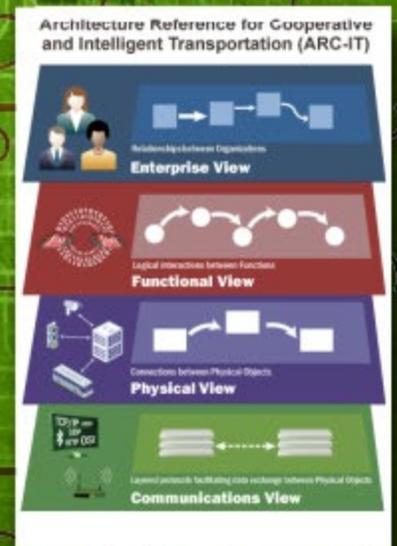
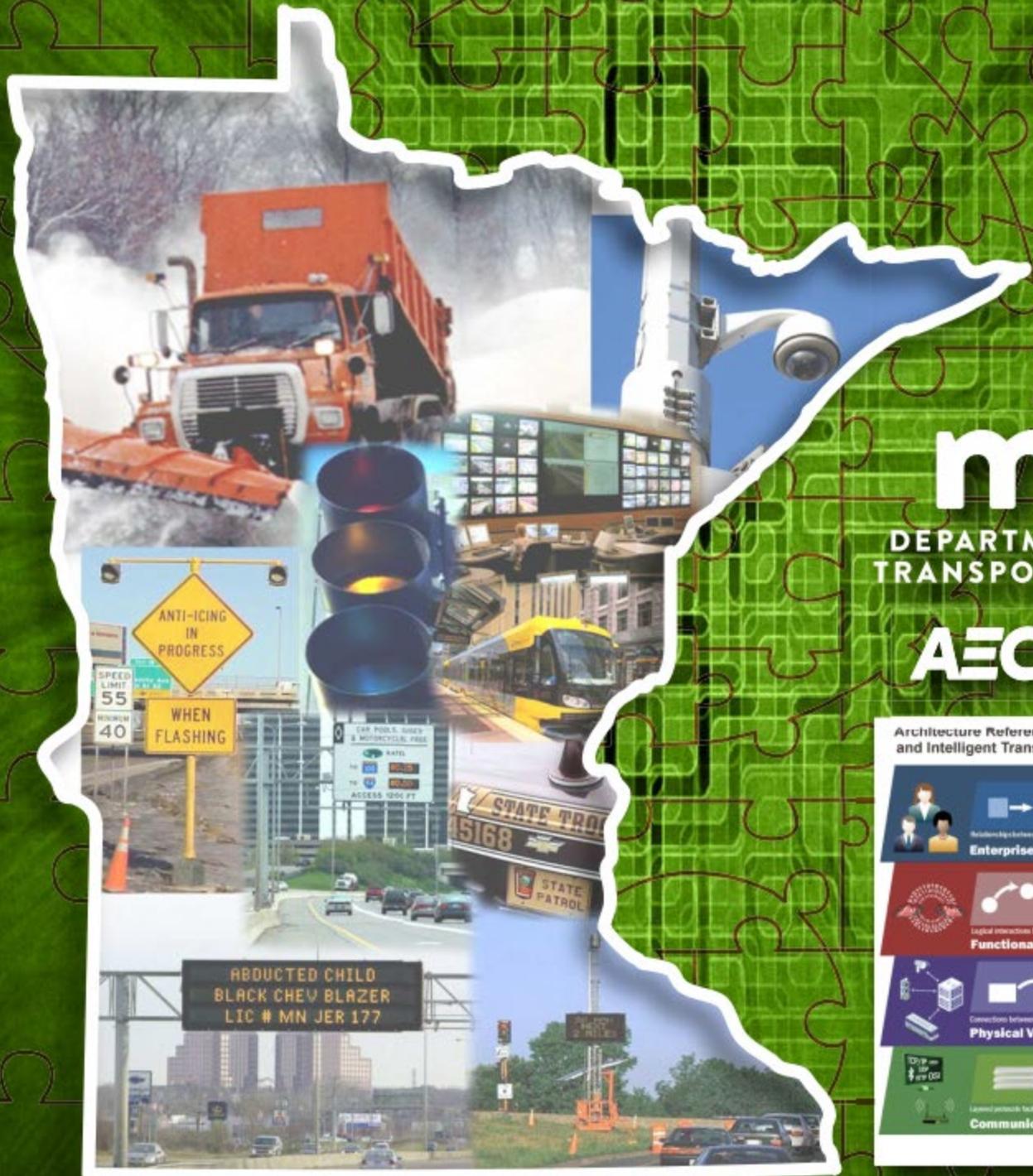


Minnesota Statewide Regional ITS Architecture

Version 2018

Volume 6:
Public Safety Service Package Area



**Minnesota Statewide Regional ITS Architecture
Version 2018**

Volume 6: Public Safety Service Package Area



Prepared by

AECOM

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ACRONYMS

AMBER	America's Missing: Broadcast Emergency Response
ARC-IT	Architecture Reference for Cooperative and Intelligent Transportation
ATIS	Advanced Traveler Information System
ATMS	Advanced Traffic Management System
AVL	Automatic Vehicle Location
CAD	Computer Aided Dispatch
CARS	Condition Acquisition and Reporting System
CO	Carbon Monoxide
CVO	Commercial Vehicle Operations
DM	Data Management
DMS	Dynamic Message Sign
DOT	Department of Transportation
DPS	Department of Public Safety
DVR	Digital Video Recording
EAS	Emergency Alert System
EM	Emergency Management
EMS	Emergency Medical Services
EOC	Emergency Operations Center
FHWA	Federal Highway Administration
FIRST	Freeway Incident Response Safety Team
FTA	Federal Transit Administration
GIS	Geographic Information System
HAR	Highway Advisory Radio
HOT	High-Occupancy Toll
HOV	High-Occupancy Vehicle
ICS	Incident Command Structure
ITS	Intelligent Transportation Systems
LOS	Level of Service
LPFM	Low Power FM Radio
MC	Maintenance and Construction
MnDOT	Minnesota Department of Transportation
MSP	Minnesota State Patrol
NDDES	North Dakota Department of Emergency Services
NIMS	National Incident Management System
PM	Parking Management
PS	Public Safety
PSAP	Public Safety Answering Point
PT	Public Transportation
RAD-IT	Regional Architecture Development for Intelligent Transportation
RTMC	Regional Transportation Management Center
SEOC	State Emergency Operations Center
SOC	State Operations Center (North Dakota)
SRCC	Southern Regional Communication Center
ST	Sustainable Travel
SU	Support
TI	Traveler Information
TM	Traffic Management
TMC	Transportation/Traffic Management Center
TraCS	Traffic and Criminal Software

VMT	Vehicle-Miles Traveled
VS	Vehicle Safety
WX	Weather

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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 2014. It conforms with the National ITS Architecture (the Architecture Reference for Cooperative and Intelligent Transportation, or ARC-IT, Version 8.2) 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. ARC-IT 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.
- **Implementation Volume – 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.
- **Volumes 1 thru 12 – Development and Documentation of Service Package Areas:** Each volume is specific to the corresponding Service Package Area and includes: a description of the Service Package Area, 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 13 – RAD-IT Outputs of the Regional ITS Architecture:** Volume 13 consists of a report generated by the Regional Architecture Development for Intelligent Transportation (RAD-IT) software, formerly known as Turbo Architecture, for the Minnesota Statewide Regional ITS Architecture.

The purpose for developing Volumes 1 through 12 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 6 – Public Safety Service Package Area

Public Safety (PS) Service Package Area comprises a wide range of incident response, public safety management and disaster management systems. PS includes the management and coordination of emergency response resources, infrastructure protection, emergency warnings, disaster response and recovery, and evacuation and reentry management.

Development of Volume 6 – PS Service Package Area entailed the Project Consultant working 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 6 summarizes the findings of data collection and analysis activities conducted to support development of the PS Service Package Area. Volume 6 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 Public Safety Systems** provides a brief overview of statewide PS 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 PS. 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 PS 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 EM Service Package Bundle and those in other Service Package Bundles.
- **Section 6: PS Research and Development Needs** describes general research that can be performed to help implement the identified services.

2. Identification of Existing PS Systems

PS systems are utilized throughout Minnesota and have aided emergency and transportation agencies in response, clearance and recovery activities associated with incidents and emergencies in a more timely and effective fashion. Using those systems has improved transportation safety, decreased response time, increased response efficiency, and mitigated the adverse effects of incidents and emergencies on the transportation system.

ITS applications in PS include hazardous materials management, the deployment of emergency medical services, and large and small-scale emergency response and evacuation operations. PS systems can be used to assist in the detection, response, and recovery from emergencies. Emergency dispatchers can receive emergency information from the public via phone calls, message from other agencies, or monitoring systems and dispatch emergency services using computer-aided dispatch (CAD) systems to assist in response vehicle routing and tracking dispatched resources. Agencies can use coordinated emergency response plans to respond to major natural or manmade disasters, improving information about and capacity of evacuation routes and allowing improved access to disaster sites for responders. Public safety alerts can be broadcast via radio or television outlets and evacuation routing information can be transmitted to the public via DMS, radio, or internet-based traveler information systems. The

same methods can be used to alert the public when it is safe to reenter an area and what routes they should use to enter.

Another related ITS application in PS is incident management systems. Incident management is a combination of PS and traffic management activities. Incident management applications can enhance services in both areas so there is a strong linkage between ATMS and PS service package areas with respect to incident management services. Incident management systems can reduce the effects of incident-related congestion by decreasing the time to detect incidents, the time for responding vehicles to arrive, and the time required for traffic to return to normal conditions. Incident management systems make use of a variety of monitoring technologies, often shared with freeway and arterial management systems, as well as enhanced communications and other technologies that facilitate coordinated response to incidents.

An inventory of existing and planned PS ITS (e.g. centers, vehicles, 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 ARC-IT.

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. PS ITS solutions involve services that improve the effectiveness and timeliness of emergency detection, response, and recovery.

PS comprises a wide range of incident response, public safety management and disaster management systems. The goal of PS is to minimize response times and provide the most appropriate level of response in the most efficient and cost effective manner possible in order to save lives and minimize traffic disruption. The Minnesota ITS Development Objectives in Table 1, specific to PS, are steps to determine and/or measure whether or not PS goals are being achieved. A complete list of Minnesota ITS Development Objectives is included in *Appendix B*.

Table 1. PS Specific Minnesota ITS Development Objectives

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

A-1 Reduce crash frequency

A-1-19 Reduce number of all secondary crashes

A-2 Reduce fatalities and life changing injuries

A-2-01 Reduce number of roadway fatalities

A-2-02 Reduce number of roadway fatalities per VMT

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-2-42 Reduce number of hazardous materials transportation incidents involving injuries

A-3 Reduce 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

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-4 Reduce traffic delays during evacuation from homeland security and Hazmat incidents

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

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-4 Reduce stress caused by transportation

- B-1-15 Reduce mean incident notification time
- B-1-16 Reduce mean time for needed responders to arrive on-scene after notification
- C-3-13 Increase number of users of notifications for traveler information (e.g., e-mail, text message)
- C-3-15 Increase the number of specifically tailored traveler information messages provided

D. Improve the Security of the Transportation System

D-1 Enhance traveler security

- C-3-09 Increase the percent of the transportation system in which travel conditions can be detected remotely via video monitoring cameras, speed detectors, etc.
- D-1-02 Increase the number of video monitoring 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 video monitoring cameras
- D-1-07 Increase the number of critical sites with security monitoring
- 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

- 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 video monitoring cameras, speed detectors, etc.
- D-1-02 Increase the number of video monitoring 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 video monitoring cameras
- D-1-07 Increase the number of critical sites with security monitoring
- 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

E. Support Regional Economic Productivity and Development

E-4 Increase agency efficiency

- 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-4-07 Increase the number of vehicles operating under CAD

F. Preserve the Transportation System

F-1 Safeguard existing infrastructure

- C-3-09 Increase the percent of the transportation system in which travel conditions can be detected remotely via video monitoring cameras, speed detectors, etc.
- D-1-06 Increase the percent of major and minor arterials are equipped with and operating with video monitoring cameras
- D-1-07 Increase the number of critical sites with security monitoring
- 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

G. Enhance the Integration and Connectivity of the Transportation System

G-1 Aid in transportation infrastructure and operations planning

- 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

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 2017 to capture the following changes since the last update of the Architecture in 2014:

- 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 2014 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.

Between July 2017 and April 2018, a series of stakeholder workshops were conducted. The purpose of those 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 2 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 2. The potential solutions and enhancements identified in Table 2 will provide the required service(s) to fill the gaps summarized in *Appendix C*. This appendix will take the PS Needs and associated PS 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 2. PS 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 areas can be found in corresponding Service Package Area documents.

^c Priority point is calculated based on limited votes (3 or less).

ID	Need/Potential Solution	Priority Point^a	ITS Development Objective	ARC-IT Reference^b
PSFT 01	Provide CAD to CAD integration for multi-agency coordination at major incidents	3.00	B-1-15, B-1-16, B-1-17, B-1-18, C-1-01, C-1-02	PS01
PSFT 02	Provide dynamic routing of emergency vehicles	1.33	B-1-16, B-1-17, B-1-18	PS02, PS03, PS06
PSFT 03	Provide enhanced Mayday services	1.33	B-1-15, B-1-16, B-1-17, B-1-18	PS04
PSFT 04	Provide technology to monitor transportation infrastructure	3.25	B-1-15, B-1-16, B-1-17, B-1-18, D-1-02, D-1-05, D-1-07, D-1-08, D-1-09	PS09, PS11
PSFT 05	Operate and enhance CAD systems	3.00	B-1-15, B-1-16, B-1-17, B-1-18	PS01
PSFT 06	Provide AVL to emergency vehicles	2.75	B-1-16, B-1-17, B-1-18	PS01, PS02, PS03, PS06
PSFT 07	Enhance CAD GIS mapping capabilities	4.00	B-1-15, B-1-16, B-1-17, B-1-18	PS02
PSFT 08	Provide mobile data computers in emergency vehicles to provide real-time information	3.00	B-1-15, B-1-16, B-1-17, B-1-18	PS01, PS02, PS06
PSFT 09	Provide emergency/ evacuation and reentry information	2.00	B-4-01	PS14
PSFT 10	Provide ability to remotely post AMBER alert information on DMS	1.67	C-1-09, C-3-09, D-1-03	PS10
PSFT 11	Provide wireless digital feed between patrol and emergency responder vehicles and dispatch centers	2.00	B-1-15, B-1-16, B-1-17, B-1-18, C-1-02, C-3-10	PS01, PS02, PS06
PSFT 12	Implement automated field reporting system	3.00	B-1-15, B-1-16, B-1-17, B-1-18, D-1-04	DM01
PSFT 13	Provide real-time digital video recordings (DVR)	2.33	B-1-15, B-1-16, B-1-17, B-1-18	PS01, PS02, PS06, DM01
PSFT 14	Develop systems to counter distracted driving by either in vehicle or external notification	5.00 ^c	A-1-14, A-2-15, A-2-36, A-2-44	VS01, VS02, TM17
ATMS 02	Implement red-light running technology	3.00	A-1-05, A-1-10, A-2-05, A-2-11, A-2-26, A-2-32	TM03, VS01, VS13
ATMS 04	Provide cameras at locations with high incidents and areas of high importance for incident identification and verification	3.08	B-1-15, B-1-17, B-1-18, C-1-09, D-1-06	TM01, TM08
ATMS 06	Provide speed enforcement at high risk locations to improve safety	3.46	A-1-12, A-2-13, A-2-34, A-2-43, C-4-01	TM17
ATMS 08	Provide enhanced manual or automated speed enforcement to improve safety	3.57	A-1-12, A-2-13, A-2-34, A-2-43, C-4-01	TM17, MC06

ID	Need/Potential Solution	Priority Point^a	ITS Development Objective	ARC-IT Reference^b
ATMS 09	Share video, data and other information with PSAPs	2.25	B-1-15, B-1-16, B-1-17, B-1-18, B-4-01, C-3-11	TM01, TM08, PS01
ATMS 22	Provide a system-coordinated response for incidents and emergencies	3.54	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	TM08
ATMS 40	Enhance enforcement in work zones	3.70	A-3-01, A-3-02, A-3-03, A-3-04	TM17, MC06
ATMS 41	Improve incident investigation capabilities	2.45	B-1-17, B-1-18, C-1-01, C-1-09	TM08
ATMS 42	Use roadside data collectors to determine locations with frequent occurrence of speeding	2.25	A-1-01, A-1-02, A-1-12, A-2-43, A-2-44, G-1-01, G-1-02, G-1-03	TM01, TM17, DM01, DM02
ATMS 48	Increase enforcement/presence of enforcement	5.00 ^c	A-2-43, A-2-44, C-1-09, C-3-09, D-1-01, D-1-02, D-1-04, D-1-05, D-1-06, D-1-07, D-1-08, D-1-09, E-2-03, F-1-02	ST06, TM17, TM22
ATMS 49	Crack down distracted driving	5.00 ^c	A-1-01, A-1-02, A-1-14, A-2-01, A-2-02, A-2-15, A-2-36, A-2-44	TM17

5. Detail of PS Needs and Services

A detailed description of PS 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 PS Service Package Area and those in other Service Package Areas.

6. PS Research and Development Needs

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

Communications

- Study best wireless technology and policies to transmit and record real-time data and video
- Develop systems to provide in-vehicle notification

Evacuation

- Test coordination of local agencies during evacuation event
- Test evacuation models for planning and management
- Develop and test alternate route recommendation systems
- Test evacuation and reentry message language to find effective communications

Dispatch

- Test incorporation of real-time congestion and road conditions information into CAD
- Test enhancements to automated incident notification systems

Surveillance and Detection

- Test automated incident detection system, both video based and detection based technology
- Test automated inspection/alert systems for monitoring suspicious activity or unusual movement
- Develop monitoring video search tools and archiving standards for incident and security threat identification
- Enhance the use of digital recording equipment (DVR) with monitoring/patrol car cameras and investigate data storage methods and practices
- Test airborne monitoring systems

Incident Management and Emergency Response

- Explore methods to improve emergency vehicle response routing
- Research incident identification and notification technologies
- Research and develop improved emergency vehicle preemption systems

Enforcement

- Enhance automated field reporting system
- Develop automated enforcement support systems for red-light running
- Develop automated vehicle passenger occupancy detection system to assist in HOV/HOT lane enforcement

Appendix A: Existing/Planned PS Elements

Element	Service Package(s)	Description	Stakeholder	Status
911 Dispatch Center	PS01, PS02, PS03, PS04, PS09, PS10, PS11, PS12, PS13, PS14	This element represents the dispatch centers that receives 911 calls and dispatch the appropriate sheriff, police, fire and emergency medical services via communication systems. Some centers are equipped with computer aided dispatch (CAD) system. Dispatch centers exchange mutual aid and incident/emergency information with other agencies as necessary.	Minnesota State Patrol, Local EM Agencies	Existing
Airport	PS10, PS11	Located throughout the state, Minnesota Airports receive important traveler, weather, and construction information from other agencies, and coordinate with emergency management.	Airports	Existing
County Emergency Operations Center	PS01, PS10, PS11, PS12, PS13, PS14	Each Minnesota county and various Minnesota cities have an emergency operations center (EOC). These EOCs range from minimally equipped, stand-by facilities to centers that operate on a daily basis. The EOCs operate for emergency operations and homeland security practices during emergencies and disasters.	Local EM Agencies	Existing
SRCC	PS01, PS02, PS03, PS10, PS13, PS14	The SRCC act as regional center for the Rochester area for 24-hour incident and emergency response, multi-agency dispatching, interagency communications, collection and dissemination of road conditions and closures, and traffic management and operations.	MnDOT	Existing
RTMC	PS01, PS02, PS03, PS08, PS10, PS13, PS14	The RTMC integrates MnDOT's Metro District Maintenance Dispatch and MnDOT's Office of Traffic, Safety and Operations with the Minnesota State Patrol Dispatch into a unified communications center. The integration provides the communications and computer infrastructure necessary for coordinated transportation management on metro freeways during normal commuting periods, as well as during special events and major incidents. The RTMC houses the FIRST Dispatch Center. In addition, the RTMC coordinates with MnDOT Emergency Operations functions to assist state agencies and local governments in the event of natural and technological disasters/emergencies. The RTMC is also designated as the primary EOC for the Metro area.	MnDOT	Existing

Element	Service Package(s)	Description	Stakeholder	Status
FIRST Vehicle Equipment	PS01, PS08	The Freeway Incident Response Safety Team (FIRST) is an incident management measure designed to assist disabled vehicles along congested freeway segments and relieve peak period non-recurrent congestion through quick detection, verification, and removal of freeway incidents. The primary purpose of the FIRST Program is to alleviate congestion and to prevent secondary crashes. Each FIRST truck is equipped with a changeable message sign and AVL system. The FIRST Dispatch Center is located at the RTMC.	MnDOT	Existing
Emergency Vehicle Equipment	PS01, PS02, PS03	This element represents vehicle equipment on emergency vehicles that communicates with 911 Computer Aided Dispatch System and requests emergency vehicle pre-emption at traffic signals throughout Minnesota.	Minnesota State Patrol, Local EM Agencies	Existing
Mayday System	PS04	Mayday System can provide data to the State Patrol, emergency responders, and hospitals in the Twin Cities and Greater Minnesota.	Private Mayday Service Providers	Existing
Mayday System Vehicle Equipment	PS04	These are vehicles equipped with Mayday systems.	Travelers	Existing
Minnesota Emergency Alert System	PS10, PS11	Information system to alert the public in emergency situations such as child abductions. The alert includes information and instructions for transportation system operators and the traveling public, improving public safety and enlisting the public's help in some scenarios.	Minnesota Homeland Security and Emergency Management, Minnesota Bureau of Criminal Apprehension	Existing
Minnesota State Emergency Operations Center (SEOC)	PS10, PS11, PS12, PS13, PS14	Through the Minnesota DPS Office of Homeland Security and Emergency Management, the state EOC coordinates notifications to the public with county EOCs through the Emergency Alert System (EAS). Personnel from state agencies report to the SEOC to be a liaison between the EOC and their agency and to aid in any decisions. County EOCs coordinate with the SEOC and the nuclear power plants to perform actions needed to ensure public safety. Local police, fire, and other public agencies may be called upon. A county EOC may request assistance from the state.	Minnesota Homeland Security and Emergency Management	Existing

Element	Service Package(s)	Description	Stakeholder	Status
Minnesota State Patrol District Office	PS01, PS10, PS11, PS13	This element represents the 12 State Patrol district offices that manage resources and communicate incident data and resource requests to other public and private agencies. Emergency vehicle components are connected to and operated by the State Patrol Dispatch Center. Central office in St. Paul coordinates alert notifications and emergency plans with the NDDDES SOC and also coordinates incident response and threat information with the North Dakota State Radio. It is planned to monitor information received from the Minnesota State Patrol Computer Aided Dispatching (CAD) System and process the transmission of this information to the MnDOT 511 Telephone Information Service and Traveler Information Website (511mn.org).	Minnesota State Patrol	Existing
Media Information Release System	TI01, DM01	This system has been created to keep the media and the public more up to date in case of serious and fatal accidents that happen within the state of Minnesota. This system contains only those accidents in which the Minnesota State Patrol is the primary reporting law enforcement agency. Records displayed here are as current as the last time State Patrol Personnel edited data. However due to extenuating circumstances such as heavy-accident periods like ice and snow storms, data entry may get back-logged and may not be up to the minute.	Minnesota State Patrol	Existing
Automated Crash Notification System	PS04	This system provides immediate notification of crashes to responders and provides access to driver, passenger, and vehicle information. This would assist emergency responders in quickly and efficiently locating crash or other road safety related incidents.	MnDOT	Planned
Neighboring State Emergency Management Centers	PS10, PS12, PS13	This element represents neighboring state agencies that coordinate alert notifications, emergency plans, evacuation plans, incident response, resources, and incident command information with Minnesota State Patrol and MnDOT RTMC/SRCC. These agencies include: Iowa State Patrol, Wisconsin State Patrol, North Dakota State Operations Center, Northwest Wisconsin Emergency Service Providers, and US Coast Guard.	Neighboring States	Existing

Element	Service Package(s)	Description	Stakeholder	Status
Security Monitoring Roadside Equipment	PS09, PS11	This element represents threat detection, video monitoring, and emergency alert systems at critical infrastructure areas (bridges, ports, tunnels, etc.) throughout the state. Surveillance cameras and threat sensors will monitor critical facilities and when suspicious activity or objects in restricted areas detected an alert will automatically be sent to RTMC and emergency management personnel. Video monitoring cameras are installed under bridges in Duluth for detecting suspicious activities. Video monitoring cameras are also installed along the Mississippi River in St. Paul to monitor bridges and river activities. These cameras are monitored by St. Paul EOC. MnDOT uses thermal imaging technology for I-35W bridge health monitoring.	MnDOT, Minnesota State Patrol, Local Agencies	Existing
Tunnel Emissions Roadside Equipment	PS09	This represents the Tunnel Alarm Monitoring System is currently operated by MnDOT District 1 and the State Patrol dispatchers and includes the monitoring of the Lief Erickson Tunnel within Segment 10 and the Silver Creek and Lafayette Bluff tunnels along Highway 61 north of Duluth (along the North Shore). Roadside equipment monitors for carbon monoxide (CO) levels, fire, fan and generator operation and communications and power.	MnDOT District Offices	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.

DM:	Data Management	VS:	Vehicle Safety
PT:	Public Transportation	CVO:	Commercial Vehicle Operations
TI:	Traveler Information	PS:	Public Safety
TM:	Traffic Management	MC:	Maintenance and Construction
PM:	Parking Management	WX:	Weather
SU:	Support	ST:	Sustainable Travel

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

A-1 Reduce crash frequency (TI, TM, PT, CVO, PS, MC, VS & WX)

- 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 (TI, TM, PT, CVO, PS, MC, VS & WX)

- 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 (TI, TM, PS, MC & VS)

- 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 (TI, TM, MC & VS)

- B-1-01 Reduce the percentage of facility miles (highway, arterial, rail, etc.) experiencing recurring congestion during peak periods
- 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 passenger occupancy and facility throughput (TM, PT & ST)

- 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 (TI, TM, PS, MC & VS)

- 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 (TI, TM, PT, CVO, PS & VS)

- 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 (TI, TM, PT, PS & VS)**

- B-1-01 Reduce the percentage of facility miles (highway, arterial, rail, etc.) experiencing recurring congestion during peak periods
- 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 (TI, TM, PT & VS)

- 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 (TI, TM, PT & ST)

- 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 video monitoring cameras, 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 (TI, TM, PT, PM, PS, MC & VS)

- 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 peak periods
- 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 (PT & PS)

- C-3-09 Increase the percent of the transportation system in which travel conditions can be detected remotely via video monitoring cameras, 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 video monitoring 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 video monitoring cameras
- D-1-07 Increase the number of critical sites with security monitoring
- 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 (TI, TM, PT, CVO, PS, MC & VS)

- 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 video monitoring cameras, 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 video monitoring 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 video monitoring cameras
- D-1-07 Increase the number of critical sites with security monitoring
- 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 (TI, TM, PT, CVO & VS)

- 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 (TI & 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 (TM, PT, CVO & VS)

- 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 video monitoring cameras, 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 (DM, TM, PT, CVO, PS, MC & SU)

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 (TM, PT, CVO & VS)

B-1-01 Reduce the percentage of facility miles (highway, arterial, rail, etc.) experiencing recurring congestion during peak periods

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 (TI & 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 (TM, CVO, PS & MC)

- C-3-09 Increase the percent of the transportation system in which travel conditions can be detected remotely via video monitoring cameras, speed detectors, etc.
- D-1-06 Increase the percent of major and minor arterials are equipped with and operating with video monitoring cameras
- D-1-07 Increase the number of critical sites with security monitoring
- 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 (TM, CVO, MC & VS)

- B-1-01 Reduce the percentage of facility miles (highway, arterial, rail, etc.) experiencing recurring congestion during peak periods
- 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 (ST, TI, TM, CVO & VS)

- B-1-01 Reduce the percentage of facility miles (highway, arterial, rail, etc.) experiencing recurring congestion during peak periods
- 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 (TM, PT, PS, ST & MC)

- 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 passenger occupancy rate in HOV lanes
- H-2-02 Increase the amount of environmentally friendly de-icing material used

Appendix C: Needs and Services Detail

Service Package PS01 - Emergency Call-taking and Dispatch

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/Responsibility	Interconnect	Data Archive Need	Associated Service Package
PSFT 01	Provide CAD to CAD integration for multi-agency coordination at major incidents	<ul style="list-style-type: none"> MSP, local public safety agencies, and other emergency responders use their integrated CAD systems to facilitate data sharing, increase situational awareness, as well as better coordinate incident/emergency response and provide appropriate resources. 	<ul style="list-style-type: none"> Agencies and PSAPs currently have separate, non-integrated CAD systems. Coordination with different dispatch centers by communicating each other on the same radio frequency during an incident. Hennepin County uses FATPOT and is upgrading to newer server in 2019. 	<ul style="list-style-type: none"> Promote data sharing among CAD systems. Integrate MSP CAD system with that of other emergency responders. Integrate CAD and/or allow data sharing among systems within the same region. Additional gaps could be identified as a result of PSAP consolidation. 	<ul style="list-style-type: none"> MSP and local public safety agencies are responsible to coordinate for data sharing, develop common standards, integrate, and maintain their CAD systems. 	<ul style="list-style-type: none"> CAD data sharing and integration includes interconnects between CAD systems at dispatch centers. 	<ul style="list-style-type: none"> None for the CAD integration. Separate CAD systems already have archiving guidelines and storage protocols. 	

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/Responsibility	Interconnect	Data Archive Need	Associated Service Package
PSFT 05	Operate and enhance CAD systems	<ul style="list-style-type: none"> MSP and local agencies (i.e. public/private school districts, private transit systems) use CAD to receive emergency calls, dispatch vehicles/personnel, ensure appropriate resources are sent, and maintain the status of responding resources in the field. 	<ul style="list-style-type: none"> Many emergency response agencies have CAD systems in their dispatch/communications centers. 	<ul style="list-style-type: none"> Enhance functions of MSP CAD-CARS integration and upgrade systems as technology evolves. Integrate CAD systems to foster multi-agency coordination. Implement an “all-call” approach to assist outstate districts with contacting the right MnDOT staff during an incident. 	<ul style="list-style-type: none"> MSP and local agencies are responsible to plan, design, construct, integrate, operate and maintain CAD systems for their fleets. 	<ul style="list-style-type: none"> CAD systems include interconnects between vehicles and dispatch centers. CAD systems also include interconnects between dispatch centers to CAD data archives. 	<ul style="list-style-type: none"> CAD data will be archived for post-incident briefings, training, and response planning. Individual agency CAD systems have archiving guidelines and storage protocols. 	

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/Responsibility	Interconnect	Data Archive Need	Associated Service Package
PSFT 06	Provide AVL to emergency vehicles	<ul style="list-style-type: none"> Agency dispatchers use AVL to track emergency vehicle location and status, identify closest available vehicles, and provide incident and routing information to responders. 	<ul style="list-style-type: none"> MnDOT FIRST trucks, MnDOT maintenance vehicles, MSP patrol vehicles, and some local agencies' emergency vehicles are equipped with AVL systems. 	<ul style="list-style-type: none"> Equip all local emergency responders with AVL systems. Equip additional MnDOT operational units with AVL systems 	<ul style="list-style-type: none"> Emergency response agencies are responsible to plan, procure, install, integrate, operate and maintain AVL systems for their fleet. 	<ul style="list-style-type: none"> AVL systems include interconnects between vehicles and dispatch centers. 	<ul style="list-style-type: none"> Vehicle location data will be archived for future response performance measure analysis and response planning. Archived data on time, speed, and location could be useful for future litigation, tort claims, etc. 	<ul style="list-style-type: none"> PS02 PS03 PS06
PSFT 08	Provide mobile data computers in emergency vehicles to provide real-time information	<ul style="list-style-type: none"> Public safety and emergency response agencies use mobile data computers to access information in a central database and to transmit data to a dispatch center. 	<ul style="list-style-type: none"> MSP and many large city police vehicles have mobile data computers. Many agencies use laptops and/or smartphones for real-time notifications. 	<ul style="list-style-type: none"> Emergency response agencies that do not have mobile data computers will install equipment in their vehicles and integrate it with databases. 	<ul style="list-style-type: none"> Agencies are responsible to plan, design, construct, integrate, operate and maintain their mobile data computers. 	<ul style="list-style-type: none"> Mobile data computers include interconnects between vehicles and dispatch centers and/or central databases. 	<ul style="list-style-type: none"> None. Mobile data computers will access data archived under other services. 	<ul style="list-style-type: none"> PS02 PS06

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/Responsibility	Interconnect	Data Archive Need	Associated Service Package
PSFT 11	Provide wireless digital feed between patrol and emergency responder vehicles and dispatch centers	<ul style="list-style-type: none"> MSP, local public safety agencies, and emergency responders use this service to access and transmit data in real-time to better respond to incidents and provide the dispatch center with data from the incident site. 	<ul style="list-style-type: none"> The statewide communications backbone is being expanded and converted from analog to digital. Cellular network is used to transfer data between squads and receive information in vehicles. 	<ul style="list-style-type: none"> Complete conversion to digital transmissions. Deploy additional base stations/repeaters and transmitters in areas where topography limits transmissions. Cellular providers don't prioritize Patrol staff any higher than other customers. Cellular internet cards in vehicles may be subject to slow download speeds or shutdowns in the event of high network usage. 	<ul style="list-style-type: none"> MnDOT Office of Electronic Communications is responsible to plan, design, construct, operate and maintain a wireless digital network. 	<ul style="list-style-type: none"> This wireless digital feed includes interconnects between vehicles and dispatch centers. 	<ul style="list-style-type: none"> None. Wireless communication will not have any archived needs. Archived data on time, speed, and location could be useful for future litigation, tort claims, etc. 	<ul style="list-style-type: none"> PS02 PS06

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/Responsibility	Interconnect	Data Archive Need	Associated Service Package
PSFT 13	Provide real-time digital video recordings (DVR)	<ul style="list-style-type: none"> Emergency responder and dispatchers will use DVR to review camera images in real-time to verify events at incident sites and make decisions to better respond to an incident. 	<ul style="list-style-type: none"> Dispatchers have access to some camera images, but do not have the ability to play images back immediately to review conditions or events at an incident scene. All MSP squads can record analog video at the scene. 	<ul style="list-style-type: none"> Integrate DVR systems into MSP dispatch centers and MnDOT RTMC and SRCC. Integrate DVR systems into MSP vehicles with cameras to allow officers to review images. 	<ul style="list-style-type: none"> MnDOT RTMC is responsible to plan, design, construct, integrate, operate and maintain DVR systems for their cameras. MSP is responsible to plan, design, construct, integrate, operate and maintain DVR systems for its fleet. 	<ul style="list-style-type: none"> DVR systems include interconnects between roadside camera systems and dispatch centers, emergency operations centers, and/or vehicles. 	<ul style="list-style-type: none"> Live video should be "buffered" for a period of time to allow saving video of interest after the fact. Long-term archiving is covered under video monitoring camera operations services. Law enforcement should be able to record an entire incident/ response. 	<ul style="list-style-type: none"> PS02 PS06 DM01

Service Package PS02 – Routing Support for Emergency Responders

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/Responsibility	Interconnect	Data Archive Need	Associated Service Package
PSFT 02	Provide dynamic routing of emergency vehicles	<ul style="list-style-type: none"> MnDOT FIRST and 911 dispatch centers use routing recommendations based on real-time data to direct emergency response vehicles to an incident scene in the shortest amount of time. 	<ul style="list-style-type: none"> MnDOT FIRST and 911 dispatch centers use dynamic routing in limited capacity through use of RTMC cameras. 	<ul style="list-style-type: none"> Complete providing metro roadway monitoring videos to MnDOT FIRST and other dispatch centers and emergency responders. Provide SRCC roadway monitoring videos to dispatch centers and emergency responders in the Rochester area. 	<ul style="list-style-type: none"> MnDOT RTMC is responsible to gather and transmit video images to dispatch centers. Emergency response agency dispatch centers are responsible to provide routing information to responders. 	<ul style="list-style-type: none"> This service includes interconnects between the RTMC and SRCC and dispatch centers. This service also includes interconnects between dispatch centers and vehicles. 	<ul style="list-style-type: none"> CAD data will be archived for post-incident briefings and future training, but no video images will be archived as part of this service. 	<ul style="list-style-type: none"> PS03 PS06
PSFT 06	Provide AVL to emergency vehicles	See information under PS01.						

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/Responsibility	Interconnect	Data Archive Need	Associated Service Package
PSFT 07	Enhance CAD GIS mapping capabilities	<ul style="list-style-type: none"> • MSP and local public safety agencies incorporate road construction data into GIS systems used by CAD systems to route responders around construction. • MSP and local public safety agencies update GIS base maps for CAD systems with desired frequencies to keep information up-to-date. 	<ul style="list-style-type: none"> • All MSP vehicles have CAD/AVL, though the latest construction information is not always incorporated into the MSP CAD system. 	<ul style="list-style-type: none"> • Enhance CAD systems to incorporate current construction information into GIS maps. • Provide evacuation traffic management routing information to GIS maps for Metro and statewide population centers. • Dispatchers mainly use CAD pages, not 511 pages, thus there is a gap in understanding where some construction/road projects exist. 	<ul style="list-style-type: none"> • MnDOT district maintenance is responsible to transmit construction data to MSP and local public safety agencies. • MSP and local public safety agencies are responsible to incorporate construction data into GIS and CAD. • MnDOT Maintenance-Emergency Management and MnDOT GIS Enterprise are responsible to incorporate and update evacuation traffic management data into GIS database. 	<ul style="list-style-type: none"> • This service includes interconnects between maintenance and construction centers and MSP dispatch centers. • GIS evacuation traffic management data includes interconnects between MnDOT and local EOCs. 	<ul style="list-style-type: none"> • None. CAD will store the most recent construction and GIS data. • Evacuation traffic management data will be archived for incident briefings, planning and training. 	
PSFT 08	Provide mobile data computers in emergency vehicles to provide real-time information	See information under PS01.						

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/Responsibility	Interconnect	Data Archive Need	Associated Service Package
PSFT 11	Provide wireless digital feed between patrol and emergency responder vehicles and dispatch centers	See information under PS01.						
PSFT 13	Provide real-time digital video recordings (DVR)	See information under PS01.						

Service Package PS03 – Emergency Vehicle Preemption

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/Responsibility	Interconnect	Data Archive Need	Associated Service Package
PSFT 02	Provide dynamic routing of emergency vehicles	See information under PS02.						
PSFT 06	Provide AVL to emergency vehicles	See information under PS01.						

Service Package PS04 – Mayday Notification

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/Responsibility	Interconnect	Data Archive Need	Associated Service Package
PSFT 03	Provide enhanced Mayday services	<ul style="list-style-type: none"> In-vehicle equipment automatically detect collision and drivers and passengers can manually initiate a request for emergency assistance and enables the responders to locate the vehicle, gather information about the incident, and determine the appropriate response. PSAP's and responders receive information from dispatch center to determine crash location and assess the crash severity to provide appropriate response. 	<ul style="list-style-type: none"> A Mayday system allowing a direct voice and data link from the vehicle to emergency dispatchers was tested in Southeastern Minnesota MnDOT has implemented enhancements to Mayday under Mayday Phase 2. MSP receives some OnStar data. 	<ul style="list-style-type: none"> Allow the system to process data and voice messages from commercial systems to provide automatic crash location and severity notification. Integrate other 3rd party Mayday service provider data into MSP and other local response agency CAD systems. 	<ul style="list-style-type: none"> PSAP's and responders are responsible to incorporate upgrades to the Mayday system and to operate and maintain it. Private Mayday providers are responsible to plan, design, operate, upgrade, and maintain their systems. 	<ul style="list-style-type: none"> Mayday system includes interconnects between in-vehicles equipment to Mayday service providers and dispatch centers. This service also includes interconnects between Mayday service providers and dispatch centers. 	<ul style="list-style-type: none"> Data will be archived for post-event briefing and future response analysis and training. Additional Mayday information provided by 3rd party providers will be archived. Additional archival resources required for this should be minor. 	

Service Package PS05 – Vehicle Emergency Response

No needs or services under this service package were identified by stakeholders.

Service Package PS06 – Incident Scene Pre-Arrival Staging Guidance for Emergency Responders

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/Responsibility	Interconnect	Data Archive Need	Associated Service Package
PSFT 02	Provide dynamic routing of emergency vehicles	See information under PS02.						
PSFT 06	Provide AVL to emergency vehicles	See information under PS01.						
PSFT 08	Provide mobile data computers in emergency vehicles to provide real-time information	See information under PS01.						
PSFT 11	Provide wireless digital feed between patrol and emergency responder vehicles and dispatch centers	See information under PS01.						
PSFT 13	Provide real-time digital video recordings (DVR)	See information under PS01.						

Service Package PS07 – Incident Scene Safety Monitoring

While monitoring incident scene safety is occurring in Minnesota, no needs or services under this service package were identified by stakeholders.

Service Package PS08 – Roadway Service Patrols

While there are roadway service patrols in Minnesota (e.g. MnDOT FIRST in the Metro area), no needs or services under this service package were identified by stakeholders.

Service Package PS09 – Transportation Infrastructure Protection

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/Responsibility	Interconnect	Data Archive Need	Associated Service Package
PSFT 04	Provide technology to monitor transportation infrastructure	<ul style="list-style-type: none"> MnDOT and local agencies use video or detection systems to monitor potential dangers or damage to critical infrastructure and provide alert information to other agencies and the public. Public safety agencies are alerted to suspicious behavior or threats to infrastructure. MnDOT maintenance, MSP, and local agencies are alerted to damage to infrastructure through bridge health monitoring systems and sensors. 	<ul style="list-style-type: none"> Video monitoring cameras are installed under bridges in Duluth for detecting suspicious activities. Video monitoring cameras are installed along the Mississippi River in St. Paul to monitor bridges and river activities. These cameras are monitored by St. Paul EOC. MnDOT uses thermal imaging technology for I-35W bridge health monitoring. 	<ul style="list-style-type: none"> Deploy and maintain cameras and detection equipment at critical infrastructure such as bridges and tunnels. Integrate automated monitoring/alerts with monitoring equipment at critical infrastructure. Gap in sharing state and local video feeds among agencies. Deploy cameras to increase building security. Operate and maintain I-35W bridge health monitoring system. 	<ul style="list-style-type: none"> MnDOT and Minnesota Dept. of Public Safety (DPS) are responsible to plan, design, construct, operate and maintain systems on State owned infrastructure. Local transportation and emergency management agencies are responsible to plan, design, construct, operate, and maintain their systems. 	<ul style="list-style-type: none"> Surveillance systems include interconnects between roadside monitoring equipment and transportation management centers; and between roadside monitoring equipment and emergency dispatch/communications centers. 	<ul style="list-style-type: none"> Live video should be "buffered" for a period of time to allow saving video of interest after the fact. Video should not be permanently saved due to data practices considerations as well as storage requirements. Alerts and video of interest should be saved and cataloged for post-event briefings, training and analysis. 	<ul style="list-style-type: none"> PS11

Service Package PS10 – Wide-Area Alert

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/ Responsibility	Interconnect	Data Archive Need	Associated Service Package
PSFT 10	Provide ability to remotely post AMBER alert information on DMS	<ul style="list-style-type: none"> • Authorized DPS staff activates AMBER alerts • MnDOT and MSP personnel receive information and post AMBER alerts on DMS remotely. • The public view AMBER Alert messages on DMS and electronic billboards to look for wanted vehicles and contact law enforcement. 	<ul style="list-style-type: none"> • DPS activates AMBER alerts and notify the AMBER alert team including MnDOT. • MnDOT RTMC and SRCC operators post AMBER alert messages on DMS. 	<ul style="list-style-type: none"> • Allow remote access to control DMS. • Post other emergency messages on DMS (i.e. tornadoes, etc.) in a similar manner 	<ul style="list-style-type: none"> • MnDOT is responsible to plan, design, implement, operate and maintain the system to remotely control DMS. 	<ul style="list-style-type: none"> • The system includes interconnects between DMS roadside equipment and laptop computers/ mobile devices with DMS control software. 	<ul style="list-style-type: none"> • DMS activation and AMBER alert information should be logged. 	

Service Package PS11 – Early Warning System

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/ Responsibility	Interconnect	Data Archive Need	Associated Service Package
PSFT 04	Provide technology to monitor transportation infrastructure	See information under PS09.						

Service Package PS12 - Disaster Response and Recovery

Disaster response and recovery planning and coordination activities are occurring in Minnesota, but no ITS needs and services were identified by stakeholders.

Service Package PS13 – Evacuation and Reentry Management

Evacuation and reentry management activities are occurring in Minnesota, but no ITS services to address needs were identified by stakeholders. Evacuation and reentry information for evacuations is addressed in Service Package PS14.

Service Package PS14 – Disaster Traveler Information

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/Responsibility	Interconnect	Data Archive Need	Associated Service Package
PSFT 09	Provide emergency/evacuation and reentry information	<ul style="list-style-type: none"> Evacuation and reentry information is disseminated through SEOC, County EOCs, RTMC, SRCC, 511, local dispatch centers, transit dispatch centers, and other traveler information systems to keep travelers away from dangerous conditions and to reduce and improve safety congestion during evacuation and reentry. Travelers use this service to determine time to travel and routes to take during evacuation and reentry. 	<ul style="list-style-type: none"> DPS operates the SEOC and provides information to transportation agencies, public safety agencies, and media. MnDOT provides information to public via traveler information systems including 511, DMS, and advisory radio (HAR, LPFM, KBEM, etc.). MnDOT provides web-based camera feeds as available for other agencies and eventually the public). Local agencies disseminate information via web sites, DMS, and other communication channels (such as cable TV). 	<ul style="list-style-type: none"> Enhance evacuation/reentry simulations to provide better information. Develop systems to recommend alternate routes based on real-time information and historic travel information. MnDOT plans to provide information through In-vehicle capabilities (VII) in future. Gap in center-to-center and/or information sharing 	<ul style="list-style-type: none"> Agency in charge of incident will work with DPS and MnDOT will determine evacuation and reentry information and using traveler information systems (including DMS, HAR, 511, web sites, and media) to distribute the information to travelers. 	<ul style="list-style-type: none"> This service includes interconnects between centers (SEOC, County EOCs, the RTMC, and SRCC) and, traveler information systems roadside equipment, media, and private traveler information providers. 	<ul style="list-style-type: none"> Evacuation/reentry information will be archived for post-event debriefings, training, and event analysis. Stakeholders would want detector, cameras, etc. data for post-event debriefing and management. 	

Other Service Package: DM01 – ITS Data Warehouse¹

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/Responsibility	Interconnect	Data Archive Need	Associated Service Package
PSFT 12	Implement automated field reporting system	<ul style="list-style-type: none"> • MSP troopers, local law enforcement, and local fire/EMS agencies use this system to reduce the time for incident reporting and citation issuance, and increase data accuracy. • This system can also include license swipe technology that allow the use of a portable license reading device to pull up driver information in real-time without manually entering information. 	<ul style="list-style-type: none"> • A license swipe system has been implemented. • An electronic reporting system is currently being deployed. • Electronic citation system has been implemented to reduce paperwork process of issuing citations. 	<ul style="list-style-type: none"> • Implement an electronic reporting system that is similar to TraCS used in Iowa. 	<ul style="list-style-type: none"> • MSP and local public safety agencies are responsible to coordinate with each other to plan, design, construct, operate and maintain the automated field reporting system. 	<ul style="list-style-type: none"> • Automated reporting systems include interconnects between in-vehicle equipment and central reporting system. • Systems also include interconnects between handheld devices and a central reporting systems/ databases. 	<ul style="list-style-type: none"> • This system will automate the data entry and archiving process and will not generate new data which is not already being archived. 	
PSFT 13	Provide real-time digital video recordings (DVR)	See information under PS01.						

¹ See Volume 1 – Data Management Service Package Area for the description of DM01- ITS Data Warehouse.

Other Service Package: VS01 – Autonomous Vehicle Safety Systems²

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/Responsibility	Interconnect	Data Archive Need	Associated Service Package
PSFT 14	Develop systems to counter distracted driving by either in vehicle or external notification	<ul style="list-style-type: none"> In-vehicle systems detect distracted driving and provide in vehicle warnings to drivers. Systems detect distracted driving and provide alerts to distracted drivers and other drivers via in-vehicle alerts and/or roadside infrastructure-based alerts. 	<ul style="list-style-type: none"> Systems capable of detecting distracted driving are under development and have not been tested or deployed in Minnesota. 	<ul style="list-style-type: none"> Research, develop and test systems to counter distracted driving. 	<ul style="list-style-type: none"> USDOT, vehicle manufacturers and private industry are responsible to research, develop and test systems for distracted driving detection and alerting. 	<ul style="list-style-type: none"> Systems may include interconnects between in-vehicle equipment and roadside warning equipment. 	<ul style="list-style-type: none"> Distracted driving data should be archived to study when it is being detected most frequently. 	<ul style="list-style-type: none"> VS02 TM17

Other Service Package: VS02 – V2V Basic Safety³

ID	Need/Service	Operational Concept	Existing Capability	Gap/Planned Enhancement	Role/Responsibility	Interconnect	Data Archive Need	Associated Service Package
PSFT 14	Develop systems to counter distracted driving by either in vehicle or external notification	See information under VS01.						

² See Volume 8 – Vehicle Safety Service Package Area for the description of VS01- Autonomous Vehicle Safety Systems.

³ See Volume 8 – Vehicle Safety Service Package Area for the description of VS02- V2V Basic Safety.

Appendix D: Public Safety Service Packages and Descriptions

The descriptions of Public Safety (PS) service packages are taken directly from ARC-IT version 8.2.

PS01 Emergency Call-Taking and Dispatch

This service package provides basic public safety call-taking and dispatch services. It includes emergency vehicle equipment, equipment used to receive and route emergency calls, and wireless communications that enable safe and rapid deployment of appropriate resources to an emergency. Coordination between Emergency Management Centers supports emergency notification between agencies. Wide area wireless communications between the Emergency Management Center and an Emergency Vehicle supports dispatch and provision of information to responding personnel.

PS02 Routing Support for Emergency Responders

This service package provides information to support dynamic routing of emergency vehicles. Traffic information, road conditions, and weather advisories are provided to enhance emergency vehicle routing. The Emergency Management Center provides routing information based on real-time conditions and has the option to request an ingress/egress route from the Traffic Management Center.

PS03 Emergency Vehicle Preemption

This service package provides signal preemption for public safety first responder vehicles. Both traditional signal preemption systems and new systems based on connected vehicle technology are covered. In more advanced systems, movement of public safety vehicles through the intersection can be facilitated by clearing queues and holding conflicting phases. In addition, this SP also covers the transition back to normal traffic signal operations after providing emergency vehicle preemption.

PS04 Mayday Notification

This service package provides the capability for a vehicle to automatically transmit an emergency message when the vehicle has been involved in a crash or other distress situation. An automatic crash notification feature transmits key data on the crash recorded by sensors mounted in the vehicle (e.g. deployment of airbags) without the need for involvement of the driver. The emergency message is sent to emergency response services, which determines and carries out the appropriate response. This service package allows passing vehicles to receive and forward mayday requests in areas where no communications infrastructure exists. Emergency notifications from personal devices are also supported.

PS05 Vehicle Emergency Response

The Vehicle Emergency Response service package provides arriving public safety vehicles with information from connected vehicles involved in a crash. Emergency responders need information about the vehicles involved in a crash to respond safely and effectively to the vehicle crash. Information such as HAZMAT data can assist the responders. Information about air bag activations and other measures indicating the severity of the crash can provide useful input to ambulance staff. In addition information about the power system of the vehicle (e.g. hybrid, electric, or internal combustion engine) can affect the response.

PS06 Incident Scene Pre-Arrival Staging Guidance for Emergency Responders

This service package will provide situational awareness to and coordination among emergency responders - upon dispatch, while en route to establish incident scene work zones, upon initial arrival and staging of assets, and afterward if circumstances require additional dispatch and staging. It collects a variety of data from emergency, traffic, and maintenance centers. It includes a vehicle and equipment staging function that supplies the en-route responders with additional information about the scene of an incident that they can use to determine where to stage personnel and equipment prior to their arrival on-scene. The service package also includes a dynamic routing function which provides emergency responders with real-time navigation instructions to travel from their base to the incident scene, accounting for traffic conditions, road closures, and snowplow reports if needed. In addition it includes an emergency responder status reporting function which continuously monitors the location of the en-route responder vehicles as well as the vehicles already on-scene. The function develops and maintains the current position of the responder's vehicles and provides updates for estimated time of arrival (ETA).

PS07 Incident Scene Safety Monitoring

This service package employs communications technologies to provide warnings and alerts relating to incident zone operations. One aspect of the service is an in-vehicle messaging system that provides drivers with merging and speed guidance around an incident. Another aspect is providing in-vehicle incident scene alerts to drivers, both for the protection of the drivers as well as incident zone personnel. A third aspect is a warning system for on-scene workers when a vehicle approaching or in the incident zone is being operated outside of safe parameters for the conditions.

PS08 Roadway Service Patrols

This service package supports roadway service patrol vehicles that monitor roads and aid motorists, offering rapid response to minor incidents (flat tire, accidents, out of gas) to minimize disruption to the traffic stream. If problems are detected, the roadway service patrol vehicles will provide assistance to the motorist (e.g., push a vehicle to the shoulder or median). The service package monitors service patrol vehicle locations and supports vehicle dispatch to identified incident locations. Incident information collected by the service patrol is shared with traffic, maintenance and construction, and traveler information systems.

PS09 Transportation Infrastructure Protection

This service package includes the monitoring of transportation infrastructure (e.g., bridges, tunnels and management centers) for potential threats using sensors and surveillance equipment and barrier and safeguard systems to control access, preclude an incident, and mitigate the impact of an incident if it occurs. Threats can result from acts of nature (e.g., hurricanes, earthquakes), terrorist attacks or other incidents causing damage to the infrastructure (e.g., stray barge hitting a bridge support). Infrastructure may be monitored with acoustic, environmental threat (such as nuclear, biological, chemical, and explosives), infrastructure condition and integrity, motion and object sensors and video and audio surveillance equipment. Data from such sensors and surveillance equipment may be processed in the field or sent to a center for processing. The data enables operators at the center to detect and verify threats. When a threat is detected, agencies are notified. Detected threats or advisories received from other agencies result in an increased level of system preparedness. In response to threats, barrier and safeguard systems may be activated to deter an incident, control access to an area or mitigate the impact of an incident. Barrier systems include gates, barriers and other automated and remotely controlled systems that manage entry to transportation infrastructure. Safeguard systems include blast shields, exhaust systems and other automated and remotely controlled systems that mitigate impact of an incident.

PS10 Wide-Area Alert

This service package uses ITS driver and traveler information systems to alert the public in emergency situations such as child abductions, severe weather events, civil emergencies, and other situations that pose a threat to life and property. The alert includes information and instructions for transportation system operators and the traveling public, improving public safety and enlisting the public's help in some scenarios. The ITS technologies will supplement and support other emergency and homeland security alert systems such as the Emergency Alert System (EAS). When an emergency situation is reported and verified and the terms and conditions for system activation are satisfied, a designated agency broadcasts emergency information to traffic agencies, transit agencies, information service providers, toll operators, and others that operate ITS systems. The ITS systems, in turn, provide the alert information to transportation system operators and the traveling public using ITS technologies such as dynamic message signs, highway advisory radios, in-vehicle displays, transit displays, 511 traveler information systems, and traveler information web sites.

PS11 Early Warning System

This service package monitors and detects potential, looming, and actual disasters including natural disasters (hurricanes, earthquakes, floods, winter storms, tsunamis, etc.) and technological and man-made disasters (hazardous materials incidents, nuclear power plant accidents, and acts of terrorism including nuclear, chemical, biological, and radiological weapons attacks). The service package monitors alerting and advisory systems, ITS sensors and surveillance systems, field reports, and emergency call-taking systems to identify emergencies and notifies all responding agencies of detected emergencies.

PS12 Disaster Response and Recovery

This service package enhances the ability of the surface transportation system to respond to and recover from disasters. It addresses the most severe incidents that require an extraordinary response from outside the local community. All types of disasters are addressed including natural disasters (hurricanes, earthquakes, floods, winter storms, tsunamis, etc.) and technological and man-made disasters (hazardous materials incidents, nuclear power plant accidents, and national security emergencies such as nuclear, chemical, biological, and radiological weapons attacks).

The service package supports coordination of emergency response plans, including general plans developed before a disaster as well as specific tactical plans with short time horizon that are developed as part of a disaster response. The service package provides enhanced access to the scene for response personnel and resources, provides better information about the transportation system in the vicinity of the disaster, and maintains situation awareness regarding the disaster itself. In addition, this service package tracks and coordinates the transportation resources - the transportation professionals, equipment, and materials - that constitute a portion of the disaster response.

The service package identifies the key points of integration between transportation systems and the public safety, emergency management, public health, and other allied organizations that form the overall disaster response. In this service package, the Emergency Management Center represents the federal, regional, state, and local Emergency Operations Centers and the Incident Commands that are established to respond to the disaster. The interface between the Emergency Management Center and the other centers provides situation awareness and resource coordination among transportation and other allied response agencies. In its role, traffic management implements special traffic control strategies and detours and restrictions to

effectively manage traffic in and around the disaster. Maintenance and construction provides damage assessment of road network facilities and manages service restoration. Transit management provides a similar assessment of status for transit facilities and modifies transit operations to meet the special demands of the disaster. As immediate public safety concerns are addressed and disaster response transitions into recovery, this service package supports transition back to normal transportation system operation, recovering resources, managing on-going transportation facility repair, supporting data collection and revised plan coordination, and other recovery activities.

This service package builds on the basic traffic incident response service that is provided by TM08, the Traffic Incident Management service package. This service package addresses the additional complexities and coordination requirements that are associated with the most severe incidents that warrant an extraordinary response from outside the local jurisdictions and require special measures such as the activation of one or more emergency operations centers. Many users of ARC-IT will want to consider both TM08 and this service package since every region is concerned with both day-to-day management of traffic-related incidents and occasional management of disasters that require extraordinary response.

Disaster Response and Recovery is also supported by PS14, the "Disaster Traveler Information" service package that keeps the public informed during a disaster response. See that service package for more information.

PS13 Evacuation and Reentry Management

This service package supports evacuation of the general public from a disaster area and manages subsequent reentry to the disaster area. The service package addresses evacuations for all types of disasters, including disasters like hurricanes that are anticipated and occur slowly, allowing a well-planned orderly evacuation, as well as disasters like terrorist acts that occur rapidly, without warning, and allow little or no time for preparation or public warning.

This service package supports coordination of evacuation plans among the federal, state, and local transportation, emergency, and law enforcement agencies that may be involved in a large-scale evacuation. All affected jurisdictions (e.g., states and counties) at the evacuation origin, evacuation destination, and along the evacuation route are informed of the plan. Information is shared with traffic management agencies to implement special traffic control strategies and to control evacuation traffic, including traffic on local streets and arterials as well as the major evacuation routes. Reversible lanes, shoulder use, closures, special signal control strategies, and other special strategies may be implemented to maximize capacity along the evacuation routes. Transit resources play an important role in an evacuation, removing many people from an evacuated area while making efficient use of limited capacity. Additional shared transit resources may be added and managed in evacuation scenarios. Resource requirements are forecast based on the evacuation plans, and the necessary resources are located, shared between agencies if necessary, and deployed at the right locations at the appropriate times.

Evacuations are also supported by PS14, the "Disaster Traveler Information" service package, which keeps the public informed during evacuations. See that service package for more information.

PS14 Disaster Traveler Information

This service package uses ITS to provide disaster-related traveler information to the general public, including evacuation and reentry information and other information concerning the operation of the transportation system during a disaster. This service package collects information from multiple sources including traffic, transit, public safety, emergency management, shelter provider, and travel service provider organizations. The collected information is processed and the public is provided with real-time disaster and evacuation information using ITS traveler information systems.

A disaster will stress the surface transportation system since it may damage transportation facilities at the same time that it places unique demands on these facilities to support public evacuation and provide access for emergency responders. Similarly, a disaster may interrupt or degrade the operation of many traveler information systems at the same time that safety-critical information must be provided to the traveling public. This service package keeps the public informed in these scenarios, using all available means to provide information about the disaster area including damage to the transportation system, detours and closures in effect, special traffic restrictions and allowances, special transit schedules, and real-time information on traffic conditions and transit system performance in and around the disaster.

This service package also provides emergency information to assist the public with evacuations when necessary. Information on mandatory and voluntary evacuation zones, evacuation times, and instructions are provided. Available evacuation routes and destinations and current and anticipated travel conditions along those routes are provided so evacuees are prepared and know their destination and preferred evacuation route. Information on available transit services and traveler services (shelters, medical services, hotels, restaurants, gas stations, etc.) is also provided. In addition to general evacuation information, this service package provides specific evacuation trip planning information that is tailored for the evacuee based on origin, selected destination, and evacuee-specified evacuation requirements and route parameters.

This service package augments the Traveler Information (TI) service packages that provide traveler information on a day-to-day basis for the surface transportation system. This service package provides focus on the special requirements for traveler information dissemination in disaster situations.