TRANSIT EVACUATION PLANNING FOR MOBILE COUNTY, ALABAMA

by

MENASSE T. KUMLACHEW

A THESIS

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ABSTRACT

The main objectives of this thesis research were to: (1) estimate the potential number of transit dependent individuals during a major hurricane event and (2) provide information describing how to effectively communicate with these individuals before, during and after an emergency evacuation. Mobile County was used as a case study.

Mobile County is one of the two Alabama coastal counties exposed to the effects of hurricane storm surges, wind and rain. The amount of danger the residents face depends on the intensity of hurricanes, the locations of the individuals, and the amount of prior preparation and planning by emergency agencies. During these events special needs individuals are the primary endangered people since they require special assistance to evacuate and are not usually included in emergency evacuation plans. Since special needs populations are diversified, and mostly isolated, it is difficult to identify, locate and communicate emergency information with them.

The study reviewed several reports and guidebooks published by federal and state emergency management agencies. This review was supplemented by contacting individuals working in the area of emergency management and evacuation of special needs populations. The study identified a variety of communication systems which can be applied in emergency information communication. The systems’ limitations and strengths in serving the special needs individuals were assessed based on the literature.
The number of potential transit dependent populations was estimated in three ways. Each method used a different dataset: (1) Census 2000, (2) 2006 American Community Survey and (3) Harvard Telephone Survey. There were several major findings for this part of the study:

1. There was a general correspondence between the three estimates, but it was not strong enough to make a statistical comparison.

2. The census data and American Community Survey data contain large standard errors, as much as ±30% at a 90th percentile confidence level.

3. The actual numbers of evacuees for previous categories 3 and 2 hurricane events near Mobile County were less than 11% of the average predicted levels.

In summary, this study provided information to assist Mobile County prepare evacuation plans to deal with extreme events.
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CHAPTER ONE
INTRODUCTION

This thesis addresses transit emergency evacuation by individuals without personal vehicles or the means to acquire them during coastal extreme events. The overall project was sponsored by the University Transportation Center for Alabama (UTCA) at the University of Alabama as project 08109. The project is a joint effort of UTCA and the Center for Transportation Policy Studies (CTPS) at the University of North Carolina Charlotte (UNCC). The project used Mobile, Alabama and Wilmington, North Carolina as simultaneous case studies.

This thesis provides basic information about plan preparation and communication with the vulnerable population. It also estimates the potential number of transit dependent individuals in Mobile County, Alabama, and provides a check list of the elements typically included in the plans for evacuation of transit dependent individuals. Similar work was conducted at the UNCC CTPS. The two centers shared ideas and findings to improve the work at both centers. Only the Mobile County case study is presented in this thesis.

1.0 Scope of the Project

This thesis provides an overview of two of the major issues involved with planning and conducting evacuations of individuals without vehicles:

- Estimation of the potential size of the vulnerable population; and
• Information on how to effectively communicate with these individuals before, during, and after an emergency evacuation.

1.1 Background Information

Alabama is one of the states along the Gulf of Mexico which is under a constant threat from seasonal hurricane events. Mobile County is one of two Alabama coastal counties exposed to the effects of hurricane storm surges, wind, and rain.

Mobile County has a total estimated population of about 400,000, scattered through ten cities and rural areas, with the City of Mobile being the most populated (Together We Teach Educational Resources, n.d.). The residents’ exposure or the amount of danger they face depends on the intensity of hurricanes, the locations of the individuals, the amount of prior preparation and planning by emergency agencies, and many other factors.

Based on information from the National Hurricane Center, the local television news station indicates that since 1995 there were seven major hurricanes which affected the Mobile Bay area. These were hurricanes Erin, Opal, Danny, Georges, Ivan, Dennis, and Katrina (WKRG News 5, n.d.).

In addition to these major hurricanes, hurricane Rita in 2005 caused severe damage along the gulf coast to both Florida and Alabama. The I-10 Bridge over Pensacola Bay was destroyed by the storm surge. Alabama experienced extreme damage in Gulf Shores and Orange Beach, with severe damage up to Five-Mile Inland. The damage to beach-front utilities took more than two years to fully restore.

Hurricane Katrina in 2005 was one of the deadliest and costliest hurricanes in US history. The highest storm surge reached 15 feet along Mobile Bay and crossed I-10 at many locations. It also caused flooding several miles inland from the coast. Katrina was so severe that afterward
major changes were made to disaster preparation plans. The storm caused devastating damage in Louisiana and Mississippi, where the death toll reached more than 1,300 and 200 respectively. Most of these deaths were attributed to the storm surge and storm surge induced flooding. The saddest fact about Hurricane Katrina damage in Louisiana was that the majority of the fatalities were persons above 60 years of age and transit dependent (non-driving) individuals. Insufficient food, water, medical care and security at the staging area (the Superdome) made things worse for this segment of the population (Knabb, Rhome, & Brown, 2005).

The size and severity of the Hurricane Katrina disaster provided lessons for planning agencies which led to improvements in their planning to minimize the reoccurrence of prior mistakes. Plans now include greater detail about the critical components of evacuation such as communication, transportation, and sheltering of transit dependent individuals. Planning regulations for transit-dependent individuals now call for the identification of needs, resources, and organizations responsible for evacuation of the vulnerable populations. These needs are required to be well integrated with the evacuation procedure for automobile evacuation.

1.2 Study Methodology

The primary component of this study was the review of a large number of reports and guide books published by federal and state emergency management agencies. Conference calls, emails, and field visits were used to acquire additional information from state emergency management agencies, technical organizations, consulting companies, and national experts. In addition the UTCA team made multiple trips to Mobile to meet with Mobile County Emergency Management Agency (MCEMA) officials to acquire and exchange information.
1.3 Contents of this Report

This thesis deals with the Mobile case study, and is divided into five chapters. Chapter One, “Introduction”, gives the background of this project. It explains why this study was needed and discusses the methodologies applied during the project.

Chapter Two, “State of Practice”, discusses major issues in relation to hurricane evacuation, defines transit-dependent individuals, provides an overview of hurricane categories, and discusses evacuation practices in relation to transit-dependent individuals. It also provides a short review of the MCEMA hurricane evacuation plan.

Chapter Three, “Communicating with the Vulnerable Population”, addresses communication of transportation related issues with vulnerable populations. It also discusses the characteristics of these population groups, communication barriers, and communication techniques. It provides a foundation for developing communication procedures, policies, and strategies.

Chapter Four, “Estimating the Evacuation Population”, discusses the important issue of estimating the number of transit dependent evacuees. It describes best practices and provides recommendations from different states and various studies about how to estimate the potential number of evacuees. This chapter also compares evacuation estimates with the number of people that actually evacuated for prior hurricanes and draws conclusions about the differences between the estimated and actual number of evacuees.

Chapter Five, “Mobile Case Study Conclusions”, contains basic conclusions and recommendations drawn from the Mobile case study.

This report also contains appendices that provide useful resources. They include identification of reference materials (complete with page numbers) for addressing the major
components of preparing and using an evacuation plan that addresses vulnerable populations that do not have vehicles for use in evacuation situations. There is also a checklist to help MCEMA planners and other groups enhance their plans for evacuating transit dependent individuals.
CHAPTER TWO
STATE OF PRACTICE

2.0 Overview

Hurricanes are catastrophic events which cause major loss of life and environmental and structural damage. This destruction is primarily due to storm surge, but a significant amount of damage is also caused by high speed winds. Hurricane severity is described using the Saffir/Simpson hurricane wind scale which categorizes them on a 1 to 5 scale based on their intensities. A category 1 hurricane has a wind speed of 74 to 95 miles per hour (mph) while a category 5 hurricane has a wind speed greater than 155mph (National Hurricane Center [NHC], n.d.).

Evacuations are the main means of protecting people in hurricane-prone areas. The Saffir/Simpson hurricane wind scale plays a big role in making decisions about whether all or part of the population in a vulnerable area needs to evacuate. In most cases in coastal areas, for category 1 and 2 hurricanes, vulnerable populations may simply move a relatively short distance inland to safe shelters, but for category 3 to 5 hurricanes, evacuations are typically to safe locations 100 or more miles inland.

Evacuation plans can be prepared for different kinds of extreme events such as hurricanes, wild fires, floods, or terrorist attacks. They can be prepared for different population groups such as general populations, individuals in hospitals, nursing homes etc. Emergency planners try to be prepared for the worst conditions and to include every population segment in
their plans. The following section of this chapter discusses evacuation planning in relation to transit-dependent individuals.

2.1 Major Topics for Planning and Conducting Transit Evacuations

2.1.1 Identifying and Estimating the Evacuating Population

Several studies have provided definitions of transit-dependent individuals, such as “special-needs populations,” but those definitions do not encompass all transit-dependent individuals. Other studies state that it is a broad group which includes several population segments, such as individuals with low income, elderly, disabled individuals, individuals with limited English proficiency, etc. To avoid confusion, the definition of individuals in the transit evacuation population for this report is presented in the next paragraph.

Transit-dependent individuals are individuals who may depend on transit during hurricane or coastal extreme events. These may be individuals without personal vehicles or those who need mobility assistance. Individuals who need special medical attention are not included in this report since their transportation and sheltering requirements are more complicated than other individuals. Also, in Alabama, evacuation plans for individuals under medical supervision or receiving intensive care in nursing homes or hospitals are prepared by health organizations; they are not included in this report. A list of some of the categories of transit dependant evacuees is provided in a latter section of this report.

Data on members of this segment of the population is difficult to find due to their diversity, isolation, and special communication needs, and the amount of time and resources collecting data requires. Registries are established in various states to identify and record the location, number and needs of transit dependent individuals in extreme events. However, these registries are not always successful due to privacy issues. Much of the key data is protected by
federal privacy legislation, so it cannot be found by screening public records. Estimation of the number of potential evacuees is also complicated for the same reasons. In a later section of this report, the author provides an example of estimating the number of transit dependent individuals based on three datasets. Comparisons are made with the actual number of evacuees during previous hurricane events.

2.1.2 Communication

Communication is an important component of the evacuation process during hurricanes or other extreme events. Communication systems must perform before, during, and after extreme events, and they must be resilient and well established in order to avoid system failure. Information must be provided to potential evacuees, such as the evacuation declaration, pickup locations, amount of individual belongings allowed on buses, etc. In addition to disseminating information to the public, communication systems are needed to make effective information exchanges between emergency management agencies, police, authorities, etc.

Communicating with special-needs populations has complex requirements. Factors such as disability, isolation, or other special restrictions sometimes make them unable to use regular communication systems. Therefore, different warning systems that target the special needs population are often provided. This thesis research discusses current practices and communication barriers in more detail in a later section.

2.1.3 Transportation

Transportation needs are considered in evacuation plans according to the number of self-evacuating individuals, transit-dependent evacuees, and medically-fragile individuals. Transportation plans also depend on the hurricane strength which influences the number of evacuees and evacuation destinations. For example, in Mobile County, hurricane categories 1
and 2 require evacuation from primary vulnerable areas and mobile homes but are typically short distance evacuations.

Transit-dependent individuals typically do not have personal vehicles or the means to acquire them. Therefore, buses are required to transport them to shelters. Mutual aid agreements signed between adjacent or nearby states or counties play a vital role in supplying services and resources such as buses, drivers etc.

2.1.4 Sheltering

During major hurricane events, evacuees go to hotels, to homes of their relatives, or to mass shelters. Shelters are prepared based on the estimated number of individuals that might use them. Shelters are usually prepared and activated based on the extent of evacuation and whether the evacuees move inside the county or out of the county. Schools are often used as shelters since they have large open spaces and can take large numbers of evacuees. However, shelters should not be susceptible to surge inundation, rain, flooding, or wind.

The location of emergency shelters designated for transit-dependent individuals should be well known by the public and should be equipped with necessary resources such as food, water, first aid kits, beds, etc. On the other hand, medically-fragile individuals living at their homes under some kind of medical care require a separate shelter which can provide medical supervision and treatment similar to the care they were receiving prior to evacuation.

2.1.5 Sample Special Situations - Medical Needs, Pets

In evacuation planning, at least two situations require special attention while planning for emergency evacuation. These situations are medically-fragile individuals and pets.

Medically-fragile individuals may live in nursing homes or other residential health care facilities. They may also live at their homes under constant supervision. Disrupting this
supervision or medical care may result in loss of life or further problems. Therefore, care should be taken starting from pick up and transportation to sheltering. Ambulances are often needed to transport these individuals, and shelters equipped with appropriate meals and professional care givers may be required. These individuals may require life-sustaining equipment for which loss of power or depleted batteries could have devastating results.

Also, many elderly individuals live alone and have a loving bond with a faithful pet. Shelters for either transit-dependent individuals or medically-fragile individuals typically do not allow pets except for service animals. Due to this situation, many individuals are reluctant to leave their pets behind, so they will be unwilling to evacuate. Planning agencies often prepare evacuation plans for pets and likewise pet owners should make the necessary precautions for their pets, such as proper vaccination, properly-sized carriers, up-to-date identification collars, and placement of micro-chips.

2.2 Experience in Other States (Southeastern States)

During the course of this study, attempts were made to contact individuals from emergency management agencies in the southeastern states. Information was gathered concerning central challenges such as definition of the transit evacuation populations, estimating the number of transit-dependent individuals, ensuring better participation in the registry, staying in contact with the vulnerable populations, and managing the evacuation. As an example of the procedures developed in other states, the standard operating procedure for evacuation of special needs populations in Georgia Coastal areas is presented in appendix C.

During the telephone calls to other states, it quickly becomes apparent that the eight southern states that border the Gulf of Mexico or Atlantic Ocean have different definitions, assumptions, and procedures for virtually every aspect of transit evacuation. This variability is
especially true for the definition of the “special needs population” and the agency planning and conducting the evacuation. The variability is illustrated by a few examples in the following paragraphs.

Texas

- Based on recent evacuation events, more assets are needed to move those who need help evacuating.
- The Texas National Guard prepared the basic evacuation plan, starting from staging areas.
- They have a very thorough registry (dialing 211 connects potential evacuees to the registry).
- They have a wide definition for “special needs population.” It includes everyone with a medical problem.
- In estimating the number of evacuees, they take a “highball” percentage.
- They stand ready to assist nursing homes and retirement homes.

South Carolina

- The state appointed a “special needs” task force to study the major issues and to determine which groups were evacuation candidates. They used census data to estimate evacuees and developed their own assumptions (such as special needs individuals include only disabled individuals). They considered people with at least one disability, omitting those who had employment because they probably had a way to travel.
- Based on historical data, they estimated the special medical needs populations at twenty-five percent of one percent of the total population.
Virginia

- Virginia does not have a clear definition for “special-needs population.” The Virginia Department of Public Health is trying to develop a definition.

- In Virginia, sheltering is a local issue, but once people start moving inland to dodge a big storm, there are no local sheltering plans. Florida has state legislation that requires a first level sheltering policy, and Virginia desires to have similar legislation. About 1.5 to 2 years ago, the Virginia Department of Social Services took over the sheltering plan. So Virginia is now developing a “state assisted” sheltering plan. They surveyed to identify state owned facilities, inspected and inventoried them. They now have 18 facilities ready to serve as shelter; with about 25-30 facilities nearly ready. They will be staffed by the state when sheltering is needed.

Georgia

- The Georgia Emergency Management Agency (GEMA) defines the special needs population as those who need transportation. Georgia has six coastal counties, in which they ran full page newspaper ads and used other means to get into contact with the population desiring evacuation. They got a number of people for each county, but the numbers were small. Chatham County had about 200. Based on experience, GEMA knew that number was too small and doubled it. Every year, GEMA checks the evacuation population and develops a fresh registry. It performs a case by case review of each person.

- Each county is different; starting with the level of resources (most counties use school buses, but Savannah uses mass transit). They put risk tags on the hands of all persons
who evacuate on their buses, so they can track them. The Department of Public Safety has conversion kits for the buses (the kits “sort of” convert the buses into ambulances).

- The Department of Human Resources identifies special needs shelters, and the American Red Cross plans to provide shelter to the segment of the population that needs assisted evacuation.

- The evacuation timeline for special-needs evacuees starts 24 hours ahead of the general population evacuation. GEMA has established clearance times for evacuations in the individual counties. For example, Chatham County takes 36 hours to clear unless Interstate 16 is reverse-laned, then it takes 22 hours.

- The GEMA standard operating procedure “State Assistance in Emergency Evacuation of Special Needs Populations from Georgia Coastal Areas” is simple and easy to use. It is provided as Appendix C to this document as an example plan.

Mississippi

- The State Department of Health (DPH) handles the definition of the special needs population.

- The State Police, Department of Education, Emergency Management Agency, Department of Transportation, and DPH have leadership roles in hurricane evacuation.

2.3 Transit Dependent Population (Vulnerable Population)

Many states have developed evacuation plans that focus on self evacuating individuals. The need to plan for the individuals who cannot self evacuate did not become clear until after hurricane Katrina. At that point, federal law changed to require planning agencies to include special-needs populations in their evacuation plans. However, lack of a nationally accepted definition for this population group has made the planning process more difficult.
In planning for transit-dependent individuals, four main issues seem to surface: (1) identifying potential evacuees, (2) locating them, (3) determining their needs, and (4) providing transportation to them. To identify these individuals, the first step is to define which population segment they represent. Different studies give different names and definitions for individuals who have special requirements during extreme events, such as special needs, carless, and transportation-disadvantaged. However, the basic idea behind these names is to identify individuals who, for whatever reason, may need transportation and other resource assistance to evacuate during extreme events. There is no nationally mandated definition for this segment of the population; however, the Comprehensive Preparedness Guide (CPG) 301 of the Federal Emergency Management Agency (FEMA) and Department of Homeland Security (DHS) recommends applying the definition produced by the National Response Framework (NRF). The report states that applying this definition helps to improve inter-government communication during an incident. The NRF provides a function-based approach to define the special-needs population, as follows:

“Populations whose members may have additional needs before, during, and after an incident in functional areas, including but not limited to:

- Maintaining independence
- Communication
- Transportation
- Supervision
- Medical care.”
Individuals in need of additional response assistance may include those who have disabilities, live in institutionalized settings, are elderly, are children, are from diverse cultures, have limited English proficiency or are non-English speaking, or are transportation disadvantaged.”

The NRF definition focuses on the following functional aspects of citizens who may need help:

- **Maintaining Independence** – Individuals requiring support to be independent in daily activities may lose this support during the course of an emergency or a disaster. This support may include supplies (e.g., diapers, formula, catheters, and ostomy supplies), DME (e.g., wheelchairs, walkers, and scooters), and/or attendants or caregivers. Supplying needed support to these individuals will enable them to maintain their pre-disaster level of independence.

- **Communication** – Individuals who have limitations that interfere with the receipt of and response to information will need that information provided in methods they can understand and use. They may not be able to hear verbal announcements, see directional signs, or understand how to get assistance because of hearing, vision, speech, cognitive, and/or intellectual limitations, and/or limited English proficiency.

- **Transportation** – Individuals who cannot drive or who do not have a vehicle may require transportation support for successful evacuation. This support may include accessible vehicles (e.g., lift equipped or vehicles suitable for transporting individuals who use oxygen) or information about how and where to access mass transportation during an evacuation.

- **Supervision** – Before, during, and after an emergency, individuals may lose the support of caregivers, family, or friends or may be unable to cope in a new environment (particularly if they have dementia or psychiatric conditions such as schizophrenia or
intense anxiety). If separated from their caregivers, young children may be unable to identify themselves and, when in danger, may lack the cognitive ability to assess the situation and react appropriately.

- Medical Care – Individuals who are not self-sufficient or who do not have adequate support from caregivers, family, or friends may need assistance with managing unstable, terminal, or contagious conditions that require observation and ongoing treatment; managing intravenous therapy, tube feeding, and vital signs; receiving dialysis, oxygen, and suction administration; managing wounds; and operating power-dependent equipment to sustain life. These individuals require the support of trained medical professionals.

The above examples illustrate function-based needs that may exist within the community.” (Federal Emergency Management Agency [FEMA], 2008).

Based on their transportation and sheltering requirements, individuals described in the NRF definition can be categorized into three groups:

- Transit dependent individuals – Individuals who can use transit service buses and school buses for transportation. The majority of them can enter general mass shelters which only provide basic services. The remaining groups such as disabled individuals may require shelters equipped for their needs unless the general mass shelters are equipped with these facilities. They include individuals described under the transportation and communication component of the NRF definition.

- Medical care dependent individuals – these are individuals getting constant medical care at their homes from family members or professional care givers. They have much more
complex needs, for example: they require an ambulance for transportation and a separate shelter equipped with medical professionals, medicine etc.

- Congregate or residential care individuals – these are individuals living in group settings under constant supervision or medical care. Congregate or residential facilities include nursing homes, adult and child care facilities, foster homes etc. According to Houston et al. (2009), these facilities are required to have emergency plans to receive Medicaid and Medicare funding and also as part of their licensing process.

This thesis focuses on the first category, transit dependent individuals. Medical care dependent individuals and congregate or residential care individuals are not included. Estimation or identification of medical care dependent individuals requires data from routine transportation providers, health departments, social service settings, etc., plus registries, which is beyond the scope of this project.

Transit-dependent individuals may be further divided based on the transportation needed to reach the staging area:

1. Individuals who can reach the staging locations by themselves including the following:
   - Individuals living within walking distance from the staging center.
   - Individuals who may want to use the transit service for reasons such as being unable to pay gas costs, owning vehicles unreliable for long distance driving, being unable to drive long distances due to age, disability, etc. Therefore, these individuals drive to the staging area, in which case preparing places for them to park at staging area may be an issue.
2. Individuals who need transportation assistance to the staging areas. Assistance can be achieved through the following ways:

- Organizing churches or other volunteer organizations to transport them.
- Using city buses or other designated buses to pick up individuals along established bus routes.

2.4 Characteristics of Transit-Dependent Individuals

As can be seen from the NRF definition, transit dependent individuals are a diversified group and in some cases constitute a large percentage of the population. Their characteristics and needs vary depending on whether they have disabilities, advanced age, or a combination of both. Individuals without physical or cognitive limitations are easier to evacuate with buses because they require minimal assistance. On the other hand, individuals with disabilities may not be able to perform activities such as walking, climbing, dressing, learning, or remembering. These conditions may impede them from using buses and general population shelters. It is also difficult to effectively communicate to them or to transmit information such as pick up locations, warnings, or evacuation orders.

Another important characteristic of these individuals is that there is a high overlap between people with disabilities, advanced age, and poverty. Renne, Sanchez & Litman (2008) indicated that individuals with severe disabilities are more likely to have low income, earning $12,000 per year compared to $25,000 for individuals without disabilities. They stated that as a result “many low-income disabled people are more prone to living in areas which lack critical infrastructure and are at higher risk for an emergency. They face additional difficulties, such as lacking adequate housing, telephone and Internet service, automobile transportation and credit cards”. In addition to this findings, Mobile County data from the Census 2000 indicates that 13%
of the population are age 65 years and over, and 50% of those persons have some form of
disability (U.S. Census Bureau, 2000).

2.5 Summary

Special-needs individuals include a large portion of the population with a variety of
characteristics and need. Evacuation plans need to consider all these individuals. However, a lot
of work is required to define, identify and locate these individuals. Currently there is no
nationally-mandated definition for special needs individuals, but applying the NRF definition
appears logical.

Contacts with southeastern states identified that each state does evacuation planning for
special-needs individuals differently because the states have different amounts of resources and
different risks. Therefore, it can be concluded that all states cannot have the same plan; it must
be adjusted according to the specific conditions in each area.
CHAPTER THREE

COMMUNICATION WITH THE SPECIAL NEEDS POPULATION

3.0 Communication Needs

Communications is a basic need in any emergency response. To conduct a successful evacuation, effective communication is essential between local government officials, emergency management agencies, emergency workers, and the community. These communications are important before, during, and after a hurricane event.

Natural disasters create fear and anxiety among the community in the disaster prone area which may lead to extreme confusion and disorder without effective communication. Lessons from Katrina and other major hurricanes have shown that many things could go wrong, impeding communication between the emergency management organization and the community. For example, a communication equipment shortage, damage to communication infrastructure, lack of interoperability between communication equipment of different emergency responders, and similar features may result in delayed response and increased loss of life (Meeds, 2006). These kinds of communication failures may have further impacts on special-needs individuals because most of them are socially isolated, have limited mobility, and have limited access to or ability to use different communication systems.

The Federal Emergency Management Agency [FEMA] (2009) indicated that during hurricane Katrina, inability to understand emergency communications played a role in the death and suffering of people with disabilities, the aging population, and people with medical
conditions. It also states “some people with psychiatric disabilities had difficulty comprehending the evacuating messages and other essential communications, and some were treated roughly because they could not follow the instructions”. The FHWA report indicated that these and other disasters led to a need to strengthen transportation and communication issues in evacuation plans for special needs populations.

Public Law 109-295, the “Department of Homeland Security Appropriations Act of 2007”, requires the Federal Emergency Management Agency (FEMA) to ensure that information made available to individuals affected by a major disaster or emergency is made available in formats that can be understood by individuals with disabilities or other special needs. It also requires each state, local, or tribal government to the maximum extent practicable to develop procedures for informing individuals with disabilities or other special needs of evacuation plans before and during an evacuation (Transportation Research Board [TRB], 2008).

3.1 Communication challenges

Communication with special needs individuals may be hindered by physical, organizational, or social factors. To achieve effective communication, it is important to identify the challenges and to implement alternative solutions. Association of State and Territorial Health Officials [ASTHO] (2008) identified several challenges in communicating with special needs individuals:

- Lack of access to radio, television, internet or telephone
- Lack of credible source of information, may not consider government officials as a reliable source of information.
- Inability to travel to where the information is available.
• Materials may be scarce or may not be available in a format understandable by the special-needs individuals. For example, it may not be available in different languages, may not be available as Braille, large print, or audio files.

• They may be geographically isolated or dispersed.

In addition to the challenges listed above, there are communication challenges caused by hurricane events. For example, if a power outage occurs, electronic channels such as television, radio, and the internet will not work. This may lead to dependence on traditional land line telephones and wireless phones as long as the batteries are charged. Even then, cell towers and switching stations may become clogged.

3.2 Measures to Minimize communication challenges

To reduce the impact of the challenges, it is essential to consider multiple measures. ASTHO (2008) suggested that effective communication plans must incorporate three key components: audience-appropriate messages, trusted messengers, and effective methods. The study made the following suggestions concerning each component:

**Audience-appropriate messages**

Content of messages is important in determining the understandability of messages. Identifying the characteristics of audiences, such as age, literacy, cultural variety etc are essential. ASTHO (2008) recommended the following to prepare audience appropriate messages:

- Messages must be customized to the differing needs of specific populations.
- Messages must reflect the cultural realities of the intended audience.
- Messages need to be geared to low-level reading ability, with simple, clear and direct language.
- Messages should be brief and constantly reevaluated.
**Messengers**

The acceptability of messages depends on the messengers conveying the message. These messengers could be media personalities, religious leaders, teachers, law enforcement officers, etc. However, different population groups may put trust in different messengers. For example, undocumented workers and immigrants are unlikely to rely on official sources, and African-American communities may not accept information from government officials because of racism history.

**Methods**

Effective communication methods that help serve special-needs populations are required before, during, and after a major hurricane event. These communication methods reach the special needs population based on their availability and the ability of this population group to understand them. As mentioned in the previous chapters, special needs populations include a diversified group of individuals which may not have access to or be unable to use regular communication channels. For example, transient populations such as the homeless and migrant workers may not have access to television or radio; individuals with a disability such as deafness and impaired hearing cannot use mass notification systems such as reverse 911, and so on.

To alleviate these kinds of problems, planners can study the strengths and weaknesses of the available technologies. These technologies may include general population technologies such as television, radio, internet, telephones, etc., or technologies available to aid individuals with disability such as the telecommunication device for the deaf (TDD), teletypewriters (TTY), and caption telephone (CapTel).
3.3 Communication Systems

Communication systems vary based on the type of service, (either day to day activity or emergency service only), the users (people without disability or people with disability), connection or notification systems (point to point or broadcast communications) and so on. The application and effectiveness of these communication systems for emergencies also varies based on the technologies capabilities, their availability and the severity of the event.

Federal Communications Commission [FCC] (2009) divides emergency communication systems into three main components:

- 911 telephone call processing and delivery through Public Safety Answering Points (PSAP) and call dispatch;
- The Emergency Alert System; and
- Radio and/or broadcast or cable television station news and updates.

911 Emergency Calling

The 911 system is generally the backbone of the emergency response system in the US. Emergency 911 calls help the public notify authorities of emergency situations and get help. Dialing 911 quickly connects the caller to a public safety answering points (PSAP) dispatcher who directs it to the local emergency medical, fire, or law enforcement agency. Enhanced 911 or E911 is also being applied widely to automatically report the telephone number and location of 911 calls made from land line phones.

Another important element of emergency 911 calling is the Reverse 911 system which automatically calls land line telephone numbers within the affected geographic area and notifies land line owners of emergencies and protective actions.
According to ASTHO (2008), these communication systems are compatible with some devices which aid people with hearing and speech disability such as CapTel and TTY. However, typical emergency notification software is not compatible with video phones and sidekick pagers.

The Reverse 911 emergency notification system has several limitations which hinder effective communication with the general population as well as the special-needs population:

- Most emergency notification systems’ telephone number databases contain only listed telephone numbers.
- They cannot reach individuals with blocked numbers, Voice over Internet Protocol (VoIP) users, cell phone users unless they are registered and individuals who are not users of communication services like transient people.
- They may be impacted by loss of power, high call volumes resulting in busy connections and hang ups.

**Emergency Alert Systems**

The Emergency Alert System (EAS) is the national public warning system that uses TV and Radio to warn the public of emergency situations. It requires cable television, digital broadcast, digital audio radio service, and direct broadcast satellite providers to offer communication capabilities to the President, as well as state and local authorities, to deliver emergency information.

In relation to alerting special needs individuals, the CPG-301 states that the FCC requires that emergency information be delivered in a format appropriate for their different needs, e.g., in aural and visual alerts and also in different languages. On the other hand, EAS lacks compatibility with technologies that provide information in accessible format for disabled
individuals. This situation leads to insufficient dissemination of emergency information outside the EAS network.

Currently FEMA (2009) indicates that development of the Integrated Public Alert and Warning System (IPAWS) is underway. This system is believed to be the nation’s next-generation infrastructure. It is an alert and warning network expanding upon the traditional radio and television EAS by providing one message over more media to more people before, during, and after a disaster.

**Radio and/or broadcast or cable television station news and updates**

Radio and/or broadcast or cable television station news and updates include non-EAS alert broadcasts or broadcasts of emergency information which does not trigger the EAS. The FCC requires all broadcasters which provide these emergency information broadcasts to include formats comprehensible by persons with disability. The FCC requires television broadcast stations to provide emergency information in the audio portion of programming in accessible formats for people with hearing disability by using closed captioning, sign language interpreters, or a method of visual presentation. Emergency information that is provided in the video portion of the programming must be accompanied with an aural format.

**Other Communication Systems**

Some communication systems reviewed in the following paragraphs are as important as the three major components of emergency communication identified by the FCC. According to the FEMA website, the reach of radio and TV is less than 40% of the populace during the workday, and even fewer persons watch TV after midnight (FEMA, 2009). At the same time, the popularity and use of the internet, cell phones, and residential phones is increasing. Therefore, applying these communication media may help to reach more people.
Emergency Telephone Notification Systems (ETNS)

Emergency Telephone Notification Systems (ETNS) are required to have the ability to communicate with TTY/TDD devices to send scripted emergency messages to deaf or hard of hearing individuals. Furthermore, these technologies must provide immediate feedback to the system administrator if the users did not receive the scripted message.

The National Emergency Number Association (2004) states that most large metropolitan communities have installed ETNS systems. They help target specific communities in a particular geographic area when they are integrated with geographic information systems. In addition, these systems require accurate databases and frequent updates to effectively transmit emergency information to the public. The data source is usually the regions’ 911 database and local telephone service providers. Additional data are recommended to be collected including cell phone users, unlisted telephone users, and special needs individuals.

It is recommended that ETNS be augmented by designated persons who contact specific, pre-identified individuals to avoid problems such as users hearing only part of the message or not being able to understand the message. The pre-designated persons may help to repeat or clarify the messages.

Phone Tree

Phone trees help to disseminate emergency information to a wide audience with only a few phone calls. The setup starts with high level emergency managers at the top of the tree, and phone calls go down to smaller and smaller branches and leaves. In this process, it is important to make sure that people on every branch have the necessary contact information like alternate phone numbers. This system helps to minimize the number of staff members required to make
phone calls; however, it may not be effective at night when the branches do not have emergency personnel at work (FEMA, 2008).

Text Messaging

The application of text messaging as an emergency notification system is mounting with the advancement of technology. It is usually available to anyone in the community with specific application for the deaf and hard of hearing individuals. In some communities the service includes individuals with limited English proficiency. It is important to note that text messages can appear on multiple devices like pagers, personal digital assistants, and computers. It has a disadvantage in that the service can be provided only for registered individuals (FEMA, 2008).

Internet

The Internet is an important tool for emergency notification and dissemination of information before, during, and after emergency situations. Two widely applied Internet tools are email and websites. Some of the advantages of the Internet for emergency notification are that internet popularity is increasing and the usage rate is high. FEMA (2009) indicated that the Internet has a 62% usage rate, averaging 108 minutes per person per day. In spite of these advantages, most special needs individuals are not among the users since most of them do not have access to or understanding of these tools.

Email transmissions are deliverable during heavy transmission periods even if they are slow. The recipient need not be available at the time of delivery. However, people may not check their emails or emergency information websites regularly enough to receive emergency messages in time to react appropriately.
Websites can be used to provide information for special needs individuals; however, the information should be provided in different languages and in simple formats, and it should be readable for a wide range of vision acuity.

**Door-To-Door Warning Systems**

FEMA (2008) considers the door-to-door warning system as time consuming and difficult to implement; however, it is inevitable in some conditions such as informing the homeless, when there is no other means of communication with a specific population group, and when power outage occurs. Some important points related to this system follow:

- Emergency management agencies may not have enough personnel to perform this type of warning.
- It is time consuming and may endanger emergency personnel.
- Cultural diversities of neighborhoods should be considered.

3.4 Summary

There are many technologies which can help communicate emergency messages to the general population as well as to special-needs individuals. However, each system has limitations and strengths regarding specific population segments. Therefore, one system cannot cover all the population.

During emergency situations, many things could go wrong to cripple communication systems. Depending only on the primary communication systems may endanger many lives. Planning a backup system and applying a combination of methods to meet the needs of special-needs people is essential. In addition to these ideas, it is essential to test compatibility of different communication systems with technologies that aid people with disabilities such as deafness or hard of hearing.
CHAPTER FOUR

ESTIMATING THE TRANSIT-DEPENDENT POPULATION

Estimating the number of transit dependent individuals during a hurricane event is an essential part of transit evacuation planning. Finding data sources for this portion of the population is difficult due to the diversity and isolation of individuals in this population and the amount of time and money required. This chapter addressed two aspects of estimating the transit-dependent population of Mobile County, Alabama:

1. An estimate was prepared for the population of transit dependent potential evacuees during a hurricane evacuation for Mobile County, Alabama, based on current methodologies, practices from other states, and information from individuals working on similar projects.

2. Given the number of potential evacuees, an estimate was obtained for the proportion of the transit dependent populations that will actually utilize transit evacuation, rather than using other evacuation means or deciding to stay in place during the passage of the hurricane.

4.0 Others Seeking the Same Information

This thesis research documented that many organizations and individuals are searching for methodologies to estimate the number of transit dependent individuals. The three following examples indicate the levels at which this information is needed and was sought during this project:
1. The CTPS and the North Carolina Emergency Management Agency (NCEMA) are conducting a Transit Evacuation Planning Project for Wilmington, North Carolina. The study is under the direction of Dr. Edd Hauser, Director of CTPS. Early in this project, both CTPS and NCEMA identified the estimation of the number of evacuees as a major unknown and the key issue in evacuation planning.

2. Dr. Brian Wolshon, an Associate Professor at Louisiana State University and Chair of the Transportation Research Board Subcommittee on Emergency Evacuation (A3B01 [4]), is concerned with all preparedness and operational issues associated with evacuation for both natural and man-made threats. Dr. Wolshon is working on a national research project which will provide advance knowledge of evacuation, especially the estimation of the population that will evacuate.

3. Dr. John L Renne is an Assistant Professor of Urban Planning and Transportation Studies at the University of New Orleans. He is a national expert on evacuation of the carless/special needs population. He is also the PI of national study on car-less and special needs evacuation planning.

As part of finding ways to estimate transit dependent evacuees in this project, contact was initiated with knowledgeable individuals (mentioned in the list of contacts in Appendix E) from agencies and organizations that deal with evacuation. Some of the responses were very helpful even though none of the individuals contacted knew of a readily available document or method that provides a precise way to estimate this portion of the population. Three examples of helpful replies follow:

1. Mr. David Schneider, Federal Transit Administration, Office of Program Management, suggested that the best way to estimate the number of people that would need to evacuate
using transit would be to use a methodology that combines census information (households without vehicles and number of persons aged 80 and above) with additional information from local human service agencies such as public and human service transportation providers.

2. Dr. John L Renne, Assistant Professor of Urban Planning and Transportation Studies at the University of New Orleans, mentioned that he and Dr. Brian Wolshon from Louisiana State University are using TRANSIM to create a synthetic population for estimating car-less and special needs populations. They are using Census data (SF3 and PUMS data) and land use data. He suggested using additional data sources like local and regional surveys (including special needs registries) and the National Household Travel Survey 2001 (this might not provide enough data at the local level).

3. Ms. Nancy Humphrey, Transportation Research Board Senior Staff Officer, said that the size of the evacuating population in total and the subgroup using transit depends on the type of emergency (e.g. a no notice event like the 9/11 terrorist attack versus an emergency like a hurricane that happens with greater frequency), its scale, the time it occurs (e.g. off-peak, on-peak, weekday, weekend), and other factors. She mentioned that baseline estimates can be developed using a voluntary special needs registry, and gathering information about customers of paratransit providers and clients of social service agencies.

4.1 Estimation Methods from Southeastern States’ Plans

In addition to the results of the phone calls and email communications presented in Chapter Two (section 2.2), the author reviewed hurricane evacuation plans of two states. The
review focused on the estimation of transit-dependent population. Useful information about their estimation methods includes the following items:

1. The Texas Governor’s Division of Emergency Management used the 2000 census to find coastal households without vehicles. In addition to this census data, they used data from a survey of the disabled, elderly, and low income populations in 78 Texas counties. The survey was conducted by the Office of Community Transportation Service. From these data they concluded that local emergency managers should target low income and elderly populations to make sure all who need to evacuate have a means of transportation (Lindell, Prater, Hwang, Wu, & Hazard, 2002).

2. The North Carolina Coastal Region Evacuation and Sheltering Standard Operating Guide states that the estimated number of people requiring transportation assistance for a county wide evacuation was provided by county officials (North Carolina Division of Emergency Management [NCDEM], 2007).

   From this information and telephone calls to southeastern state emergency management agency offices, it became clear that the states do not have a standard way to estimate evacuees and are using different ways for these estimations.

4.2 Guidance on Estimating Transit Dependent Evacuation Populations

   There is no definitive national standard on how to estimate the transit dependant population. However, more guidance documents are beginning to surface. For example, the U.S. Government Accountability Office [GAO] (2006) studied the challenges in evacuating the transportation-disadvantaged population and assessed the barriers that state and local officials face. This work included issues like the state of preparedness of state and local officials for these challenges and barriers, steps they are taking to address the challenges and barriers, and federal
efforts to provide evacuation assistance for people without vehicles. According to the GAO report, the transportation-disadvantaged population can include numerous categories of people without personal vehicles. The report also mentioned that data on the location of transportation-disadvantaged populations is not readily available. Emergency management agencies face a major challenge is assembling such data, given the following reasons identified by the GAO:

- These population segments are diverse and constantly changing. That makes data collection time consuming and expensive, and it requires a lot of resources.

- Some of this information is located in databases of organizations such as social service providers, departments of motor vehicles, and public/private transportation providers. These data are not usually shared with emergency officials or they cannot be shared due to federal privacy restrictions.

GAO (2006) did provide help in the form of a list of measures underway by some state and local governments to address the evacuation preparedness challenges facing transportation disadvantaged populations. The following measures are related to estimating and identifying this segment of the population:

- Conducting surveys and studies by collaborating with local universities and schools of public health,

- Collaborating with state and local entities, social service organizations, community groups, etc.

- Working in partnership with academic institutions to map transportation-disadvantaged populations using tools such as Geographic Information Systems (GIS).

The GAO report was written at the request of Congress and will likely be very influential in future legislation and funding. However, it certainly is not the only recent authoritative
document to provide guidance on estimating the target population. For example, some important recommendations from two documents by FEMA and FHWA (Federal Highway administration) are presented in the following paragraphs.

FEMA (2008) suggests that planners should make an informed estimate of special needs individuals by using multiple relevant sources such as the U.S. Census, social service listings, motor vehicle bureaus, paratransit providers, health departments, utility providers, and job access services. It also states that establishing relationships with different stakeholders such as state, territorial, tribal or local EMAs, departments of aging, social services, health, education, and the media helps to produce effective special needs evacuation plans.

Similarly, Houston et al. (2009) recommends preparing a baseline using census data, social service and home health agencies, and other supporting organizations. It also recommends applying specialized registries and GIS to prepare the general estimates. However, it accepts the limitations of registries such as their expense and the reluctance of people to use them.

4.3 What Can Be Learned From Evacuation Experiences

According to the literature, the percentage of residents that will evacuate during a hurricane threat will depend on factors such as the vulnerability of their location, how safe they feel their home will be during the storm, how much they believe what public officials are saying about the actual threat, and their prior experiences with hurricane landfalls in their vicinities. They have responded differently in different circumstances and at different times. For example, Hurricane Katrina was the most costly and one of the deadliest hurricanes in the history of the United States. Knabb et al. (2005) indicated that 1.2 million people from southeastern Louisiana to Alabama were ordered to evacuate; however, it is unknown how many actually evacuated. Hurricane Rita was the fourth most intense Atlantic hurricane ever recorded, and it caused an
estimated three million people to evacuate from the Texas coast (Litman, 2006). These two storms brought unprecedented evacuation and escalated concern. The number that actually evacuated compared to the number predicted to evacuate is not known.

Prior to Katrina and Rita, the resident population along the Gulf Coast took hurricane warnings “in stride.” Their experiences told them that hurricane routes in the shallow Gulf of Mexico could change, sometimes often. They also knew that early predictions of the landfall location could be inaccurate. In August 2008, hurricane Fay fuelled this feeling when it made landfall at four different locations in Florida, triggering hurricane or tropical storm warnings along the entire coast of Florida. After seemingly wandering haphazardly, it scooted westward along the Panhandle where it deteriorated to a tropical storm over the shallow Gulf water near the coast, prior to turning inland and crossing over Alabama (Stewart & Beven, 2009).

From experiences with prior hurricanes, long time Mobile coastal residents learned to expect structural damage (sometimes costly), loss of utilities and other inconveniences, but rarely anything more severe. In making evacuation decisions, this knowledge was balanced against the inconvenience and distaste of suddenly leaving home and fleeing to an unknown, costly location for an unknown length of time until the storm passed.

To understand how Mobile transit dependent evacuees have made evacuation decisions in the past, it is helpful to look at the pattern of evacuation participation in Mobile County for four major hurricane events over the past several years. The storms’ characteristics are briefly described in the following paragraphs, and they are summarized in Table 4 - 1.

During Hurricane Ivan, the strongest hurricane of the 2004 Atlantic hurricane season (Wikipedia, n.d.), evacuation was ordered for Mobile and Baldwin counties south of Interstate
10, including a third of the incorporated territory of the City of Mobile as well as several of its suburbs. However, only about 1,000 transit dependant residents evacuated.

Hurricane Dennis made landfall on the Florida Panhandle as a Category 3 storm on the Saffir/Simpson Hurricane scale on July 10, 2005, before tracking over Alabama as a minimal hurricane (Wikipedia, n.d.). Residents in Mobile County and those south of I-10 in Baldwin County were ordered to evacuate, but the Mobile EMA estimated that only about 3,000 people participated in the evacuation of those without personal transportation.

At one time a Category 5 storm, Hurricane Katrina dropped to 125 mph winds (Category 3) when it made landfall near Buras-Triumph, Louisiana and again near the Louisiana/Mississippi border. Although Katrina made landfall well to the west, the Alabama and the Florida Panhandle coasts were both affected by tropical-storm force winds and storm surges varying from 12 to 16 feet. Sustained winds of 67 mph were recorded in Mobile (Wikipedia, n.d.). But during this severe hurricane there were less than 1,000 transit dependent evacuees from Mobile County.

Hurricane Gustav was one of three to endanger the Alabama coast in 2008. It was a 150-mph, Category 4 storm when it devastated the entire length of Cuba. After entering the Gulf of Mexico it dropped to a Category 3 storm, but it was immense in size. The storm has so much energy that it traversed the entire Gulf in a little over one day, dropping to a Category 2 storm as it made landfall on the Louisiana coast. Since it reached Category 4 early, inflicted severe damage in Cuba, was huge in size and traveled at high speed, the media issued repeated warnings. Evacuation was ordered when it travelled relatively close to Mobile, only about 300 people needed transportation help in evacuating.
Table 4-1 summarizes the number of evacuees during four recent major hurricane events in the Gulf Coast area. To place the storm threat into context, the table shows the distance from Mobile County to the landfall of each storm.

Table 4-1: Number of Mobile County transit dependant evacuees during major Gulf Coast hurricanes

<table>
<thead>
<tr>
<th>Hurricane</th>
<th>Date</th>
<th>Landfall Category</th>
<th>Landfall Location</th>
<th>Landfall Miles from Mobile</th>
<th>Mobile County Evacuees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ivan</td>
<td>16-Sep-04</td>
<td>3</td>
<td>Orange Beach</td>
<td>30</td>
<td>1000</td>
</tr>
<tr>
<td>Dennis</td>
<td>10-Jul-05</td>
<td>3</td>
<td>Pensacola</td>
<td>65</td>
<td>3000</td>
</tr>
<tr>
<td>Katrina</td>
<td>29-Aug-05</td>
<td>3</td>
<td>New Orleans</td>
<td>115</td>
<td>&lt;1000</td>
</tr>
<tr>
<td>Gustav</td>
<td>5-Aug-08</td>
<td>Strong 2</td>
<td>Louisiana</td>
<td>130</td>
<td>300</td>
</tr>
</tbody>
</table>

It is worth noting that Hurricane Ivan caused extensive damage to the Gulf Coast, with a recovery period of almost two years. Hurricane Dennis destroyed the I-10 Bridge just west of Pensacola, caused severe damage elsewhere, and caused a major disruption of travel patterns in Alabama and Florida along the Panhandle. By the time Katrina entered the Gulf of Mexico, Mobile County citizens had fresh memories that underscored the severity of the threat. The “just offshore” passage of major hurricanes Gustav in August, quickly followed by Ike in September, gave Mobile County residents reasons to embrace evacuation, but in general the population did not seem to respond in fear of these two storms. The tracks of the four hurricanes (Ivan, Dennis, Katrina and Gustav) are shown in Figure 4-1. The figure shows the most prevalent pattern for hurricanes in the Gulf of Mexico – entering the Gulf south of Florida, moving northwest, turning north and making a sweeping turn to the northeast near or after landfall. It is difficult to forecast the intensity of hurricanes at landfall because the Gulf becomes shallow near land, causing many storms to lose energy. Gulf residents know these general trends, but they also know that not all hurricanes follow them. This complicates the decision to evacuate.
4.3.1 Identifying and Estimating the evacuating population

An additional set of evacuation data was provided by Drs. Steven Meinhold of the University of North Carolina-Wilmington and Dr. Billy Williams of North Carolina State. Their 2005 evacuation study included a survey of the attitudes of residents regarding the size storm for which responders would evacuate the Wilmington, NC coastal area. Their survey results are contained in Table 4 - 2.
Table 4 - 2: Evacuation attitude survey of North Carolina coastal residents

<table>
<thead>
<tr>
<th>North Carolina Storm Class</th>
<th>% Population Indicating They Will Evacuate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 5</td>
<td>84%</td>
</tr>
<tr>
<td>Category 4</td>
<td>67%</td>
</tr>
<tr>
<td>Category 3</td>
<td>33%</td>
</tr>
<tr>
<td>Category 2</td>
<td>17%</td>
</tr>
<tr>
<td>Category 1</td>
<td>11%</td>
</tr>
</tbody>
</table>

Hurricane Isabel was weak Category 3 storm for which 8% of the population evacuated

The North Carolina survey echoes the Alabama experience. It shows a similar trend in the general population evacuation. It is especially interesting that the survey responses for a Category 3 hurricane were later contradicted by the Hurricane Isabel experience. Only one fourth of those who said they would evacuate actually did so. Apparently many (or most) people are reluctant to actually evacuate, even though they might have previously thought that it was a good idea until they faced the actual evacuation decision. This adds a layer of complexity to evacuation planning.

Emergency management planners attempt to provide transportation for all of those who need it, realizing that many eligible people might decline at the last moment. This requires estimating the maximum number who might accept evacuation in the face of an extremely large storm and planning for that many. But it wastes scarce funding to “over plan” and gather resources for a huge evacuation event that never happens, when that funding could be put to use in locations that are actually experiencing disasters.

4.4 Estimate of Mobile County Transit Evacuation Population

As mentioned previously in this thesis, there are no readily available methodologies to establish the number of transit dependant individuals during hurricane evacuation. In preparing
estimates for MCEMA, the author depended upon the recommendations by experts, the literature, and different census-based data sources. In each estimation method, the estimate was based upon data for the number of households without vehicles and the number of persons aged 80 and above.

Census data on households without vehicles may underestimate the number of people who need evacuation assistance since it does not include tourists and commuters who are frequent users of public transportation. In addition, there are households comprised of older adults who may have a vehicle but use it only for short trips. They may not be comfortable using their personal vehicles for longer distance evacuations in emergency situations. Even though there might be some overlap between households without vehicles and people over 80, a reasonable way to reduce the effect of underestimation when determining evacuees might be to count twice the persons who fall into both groups.

4.4.1 First Estimate – Census 2000 Data Source

Based on 2000 census data, the number of households without a vehicle is 13,410 or 8.9% of the total households for Mobile County. Using an average household size of 2.61 (taken from the census), there are about 35,000 people without a vehicle. However, 2.61 people per household may well be too high since many older citizens live in either one or two person households. In developing an estimate, the author estimated that half of the 13,410 households without vehicles are occupied by one or two persons and the other half are occupied by 2.61 persons.

\[(6,705 \text{ households}) \times (\text{ave 1.5 persons/household}) = 10,057\]

\[(6,705 \text{ households}) \times (2.61 \text{ persons/household}) = 17,500\]

Estimated total persons without vehicle = 27,557
According to the 2000 Census, about 11,665 people or 2.9% of the total Mobile County population are above age 80.

Adding the estimates for those without vehicles and those age 80 or above yields an estimate of 39,222 individuals who need transportation assistance during extreme coastal events. All indications are that this is a conservative estimate.

4.4.2 Second Estimate – 2006 American Community Survey Data Source

The American Community Survey is conducted by the U.S. Census Bureau in every county, American Indian and Alaska Native area, and the Hawaiian home land. It is conducted using mail, telephone, and personal visits to sample addresses. Since the data is sample based, they are subject to sampling variability for which the degree of uncertainty is represented through the use of a margin of error.

The American Community Survey data was extended to provide the number of households without vehicles. Then the number was adjusted to a range of population through use of the standard error to provide a 90% confidence range. These calculations of people without vehicle and people 80 years or more old are shown in Tables 4 - 3 and 4 - 4.

Table 4 - 3: Mobile County households with no vehicle

<table>
<thead>
<tr>
<th>People Per Household</th>
<th>Households</th>
<th>People</th>
<th>Margin of Error</th>
<th>90% probability error range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Min</td>
</tr>
<tr>
<td>1 Person</td>
<td>5,731</td>
<td>5,731</td>
<td>1,055</td>
<td>4,676</td>
</tr>
<tr>
<td>2 Persons</td>
<td>1,951</td>
<td>3,902</td>
<td>1,200</td>
<td>2,702</td>
</tr>
<tr>
<td>3 Persons</td>
<td>651</td>
<td>1,953</td>
<td>1,005</td>
<td>948</td>
</tr>
<tr>
<td>4 or more Persons</td>
<td>1,312</td>
<td>5,248</td>
<td>2,380</td>
<td>2,868</td>
</tr>
<tr>
<td>Total with no vehicle</td>
<td>9,645</td>
<td>16,834</td>
<td>5,640</td>
<td>11,194</td>
</tr>
</tbody>
</table>

Source: 2006 American community survey data
Table 4 - 4: People 80 years or more old

<table>
<thead>
<tr>
<th>Age</th>
<th>Total People</th>
<th>Margin of Error</th>
<th>90% probability range</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Max</td>
<td>Min</td>
</tr>
<tr>
<td>Male</td>
<td>80 to 84</td>
<td>2,290</td>
<td>499</td>
</tr>
<tr>
<td>85 &amp; above</td>
<td>1,474</td>
<td></td>
<td>467</td>
</tr>
<tr>
<td>Female</td>
<td>80 to 84</td>
<td>4,824</td>
<td>759</td>
</tr>
<tr>
<td>85 &amp; above</td>
<td>4,320</td>
<td></td>
<td>752</td>
</tr>
<tr>
<td>Total</td>
<td>12,908</td>
<td>2,477</td>
<td>10,431</td>
</tr>
</tbody>
</table>

Source: 2006 American community survey data

Combining the estimates from the tables, the total population that will need transportation assistance is somewhere from 21,685 to 37,859 people, and the most likely number is \((16,834 + 12,908) = 29,742\) people. The reader should recognize that this represents an extreme estimate (max possible desiring evacuation) based upon the extreme event (max hurricane possible).

4.4.3 Third Estimate – Data Source, Harvard Telephone Survey

For three years, the Harvard School of Public Health has conducted a telephone survey of southeastern states to determine the public’s attitudes and perceptions about emergency evacuation in the event of a hurricane. The 2007 survey was conducted for Harvard via telephone by ICR (International Communications Research), an independent research company (Blendon, Buhr, Benson, Weldon, & Herrmann, 2007). Approximately 5000 interviews were conducted from June 18 to July 10, 2007 in eight southeastern states. This included a representative sample of 503 respondents age 18 and older from Mobile and Baldwin Counties who lived within 20 miles of the Gulf of Mexico. The margin of error for the study was +/- 5.0 percentage points at the 95% confidence level.

The survey reported that 70% of the Alabama respondents would/ might leave the area if evacuation was ordered. Of the total population, 9% would need help in evacuating but did not
have such help “lined up.” Table 4-5 was prepared using the telephone responses of those “without help lined up,” and the 2007 population estimate based on the 2000 census.

Table 4-5: People who would need help evacuating from Mobile County

<table>
<thead>
<tr>
<th>Population of Mobile County</th>
<th>People having no help lined up</th>
<th>Margin of Error</th>
<th>95% confidence level</th>
</tr>
</thead>
<tbody>
<tr>
<td>404,406</td>
<td>36397</td>
<td>1820</td>
<td>34577</td>
</tr>
</tbody>
</table>

The table does not reflect individuals who replied that they would stay if an evacuation order was issued (30% of total). Their reasons for staying varied and included statements like: don’t know where to go, don’t have a car or know anyone who could give me a ride, and have a medical problem that would make it difficult to leave. These are personal inconvenience answers that might change in the face of a major hurricane. That means that the values in Table 4-5 should not be interpreted as absolute, but rather as a guide to the approximate maximum number that might desire evacuation assistance in a maximum hurricane.

4.4.4 Comparison of the Estimates

The three estimates in the previous sections show that a large number of individuals might need assistance during major hurricane events. The first and second estimates apply to households without vehicles and people above age 80, and were based upon data from the Census 2000 and 2006 American Community Survey, respectively. The first estimate calculated 39,222 individuals who need transportation assistance, but the second estimate gave a smaller number with the most likely estimate of 29,742 individuals. The third estimate, a Harvard Telephone Survey, gave an intermediate result of 36,397 individuals. Therefore, based on the three estimates the average number of evacuees who need transportation assistance were estimated to be approximately as 34,500 or 8.63%.
As mentioned in section 4.3 of this thesis, during the four major hurricanes (Ivan, Dennis, Katrina and Gustav) in the Gulf Coast, evacuation orders were given. The estimated number of transit dependent individuals that might want to evacuate varies based on the number of total people or zones ordered to evacuate. Table 4–6 shows the percentage of actual transit dependant individuals evacuated based on the evacuation order zone. To calculate the potential transit dependent evacuees in each zone, 8.63% of the total population in each zone is assumed to be transit dependent. This percentage is based on the assumption that similar percentages of transit-dependent populations are present in each zone as the percentage of the transit dependent populations in the general population. The numbers of populations in each zone are presented in Appendix B, Fig B–3.

Table 4-6: Comparison between actual and estimated transit dependent evacuees

<table>
<thead>
<tr>
<th>Hurricane</th>
<th>Landfall Category</th>
<th>Landfall Miles from Mobile</th>
<th>Actual Transit Dependent Evacuees</th>
<th>Potential Transit Dependent Evacuees based on evacuation order zone</th>
<th>Percent Evacuated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ivan</td>
<td>3</td>
<td>30</td>
<td>1000</td>
<td>4815</td>
<td>20.8</td>
</tr>
<tr>
<td>Dennis</td>
<td>3</td>
<td>65</td>
<td>3000</td>
<td>34500</td>
<td>8.7</td>
</tr>
<tr>
<td>Katrina</td>
<td>3</td>
<td>115</td>
<td>1000</td>
<td>4815</td>
<td>20.8</td>
</tr>
<tr>
<td>Gustav</td>
<td>Strong 2</td>
<td>130</td>
<td>300</td>
<td>4815</td>
<td>6.2</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td></td>
<td>1325</td>
<td>12236</td>
<td>10.8</td>
</tr>
</tbody>
</table>

As can be seen from table 4–6, during hurricane Ivan and Katrina 20.8% of the potential transit dependent populations were evacuated. However, during hurricane Dennis and Gustav a lower percentage of transit-dependent populations, 8.7% and 6.2% respectively were evacuated. On average only 10.8% of the potential transit-dependent population evacuated during the four major hurricanes. It would be very helpful to MCEMA if the percent evacuated could be related to a specific cause or factor (like those listed in Table 4-6). This would be a direct key to the number of individuals that might evacuate from any storm, and would be a good tool to help
manage evacuations. Unfortunately there is insufficient data to establish the exact reason for the specific evacuation percentage for any of these hurricanes. It is probable that the evacuation percentage for Ivan was strongly influenced by the proximity of its landfall. The evacuation from Katrina was positively influenced by the enormous size and strength of the storm (before it eroded to a Category 3 near landfall). But these are informed speculations, and not scientific proof.

In general the average estimated number of transit-dependent individuals (12,236) seems arbitrarily higher than the average actual number of transit dependent evacuees (1,325) during hurricanes Ivan, Dennis, Katrina, and Gustav. The table also indicates that the maximum number of transit-dependent individuals actually evacuated is 3,000 during several Category 3 hurricanes, including some that were Category 5 or 4 before losing energy as they approached landfall in the shallow Gulf Coast waters.

4.5 Summary

The national literature did not provide a concise methodology for calculating the desired population. Instead it contained discussions of the potential types of persons to be evacuated and suggested reliance on census data supplemented by data from transit systems, churches, health organizations, and others. The same general types of guidance were found in a number of sources. This project adopted the guidance of a GAO (2006) report in conjunction with information in recent FEMA and FHWA reports.

When guidance from the literature was applied to Mobile County, it yielded a range of about 21,000 to 40,000 evacuees needing transportation assistance during the most extreme event. This range seems very large, and arbitrarily high, especially in light of the actual number of evacuees during major hurricanes in recent years. There were never more than 3,000 evacuees
needing transportation, during several Category 3 hurricanes, including some that were Category 5 or 4 before losing energy as they approached the shallow gulf coast waters at landfall.
CHAPTER FIVE

MOBILE CASE STUDY CONCLUSIONS

Earlier in this thesis, the major issues of transit evacuation planning were discussed. These issues are the state of practice of transit evacuation planning, estimating the number of transit-dependent individuals, and communicating with them before, during and after a major hurricane event.

In relation to the state of practice, the authors considered the experiences of other southeastern states, including Texas, South Carolina, Virginia, Georgia, and Mississippi. The results from phone calls and email correspondence with these states showed that each state had its own way of defining, estimating the number of, and planning for transit dependent individuals. This variability can be attributed to the different levels of risk and amounts of resources available to the individual states. This illustrates that all states cannot have the same plan; plans must be adjusted according to the specific conditions in each state and region.

The many different definitions of transit-dependent individuals show the diversity of the population. There is no nationally mandated definition for transit-dependent individuals, and various studies use different names and definitions for this portion of the population. The FEMA and DHS recommendation, the function-based NRF definition, was adopted for this report.

Some important issues were identified for communication with the special needs population during emergency situations. Communication needs were discussed based on lessons from hurricane Katrina and other major hurricanes and from the legislative aspect. Example
communication challenges that hinder the fulfillment of the needs were identified, and measures to reduce their effect were suggested based on the literature review.

Communication technologies that help deliver information to special-needs populations during emergency situations were identified from an FCC website and other relevant studies. However, each communication system has its own limitation and strengths towards a specific population segment, so a single communication system cannot cover all special needs populations. Therefore, multiple methods of communication are recommended to alleviate this problem.

Communication plans should include three key components: (1) Audience-appropriate messages depending on the characteristics of audiences, such as age, literacy, cultural variety etc (2)Trusted messengers such as media personalities, religious leaders, teachers, law enforcement officers, (3) Effective communication methods based on their availability and the ability of special needs populations.

The author attempted to determine how to estimate the size of a transit dependent population by consulting knowledgeable individuals from different agencies, contacting southeastern state EMAs through phone calls and emails, reviewing their plans, and reviewing guidance documents from different organizations. In general, the current recommended practice for estimating the size of the vulnerable population is to use census data and to combine households without vehicles and the number of persons aged 80 and above. This can be supplemented by local and regional surveys including special needs registries.

Based on these suggestions and a literature review, three estimates for Mobile County, Alabama were produced indicating that a large number of individuals need assistance during a major hurricane event. The estimates were based on data from the Census 2000, the 2006
American Community Survey, and a 2007 Harvard Telephone Survey. This work produced estimates of individuals who need transportation assistance of 39,222, 29,742 and 36,397 individuals, respectively. Based on the three estimates, the average number of evacuees who need transportation assistance is estimated approximately as 34,500.

This estimate was compared with the actual number of transit-dependent evacuees during major gulf coast hurricanes Ivan, Dennis, Katrina, and Gustav. There was a huge discrepancy between the estimate and the actual evacuees. Despite the fact that these hurricanes caused significant damage near Mobile and evacuation orders were in place, the number of people who actually evacuated was never more than 3,000. However, the author believes that it is necessary to plan for the worst conditions, but recognize that usually far fewer people will evacuate.

In general, this thesis describes who special-needs people are, what their characteristics are, how their number can be estimated, and how to communicate with them before, during and after a major hurricane event. The thesis is built on information from state-of-practice guide books, studies and interviews, and email correspondences with knowledgeable individuals. It is the author’s intention that the ideas presented on the population definition, communication practices, and estimate of transit-dependent evacuees can assist in planning for special-needs population evacuation in the Mobile, Alabama region.
REFERENCES


APPENDIX A

USEFUL REFERENCES FOR PLANNING AND CONDUCTING EMERGENCY EVACUATION OF THE VULNERABLE POPULATION

While conducting this project, UTCA researchers reviewed much of the technical literature appropriate to this field. The best of these materials is presented in this Appendix to assist evacuation and transportation managers with future evacuation situations.

Transit evacuation planning includes many issues. UA researchers identified five of the most important elements: estimating and identifying evacuees, communication, transportation, tracking, and sheltering. For each of these elements, good reference materials were identified and listed below. The list provides the titles and specific pages with in the reports that provide good assistance with these five issues.

a) Estimating the number of Evacuees

i. Transportation Disadvantaged Populations, Actions Needed to Clarify Responsibilities and Increase Preparedness for Evacuations, Report to Congressional Committees, Government Accountability Office, December 2006:

- The report provides a list of categories of individuals without personal vehicles that can be included in the transportation-disadvantaged populations. Page 15.

- The report reviews some of the reasons why data is not readily available about the location of transportation-disadvantaged populations. Page 16.
• The report also identifies measures taken by different state and local governments to address the evacuation preparedness challenges facing transportation disadvantaged populations. Pages 27-32.


• On page 58 this reference provides a list of population groups with potential demand for transit service in an emergency evacuation.

• In the example in this report the 2000 Census and the American Community Survey 2005 were used as a primary data source to estimate the number of people with a potential demand for transit service in emergency evacuation. Pages 84 – 91.


• This FHWA report provides suggestions on how to gather data on the number and types of people in the special needs population. Chapter 3, pages 20 – 21.


• This report provides information on preparing an informed estimate of the number and types of individuals with special needs. It also provides some information about how to establish registries and how to apply geographic information systems (GIS). Pages 13 - 18.

- This study provides information on the correlation between four demographics of special needs populations using census 2000 data. Pages 18 -30.

b) Communication with the Vulnerable Population


- The study identifies communication system qualities that enhance the role of transit in emergency evacuation. Pages 99, 101, 103 and 105.


- This report provides information on how to better communicate with the special needs population. Chapter 4, pages 29 – 38.


- This document provides additional information on how to communicate with the special needs population during emergencies. Pages 18 – 25.

iv. ASTHO (Association of State and Territorial Health Officials). “At-risk populations and pandemic influenza: Planning guidance for state, territorial, tribal, and local health
This document provides additional information on communication with and education of at-risk populations before, during and after emergencies. Pages 46 – 59.


• This document provides an extensive literature review in the area of communication with persons with sensory and cognitive disabilities in transit environment. Pages 8 – 16.

c) Transportation of the vulnerable Population


• This publication provides information on how to make careful planning to conduct a successful transportation during evacuation. Chapter 5, pages 39 – 48.

• It also provides information on how to store, maintain and document transportation resources. Chapter 3, pages 17 – 18.


• This document provides information on how to identify available transportation resources and suggests major emergency transportation planning considerations. Page 33 – 37.

d) Tracking the Vulnerable Population
   • This study provides information on dispatching and tracking. Chapter 5, pages 40 – 41.

   • This report provides information on patient tracking. Page 40.

e) Sheltering the Vulnerable Population

   • Even though the focus of this document is not transportation, it provides some primary considerations for planning of shelters. Chapter 3, pages 26 – 28.

   • This document outlines some important ideas on how to plan safe and healthy shelters. Pages 25 – 28.
APPENDIX B

REVIEW OF 2006 MOBILE COUNTY HURRICANE PLAN
WITH RESPECT TO TRANSIT EVACUATION OF VULNERABLE POPULATION

1.0 Introduction

This portion of the thesis documents the procedure in place for transit evacuation of the vulnerable population in Mobile County at the beginning of 2007. The information was gathered with the support and cooperation of the Mobile county EMA. Part of the information came from written documents, interviews, and discussions with MCEMA officials, and part came from field trips to the MCEMA offices and other sites in Mobile.

It is important to note that changes have been made to the MCEMA plan since the initiation of this UTCA project. In particular, FEMA has provided funding for detailed plan development by a consulting firm and has provided funding to the Alabama EMA for commercial buses to evacuate those in the MCEMA region without personal vehicles.

2.0 Overview of written plan

The simplified version of the plan is offered in the following paragraphs. The majority of the material came from the authors’ review of the document “Mobile County Hurricane Plan.”

**Purpose** – The purpose of the plan is to develop procedures and provide a coordinated and orderly plan of operation to minimize effects of hurricanes on residents and visitors in Mobile County, Alabama. The plan covers all mass evacuations and special needs evacuations, and it is an integral part of the Mobile County Emergency Operations Plan (EOP).
**Assumptions** – The plan assumes that a hurricane will be detected and tracked with adequate time to implement the plan procedures. When a hurricane strikes, help from the state and federal government may not be available during the first 24 to 72 hrs; therefore, local governments should maintain a combination of governmental and volunteer emergency services and facilities to cope with day to day emergencies.

**Management of Evacuation** – To effectively guide the preparation, evacuation and recovery processes, the plan establishes two groups: the Executive Group which has the overall direction and control of the hurricane procedures, and the Operations Group which acts in accordance with procedures as conditions warrant for its jurisdictional areas and responds to overall directions issued by the Executive group. The composition of each group is stated, but specific roles and responsibilities of agencies and representatives are not stated for the Executive Group.

**Levels of Evacuation** – The County is divided into four hurricane evacuation geographical zones (See Figure B – 3 at the end of this appendix). During category 1 and 2 hurricanes, all people from Zones I and II, all mobile homes and persons in low-lying flood prone areas will evacuate. During category 3, 4 and 5 hurricanes, people from all zones will evacuate.

The primary evacuation routes are designated for different parts of the county. For in-county evacuation, 19 shelters are designated with a total capacity of 10,805; however, the plan does not specify out-of-county shelters.

**Transit dependent individuals** – The Mobile County Hurricane Plan includes most of the information required to develop a plan for transit-dependent evacuation. However, there are some areas that are not yet specified, such as an implementation time line, detailed responsibilities, shelter activation, and public information in pre-scripted form.
The plan provides a list of the number of required buses, drivers, and pick up stations for transit dependent individuals. However, it does not provide an estimate of the number of people who can use the general population buses or those who need special types of buses and shelters.

3.0 Information Provided by MCEMA

Important points from the discussions and interviews of MCEMA officials are reviewed in the following paragraphs.

The current plan has two options for evacuating persons without a vehicle. For Category 1 or 2 hurricanes, individuals will be moved to shelters in the northern part of the county. For Category 3, 4, and 5 hurricanes, the evacuees will be moved in two steps: (1) they will be picked up at their homes or at staging areas and moved to a hub (the Civic Center) where they will be registered and undergo triage, and (2) from the Civic Center they will travel by school bus to various junior colleges around the state.

**Pick up & Transport** – For evacuees living in the City of Mobile, the WAVE transit system will carry them to the hub. For evacuees living in the rural part of the county, transportation will be provided by churches, nonprofit organizations, and others.

MCEMA has made provisions to obtain enough school buses, but will need additional drivers. This is detailed on the shortfall list. The Alabama EMA office will pay for bus fuel and food. For planning purposes, the current projection is that about 300 school busses will be needed for major evacuation. About 200 drivers must be brought to Mobile to drive them, and the Alabama EMA has made arrangements to secure and deliver the drivers.

**Time Table** – The evacuation of the carless population will start 48 hours before the projected landfall of a hurricane. It will occur over a 12 hour period, from 6:00 am to 6:00 pm.
**Number Estimated to Evacuate by the Mobile EMA** – The Mobile EMA used 2000 Census data, which indicated that the County had a population of 399,842. Of these persons, 13,410 individuals (3.4 percent) did not have personal vehicles. This is a relatively low percentage, compared to the larger coastal cities in the southeast. It is also smaller than the number estimated by the authors using census data and recommended methods. However, it is much larger than the number of transit dependent individuals who actually evacuated in the past.

**Volunteer Mobile** – This is a nonprofit volunteer organization involved in transit evacuations. It is a terrific asset. For example, they contact potential evacuees and provide information to them, enroll them in the Registry, and otherwise help them understand and prepare for evacuation. They periodically contact the potential evacuees to make sure they still want to be evacuated if a storm threatens.

In addition, Volunteer Mobile will manage the hub process during evacuation, with 45-50 volunteers on the ground at the Mobile Civic Center. On July 22, 2008 they conducted a mock evacuation scenario for three hours. MCEMA reserved the Civic Center for them. Working with the MCEMA, they put feet on the ground and worked out the plan details for issues like providing signing to instruct evacuees on the processes and locations involved in evacuation. This plan includes where Volunteer Mobile would set up processing stations, how they would get data from evacuees, where buses will arrive/park/load/depart, and other steps in the process.

**Keeping Track of Evacuees** – MCEMA originally had PERMATS software to keep track of evacuees. It was replaced during this project by Phoenix Software, which is web based and more versatile than the prior software. At the hub, they gather crucial information from each evacuee and enter it into the software. The software allows scanning of drivers’ licenses, etc., to populate the data base. It prints reports and wristbands to keep track of evacuees. For example, a scanner
at the door of an evacuation bus can provide a list of all those on board and can allow the driver to track them. There is a pen and paper copy for backup if the internet goes down. When the evacuee arrives at the destination, his or her wrist band is scanned, and the name and arrival date is placed in the software.

**Contacting Evacuees** – The City, County and Mobile EMS purchased “Connect CTY” which works like a reverse 911. It has call-back service and other options. For example, it can call potential evacuees in all parts of the county in a matter of hours. It can also contact those in a zip code group, or create other location designations (i.e., trace a location on a GIS map). It can do text messages, recorded voice messages, and other communications. The EMS will use it to issue mandatory evacuation messages, and the system will then report how many of those called answered. It has the capability to go to a secondary number if the primary number of an evacuee does not answer.

**Traffic Flow at the Hub** – The UTCA researchers evaluated how the 300 busses would arrive, park, load, and depart from the Civic Center, since this is a potential source of congestion and confusion. In addition, the city will likely experience increased traffic flow from anxious drivers, all of which will increase congestion. The parking lots, entrances, and exits of the civic center are not conducive to a smooth entrance or internal flow with overflow storage. Ideally, the busses could arrive at uniform time spacing of exactly 2.5 minutes apart. But this is unrealistic, and groups of buses will likely arrive at the same time. In addition, it is probable that many of the older evacuees will get tired of waiting and get friends to drop them off at the hub, creating a “person jam.” Or even worse, they may drive their own vehicles to the hub and plan to park at the hub. After consultation with MCEMA managers, this challenge was found to be
surmountable with assistance from the City of Mobile Police Department and the logistics/transportation expertise of MCEMA managers.

The following pages display four figures that are examples from the MCEMA plan. They include a surge map, evacuation routes, evacuation zones, and a population map.
Figure B - 1 Surge Map, MCEMA 2006 Plan
Evacuation Routes

Mobile County: I-65 North, Highway 43 North, Highway 45 North
Dauphin Island take Highway 193
Bayou La Batre and Grand Bay take Highway 188 or C.R. 19 to I-10 East to I-65 North
Mobile Bay at Alabama Port take Highway 193 North
Saraland and Satsuma area can use Highway 43 North or I-65.

Planning
Study the map and the evacuation routes. Plan out which roads you are going to take before the hurricane season. Make reservations for motels early or have other plans for lodging. Plan on leaving early due to congested traffic.

When Evacuating – Leave 24 to 36 hours before gale force winds are expected to hit.
- Bring things indoors
- Look for potential hazards
- Leave natural gas on
- Turn off propane gas service
- If high winds are expected, cover the outside of all windows of your home.

Important Papers to Take With You:
- Driver’s license or personal identification
- Social Security card
- Proof of residence (deed or lease)
- Birth and marriage certificates
- Stocks, bonds, and other negotiable certificates
- Wills, deeds, and copies of recent tax returns

Figure B - 2 Mobile County hurricane evacuation routes, MCEMA 2006 Plan
Figure B - 3 Evacuation Zones, MCEMA 2006 Plan

LEGEND

Zone I (Red)
56,453 people
South of I-10

Zone II (Blue)
128,481 people
North of I-10
East of I-65
East of US 43

Zone III (Green)
160,859 people
North of I-10
South of US 98
West of I-65

Zone IV (Yellow)
54,050 people
North of US 99
West of I-65
Mobile County population map

- **Total Population**: 400,000
- **Incorporated**: 271,950
- **Unincorporated**: 128,050

**Cities**
- **Mobile**: 201,000
- **Prichard**: 34,000
- **Saraland**: 12,000
- **Satsuma**: 7,000
- **Chickasaw**: 6,600
- **Citronelle**: 4,000
- **Bayou LaBate**: 3,000
- **Creola**: 2,100
- **Dauphin Island**: 1,200
- **Mt. Vernon**: 1,050

**MC Households**
- 151,000 Households

**Mobile County**
- 1144 Square Miles

Figure B - 4 Mobile County population map
APPENDIX C

1 GEMA STANDARD OPERATING PROCEDURE: STATE ASSISTANCE IN EVACUATION OF SPECIAL NEEDS POPULATIONS FROM GEORGIA COASTAL AREAS

i. Purpose: The purpose of this SOP is to provide an overview of GEMA’s role in assisting coastal areas with the evacuation of Special Needs Populations (SpN) and documentation of the process to be used in requesting this assistance. Each Public Health District, under the direction of GA Dept of Human Resources, Division of Public Health, has been assigned the task of developing plans in conjunction with the local EMAs. This SOP will not replace any Public Health District Plan but serves to clarify the process of additional assistance requests to GEMA.

ii. Assumptions: The following situations and events are assumed to have either taken place or are taking place for this SOP to be activated and used.

A. A significant threat to the six coastal counties of Georgia exists. (e.g. Hurricane projected to make landfall directly on the GA coast or near enough to cause significant infrastructure damage and poses a threat to those remaining in the area.)

B. The threat requires the evacuation of not only Special Needs Populations but general populace. The decision to evacuate SpN will be made prior to evacuation of general population.

1This plan is provided to readers of this thesis research as an example of plans that Southeastern states have in place for transit evacuation.
C. It will require at least 12 hours for State procured transportation assets to be in place.

D. A mandatory evacuation order will be given by local elected officials due to the seriousness of the threat. The determination of the need to evacuate is a local decision but will be coordinated with state government.

E. The Special Needs Population has been identified and meets the criteria set by DHR Division of Public Health and the local Public Health District to qualify as needing additional assistance not provided in another setting.

F. Local resources are not adequate to accomplish the transport of the SpNs.

G. A destination (e.g. Special Needs Shelter, Nursing Home, or Hospital) for each evacuee has been designated and is available.

H. Prior coordination and planning involving the local EMA requesting evacuation of SpN, local Public Health District and the receiving Public Health District has occurred and directors of all three organizations are aware of the request.

iii. Responsibilities: The following responsibilities are shown for clarification.

A. GEMA: As overall coordinator for the State of Georgia in disasters and emergency management, GEMA is responsible for the following activities when a request for assistance in evacuating Special Needs Populations from an endangered area.

1. Receive the request for assistance from the local EMA in conjunction with the affected Public Health District Directors.

2. Work with ESFs 1, 8 and 13 to rapidly provide transportation that can accommodate SpN that can sit upright and others that can only travel lying down.

   a. Those SpN that can travel sitting upright should be placed on a conveyance that at a minimum is handicapped accessible, has air conditioning/heat as
appropriate and an on-board room equipped with a flush toilet and facilities to wash the hands and face. (Example: Tour Bus, Coach Bus etc. with a lift for wheel chairs). Only in the direst situation should an evacuee be separated from assistive technologies, a caregiver, or a service animal. It should be noted that most vehicles with a wheelchair lift have secured locations for only two chairs.

b. Those SpN that must travel in a horizontal position should be placed in a conveyance that can accommodate them lying horizontal on a gurney or similar device; can lock the individual and that device in place to prevent movement; room to accommodate the necessary equipment the evacuee may medically require, and air conditioning/heat as appropriate. (Example: Ambulance, Non-Emergency Transport, Medical Transport, etc.)

3. Have those assets in place and beginning transport within 12 hours of notification.

4. Facilitate planning between local EMAs, DHR and Public Health Districts.

B. Georgia Department of Human Resources (DHR): As the umbrella agency for numerous human service functions of state government, DHR has an important responsibility as coordinator of those services and the agency tasked with primary responsibility for Emergency Support Functions (ESF) -6 and -8 for the state.

1. Coordinate emergency planning between GEMA and DHR Divisions and Offices.

2. Assist GEMA in coordination of efforts between Division of Public Health and EMAs.

C. DHR Division of Public Health (DHR-DPH): As the lead for ESF-8, Public Health is responsible for the coordination of ongoing planning and preparation at the local level
and in Public Health Districts to address the identification, triage, evacuation (if necessary), sheltering, and return of Special Needs populations to the point of origin.

1. Coordinate training and planning to address Special Needs Populations requirements in the state.


3. Coordinate improvement of shortfalls in staffing, location, supplies etc. for Special Needs Shelters and Populations.

4. Coordinate Public Health District requests in the State Operations Center.

D. Georgia State Patrol (GSP): As the lead agency for ESF-13, Public Safety and Security Services, GSP will coordinate with ESF 8 to provide escort for those vehicles transporting Special Needs Populations from the triage point to the final shelter location. Police escort is necessary to facilitate the rapid movement of these populations to shelters due to the timeliness of the evacuation.

E. Public Health Districts: Each District requesting state assistance in evacuation of Special Needs Populations should:

F. Coordinate with local EMAs in the areas of planning, identification, triage, evacuation, sheltering, and return of Special Needs Populations

1. Upon request by the local EMA, be prepared to provide an appropriate means of sheltering Special Needs Populations at risk. If evacuation of the population to outside of the Public Health District is necessary, coordinate planning and communication with the receiving Public Health District
2. If receiving Special Needs Populations from outside of Public Health District, facilitate planning and communication with the evacuating Public Health District and EMA (both from evacuation area and receiving area.)

3. Assist local officials in the nomination, selection, inspection and certification of Special Needs Shelters or other appropriate housing measures as determined by the Public Health District Director.

4. Coordinate staffing and supplies for Special Needs Sheltering as well as other requirements as determined by DHR-DPH

5. Maintain communication with DHR-DPH with status of planning, requests from EMA, and other information regarding evacuation of SpN.

G. Local EMA: As the primary coordinator for local citizens, the Local EMA must be involved at all levels of the planning, identification, evacuation, sheltering and return of Special Needs Populations in their area

1. Coordinate with local Public Health District in the areas of planning, identification, triage, evacuation, sheltering, and return of Special Needs Populations

2. Provide as early as possible notification to Public Health District and GEMA of intention to evacuate and requirement for sheltering Special Needs Populations at risk. If evacuation of the population to outside of the Public Health District is necessary, assist Public Health District in planning and communication with the receiving Public Health District as requested.

3. If receiving Special Needs Populations from outside of Public Health District, facilitate planning and communication with the evacuating Public Health District and EMA
4. Assist local officials and Public Health District in the nomination, selection, inspection and certification of Special Needs Shelters or other appropriate housing measures.

5. Assist Public Health District with staffing and supplies for Special Needs Sheltering and other requirements as requested. While Public Health District has the primary responsibility for the staff and shelter, they may need assistance in transportation of staff to the shelter, police escort of supply trucks or other needs best suited to assistance by the local EMA.

6. Maintain communication with GEMA regarding planning, decision to evacuate, communication with evacuating and receiving Public Health Districts and EMAs, ongoing progress and associated issues.

7. Notify GEMA of shortages in transportation assets as soon as identified. It is expected that shortages will be identified during the planning process prior to an actual evacuation. However, events may occur that prevent planned asset availability and require outside assistance in evacuation of these populations. It should be noted that it will take roughly 12 hours from the request until GEMA procured transportation assets begin to arrive.

8. Provide chaperones for each evacuating facility to accompany SpN evacuees to shelters. These individuals can be medical or non-medical personnel as their role is to monitor the passengers and notify driver and EOC of emerging problems during transportation. In the event of any medical situation, they will notify driver to move the bus to the side of the road, contact the EOC to request medical support and report their location. In the event Local EMA is unable to provide chaperones, they
should request this assistance at the same time as requesting additional transportation support.

iv. SpN Transportation Assistance Protocols

A. Upon determination by Local EMA, with concurrence of local elected officials, that evacuation of Special Needs Populations and General Public is required, the local Public Health District will be notified of the decision.

B. If the District Health Director (DHD) does not concur with the decision, the local EMA will notify GEMA of the decision and disagreement. The DHD will notify State Public Health of the request and disagreement.

1. GEMA and State Public Health will review the disagreement and reach a consensus on the correct course of action.

2. This consensus will be communicated to the Local EMA and DHD. A resolution of the disagreement will be reached as quickly as possible.

C. Local EMA will notify GEMA of the planned timeline for evacuation. Additional transportation assets, if needed, will be requested from GEMA. These assets will be dispatched to a single location in the evacuating county to transport SpN to a single designated location in the receiving county.

1. SpN need to be evacuated prior to any general population evacuation. This will reduce trip times and general stress on this population.

2. From time of request to arrival of first transportation assets will be roughly 12 hours. Proper planning for this lead time, time for the trip and completion of evacuation of the population is essential.
3. Each county expecting to use GEMA assets to transport SpN populations must notify GEMA and the local Public Health District of this prior to any disaster. Included in this notification, will be the total numbers to be transported, number that can transport sitting up, and the number that will require horizontal transport. This info is critical for planning purposes.

D. State Public Health will coordinate with the evacuating Public Health District and receiving Public Health District to facilitate any triage, transport, or sheltering problems that arise during the evacuation.

E. When the situation requiring evacuation of SpN populations has passed, the EMA that evacuated, in conjunction with the local Public Health District, will determine if sufficient infrastructure exists to allow the population to return home. Once the determination has been made to return the population, the same procedures will be used as when evacuating initially. Once again, GEMA transportation assets will used only for single point to single point transportation. Any changes in numbers or types of transport needed will be communicated to GEMA at the earliest point possible.
When resolved District Health Director (DHD) concurs with decision?

No

If EMA and DHD cannot resolve:
EMA notifies GEMA;
DHD notifies State Pub Health.

When resolved Yes

EMA notifies GEMA Field Coordinator or SOC of Evacuation timeline and requests previously planned transport assets;
DHD notifies State Pub Health of evacuation. State Pub Health facilitates coordination with receiving PH District

GEMA coordinates pre-planned numbers of transportation assets to arrive at single pick-up point in each county and notifies Local EMA and Receiving EMA of timeline

Repeat process to return SpN to Home County

END
APPENDIX D

CHECK LIST FOR PREPARING A TRANSIT EVACUATION PLAN

This check list is from the FHWA document “Evacuating Populations with special needs”. It contains important information that can help prepare a transit evacuation plan.

<table>
<thead>
<tr>
<th>Task</th>
<th>Date Completed</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Planning and Preparedness</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What local groups did you bring into the planning forum to address evacuations (e.g., local health, EMA, transportation, CRCFs, NGOs)?</td>
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<tr>
<td>Does the plan clearly define roles for staff?</td>
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<tr>
<td>□ Which staff received a briefing and copy of their roles?</td>
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<tr>
<td>How does the plan identify people with special needs?</td>
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<tr>
<td>Do you have a registry of people with special needs that may need to be evacuated and does it address their:</td>
<td></td>
<td></td>
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<tr>
<td>□ Medical equipment needs</td>
<td></td>
<td></td>
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<tr>
<td>□ Companion caregiver/attendant</td>
<td></td>
<td></td>
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<tr>
<td>□ Service animal</td>
<td></td>
<td></td>
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<tr>
<td>□ Household pet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Communication needs</td>
<td></td>
<td></td>
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<tr>
<td>What agency is responsible for maintaining/updating the registry of those with special needs who may need evacuation?</td>
<td></td>
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<tr>
<td>How often is the registry updated and disseminated to agencies responsible for evacuating those on the registry?</td>
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<tr>
<td>How the need to register is communicated to those with special needs?</td>
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<tr>
<td>How does the plan address the timeline for evacuating those with special needs?</td>
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<tr>
<td>How does the plan address coordinating transport of those with special needs with the special needs shelters?</td>
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<tr>
<td>Task</td>
<td>Date Completed</td>
<td>Notes</td>
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<td>----------------------------------------------------------------------</td>
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<tr>
<td>Do you have copies of all agreements with CRCFs, hospitals, jails, etc.?</td>
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<tr>
<td>□ Where are they located?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Who do you have agreements with?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Who do you not have agreements with?</td>
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<tr>
<td>□ Have you ensured that your agency is not the sole transportation provider?</td>
<td></td>
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<tr>
<td>□ Is there the potential for competition for transportation resources between your agency and CRCFs?</td>
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<tr>
<td>Describe your system of communication with your local EMA.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ When was it last tested?</td>
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<td></td>
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<tr>
<td>□ How do plans differ between the planning phase and operations phase?</td>
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<tr>
<td>How does the plan address communicating with people who have special needs such as:</td>
<td></td>
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<tr>
<td>Speakers of other languages and those with limited English proficiency</td>
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<td></td>
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<tr>
<td>□ People with disabilities</td>
<td></td>
<td></td>
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<tr>
<td>□ People with medical needs</td>
<td></td>
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<tr>
<td>How does the plan address communicating information/outreach to people with special needs about:</td>
<td></td>
<td></td>
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<tr>
<td>□ Pick-up locations for transportation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ What they can bring with them</td>
<td></td>
<td></td>
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<tr>
<td>□ What services/facilities are available at special needs shelters</td>
<td></td>
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<tr>
<td>Do you have an inventory of available vehicles for an evacuation and does it address:</td>
<td></td>
<td></td>
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<tr>
<td>□ Contact information</td>
<td></td>
<td></td>
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<tr>
<td>□ Number and types of vehicles</td>
<td></td>
<td></td>
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<tr>
<td>Describe your staff notification system.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ When was it last updated?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ When was it last tested?</td>
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<tr>
<td>Describe your agency’s staff personal and family preparedness plans for essential personnel.</td>
<td></td>
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<tr>
<td>□ Describe your back-up plans to fill essential functions if staff cannot fulfill their duties.</td>
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<tr>
<td>When were the plans tested and exercised? (Annual exercises are recommended.)</td>
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<tr>
<td>Task</td>
<td>Date Completed</td>
<td>Notes</td>
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<tr>
<td>----------------------------------------------------------------------</td>
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<td>-------</td>
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<tr>
<td>Which transportation staff received training?</td>
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<tr>
<td><strong>Communication Needs</strong></td>
<td></td>
<td></td>
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<tr>
<td>When communicating with CRCFs, have you:</td>
<td></td>
<td></td>
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<tr>
<td>□ Identified the types of communication resources available prior to an event?</td>
<td></td>
<td></td>
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<tr>
<td>□ Ensured that as many agencies and facilities as possible know the communications plan and use the same equipment?</td>
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<tr>
<td>□ Conducted routine tests, if using a radio system?</td>
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<tr>
<td>□ Tested all communication resources on a regular basis?</td>
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<tr>
<td>□ Developed a phone-tree of key people to contact for transportation during an evacuation</td>
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<tr>
<td>□ Do numbers include supervisors, medical staff, facility directors and others?</td>
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<td></td>
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<tr>
<td>□ Do you test these phone numbers on a regular basis to update accordingly?</td>
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<td></td>
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<tr>
<td>□ Conducted a communications drill at least once a year?</td>
<td></td>
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<tr>
<td>When preparing for communication with people who have limited English proficiency or are non-English speaking, have you:</td>
<td></td>
<td></td>
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<tr>
<td>□ Developed written and pictorial illustrations of various words and phrases that may need to be used during the evacuation process and included copies on board all transportation vehicles?</td>
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<tr>
<td>□ Did you create consistent, easily readable photo identification badges and shirts for the transportation staff?</td>
<td></td>
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<tr>
<td>□ Color-code the shirts and/or badges to identify supervisors, drivers, and other key staff</td>
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</tr>
<tr>
<td>□ Give a printed handout in relevant languages and/or with illustrations to each evacuee being transported.</td>
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<tr>
<td><strong>Transportation Needs During Activation and Operations</strong></td>
<td></td>
<td></td>
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<tr>
<td>How and when do you notify transportation providers to activate the evacuation?</td>
<td></td>
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<tr>
<td>How do you track requests for transportation to ensure requests are responded to and to support future planning for transportation?</td>
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<tr>
<td>How do you monitor the status of the evacuation and report it to your EMA?</td>
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<tr>
<td>Task</td>
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<tr>
<td>How do you provide staff at the transportation pick-up locations?</td>
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<tr>
<td>How do you use ITS components to support the evacuation and who is responsible for the operation and monitoring of those components?</td>
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<tr>
<td>Are transportation dispatchers keeping track of the following:</td>
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<td></td>
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<tr>
<td>☐ Driver names/contact information</td>
<td></td>
<td></td>
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<tr>
<td>☐ Vehicle information (owner, number, license plate, type, capacity, etc.) and assignment</td>
<td></td>
<td></td>
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<tr>
<td>☐ Route maps</td>
<td></td>
<td></td>
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<tr>
<td>☐ Locations of fuel</td>
<td></td>
<td></td>
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<tr>
<td>☐ Contact information for interpreters and translators</td>
<td></td>
<td></td>
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<tr>
<td>☐ Evacuee information (where available through evacuation registries)</td>
<td></td>
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<tr>
<td>☐ Contact information for liaisons and other people/agencies that will provide critical up-to-date information</td>
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<tr>
<td>☐ Names and contact information for people assisting with evacuations (mechanics, personnel at fuel depots, staging area workers, assistants traveling with vehicles)</td>
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<tr>
<td>Are checklists placed in all vehicles for field drivers to use?</td>
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<tr>
<td>Does the field checklist include:</td>
<td></td>
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<tr>
<td>☐ Driver ID (name, contact information)/credentials</td>
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<td></td>
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<tr>
<td>☐ Location of mustering areas/staging areas</td>
<td></td>
<td></td>
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<tr>
<td>☐ Location of vehicle keys and back-up keys</td>
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<tr>
<td>☐ Emergency contact for drivers and format (e.g., CB radio, Push-to-talk)</td>
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<tr>
<td>☐ Dispatch contact and alternate</td>
<td></td>
<td></td>
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<tr>
<td>☐ Route maps and alternate route maps</td>
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<td></td>
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<tr>
<td>☐ Lists of evacuees per vehicle with contact information</td>
<td></td>
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<tr>
<td>☐ Shelter locations and types (e.g., general population, special medical needs, pet-friendly)</td>
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<tr>
<td>☐ Specialized equipment required (e.g., lifts, foreign language information)</td>
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<tr>
<td>☐ Fuel locations</td>
<td></td>
<td></td>
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<tr>
<td>☐ Instructions for breaks and shift changes</td>
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<td>Task</td>
<td>Date Completed</td>
<td>Notes</td>
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<tr>
<td>□ Local information sources (211/511 systems, Highway Advisory Radio (HAR) locations, etc.)</td>
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<tr>
<td>□ Point-of-contact for rumor control (e.g., to verify road closures or shelter changes that may be announced by the media or purported by evacuees)</td>
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<td></td>
</tr>
<tr>
<td>□ Worksheets for trip times (departure/arrival), mileage, passenger names/counts, driver name and company/contact information, staging areas, pick-up points, and shelter locations. Detailed records must be kept for any potential reimbursements.</td>
<td></td>
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<tr>
<td><strong>Congregate and Residential Care Facilities</strong></td>
<td></td>
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<tr>
<td>Have all the CRCFs identified a like-to-like facility to which to evacuate, and what agreements are in place to support such an action?</td>
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<tr>
<td>How does the plan address communications with CRCFs before, during, and after an evacuation?</td>
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<tr>
<td>Have you considered, during the planning phase, some of the challenges that transportation agencies should include, such as:</td>
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<tr>
<td>□ Transporting adequate supplies on a continuous basis during an emergency when medical supplies and equipment may be at high demand</td>
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<tr>
<td>□ Transporting adequate food supplies</td>
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<tr>
<td>□ Coordinating transportation resources that include vehicles with accommodations for people with special needs during evacuations, re-entry, and recovery</td>
<td></td>
<td></td>
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<tr>
<td>□ Procurement of medical equipment, supplies, and medication that takes into consideration the full age, disability, and medical needs spectrum</td>
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<tr>
<td>□ Working with emergency officials on credentialing issues for “essential transportation personnel” in the context of special needs/CRCF patients</td>
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<tr>
<td>Have you considered different scenarios to help with contingency planning including:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>□ Timing of the evacuation (should special needs populations be evacuated prior to others)</td>
<td></td>
<td></td>
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<tr>
<td>□ Specialized equipment to assist with the process</td>
<td></td>
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<tr>
<td>□ Different scenarios and the types of evacuation that would occur</td>
<td></td>
<td></td>
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<tr>
<td>□ Dealing with medically fragile people who are at high risk</td>
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<tr>
<td>Task</td>
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<td>Notes</td>
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<tr>
<td>How does the plan for CRCFs address:</td>
<td></td>
<td></td>
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<tr>
<td>- Vehicle types</td>
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<td>- Fuel for vehicles</td>
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<td>- Vehicle operators</td>
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<tr>
<td>- Security</td>
<td></td>
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<tr>
<td>- Transport of service animals</td>
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<tr>
<td>- Medical emergencies en route</td>
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<tr>
<td>- Vehicle identification</td>
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<tr>
<td>- Credentialing</td>
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<tr>
<td>- Dispatch and tracking</td>
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<tr>
<td>How does the plan address transportation of CRCF support items including:</td>
<td></td>
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<tr>
<td>- Durable medical equipment</td>
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<tr>
<td>- Food supplies</td>
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<td>- Medical records</td>
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<tr>
<td>- Medicine</td>
<td></td>
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<tr>
<td>- CRCF staff</td>
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</tbody>
</table>

**Animal Needs**

How does your plan address transporting different types of animals including:

- Service animals
- Household pets
- Farm animals/livestock
- Institutional animals (theme parks, zoos, research labs, pet stores, animal shelters)

How are drivers trained for transporting various animal types?

How are the animals being transported and tracked to their destination, and who is responsible for that tracking?

Some key elements must be present in vehicles that transport animals. Have you considered the following:

- Ventilation
- Security from attack or disease spread from other animals
- Crates or units that are secured and will not move about or slip from the vehicle
- Crates or units that are not subject to winds and projectiles from driving during transport

When transporting animals, have you considered containers that have the following components:

- Locking bolts to secure the container
<table>
<thead>
<tr>
<th>Task</th>
<th>Date Completed</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>☐ Metal doors since animals can chew through plastic</td>
<td></td>
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<tr>
<td>☐ Four metal rods that fasten and secure the door into the container</td>
<td></td>
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<tr>
<td>☐ No wheels since airlines will not accept such crates</td>
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<td></td>
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<tr>
<td>☐ Sturdy construction with no weak points</td>
<td></td>
<td></td>
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<tr>
<td>☐ Adequate ventilation</td>
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<td></td>
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<tr>
<td>☐ Enough space for the animal to turn around</td>
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<td></td>
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<tr>
<td>☐ Access and room for food and water</td>
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<td></td>
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<tr>
<td>☐ Access and room for cleaning</td>
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</tbody>
</table>

Does your plan encourage owners to provide animal travel kits that contain the following:

☐ Proof of vaccination and veterinary records
☐ Licenses, rabies, and ID tags
☐ Two weeks of food, water, and medications
☐ Bedding and toys
☐ Litter box, litter, and a scoop
☐ Food and water bowls
☐ Information on medication and feeding schedules
☐ Newspapers, pee pads, cleaning supplies
☐ Collars, leashes, muzzles, harnesses
☐ First-aid kit
☐ A manual can opener and spoons
☐ Stakes and a break-proof rope or tie down

### Re-entry and Return to Readiness

How does the plan address re-entry needs including:

☐ Assessment of road conditions
☐ Identification of re-entry routes
☐ Fuel availability on re-entry routes
☐ Security
☐ Availability of rest areas
☐ Availability of food and water
☐ Use of ITS components to support re-entry

During re-entry how does your agency track and report to the EMA:

☐ Road conditions and status of whether they are open or closed
☐ Need for vehicles to transport returning evacuees with special needs
☐ Status of shelters – open or closed

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<table>
<thead>
<tr>
<th>Task</th>
<th>Date Completed</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>Post-event, how is your transportation agency taking the following actions:</td>
<td></td>
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<tr>
<td>☐ Conduct an after-action debriefing soon after the event (within a week)</td>
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<tr>
<td>☐ Develop an after-action report to capture lessons learned and actions that worked</td>
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</tr>
<tr>
<td>Did the after-action debriefing include a facilitator who:</td>
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<tr>
<td>☐ Includes everyone involved in the operation</td>
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<tr>
<td>☐ Ensures all issues are addressed fully and thoughtfully</td>
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<tr>
<td>☐ Has participants focus on both positive and negative actions and outcomes, as well as suggested corrections</td>
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<tr>
<td>☐ Ensures that participants do not feel intimidated or pressured to say something or to silence themselves about events that happened</td>
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<tr>
<td>Did the debriefing and after-action report result in revisions of the plan, and how have those revisions been disseminated?</td>
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<tr>
<td>Did the debriefing and after-action plan identify revised or new training needs, and has that training been completed?</td>
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<tr>
<td>Did the debriefing and after-action plan identify revised or new contracts or agreements, and have those contracts and agreements been executed?</td>
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<tr>
<td>How does the plan address seeking reimbursement for the costs of the evacuation?</td>
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<tr>
<td>As with evacuation procedures, transportation dispatchers should track the following:</td>
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<tr>
<td>☐ Driver names/contact information</td>
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<td></td>
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<tr>
<td>☐ Vehicle information (owner, number, license plate, type, capacity, etc.) and assignment</td>
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<tr>
<td>☐ Route maps</td>
<td></td>
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<tr>
<td>☐ Location of fuel</td>
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<tr>
<td>☐ Contact information for interpreters and translators</td>
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<tr>
<td>☐ Evacuee information (where available through evacuation registries)</td>
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<tr>
<td>☐ Contact information for liaisons and other people/agencies that will provide critical up-to-date information, including medical support personnel who cared for an evacuee prior to the exodus</td>
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<tr>
<td>Task</td>
<td>Date Completed</td>
<td>Notes</td>
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<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
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<tr>
<td>- Names and contact information for people assisting with evacuations (mechanics, personnel at fuel depots, staging area workers, assistants traveling with vehicles)</td>
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<tr>
<td>Driver checklists for re-entry should mirror those used during evacuation, to include:</td>
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<tr>
<td>- Driver ID (name, contact information)/credentials</td>
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<tr>
<td>- Location of collection points/ staging areas</td>
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<tr>
<td>- Location of vehicle keys and back-up keys</td>
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<td>- Emergency contact for drivers and format of communication used by the drivers (e.g., CB radio, Push-to-talk)</td>
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<td>- Dispatch contact and alternate contacts</td>
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<tr>
<td>- Route maps and alternate route maps</td>
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<tr>
<td>- Lists of evacuees per vehicle with their contact information</td>
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<tr>
<td>- Shelter locations and types (e.g., general population, special medical needs, pet-friendly)</td>
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<td>- Specialized equipment required (e.g., lifts)</td>
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<tr>
<td>- Fuel locations</td>
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<tr>
<td>- Instructions for breaks and shift changes</td>
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<tr>
<td>- Local information sources (211/511 systems, HAR locations, etc.)</td>
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<tr>
<td>- Point-of-contact for rumor control (e.g., to verify road closures or shelter changes that may be announced by the media or reported by evacuees)</td>
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<tr>
<td>Due to potential hazardous road conditions on re-entry, have the vehicles also been equipped with:</td>
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<tr>
<td>- Flashlights</td>
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<td>- Spare tires</td>
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<td>- Flat tire fixative</td>
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<tr>
<td>- Shovel</td>
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<tr>
<td>- Heavy-duty gloves</td>
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<tr>
<td>Have vehicles used in the evacuation been:</td>
<td></td>
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<tr>
<td>- Cleaned</td>
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<tr>
<td>- Refueled</td>
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<td>- Repaired</td>
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<tr>
<td>- Restocked</td>
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</tbody>
</table>

Source: FHWA-HOP-09-022, Evacuating Populations with Special Needs
APPENDIX E

LIST OF PRINCIPAL CONTACTS FOR MOBILE CASE STUDY

The following individuals are experts within various specialty areas of emergency evacuation.

They were contacted by the project staff to gather information about emergency evacuation and to identify resources documents and case studies. The authors express their appreciation for the assistance rendered by these individuals.

1. Kimberly C. Vásconez, M.P.I.A.
   Team Leader, Emergency Transportation Operations
   Office of Operations, Federal Highway Administration
   US Department of Transportation
   Washington, DC

2. Paul K. Schwartz
   Chief, Operational Integration
   Operations Management Division
   Disaster Operations Directorate
   FEMA
   500 C. St., SW
   Washington, D.C. 20472

3. David Schneider
   Federal Transit Administration
   Office of Program Management
   1200 New Jersey Ave. S.E.
   4th Floor - East Building
   Washington, DC 20590

4. Brian Wolshon, Ph.D., P.E.
   Department of Civil and Environmental Engineering
   Louisiana State University
   Baton Rouge, Louisiana 70803

5. John L. Renne, Ph.D. AICP
   Assistant Professor of Urban Planning and Transportation Studies
Associate Director of the University of New Orleans Transportation Center  
School of Urban Planning and Regional Studies  
University of New Orleans

6. Gail R. Staba, AICP  
   Senior Program Officer  
   Airport Cooperative Research Program  
   National Cooperative Highway Research Program  
   Transportation Research Board  
   The National Academies  
   500 Fifth Street, NW  
   Washington, D.C. 20001

7. Ms. Nancy Humphrey  
   Senior Staff Officer  
   National Cooperative Highway Research Program  
   Transportation Research Board  
   500 Fifth St. NW - Keck 467  
   Washington, D.C. 20001

8. Donna Vlasak  
   Senior Program Officer  
   National Cooperative Highway Research Program  
   Transportation Research Board  
   500 Fifth St. NW - Keck 467  
   Washington, D.C. 20001

9. Mr. Michael E. Leonard  
   Lead Transit Planner  
   METRO-Houston TX  
   P.O. Box 61429  
   1900 Main Street  
   Houston, TX 77208-1429 USA

10. Jay Marts  
    Federal Emergency Management Administration  
    US Department of Homeland Security  
    Washington, DC

11. Philip J. Tarnoff  
    Director, Center for Advanced Transportation Technology  
    Director, Technology Transfer Center  
    Maryland Center for Advanced Transportation Technology (CATT)  
    Department of Civil and Environmental Engineering  
    University of Maryland, College Park