

Communicating with the Public Using ATIS During Disasters

Concept of Operations



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The Business of Innovation



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16. Abstract <p>This document is part of a study on “Communicating with the Public Using ATIS during Disasters” being conducted by Battelle for the Federal Highway Administration (FHWA) Office of Operations and the U.S. DOT ITS Joint Program Office. The purpose of the study is to examine what information needs to be communicated to evacuees and other travelers under disaster conditions and how the advanced traveler information system (ATIS) assets of a state’s department of transportation (DOT) or other transportation agency can be effectively used to deliver such information.</p> <p>This document details a concept of operations for dissemination of information to the traveling public during disaster events. The concept of operations report is intended to illustrate how agencies need to interface with each other and what data and information need to be shared to effectively manage and deliver traveler information during disasters.</p>					
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List of Acronyms

AIAA	American Institute of Aeronautics and Astronautics
ANSI	American National Standards Institute
ATIS	Advanced Traveler Information Systems
CCTV	Closed-Circuit Television
DEM	Department of Emergency Management
DHS	Department of Homeland Security
DMS	Dynamic Message Sign
DOT	Department of Transportation
DPS	Department of Public Safety
EOC	Emergency Operations Center
EMS	Emergency Management Service
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
HAR	Highway Advisory Radio
IC	Incident Commander
ICS	Incident Command System
IEEE	Institute of Electrical and Electronics Engineers
IVR	Interactive Voice Response
JIC	Joint Information Center
MPO	Metropolitan Planning Organization
PIO	Public Information Officer
TMC	Transportation Management Center
UCS	Unified Command Structure

1.0 Introduction

This document is part of a study on “Communicating with the Public Using ATIS during Disasters” being conducted by Battelle for the Federal Highway Administration (FHWA) Office of Operations and the U.S. DOT ITS Joint Program Office. The purpose of the study is to examine what information needs to be communicated to evacuees and other travelers under disaster conditions and how the advanced traveler information system (ATIS) assets of a state’s department of transportation (DOT) or other transportation agency can be effectively used to deliver such information.

This document details a concept of operations for dissemination of information to the traveling public during disaster events. The concept of operations report is intended to illustrate how agencies need to interface with each other and what data and information need to be shared to effectively manage and deliver traveler information during disasters. It will encompass the major systems and operational roles and responsibilities of participating agencies included in the delivery of traveler information during disasters in various environments. The concept of operations is intended to address who, what, when, where, why and how the system needs to operate to deliver critical and useful information to the public using available ATIS during major no-notice events or disasters. Addressing and documenting this type of information has become even more critical due to the aftermath of various types of disasters that have occurred in the United States in the past several years ranging from major hurricanes, floods, earthquakes, wildfires and the post-9/11 threat of terrorism. However, it is important to note that the focus of this concept of operations is on no-notice types of disasters. Based on the knowledge gained from various sources and documentation, a common definition for a disaster has been applied to this study and includes the following characteristics:

- Suddenness – unforeseen, unpredictable
- Scale – has large impact and involves a large part of the public
- Institutional response – beyond the normal capacity for coping; involves many institutions
- Prolonged duration of effect – impact does not quickly dissipate
- Uncertainty in behavioral response – outside of normal range of experience.

This document provides an overview of the various stakeholders, their roles and responsibilities, the type of information exchanged between them, some operational needs and requirements, and a system overview for agencies that need to communicate with the public using traveler information mechanisms during disasters as characterized above.

This document is NOT intended to serve as an emergency response plan or an incident management plan nor detail an operational concept for a specific system or program. It is, however, assumed that it will serve as a guide and a template for developing these types of documents.

The basis for the development of the concept of operations includes several reports conducted as part of the overall study on how agencies communicate with the public using ATIS during

disasters¹. This document will also be used for reviewing functional requirements currently in the National ITS Architecture and developing additional requirements where necessary.

1.1 Organization of the Document

The remainder of this chapter discusses the purpose, approach, goals and objectives of the document and an overall vision for the concept. This chapter concludes with a discussion of the intended audience and a list of references used in developing the document.

- Chapter 2 provides details on the stakeholders and discusses a user-oriented description, the organizational structure, and interrelationships among them. This chapter also describes an existing concept of operations system overview.
- Chapter 3 focuses on the operational needs and requirements associated with disseminating information to the public during disasters.
- Chapter 4 outlines the components of an ideal system drawing upon and enhancing the existing system described in Chapter 2.
- Chapter 5 discusses operational concept examples for an urban disaster and a rural disaster.
- Chapter 6 provides a brief conclusion.

1.2 Purpose of the Document

The purpose of this concept of operations document is to provide a high-level system overview of who, what, when, where, why, and how agencies and data need to interact and operate to deliver appropriate and necessary traveler information to the public during disasters using ATIS devices and mechanisms. Its purpose is also to provide a vision for the current and future systems through an architectural view of system and subsystem level interactions and interfaces along with ensuring that it is suitable for both metropolitan/urban and rural areas. The document will also describe roles and responsibilities associated with participating agencies and people and serve as a source to collect and verify functional requirements that can be used as a basis to develop system design plans for specific project needs. It is envisioned that this document will be a “living” document that will enable updates and future enhancements.

1.3 Context

It is important that the reader understands that this document does not encompass all the variations and context settings on to whom, how and what information gets delivered to the public during the timeline of a disaster (pre-event, during the event, and post event). The variations evoke the concept of operations to be developed in many ways, and it is very difficult

¹ Documents include a review of literature on the delivery of information during disasters, findings from five case studies, and a review of literature and practitioner experience related to the delivery of information to assist travelers during typical traffic incidents and planned special events.

to comprehensively document that in one report. Based on the knowledge gathered, the different contexts can be summarized as:

- **Types of Disasters** – For the purposes of this document, disasters are defined as sudden, no-notice events of prolonged duration caused through a natural or man-made means and requiring an institutional and behavioral response beyond the norm. The following are examples of disasters that fit this definition: tornados, earthquakes, forest fires, tsunamis, flash flooding, chemical releases and biological events. These events can occur in either a rural or urban setting.
- **Agency Organization** – There are many different approaches to organizing public agencies, and specifically transportation agencies. For example, some have a very strong centralized approach, while others do not. Additionally, the geographic area of responsibility may also vary. For example, some DOTs maintain all road types from interstates to local roads, while some are more limited. Furthermore, some agencies that operate ATIS are not transportation agencies at all, as in the case of some multi-agency organizations or metropolitan planning organizations that act as information collectors and disseminators. The focus of this document is not on who the ATIS operator is, but rather what it does in the context of providing information during extreme situations.
- **Centralized vs. Decentralized Traveler Information** – There are divergent approaches to providing traveler information across transportation agencies. The two basic approaches are centralized, with all decisions and dissemination tools controlled in one location, versus decentralized, where a state is broken into fairly autonomous districts or regions, each having significant control over the resources available, including ATIS. As each approach is common and accepted practice, this document does not address this topic.
- **Relationships with Private Media** – The private media, typically broadcast radio and television, have differing relationships with public sector ATIS operators. In some locations, the media are recognized as key providers of information to travelers on a daily basis. In these instances, media outlets are often provided data feeds and video feeds, and may have reporting desks at regional or statewide transportation management centers (TMCs). Conversely, other ATIS operators do not have the same level of interaction or relationship with the media, especially on a daily basis.
- **Unified Command Structure** – For this document, it is assumed that readers are familiar with, and/or have direct experience with, the Unified Command Structure (UCS). This approach to incident management is not a new concept, and thus, the details of it are not fully described in this document. The UCS is recognized as the accepted organizational structure for handling large-scale incidents and disasters that involve multiple agencies and organizations.

Within this context, this document is intended to serve as a starting point to assist and guide in the development of detailed lower-level descriptions of different systems along with functional requirements and design specifications.

1.4 Approach

The approach for developing the concept of operations for disaster information dissemination was a workshop that convened a panel of subject matter experts. The expert panel consisted of seventeen individuals drawn from transportation, transit, regional planning or coordinating organizations, police, fire, emergency management, and private sector traveler information providers. Appendix A provides a list of participants who attended the workshop. The objective of the workshop, held in Houston, Texas, in October of 2005, was to synthesize diverse but pertinent expertise into a high-level concept of operations as the basis for the planning and management of traveler information during disasters. The panel provided their perspectives on operational roles and responsibilities and information flows leading to effective information delivery.

Additionally, a facilitated discussion was organized around disaster scenarios to examine issues surrounding the concept of operations. Scenarios included both urban and rural conditions for collection and dissemination of information and were based on case study sites that were conducted earlier as part of the overall project.

The types of issues examined during the workshop discussions included:

- What information is needed, by whom, when, and how?
- How does information currently flow among the parties that generate or use information?
- How does the type of disaster affect the information needed and how it flows?
- Are there sufficient means/mechanisms currently available to provide accurate and timely information to the public? What has been successfully used and what has not worked?
- What are the procedures that agencies follow to gather, coordinate, and disseminate information in normal situations and how does that differ in disaster situations?
- What is the protocol that agencies follow for providing information to the media and the public? Is information always relayed through a public information officer (PIO) or Joint Information Center (JIC)?
- What problems arise with regard to information and how are they resolved, such as miscommunication, rumor control, inconsistent information, and delayed information?
- Are there agreements in place that describe the roles and responsibilities of agencies regarding information dissemination during major disasters?
- Are there ways in which DOT's ATIS assets can serve the purpose of other agencies involved in the response? How would this be coordinated?

The results of the discussion of the scenarios at the workshop were used in the development of a concept of operations. The concept of operations was reviewed by the panel members and modified as appropriate. It will serve as input to support the currently identified functional requirements in the National ITS Architecture and to guide the next steps of the overall project.

1.5 Goals and Objectives

The overall goal of the project is to have systems in place throughout the country that can effectively provide information to travelers during a disaster situation. The objective of this document is to provide assistance and guidance to regions and individual agencies as they develop traveler information systems with a specific focus on traveler information dissemination during disasters. This includes both natural and manmade disasters in both urban and rural settings.

1.6 Overall Vision

The vision is that there would be systems in place throughout the country with appropriate coverage to provide useful traveler information during a disaster situation. Traveler information is disseminated to the public in a variety of ways that are controlled by both public and private entities. As comprehensive ATIS systems are developed, they would reach as much of the impacted population as possible and provide consistent and concise information regarding disaster-related travel and other information as appropriate. Information would be focused on those in the immediate disaster area as well as those in the surrounding areas that may be impacted.

1.7 Audience

Based on the intelligence gathered from the previous task reports in the project, it is intended that the principal target audience for this document will be transportation agencies and other emergency planning and response agencies in the public sector, as they are responsible for developing and implementing a system for communicating with the public during disasters. These public sector agencies include:

- Transportation agencies/authorities
 - State DOTs
 - Turnpike/Toll
 - Regional MPOs
 - City and County transportation departments
 - Transit and other modes (i.e., trucking)
- Police (State and local)
- Emergency management
- Fire departments.

Another important audience for the document will be the private organizations that are also involved in delivering information to the public, including those that currently provide traveler information over the Internet, radio and television broadcast, and other means (e.g., OnStar). There also will be intermediaries for the document, such as associations like AAA and convention and tourism bureaus that represent targeted audiences, and those intermediaries should also be recipients of the guidance so they can disseminate it to their memberships.

1.8 Referenced Documents

Several documents, reports, and guides were used as references in developing this concept of operations. These documents are listed below:

- Guide for the Preparation of Operations Concept Documents (ANSI/AIAA G-043-1992)
- IEEE Guide for Information Technologies – System Definition – Con Ops Document (IEEE 1362-1998)
- Developing and Using a Concept of Operations in Transportation Management Systems, FHWA (December 2004)
- Concept of Operations for Emergency Transportation Operations, FHWA (January 2004)
- iFlorida Concept of Operations (September 2003)
- CLARUS Concept of Operations (June 2005).

2.0 Operator Oriented Description

This chapter describes a typical system in place to disseminate traveler information during a disaster from the vantage point of the ATIS operator, generally a public agency. The operator description includes discussion of the following items:

- Operators and the activities they perform at a high level
- Generalized organizational structure and chain of command
- A general timeline of activities
- Capabilities of a typical ATIS
- Existing structure of information dissemination during a disaster.

2.1 Operators and the Activities they Perform at a High Level

Public agencies most commonly are the operators of an ATIS that is used during disaster events. However, those agencies range greatly in their size, impact on the process and overall level of involvement. They also range across the federal, state, regional and local levels of government.

Transportation Agencies – State DOTs or regional transportation operations control the ATIS assets in a given region. However, even within those organizations, there are multiple subgroups that may have relevant roles. These subgroups typically include TMCs, field/maintenance staff and public affairs staff. The transportation agencies tend to have a dynamic role based on the timeline of the event. These roles can range from an early responder to the event, through supporting the lead agency or incident commander, to managing post-event transportation and possibly the return of an evacuated population.

On-scene Incident Commander via Unified Command Structure – For every event of significance, an Incident Commander assumes the on-scene leadership role to assess the situational status and provide initial direction for assets and often controls the initial release of information to other agencies and to the media. The Incident Commander (typically a high-ranking state police officer or fire chief) works with transportation agencies, when appropriate, to manage traffic and information that impacts the immediate area of the disaster's impact.

State Department of Public Safety (DPS) or State Department of Emergency Management (DEM) – The state DPS or DEM activates an Emergency Operations Center (EOC) for major events or disasters, which is designed to function as the main collection point of information for multiple agencies and decision making. It is this body that typically passes information along to the Joint Information Center (JIC) for message development and dissemination to the public.

Federal Agencies – A large-scale disaster or terrorist event will trigger a response by one or more federal agencies, either within the Department of Homeland Security (DHS), including the Federal Emergency Management Agency (FEMA), or the Department of Justice, which includes the Federal Bureau of Investigation (FBI). These agencies tend to play a coordinating or investigative role after the disaster has taken place, and after local and state agencies' initial response to the event.

Travel Information Services and Media Outlets – Though the media and private sector information providers are not true “users” of the ATIS, they are clearly part of the information dissemination mechanism, and, in some locations, are enveloped more directly in the process. This occurs by having a consistent, known and respected presence at a TMC or EOC. By knowing how the entire process works and knowing the key “users,” the private sector is viewed as part of the solution and generally is the most important conduit for distributing information through radio and television reports.

2.2 Generalized Organizational Structure and Chain of Command

During a disaster, the organizational structure and chain of command, and thus the control over what information is disseminated and when, change over time as the needs and conditions of the emergency change. In addition, that same command or control may depend on the specific type of event itself (scale, location, expected duration, etc.), as it depends on the activity itself. This seamless coordination that goes into effect once an emergency has been identified is in fact dormant until necessary.

At the onset of a disaster, or during early detection, most agencies are performing their standard daily duties. For the transportation agency that controls the various ATIS and detection devices, standard information is being provided at this time. Immediately upon detection of an event, the ATIS operator will first determine if there has been any direct impact to the transportation for which it is responsible and will report any critical information to the public, such as roads being impassable in a certain area.

In response to the event, the incident responders will establish an on-scene commander through the unified command structure. At that time, the Incident Commander is in charge of all operations necessary to manage the event. This can include public communications to the media. The ATIS operator is disseminating information based on the Incident Commander’s decisions and/or with his guidance. In particular, this may include detours or evacuation/shelter-in-place advice for a specified area. The transportation agency’s field staff will also be involved in setting up an official detour, which may involve the use of portable dynamic message signs (DMS).

Upon initial assessment of the event, the EOC and JIC are established as planned and practiced across multiple agencies, which include the state and/or local transportation agencies, as well as public information specialists. During this phase, the ATIS operating agency primarily serves in an advisory capacity as information is tightly controlled via the JIC in conjunction with the EOC and Incident Commander. An issue that has the potential for conflict is local EOC decisions being impacted, or in some cases overruled, by state EOC decisions. State and local authorities need to decide in advance of a disaster which agency takes precedence. Elements that would go into making that distinction include deciding if the people closest to the disaster have a better capacity to make decisions, or if those who are farther away and might see more of “the big picture” should take the lead.

During the recovery phase of the event, which may include assisting evacuees with travel decisions, the ATIS operator will continue to assist the EOC by disseminating various messages regarding the availability of transportation facilities throughout the region, general travel advice, and recommended routes. The ATIS operator will continue to monitor and manage transportation in the remaining area not directly impacted by the event.

2.3 General Timeline of Activities

Operations during a disaster for an ATIS operator can be divided into phases based on a timeline of events and/or which organization is in command:

- Event detection – the detection function is performed by numerous agencies and the general public. Detection can include the DOT staff, who typically report an event to the local 911 center first and then may report it to the ATIS operator, who in turn can report any known impacts on the transportation network they have observed or expect.
- General alert/notification of an event to agency(ies) – in most instances, after an event is detected it must be verified. After verification, all necessary agencies are notified of the event and asked to respond appropriately. For the ATIS operator, this may include posting preliminary information on DMS, website, and other available channels to inform the public and internal staff of an event. In urban settings, ATIS operators may be located in more than one facility, and therefore must recognize the need to communicate with each other so that a consistent message is disseminated between agencies. However, even multiple ATIS operators in one region should be receiving information directly from the JIC.
- Dissemination of information to the public – the information provided to the public can cover many topics given the specific type, its location, time of day, etc. Key information to provide includes but is not limited to the following: whether or not persons need to evacuate an area; if the transportation infrastructure is impacted in any way (is a bridge impassable, are all modes operating?); and if the transportation network is impacted, the public (and other agencies) need to know what other options or detours are available.
- State or local transportation agency support as directed depending on event – during a large-scale event, the ATIS operator, and transportation agencies in general, typically act in a supporting role to the Incident Commander, or EOC, who may solicit input on controlling the event through better traffic management, setting up detours, and using all available tools to provide actionable information to the public.

2.4 Capabilities of an ATIS

Advanced traveler information systems have a variety of dissemination tools available, each meeting a range of needs. A typical ATIS may consist of the following components:

- Website – good for disseminating information to people within the impacted area, those outside of the impacted area, or for informing evacuees of information regarding when and how they should return. Websites are also useful in providing video images to confirm roadway conditions.
- 511 or other call-in telephone systems – best for persons seeking specific information about roadways pre-trip, or during their travel, as conditions and recommendations may be highly dynamic.
- Push technologies – Reverse 911, email, pager and text alerts – these are best for alerting those unaware of a situation and/or those wanting immediate updates without making specific informational queries.
- Private-sector travel information – these services typically collect and disseminate information produced by the public sector, but also have the ability to add privately collected information, which may offer a more comprehensive picture of the event and its impacts. This information is often available across the general media, websites and through push technologies, though there may be an associated fee in some markets.
- Radio and TV media – used as an informational outlet, these media reach the widest group of the population and through multiple channels, whether from home, office or mobile devices.

2.5 Existing System for Disseminating Information

With the above listed ATIS capabilities documented, though not all are available everywhere, the documentation of the existing system or process is developed below.

During the workshop, a baseline model for information dissemination was presented to the group for comment. The information provided by the attendees was collected and added to the original model to create an accurate depiction of a range of existing information dissemination processes. Though generic, Figure 1 shows the relationships across multiple activities required to take place during a disaster to get information out to those who need it.

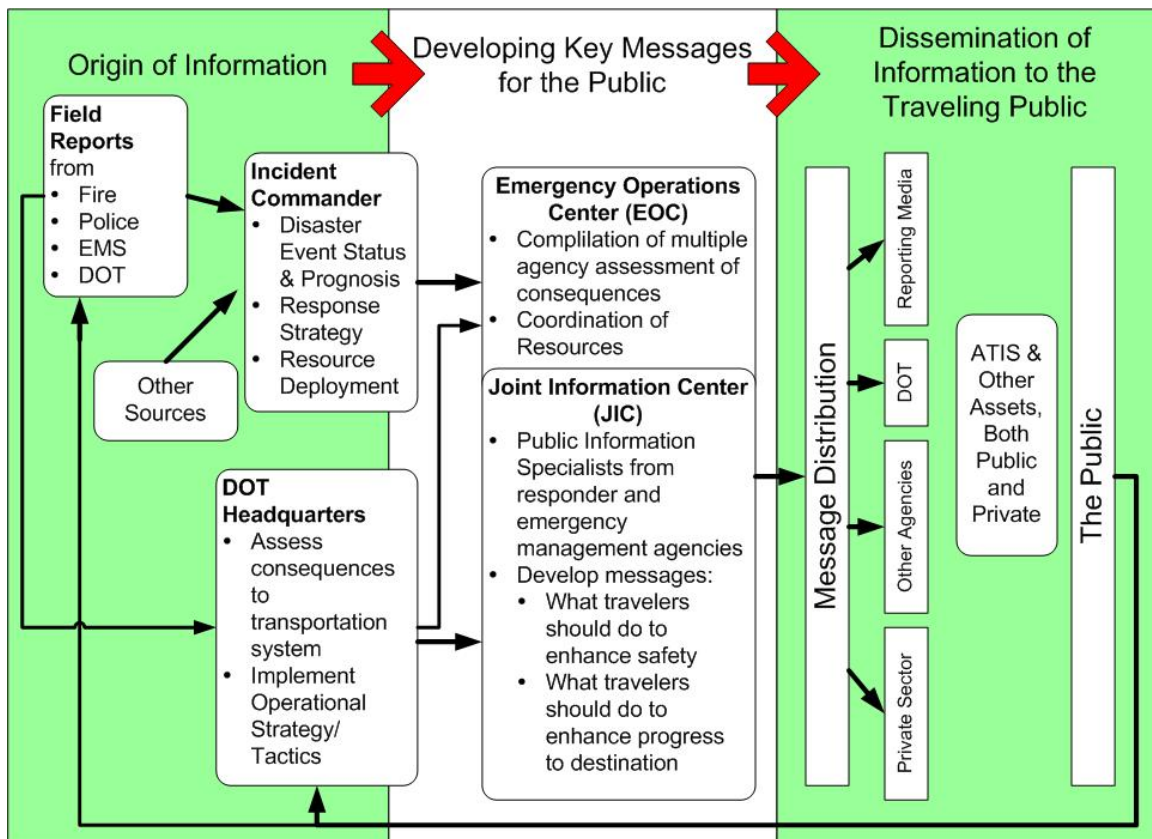


Figure 1. Information Dissemination Model Developed at Workshop

The information flows depicted in Figure 1 are intended to illustrate the full range of information that is generated and communicated to the public throughout a disaster situation. It should be noted that there are elements of timing and dependency relationships that come into play as a disaster unfolds, as players enter or exit the picture and as information evolves. Moreover, the information flow embodies a continuous feedback loop, which recognizes that the response of the public to the information they receive and the outcome of disaster mitigation. Table 1 further expands upon the aspect of timing according to three disaster stages: early detection and notification, during the event, and recovery. Shown are some of the significant changes in information delivery over the course of the disaster. For example, the earliest stage is marked by uncertainty and incomplete information. As the disaster proceeds, responders become more organized and information to the public coordinated more effectively. Finally, in the recovery stage the urgency has passed but the public, nonetheless, continues to need information about transportation after the disaster.

Table 1. Activities Related to Information Delivery During Disasters

Early Detection/Notification	During the Event	Recovery
<ul style="list-style-type: none"> • Field reports from public or other agencies • Transportation agency may be first on the scene • First responders notified • ATIS operator alerts public to any immediate/known impacts to transportation network • Information may be more general as specifics may not be known. 	<ul style="list-style-type: none"> • First responders reach the site • Incident Commander assesses the event • ATIS operator may need to modify initial public messages quickly. • EOC and JIC are activated – transportation provides a supporting role • As the event unfolds, ATIS messages will be modified based on the event’s status • EOC and JIC craft and disseminate all messages, with the help of staff trained in creating messages for different types of media, i.e. email vs. DMS • Public agencies monitor messages sent out by private sector in the field. 	<ul style="list-style-type: none"> • EOC and JIC work with multiple agencies to develop a recovery plan and public messages • ATIS operator disseminates the messages, either general or targeted • ATIS operator will change messages over time as the event or transportation network’s status changes

3.0 Operational Needs and Requirements

This chapter summarizes many of the problems, needs, and issues experienced by transportation agencies today when responding to disasters, as well as objectives for changing the current system.

3.1 Potential Needs and Recommended Solutions

The workshop participants provided an array of issues impacting the dissemination of travel information during disasters. Most ATIS and general information dissemination tools meet with similar challenges and needs during disasters. Listed below is a discussion of the potential needs for enhanced ties between emergency response and application of ATIS assets along with recommendations that are categorized by some common themes and can be employed to help better prepare for and manage disaster-related information.

3.1.1 Inter-jurisdictional Issues

Potential Need – Often cross-agency coordination occurs in a real-time, and unplanned, manner due to the severity of a disaster. This informal activity can also occur within a single state where multiple districts or regions may each have a well conceived and practiced disaster plan, but often the plans are not coordinated with adjacent districts.

Recommended Solution – Due to the large-scale impacts caused by multiple natural disasters in 2005 (primarily large hurricanes), many regions of the country are taking the opportunity to re-think their disaster plans, which includes coordination with non-congruent or distant geopolitical areas. For example, using an ATIS to impart evacuation information to the public is a normal procedure given certain events. However, through better coordination the “local” ATIS and media could also inform people about what to do, or where to go once they relocated to a distant, and often unfamiliar, community.

3.1.2 Communicating Using Different Devices

Potential Need – The DOT and other agencies they support should recognize that all communications devices have different limitations, and thus the exact same message cannot be developed for all media. Different devices will inherently have different levels of information, and consequently developing only one “key message” may not be practical.

Recommended Solution – As described above, all parties involved in the message development must understand that there are inherent limitations with each dissemination method. Therefore, the core of each message should be consistent, while the details of the message may need to vary depending on the specific medium. Below are some dissemination tools categorized by the level for which detail a message/system is most suitable:

Table 2. Dissemination Tools and Level of Message Detail

Level of Message Detail	Dissemination Tool
Most Details	<ul style="list-style-type: none"> • Broadcast radio • TV
Fewer Details	<ul style="list-style-type: none"> • Email, pager and text message alerts • Telephone and websites (including 511 and reverse 911 systems) • HAR
Least Details	<ul style="list-style-type: none"> • Fixed and portable DMS • Telephone – a phone-in system can typically be modified to provide less information, allowing it to handle a larger number of calls

3.1.3 Message Content, Knowing the Information is Correct

Potential Need – One problem often experienced is that of having reliable, credible, consistent and timely information to help develop the messages for the public. This also can lead to the problem of not meeting expectations, described below. In addition, the issue of having the media disseminate incorrect information is a common occurrence, which can create an inconsistent message.

As is often the occasion during a major event, the information flow can be limited and/or conflicting. Additionally, the media outlets will often broadcast an initial report, which may not be totally accurate. During a disaster, it is critical that all information is checked and cleared through the EOC and/or JIC to ensure accuracy and consistency. Conflicting reports cause confusion.

Recommended Solution – It is advisable for the responders in the field to be directed to the designated spokesperson like a PIO or JIC to avoid conflict in the message being delivered. During a disaster good quality and actionable information, even if limited, is the best information the public can receive. To ensure accuracy, a group should be assigned to monitor news reports and be it part of the EOC or JIC to confirm that accurate and consistent messages are being disseminated to the public. If they are not, immediate action should be taken to correct the reports.

Evacuation messages should be developed ahead of time through practice sessions. Scenarios for potential disasters can be discussed and accurate messages should be developed in a much less stressful environment.

3.1.4 Unrealistic Expectations and Lack of Pre-education

Potential Need – Some emergency-prone areas have good, consistent education programs targeted to specific types of events, such as tornados, wildfires, chemical leaks, or other disasters. For example, in an area that regularly experiences tornados, all in the community are aware of the public notification systems and many know what to do when a warning is activated. However, in many areas, disasters, or the threat of disasters, are often not a common occurrence, making pre-education an important activity. A component of that education that is often not developed, or completely understood, is the level of information likely to be available during and immediately after a disaster. Therefore, people often have unrealistic expectations of what the various public agencies can do, or what information will be available.

Recommended Solution – In emergency-prone areas, the education process needs to be introduced at an early age, primarily through the school curriculum. The education should focus on what to do (or not do), where to go for information (best sources), and what to expect (services may be limited or completely disrupted, mobility may be reduced). There are many national groups that develop education materials for these types of events and can help organize speaking engagements for driver’s education classes, or other scholastic settings. Also, there is a need to educate the general public through public service announcements and advertising and other resources about the types of disasters, what to expect and how to be prepared. These should be seen as an opportunity to introduce a wider audience to what an ATIS can do for them on a daily basis and during major events.

3.1.5 Reaching all of the Audiences

Potential Need – Though often referred to as the “general public” or “traveling public,” there is not one large cohesive “public.” Instead, this large group consists of multiple smaller groups, each searching for a slightly different type or level of information and/or direction from the various reporting or responding agencies. Each group may also have a different level of technological experience or acceptance, as economics and locale often can dictate how communications are received and thus should be provided. It is important to take these multiple groups into account when developing and disseminating messages that are intended to impart specific knowledge asking persons to take action, or inaction, based on numerous variables.

Recommended Solution – The solution begins before an emergency is apparent, with the creation and regular updating as necessary of a region-wide communications plan. The agencies and individuals responsible for developing and disseminating informational messages during a disaster should then understand that there are multiple audiences that require information, and should have a good knowledge of what those are and how best to reach them. Some of the groups that exist include:

- Driving community (in and outside the impacted area)
- Transit dependents
- Younger generations (typically more advanced users of new technologies and devices)
- Elderly (typically more reliant on more traditional and proven technologies)
- Public and elected officials

- First responders' families
- Tourists and business travelers
- Large employers or managers of high-rises/office parks
- Hospitals
- Nursing homes
- Schools
- Large public facilities (jails, arenas, etc.)
- Convention and visitors bureaus
- Trucking associations
- Towing community.

3.1.6 Communications and Power Failures

Potential Need – Often information dissemination methods rely entirely on an infrastructure that is not within the control of the information providers. Though the ATIS provider may have a back-up power supply, or perhaps a limited redundant communications network, it is the intended audience that often is without either, and this can last for days, or longer.

Recommended Solution – There is no complete solution for communications and power failures, whether they occur at the site controlling the information flow (EOC, JIC, ATIS), or at the point of intended reception. It is during these times that alternative means of communications should be utilized, which include in-person communication through loudspeakers (in some rugged or natural areas this is the only true means of communications), HAM radios to communicate with media or other public agencies, static or flip-down signs posted along specific routes, and the full utilization of broadcast radio, as it reaches the largest audience.

4.0 Components of an Ideal System

Chapter 2.0 described the key components of an existing system and identified the information dissemination model detailing the stakeholders, information, and the process involved for the dissemination of information from the origin to the public during disasters. This chapter draws upon the existing system and provides some recommendations on some of the components of an “ideal” disaster ATIS system.

An ideal ATIS system and disaster information mechanism should include components, devices, activities and players to make the system the best it can be. Based on the information and knowledge gathered from the workshop and reviewing the existing systems, an ideal ATIS disaster system includes functions of three subsystems:

- transportation system operations,
- emergency management and operations, and
- traveler information.

These three systems, their stakeholders, and their operations encompass a complete ideal ATIS system. The rest of this chapter briefly discusses these subsystems, and provides some key recommendations and suggestions in these areas that could potentially be used to deliver accurate and essential information to the public during disasters using traveler information mechanisms. These recommendations come directly from workshop participants and are based on real-work experience in both urban and rural areas.

4.1 Transportation Systems Operations

The state transportation departments and city and local traffic departments are primarily the agencies that control the ATIS assets and also provide day-to-day operations for delivering traveler information to the public. This subsystem includes agencies that manage local freeways and arterials and incident management activities along with response activities and operations for major incidents and disasters. These agencies are also responsible for recovery efforts directed at the transportation infrastructure during the post-disaster timeframe. Other modes of transportation including transit (rail and bus) are also part of this subsystem. As discussed in the existing system overview, the roles of these agencies are dynamic based on the nature of the disaster, the extent of it, and the area affected by it. Recommendations made for this sub-system included:

- Transportation agencies need to be flexible and have to realize they may serve many roles over the duration of the event, including being an early responder, a coordinator of travel-related information, and later, serve as support to the Incident Commander, or agency in charge by supplying resources as necessary and taking actions as directed.

- Critical transportation agency staff (i.e., TMC) need access to necessary monitoring and reporting systems to assist in the early stages of a major event.
 - Transportation agency staff should focus on adapting and delivering the appropriate messages based on the ATIS assets and capabilities (i.e., lesser detail on DMS, more detail on web page, etc).
- Power and communication redundancy and options exist, and they must be well thought out in advance, realizing that any failures will cause limitations in capabilities. This is especially critical in urban areas, to ensure proper communications between the TMC and the EOC, as they are not always located in the same facility.
- Federal agencies should work cooperatively with the local TMCs during disasters, as they usually have very knowledgeable, respected, local experts working as operators.
- Practice scenarios have been performed regularly and approved, up-to-date procedures manuals and contact information exist.

4.2 Emergency Management and Operations

This subsystem includes all of the operations and activities related to the planning and response functions for major disasters and events. Transportation agencies along with fire, local EMS, and police are the primary agencies involved in these operations. The coordination and communication among these agencies are critical as these systems and operations not only among themselves but also with other regional, statewide and sometimes federal agencies based on the type and nature of the disaster. The activities operated by this subsystem are usually from an EOC that is activated when a disaster occurs. The EOC, when activated, consists of representatives from all the major emergency response agencies, along with systems that support the Incident Command System (ICS) and Public Information Officers (PIOs). Recommendations made in this subcategory include:

- Incident Commander – there is one person in charge of the response strategy directing resources at the scene of the disaster.
- When decisions are being made, the appropriate people must be in the room, typically at the EOC (i.e., personnel who have the authority to make decisions).
- The PIOs from all key agencies gather at a Joint Information Center (JIC) and coordinate information for dissemination to the media and the general public. The JIC and the PIOs passes along only coordinated key messages and all pertinent verified information to the media. Extraneous information is limited so as not to send confusing or mixed messages.
- Creating the right messages is critical – properly crafted messages cover three critical characteristics that:
 - Describe the threat
 - Nature of event – what is happening or has occurred

- Geography of event (where, impacted area)
 - Provide guidance
 - Who, if anyone, needs to leave a certain area
 - Shelter in place information, if pertinent
 - What roads or transportation facilities are open, closed, or have limited access
 - Health advisories, if pertinent
 - Determine what information is released to the public and when. Premature information can often be as bad as information that is not released soon enough.
 - Accurate information released to the public in a timely manner is the key to successful operations.
 - Provide where more information can be obtained.
- All relevant previously established emergency contact points of sensitive locations or large groups are informed of critical information. These groups include but are not limited to:
 - High-rise building and office park facility managers
 - Hospitals
 - Nursing homes
 - Schools
 - Large public facilities (jails, arenas, etc.)
 - Convention and Visitors Bureaus
 - Tucking associations
 - Towing community.

Agencies involved in using ATIS during a disaster may wish to craft a customized “ideal” list of items as a checklist during an event. In addition, agencies may wish to use this checklist as a long-range planning tool to help focus coordination and technical activities and tasks.

5.0 Operational Scenarios

To summarize the information provided in the previous three chapters, this chapter examines sample disaster scenarios (one urban and one rural) including the major systems, stakeholder roles and responsibilities, and ATIS delivery to the public for a specific disaster. The examples provide a description of the event with some salient characteristics of the disaster, the stakeholders involved, the ATIS assets available, the operations and activities performed by the various agencies during the stages of the event, and finally some potential improvements and suggestions for communicating with the public during disasters.

5.1 Urban Setting Example

5.1.1 Description of the Event

On a Sunday, late afternoon, close to a major metropolitan area, dry forest conditions and wind caused a wildfire to spread extremely rapidly west out of a mountainous area and into residential areas. Due to the size of the event the duration is expected to last over 4 days. There is low visibility on sections of a major interstate due to smoke, and various state routes approaching the freeway are also impacted by smoke and fire. Many state routes and county roads are suffering fire damage to sign posts, guard rails, striping, power poles, and other structures. Several small municipalities are in the path of the fire, as are some predominately residential portions of the city itself.

5.1.2 Stakeholders

The agencies involved in the various stages of this event include:

- Transportation department – Since it's a large urban city, the agency operating the TMC is the lead transportation agency in conjunction with the regional MPO, county traffic departments and two smaller city traffic departments.
- Emergency management – Due to the size of the event, the state police, local and county fire and police departments and the regional emergency agency responsible for operating an EOC are all involved.
- Major transit providers – Due to the size of the city, major bus and rail agencies are used as evacuation transportation to move a large number of people to safe shelters and buildings.
- Private traveler information providers – Due to the size of the urban area, several media affiliates (radio and TV) and other private information sources are available.

5.1.3 ATIS Assets

The information dissemination tools available in the urban area include the following:

- DMS – fixed and portable
- Internet
- Telephone/511 system
- Text message, pager and email alerts to registered recipients (typically part of an ATIS)
- Media outlets – radio, TV, local access cable.

5.1.4 Stakeholder Actions and Timeline of Events

The table below summarizes the series of events that occur during and after the disaster based on the description of the event, the stakeholder agencies that are responsible for managing, maintaining, and performing operations during a major disaster and a list of ATIS assets available to the agencies to inform the public about the disaster.

Table 3. Actions and Timeline of Events – Urban Disaster Example

Timeline of Event	Agency	Activity/Operation
On-Scene when Disaster Occurs	City Fire Department	<ul style="list-style-type: none"> • Local fire department officials are on-scene near the major freeway, close to the residential area. • State Police is called into the scene by the fire department to close down the freeway and start potential evacuations.
	State Police	<ul style="list-style-type: none"> • State Police calls into the department for back up and describes the size of the event. The State Police activate their emergency operations and dispatch.
	Private Media (Radio and TV)	<ul style="list-style-type: none"> • Private media helicopters visually see the size and extent of the fire and get ready to send their reporting personnel to the scene of the event.
	Regional County	<ul style="list-style-type: none"> • County emergency operations contact receives the call regarding the nature, extent and rapid growth of the event.
	Transportation Management Center (TMC)	<ul style="list-style-type: none"> • Traffic management personnel monitoring the state police data hear about the disaster. • Traffic management personnel use CCTV to view images of the disaster. • TMC goes into emergency operations 24 hour mode.

Timeline of Event	Agency	Activity/Operation
During the Disaster	Regional County/Emergency Center	<ul style="list-style-type: none"> • Due to the nature of the disaster, the county officials activated the EOC. • The county called specific agency representatives on the EOC contact list to start a shift phase operations. • The county identifies the leader of the Joint Information Center (JIC) responsible for dissemination of information from the EOC. • The county uses an incident command plan to document and communicate operations and priority actions.
	Public/Elected Official	<ul style="list-style-type: none"> • EOC communicates to the elected official in the area on the extent of the disaster and the need to declare an “emergency.” • Elected official announces emergency for the immediate affected area.
	State and Local Police	<ul style="list-style-type: none"> • With coordination from EOC, the police post an Incident Commander (IC) on the scene to be in charge of the events and to communicate with the EOC and sets up a mobile command unit on-scene. • IC coordinates with the EOC and begins evacuations. • Police headquarters calls for additional support from adjoining cities and counties to assist in evacuations of residential areas. • State Police coordinates with the TMC on road closures and alternate route information to travelers. TMC provides access to Police personnel to portable dynamic message signs and post messages on “closed roads”. • State police web page also posts information on the web site regarding closed roads.
	TMC	<ul style="list-style-type: none"> • TMC emergency contact (senior level personnel) and PIOs are posted at the JIC established at the EOC. • TMC personnel are in constant coordination and communication with their personnel at the EOC and receive information on the resources required, damage to infrastructure, traffic management, etc. • TMC uses the cameras and sensors to continuously monitor the situation. • TMC PIO carefully crafts messages for the media and answers questions from the media based on direction of the JIC. Also coordinates with TMC staff who post messages to the DMS, HAR, web page, telephone system (including 511 and IVR), e-mail and pager alerts.
	Transit Agencies (Bus and Rail)	<ul style="list-style-type: none"> • State Police coordinates with major bus and rail agencies that have assets in the areas affected to assist in evacuations, phased if necessary, of large residential areas.
	Private Media Outlets (Radio and TV)	<ul style="list-style-type: none"> • Radio and TV stations place representatives at the TMC and gather critical and accurate information from the TMC PIO. • Radio and TV affiliates disseminate information to the public on road closures, evacuation and shelter information.
	Other Private Information Providers	<ul style="list-style-type: none"> • Other providers like XM Satellite Radio, OnStar, and Internet traveler information service providers use the information from their sources and send it to their subscribers reaching a wider and larger set of the population.

Timeline of Event	Agency	Activity/Operation
Post-event	Fire Department	<ul style="list-style-type: none"> • Fire officials inform the EOC that the event is under control and that it is safe for the public to return to their houses.
	Regional County/EOC	<ul style="list-style-type: none"> • EOC closes and representatives return to their respective offices to resume normal operations. • Representatives from each major agency fill out after action reports on lessons learned, significant suggestions/improvements.
	State Police	<ul style="list-style-type: none"> • Open roads and resume normal operations.
	TMC	<ul style="list-style-type: none"> • Send information to the public on open roads and any prolonged closures. • Start assessing the damage to the infrastructure and begin repairs • Enhance/develop emergency response plans based on after action reports. • Input relevant information into 511 system if available.
	Traveler Information Providers	<ul style="list-style-type: none"> • Provide information to the public on open roads and resume normal operations.

5.1.5 Potential Improvements

Listed below are some lessons learned/suggestions that were compiled into some common themes from the workshop members for an urban disaster scenario:

- Typically, an urban setting offers disaster managers and responders more information dissemination options as ITS devices like DMS, HAR, metro-focused travel information websites and 511 phone systems are more prevalent. In addition, there are also more media outlets – radio, television, newspapers – with a presence that are focused on the urban area, and these are what most people turn to during a major event. Another useful tool is Reverse 911 which can be used to alert people at home, especially if the disaster occurs at night. Agencies also need to be aware and ensure that the ATIS dissemination tool has enough capacity to handle larger volumes (i.e., call volumes into 511 phone system, accessing the website, etc).
- It is also necessary to plan for many of those tools to experience reduced capacity or to fail completely due to limited electrical power, or only to be available through back-up supplies. Additionally, overloaded communications infrastructure and failures also impact the utility and effectiveness of these tools. When these problems occur, the number of information tools quickly becomes limited to battery-powered portable (or car) radios as they are ubiquitous, don't require the user to be stationary, and can provide information to a wide area quickly.
- In planning for disasters, it is important to forge relationships ahead of time and not at the scene of an event or in the lobby of the TMC for the first time. The DOT should strive to create ties with the following communities and groups:

- All agencies and key individuals that may have direct control over a major event should be educated about the information gathering abilities and limitations of the TMC and the dissemination abilities and limitations of the ATIS.
 - Other supporting agencies (i.e., transit, public health) should also be aware of the ATIS and key persons at each entity should know what to expect or receive.
 - Large employers and large facility managers should be recruited to receive email, text and other alerts. They should know what to expect from the ATIS during disasters and should not see an alert for the first time.
- It is important to realize that emergency response plans may differ greatly from region to region, due to differences in political makeup, responsibilities, and geography.

5.2 Rural Setting

5.2.1 Description of Event

On an early Monday morning, a warehouse fire started in a small rural town, 100 miles from the closest major metropolitan city. The products that started the fire contain calcium hypochlorite which combusted, creating a very intense fire and massive chlorine-scented cloud of smoke. The concentration of atmospheric chlorine close to the burning plant was about the same level as that of a swimming pool and tended to diminish further away from the plant. However, the smoke plume had the potential to cause respiratory, eye, and skin irritation for those closest to the source and for “at risk” population like the elderly. A massive plume billowed out of the fire and continuously streamed east and northeast from the fire for more than two days.

5.2.2 Stakeholders

The agencies involved in the various stages of this event include:

- Local City and County Traffic Departments – Since the area is largely rural, the traffic and roads are maintained by the city and county traffic departments.
- Emergency Management – The local sheriff’s office and fire departments provide emergency management and operations in the rural town. The sheriff’s office served as the lead agency for this event.
- Private Traveler Information Providers – There is a general lack of private information service providers in a rural town due to the lack of everyday traffic and congestion.

5.2.3 ATIS Assets

The information dissemination tools available in the rural town include the following:

- Internet
- Telephone / 511 System
- Limited portable DMS
- Radio and TV (especially all news programming)
- HAR.

5.2.4 Stakeholder Actions and Timeline of Events

The table below summarizes the series of events that occur during and after the disaster based on the description of the event, the stakeholder agencies that are responsible for managing, maintaining, and performing operations during a major disaster and a list of ATIS assets available to the agencies to inform the public about the disaster.

Table 4. Actions and Timeline of Events – Rural Disaster Example

Timeline of Event	Agency	Activity/Operation
On-Scene when Disaster Occurs	Local Sheriff	<ul style="list-style-type: none"> • Sheriff’s office receives 911 call regarding the warehouse fire. • Sheriff dispatches to the scene immediately to assess the damage.
	Local Fire Department	<ul style="list-style-type: none"> • At the same time the sheriff receives the call, the local fire department is contacted and they rush to the scene of the event.
	City and County Traffic Departments	<ul style="list-style-type: none"> • Emergency contacts at the traffic departments are informed of the event and ready to begin emergency operations.
During the Disaster	Local Sheriff’s Office	<ul style="list-style-type: none"> • Sheriff’s office sets up an incident command and a mobile command center near the disaster. • Sheriff department requests additional resources from adjoining counties and cities to help in the evacuation of nearby residences and offices. • Sheriff’s office uses buses, ambulances and other means of transportation to evacuate nursing homes, trailer parks and other near-by rural communities. • Sheriff’s office closes roads leading to the plant and uses portable DMS signs along the major arterials to inform the traveling public of the potential danger.
	City and County Traffic Departments	<ul style="list-style-type: none"> • Using limited monitoring facilities, traffic management personnel support and assist emergency responders in disaster response. • Using the limited dissemination technologies available to them, traffic management personnel disseminate information to the local media affiliates, and a general customer service information telephone number, and 511 if available.
	Private Media (Radio and TV)	<ul style="list-style-type: none"> • Radio and TV stations gather information from local sources. • Radio and TV affiliates disseminate information to the public on road closures, and evacuation information.
Post-event	City and County Traffic Departments	<ul style="list-style-type: none"> • Send information to the public on open roads using limited dissemination media. • Start assessing the damage to the infrastructure and begin repairs. • Enhance/Develop emergency response plans based on after action reports.

5.2.5 Potential Improvements

Listed below are some lessons learned/suggestions from the workshop members that were compiled into some common themes for a rural disaster scenario:

- A disaster experienced in a rural setting provides a unique set of challenges and limitations primarily due to a lack of infrastructure. Typically, a rural environment requires disaster managers and responders to rely on more traditional information dissemination options, since ITS devices like DMS, travel information websites, and phone systems may not be available.
- Rural areas also typically have fewer media outlets – radio, television, newspapers – than an urban area. However, this can be viewed in a positive light as most residents will know which outlets to turn to and the messages being disseminated have a reduced chance of being changed or misunderstood if only coming from a limited number of sources. As with an urban area, radio and television are the sources of information most people are familiar with and turn to during a major event.
- Knowing what resources are available in advance is the key to managing the information flow to the public, which in this case may be solely through the media. This requires that the media be a trusted part of the process. Sometimes, agencies can depend on the citizens themselves as viable sources as they may serve as a dissemination media to inform their neighbors, friends and surrounding communities.
- Rural areas, their communities and the evacuations of special populations pose challenges and issues. Planning ahead for multi-lingual evacuees and enabling contacts with emergency personnel who can speak, for example, Spanish or French is essential. Rural areas also have large farm communities that are reluctant to evacuate unless their animals are taken care of. Identifying the location of potential animal and farm shelters can help agencies plan for evacuations of these rural farm communities more easily.
- As with the urban environment, it is necessary to plan for a reduction in carrying capacity or complete failure due to limited electrical power. Communications infrastructure can also impact the dissemination of the key messages. When these problems occur, the number of information tools quickly becomes limited to battery-powered portable (or car) radios as they are ubiquitous, don't require the user to be stationary and can provide information to a wide area quickly.

6.0 Conclusion

As previously stated, this concept of operations is meant to be a guide to assist regions and agencies to develop and/or evolve their use of ATIS to better provide traveler information to the public during a disaster. The concept of operations shows how agencies need to interface with each other and what data and information need to be shared to effectively manage and deliver traveler information during disasters. This included the major systems and operational roles and responsibilities of participating agencies included in the delivery of traveler information during disasters in various environments. The concept of operations also addressed the who, what, when, where, why and how the system needs to operate to deliver critical and useful information to the public using available ATIS technologies during no-notice events/disasters. There are many variables that do not allow this document to be prescriptive in exactly how a region should operate including:

- Type of agencies involved
- Agency responsibilities
- Resources available
- Agreements needed or in place
- Region topology.

Even so, the information and lessons learned will assist agencies in developing the relationships, establishing the agreements, developing the process, and deploying technology wisely. Agencies should regularly exercise their response plans and meet with partners to make sure everyone understands what needs to be done during an emergency.

Appendix A

Workshop Participants

Name	Organization
Carol Kuester	Metropolitan Transportation Commission (MTC)
Gary Shepherd	Rapid City Fire and Emergency Services
Keith Gates	Transportation Security Administration (TSA)
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