructure (ATMS, CVO, EM & MCM)

- E-2-03 Increase the percent of agencies involved in CVO inspection, administration, enforcement, and emergency management in the region with interoperable communications
- F-1-01 Decrease the number of pavement miles damaged by commercial vehicles
- F-1-02 Decrease the number of size and weight violations

G. Enhance the Integration and Connectivity of the Transportation System

G-1 Aid in transportation infrastructure and operations planning (ALL)

- G-1-01 Increase the amount of data gathered from ITS enhancements used in infrastructure and operations planning
- G-1-02 Increase the number of planning activities using data from ITS systems
- G-1-03 Increase the number of years of data in database that is easily searchable and extractable

G-2 Reduce need for new facilities (ATMS, CVO, MCM & AVSS)

- E-2-04 Increase the use of electronic credentialing at weigh stations and border crossings
- E-2-05 Increase the number of automated permits/credentials issued
- E-3-11 Reduce average crossing times at international borders

4. Needs and Services

Stakeholder outreach has been a key component for updating the Minnesota Statewide Regional ITS Architecture. A stakeholder survey was conducted in early 2013 to capture the following changes since the last update of the Architecture in 2009:

- Additional ITS needs and services have been identified and added
- New technologies have come on-line
- New technologies have replaced out-of-date technology.

The survey asked each survey participant to review and provide priority ranking to each of the ITS functional/informational needs as well as research and technology development needs that were identified previously in the 2009 Minnesota Statewide Regional ITS Architecture. Survey participants were also asked to identify additional needs and provide information on the status of current projects/initiatives and plans for future projects/initiatives.

Workshops with CVO stakeholders were conducted in May and June 2013. The purpose of the workshops was to obtain feedback on the Minnesota ITS Goals and Objectives, discuss the results of the stakeholder survey, and gather additional feedback on needs and priority rankings. Stakeholders reviewed the ITS functional/informational needs as well as discussed the research and technology development needs. Subsequently, the highest priority needs that would benefit the traveling public were identified.

Table 4-1 displays the Specific Functional/Informational Needs/Services as potential solutions and enhancements. Priority is indicated in the Priority Points column, with each point

representing one vote from responders through the stakeholder survey. The ITS Development Objectives and ITS Architecture Service Packages corresponding with the potential solutions are also listed in Table 4-1. The potential solutions and enhancements identified in Table 4-1 will provide the required service(s) to fill the gaps summarized in *Appendix C*. This appendix will take the Needs and associated CVO Solutions and define what and how the system will be used, who will use it and who is responsible for planning, design, implementation, operation and maintenance of the system.

Table 4-1. CVO Needs and Potential Solutions

Notes:

^a Priority point scoring system: 0 point for “no need”; 1 point for “low”; 2 points for “low to moderate”; 3 points for “moderate”; 4 points for “moderate to high”; and 5 points for “high”.

^b Discussions on needs/solutions fall under other service package bundles can be found in corresponding Service Package Bundle documents.

ID	Need/Potential Solution	Priority Point ^a	ITS Development Objective	National ITS Architecture Reference ^b
CF01	Minimize delays at weigh stations through additional automation	3.00	E-2-03, E-2-04, E-2-05, E-2-06, E-2-07, E-3-01, E-3-11	CVO03
CF02	Provide mobile weight enforcement	2.00	E-2-04, F-1-02	CVO06, CVO07
CF03	Target enforcement at locations with history of violations	3.00	F-1-01, F-1-02	CVO06, CVO07, AD1
CF04	Target enforcement on carriers, vehicles and drivers with history of violations and poor safety records	4.00	E-2-02, E-2-04, F-1-01, F-1-02	CVO04, CVO07, AD1
CF05	Provide HAZMAT detection at roadside check facilities	3.50	D-2-01, D-2-07, E-2-01, E-2-02, E-2-04,	CVO11
CF06	Provide electronic application, processing, fee collection, issuance and distribution of CVO credentials	4.50	E-2-04, E-2-05,	CVO04
CF07	Provide safety information from CVO databases to roadside and enforcement vehicles/personnel	4.00	A-1-07, A-2-07, A-2-28, D-1-05, D-1-07, D-1-08, D-1-09, D-2-03, D-2-04, D-2-07	CVO04, CVO07
CF08	Provide collision avoidance assistance for commercial vehicles	2.50	A-1-01, A-1-02, A-1-06, A-1-07, A-1-08, A-1-12, A-1-13, A-1-14	AVSS03, AVSS04, AVSS10
CF09	Provide automated roadside safety monitoring and reporting	1.50	A-1-07, A-2-07, A-2-28, D-1-05, D-1-07, D-1-08, D-1-09, D-2-03, D-2-04, D-2-07	CVO07
CF10	Provide on-board commercial vehicle safety monitoring and reporting	2.50	A-1-07, A-2-07, A-2-28, D-1-05, D-1-07, D-1-08, D-1-09, D-2-03, D-2-04, D-2-07	CVO08
CF11	Use RFID tags in conjunction with a black box for identification of HAZMAT materials	3.00	D-2-03, D-2-04, D-2-07	CVO10

Table 4-1. (Continued)

ID	Need/Potential Solution	Priority Point^a	ITS Development Objective	National ITS Architecture Reference^b
CF12	Permit and route commercial vehicle operators of oversize and overweight loads to routes that accommodate size and weight requirements	4.00	A-1-01, A-1-02, A-1-06, A-1-07, C-3-10, C-3-11, C-3-12, C-3-13, C-3-15, F-1-02	CVO01
CF13	Provide size and weight restrictions due to work zones for permitted loads	4.00	A-1-01, A-1-02, A-1-06, A-1-07, C-3-10, C-3-11, C-3-12, C-3-13, C-3-15, F-1-02	CVO01
CF14	Direct commercial vehicle operators to the quickest route/time of travel	2.50	B-1-01, B-1-02, B-1-03, B-1-04, B-1-05, B-1-06, B-1-07, B-1-08, B-1-09, B-1-10, B-1-11, B-1-12, B-1-13, B-1-14, B-3-01, B-3-02, B-3-03, B-3-04, B-3-05, C-3-15	CVO01, ATIS01, ATIS02
CF15	Track and manage interstate intermodal freight movements	3.00	D-1-05, D-1-06, D-1-07, D-1-08, D-1-09, D-2-07, E-2-01, E-2-02, E-2-03, E-2-04, E-2-05, E-2-06, E-2-07	CVO02
CF16	Track commercial fleet	1.00	D-1-05, D-1-06, D-1-07, D-1-08, D-2-07, E-2-01, E-2-02	CVO01
CF17	Manage Hazmat incidents	2.50	B-4-01, D-2-01, D-2-03, D-2-05, D-2-07	CVO01
CF18	Provide multi-state oversize/overweight permitting	2.50	E-2-04, E-2-05	CVO04
CF19	Improve quality and accessibility of commercial vehicle-related crash data	3.00	A-1-01, A-1-02, A-1-06, A-1-07, G-1-01, G-1-02, G-1-03	AD1, AD2
CF20	Measure historic commercial vehicle shipment performance	2.00	G-1-01, G-1-02, G-1-03	CVO01
TI02	Provide traveler information across state borders	2.44	C-3-10, C-3-12, C-3-15	ATIS06
TI23	Provide information on available public and private truck parking facilities	2.85	C-4-04, C-4-05, C-4-07	ATIS01, ATMS16
TM22	Provide a system-coordinated response for incidents and emergencies	3.25	B-1-15, B-1-16, B-1-17, B-1-18, B-4-01, C-1-01, C-1-02, C-1-03, C-1-04, C-1-05, C-1-06, C-1-07, C-1-08, C-1-09	ATMS08
TM28	Provide railroad flashing light signals and gates	3.50	A-1-09, A-2-10, A-2-31	ATMS13, ATMS14
TM35	Provide vehicle overheight detection/warning systems	2.00	A-1-06, A-1-17, A-2-06, A-2-18, A-2-27, A-2-39	ATMS24, EM05

5. Detail of CVO Needs and Services

A detailed description of each CVO Needs and Services for Minnesota is found in *Appendix C*. *Appendix C* contains a table, listing the services sorted by Service Package and details for the service. The details described in the table include:

- **Operational Concept:** Describes who is currently using the service and how they are using it. Users of the service include both managers and operators of a system and other users who may be impacted and/or benefit from such a service, such as other agencies and the traveling public.
- **Existing Capabilities:** Describes what systems are currently in place that are used to provide this service and who operates these systems and provides such services.
- **Gaps and Planned Enhancements:** Summarizes enhancements that can be made to better provide the service and address needs, who will use these enhancements, and what they will be used for. These enhancements include expanding current systems to geographic areas that presently do not have access to the service, enhancing an existing service to fill identified gaps or use by more groups, or implementing a new system to address a need.
- **Roles and Responsibilities:** Describes the roles and responsibility of involving stakeholders to make the service operate successfully throughout a system's lifecycle (planning, design, implementation, operations, and maintenance).
- **Interconnects:** Presents the communications linkages between subsystems or stakeholders to provide the service.
- **Data Archive Needs:** Summarizes what data is generated for the service that should be archived, who is responsible for archiving, and any special needs or requirements for such archiving.
- **Associated Service Packages:** Describes other Service Package(s) required to deliver the desired service. This includes both Service Packages within the CVO Service Package Bundle and those in other Service Package Bundles.

6. CVO Research and Development Needs

In order to fill gaps and meet the needs for technology advancement in CVO services, some research must be performed to test solutions and gain a greater understanding of what can effectively address identified needs. Research and Technology development needs and opportunities for CVO are as follows:

Administrative Processes

- Investigate improvements to automated permit routing system to provide for one stop overweight/overheight permitting.
- Enhance an automated permit routing system to automate the entering of real-time data.
- Measure historical commercial vehicle shipment performance and automated clearances at weigh stations to determine how competitive Minnesota is with other states.

Transportation Safety

- Identify ways to improve incident response time in rural areas.
- Improve MnDOT CVO access to out-state information from the Minnesota State Patrol to allow for quicker response time to Hazmat incidents.

Freight Administration

- Investigate ITS technologies to process and move cargo more quickly, including using the GPS capability on commercial trucks to monitor congestion.

Weigh-In-Motion

- Investigate ways to apply data from weigh-in-motion (WIM) stations to planning and pavement design.
- Investigate ways to more effectively utilize automatic traffic recorders (ATRs) and WIM data to improve the management of CVO programs.

Appendix A: Existing/Planned CVO Elements

Element	Service Package	Description	Stakeholder	Status
Commercial Vehicle	CVO01, CVO03, CVO05, CVO06, CVO07, CVO10	This ITS element represents commercial vehicles equipped with the sensory, processing, storage, and communications functions to promote the safe and efficient operation of commercial vehicles in the state of Minnesota. These vehicles may be equipped with two-way communications allowing commercial vehicle drivers to communicate with their fleet managers, and roadside officials. The vehicle may also have the capability to collect and process vehicle, cargo information from the attached freight equipment, and driver safety data and status and alert the driver whenever there is a potential safety or security problem. Basic identification, security and safety status data may be supplied to inspection facilities at mainline speeds.	Private Trucking Companies	Existing
FAST Compliance Management Center	CVO05	The FAST (Free and Secure Trade) Compliance Management Center supports moving pre-approved eligible goods across the border quickly and verifying trade compliance away from the border. The FAST system is deployed at the Fort Frances Bridge in International Falls, MN. FAST is a commercial process offered to pre-approved importers, carriers, and registered drivers. Shipments for approved companies, transported by approved carriers using registered drivers, will be cleared into either country with greater speed and certainty, and at a reduced cost of compliance. This is achieved through electronic data transmissions and transponder technology within Commercial Vehicles.	US Customs and Border Protection	Existing
FAST Compliance Management Roadside Equipment	CVO05	This element represents roadside equipment operated by the FAST Compliance Management Center to support moving pre-approved eligible goods across the border quickly and verifying trade compliance away from the border.	US Customs and Border Protection	Existing
IFTA Clearinghouse	CVO03, CVO04	The IFTA Clearinghouse supports the IFTA base state agreement electronically. The IFTA Clearinghouse coordinates IFTA carrier information and transmittal records between participated jurisdictions.	IFTA, Inc.	Existing
IRP Clearinghouse	CVO03, CVO04	The IRP Clearinghouse supports the IRP base state agreement electronically. The Clearinghouse supports exchange of motor carrier and financial information between participating jurisdictions.	IRP, Inc.	Existing

Element	Service Package	Description	Stakeholder	Status
MCMIS	CVO03, CVO04	Motor Carrier Management Information System (MCMIS) is a national system to consolidate and process motor carrier safety data from sources throughout the US. MCMIS contains safety records of active intrastate and interstate motor carriers, safety and compliance reviews, and roadside inspection records and crash records. MCMIS also carries a Safety Fitness Rating based on algorithms that evaluate all of a carrier's safety data. It supplies carrier ID and safety data history for each interstate carrier via the SAFER system to the Aspen ISS.	FMCSA	Existing
Minnesota CVIEW	CVO03, CVO04, CVO07	Minnesota's Commercial Vehicle Information Exchange Window (CVIEW) allows users to search for information pertaining to: For-Hire and Private Motor Carriers; Household Goods Movers; Building or House Movers; Limousine Operators; Special Transportation Service (STS) Providers; and Motor Carrier of Passengers. Minnesota CVIEW query results provide a snapshot of the following motor carrier information: Company name, address, and telephone number; USDOT, MnDOT, and ICC numbers; Safety fitness and ratings as provided by FMCSA; and Minnesota operating authority status. Minnesota CVIEW has been in continuous operation since 2000, and holds Federal and state data on more than 1.5 million carriers and 2.2 million vehicles.	MnDOT CVO	Existing
Minnesota CVO Online	CVO04	Minnesota CVO Online is a collaboration of the MnDOT CVO and the Minnesota Department of Public Safety. This website provides commercial vehicle operation and management information, as well as electronic permit application, license renewals, and IRP and IFTA electronic applications. The system includes the processes for accepting and reviewing applications issuing credentials, auditing, and reporting.	MnDOT CVO	Existing
Motor Carrier Registration System	CVO04	This system is responsible for the administration of Minnesota's driver's license and vehicle registration programs. Its primary functions include driver's license testing and issuance, driver safety compliance, motor vehicle title and registration, commercial vehicle registration, and auto dealer licensing and regulation. The Motor Carrier Registration System sends commercial vehicle operations credentials information to MnDOT CVO.	Minnesota DVS	Existing

Element	Service Package	Description	Stakeholder	Status
PRISM	CVO04	The FMCSA PRISM links interstate commercial motor vehicle registration to safety and safety fitness of motor carriers. Identifies motor carriers and improves safety through a comprehensive system of education, awareness, performance monitoring, and treatment.	FMCSA	Existing
Private Fleet and Freight Management Center	CVO01, CVO03, CVO04, CVO07, CVO10	Private trucking companies represent those companies that own and manage their own commercial fleets of vehicles traveling through the state of Minnesota. They provide route plans for oversized and overweight vehicles based on information received from the CARS database.	Private Trucking Companies	Existing
SAFER	CVO03, CVO04, CVO07	The FMCSA Safety and Fitness Electronic Records (SAFER) System offers company safety data and related services to industry and the public over the Internet. Users can search FMCSA databases, register for a USDOT number, pay fines online, order company safety profiles, challenge FMCSA data using the DataQs system, access the Hazardous Material Route registry, obtain National Crash and Out of Service rates for Hazmat Permit Registration, get printable registration forms and find information about other FMCSA Information Systems.	FMCSA	Existing
MnDOT CVO	CVO01, CVO03, CVO04, CVO05	This element represents the Minnesota Administrative MnDOT CVO in Mendota Heights. The center reviews and issues permits for oversize and overweight load movements and provides route plans for oversized and overweight vehicles based on information it receives from CARS. The center also collects and distributes planned event (i.e., road maintenance) and unplanned event (i.e., incident, weather, road conditions) information.	MnDOT CVO	Existing
Virtual Weigh Station Roadside Equipment	CVO06, CVO07	Virtual weigh stations allow for real-time identification of trucks violating weight restrictions using a weigh-in-motion (WIM) scale and other enhancements. Virtual weigh stations flag potential violators for enforcement officers to perform further checks. These stations can either act as standalone WIM sites or be connected to a central operating network. Virtual weigh stations also investigate the use of a dynamic feedback system that presents a weight compliance message to vehicles immediately after they have passed over a WIM scale.	MnDOT CVO	Existing
Weigh In Motion (WIM) Stations Roadside Equipment	CVO06, CVO07	This element represents WIM scales at fixed locations that weigh trucks while they are moving so that they do not have to pull off the road.	MnDOT CVO	Existing

Element	Service Package	Description	Stakeholder	Status
Weigh Station Roadside Equipment	CVO03	This element represents weigh stations at fixed locations that are operated by the Minnesota State Patrol that ensures commercial vehicles comply with weight restrictions along Minnesota roads and highways. Unlike WIM stations, these stations require trucks to stop at the scales to complete weight compliance check.	MSP	Existing

Appendix B: Minnesota ITS Development Objectives

General Purpose: Create a system that enhances transportation through the safe and efficient movement of people, goods, and information, with greater mobility and fuel efficiency, less pollution, and increased operating efficiency in Minnesota.

A. Improve the Safety of the State's Transportation System

A-1 Reduce crash frequency (ATIS, ATMS, APTS, CVO, EM, MCM & AVSS)

- A-1-01 Reduce number of vehicle crashes
- A-1-02 Reduce number of vehicle crashes per VMT
- A-1-03 Reduce number of crashes due to road weather conditions
- A-1-04 Reduce number of crashes due to unexpected congestion
- A-1-05 Reduce number of crashes due to red-light running
- A-1-06 Reduce number of crashes involving large trucks and buses
- A-1-07 Reduce number of crashes due to commercial vehicle safety violations
- A-1-08 Reduce number of crashes due to inappropriate lane departure, crossing and merging
- A-1-09 Reduce number of crashes at railroad crossings
- A-1-10 Reduce number of crashes at signalized intersections
- A-1-11 Reduce number of crashes at un-signalized intersections
- A-1-12 Reduce number of crashes due to excessive speeding
- A-1-13 Reduce number of crashes related to driving while intoxicated
- A-1-14 Reduce number of crashes related to driver inattention and distraction
- A-1-15 Reduce number of crashes involving pedestrians and non-motorized vehicles
- A-1-16 Reduce number of crashes at intersections due to inappropriate crossing
- A-1-17 Reduce number of crashes due to roadway/geometric restrictions
- A-1-18 Reduce number of crashes involving younger drivers (under 21)
- A-1-19 Reduce number of all secondary crashes

A-2 Reduce fatalities and life changing injuries (ATIS, ATMS, APTS, CVO, EM, MCM & AVSS)

- A-2-01 Reduce number of roadway fatalities
- A-2-02 Reduce number of roadway fatalities per VMT
- A-2-03 Reduce number of fatalities due to road weather conditions
- A-2-04 Reduce number of fatalities due to unexpected congestion
- A-2-05 Reduce number of fatalities due to red-light running
- A-2-06 Reduce number of fatalities involving large trucks and buses
- A-2-07 Reduce number of fatalities due to commercial vehicle safety violations
- A-2-08 Reduce number of transit fatalities
- A-2-09 Reduce number of fatalities due to inappropriate lane departure, crossing and merging
- A-2-10 Reduce number of fatalities at railroad crossings
- A-2-11 Reduce number of fatalities at signalized intersections
- A-2-12 Reduce number of fatalities at un-signalized intersections
- A-2-13 Reduce number of fatalities due to excessive speeding
- A-2-14 Reduce number of fatalities related to driving while intoxicated
- A-2-15 Reduce number of fatalities related to driver inattention and distraction
- A-2-16 Reduce number of fatalities involving pedestrians and non-motorized vehicles
- A-2-17 Reduce number of fatalities at intersections due to inappropriate crossing
- A-2-18 Reduce number of fatalities due to roadway/geometric restrictions
- A-2-19 Reduce number of fatalities involving younger drivers (under 21)

- A-2-20 Reduce number of fatalities involving unbelted vehicle occupants
- A-2-21 Reduce number of hazardous materials transportation incidents involving fatalities
- A-2-22 Reduce number of roadway injuries
- A-2-23 Reduce number of roadway injuries per VMT
- A-2-24 Reduce number of injuries due to road weather conditions
- A-2-25 Reduce number of injuries due to unexpected congestion
- A-2-26 Reduce number of injuries due to red-light running
- A-2-27 Reduce number of injuries involving large trucks and buses
- A-2-28 Reduce number of injuries due to commercial vehicle safety violations
- A-2-29 Reduce number of transit injuries
- A-2-30 Reduce number of injuries due to inappropriate lane departure, crossing and merging
- A-2-31 Reduce number of injuries at railroad crossings
- A-2-32 Reduce number of injuries at signalized intersections
- A-2-33 Reduce number of injuries at un-signalized intersections
- A-2-34 Reduce number of injuries due to excessive speeding
- A-2-35 Reduce number of injuries related to driving while intoxicated
- A-2-36 Reduce number of injuries related to driver inattention and distraction
- A-2-37 Reduce number of injuries involving pedestrians and non-motorized vehicles
- A-2-38 Reduce number of injuries at intersections due to inappropriate crossing
- A-2-39 Reduce number of injuries due to roadway/geometric restrictions
- A-2-40 Reduce number of injuries involving younger drivers (under 21)
- A-2-41 Reduce number of injuries involving unbelted vehicle occupants
- A-2-42 Reduce number of hazardous materials transportation incidents involving injuries
- A-2-43 Reduce number of speed violations
- A-2-44 Reduce number of traffic law violations

A-3 Reduce crashes in work zones (ATIS, ATMS, EM, MCM & AVSS)

- A-3-01 Reduce number of crashes in work zones
- A-3-02 Reduce number of fatalities in work zones
- A-3-03 Reduce number of motorist injuries in work zones
- A-3-04 Reduce number of workers injured by vehicles in work zones

B. Increase Operational Efficiency and Reliability of the Transportation System

B-1 Reduce overall delay associated with congestion (ATIS, ATMS, MCM & AVSS)

- B-1-01 Reduce the percentage of facility miles (highway, arterial, rail, etc.) experiencing recurring congestion during the peak period
- B-1-02 Reduce the percentage of Twin Cities freeway miles congested in weekday peak periods
- B-1-03 Reduce the share of major intersections operating at LOS F
- B-1-04 Maintain the rate of growth in facility miles experiencing recurring congestion as less than the population growth rate (or employment growth rate)
- B-1-05 Reduce the daily hours of recurring congestion on major freeways
- B-1-06 Reduce the number of hours per day that the top 20 most congested roadways experience recurring congestion
- B-1-07 Reduce the regional average travel time index
- B-1-08 Annual rate of change in regional average commute travel time will not exceed regional rate of population growth
- B-1-09 Improve average travel time during peak periods

- B-1-10 Reduce hours of delay per capita
- B-1-11 Reduce hours of delay per driver
- B-1-12 Reduce the average of the 90th (or 95th) percentile travel times for (a group of specific travel routes or trips in the region)
- B-1-13 Reduce the 90th (or 95th) percentile travel times for each route selected
- B-1-14 Reduce the variability of travel time on specified routes during peak and off-peak periods
- B-1-15 Reduce mean incident notification time
- B-1-16 Reduce mean time for needed responders to arrive on-scene after notification
- B-1-17 Reduce mean incident clearance time per incident
- B-1-18 Reduce mean incident clearance time for Twin Cities urban freeway incidents

B-2 Increase average vehicle occupancy and facility throughput (ATMS & APTS)

- B-2-01 Increase annual transit ridership
- B-2-02 Increase annual express bus ridership
- B-2-03 Increase annual light rail ridership
- B-2-04 Increase annual commuter rail ridership
- B-2-05 Maintain agency pre-defined performance targets for rides per hour of transit service
- B-2-06 Maintain transit passengers per capita rate for service types
- B-2-07 Maintain the cost efficiency of the statewide public transit network
- B-2-08 Maintain the service effectiveness of the statewide public transit network in terms of passengers/service hour and passengers/mile
- B-2-09 Maintain the cost effectiveness of the statewide public transit network in terms of cost per service hour, cost per passenger trip, and revenue recovery percentage
- B-2-10 Maintain the availability of the statewide public transit network in terms of hours (span) of service and frequency
- B-2-11 Reduce per capita single occupancy vehicle commute trip rate
- B-2-12 Increase the percentage of major employers actively participating in transportation demand management programs
- B-2-13 Reduce commuter vehicle miles traveled (VMT) per regional job
- B-2-14 Create a transportation access guide, which provides concise directions to reach destinations by alternative modes (transit, walking, bike, etc.)
- B-2-15 Improve average on-time performance for specified transit routes/facilities
- B-2-16 Increase use of automated fare collection system per year
- B-2-17 Increase the percent of transfers performed with automated fare cards
- B-2-18 Increase the miles of bus-only shoulder lanes in the metro area
- B-2-19 Increase the number of carpools
- B-2-20 Increase use of vanpools
- B-2-21 Provide carpool/vanpool matching and ridesharing information services
- B-2-22 Reduce trips per year in region through carpools/vanpools
- B-2-23 Increase vehicle throughput on specified routes
- B-2-24 Increase AM/PM peak hour vehicle throughput on specified routes
- B-2-25 Increase AM/PM peak hour person throughput on specified routes

B-3 Reduce delays due to work zones (ATIS, ATMS, EM, MCM & AVSS)

- B-3-01 Reduce total vehicle hours of delay by time period (peak, off-peak) caused by work zones
- B-3-02 Reduce the percentage of vehicles traveling through work zones that are queued

- B-3-03 Reduce the average and maximum length of queues, when present,
- B-3-04 Reduce the average time duration (in minutes) of queue length greater than some threshold (e.g., 0.5 mile)
- B-3-05 Reduce the variability of travel time in work zones during peak and off-peak periods

B-4 Reduce traffic delays during evacuation from homeland security and Hazmat incidents (ATIS, ATMS, APTS, CVO, EM, MCM & AVSS)

- B-4-01 Reduce vehicle hours of delay per capita during evacuation from homeland security and Hazmat incidents

C. Enhance Mobility, Convenience, and Comfort for Transportation System Users

C-1 Reduce congestion and incident-related delay for travelers (ATIS, ATMS, APTS, EM & AVSS)

- B-1-01 Reduce the percentage of facility miles (highway, arterial, rail, etc.) experiencing recurring congestion during the peak period
- B-1-02 Reduce the percentage of Twin Cities freeway miles congested in weekday peak periods
- B-1-03 Reduce the share of major intersections operating at LOS F
- B-1-04 Maintain the rate of growth in facility miles experiencing recurring congestion as less than the population growth rate (or employment growth rate)
- B-1-05 Reduce the daily hours of recurring congestion on major freeways
- B-1-06 Reduce the number of hours per day that the top 20 most congested roadways experience recurring congestion
- B-1-07 Reduce the regional average travel time index
- B-1-08 Annual rate of change in regional average commute travel time will not exceed regional rate of population growth
- B-1-09 Improve average travel time during peak periods
- B-1-10 Reduce hours of delay per capita
- B-1-11 Reduce hours of delay per driver
- B-1-12 Reduce the average of the 90th (or 95th) percentile travel times for (a group of specific travel routes or trips in the region)
- B-1-13 Reduce the 90th (or 95th) percentile travel times for each route selected
- B-1-14 Reduce the variability of travel time on specified routes during peak and off-peak periods
- B-1-15 Reduce mean incident notification time
- B-1-16 Reduce mean time for needed responders to arrive on-scene after notification
- B-1-17 Reduce mean incident clearance time per incident
- B-1-18 Reduce mean incident clearance time for Twin Cities urban freeway incidents
- C-1-01 Reduce the vehicle hours of total delay associated with traffic incidents during peak and off-peak periods
- C-1-02 Increase percentage of incident management agencies in the region that participate in a multi-modal information exchange network
- C-1-03 Increase percentage of incident management agencies in the region that use interoperable voice communications
- C-1-04 Increase percentage of incident management agencies in the region that participate in a regional coordinated incident response team
- C-1-05 Increase the number of corridors in the region covered by regional coordinated incident response teams
- C-1-06 Maintain a percentage of transportation operating agencies have a plan in place for a representative to be at the local or State Emergency Operations

- Center (EOC) to coordinate strategic activities and response planning for transportation during emergencies
- C-1-07 Conduct joint training exercises among operators and emergency responders in the region
- C-1-08 Maintain a percentage of staff in region with incident management responsibilities who have completed the National Incident Management System (NIMS) Training and a percentage of transportation responders in the region are familiar with the incident command structure (ICS)
- C-1-09 Increase number of regional road miles covered by ITS-related assets (e.g., roadside cameras, dynamic message signs, vehicle speed detectors) in use for incident detection/response
- C-1-10 Increase number of traffic signals equipped with emergency vehicle preemption

C-2 Improve travel time reliability (ATIS, ATMS, APTS & AVSS)

- B-1-07 Reduce the regional average travel time index
- B-1-12 Reduce the average of the 90th (or 95th) percentile travel times for (a group of specific travel routes or trips in the region)
- B-1-14 Reduce the variability of travel time on specified routes during peak and off-peak periods
- B-2-15 Improve average on-time performance for specified transit routes/facilities
- B-2-16 Increase use of automated fare collection system per year
- B-2-17 Increase the percent of transfers performed with automated fare cards
- C-2-01 Decrease the average buffer index for multiple routes or trips
- C-2-02 Reduce the average planning time index for specific routes in region
- C-2-03 Increase the miles of bus-only shoulder lanes in the metro area

C-3 Increase choice of travel modes (ATIS, ATMS & APTS)

- B-2-01 Increase annual transit ridership
- B-2-11 Reduce per capita single occupancy vehicle commute trip rate
- B-2-12 Increase the percentage of major employers actively participating in transportation demand management programs
- B-2-13 Reduce commuter vehicle miles traveled (VMT) per regional job
- B-2-14 Create a transportation access guide, which provides concise directions to reach destinations by alternative modes (transit, walking, bike, etc.)
- C-3-01 Increase active (bicycle/pedestrian) mode share
- C-3-02 Reduce single occupancy vehicle trips through travel demand management strategies (e.g., employer or residential rideshare)
- C-3-03 Increase the percent of alternative (non-single occupancy vehicle) mode share in transit station communities (or other areas)
- C-3-04 Increase transit mode share
- C-3-05 Increase transit mode share during peak periods
- C-3-06 Increase average transit load factor
- C-3-07 Increase passenger miles traveled per capita on transit
- C-3-08 Reduce the travel time differential between transit and auto during peak periods per year
- C-3-09 Increase the percent of the transportation system in which travel conditions can be detected remotely via CCTV, speed detectors, etc.
- C-3-10 Increase the percent of transportation facilities whose owners share their traveler information with other agencies in the region
- C-3-11 Increase number of 511 calls per year

- C-3-12 Increase number of visitors to traveler information website per year
- C-3-13 Increase number of users of notifications for traveler information (e.g., e-mail, text message)
- C-3-14 Increase the number of transit routes with information being provided by ATIS
- C-3-15 Increase the number of specifically tailored traveler information messages provided
- C-3-16 Increase annual transit ridership reported by urbanized area transit providers
- C-3-17 Increase annual transit ridership reported by rural area transit providers

C-4 Reduce stress caused by transportation (ATIS, ATMS, APTS, EM, MCM & AVSS)

- A-2-43 Reduce number of speed violations
- A-2-44 Reduce number of traffic law violations
- B-1-01 Reduce the percentage of facility miles (highway, arterial, rail, etc.) experiencing recurring congestion during the peak period
- B-1-02 Reduce the percentage of Twin Cities freeway miles congested in weekday peak periods
- B-1-03 Reduce the share of major intersections operating at LOS F
- B-1-04 Maintain the rate of growth in facility miles experiencing recurring congestion as less than the population growth rate (or employment growth rate)
- B-1-05 Reduce the daily hours of recurring congestion on major freeways
- B-1-06 Reduce the number of hours per day that the top 20 most congested roadways experience recurring congestion
- B-1-07 Reduce the regional average travel time index
- B-1-08 Annual rate of change in regional average commute travel time will not exceed regional rate of population growth
- B-1-09 Improve average travel time during peak periods
- B-1-10 Reduce hours of delay per capita
- B-1-11 Reduce hours of delay per driver
- B-1-12 Reduce the average of the 90th (or 95th) percentile travel times for (a group of specific travel routes or trips in the region)
- B-1-13 Reduce the 90th (or 95th) percentile travel times for each route selected
- B-1-14 Reduce the variability of travel time on specified routes during peak and off-peak periods
- B-1-15 Reduce mean incident notification time
- B-1-16 Reduce mean time for needed responders to arrive on-scene after notification
- C-3-11 Increase number of 511 calls per year
- C-3-12 Increase number of visitors to traveler information website per year
- C-3-13 Increase number of users of notifications for traveler information (e.g., e-mail, text message)
- C-3-14 Increase the number of transit routes with information being provided by ATIS
- C-3-15 Increase the number of specifically tailored traveler information messages provided
- C-4-01 Reduce the speed differential between lanes of traffic on multi-lane highways
- C-4-02 Increase the number of users aware of park-and-ride lots in their region
- C-4-03 Increase the number parking facilities with electronic fee collection
- C-4-04 Increase the number of parking facilities with automated occupancy counting and space management
- C-4-05 Increase the number of parking facilities with advanced parking information to customers
- C-4-06 Increase the number of parking facilities with coordinated electronic payment systems

- C-4-07 Increase the number of parking facilities with coordinated availability information

D. Improve the Security of the Transportation System

D-1 Enhance traveler security (APTS & EM)

- C-3-09 Increase the percent of the transportation system in which travel conditions can be detected remotely via CCTV, speed detectors, etc.
- D-1-01 Reduce on an annual basis the number of complaints per 1,000 boarding passengers
- D-1-02 Increase the number of closed circuit television (CCTV) cameras installed on platforms, park-n-ride lots, vehicles, and other transit facilities
- D-1-03 Increase customer service and personal safety ratings
- D-1-04 Reduce the number of reported personal safety incidents
- D-1-05 Decrease the number of security incidents on roadways
- D-1-06 Increase the percent of major and minor arterials are equipped with and operating with closed circuit television (CCTV) cameras
- D-1-07 Increase the number of critical sites with security surveillance
- D-1-08 Reduce the number of security incidents on transportation infrastructure
- D-1-09 Increase the number of critical sites with hardened security enhancements

D-2 Safeguard the motoring public from homeland security and/or Hazmat incidents (ATIS, ATMS, APTS, CVO, EM, MCM & AVSS)

- B-1-16 Reduce mean time for needed responders to arrive on-scene after notification
- C-3-09 Increase the percent of the transportation system in which travel conditions can be detected remotely via CCTV, speed detectors, etc.
- D-1-01 Reduce on an annual basis the number of complaints per 1,000 boarding passengers
- D-1-02 Increase the number of closed circuit television (CCTV) cameras installed on platforms, park-n-ride lots, vehicles, and other transit facilities
- D-1-03 Increase customer service and personal safety ratings
- D-1-04 Reduce the number of reported personal safety incidents
- D-1-05 Decrease the number of security incidents on roadways
- D-1-06 Increase the percent of major and minor arterials are equipped with and operating with closed circuit television (CCTV) cameras
- D-1-07 Increase the number of critical sites with security surveillance
- D-1-08 Reduce the number of security incidents on transportation infrastructure
- D-1-09 Increase the number of critical sites with hardened security enhancements
- D-2-01 Reduce the number of Hazmat incidents
- D-2-02 Reduce the number of homeland security incidents
- D-2-03 Increase the number of travelers routed around Hazmat incidents
- D-2-04 Increase the number of travelers routed around homeland security incidents
- D-2-05 Reduce the Hazmat incident response time
- D-2-06 Reduce the homeland security incident response time
- D-2-07 Increase the number of Hazmat shipments tracked in real-time

E. Support Regional Economic Productivity and Development

E-1 Reduce travel time for freight, transit and businesses (ATIS, ATMS, APTS, CVO & AVSS)

- B-1-14 Reduce the variability of travel time on specified routes during peak and off-peak periods
- B-2-15 Improve average on-time performance for specified transit routes/facilities

- B-2-16 Increase use of automated fare collection system per year
- B-2-17 Increase the percent of transfers performed with automated fare cards
- C-2-09 Increase the miles of bus-only shoulder lanes in the metro area
- C-3-08 Reduce the travel time differential between transit and auto during peak periods per year
- E-1-01 Maintain a travel time differential between transit and auto during peak periods
- E-1-02 Improve average transit travel time compared to auto in major corridors
- E-1-03 Decrease the annual average travel time index for selected freight-significant highways
- E-1-04 Decrease point-to-point travel times on selected freight-significant highways
- E-1-05 Decrease hours of delay per 1,000 vehicle miles traveled on selected freight-significant highways

E-2 Improve the efficiency of freight movement, permitting and credentials process (ATIS & CVO)

- E-2-01 Increase the percent (or number) of commercial vehicles tracked by trucking companies
- E-2-02 Increase the percent (or number) of freight shipment tracked
- E-2-03 Increase the percent of agencies involved in CVO inspection, administration, enforcement, and emergency management in the region with interoperable communications
- E-2-04 Increase the use of electronic credentialing at weigh stations and border crossings
- E-2-05 Increase the number of automated permits/credentials issued
- E-2-06 Reduce the frequency of delays per month at intermodal facilities
- E-2-07 Reduce the average duration of delays per month at intermodal facilities

E-3 Improve travel time reliability for freight, transit and businesses (ATMS, APTS, CVO & AVSS)

- B-1-14 Reduce the variability of travel time on specified routes during peak and off-peak periods
- B-2-15 Improve average on-time performance for specified transit routes/facilities
- B-2-16 Increase use of automated fare collection system per year
- B-2-17 Increase the percent of transfers performed with automated fare cards
- C-1-06 Increase percentage of incident management agencies in the region that participate in a multi-modal information exchange network
- C-2-09 Increase the miles of bus-only shoulder lanes in the metro area
- C-3-09 Increase the percent of the transportation system in which travel conditions can be detected remotely via CCTV, speed detectors, etc.
- C-3-10 Increase the percent of transportation facilities whose owners share their traveler information with other agencies in the region
- C-3-13 Increase number of users of notifications for traveler information (e.g., e-mail, text message)
- E-1-08 Decrease the annual average travel time index for selected freight-significant highways
- E-2-04 Increase the use of electronic credentialing at weigh stations and border crossings
- E-3-01 Reduce average crossing times at international borders

E-4 Increase agency efficiency (ADMS, ATMS, APTS, CVO, EM & MCM)

- B-2-15 Improve average on-time performance for specified transit routes/facilities
- B-2-16 Increase use of automated fare collection system per year
- B-2-17 Increase the percent of transfers performed with automated fare cards
- C-2-09 Increase the miles of bus-only shoulder lanes in the metro area
- E-2-01 Increase the percent (or number) of commercial vehicles tracked by trucking companies
- E-2-03 Increase the percent of agencies involved in CVO inspection, administration, enforcement, and emergency management in the region with interoperable communications
- E-4-01 Increase the number of ITS-related assets tracked
- E-4-02 Reduce the number of pavement miles damaged by commercial vehicles
- E-4-03 Increase the rate of on-time completion of construction projects
- E-4-04 Increase the rate at which equipment is utilized
- E-4-05 Increase the percentage of fleet/equipment within its lifecycle
- E-4-06 Increase the number of fleet vehicles with maintenance diagnostic equipment
- E-4-07 Increase the number of vehicles operating under CAD

E-5 Reduce vehicle operating costs (ATMS, APTS, CVO & AVSS)

- B-1-01 Reduce the percentage of facility miles (highway, arterial, rail, etc.) experiencing recurring congestion during the peak period
- B-1-02 Reduce the percentage of Twin Cities freeway miles congested in weekday peak periods
- B-1-03 Reduce the share of major intersections operating at LOS F
- B-1-04 Maintain the rate of growth in facility miles experiencing recurring congestion as less than the population growth rate (or employment growth rate)
- B-1-05 Reduce the daily hours of recurring congestion on major freeways
- B-1-06 Reduce the number of hours per day that the top 20 most congested roadways experience recurring congestion
- B-1-07 Reduce the regional average travel time index
- B-1-08 Annual rate of change in regional average commute travel time will not exceed regional rate of population growth
- B-1-09 Improve average travel time during peak periods
- B-1-10 Reduce hours of delay per capita
- B-1-11 Reduce hours of delay per driver
- B-1-12 Reduce the average of the 90th (or 95th) percentile travel times for (a group of specific travel routes or trips in the region)
- B-1-13 Reduce the 90th (or 95th) percentile travel times for each route selected
- B-1-14 Reduce the variability of travel time on specified routes during peak and off-peak periods

E-6 Enhance efficiency at borders (ATIS & CVO)

- E-2-04 Increase the use of electronic credentialing at weigh stations and border crossings
- E-3-11 Reduce average crossing times at international borders

F. Preserve the Transportation System

F-1 Safeguard existing infrastructure (ATMS, CVO, EM & MCM)

- C-3-09 Increase the percent of the transportation system in which travel conditions can be detected remotely via CCTV, speed detectors, etc.

- D-1-06 Increase the percent of major and minor arterials are equipped with and operating with closed circuit television (CCTV) cameras
- D-1-07 Increase the number of critical sites with security surveillance
- D-1-08 Reduce the number of security incidents on transportation infrastructure
- D-1-09 Increase the number of critical sites with hardened security enhancements
- E-2-03 Increase the percent of agencies involved in CVO inspection, administration, enforcement, and emergency management in the region with interoperable communications
- E-4-03 Increase the rate of on-time completion of construction projects
- F-1-01 Decrease the number of pavement miles damaged by commercial vehicles
- F-1-02 Decrease the number of size and weight violations

G. Enhance the Integration and Connectivity of the Transportation System

G-1 Aid in transportation infrastructure and operations planning (ALL)

- G-1-01 Increase the amount of data gathered from ITS enhancements used in infrastructure and operations planning
- G-1-02 Increase the number of planning activities using data from ITS systems
- G-1-03 Increase the number of years of data in database that is easily searchable and extractable
- G-1-04 Reduce project schedule deviation
- G-1-05 Reduce project cost deviation
- G-1-06 Reduce operations cost deviation
- G-1-07 Reduce administrative support rate (as part of overall project budget)

G-2 Reduce need for new facilities (ATMS, CVO, MCM & AVSS)

- B-1-01 Reduce the percentage of facility miles (highway, arterial, rail, etc.) experiencing recurring congestion during the peak period
- B-1-02 Reduce the percentage of Twin Cities freeway miles congested in weekday peak periods
- B-1-03 Reduce the share of major intersections operating at LOS F
- B-1-04 Maintain the rate of growth in facility miles experiencing recurring congestion as less than the population growth rate (or employment growth rate)
- B-1-05 Reduce the daily hours of recurring congestion on major freeways
- B-1-06 Reduce the number of hours per day that the top 20 most congested roadways experience recurring congestion
- B-1-07 Reduce the regional average travel time index
- B-1-08 Annual rate of change in regional average commute travel time will not exceed regional rate of population growth
- B-1-09 Improve average travel time during peak periods
- B-1-10 Reduce hours of delay per capita
- B-1-11 Reduce hours of delay per driver
- B-1-12 Reduce the average of the 90th (or 95th) percentile travel times for (a group of specific travel routes or trips in the region)
- B-1-13 Reduce the 90th (or 95th) percentile travel times for each route selected
- B-1-14 Reduce the variability of travel time on specified routes during peak and off-peak periods
- E-2-04 Increase the use of electronic credentialing at weigh stations and border crossings
- E-2-05 Increase the number of automated permits/credentials issued
- E-3-11 Reduce average crossing times at international borders

H. Reduce Environmental Impacts**H-1 Reduce emissions/energy impacts and use associated with congestion (ATIS, ATMS, CVO & AVSS)**

- B-1-01 Reduce the percentage of facility miles (highway, arterial, rail, etc.) experiencing recurring congestion during the peak period
- B-1-02 Reduce the percentage of Twin Cities freeway miles congested in weekday peak periods
- B-1-03 Reduce the share of major intersections operating at LOS F
- B-1-04 Maintain the rate of growth in facility miles experiencing recurring congestion as less than the population growth rate (or employment growth rate)
- B-1-05 Reduce the daily hours of recurring congestion on major freeways
- B-1-06 Reduce the number of hours per day that the top 20 most congested roadways experience recurring congestion
- B-1-07 Reduce the regional average travel time index
- B-1-08 Annual rate of change in regional average commute travel time will not exceed regional rate of population growth
- B-1-09 Improve average travel time during peak periods
- B-1-10 Reduce hours of delay per capita
- B-1-11 Reduce hours of delay per driver
- B-1-12 Reduce the average of the 90th (or 95th) percentile travel times for (a group of specific travel routes or trips in the region)
- B-1-13 Reduce the 90th (or 95th) percentile travel times for each route selected
- B-1-14 Reduce the variability of travel time on specified routes during peak and off-peak periods
- H-1-01 Reduce excess fuel consumed due to congestion
- H-1-02 Reduce total fuel consumed per capita for transportation
- H-1-03 Reduce vehicle miles traveled per capita
- H-1-04 Reduce MnDOT fleet gasoline use
- H-1-05 Reduce MnDOT fleet diesel use
- H-1-06 Reduce the amount of all emissions in the atmosphere
- H-1-07 Reduce the amount of carbon dioxide emissions measured

H-2 Reduce negative impacts of the transportation system on communities (ATMS, APTS, EM & MCM)

- A-2-44 Reduce number of traffic law violations
- B-2-01 Increase annual transit ridership
- B-2-12 Increase the percentage of major employers actively participating in transportation demand management programs
- B-2-13 Reduce commuter vehicle miles traveled (VMT) per regional job
- B-2-14 Create a transportation access guide, which provides concise directions to reach destinations by alternative modes (transit, walking, bike, etc.)
- B-2-19 Increase the number of carpools
- B-2-20 Increase use of vanpools
- B-2-21 Provide carpool/vanpool matching and ridesharing information services
- B-2-22 Reduce trips per year in region through carpools/vanpools
- H-2-01 Increase the average vehicle occupancy rate in HOV lanes
- H-2-02 Increase the amount of environmentally friendly de-icing material used

Appendix C: Needs and Services Detail

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/ Responsibility	Interconnect	Data Archive Need	Associated Service Package
Service Package CVO01-Carrier Operations and Fleet Management								
CF12	Permit and route commercial vehicle operators of oversize and overweight loads to routes that accommodate size and weight requirements	Permitted commercial vehicle operators and oversize/ overweight vehicles use automated permit routing systems to generate route information based on size and weight requirements.	- Commercial vehicle operators apply for overweight/ oversize permits online using Minnesota CVO Online (automated permit routing system). - Automated permit routing system (RouteBuilder) is integrated with CARS database and the Bridge Management database to allow for activated updating of bridge and roadway information.	- Automate data entry into the RouteBuilder to allow for the provision of real time data. - Automate real time data log to confirm movement on selected route(s). - Improve timeliness of data exchange among the RouteBuilder, CARS and Bridge Management Database. - Expand routing and permitting to include multistate and multi-jurisdictional road authorities. - Provide RFID on commercial vehicles to track permits. - Integrate CARS with RouteBuilder. - Use GIS mapping for route permit issuing.	- MnDOT and local agencies are responsible for providing data on size and weight restrictions and road conditions. - MnDOT is responsible to plan, design, and implement automated permit routing system enhancements. - MnDOT is responsible to operate and maintain automated permit routing system.	- This service includes interconnects between automated permit routing system and CARS; MnDOT, local agencies and CARS. - Interconnects between automated permit routing system and Private Fleet and Freight Management Center.	Historical information to determine performance measures for number of permits issued, and what type of permit issued over a certain period of time.	

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/ Responsibility	Interconnect	Data Archive Need	Associated Service Package
CF13	Provide size and weight restrictions due to work zones for permitted loads	• MnDOT and local agencies input information on size and weight restrictions within work zones into CARS. • Size and weight restriction information entered into CARS is integrated into the 511 system and automated permit routing system. • Commercial vehicle operators use automated permit routing system to obtain size and weight restrictions.	• Information about commercial vehicle restrictions due to work zones is provided on the 511 website in text and map format.	• Integrate real-time restriction due to work zone data into automated permit routing system to allow for real-time routing. • Automate real time data input to CARS and make timely information updates to the 511 system.	• MnDOT and local agencies are responsible for providing size and weight restriction information for work zones on their roadways. • MnDOT is responsible to plan, design, operate and maintain the automated permit routing system and the 511 system.	• This service requires interconnects between MnDOT CVO, maintenance and construction management centers, and 511. • Providing a feed of the restriction data requires interconnects between 511 and fleet management.	• None	

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/ Responsibility	Interconnect	Data Archive Need	Associated Service Package
CF14	Direct commercial vehicle operators to the quickest route/time of travel	• MnDOT provides real time traffic and overweight/ overweight restriction information to private trucking companies • Private fleet management develops routes utilizing in-house software or automated permit routing system and provides this information to drivers through electronic communications. • Commercial vehicle operators may also access route information at rest stops through the 511 website utilizing Wi-Fi and use the information to guide them to their destinations.	• MnDOT provides an XML feed of speed data through 511. • Critical incident, road condition, and commercial vehicle restriction and permit information is currently provided by 511. • RouteBuilder is the permit routing system used by MnDOT to direct commercial vehicle operators along a specified route.	• Integrate real-time speed, travel time, incident and restriction data, as well as data from the 511 system, into automated permit routing system to allow for providing routing based on travel time for CVO. • Automate real time data input to make more timely.	• MnDOT and local agencies are responsible for providing real-time size and weight restriction and traffic data for their roads. • MnDOT is responsible to plan, design, operate and maintain the automated permit routing system and the 511 system.	• Provision of the required real-time traffic data to automated permit routing system NT requires an interconnect between 511 and MnDOT CVO.	• None	• ATIS01 • ATIS02

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/ Responsibility	Interconnect	Data Archive Need	Associated Service Package
CF16	Track commercial fleet	Private fleet management tracks the location of their vehicles using GPS.	- Larger trucking companies currently have the ability to track their fleet vehicles/ personnel. - ISPs currently provide travel time and other data from probe vehicles.	Investigate developing a partnership with a private company to provide MnDOT with anonymous probe traffic data.	- Private trucking companies are responsible for tracking their commercial fleets. - Private traffic providers are responsible to plan, design, operate and maintain their systems and to provide traffic data to MnDOT and other agencies in a usable format.	- Interconnects are required between MnDOT CVO and private fleet management to receive a data feed of vehicle location information and traffic data. - An interconnect is required between MnDOT CVO and 511 to provide travel time data.	Historical vehicle location and traffic data is archived for future analysis and planning purposes.	

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/ Responsibility	Interconnect	Data Archive Need	Associated Service Package
CF17	Manage Hazmat incidents	- Fleet managers track the location of vehicles and provide notification to MnDOT CVO when an incident involving hazardous materials has occurred or drivers when there has been a deviation in route of a vehicle carrying hazardous materials. - MnDOT CVO would then notify 511 and law enforcement/ maintenance agencies of reported incidents involving hazardous materials.	- Larger trucking companies currently have the ability to track their fleet vehicles/ personnel. - HAZMAT specialists are on call to respond to incidents when needed.	- Develop quick clearance (e.g. communication) procedures to address Hazmat rollovers. - Allow HAZMAT responders the ability to enter real-time incident information into 511.	Private trucking companies are responsible for tracking and managing operations of their commercial fleets and notifying authorities of incidents involving hazardous materials.	- Interconnects between fleet management or ISP and MnDOT CVO are required to provide notification of incidents. - Interconnects between MnDOT CVO and 511 and law enforcement/ maintenance agencies are required to provide notification to responders and travelers.	Incident information is archived for future analysis, planning efforts, and tort claims.	

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/ Responsibility	Interconnect	Data Archive Need	Associated Service Package
CF20	Measure historic commercial vehicle shipment performance	MnDOT CVO and OIM measure historical commercial vehicle shipment performance by looking at industry measures to assist in planning and investment efforts.	MnDOT CVO obtains information on freight movement and analyzes it to develop strategies and performance measures for MnDOT's role in improving or augmenting freight movement.	- Improve timeliness and accuracy of shipment information to provide better data for performance analysis. - Provide new types of freight shipment data for new analysis and planning.	MnDOT is responsible for obtaining and analysis of commercial shipment data.	None.	Historical commercial vehicle shipment performance data is archived for future analysis and planning efforts.	
Service Package CVO02-Freight Administration								
CF15	Track and manage interstate intermodal freight movements	- Fleet/freight managers track the movement of cargo and monitor its condition as it passes between modes and from state to state. - North American Super Corridor Coalition Task Force has the ability to track containers from source to destination.	Larger Private Trucking companies have the capability to track and manage movements of their freight.	RFID on CVO vehicle license plate to give freight managers the ability to track carrier and loads (e.g. breach of security).	Private trucking companies are responsible for tracking and managing their commercial fleets and freight.	- Interconnects are required between commercial vehicles and Private Fleet and Freight Management Centers. - Interconnects are required between Private Fleet and Freight Management Centers and intermodal freight depots.	Historical commercial vehicle shipment performance data is archived for future analysis and planning efforts.	

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/ Responsibility	Interconnect	Data Archive Need	Associated Service Package
Service Package CVO03-Electronic Clearance								
CF01	Minimize delays at weigh stations through additional automation	• Weigh stations use weight sensors, transponder readers, and automated vehicle identification devices to gather safety and credential information and perform compliance check. • Weigh stations communicate with MnDOT CVO to retrieve critical carrier, vehicle, and driver data that is used to sort passing vehicles allowing vehicles with good records to pass or bypass the weigh station.	• MnDOT does not currently provide automated clearance at any of its weigh stations. • Sorting scales are located at the entrance of some weigh stations.	• Investigate whether automated clearance at weigh stations can be effective in the current market. • Utilization of virtual weigh stations to minimize delays. • Utilize sorting scales at all weigh stations. • Mobile 511 application is under development to assist in reporting.	• MnDOT and DPS are responsible to plan and design of automated clearance systems. • MnDOT maintains automated clearance systems. • DPS operates automated clearance systems.	• Interconnects between the roadside equipment, in-vehicle equipment and MnDOT CVO are required.	• Data related to automated clearances is archived for future analysis and planning purposes.	

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/ Responsibility	Interconnect	Data Archive Need	Associated Service Package
Service Package CVO04-CV Administrative Processes								
CF04	Target enforcement on carriers, vehicles and drivers with history of violations and poor safety records	- Data from PRISM, SAFER, and complaints made to MnDOT CVO and/or DPS are analyzed to determine carriers, drivers and vehicles that have a high level of violations or crashes. These problem drivers, carriers or vehicles are then targeted for future enforcement. - MnDOT uses federal FMCSA database to monitor safety data for compliance reviews.	- The FMCSA has a record of complaints against carriers. - FMCSA PRISM identifies problem vehicles to revoke licenses. - SAFER system has company safety data, though it is possible for companies to hide their histories within the SAFER database by changing their company names. - Motor Carrier Management Information System (MCMIS) has data on commercial vehicle operation credentials. - License Plate Readers (LPR) equipment is being installed in Winona for Minnesota State Patrol to distinguish between violators.	Improve company tracking in SAFER to reduce hiding of past safety issues.	- MnDOT is responsible to plan, design, operate and maintain CVO administrative databases. - Minnesota State Patrol is responsible for enforcement.	Interconnects are required between MnDOT CVO and various regional, state and federal CVO database.	Legislation on LPR data may restrict MnDOT from archiving and reporting LPR data. LPR data may be available for up to two weeks of time to allow for Minnesota State Patrol to issue citations on past violations.	- CVO07 - AD01

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/Responsibility	Interconnect	Data Archive Need	Associated Service Package
CF06	Provide electronic application, processing, fee collection, issuance and distribution of CVO credentials	- Commercial vehicle operators apply online for credentials and permits, make appropriate payments for fees, and receive the credentials and permits electronically. - State agencies quickly process applications and fees/taxes.	- Minnesota CVO Online website provides for electronic permit applications, license renewals, and IRP and IFTA applications. - MCMIS is used to issue credentials to non OS/OW vehicles.	- Integrate more permitting, credentialing, and tax features into CVO Online to make it a one-stop shopping website. - MnDOT plans to create a web-based system to replace the use of MCMIS.	MnDOT and DPS are both responsible to plan, design, operate and maintain electronic permitting application systems.	Interconnects are required between various state, regional, and federal database.	Credential, permit and fee data are archived for customer records and future analysis and planning.	
CF07	Provide safety information from CVO databases to roadside and enforcement vehicles/personnel	Roadside safety workers and law enforcement officers use CVO safety information from MnDOT and other agency central systems to identify vehicles or operators with safety issues.	MnDOT and Minnesota State Patrol can query databases such as PRISM, and SAFER for current safety information.	Investigate ways to minimize inefficiencies due to overlap of systems.	MnDOT, DPS, and federal authorities are responsible to plan, design, operate and maintain their respective systems and equipment.	Interconnects are required between MnDOT CVO, roadside equipment, and law enforcement vehicles/personnel.	Records of database queries are archived for future planning and enforcement efforts.	CVO07

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/Responsibility	Interconnect	Data Archive Need	Associated Service Package
CF18	Provide multi-state oversize/overweight permitting	Commercial vehicle operators obtain OS/OW permits from multiple states with one application, rather than applying to each state individually.	MnDOT already has an existing online OS/OW permitting system.	Integrate Minnesota OS/OW permitting system with those of neighboring states to issue one permit for travel across multiple states.	MnDOT and other state DOTs are responsible to plan, design, operate and maintain their own oversize/permitting systems and for coordination with other states and local agencies.	Interconnects are required between various state, regional, and MnDOT CVO to coordinate multi-state permitting.	Permit data is archived for customer records and future analysis and planning.	
Service Package CVO05-International Border Electronic Clearance								
While there are international border crossings in Minnesota, no needs or services under this service package were identified by stakeholders.								

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/ Responsibility	Interconnect	Data Archive Need	Associated Service Package
Service Package CVO06-Weigh-In-Motion								
CF02	Provide mobile weight enforcement	- Minnesota State Patrol officers use a portable scale on the roadside if they have reason to suspect a specific vehicle is in violation of weight laws. - Mobile weight enforcement is also used as part of virtual weigh stations.	- DPS currently uses both permanent and portable scales for weight enforcement. - MnDOT currently uses WIM stations at selected weigh stations for weight enforcement.	- Add additional WIM stations as identified in MnDOT CVO Strategic Plan. - Equip WIM stations with cameras to enhance enforcement. - WIM sites used as enforcement areas with license plate readers to enhance enforcement.	- MnDOT and Minnesota State Patrol are responsible to plan, design, operate and maintain weight enforcement systems. - FHWA oversees Weight Enforcement Plan.	- This service includes interconnects between roadside equipment and in-vehicle equipment. - Interconnect are required between MnDOT CVO and in-vehicle equipment.	- Archiving of historical enforcement data enhances planning for enforcement records and future targeted enforcement efforts. - Identification of violators - Plan for deployment of enforcement personnel. - Performance measures to measure the effectiveness of the program.	CVO07

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/ Responsibility	Interconnect	Data Archive Need	Associated Service Package
CF03	Target enforcement at locations with history of violations	• Law enforcement agencies use analysis of data from WIM sites and from Virtual Weigh Stations (VWS) to determine locations with high levels of violations and use mobile enforcement to target these “hot spots”	• MnDOT currently uses both permanent and portable scales to address problem areas.	• Deploy additional VWS to provide for better identification of locations with high levels of violations.	• MnDOT is responsible to plan, design, operate and maintain portable and permanent scales. • Minnesota State Patrol is responsible for enforcement.	• Interconnects between in-vehicle equipment, roadside equipment and MnDOT CVO are required.	• None	• CVO07 • AD1
Service Package CVO07-Roadside CVO Safety								
CF02	Provide mobile weight enforcement	See information under CVO06						
CF03	Target enforcement at locations with history of violations	See information under CVO06						
CF04	Target enforcement on carriers, vehicles and drivers with history of violations	See information under CVO04						

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/ Responsibility	Interconnect	Data Archive Need	Associated Service Package
CF07	Provide safety information from CVO databases to roadside and enforcement vehicles/personnel	See information under CVO04						
CF09	Provide automated roadside safety monitoring and reporting	MnDOT CVO uses roadside facility equipment to communicate with on-board commercial vehicle equipment, as well as CVO administrative systems, in order to cross-check safety and security records regarding drivers, vehicles, and/or cargo.	- MnDOT does not currently provide automated roadside safety monitoring and reporting. - MnDOT currently uses license plate reader technology at some WIM sites for enforcement. - Cellular-based DRIVEWAY system is used for communicating vehicle safety information.	Investigate the feasibility of providing automated roadside safety monitoring.	MnDOT is responsible to plan, design, operate and maintain their roadside safety monitoring systems.	Interconnections are required between in-vehicle equipment, roadside facility equipment, and MnDOT CVO.	Safety data is archived for customer /vehicle records and future analysis and planning.	

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/ Responsibility	Interconnect	Data Archive Need	Associated Service Package
Service Package CVO08-On-board CVO Safety								
CF10	Provide on-board commercial vehicle safety monitoring and reporting	- Equipment in the commercial vehicle monitors the safety and security of the vehicle, driver, and cargo. - The information is relayed to the driver, fleet managers, and roadside safety inspection facilities.	A limited number of commercial vehicles are currently equipped with safety monitoring equipment.	Research the market penetration of on-board commercial vehicle safety and monitoring equipment in Minnesota.	- Private trucking companies are responsible for the maintenance and operations equipment located in their trucks and offices. - MnDOT is responsible for the maintenance and operations of equipment at roadside inspection facilities.	Interconnects are required between in-vehicle equipment, fleet management, and roadside equipment.	Safety data is archived for customer /vehicle records and future analysis and planning	
Service Package CVO09-CVO Fleet Maintenance								
While trucking firms use the Fleet Maintenance service package, no needs or services under this service package were identified by stakeholders.								

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/ Responsibility	Interconnect	Data Archive Need	Associated Service Package
Service Package CVO10-HAZMAT Management								
CF11	Use RFID tags in conjunction with a black box for identification of HAZMAT materials	MnDOT, other state and local maintenance, law enforcement, and emergency response agencies can quickly identify the type(s) of hazardous materials carried by a truck involved in an incident or at an inspection and request the appropriate response equipment.	MnDOT does not currently have the ability to identify HAZMAT materials utilizing RFID tags.	Investigate the feasibility of utilizing RFID tags for identification of HAZMAT materials.	- MnDOT and other agencies are responsible to operate and maintain mobile or roadside tag-reader equipment - Private trucking companies are responsible to procure and use RFID tags to identify HAZMAT materials.	Interconnects are required between in-vehicle equipment, roadside facility equipment, law enforcement and maintenance agencies, and MnDOT CVO.	HAZMAT identification data is archived for customer records and future safety studies and planning efforts.	
Service Package CVO11-Roadside HAZMAT Security Detection and Mitigation								
CF05	Provide HAZMAT detection at roadside check facilities	Roadside check facility workers use sensors at the roadside check facility detect the presence of hazardous materials.	MnDOT does not currently provide for roadside HAZMAT detection.	Investigate the feasibility of providing HAZMAT detection in Minnesota.	MnDOT is responsible to operate and maintain roadside sensing and communications equipment.	Interconnects are required between roadside facility equipment, law enforcement and maintenance agencies, and MnDOT CVO.	HAZMAT detection data is archived for customer records, post-incident briefings, future safety studies and planning efforts.	
Service Package CVO12-CV Driver Security Authentication								
No needs or services under this service package were identified by stakeholders.								
Service Package CVO13-Freight Assignment Tracking								
No needs or services under this service package were identified by stakeholders.								

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/Responsibility	Interconnect	Data Archive Need	Associated Service Package
Service Package AD1 – ITS Data Mart¹								
CF03	Target enforcement on locations with history of violations	See information under CVO07						
CF04	Target enforcement on carriers, vehicles and drivers with history of violations	See information under CVO04						
CF19	Improve quality and accessibility of commercial vehicle-related crash data	• Minnesota State Patrol and other law enforcement agencies collect and enter improved and more detailed data regarding crashes involving commercial vehicles into crash databases. • Law enforcement, DPS, planning agencies use improved data to plan safety and enforcement enhancements.	• Minnesota State Patrol and other law enforcement agencies currently collect relevant information during investigations of crashes.	• Investigate the use of advanced equipment to more efficiently collect crash data while minimizing the amount of field investigation time needed.	• MnDOT and Minnesota State Patrol are responsible to operate and maintain the field equipment and central databases.	• Interconnects are required between field equipment, law enforcement, and MnDOT CVO.	• Crash data is archived for future safety studies and planning efforts.	• AD2

¹ See Volume 1 – ADMS Service Package Bundle for the description of AD1 – ITS Data Mart.

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/ Responsibility	Interconnect	Data Archive Need	Associated Service Package
Service Package AD2 – ITS Data Warehouse ²								
CF19	Improve quality and accessibility of commercial vehicle-related crash data	See information under AD1						
Service Package AVSS03 – Longitudinal Safety Warning ³								
CF08	Provide collision avoidance assistance for commercial vehicles	• Intersection collision warning systems alert drivers of potential collisions. • Truck drivers use on-board safety and collision sensors to provide warnings to drivers about potential hazards around the vehicle or in its path.	• MnDOT is currently testing the FHWA’s Cooperative Intersection Collision Avoidance System (CICAS) under the Connected Vehicle Initiative. • Individual trucking companies are investigating the use of on-board safety and collision sensors.	• Investigate the use of on-board safety and collision sensors to aid drivers in avoiding collisions.	• MnDOT is responsible to investigate and test appropriate sensors and related equipment, and maintain roadside equipment. • Private trucking companies and fleet managers are responsible to procure, operate, and maintain on-board equipment.	• Interconnects are required between roadside, on-board, and in-vehicle equipment.	• Warnings and driver/vehicle responses are archived for studies of effectiveness or accident investigations.	• AVSS04 • AVSS10

² See Volume 1 – ADMS Service Package Bundle for the description of AD2 – ITS Data Warehouse.

³ See Volume 8 – AVSS Service Package Bundle for the description of AVSS03 – Longitudinal Safety Warning.

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/ Responsibility	Interconnect	Data Archive Need	Associated Service Package
Service Package AVSS04 – Lateral Safety Warning ⁴								
CF08	Provide collision avoidance assistance for commercial vehicles	See information under AVSS03						
Service Package AVSS10 – Intersection Collision Avoidance ⁵								
CF08	Provide collision avoidance assistance for commercial vehicles	See information under AVSS03						

⁴ See Volume 8 – AVSS Service Package Bundle for the description of AVSS04 – Lateral Safety Warning.

⁵ See Volume 8 – AVSS Service Package Bundle for the description of AVSS10 – Intersection Collision Avoidance.

Appendix D: CVO Service Packages and Descriptions

The descriptions of CVO service packages are taken directly from the National ITS Architecture version 7.0.

CVO01 Carrier Operations and Fleet Management

This service package provides the capabilities to manage a fleet of commercial vehicles. The Fleet and Freight Management subsystem provides the route for a commercial vehicle by either utilizing an in-house routing software package or an Information Service Provider. Routes generated by either approach are constrained by hazardous materials and other restrictions (such as height or weight). Any such restricted areas are determined by the Commercial Vehicle Administration. A route would be electronically sent to the Commercial Vehicle with any appropriate dispatch instructions. The location of the Commercial Vehicle can be monitored by the Fleet and Freight Management subsystem and routing changes can be made depending on current road network conditions. Once a route has been assigned, changes must be coordinated between the Fleet and Freight Management subsystem and the Commercial Vehicle. Commercial Vehicle Drivers would be alerted to any changes in route from the planned route and given an opportunity to justify a rerouting. Any unauthorized or unexpected route changes by the Commercial Vehicle will register a route deviation alert with the Fleet and Freight Management subsystem. The Fleet and Freight Management subsystem can also notify local public safety agencies of the route deviation when appropriate (e.g., if there is safety sensitive HAZMAT being carried), by sending an alarm to the Emergency Management subsystem.

CVO02 Freight Administration

This service package tracks the movement of cargo and monitors the cargo condition. Interconnections are provided to intermodal freight shippers and intermodal freight depots for tracking of cargo from source to destination. In addition to the usual cargo monitoring required to insure that cargo gets from origin to destination, the Fleet and Freight Management subsystem monitors shipments to make sure that no tampering or breach of security occurs to the cargo on commercial vehicles. Any such tampering will be reported to the Fleet and Freight Management subsystem. In addition to exceptions (e.g., alerts) that are reported, on-going indications of the state of the various freight equipment are reported to the Fleet and Freight Management subsystem. The commercial vehicle driver is also alerted of any tampering or breach of cargo security. Freight managers may decide to take further action on the alerts and/or provide responses that explain that the alerts are false alarms. If no explanation is received, the Fleet and Freight Management subsystem may notify the Emergency Management subsystem. Commercial vehicle and freight security breaches may also be sent to the Commercial Vehicle Check subsystem.

CVO03 Electronic Clearance

This service package provides for automated clearance at roadside check facilities. The roadside check facility communicates with the Commercial Vehicle Administration subsystem to retrieve infrastructure snapshots of critical carrier, vehicle, and driver data to be used to sort passing vehicles. This allows a good driver/vehicle/carrier to pass roadside facilities at highway speeds using transponders and Field-Vehicle Communications to the roadside. Results of roadside clearance activities will be passed on to the Commercial Vehicle Administration. The roadside check facility may be equipped with Automated Vehicle Identification (AVI), weighing sensors, transponder read/write devices and computer workstations.

CVO04 CV Administrative Processes

This service package supports program administration and enrollment and provides for electronic application, processing, fee collection, issuance, and distribution of CVO credential and tax filing. Through this process, carriers, drivers, and vehicles may be enrolled in a variety of programs including electronic clearance and wireless inspection programs which allow commercial vehicles to be screened at mainline speeds. Through this enrollment process, current profile databases are maintained in the Commercial Vehicle Administration subsystem and snapshots of this data are made available to the roadside check facilities. Current program status is maintained and made available to carriers, drivers, and other authorized users of the data. Enrolled carriers are provided the option to review and challenge the collected data.

Commercial Vehicle Administration subsystems can share current program status and credential information with other Commercial Vehicle Administration subsystems, so that it is possible for any Commercial Vehicle Administration subsystem to have access to all credentials, credential fees, credentials status and safety status information. In addition, it is possible for one Commercial Vehicle Administration subsystem to collect HAZMAT route restrictions information from other Commercial Vehicle Administration subsystems and then act as a clearinghouse for this route restrictions information for Information Service Providers, Map Update Providers, and Fleet and Freight Management subsystems.

CVO05 International Border Electronic Clearance

This service package provides for automated clearance at international border crossings. It augments the Electronic Clearance service package by allowing interface with border administration and border inspection related functions. This service package processes the entry documentation for vehicle, cargo, and driver, checks compliance with import/export and immigration regulations, handles duty fee processing, and reports the results of the crossing event to manage release of commercial vehicle, cargo, and driver across an international border. It interfaces with administrative systems used by customs and border protection, immigration, carriers, and service providers (e.g., brokers) and inspection systems at international border crossings to generate, process, and store entry documentation.

CVO06 Weigh-In-Motion

This service package provides for high speed weigh-in-motion with or without Automated Vehicle Identification (AVI) capabilities. This service package provides the roadside equipment that could be used as a stand-alone system or to augment the Electronic Clearance (CVO03) service package.

CVO07 Roadside CVO Safety

This service package provides for automated roadside safety monitoring and reporting. It automates commercial vehicle safety inspections at the roadside check locations. The capabilities for performing the safety inspection are shared between this service package and the On-board CVO and Freight Safety & Security (CVO08) service package which enables a variety of implementation options. The basic option, directly supported by this service package, facilitates safety inspection of vehicles that have been pulled off the highway, perhaps as a result of the automated screening process provided by the Electronic Clearance (CVO03) service package. In this scenario, only basic identification data and status information is read from the electronic tag on the commercial vehicle. The identification data from the tag enables access to additional safety data maintained in the infrastructure which is used to support the safety inspection, and may also inform the pull-in decision if system timing requirements can be met. More advanced implementations, supported by the On-board CVO and Freight Safety &

Security (CVO08) service package, utilize additional on-board vehicle safety monitoring and reporting capabilities in the commercial vehicle to augment the roadside safety check.

CVO08 On-board CVO Safety

This service package provides for on-board commercial vehicle safety monitoring and reporting. It is an enhancement of the Roadside CVO Safety Service Package and includes support for collecting on-board safety data via transceivers or other means. The on-board safety data are assessed by an off-board system. In some cases the monitoring and safety assessment may occur remotely (i.e., not at a roadside site). Following the assessment, safety warnings are provided to the driver, the Commercial Vehicle Check roadside elements, and carrier. This service package allows for the Fleet and Freight Management subsystem to have access to the on-board safety data.

CVO09 CVO Fleet Maintenance

This service package supports maintenance of CVO fleet vehicles with on-board monitoring equipment and Automated Vehicle Location (AVL) capabilities within the Fleet and Freight Management Subsystem. Records of vehicle mileage, repairs, and safety violations are maintained to assure safe vehicles on the highway.

CVO10 HAZMAT Management

This service package integrates incident management capabilities with commercial vehicle tracking to assure effective treatment of HAZMAT material and incidents. HAZMAT tracking is performed by the Fleet and Freight Management Subsystem. The Emergency Management subsystem is notified by the Commercial Vehicle if an incident occurs and coordinates the response. The response is tailored based on information that is provided as part of the original incident notification or derived from supplemental information provided by the Fleet and Freight Management Subsystem. The latter information can be provided prior to the beginning of the trip or gathered following the incident depending on the selected policy and implementation.

CVO11 Roadside HAZMAT Security Detection and Mitigation

This service package provides the capability to detect and classify security sensitive HAZMAT on commercial vehicles using roadside sensing and imaging technology. Credentials information can be accessed to verify if the commercial driver, vehicle and carrier are permitted to transport the identified HAZMAT. If the credentials analysis and sensed HAZMAT information do not agree, the vehicle can be signaled to pull off the highway, and if required, an alarm can be sent to Emergency Management to request they monitor, traffic stop or disable the vehicle.

CVO12 CV Driver Security Authentication

This service package provides the ability for Fleet and Freight Management to detect when an unauthorized commercial vehicle driver attempts to drive their vehicle based on stored driver identity information. If an unauthorized driver has been detected, Fleet and Freight Management can activate commands to safely disable the commercial vehicle. Alarms can also be sent to emergency management to inform them of a potential commercial vehicle hijacking or theft and potential hazardous situation. In addition, Emergency Management can request Fleet and Freight Management to disable a specific vehicle in their fleet.

CVO13 Freight Assignment Tracking

This service package provides for the planning and tracking of three aspects of commercial vehicle shipments. For each shipment, the commercial vehicle, the freight equipment, and the commercial vehicle driver are monitored for consistency with the planned assignment. Any unauthorized changes are determined by the Fleet and Freight Management subsystem and

then the appropriate people and subsystems are notified. Data collected by the On-board CV and Freight Safety & Security and the On-board Driver Authentication equipment packages used in other service packages are also used to monitor the three aspects of assignment for this service package. In addition to this service package, Fleet and Freight Managers may also monitor routes and itineraries and this capability is included in Fleet Administration.