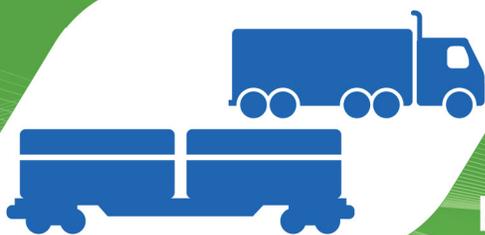


Texas Department of Transportation



STATEWIDE
FREIGHT
RESILIENCY
PLAN

Stage 2a: Communication Needs and Capabilities
August 2011





Prepared by



EXPERIENCE | Transportation

Texas Registered Engineering Firm F-3557

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Executive Summary

As the twelfth largest economy in the world and the second largest in the United States, a resilient freight network in Texas is important to the economic health of the State and the nation. Each day millions of dollars of freight move into, out of, and through the state on highways, railroads, water, and air. Ensuring that the movement of these goods, in the face of an event, whether a hurricane, terrorist incident or infrastructure failure, is important not only to Texas but national and international interests.

The Texas Department of Transportation (TxDOT) recognized that the highway system is a major component of a resilient freight network. As the managing organization responsible for maintaining the State's highways, TxDOT developed this plan to provide a comprehensive framework for identifying key freight infrastructure corridors and strategies to ensure a resilient freight transportation network in the State of Texas.

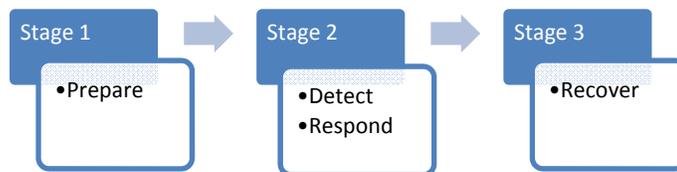
Definition of Freight Transportation System Resilience

Resilience is a term that is used by industry and government in a host of different applications. Only until recently has the resilience term been applied by state departments of transportation (DOTs) to their transportation networks. The currently accepted definition for **freight transportation system resilience** is **“the ability for the system to absorb the consequences of disruptions, to reduce the impacts of disruptions and maintain freight mobility.”**

Approach and Process

The approach to developing the Texas Statewide Freight Resiliency (SFR) Plan considers national, state, local, and private plans for infrastructure protection, emergency management, and incident response. Research into these individual plans suggests a common approach to systematically develop a resiliency plan: prepare, detect, respond, and recover. This approach, as presented, appears simple but as the various managing organizations, users, and infrastructure elements are considered, the overall plan grows in complexity.

Considering the complexity involved in developing a resiliency plan, the Texas SFR Plan progresses in stages. The stages are phased to accommodate the prepare, detect, respond, and recover approach. Stage 1 is focused on an assessment of the freight system's preparedness from the perspective of TxDOT as the managing organization. Stage 2 is associated with communication and plan implementation during response to an actual event and its recovery. Stage 3 incorporates a continuous feedback loop that recognizes that change is ever present and the plan must be updated on a regular basis to remain effective.



The purpose of the Texas Statewide Freight Resiliency Plan is to assess the resilience of the strategic freight system in Texas when an event of extended duration limits freight mobility, resulting in prioritized infrastructure enhancements to keep freight moving.

Understanding Shipper and Carrier Communication Needs

Private sector interviews conducted in the Stage I SFR Plan, indicated that TxDOT is heavily relied upon to communicate traffic information that will enable freight to route through or around regions experiencing traffic disruptions, resulting from man-made or natural events. All transportation modes look to TxDOT to provide information to some degree, but none more heavily than the trucking sector, where key interstates and highways are the main concern due to the sheer volume of traffic that moves along these routes. In order to better understand the communication needs of the private sector, a survey of transportation companies, a communications company and related government agencies was used to further drill down into the need for various types of information and the appropriate communication channels.

The survey results indicate that Real-Time Road Closure and Alternative Routing information is most critical to those responsible for finding alternative routes during, or in the weeks and months following a severe and extended traffic disruption, yet the preferred source of this information changes depending on where in the event life cycle this information is needed. Status updates required at the time of a disruptive event are provided by either law enforcement, TxDOT or other sources. Similarly, the number of communications channels needed at the time of a severely disruptive event should be established based on the capabilities of the channels to target areas in need and be able to meet the communications channel preference of the targeted audience. TxDOT is increasingly preferred as the source of traffic information as conditions stabilize.

Texas State Agency Communication Capabilities

In the Stage I SFR Plan, the private sector pointed to the lack of a central location for all transportation-related activities during a severe disruption and suggested that TxDOT might consider creating a tool that assists shippers and transportation providers during these events. Stage 2a investigated the communications capabilities of TxDOT, and other state agencies, to determine if the needs of the private sector can be met through existing or expanded efforts.

The communication capabilities within Texas agencies responsible for disseminating information to transportation systems user relies on coordinated services and multiple communication channels. The Governor's Emergency Management Council is a clearinghouse for agencies responsible for varying levels of message delivery. From the governor's office to local officials, there is a set protocol for communication with system users before, during and after an event.

Specifically, TxDOT utilizes a wide range of communication channels to deliver messages to their customers. The district-level Public Information Officers interviewed in this study emphasized that they work in a proactive manner when notifying the public of road hazards, construction, maintenance and closures. Social media is at the forefront of the communications tools that are utilized.

One of the most heavily relied upon means of communication with freight transportation system users is Dynamic Message Signs (DMS). These signs provide immediate messages to all travelers regarding real-time travel conditions. Coverage is limited in rural areas but urban areas are well covered through Intelligent Transportation Systems (ITS). ITS is also encouraging the development and use of mobile applications for traveler information in Texas.

Recommendations for Communicating with Freight Stakeholders

Consistent with findings from the Stage I Private Sector Interviews, traffic condition communications concerning blockages and congestion remain a high priority for transportation providers of all modes when routing freight through areas impacted by natural or manmade disasters. TxDOT is viewed as



being a key information resource that will enable operators to evaluate road closure and alternative routing data, especially during the weeks and months following a severe event. The communication channel used is the key to efficiently disseminating vital information.

The number and type of information channels are continuously evolving. The ability to target specific locations of cell phone devices using GPS services, coupled with GIS routing and mapping technology has created an opportunity for private companies to offer routing services targeted to trucking and railroad modes. These private entities will utilize technology that allows them to estimate traffic speeds, but will require source data provided by TxDOT, such as road closure information or truck roadway restriction information, to power their applications.

This research confirms the need for a well publicized and robust central location for traffic information that will assist transportation companies with identifying alternative routes. Real-time status reports concerning road closure information, alternative routes for impacted areas, and evacuation routes are examples of information required. Regional traffic maps should be expanded to include evacuation and alternative route information to facilitate the quick dissemination of information. These conclusions underscore the need for TxDOT to expand its systems of message delivery through deployment of DMS and expanded ITS services.

TxDOT's data collection capabilities and responsibilities are integral to capitalizing on technology innovations. Providing good customer service not only means monitoring and responding in a timely manner, but it also means providing information such that customers can make good decisions that help the system. TxDOT should not be expected to be the single-source for technology expansion, but the data housed within TxDOT is valuable for these services. Identifying data-sharing capabilities is recommended to provide good customer communication before, during and after events causing traffic disruptions.

Future efforts in Stage 2 will identify evolving technology and the data required for implementing these technologies. Identifying the gaps in existing data collection will aid in providing robust information to customers required during a travel disruption.



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Section I. Introduction

As the twelfth largest economy in the world and the second largest in the United States, a resilient freight network in Texas is important to the economic health of the State and the nation. Each day millions of dollars of freight move into, out of, and through the state on highways, railroads, water, and air. Ensuring that the movement of these goods, in the face of an event, whether a hurricane, terrorist incident or infrastructure failure, is important not only to Texas but national and international interests.

The Texas Department of Transportation (TxDOT) recognized that the highway system is a major component of a resilient freight network. As the managing organization responsible for maintaining the State's highways, TxDOT developed this plan to provide a comprehensive framework for identifying key freight infrastructure corridors and strategies to ensure a resilient freight transportation network in the State of Texas.

Resilience is a term that is used by industry and government in a host of different applications. Only until recently has the resilience term been applied by state departments of transportation (DOTs) to their transportation networks. The currently accepted definition for **freight transportation system resilience** is “**the ability for the system to absorb the consequences of disruptions, to reduce the impacts of disruptions and maintain freight mobility.**” (1)

TxDOT initiated its resiliency planning by issuing a report in February 2011 titled “Statewide Freight Resiliency Plan, Stage I: Prepare the Freight System” prepared by TranSystems. The research in the Stage I Plan concluded that Texas highway corridors are highly resilient when considering robustness and redundancy. This was evidenced by the low overall hazard risk ratings, relatively few physical constraints and limited areas of operational constraints on the primary and secondary highway routes.

While the overall freight transportation system in Texas was found to be robust and redundant in Stage I, the research concluded that there are actions that TxDOT can take in a continued effort to improve freight resilience in Texas. Based on the research completed in Stage I and interviews with other states and the private sector, four strategies for advancing the resilient freight transportation system were developed. Stage 2a will focus on advancing Strategy 4.

Communicate before, during, and after events

- Provide up-to-date, comprehensive status reports
- Hold coordinating meetings among critical sector groups
- Engage the private sector

“Communication was overwhelmingly viewed as the primary need of users and system managers before, during, and after an event that impacts the freight transportation system. TxDOT was viewed as an organization that could act in a support role to assist the private sector to recover from man-made or natural freight resiliency events. The lack of a central location for all transportation-related activities during a severe disruption suggests that TxDOT might consider creating a tool that assists shippers and transportation providers when considering various options. A single location providing information on such matters as traffic conditions, barge, and rail availability, port status, and emergency truck stop information will enhance freight resiliency in the state. Engaging the private sector allows TxDOT to target the right forum and messages to communicate with users.” (Stage I, Strategy 4)

Approach and Process

The approach to developing the Texas Statewide Freight Resiliency (SFR) Plan considers national, state, local, and private plans for infrastructure protection, emergency management, and incident response. Research into these individual plans suggests a common approach to systematically develop a resiliency plan: prepare, detect, respond, and recover. This approach, as presented, appears simple but as the various managing organizations, users, and infrastructure elements are considered, the overall plan grows in complexity and must be tailored for Texas.

Considering the complexity involved in developing a resiliency plan, the Texas SFR Plan progresses in stages as illustrated in Figure 1. The stages are phased to accommodate the more familiar prepare, detect, respond, and recover approach. Stage 1 is focused on an assessment of the freight system's preparedness from the perspective of TxDOT as the managing organization. Stage 2 is associated with communication and plan implementation during response to an actual event and its recovery. Stage 3 incorporates a continuous feedback loop that recognizes that change is ever present and the plan must be updated on a regular basis to remain effective.

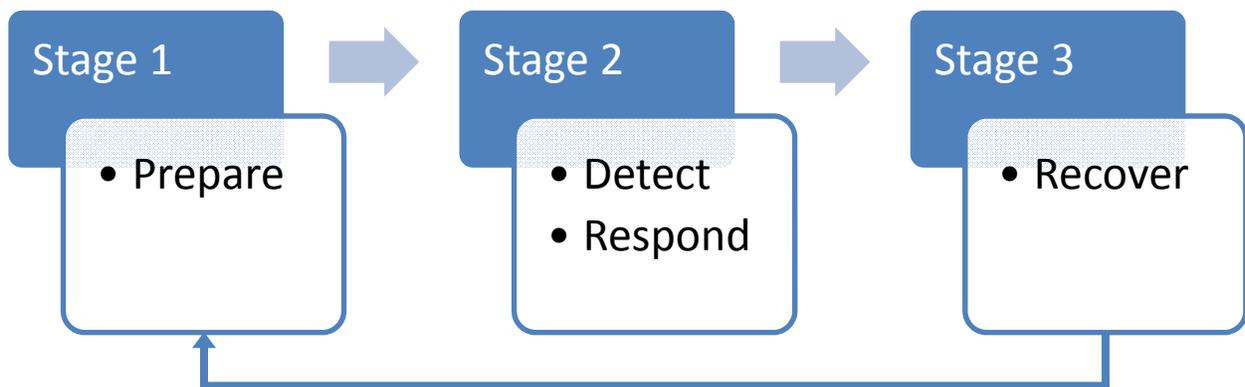


Figure 1. Texas SFR Plan Stages

Source: TranSystems

Purpose and Goals

The purpose of the SFR Plan was established by TxDOT with support from the Texas SFR Plan Advisory Committee. Three goals were developed to support the plan purpose. The purpose and goals guide the plan and are structured to follow the stages outlined in the Approach and Process.

The purpose of the Texas Statewide Freight Resiliency Plan is to assess the resilience of the strategic freight system in Texas when an event of extended duration limits freight mobility, resulting in prioritized infrastructure enhancements to keep freight moving.

Stage 1 Goal: To have a freight transportation system prepared to keep freight moving during an event.

- Provide redundant corridors clear of vertical, lateral, and load restrictions with reasonable capacity to detour freight during an event.
- Provide robust corridors when detour routes are unavailable.
- If redundancy and robustness are not feasible, then outline predictive information to relay through targeted communications channels.



Stage 2 Goal: To have a responsive framework to address shipper and carrier needs as an event occurs, and to recover the freight transportation system as quickly as possible.

- Institute a communications network targeted to sending messages to shippers and carriers.
- Rapidly return the freight transportation system to normal operations by deploying all available and appropriate resources in coordination with the appropriate chain of command.

Stage 3 Goal: To have a flexible, relevant plan that is used to improve freight mobility in Texas.

- Identify funding to implement infrastructure solutions that increase the robustness and redundancy of the freight transportation system.
- Build partnerships with emergency management to ensure that economic considerations are appropriately incorporated into response and recovery.
- Evaluate resilience on a regular schedule and incorporate feedback into plan updates.

Stage 2a Plan Outline

The Stage 2a Plan is organized into sections. Section 1 introduces the purpose of TxDOT's overall resiliency planning and the specific objective of Stage 2a. Section 2 provides information on the private sectors communication needs. Section 3 details the communication capabilities at TxDOT and the Texas Department of Public Safety's Division of Emergency Management. Recommendations for matching the information needs with capabilities are described in Section 4. Section 5 summarizes the next Stages of the freight resiliency planning process for Texas.

Future steps of Stage 2 will develop the necessary implementation plan to test what is developed in Stage 2a. Stage 3 is an on-going, internal function for TxDOT to complete when the initial plan is finalized. Continuous feedback and improvement of the plan after real events will improve the plan and ensure its effectiveness.

Section 2. Understanding Shipper and Carrier Communication Needs

Private sector interviews conducted in the Stage 1 SFR Plan, indicated that TxDOT is heavily relied upon to communicate traffic information that will enable freight to route through or around regions experiencing traffic disruptions, resulting from man-made or natural events. All transportation modes look to TxDOT to provide information to some degree, but none more heavily than the trucking sector, where key interstates and highways are the main concern due to the sheer volume of traffic that moves along these routes. Truckers have many options to receive traffic information, including dispatchers, GPS devices and other truckers, but TxDOT is viewed as the ultimate source of this vital information in the weeks and months following an event.

Other transportation modes, such as rail, barge or ocean carriers, are more self reliant when responding to events causing major service disruption. This is due primarily because they either control the entire network, as in the case of the railroads, or they share transportation corridors, such as rivers or port channels with relatively fewer vessels as compared to the highway system. Requirements for traffic information provided by TxDOT is used mostly to make decisions about whether or not to send a train or vessel to an affected area based on traffic conditions. In these cases, TxDOT is relied upon to disseminate traffic congestion detail, but is not considered to be responsible to provide alternative routing options.

Previous interviews suggest that although shippers make decisions about how much, and where to ship freight, they defer to transportation providers, e.g. the trucker, rail carrier or ocean carrier, to make routing decisions. Stage 2 focuses on the transportation operators, mainly truckers, because of their responsibility to find alternative paths, and their heavy reliance on TxDOT to provide roadway traffic information.

Methodology

In order to better understand the communication needs of the private sector, particularly in the weeks and months following a long term, disruptive man-made or natural event, TranSystems conducted a survey of transportation companies, a communications company and related government agencies, to further drill down into the need for various types of information, and the appropriate communication channels that are considered to be most useful in the time period following a severe traffic disruption events.

Five telephone interviews were conducted and 25 on-line responses were collected. The five telephone interviews were unstructured and solicited respondents' views on communications needs and procedures for rail, waterborne and communications sectors that interact with TxDOT. Twenty-five online responses were obtained from the trucking community. The online questionnaire assessed communication categories and channel preferences. Communication categories are based on the Stage 1 private sector interviews, and separate TranSystems research, and are as follows:

- Real-time road closure information
- Alternative routing information
- Expected road openings and closures (duration)
- Evacuation routes
- Real time incident situation updates
- Regional traffic maps indicating traffic speed
- Truck repair locations
- Shelter locations

Respondents were also given the opportunity to provide additional information categories if they were not included on the questionnaire.

Respondents were asked to rate the information categories on several dimensions:

- Importance
- Preferred communications channel
- Preferred information source
- Preference for going to a source, or having information sent

Respondent Information

The telephone interview respondent descriptions are as follows: (n = 5)

- Wireless Cell Phone Provider
- TxDOT
- US Coast Guard
- Barge Operator
- Class One Railroad Operator

Trucking company responses were received via the internet. Table I displays the cargo type and number of trucks operated of the online respondents:

Table I: Trucking Respondent Cargo Type and Number of Trucks Operated							
Cargo	Number of Trucks						Grand Total
	1	> 1 and < 10	> 10 and < 30	> 30 and < 100	> 100	Blank	
Cement sand or gravel						1	1
Construction or repair				1	3		4
Fuels					2		2
General			1	1	3		5
General Including Grocery	1	1	1		2		5
Grocery Items				2	2		4
Items used in Manufacturing					1		1
Oilfield Equipment				2			2
Retail					1		1
Grand Total	1	1	2	6	14	1	25

Trucking Information Requirements

As mentioned, the trucking sector, as opposed to rail or waterborne transportation modes, is most heavily dependent on traffic information, and is viewed by cargo shippers as being responsible to navigate through major and long term obstructions. The overwhelming customer need for TxDOT support therefore comes from the trucking community. The following section will focus on trucking communication needs, followed by the rail, barge and port transportation sector needs.

Information Type Requirements

The majority of truckers responding to the online questionnaire indicated that providing Real Time Road Closure, Alternative Routing Information, Expected Road Openings and Closures, Evacuation Routes, and Expected Road Opening are most important when routing freight, as displayed in Figure 2

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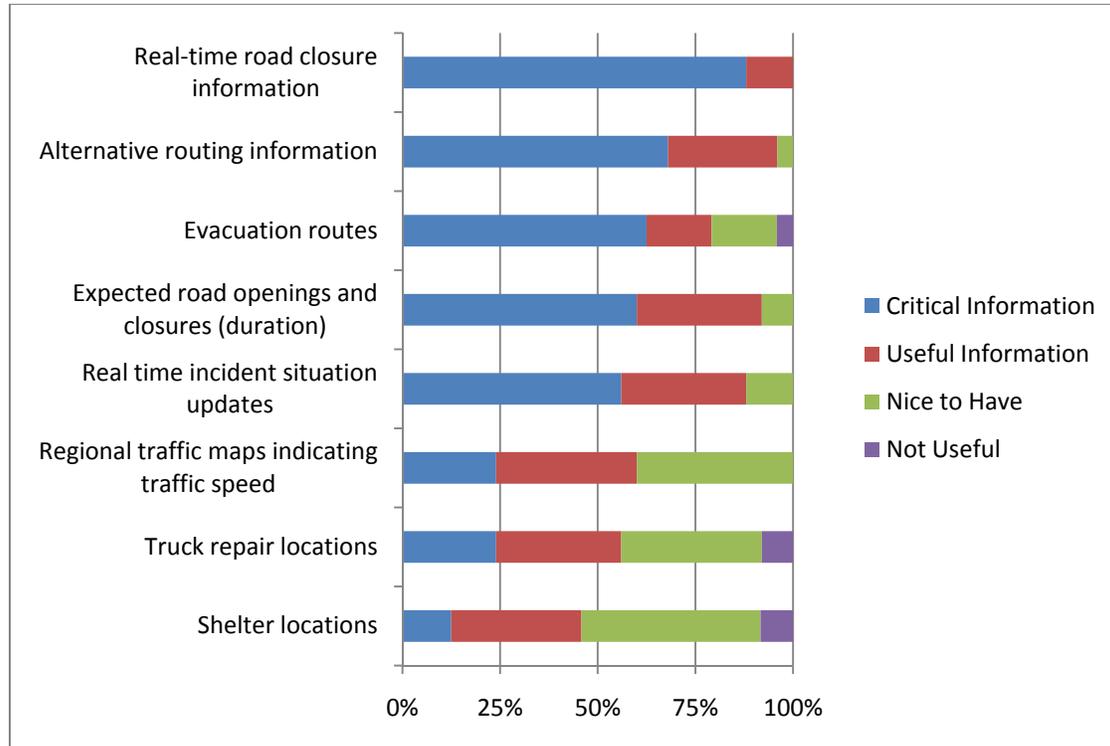


Figure 2. Texas Resiliency Information Preference, All Respondents

Source: TranSystems.

Note: n = 25

The most critical pieces of information tend to provide truckers with information that allows them to assess passable routes, and re-route trucks accordingly. Real time incident updates, truck repair locations and shelter locations are less important, but may increase in importance under certain conditions. TranSystems conducted separate interviews of truckers to further understand the importance of knowing where fueling locations are. Similar to truck repair location, fueling location awareness becomes an issue only in cases where truckers do not have enough fuel to exit an affected area. The importance of traffic speed maps may increase as data are reported on larger portions of the Texas highway system. Traffic speed and congestion data are critical elements of alternate route planning as shortest possible alternative route transit times are estimated.

Disaster Experience

One factor that changes truckers' views on the importance of certain types of information is whether or not they have had experience routing freight during, or after an event that caused severe disruptions to the Texas freight transportation network. Figure 3 and Figure 4 display responses pertaining to the importance of evacuation route and truck repair location information respectively for truckers without and with disaster experience, respectively.

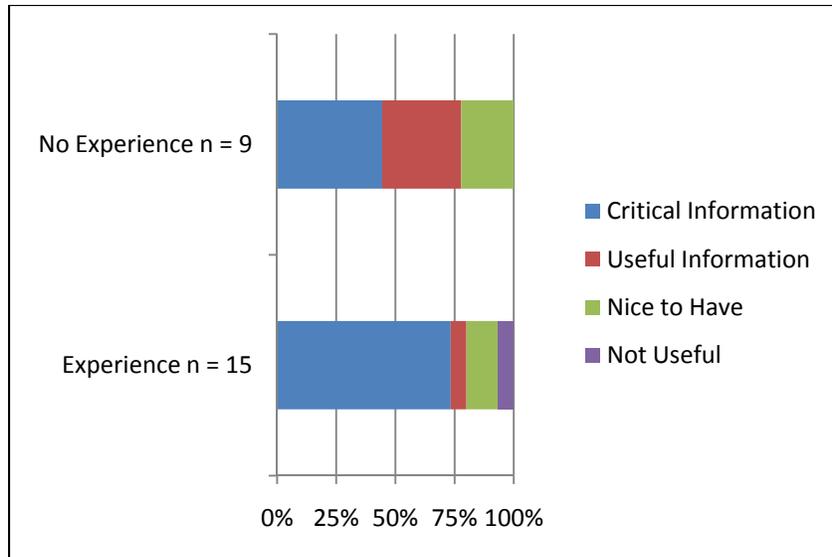


Figure 3. Importance of Evacuation Route Information by Respondents' Experience with Routing Freight through Areas Experiencing Severe and Extended Traffic Disruption

Source: TranSystems.

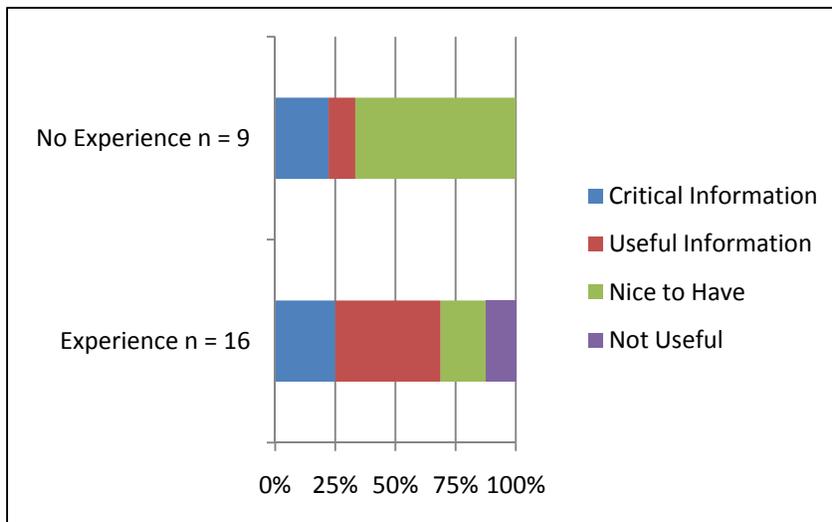


Figure 4. Importance of Truck Repair Locations by Respondents' Experience with Routing Freight through Areas Experiencing Severe and Extended Traffic Disruption

Source: TranSystems.

In each figure above, trucking companies with disaster routing experience place a higher importance on information concerning evacuation routes or knowing truck repair locations. These charts suggest that previous experience provides truckers with the knowledge of what information is needed, and where to get it. Out-of-state truckers who do not typically operate in Texas or the Gulf Region may be less likely to have disaster experience, such as with hurricanes, and may therefore be less prepared to react to an unexpected incident. Outreach to out-of-state truckers may be necessary to ensure that freight flows smoothly during and after disruptive events.



The remainder of the report focuses on truckers with experience with disaster recovery, in order to obtain informed input based on actual re-routing information needs.

Information Duration

Figure 5 plots respondents’ preferences for the duration of the information types listed for truckers who have had experience with re-routing freight due to extended traffic disruptions. Nearly 75 percent of these respondents prefer that Alternate Routing, Real Time Road Closure and Traffic Speed Maps be made readily available until the situation returns to normal. This suggests that traffic information will be continuously monitored to adjust routes as conditions change, so that freight can be delivered in the most efficient and expeditious way possible.

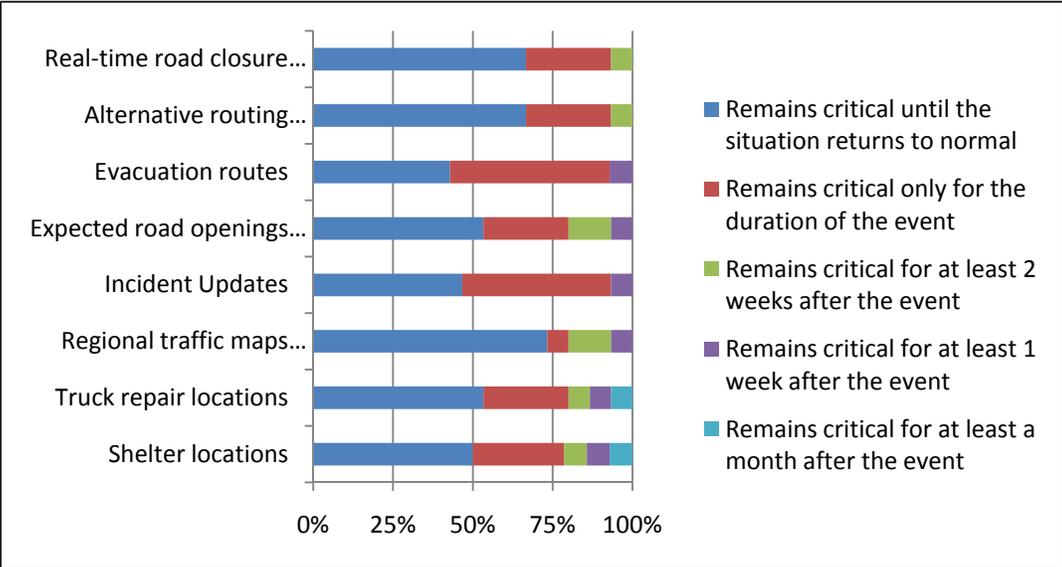


Figure 5. Traffic Messages Duration Preference of Truckers with Experience with Routing Freight through Areas Experiencing Severe and Extended Traffic Disruption

Source: TranSystems.
 Note: n = 15, Information categories are in order of importance, per Figure 2.

Information Sources

Telephone interviews indicate that the source of traffic status and routing information varies, and in fact may be dependent on each other. Law enforcement and TxDOT, for example, coordinate to provide critical traffic information. The trucking community itself can be a source of information. The preferred source appears to depend on the type of information required, and where in the event lifecycle that information is needed. It should be noted that the subject of the information source is separate from a discussion concerning communication channels, i.e. cell phone or Dynamic Message Sign (DMS). The communication channel selected by each source to distribute information is critical, and will be discussed in the following section.

Respondents were asked to select their preferred source for traffic status information (Figure 6). TxDOT and federal and other law enforcement agencies are preferred sources for the most critical types of information, especially as events are occurring, according to telephone interviews.

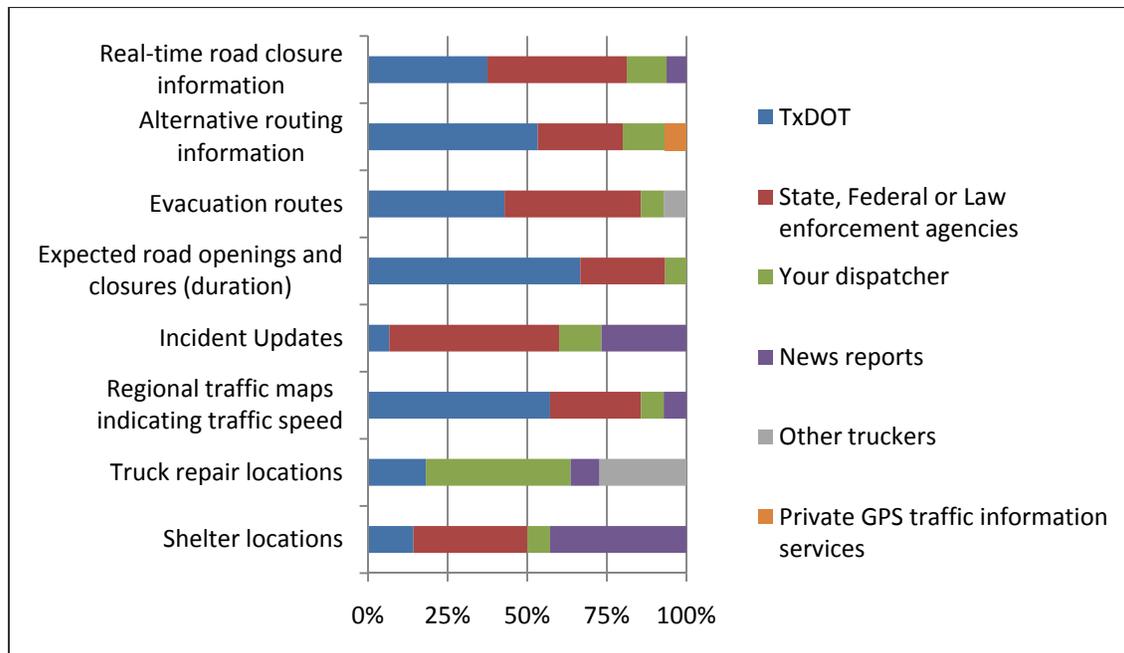


Figure 6. Traffic Information Source Preference of Truckers with Experience with Routing Freight through Areas Experiencing Severe and Extended Traffic Disruption

Source: TranSystems.

Note: n = 16, Information categories are in order of importance, per Figure 2.

TxDOT is the preferred source of over half of the respondents with experience routing freight during severe events, for Alternative Routing, Road Closure, Evacuation Routes and Regional Traffic Map information. As mentioned previously, TxDOT increasingly becomes the preferred provider of this information as time progresses after an event.

Communications Channels

Perhaps one of the fastest evolving elements of any communications plan is the rapidly expanding number of communications channel options: social media (i.e., Facebook, Twitter), cellular technology services (i.e., voice calls, text messaging, smart phone GPS services), email, internet web pages, and the land-line telephone. The channel used often depends on the types and urgency of communications required.

An example of a channel that is designed to address an urgent information need is The Federal Emergency Management Agency’s Personal Localized Alerting Network¹ (PLAN). PLAN is designed to send 90 character text messages to cell phone subscribers in targeted geographic areas that are in imminent danger of a catastrophic event, such as a terrorist attack or a hurricane. This channel “pushes” information to concerned parties and does not depend on users to go to a source. The obvious limitation of the text message option is that the entire message must be contained within 90 characters. Other communications channels, such as the internet, can provide critical traffic detail on congestion or alternative routes, because of this channel’s capability of presenting large amounts of information at a single location. Web-based applications require users to go to the source, which may not be appropriate in an emergency situation. Obtaining alternative routing in the weeks and months following a disaster is

¹ <http://www.fema.gov/news/newsrelease.fema?id=54882>

more suitable to a web-based application, given the amount of information that is necessary to efficiently re-route cargo as the urgency of the situation gradually subsides.

Truckers were asked to choose their preferred communications channel for key traffic information categories, as shown in Figure 7.

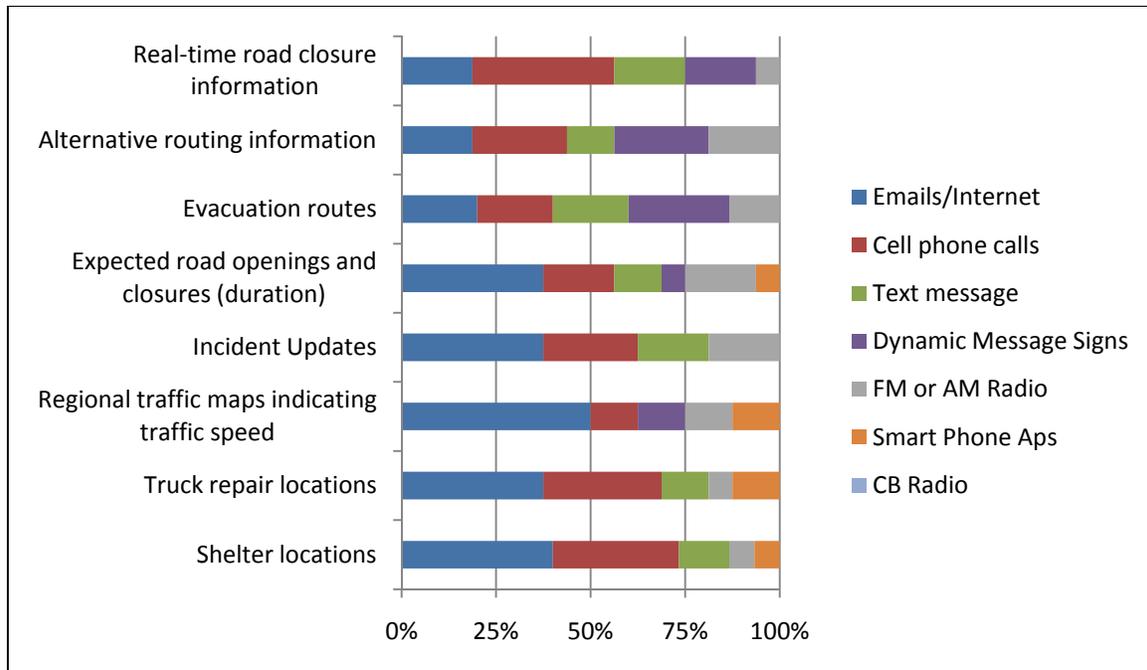


Figure 7. Traffic Communications Channel Preference of Truckers with Experience with Routing Freight through Areas Experiencing Severe and Extended Traffic Disruption

Source: TranSystems.

Note: n = 16, Information categories are in order of importance, per Figure 2.

Email and Internet, and Cell Phone calls are most often the preferred communications channels. Survey respondents did not indicate who was sending or receiving the cell calls, but presumably these conversations are between truck drivers and dispatchers, who in turn have received information from sources such as TxDOT or state or federal law enforcement agencies, for example. The preferred source of truck fueling station information is similar to truck repair locations according to interviews. In some key categories, such as Alternative Routing, Real-Time Road Closure and Evacuation Route information, the preferred channel is more evenly distributed among all channels. This seems to suggest that all appropriate communications channels should be utilized to disseminate information, according to user preferences. This is particularly important for companies that hire independent truck drivers who own their own tractors. In these cases, the communications device used between the company and the trucker is generally a cell phone, but a communications device may not be standard among all drivers.

The need of proper placement of information is also evident in the data. Dynamic Message Signs, for example, were noted as the preferred channel to distribute information directly to drivers in affected areas that have the greatest need, such as road closures, alternative routing and evacuation routing. Cell phones have a similar capability, as cell phone locations can be identified by GPS and other means.

Railroads, Coastal Waterways and Ocean Ports

Rail, barge and ship transportation providers have basic traffic information requirements, with their main concern being roadway damage or traffic conditions that might impact rail or waterborne operations. Earliest possible notifications of these types of events are preferred; however, law enforcement is the primary source of initial incident reporting. TxDOT is considered to be responsible for maintaining road closure information in the time period following a major incident, so that rail and waterborne operators can plan alternative routes.

In the case of rail operator interviewed, roadway incidents that block or affect rail passage or at-grade crossing signals are reported by law enforcement personnel to an established incident 800 number. High water incidents are reported by the US Army Corps of Engineers (USACE), and USACE is responsible for ongoing reports of track status in water-affected areas, especially in isolated regions without road access. The railroad operator also has procedures to report incidents that are noticed by train personnel. These incidents are reported to rail incident desks, who in turn notify local law enforcement.

Waterborne transportation, either on the Gulf Intracoastal Waterway or off the Texas Coast is the responsibility of the US Coast Guard (USCG). Events causing blockages on the inland waterway system are reported either directly by vessel operators or by local law enforcement to the USCG, who then broadcasts a "Notice to Mariners" via VHF radio. The USCG also notifies the Gulf Intracoastal Canal Association, who in turn emails this information to Gulf inland waterway operators.

Railroad and waterborne event reporting procedures are well established, and TxDOT is mainly viewed as being responsible for maintaining a source of road closure status information so operators can make re-routing plans around affected roadways or bridges until conditions return to normal. TxDOT communications that will assist rail and waterborne operators should be directed to incident desks, or to the US Coast Guard for distribution.

Summary of Information Needs

Real-Time Road Closure and Alternative Routing information is most critical to those responsible to finding alternative routes during or in the weeks and months following a severe and extended traffic disruption, yet the preferred source of this information changes depending on where in the event life cycle this information is needed. Status updates required at the time of a disruptive event are provided by either law enforcement, TxDOT or other sources, but TxDOT is the preferred source of this information as conditions stabilize and the urgency of finding contingency routing gradually subsides. Similarly, the number of communications channels needed at the time of a severely disruptive event should be established based on the capabilities of the channels to target areas in need, and be able to meet the communications channel preference of the targeted audience. Status information that enables transportation companies to evaluate alternative paths in the time period following an initial event (weeks or months), is not as urgent and users can be directed to tools that provide this type of information. TxDOT is increasingly preferred as the source of traffic information as conditions stabilize.

Railroad, barge and ocean shipping companies require roadway advisories of incidents that either block vessels or that prevents trucks that take cargo unloaded from vessels from accessing roadways. The main information access point of these carriers is the USCG or local law enforcement agencies. Information provided by TxDOT is used to make vessel port call decisions or to find alternative routes in the case of railroad or barge companies.

TxDOT is viewed as a communications organization, responsible for housing and distributing information that will enable transportation companies to efficiently maneuver through or around areas impacted by severe and extended traffic disruptions.

Section 3. Texas State Agency Communication Capabilities

Information from the private sector, reported in the Stage I SFR Plan, indicated that TxDOT was viewed as an organization that could act in a support role to assist the private sector to recover from man-made or natural events. The private sector pointed to the lack of a central location for all transportation-related activities during a severe disruption and suggested that TxDOT might consider creating a tool that assists shippers and transportation providers during these events. This section focuses on investigating the communications capabilities of TxDOT, and other state agencies, to determine if the needs of the private sector can be met through existing or expanded efforts.

Description of Texas Emergency Management Organizations and Officials

In Texas, the Governor is the highest level official responsible for directing homeland security and dealing with dangers associated with disasters and disruptions. Thirty-two state agencies, and the American Red Cross and Salvation Army, are responsible for supporting the Governor in all matters relating to disaster mitigation, emergency preparedness, disaster response and recovery. These agencies and organizations form the Emergency Management Council. During major emergencies, representatives activate the State Operations Center to coordinate actions on assistance and deployment of resources.

The Texas Division of Emergency Management (TDEM) within the Department of Public Safety and TxDOT both serve on the Emergency Management Council. TDEM's specific responsibilities include implementation of a comprehensive all-hazard emergency management program for the State and assisting cities, counties and state agencies in implementing their own emergency management programs. TxDOT's Emergency Management Coordinator (EMC) is within the Maintenance Division. TxDOT's internal role is to mobilize personnel and equipment in partnership with public and private entities to plan for, coordinate, and respond to disasters and emergencies. TxDOT external role is in providing public information on TxDOT's emergency services using a variety of traveler information platforms.

At the local level, mayors and county judges are responsible for emergency management functions. Many jurisdictions appoint an Emergency Management Coordinator to manage day-to-day program activities. Often times it is these local EMCs that carry out public education about known hazards during non-emergency times but also provide communication during and after an event.

The private sector's role varies in emergency management within Texas. Most evident is the role that organization's like the American Red Cross and Salvation Army play in providing disaster assistance to the public. However, in Texas the Governor has fostered cooperation between the state and private sector for functions like the Fuel Team and through partner distribution systems. The Fuel Team is comprised of representatives from refining, supply, terminal and transportation sectors who coordinate fueling increases for evacuation routes. The partner distribution system includes companies like Wal-Mart, HEB and Home Depot to provide ice, water, medicine, food and emergency materials in disaster areas.

Description of TxDOT Communication Structure

While TxDOT's EMC sits within the Maintenance Division, communication with TxDOT customers is executed by the Government and Public Affairs Division (GPA) and district-level Public Information Officers (PIO). The GPA handles statewide issues and government/legislative relations. The GPA, which is based in Austin, also acts as support for the PIO's in the district offices around the state. Statewide media publications such as newsletters, postings on the TxDOT Facebook page and podcasts are done through the GPA.

There are 25 districts within TxDOT and each district is assigned a PIO responsible for communicating with the public within their district. The PIO's in each district disseminate information by various methods (i.e., Twitter, email, meetings) to individuals or groups included in customized databases. Communications with customers takes place at the district level unless the information being distributed affects the state; then it is disseminated by the GPA.

The SFR Plan is being conducted by the Transportation Planning and Programming Division (TPP) within TxDOT. The TPP's role is to administer planning funds, collect data on the highway system and program projects. It is also responsible for rural and urban multimodal transportation systems planning including project planning, policy development and operations regarding water, bicycle and pedestrian transportation. TPP communicates with stakeholders on specific projects or programs by relying on the GPA and PIO to support or direct the efforts.

Description of Agency Communication Capabilities

In order to understand how TDEM and TxDOT facilitate communication with transportation network users surrounding a man-made or natural event, interviews were conducted with agency representatives throughout the state. The purpose of these interviews was to gather information on communication capabilities and specifically communication with freight stakeholders. The following agency personnel were interviewed as part of this information gathering process.

Table 2: Agency Interviewees				
Name	Title	Location	Date of Meeting	Format
Texas Department of Transportation				
Laura Lopez	Public Information Officer	San Antonio	June 7, 2011	Face-to-face
Raul Leal	Public Information Officer	Laredo	June 8, 2011	Conference Call
Tom Tagliabue	Public Information Officer	Corpus Christi	June 9, 2011	Conference Call
Blanca Del Valle	Public Information Officer	El Paso	June 12, 2011	Conference Call
Raquelle Lewis	Public Information Officer	Houston	June 13, 2011	Conference Call
Carla Baze	Emergency Management Coordinator (Outgoing)	Austin	June 30, 2011	Conference Call
Gilbert Jordan	Emergency Management Coordinator (Incoming)	Austin	June 30, 2011	Conference Call
Texas Division of Emergency Management				
Dede Powell	State Coordinator for Operations	Austin	July 12, 2011	Conference Call
Gisela Ryan-Bunger	Section Administrator for Operations	Austin	July 12, 2011	Conference Call

Source: TranSystems.

Interagency Communication between TxDOT and TDEM occurs through their participation in the Emergency Management Council. Both agencies provide staff to man the State Operations Center and attend in-person meetings as required. It was reported during interviews that the majority of communication between the agencies occurs via email and telephone. No changes in this communication approach were suggested as the Emergency Management Council has established communication protocols and implements changes as needed for improved operations.



Internal communication at TxDOT occurs between the EMC and the various divisions and districts via email and telephone during situations that require TxDOT personnel or equipment. Through emergency preparedness exercises, TxDOT practices response plan execution and institutes changes to internal communication methods to better execute plans that are in place as identified.

TxDOT has a more direct role in communication with their customers, the user of the state transportation system. Discussions with the various TxDOT districts throughout the state identified channels that are utilized to inform network users including the freight industry of a major incidence such as a wildfire, hurricane or winter weather event. Table 3 (next page) outlines the communications channel as well as the audience that each communications channel targets. Some of these channels are also utilized to notify network users of construction projects or recurring events like rush hour traffic.

Dynamic Message Signs, a facet of Intelligent Transportation Systems, are an integral part of efforts to inform travelers who utilize Texas roadways for travel and commerce. The Traffic Operations Division manages the state intelligent transportation systems, and works with the EMC to post DMS messages alerting drivers to potential hazards. The EMC reported that the primary format for communicating with the trucking industry is via DMS. All of the TxDOT districts interviewed utilize DMS in their regions and urban centers. During summer 2011, DMS was used to provide traveler information on wildfires throughout the State. The Texas Forest Service, through the Emergency Management Council, coordinated with TxDOT to post information messages like “Watch for Smoke on Road” on DMS throughout the state to inform travelers of current conditions.

TxDOT maintains a Road Conditions map and text information on its website which identifies road closures, accidents and construction information. Customers can view text description of current road conditions by selecting a specific road, county and/or condition, such as flooding or construction, from a database maintained by district personnel. The road conditions map also illustrates road closure and condition information using a GIS application. The Road Conditions map and text information is maintained by district personnel who enter information into the Highway Condition Reporting System database. TxDOT also maintains a toll-free number that can be called for current road condition information.

More than fifteen metropolitan areas in Texas maintain ITS systems that include traveler information maps with varying degrees of information. TxDOT uses video cameras, DMS, traffic detection devices, and Lane Control Signals to assist in warning the traveling public of lane closures due to incidents and construction projects. The data is also used to provide estimated travel times in many locations and monitoring traffic conditions. Most of the information can be accessed via mobile devices which is useful for travelers who cannot access the internet from a traditional connection while traveling.

This information does not generally extend onto the statewide highway system. However, in 2010, Houston’s TranStar pioneered the use of traffic monitoring using Anonymous Wireless Address Matching (AWAM) technology. AWAM currently uses anonymous addresses from Bluetooth™ network devices to identify probes and calculate travel times and speeds on roadway segments. This allows Houston TranStar to provide travel updates to drivers during daily commutes as well as in emergency evacuation situations. This system is currently active on Interstate 45 between Houston and Dallas, as it is the main evacuation route for gulf hurricanes. It is under development for IH 35 between Waco and Dallas in anticipation of major future construction.

The EMC relies on the TxDOT Rail Division to coordinate with railroad industry contacts during emergency situations. The greatest need is to keep evacuation routes clear of train traffic during an event. While the railroads operating in Texas are not required to comply with TxDOT’s requests during

a natural or man-made event, the relationships that exist in the Rail Division are helpful to open lines of communication.

Table 3: TxDOT District Communication Summary							
Audience ¹	Communication Channels Used						
	Statewide Facebook	Statewide Twitter	District Twitter	Newsletters	Email	Dynamic Message Signs (ITS)	Highway Advisory Radio
Corpus Christi District							
General Public	X					X	
Media	X		X		X		
Rural	X		X	X			
Military					X		
Tourists	X					X	
El Paso District							
General Public	X		X		X	X	X
Law Enforcement					X		
Media	X				X		
Military					X		
Rural					X		
Houston District							
General Public			X		X	X	
Media			X		X	X	
Laredo District							
General Public			X			X	X
Elected Officials					X		
Freight					X	X	
Law Enforcement					X		
Paisanos ²						X	X
San Antonio District							
General Public			X			X	
Media					X		
Rural					X	X	
Law Enforcement					X		

¹ Not all audiences were discussed with each District PIO.

² A Paisano is a term used to describe Mexican nationals working or living in the United States who frequently travel across the United States – Mexico international border.

Source: TranSystems.



TxDOT initiated a campaign in 2011 to combat distracted driving. Their "Talk, Text, Crash" campaign is being displayed on signs throughout the state with the intent of limiting distracted driving by all transportation network users. Therefore, it is unlikely that a text-based line of communication will be available to transportation system users in the future.

The Texas Division of Emergency Management primarily communicates with the general public through local government. Communication is not TDEM's primary role; they work through the Governor's office and local governments to deliver messages relevant to the general public about emergency situations. TDEM reported that large trucking companies have a very robust way of notifying their drivers in emergency situations while smaller, independent companies have fewer tools available to communicate with their drivers. They noted that maintaining a database of trucking companies utilizing Texas roadways would be very challenging.

Summary of Communication Capabilities

The communication capabilities within Texas agencies responsible for disseminating information to transportation systems user relies on coordinated services and multiple communication channels. The Governor's Emergency Management Council is a clearinghouse for agencies responsible for varying levels of message delivery. From the governor's office to local officials, there is a set protocol for communication with system users before, during and after an event.

Specifically, TxDOT utilizes a wide range of communication channels to deliver messages to their customers. The district-level PIOs interviewed in this study emphasized that they work in a proactive manner when notifying the public of road hazards, construction, maintenance and closures. Social media is at the forefront of the communications tools that are utilized.

One of the most heavily relied upon means of communication with freight transportation system users is Dynamic Message Signs. These signs provide immediate messages to all travelers regarding real-time travel conditions. Coverage is limited in rural areas but urban areas are well covered through ITS. ITS is also encouraging the development and use of mobile applications for traveler information in Texas.

Section 4. Recommendations for Communicating with Freight Stakeholders

Consistent with findings from the Stage I Private Sector Interviews, traffic condition communications concerning blockages and congestion remain a high priority for transportation providers of all modes when routing freight through areas impacted by natural or manmade disasters. Alternative routes are chosen using traffic data to determine if the selected route:

- Has the shortest transit time
- Is safe and suitable for freight transportation
- Is potentially a parallel route to the affected road, in the case of trucks
- Has the lowest congestion level

TxDOT is viewed as being a key information resource that will enable operators to evaluate road closure and alternative routing data, especially during the weeks and months following a severe event. The communication channel used is the key to efficiently disseminating vital information.

The preferred communications channel depends on communications devices available to the carriers, and where in the event lifecycle that the information is needed. Events with no advanced warning might require communications to be dispersed using all means possible, but the number of necessary channels may be reduced as conditions stabilize. The underlying requirement is that transportation providers know where to access traffic information when it is needed. Key points that surfaced during this research include:

- TxDOT is viewed as being an organization responsible for housing and distributing travel information that will enable transportation companies to efficiently maneuver through or around areas impacted by severe and extended traffic disruptions.
- The most critical pieces of information tend to provide truckers with information that allows them to assess passable routes, and re-route trucks accordingly, such as real-time road closure information or alternative routing information. This information remains critical for the duration of an event.
- Traffic information, such as real-time road closure and alternative routing information will be monitored until conditions caused by a significant traffic event stabilize. Transportation companies look to TxDOT to continuously provide timely information for the duration of the event. This will enable routes to be adjusted as conditions change, and freight to be delivered in the most efficient and expeditious way possible.
- Careful consideration should be given to the selection of communications channels. Traffic information relayed during or close to a disruptive event should be capable of reaching a wide range of devices, with the ability to target messages directly to selected areas. TxDOT, law enforcement, or other truckers can be the source of this information. As conditions stabilize in the weeks and months following a severe event, TxDOT becomes more preferred as the source of traffic conditions.
- Out-of-state truckers who do not typically operate in Texas or the Gulf Region may be less likely to have disaster experience, such as with hurricanes, and may therefore be less prepared to react to an unexpected incident. Outreach to out-of-state truckers may be necessary to ensure that freight flows smoothly during and after events that disruption travel.

- Rail, barge and ship transportation providers have basic traffic information requirements, with their main concern being roadway damage or traffic conditions that might impact rail or waterborne operations. Earliest possible notifications of these types of events are preferred; however, law enforcement is the primary contact for initial reports of rail or waterway disruption. TxDOT is increasingly viewed as the source of surface road disruptions as conditions stabilize.

Recommended Approach

The future trend in traffic information channels is continuously evolving. The ability to target specific locations of cell phone devices using GPS services, coupled with GIS routing and mapping technology has created an opportunity for private companies to offer routing services targeted to trucking and railroad modes, as route coverage is expanded to include railroad and port infrastructure areas. Routing through or around extended network blockages will likely be part of these new service offerings. These private entities will utilize technology that allows them to estimate traffic speeds, but will require source data provided by TxDOT, such as road closure information or truck roadway restriction information, to power their applications.

This research confirms the need for a well publicized and robust central location for traffic information that will assist transportation companies with identifying alternative routes. Real-time status reports concerning road closure information, alternative routes for impacted areas, evacuation routes are examples of information required. Regional traffic maps should be expanded, or at least traffic maps that illustrate conditions in impacted areas, including evacuation and alternative route information should be quickly deployed. These conclusions illustrate the need for TxDOT to expand its systems of message delivery through deployment of DMS and expanded ITS services.

TxDOT's data collection capabilities and responsibilities are integral to capitalizing on technology innovations. Providing good customer service means monitoring and responding in a timely manner but it also means providing information such that customers can make good decisions that help the system. TxDOT should not be expected to be the single-source for technology expansion, but the data housed within TxDOT is valuable for these services. Identifying data-sharing capabilities is recommended to provide good customer communication before, during and after events causing traffic disruptions.

All possible communication channels should be evaluated to determine capabilities, and suitability for communicating various types of information at varying stages in the lifecycle of an incident. Due to the continuously evolving communications capabilities, this should be an ongoing process. User preference should be the key selection criteria. TxDOT should ensure that customer relationships are nurtured when conditions are stable so that when it matters there is trust.



Section 5. Approach for Future Stages

The Stage 1 SFR Plan focused on setting the context and purpose of resiliency planning for Texas, while identifying and assessing the state's freight transportation corridors. The Stage 1 goal was to have a freight transportation system prepared to keep freight moving during an event. Texas corridors are robust, and an extensive system of redundant corridors is available. Many stakeholders indicated that communication is important to freight transportation system resilience. The results of the Stage 1 plan indicate that the overall Texas freight transportation system is prepared for an event but there are physical and institutional areas that could be improved to provide higher levels of resiliency.

The Stage 2 SFR Plan builds on the recommendations of stakeholders to develop the necessary communication and implementation plan, to provide a resilient transportation system during and after an event. While stakeholders provided some information on their needs during an event, any communication plan should be developed with their input. Stage 2a expanded on earlier interviews to determine communication needs and capabilities. Stage 2a also investigated coordination efforts with state emergency management agencies to consider the needs of freight.

Future efforts in Stage 2 will identify evolving technology and the data required for implementing these technologies. Identifying the gaps in existing data collection will aid in providing robust information to customers required during a travel disruption.

Stage 3 is an on-going, internal function for TxDOT. Continuous feedback after real events will improve the plan and ensure its relevance. After an event, freight considerations should be included in summary reporting so that efforts are documented and lessons drawn from the experience. In the absence of an event, TxDOT should continually evaluate resilience on a regular schedule and incorporate feedback so that consideration of the Texas economy stays in the forefront.



List of Acronyms

AWAM	Anonymous Wireless Address Matching
DMS	Dynamic Message Signs
DOT	Department of Transportation
TxDOT	Texas Department of Transportation
EMC	Emergency Management Coordinator
GIS	Geographic Information Systems
GPA	Government and Public Affairs Division
GPS	Global Positioning Satellite
ITS	Intelligent Transportation System
PIO	Public Information Officer
PLAN	Personal Localized Alerting Network
SFR	Statewide Freight Resiliency
TDEM	Texas Division of Emergency Management
TPP	Transportation Planning and Programming
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard



References

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