



FEMA



**US Army Corps
of Engineers**®
Galveston District

Prepared by:

**National Planning Center of Expertise
for Coastal Storm Damage Reduction
National Hurricane Program Office**

**State of Texas
Post Storm Assessment: Hurricane Ike
Final Report - June 2010**

**STATE OF TEXAS
POST STORM ASSESSMENT: HURRICANE IKE**

FINAL REPORT

Prepared for:

Federal Emergency Management Agency
National Hurricane Program



Prepared by:

U.S. Army Corps of Engineers
National Planning Center of Expertise for
Coastal Storm Damage Reduction
National Hurricane Program Office



And



U.S. Army Corps
Of Engineers ®
Galveston District

And



June 2010

EXECUTIVE SUMMARY

Since 1980, the National Hurricane Program (NHP) has developed Hurricane Evacuation Studies (HES) as a service to State and local emergency managers, to provide a sound technical basis for their hurricane evacuation planning and decision-making. The NHP is a multi-agency partnership of Federal agencies, including Federal Emergency Management Agency (FEMA), National Oceanic and Atmospheric Association (NOAA), National Weather Service (NWS), U.S. Department of Transportation (USDOT), and U.S. Army Corps of Engineers (USACE). The HES products analyze and provide objective data on the following evacuation planning variables: Hazard, Vulnerability, Behavior, Transportation and Shelter. Following almost every significant storm since 1980 (the exceptions were Hurricanes Katrina and Rita), a Post-Storm Assessment (PSA) of the HES products has been conducted and funded through Interagency Agreements (IAA) and corresponding Statements of Support between FEMA and the USACE, to determine the accuracy of the HES products and foster improvement of their methodologies as warranted. The PSA also serves as a review of other tools and products provided by the NHP, as well as emergency management data collection and analysis efforts of the Federal government in general, and the FEMA Directorates in particular, to ensure that these efforts are coordinated for maximum effect and efficiency.

Hurricane Ike entered the Gulf of Mexico late on September 9, 2008 as a Category 1 storm and made landfall on Galveston Island, TX, on September 13, 2008 at 2:10 am Central Daylight Time (CDT) as a Category 2 storm generating significant storm surge along the upper Texas Gulf Coast. The purpose of this PSA for the State of Texas is to summarize the impacts of Hurricane Ike and evaluate the performance of the NHP HES products for the three Texas HES study areas where evacuations were undertaken (Sabine Lake, Galveston-Houston, and Matagorda). The PSA presents recommendations to improve NHP products and programs and examines the following key questions:

- Did local and State officials use the products produced in these hurricane evacuation studies?
- Were study data regarding storm hazards, behavioral characteristics of the threatened population, shelter information, evacuation clearance times and decision making tools accurate and reliable?
- Which study products were most useful and which least useful - what improvements could be made to current methodologies and products?

The PSA was conducted by interviewing local and State emergency managers who responded to the storm to obtain data on the utilization of NHP products and tools, including the HES for the area. Study teams consisting of representatives from FEMA, USACE and Dewberry visited with these communities and individuals throughout the State of Texas. Media representatives in the storm threatened area were also interviewed to determine the extent of public information provided to the threatened areas and whether they used any of the HES products to alert the

public of the approaching storm. Local, State and Media questionnaires covering the NHP's products and tools, including the components of the HES, were developed and utilized to capture pertinent data from each group for the assessment. Internet searches, interviews and contacts with other agencies were also conducted. All the collected data is compiled, analyzed and published in the following report.

Meetings were conducted with representatives from the emergency management offices in the counties of Chambers, Liberty, Hardin, Jefferson, Orange, Jasper, Newton, Polk, Tyler, San Jacinto, Harris, Galveston, Brazoria, Matagorda and Fort Bend. These meetings were conducted on the following dates: July 20-23 2009, August 17-19 2009, and September 8, 2009. The Houston TranStar meeting was conducted on September 9, 2009. The media meeting was held in Houston at the Harris County EOC on August 20, 2009 and the State meeting was held in Austin at the State EOC on September 10, 2009.

The main issues that surfaced in these sessions were:

Local: For the coastal counties, a major topic was the use of HURREVAC and SLOSH as decision assistance tools and the need for additional training for both tools. The coastal counties primary concern is the evacuation process as they generally do not shelter evacuees within the coastal counties. The increased expectations of the public for assistance from government during the evacuation process were a major concern and the importance of better public information and preparedness materials was also a major topic. The inland counties expressed their issues with traffic problems and bottlenecks created by the evacuees as they passed through their counties. Greater involvement with the Hurricane Liaison Team (HLT) during storm events was also expressed.

State: The major issues and topics of discussion during the State agency meeting were the problems associated with the state-wide transportation and sheltering programs. The State noted that its point-to-point or "sister city" sheltering system was effective but reported that the existing shelters reached maximum capacity during Hurricane Ike with extremely limited shelter availability for overflow evacuees. The State stressed that there is a definite need for more special needs and medical shelters as these groups were common and even the majority in general population shelters. There was concern surrounding the availability of transportation resources for evacuation assistance and the need for a national system for airbus support.

Media: The main issues discussed by the media were the desire to have more access to the Emergency Operations Center (EOC) and to have direct interaction with evacuation decision makers. More localized public information materials and a consistent set of evacuation zones for the public were major requests. Information is disseminated to the media from the Joint Information Centers (JIC) set up in the local EOCs. Generally, relationships between the emergency management agencies and the media were very good and most conducted and/or participated in annual hurricane expositions and public information seminars prior to the start of hurricane season. Media sources would like to present more information which stresses the impact of the storm rather than the typical the storm category reference.

A significant amount of data was collected during this assessment on topics related to and issues encountered by the State and Locals during a storm. Included in these topics were: vulnerable populations affected by the storm, the shelters utilized, the behavioral tendencies of the threatened populations, how well the transportation networks performed and whether contra-flow was utilized, how evacuation decisions were made, the extent of public information provided to the public, and whether other FEMA programs had a positive or negative effect on the response to the storm. The main issues that were raised during the Hurricane Ike PSA, along with recommendations for their improvement, are listed in the following table.

Topic	Issue	Recommendation
General	Development of new zip-zone evacuation maps without new transportation, behavioral and vulnerability analyses invalidates certain data in existing HESs.	Update the HES for all study areas.
	Hurricane study products provide valuable information for evacuation timing and decision making but are sometimes misunderstood or underutilized by local emergency management agencies.	Emphasize the availability of HES study products in the study areas and provide training on their utilization.
HLT	Inconsistent communication between the Hurricane Liaison Team (HLT) and coastal counties.	Permit HLT members to contact local EMS directly during storm events.
		Increase awareness of the HLT and its value to State/local EMs. Clearly define the HLT's national roles and protocols.
Technological	The HURREVAC software program is dependent on updated information after completion of a new study.	Hurricane Study Managers should coordinate with the State to ensure that individual modules in HURREVAC are updated with current HES study data, especially clearance times.
	More training is needed at the State and local levels on HURREVAC, SLOSH and HAZUS.	FEMA and USACE, in cooperation with State and local agencies, should conduct training workshops for HURREVAC, SLOSH and HAZUS. Initiate training and develop training materials for HURREVAC 2010.

Evacuation and Decision Making	Risk maps and evacuation zones vary in format and quality between HES study areas depending on the latest guidelines and standards used at the time of the product development.	Continue modernizing standard template for HES development and utilize it for re-studies.
		Develop guidance for including inland counties in the HES process.
	The current alert system is based on the Saffir-Simpson scale and does not adequately account for storm surge that can occur prior to landfall of the hurricane.	Train local emergency management on the National Hurricane Center's (NHC) Tropical Cyclone Storm Surge Probabilities product.
Evacuation Roadway Network	Post-storm re-entry requires immense coordination between multiple local, State and Federal agencies and a clear, open line of communication to evacuees.	Re-entry plans should be developed to create transportation re-entry templates and procedures for local governments.
Communication and Public Information	State and local officials are concerned that many people are still not taking appropriate protective actions, including evacuation in a timely manner, despite a relatively high level of hurricane vulnerability and hurricane history.	Update and expand public education campaigns and stress personal accountability from the evacuating public.
	Public expectations have been raised and the public has been heavily conditioned to rely on support from the Government in disaster situations.	
Sheltering	More facilities should be made available as safe hurricane evacuation shelters in areas closer to the coast following inspections and concurrence by the appropriate parties.	Emergency Support Function 6 (Mass Care) agencies at the State and local levels should coordinate with local emergency management agencies to inspect and designate more public buildings along evacuation routes for use as approved American Red Cross shelters.

Post Storm Recovery	FEMA's Federal Coordinating Officers (FCO) do not have full authority to obligate all necessary disaster funds.	Return to the prior FCO structure where the FCO has the authority to make decisions and commit resources concerning temporary housing and logistics.
	There is a high turnover rate of FEMA disaster assistance employees (DAE) assigned to local counties. These representatives are on a rotation schedule that does not provide adequate continuity for local recovery operations.	Encourage FEMA to lengthen the rotation period for reservists so that continuity of recovery operations can be obtained.
		Provide a transitional period of time for overlapping duties to all DAEs in leadership positions in PA, and those assigned to local/state EOCs.
	FEMA DAEs assigned to the state/local EOCs do not have the necessary decision making capabilities	Designated DAEs should have knowledge of hurricanes and the local area. They need to be able to make decisions or have direct access to an FCO or other FEMA manager to quickly receive approval.
	FEMA mitigation funding cannot be used to construct evacuation shelters	Encourage FEMA to change their policy to allow the use of mitigation funding to construct and/or retrofit facilities for use as evacuation shelters. Mitigation funds should be applicable to more than directly damaged facilities.
		Conduct training on Public Assistance paperwork and eligibility.

Finally, an analysis of the HES data and products currently available to the emergency managers was conducted. Issues discussed consisted of whether and how HES products were utilized, how accurate they were during these storm events and if the users had recommendations for improving or enhancing the products. The HES products for each of the three HES study areas are listed along with their dates of completion in the table below.

HES Study Area	Counties in PSA Study Area	HES Completion Date and Title
Lake Sabine (SSA)	Chambers, Hardin, Jasper, Jefferson, Liberty, Newton, Orange	1998—Hurricane Storm Atlas 2002—Hurricane Contingency Planning Guide
Houston-Galveston (GSA)	Brazoria, Galveston, Harris	2004—Texas Hurricane Evacuation Study, Galveston Study Area
Matagorda (MSA)	Matagorda	2002—Hurricane Evacuation Time Estimates for the Texas Gulf Coast* 1998—Hurricane Contingency Planning Guide 1995—Hurricane Storm Atlas
n/a	Fort Bend, Polk, Tyler, San Jacinto	n/a

*MSA clearance times were updated in Lindell M.K., Prater C.S. and Wu J.Y. (2002). *Hurricane Evacuation Time Estimates for the Texas Gulf Coast*. College Station TX: Texas A & M University Hazard Reduction & Recovery Center.

The findings exemplify that the HES data and products, although recognized and readily available, were not always fully utilized in the decision making process. Many times, past experiences with previous storm events were the determining factor when making important evacuation decisions. Typically, the County Judge in each local County issued general evacuation orders leaving local emergency management agencies to decide on the specific locations to be evacuated. The locally reported estimated time it took to complete evacuations for Hurricane Ike did not correspond to Category 2 Evacuation Time Estimates (ETE) published in the HES studies. The observed evacuation times were more in-line with the ETEs / clearance times for category 3 and 4 hurricanes. This was not unexpected given that the size of Hurricane Ike generated storm surge well above a category 2 level storm. In the 72 hours prior to landfall, the official forecasts called for a storm surge well above what was identified on the old Saffir-Simpson Hurricane Scale. The use of the official evacuation zones from the older HESs was not widespread do to age of the studies and difficulty of relaying the zones to the general public. In fact, even the more recent evacuation zone maps developed for the Houston-Galveston HES area have been replaced by newer evacuation zip-zone maps (originally created by expanding the HES evacuation zones further inland to match zip-code boundaries). The zip-zone maps facilitate the announcing and execution of evacuations as the public need only watch for when their zip-code is announced. However, an updated transportation analysis was not conducted for these new zones and clearance times are unknown. There is a definite need for more training on the HES products that are currently available and how to best utilize them.

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1 INTRODUCTION

The Federal Emergency Management Agency's National Hurricane Program (NHP) helps protect communities and residents from hurricane hazards through various projects and activities. The program is a multi-agency partnership involving numerous Federal agencies, including: Federal Emergency Management Agency (FEMA), National Oceanic & Atmospheric Association (NOAA), National Weather Service (NWS), and U.S. Army Corps of Engineers (USACE). Traditionally, the main product produced by the NHP has been the Hurricane Evacuation Study (HES), which uses national consensus standard methodologies to develop analyses to assist emergency management personnel in the evacuation planning and decision-making process. State and local governments use the planning assumptions and decision-making tools provided by the NHP and these HES products to plan for and implement hurricane evacuation decisions.

A traditional HES includes the following five (5) components:

Hazards Analysis – quantifying potential wind speeds, surge inundation areas, water depths and other hurricane hazards that could be produced by a combination of hurricane intensities, approach speeds, approach directions, and tracks that have a reasonable meteorological probability of occurrence within the study area. The Sea, Lake and Overland Surges from Hurricanes (SLOSH) model from the National Oceanic and Atmospheric Administration (NOAA) is used to predict the storm surge heights and inundation areas.

Vulnerability Analysis – identifying the areas, populations, and facilities that are potentially vulnerable to flooding and extraordinary wind damage under various hurricane threats;

Behavioral Analysis – developing assumptions about how the population in and around the vulnerable area will react to threats of hurricanes;

Shelter Analysis – identifying shelter locations, capacities, demand, and vulnerability; and

Transportation Analysis – calculating evacuation clearance times for a range of hurricane threats, helping to define the evacuation roadway network and evaluating and recommending traffic control measures or highway improvements needed for improved traffic flow.

Another main product of the NHP is the annual update, maintenance and operation of HURREVAC, the software package developed to provide a “real-time” user interface for emergency managers. HURREVAC queries the hurricane forecast products of the National Hurricane Center, combines that with the planning assumptions (especially for clearance time) of the respective HESs, and provides a “smart picture” which emergency managers can use to track the storm and make their evacuation decisions, freeing emergency managers to focus on

operational planning rather than storm tracking and analysis during actual events. The NHP also offers a unique training program held annually at the National Hurricane Center (Miami, FL) to train State and local emergency managers and decision-makers in the use of their HES products.

The PSA for the State of Texas was conducted in response to Hurricane Ike, to determine the accuracy of the HES products and foster improvement of their methodologies as warranted. The tools and products provided by the NHP, as well as emergency management data collection and analysis efforts of the Federal government in general, and the FEMA Directorates in particular, were also reviewed to ensure that these efforts are coordinated for maximum effect and efficiency.

HES products and their use relative to the evacuation decision process, evacuation clearance time, sheltering, and public information were discussed with local emergency management officials as part of the PSA interview process. Discussions with State officials centered on the role the State played in the evacuation process, including the use of study products in communicating with local officials and the media. Media representatives were asked to focus on study related materials that they possessed and that were broadcast to the general public. PSA participants also addressed the types of materials and public information products that they would like to have.

1.1 STUDY AUTHORITY

The authority for this study is Interagency Agreement (IAA) HSFEHQ 09-X-0045 and the corresponding Statement of Support between FEMA and the USACE, entered into under the Economy Act, 31 U.S.C. 1535. The IAA and Statement of Support authorize the USACE to conduct this PSA on behalf of FEMA.

1.2 STUDY AREA

The study area selected for the PSA of Hurricane Ike for Texas covered the Lake Sabine and Houston-Galveston HES study areas and a portion of the Matagorda HES study area (Figure 1-1). The Lake Sabine HES study area includes Chambers, Hardin, Jasper, Jefferson, Liberty, Orange and Newton counties. The Houston-Galveston HES study area includes Brazoria, Galveston and Harris counties. Only Matagorda County from the Matagorda HES study area was included in the PSA study area. Additionally, the inland counties of Fort Bend, Polk, San Jacinto and Tyler, which are not covered by an existing HES, were selected for inclusion in the PSA study area to incorporate the effects of Hurricane Ike along the major evacuation routes. All fifteen counties selected for the PSA study area were included in FEMA's disaster declaration.

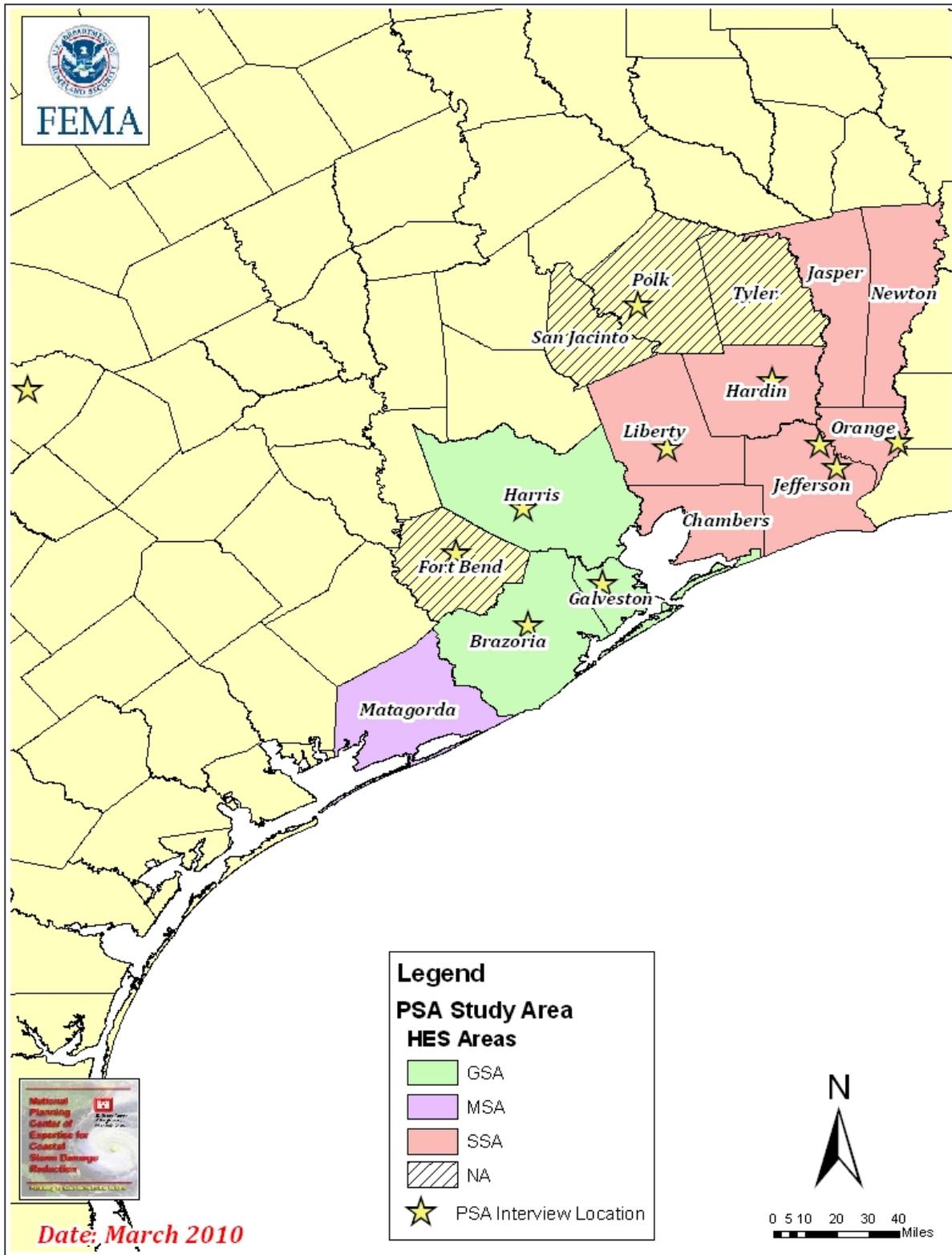


Figure 1-1: PSA Study Area

1.3 HURRICANE IMPACTS

1.3.1 STORM SUMMARY:

(from NWS Houston/Galveston http://www.srh.noaa.gov/hgx/?n=projects_ike08)

The Houston/Galveston NWS Weather Forecast Office published a detailed storm account in the aftermath of Hurricane Ike. Their synopsis provides an informative overview of the storm's progression:

[Hurricane] Ike evolved from a tropical disturbance that moved off the west coast of Africa at the end of August [2008]. On the morning of September 1st, a tropical depression formed approximately 1,750 miles east of Puerto Rico. The depression quickly strengthened into a tropical storm later that afternoon. Moving west-northwest, Hurricane Ike strengthened into a hurricane on the afternoon of September 3rd, and was located approximately 885 miles east-northeast of Puerto Rico. [Hurricane] Ike rapidly intensified into a major hurricane late that afternoon and into the evening hours, reaching a maximum intensity of 145 mph during the early morning hours on Thursday, September 4th.

Continuing to move west and then west-southwest, [Hurricane] Ike began to impact the Turks and Caicos Islands on Saturday, September 6th. On Sunday, September 7th, [... Hurricane] Ike slammed into the island of Great Inagua [as a Category 4 hurricane]. By Sunday night, [Hurricane] Ike moved to the Cuban coast and made another landfall as a major hurricane near the province of Holguin near Punto de Sama with maximum winds around 125 mph. [Hurricane] Ike moved west across Cuba and eventually exited the southwest Cuban coastline near Camaguey on Monday afternoon, September 8th. [Hurricane] Ike moved northwest that night just off the coast with a track that paralleled the Cuban coastline before making a second Cuban landfall near the town of Puerto Padre on Tuesday afternoon September 9th. Just prior to crossing the northwest tip of Cuba as a Category 1 hurricane with winds approaching 80 mph [...], [Hurricane] Ike began producing tropical storm force winds across portions of the Florida Keys. Fortunately for the Keys, [Hurricane] Ike would only deliver a glancing blow, as the hurricane continued to move west-northwest toward the US. Gulf coast as it crossed the southeast Gulf of Mexico on Tuesday night and early Wednesday, September 10th.

Over the warm waters of the Gulf of Mexico, [Hurricane] Ike grew in size and intensified to a Category 2 hurricane with maximum winds of 100 mph [...]. [...] As the hurricane crossed the central and northwest Gulf of Mexico, [Hurricane] Ike continued to move northwest toward the Texas coast. Although [Hurricane] Ike's intensity remained in the Category 2 range, the cyclone continued to grow in size and became a very large hurricane. The diameter of tropical storm force winds [reached] 425 miles from the northwest to southeast as [Hurricane] Ike approached the upper Texas coast on Friday, September 12 [2008]. [The eye of Hurricane] Ike made landfall at 2:10 am CDT (9:10 Coordinated Universal Time (UTC)) Saturday, September 13 [2008] near Galveston, Texas. [Hurricane] Ike was a Category 2 hurricane at landfall with maximum sustained winds of 110 mph. [A graphical timeline of the life of the storm is depicted in Figure 1-2].

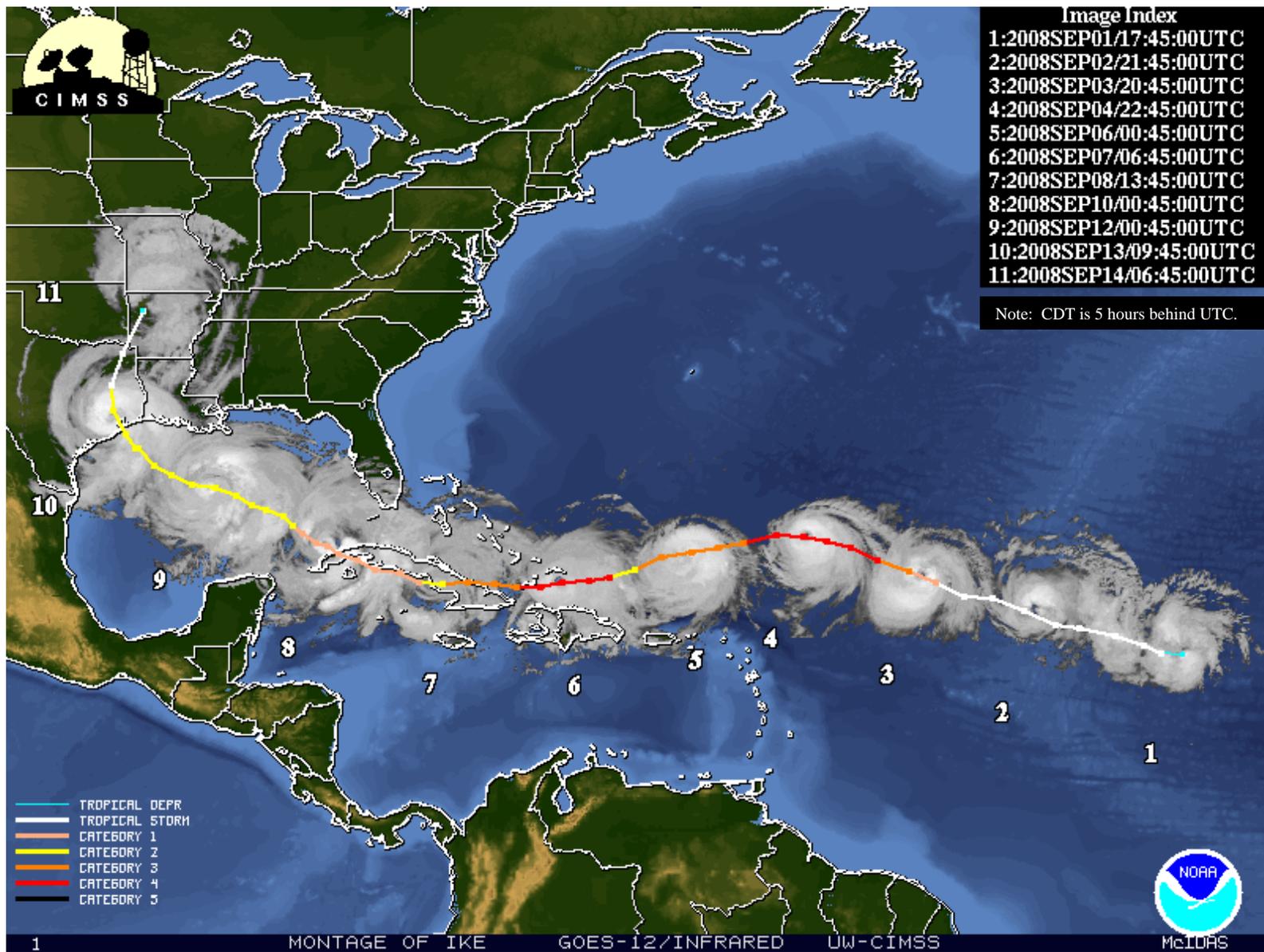


Figure 1-2: Graphical Timeline of Hurricane Ike
<http://cimss.ssec.wisc.edu/tropic/archive/montage/atlantic/2008/IKE08-track.gif>

1.3.2 STORM SURGE:

The storm surge from Ike caused significant and extensive damage along the coast of Texas. Although Ike came onshore as a strong Category 2 hurricane, or just slightly below major hurricane strength (winds of 115 mph or greater), observed surge values were generally representative of a Category 3 hurricane. Storm surge values ranged from several feet MLLW in Brazoria County to 17.5 feet MLLW in Chambers County. For a more detailed storm surge report, please refer to the NWS Houston/Galveston website at: http://www.srh.noaa.gov/hgx/?n=projects_ike08_storm_surge_overview.

Table 1-1 shows the maximum observed storm tides for operating tide gage stations in the PSA study area. Figure 1-3 shows the SLOSH model output of surge heights above mean sea level (MSL) for Hurricane Ike in Galveston Bay. Figure 1-4 shows inundation depths across the study area from Hurricane Ike.

Table 1-1: Maximum Storm Surge and Storm Tide during Hurricane Ike

COUNTY	GAUGE LOCATION	STORM SURGE ¹	STORM TIDE ²	SLOSH ³	DATE/TIME (UTC)	BEACH EROSION
GALVESTON	ROLLOVER PASS	11.06	11.23	11.4	13/0548	MAJOR
HARRIS	MORGANS POINT	7.76	9.01	7.1	13/0600	MAJOR
GALVESTON	GALVESTON STATE PLEASURE PIER	10.8	12.25	9	13/0530	MAJOR
GALVESTON	GALVESTON BAY ENTRANCE (NORTH JETTY)	9.41	9.75	9.2	13/0112	MAJOR
BRAZORIA	USCG FREEPORT	6.25	7.42	4	12/2036	MINOR
GALVESTON	EAGLE POINT	10.75	11.95	8.7	13/0554	MAJOR
GALVESTON	ENTRANCE TO CLEAR LAKE	7.95	8.19	7.4	13/0600	MAJOR
GALVESTON	PORT OF GALVESTON PIER 21	10.25	11.38	9	13/0648	MODERATE
HARRIS	MANCHESTER, TX (LYNCHBURG FERRY)	11.74	12.3	n/a	13/0912	MINOR
HARRIS	BATTLESHIP TEXAS STATE PARK	6.11	7.89	6.6	13/0600	MINOR
JEFFERSON	PORT ARTHUR	11.25	11.93	12.4	13/0912	MAJOR
JEFFERSON	RAINBOW BRIDGE	9.29	9.69	11.2	13/0954	MODERATE
JEFFERSON	SABINE PASS	12.54	14.24	11	13/0742	MAJOR
JEFFERSON	TEXAS POINT	11.79	13.37	10.7	13/0412	MAJOR

1. Storm surge is in feet and referenced to Mean Lower Low Water (MLLW).

2. Storm tide is in feet and referenced to Mean Lower Low Water (MLLW).

3. The SLOSH value is in feet and referenced to the National Geodetic Vertical Datum of 1929 (NGVD29). The value was taken from the SLOSH display program V1.61g. The rexfile used for Ike was provided by the National Hurricane Center as part of the SLOSH Display installation for Galveston Bay. Locations with n/a were outside the SLOSH grid limit and surge heights could not be obtained.

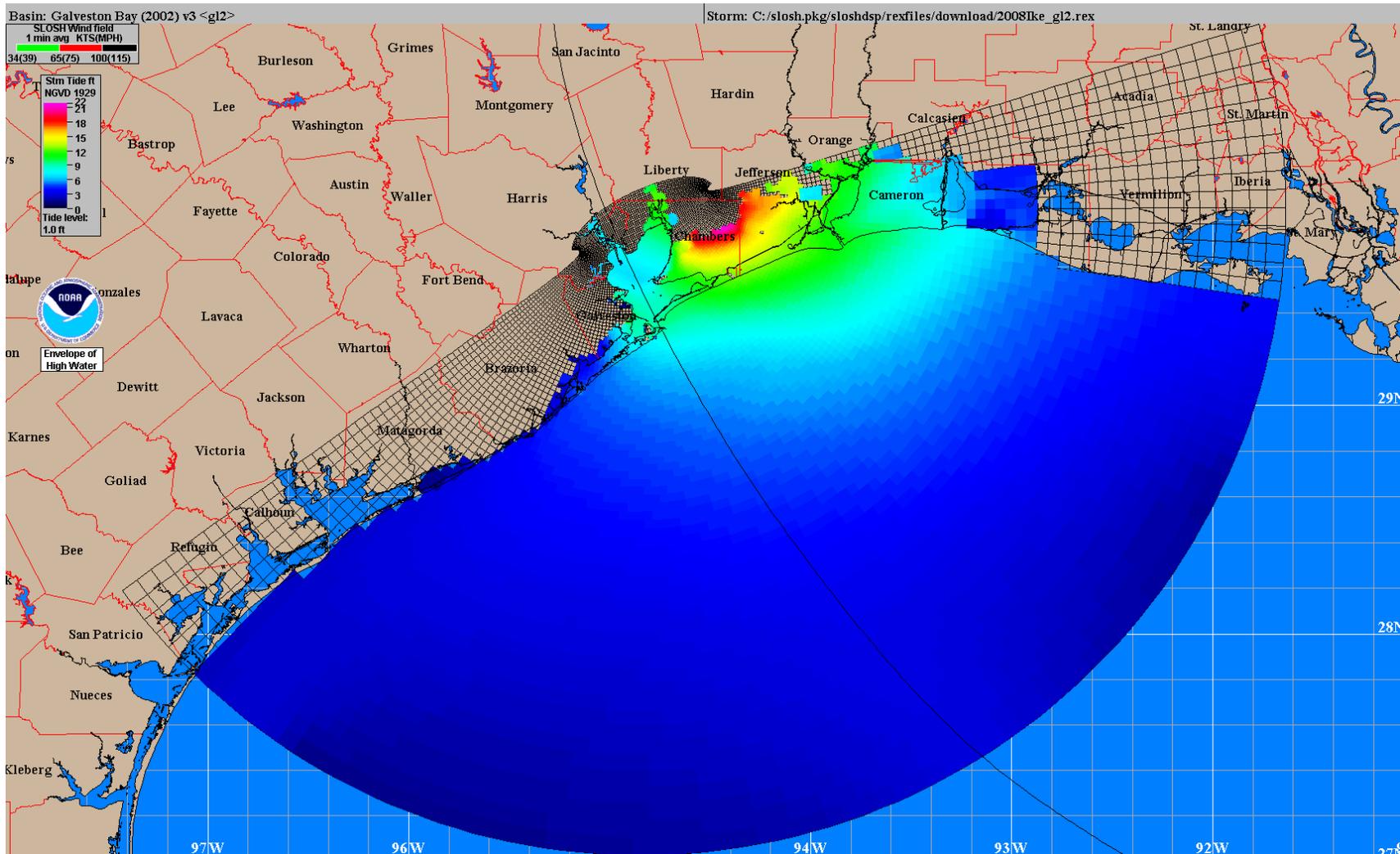


Figure 1-3: Storm Surge Heights above MSL from the Galveston Bay SLOSH Basin for Hurricane Ike

Hurricane Ike Inundation Depth

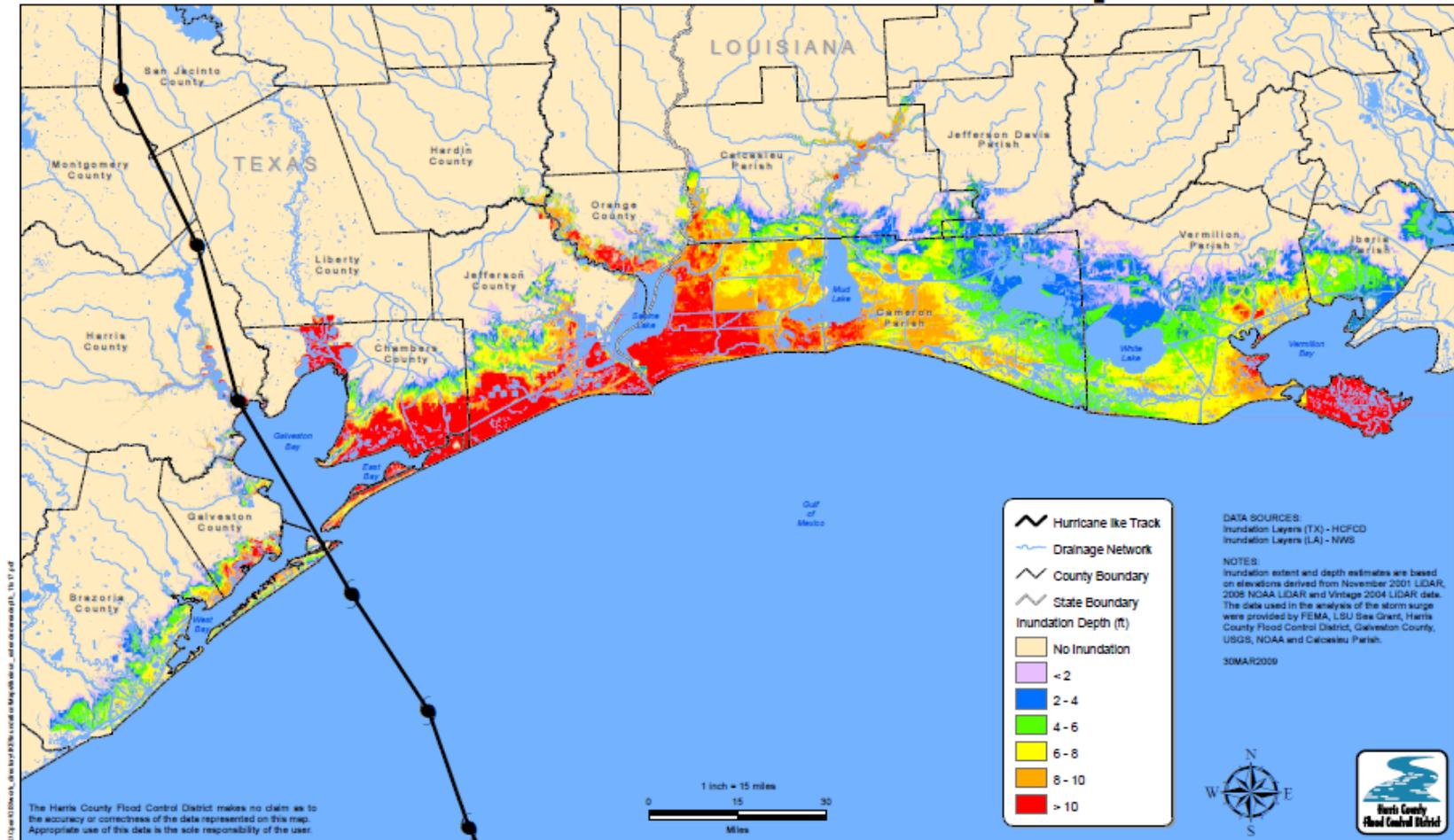


Figure 1-4: Storm Surge Inundation Map from Hurricane Ike Showing Depth of Water above Ground Level (http://www.srh.noaa.gov/hgx/?n=projects_ike08_inundation)

Table 1-2 shows a comparison between High Water Marks (HWM) collected after Hurricane Ike and values of Category 2-4 Maximums of Maximums (MOMs) from the SLOSH model (Figure 1-5 shows location of the HWM IDs). A MOM is a composite of the maximum storm surge heights for all simulated hurricanes of a given category. Thus, the MOM depicts the potential flooding for a given hurricane category, regardless of landfall approach direction and speed. MOM data was selected for comparison with the surveyed HWMs since the Storm Tide Atlases, upon which HES Vulnerability Analyses are based, also incorporates this data. SLOSH display 1.61g was used to export the MOMs into a GIS compatible file which were then imported into ESRI ArcGIS (Figure 1-5). The SLOSH values were based upon the Galveston Bay Basin V3 (GL2) created in 2002. It is the assumption of the author that SLOSH Basin GL2 was used as the basis for the HES.

Table 1-2: FEMA HWM Compared to SLOSH MOMs

HWM ID	HES Study Area	Observed Elevation (NAVD88)	SLOSH MOM Elevation (NGVD29)					
			Category 2		Category 3		Category 4	
			Mean	High	Mean	High	Mean	High
353-ITX-02-032	GSA	5.5	7	9.5	11.8	13.6	15.3	17.3
353-ITX-02-037	GSA	10.7	8.5	10	12	13.5	15.5	17.3
353-ITX-03-010	SSA	16.6				17	20.8	22.8
353-ITX-03-013	SSA	10.6		8	11.6	14.5	17	19.1
353-ITX-02-001	GSA	10.3	8	9.8	12	13.7	15.7	17.3
353-ITX-02-005	GSA	10.5	7.9	9.2	11.2	13.4	15.5	17
353-ITX-02-011	GSA	12	7.2	8.7	11.1	13.3	15.2	16.8
353-ITX-02-014	GSA	11.9	5.9	9.2	12.2	14.6	17.2	18.2
353-ITX-04-029	GSA	15.4				17.9	21	22.9
353-ITX-04-022	GSA	12.8	6.2	10.5	15.2	17.8	20.9	23.2
353-ITX-03-023	SSA	13	9.7	11.3	13.2	14.5	16.4	17.9

Note: Conversion from NGVD29 to NAVD88 range from 0.2 ft in Matagorda County to 0.002 ft in Jefferson County.

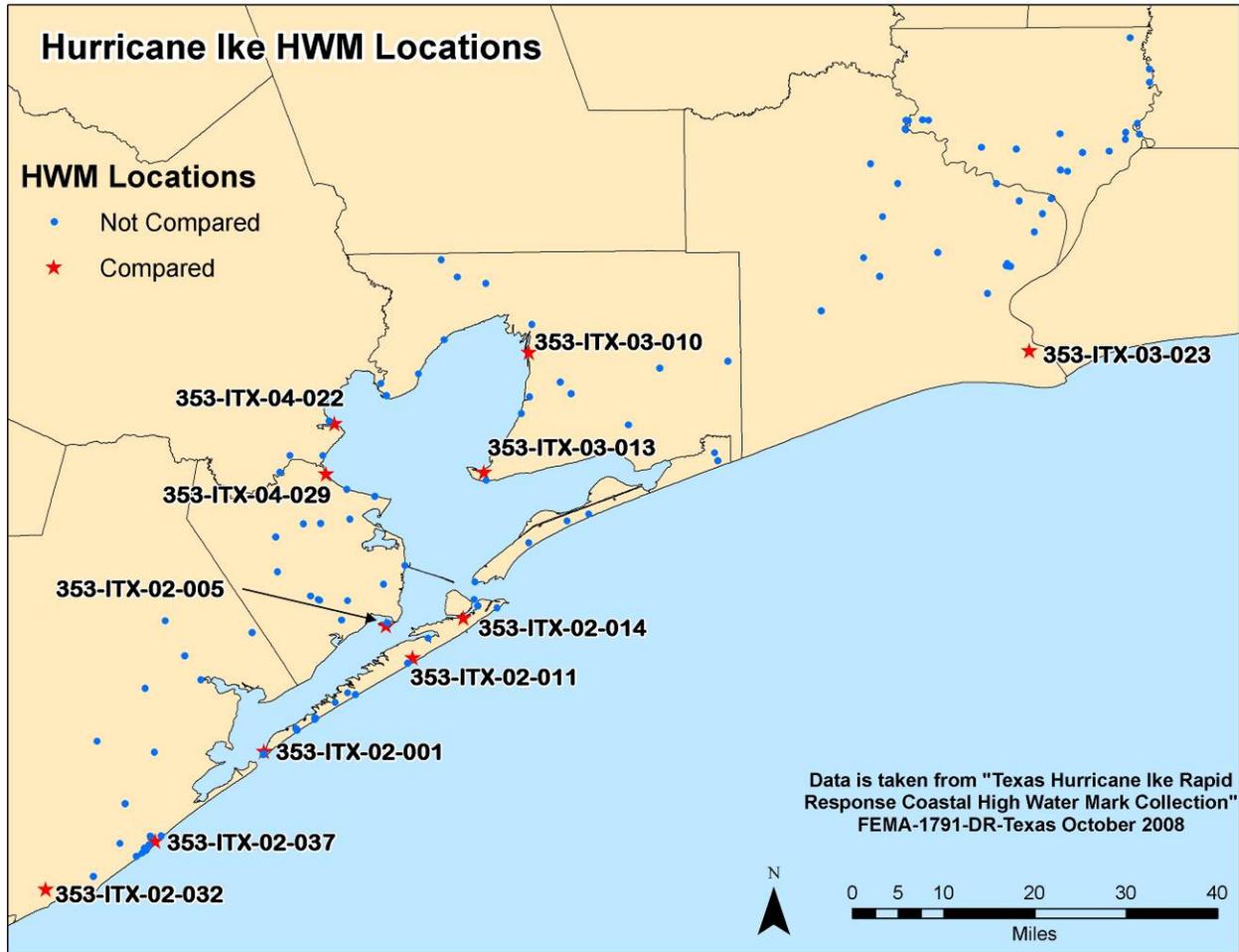


Figure 1-5: Hurricane Ike High Water Mark Locations

1.3.3 WIND:

(from NWS Houston/Galveston http://www.srh.noaa.gov/hgx/?n=projects_ike08_wind_analysis)

The NWS Houston/Galveston provided a table of maximum winds in its post storm report. Table 1-3 shows wind observations from area surface observations at airports across southeast Texas. This should provide a general idea of the strength of the winds across the area especially for areas where power outages were not an issue. Only one observing station reported sustained hurricane force winds and hurricane force wind gusts. A manual observation from the control tower at Hobby Airport in Houston reported winds of 65 knots (75 mph) with gusts of 80 knots (92 mph). Despite the eye of the Hurricane Ike passing fairly close to the airport, Bush Intercontinental Airport did not report hurricane force winds due to the weakening of the storm as it moved inland. Other observation stations quit operating as Hurricane Ike moved inland mainly due to power outages. The observation station at Galveston Scholes Field stopped reporting due to the storm surge that moved into the island on Friday.

Wind analyses of Hurricane Ike performed by NOAA's Hurricane Research Division (HRD) provide the best way to visualize the wind fields. The HRD produced wind field graphics shown in Figures 1-6 and 1-7 illustrate the observed winds (mph) from Hurricane Ike. Hurricane Ike had a large wind field covering a broad area and this affected a large area of southeast Texas.

Table 1-3: Table of minimal pressure, sustained winds and wind gusts for SE Texas Airports

Surface Observation	Minimal Pressure (MB)	Maximum Sustained Wind (MPH)	Peak Wind Gust (MPH)
Bush Intercontinental Airport	961.1	56	82
Brenham Regional Airport	987.5	38	51
Wharton Regional Airport	987.5	39	51
Bay City Municipal Airport	985.8	38	53
College Station/Easterwood Field	985.8	35	50
Conroe/Montgomery County Airport*	962.4	41	60
Houston/D.W. Hooks Airport*	967.5	32	54
Galveston Scholes Field*	1002.3	28	38
Houston/Hobby Airport	960.0	75	92
Angleton/Brazoria County Airport*	974.6	37	56
Pearland/Clover Field*	982.4	43	64
Palacios Municipal Airport	991.2	35	50
Caldwell Municipal Airport*	991.9	28	37
Sugarland Regional Airport*	991.2	43	54
Huntsville Municipal Airport	968.2	34	58

*incomplete data due to sensor failure during Hurricane Ike

Hurricane Ike Sustained One Minute Winds

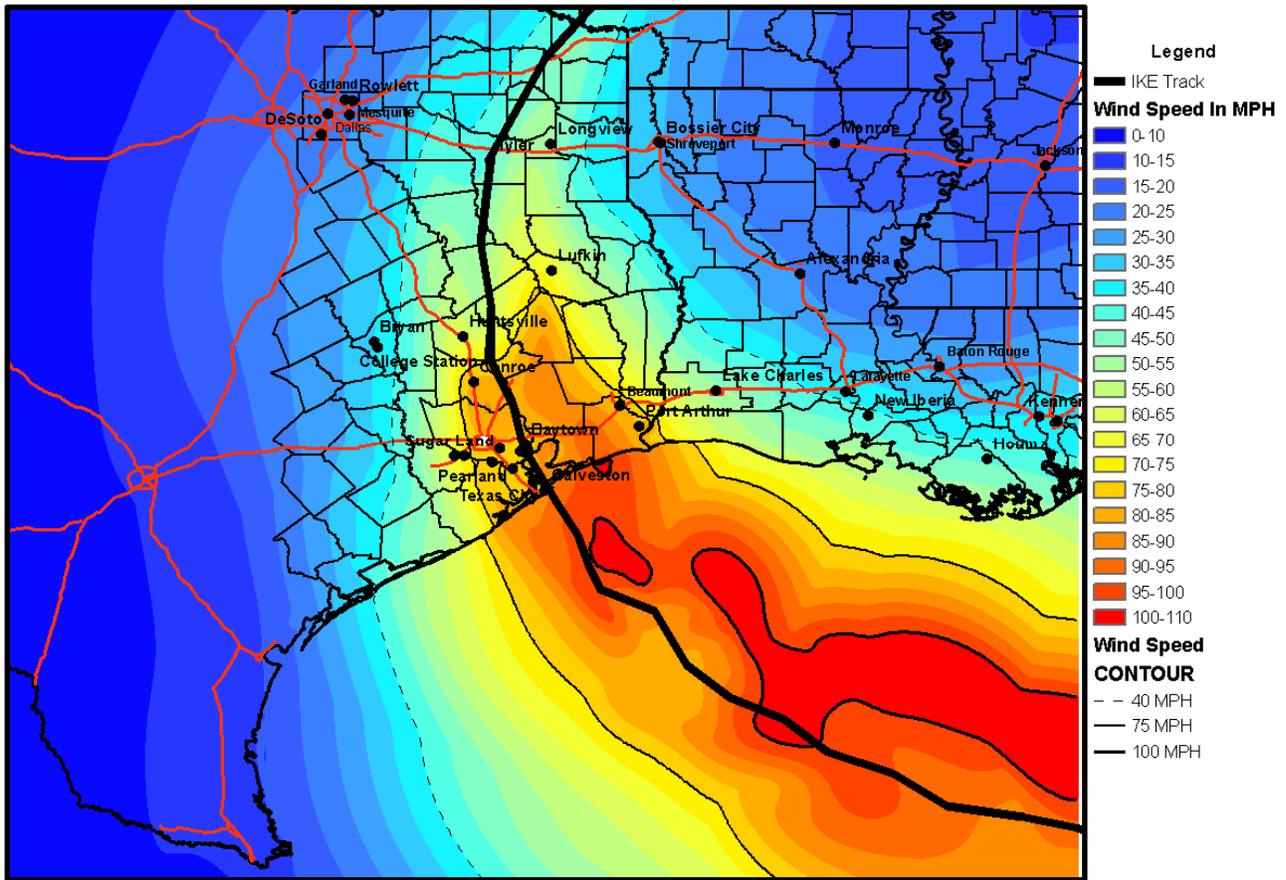


Figure 1-6: Wind Swath Analysis from the Hurricane Research Division
http://www.srh.noaa.gov/lch/ike/Ike_Wind.png

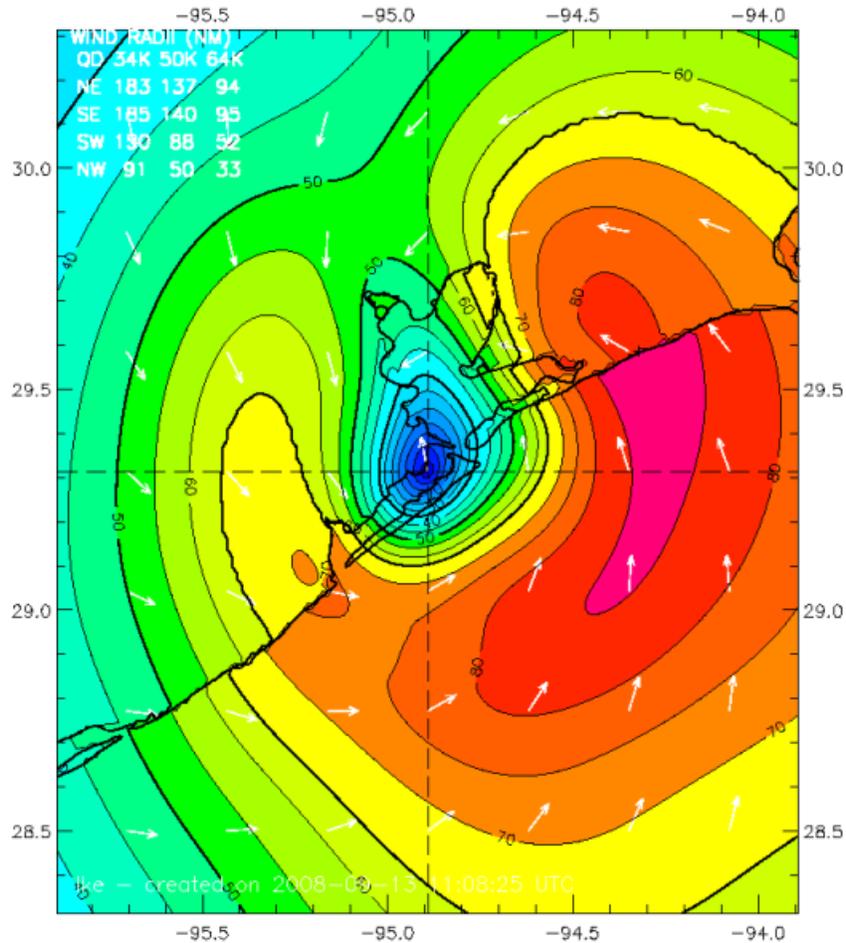
Hurricane Ike 0730 UTC 13 SEP 2008

Max 1-min sustained surface winds (kt)

Valid for marine exposure over water, open terrain exposure over land

Analysis based on GOES_SWIR from 0702 - 1002 z; CMAN from 0439 - 0959 z; MOORED_BUOY from 0430 - 0949 z; ASOS from 0432 - 1030 z; GPSSONDE_SFC from 0431 - 0850 z; SHIP from 0600 - 0900 z; METAR from 0430 - 1030 z; FCMPTOWER from 0434 - 1025 z; GPSSONDE_WL150 from 0431 - 0850 z; WEATHER_FLOW from 0430 - 1030 z; BACKGROUND_FIELD from 0730 - 0730 z; SFMR_AFRC from 0900 - 0956 z;

0730 z position interpolated from 0631 Vortex; mslp = 953.0 mb



Integrated Kinetic Energy: for Winds > TS force: 70 TJ, for Winds > Hurricane Force: 26 TJ
Destructive Potential Rating(0-6) Wind: 3.0, Surge/Waves: 4.2

Observed Max. Surface Wind: 89 kts, 37 nm NE of center based on 0438 z SFMR_AFRC
Analyzed Max. Wind: 88 kts, 39 nm NE of center

Uncertainty -> mean wind speed error: 1.24 kt, mean direction error: -0.24 deg
rms wind speed error: 6.56 kt, rms direction error: 9.96 deg

Experimental research product of NOAA / AOML / Hurricane Research Division

Figure 1-7: HRD H*Wind analyses for Hurricane Ike at Landfall
http://www.srh.noaa.gov/lch/ike/Ike_Wind.png

1.3.4 RAINFALL:

(from NWS Houston/Galveston http://www.srh.noaa.gov/hgx/?n=projects_ike08_HurricaneIkeRainfall)

The Rainfall Analysis, a key component of the detailed Post Storm Analyses provided by the Houston/Galveston NWS, summarizes the rainfall effects of Hurricane Ike:

[Hurricane] Ike produced heavy rainfall across portions of southeastern Texas September 8-15, 2008 [as illustrated in Figure 1-8]. A cold front then moved across these same locations on the 14th and heavy rainfall developed as moisture feeding into the remnants of [Hurricane] Ike was focused along the front. Rainfall totals on the 14th equaled or exceeded those associated with [Hurricane] Ike and some locations experienced freshwater flooding during both events.

The National Hurricane Center estimated that [Hurricane] Ike moved northwest between 12 and 18 mph across southeastern Texas. The general rainfall estimate rule-of-thumb for a landfalling tropical cyclone is to divide the speed of the storm's movement into 100. When utilizing an average speed of 15 mph for Hurricane Ike, this calculation gives an estimate of almost 7 inches of rainfall. Actual rainfall recorded for [Hurricane] Ike was between 5 and 10 inches across the 9 county area that ranges between Livingston and Navasota south to the coast. Rainfall ahead of the cold front totaled another 5 to 8 inches. By the evening of the 14th, rainfall maximums of near 15 inches had fallen across portions of Harris, Liberty, and Montgomery Counties. In the uptown area of Houston, isolated observations of around 18 inches were recorded [Figure 1-9].

Moderate to heavy rainfall began as [Hurricane] Ike's forward rain bands moved into the upper Texas coastal areas during the afternoon and evening of the 12th. These rain bands intensified as [Hurricane] Ike made landfall at Galveston around 2:10 AM [CDT] on the 13th. The radar data indicated that the heaviest rain fell on the northern and western sides of the eye of the storm as it moved northwest up Galveston Bay and into the eastern portions of metropolitan Houston during the pre-dawn hours. The heaviest rainfall area then shifted to over the southern half of [Hurricane] Ike as the storm moved north of Houston. Because of this, portions of Harris, Montgomery, and Liberty Counties experienced moderate to heavy rainfall for about a 12-hour period.

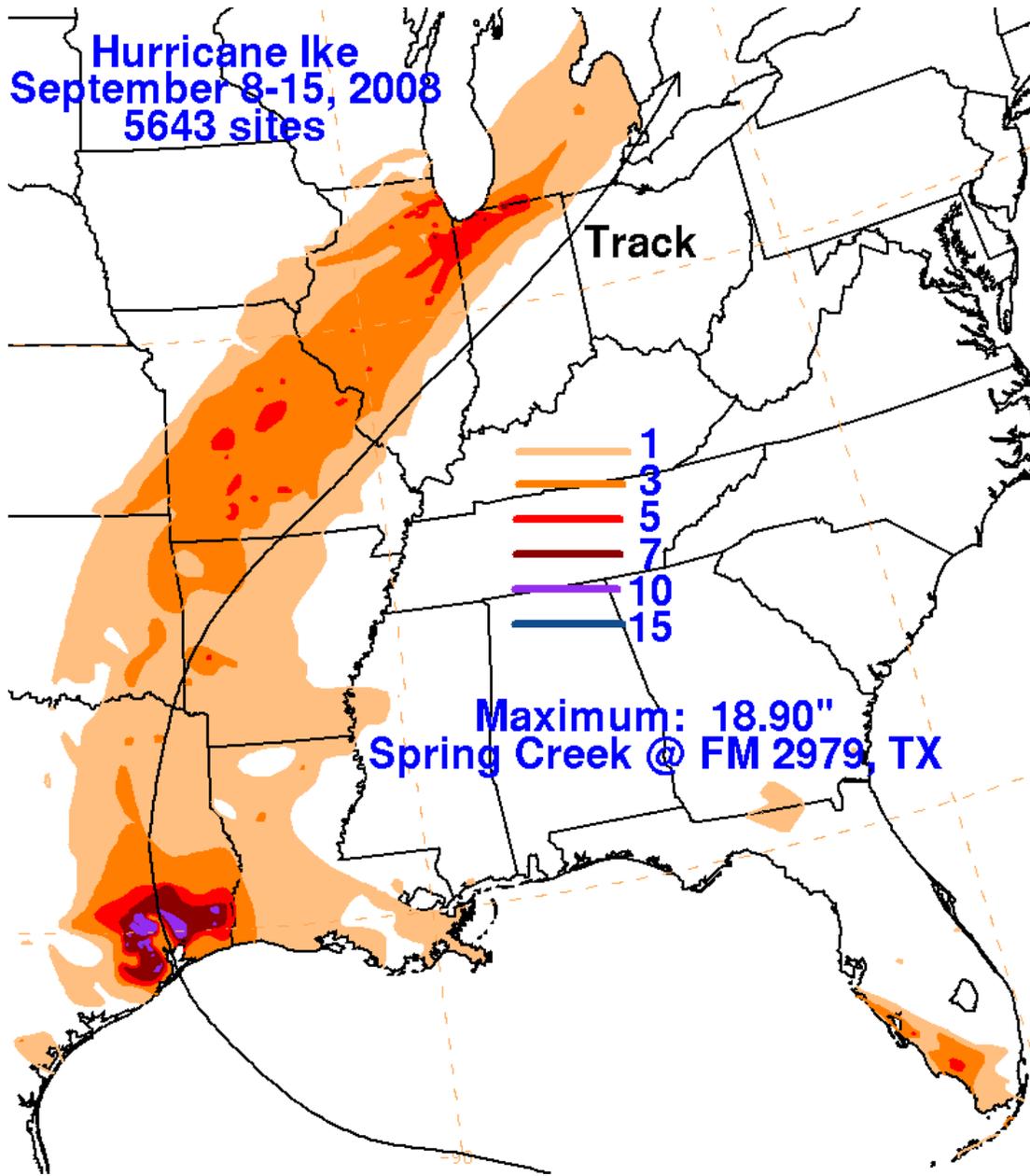


Figure 1-8: HPC Rainfall Analysis for Hurricane Ike
http://www.nhc.noaa.gov/pdf/TCR-AL092008_Ike.pdf

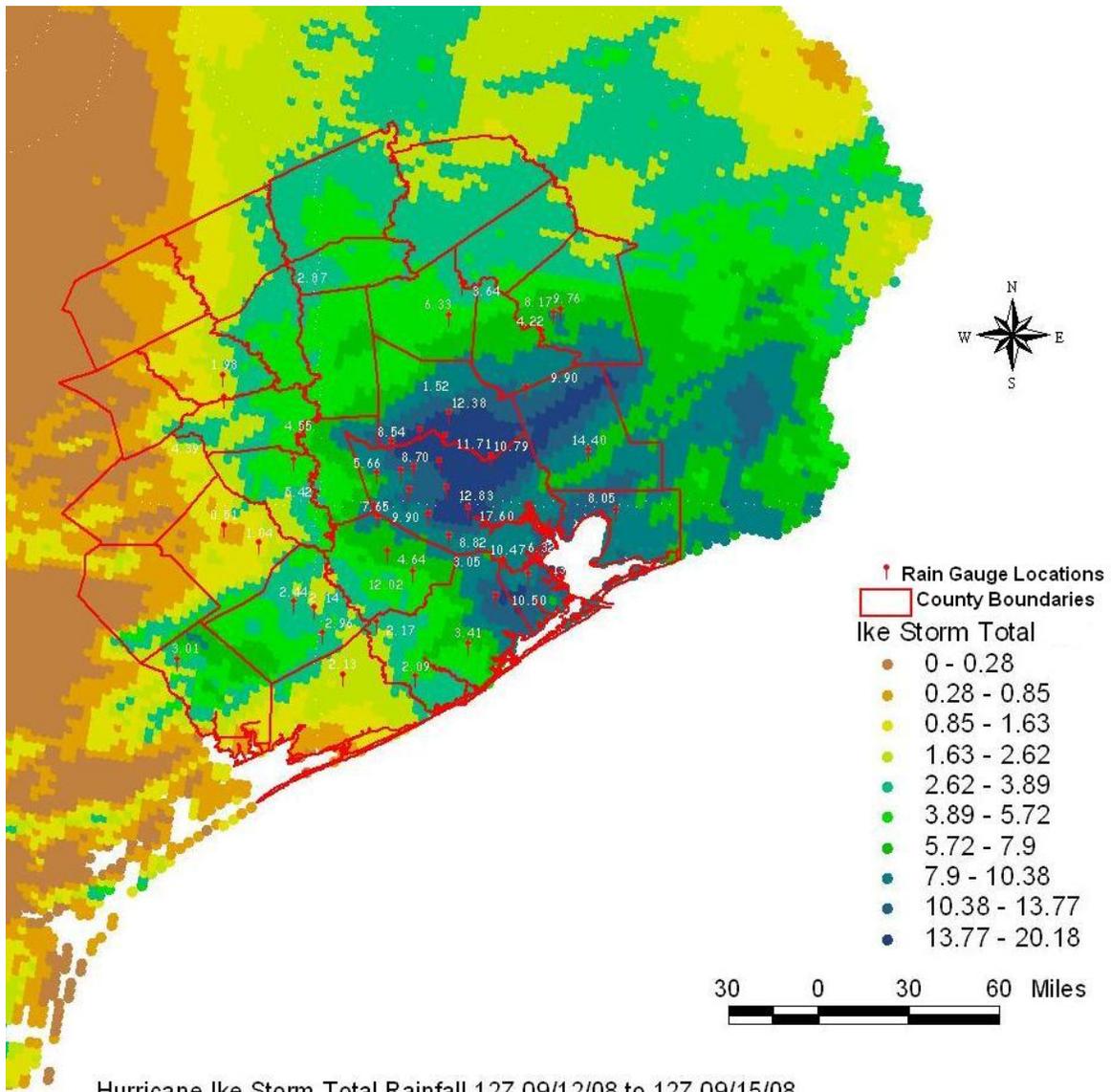


Figure 1-9: Hurricane Ike Corrected 3-Day Rainfall Total from the West Gulf River Forecast Center (RFC)
http://www.srh.noaa.gov/hgx/?n=projects_ike08_HurricaneIkeRainfall

1.3.5 TORNADOES:

Any potential tornado activity associated with Hurricane Ike most likely would have been confined to areas east and northeast of the track of the storm over Southeast Texas into western portions of Louisiana. Outer rain bands that typically spawn tornadoes occurred mostly over western Louisiana. The reflectivity data from the NWS Houston/Galveston radar showed that Hurricane Ike had several small vortices within its eye-wall structure. Velocity data and storm relative velocity maps did not indicate any strong areas of rotation within these vortices. It is possible that as Hurricane Ike made landfall that these vortices did produce brief tornadoes that were too small and weak for the radar to detect rotation.

The NWS Houston/Galveston did not issue any tornado warnings until 4:46 PM CDT 13 September 2008 as a line of storms was moving through Liberty County associated with a front wrapping around Hurricane Ike. This came about 12 to 15 hours after Hurricane Ike made landfall. Weeks after the storm, the NWS Houston/Galveston received public reports of brief tornadoes, but these reports were not officially confirmed. In summary, while there may have been brief tornadic circulations during the storm, neither radar data nor storm damage could confirm that Hurricane Ike caused any tornadoes in Southeast Texas.

1.3.6 STORM IMPACTS—HES COUNTIES

The following information on storm impacts was obtained from the Hurricane Ike Post Tropical Cyclone Reports from the Houston/Galveston (http://www.srh.noaa.gov/hgx/?n=projects_ike08) and Lake Charles (<http://www.srh.noaa.gov/images/lch/ike/PSHLCH.txt>) NWS Offices:

Matagorda HES

Matagorda County:

Storm surge caused damage to structures near the coast, primarily near the towns of Matagorda and Sargent. Debris lines suggest an estimated storm surge of four to seven feet above MSL along the Gulf facing beaches near Sargent. Significant beach erosion occurred with an estimated four to five feet of sand lost near a previously buried retaining wall. According to the Emergency Management personnel participating in the Hurricane Ike PSA, the city hall in Matagorda was damaged by the wind. One nursing home (Bay Villa) and one hospital (Matagorda General Hospital) were damaged by Hurricane Ike.

Houston-Galveston HES Counties

Brazoria County:

Significant damage due to storm surge occurred along the shoreline of the Gulf, including Treasure Island, Quintana and Surfside areas. The NWS storm survey estimated that surge heights reached eight feet above MSL near Surfside. During the Ike PSA interview, emergency management personnel stated that one nursing home (Sweeney House) and two hospitals (Angleton-Danberry Hospital and Brazosport Regional Medical Center) were damaged during the storm.

Galveston County:

The number of fatalities directly related to Hurricane Ike was reported as 11 in Galveston County. There were several others whose death was indirectly attributable to the storm, either due to carbon monoxide poisoning or due to lack of access to dialysis. To date, three people still remain missing from the Bolivar Peninsula¹. More than 100,000 people were ordered to evacuate from surge prone areas in the county. Major damage occurred due to the storm surge and high surf along coastal areas facing the Gulf of Mexico and Galveston Bay. Water damage due to coastal flooding also occurred along adjoining rivers, lakes and bays. The hardest hit area was the Bolivar Peninsula, which was completely inundated by the surge, with nearly all homes destroyed. Galveston Island, including the City of Galveston, also suffered major damage.

NWS storm survey estimated a storm surge of approximately 13 feet above MSL on the Bay side and 14 feet above MSL on the Gulf side near the town of Galveston on the east side of the island. On the Gulf side of the island's west end, the surge was estimated to range from nearly eight feet above MSL on the far western portion, to almost 10 feet above MSL near Jamaica Beach. Bay side storm tides were estimated to be 13 to 14 feet above MSL near Jamaica Beach. Along Galveston Bay, major damage due to surge and wave action was observed near Kemah and San Leon. Along the Kemah boardwalk, several businesses suffered major damage. High water marks were observed near 10 feet above MSL on the east facing portions of the levee surrounding Texas City. However, near the top of the northeast facing portion of the levee, high water marks of 16 feet above MSL were recorded.

Significant water damage was observed in the community of Clear Lake Shores, with all homes in the community suffering water damage due to surge inundation. Storm tide estimates of 12 to 14 feet above MSL were measured from water marks and surveyed elevations. During the Hurricane Ike PSA interview, Galveston County Emergency Managers reported that most all critical facilities were impacted by the wind and surge including the County Courthouse and several county buildings. Even though 75% of the homes in Galveston were flooded along with the waste water lift stations in League City, the 10.7 mile Galveston Seawall, constructed by USACE and Galveston County, actually prevented a complete catastrophe. They also reported that special needs populations consisting of more than 500 people were impacted in Bolivar Peninsula, San Leon, Bacliff and Freddiesville.

Harris County:

Eleven fatalities were reported in Harris County, but none were directly attributable to the storm. All were a result of either carbon monoxide poisoning, house fires started by candles, or trauma related to accidents during debris removal. Widespread wind damage caused trees to be blown down and uprooted in many locations. There was a great amount of shingle damage to many roofs. Damages were consistent with wind gusts in the 70 to 90 mph range. Major damage due

¹ As reported by Galveston County EMA, March 12, 2010.

to coastal flooding occurred in the communities of Nassau Bay and Taylor Lake Village, where high water marks and surveyed elevations indicated storm tides of 10-12 feet above MSL. Major damage due to surge and high surf was found in Seabrook and Shoreacres with numerous homes destroyed and with major erosion of beaches and some coastal roads.

Several businesses along waterfront in Seabrook were destroyed or sustained major damage. Several homes were destroyed along Burrets Drive in Baytown, next to Burrets Bay. Significant surge and rainfall flooding was observed over portions of the Houston Metro Area. Another period of heavy rainfall the day following the storm led to increased flooding throughout the area. According to Harris County Emergency Management personnel, the critical facilities impacted by this storm were simply too many to list. Over 19 hospitals and 400 nursing homes were evacuated.

Lake Sabine HES Counties

Chambers County:

Approximately 700 homes were isolated due to road closures and high standing water post-storm. More than 700 homes were completely destroyed; 3,418 suffered major damage; and 3,252 homes incurred minor damage. Fifteen local businesses suffered major damage. The majority of the significant damage came from storm surge with the hardest hit areas being the southern portions of the county adjacent to Galveston Bay. Wind gusts estimated in the 70 to 90 mph range led to numerous downed trees and damaged roofs. High water marks and debris appeared in areas up to 17 miles inland of the Bay. Additionally, surge estimates of 15 to 20 feet above MSL were reported in the northern reaches of the Bay. Most of the debris had washed over from the Bolívar Peninsula. There were no direct fatalities of county residents but 200 injuries were reported.

Hardin County:

Maximum wind gusts of 70 to 90 mph blew down and uprooted trees, damaged power lines and caused minor wind damage to many buildings. One nursing home (Village Creek) received wind damage and power was out throughout Hardin County for three days.

Jasper County:

Maximum wind gusts of 50 to 60 mph across northern Jasper County and up to 75 mph in southern Jasper County blew down and uprooted trees and power lines and caused minor wind damage to many buildings especially in the southern half of Jasper County. Total damage estimates from the Jasper County judge were reported at \$53 million.

Jefferson County:

More than 85,000 people were ordered to evacuate low lying areas in the county. Storm surge of 14-15 foot above MSL at Sabine Pass resulted in the highest water level ever recorded at that location. Any home that was not elevated was destroyed. Even homes that were elevated received water damage due to high waves on top of the storm surge. The storm surge did not overtop the seawall around Port Arthur which was 14.5 to 17 feet above MSL; however, wave action on top of the storm surge did push some water over the seawall late Friday evening (September 12, 2009) through early Saturday morning (September 13, 2008). A sailboat was

pushed over the seawall and landed behind Lamar State College in Port Arthur. Water backed up Hillebrant and Taylors Bayou west of Port Arthur causing widespread flooding of the Hamshire and Labelle communities, where many water rescues were performed Saturday through Monday.

Extensive damage occurred on Pleasure Island next to Port Arthur where nearly all of the boats in the marina were damaged and pushed against the fences along the western side of the island. Storm surge also backed up the Neches River near Beaumont and flooded some homes north of I-10 near the river. Many underpasses were flooded across Beaumont, resulting in standing water over 10 feet deep in some places. In total, at least 4,000 homes in the Hamshire, Fannett, Sabine Pass and northeast Beaumont areas were flooded.

Estimated wind gusts ranged from 90 to 100 mph in downtown Beaumont, to 100-120 mph between Nome, China, Hamshire and Sabine Pass. Wind damage was widespread throughout downtown Beaumont. The county courthouse suffered roof damage and many trees and power lines were blown down in northern Beaumont and across western section of Jefferson County, including China, Nome, Hamshire and Fannett. The Montagne Center and Lamar University received wind damage to the roof and walls. Nederland, Port Neches and Groves also saw trees and power lines blown down, some landing on homes and businesses. Nearly 100% of the County was without power on Saturday.

Emergency Management officials reported that wind damage impacted the 23rd Street lift station, the water treatment plant and the salt water intrusion system. Surge damage affected the Exxon Chemical Plant, the EOC, Police Headquarters, fire sub stations and the Refinery Energy power station.

Liberty County:

Widespread wind damage was reported with tree limbs down and trees uprooted in many locations. Shingle damage was reported on some roofs. Damage was consistent with wind gusts in the 70 to 90 mph range. During the Hurricane Ike PSA interview, Emergency Management Personnel reported heavy wind damage to the Police Department, City Hall, the Fire Station, the Power Plant and the wall of one school.

Newton County:

Maximum wind gusts of 50 to 60 mph across northern Newton County and up to 75 mph in southern Newton County blew down and uprooted trees and power lines and caused minor wind damage to many structures. Emergency Managers reported the power outages lasted about three days.

Orange County:

A storm surge as high as 10 to 12 feet above MSL reached Bridge City and Downtown Orange. A 40 year old man died when his truck was washed off of Highway 73/87 near Bridge City on September 13, 2008. Over 5,000 homes from Bridge City to Rose City had water inundation and damage. Water was as deep as nine feet MSL in portions of Bridge City. In Bridge City and Downtown Orange, the storm tide overtopped the levee on the east side of town, resulting in water as deep as 9 feet above MSL on the roads. Over 3,000 homes in the City of Orange and

surrounding areas had extensive water damage. Multiple rescues of stranded residents were carried out in Bridge City, West Orange and Downtown Orange. Wind damage was less than Hurricane Rita in 2005: nevertheless, wind gusts were estimated to be 75 to 90 mph across much of Orange County. Widespread downed trees and power lines left over 90% of Orange County without power for several days. Emergency Management Personnel reported that over 25% of the Orange County population was displaced by Hurricane Ike. Almost every county building was damaged by the surge including the fire station, city hall and all the schools. Approximately 2,000 people were evacuated from assisted living homes.

1.3.7 STORM IMPACTS—NON HES COUNTIES

Fort Bend County:

The eastern part of the County was the hardest hit. Numerous trees were downed and moderate damage was reported to an estimated 200 roofs. Power outages were widespread and the emergency manager reported that the pump station, lift station, the EOC radio tower and the Richmond School were impacted. Approximately 800 people were evacuated from the Richmond State School to Brenham.

Polk County:

Due to wind impacts 875 homes suffered minor damage, which consisted mainly of shingle damage on roofs and more than 600 homes suffered major damage or were completely destroyed. Numerous trees were down across the area. The Polk Emergency Manager reported damage to the Sheriff's Office and the radio tower. One nursing home (Timberwood Nursing Home) was also impacted.

San Jacinto:

Widespread wind damage was reported that consisted of uprooted trees and damage to roofs. Damage was consistent with wind gusts of 60 to 80 mph. The hardest hit areas included Shepherd and Camilla. One nursing home (Woodland Park Care and Rehabilitation Clinic and one doctor's office (Office of Dr. Wisiackas) was damaged.

Tyler County:

Maximum wind gusts of 60 to 80 mph blew down and uprooted trees and power lines and caused minor wind damage to many buildings. Total damage estimates from the Tyler County judge were reported at 47 million dollars.

1.3.8 DAMAGE ESTIMATES:

Hurricane Ike proved to be an impressive storm, ranking as the third costliest tropical system to strike the United States in 150 years, behind only Hurricane Katrina (2005) and Hurricane Andrew (1992). It was the ninth named storm, the fifth named hurricane, and the third major hurricane of the 2008 Atlantic Hurricane Season. Total damage estimates were approximately \$32 billion dollars with the majority of the damages associated with debris removal followed by repair to buildings, roadway networks, water and utility infrastructure. Individual and Public Assistance (IA/PA) funds awarded by FEMA to the PSA counties are displayed in Table 1-4.

Table 1-4: Individual and Public Assistance Project Worksheet Summary, Municipalities Public and Private Non-Profit

HES Area	County	Total FEMA Grant Monies Funded								
		Total IA	Total PA	Debris Removal	Emergency Protective Measures	Road Systems and Bridges	Water Control Facilities	Buildings, Contents, and Equipment	Utilities	Parks, Recreational, and Other
GSA	Brazoria	\$16,726,721.38	\$38,427,986.99	\$23,656,025.57	\$5,856,444.56	\$884,192.06	\$17,052.44	\$4,689,506.78	\$741,109.41	\$2,583,656.16
	Galveston	\$190,209,761.34	\$338,416,766.72	\$171,286,997.41	\$46,287,487.79	\$16,801,157.97	\$3,903,512.37	\$71,142,750.30	10,708,179.65	\$18,286,681.22
	Harris	\$0	\$380,699,153.76	\$226,131,022.77	\$86,429,942.11	\$1,712,765.09	\$107,945.81	\$47,062,097.01	\$5,561,117.34	\$13,694,263.64
SSA	Chambers	\$15,585,286.89	\$74,669,354.61	\$64,494,231.04	\$5,533,108.06	\$664,276.46	\$619,996.65	\$1,772,271.74	\$282,840.91	\$1,302,629.77
	Hardin	\$6,020,052.93	\$12,920,329.47	\$10,231,871.15	\$1,501,608.04	\$22,492.44	\$0	\$945,585.41	\$91,684.32	\$127,088.11
	Jasper	\$2,277,631.28	\$2,761,531.02	\$2,202,231.57	\$317,172.19	\$5,900.85	\$0	\$57,483.43	\$159,749.26	\$18,993.72
	Jefferson	\$29,658,795.67	\$90,143,359.81	\$35,981,451.26	\$24,381,704.29	\$2,202,138.39	\$291,484.25	\$15,093,193.71	\$2,539,186.75	\$9,653,201.15
	Liberty	\$15,785,485.55	\$34,709,213.79	\$26,990,405.14	\$1,852,681.94	\$126,244.74	\$33,716.03	\$2,552,336.48	\$2,911,192.34	\$242,637.13
	Newton	\$685,696.05	\$725,820.66	\$380,584.26	\$258,790.66	\$8,121.60	\$0	\$50,030.31	\$8,593.71	\$19,700.03
	Orange	\$68,448,690.86	\$48,473,455.56	\$20,444,686.45	\$11,285,784.23	\$2,480,659.36	\$159,914.16	\$12,555,215.47	\$762,018.96	\$785,176.93
MSA	Matagorda	\$312,630.12	\$624,332.89	\$271,605.93	\$196,236.76	\$111,613.22	\$0	\$1246.50	\$0	\$43,630.48

*FEMA Recovery Statistics website provides access to the latest disaster aid totals covering rental assistance, home repairs, and other disaster related expenses as well as current reimbursement funding for Public and Individual Assistance projects. <http://www.fema.gov/hazard/hurricane/2008/ike/portal.shtm>

2 STUDY COORDINATION

The HES products, tools and clearance times developed during the HES process provide State and local governments with decision assistance information, data and support during hurricane events. The interviews with these agencies and groups, and the sharing of information between the groups, is critical to the success of the PSA as the use, accuracy and effectiveness of HES products can best be measured during an actual event. Recommendations for improvements and additions were solicited.

Discussion with local emergency management officials focused on HES products and their use relative to the evacuation decision process, evacuation and clearance time, sheltering and public information. Discussions with State officials centered on the role the State played in the evacuation process, including the use of study products in communicating with local officials. Media representatives were asked to focus on study related materials that they possessed and that were broadcast to the general public. They also addressed the types of materials and public information they could have used that had not been developed or delivered to them to date. The kickoff meeting for the State of Texas Post Storm Assessment for Hurricane Ike was held on June 19, 2009, at the Offices of the Galveston District of the Corps of Engineers.

2.1 KICKOFF MEETING

The kick-off meeting for the state of Texas Post Storm Assessment for Hurricanes Ike was held on June 19, 2009, at the Offices of the Galveston District of the Corps of Engineers. Bob Heinly and Seth Jones represented the Galveston District, Wendy Phillips represented FEMA Region VI, Jay Hall represented the Texas Department of Public Safety (DPS) and Bill Massey represented Dewberry. The purpose of the meeting was to review the PSA Scope of Work, the proposed questionnaires and to discuss the proposed interview schedule and the interview process. A description of the kick-off meeting, including the agencies represented, the interview question development and data collection procedures, is detailed below.

2.2 INTERVIEW QUESTION DEVELOPMENT

Three separate questionnaires were used during the Hurricane Ike PSA interview process. The questionnaires were modified and updated by FEMA, USACE and Dewberry from local, State and media questionnaires utilized in prior PSAs. Draft survey documents were presented to State and local EMs and the contractor for review and comments, and then finalized by the NHP study team. The main topics covered by the questionnaires included vulnerability, shelter, behavioral, transportation, evacuation and public information data. The final draft was approved after the PSA Kickoff meeting on June 19, 2009 in Galveston, Texas. The final documents are available in Appendices B (Local), C (State), and D (Media).

2.3 DATA COLLECTION

Post Storm Assessment study teams consisting of representatives from FEMA Region VI, USACE, and the contractor interviewed local officials, emergency managers, law enforcement officers, fire department personnel, judges and Red Cross personnel throughout the PSA study area involved in evacuation planning and actual evacuations for Hurricane Ike. Both the State and local groups and agencies that attended the interview meetings provided their observations and experiences throughout the evacuation decision making process. Table 2-1 shows the groups and organizations that were contacted and/or queried for post storm information during the PSA.

Initially, data collection of HES materials also proved difficult. Due to the age of some of the study materials and the predominance of hard-copy formats, obtaining complete study materials did not occur in a timely fashion. It is recommended that an HES clearinghouse be created so that past and current study products, storm atlases and contingency planning guides can easily be accessed in digital format on the web. Such a clearinghouse is currently under development by the USACE Planning Center of Expertise (PCX) for Coastal Storm Damage Reduction and should be operational in 2010.

During the interview processes, participants noted that in order to complete the questionnaire in its entirety, they would need to refer to their log books to obtain specific dates, times and data counts. Agencies that were unable to attend the interview personally were asked to complete the questionnaire and return it to either their local emergency manager or the contractor.

Follow up with the counties proved difficult due to their ongoing recovery efforts and limited availability. As such, many of the responses provided at the interview sessions were best estimates rather than exact figures. Future post storm assessment coordination efforts should include specific instructions for PSA participants to review and complete the questionnaire prior to holding the meetings in order to familiarize all parties with the goals of the study and the types of data that will be requested of them during the study process.

Additionally, better coordination is needed to standardize the invitation procedure to outside agencies. In particular, invitations to local media outlets to attend the post storm assessment interview sessions fell short of the intended goal. Whether the issue is related to the invitation procedure, scheduling conflicts, or the availability of media representatives during the interview timeframe, remains undetermined. Future studies should examine this issue in order to increase the likelihood of media participation during the interview sessions.

Table 2-1: Groups and Agencies Contacted during the Post Storm Assessment of Hurricane Ike for Texas

Federal	State	Local	Non-governmental Organizations		
Federal Emergency Management Agency (FEMA)	Texas Department of Emergency Management	Brazoria County Emergency Management Agency	Chambers County Emergency Management Agency	Houston TranStar	
		Fort Bend County Emergency Management Agency	Galveston County Emergency Management Agency		
		Hardin County Emergency Management Agency	Harris County Office of Homeland Security and Emergency Management (OHSEM)		
		Jasper County Emergency Management Agency	Jefferson County Emergency Management Agency		
NWS Houston			Liberty County Emergency Management Agency	Liberty County Fire Department	KHOU-TV
			Matagorda County Emergency Management Agency	Newton County Emergency Management Agency	
			Orange County Emergency Management Agency	Polk County Emergency Management Agency	
			San Jacinto County Emergency Management Agency	Tyler County Emergency Management Agency	
			Texas Department of Transportation		
City of Beaumont Public Works		Bridge City Emergency Management			
City of Friendswood		City of Galveston			
City of Groves		City of Houston Emergency Management Agency			
Greater Houston Transportation and Emergency Management Center	Kountze Police Department				
United States Army Corps of Engineers (USACE) Galveston District	Texas Department of Public Safety	City of League City			City of Orange Emergency Management Agency
		Pearland Fire Marshall	City of Pinehurst Emergency Management Agency		
		City of Plum Grove Emergency Management Agency	City of Port Arthur		
		Sour Lake Police Department	Sugarland Emergency Management Agency		
		City of Sweeny	City of Webster Emergency Management Agency		
		City of West Orange Emergency Management Agency	City of Weston Lake Emergency Management Agency		

3 LOCAL INTERVIEWS

The PSA interview process provided the study team the opportunity to document the evacuation decision making process and overall experiences of the local county EM's during Hurricane Ike. Discussions centered on the tools and products that were used by emergency managers to make evacuation decisions, how they felt the public reacted to the situation, any specific issues and problems that were encountered, their interaction with State and Federal Government officials and ideas for improved tools and products that would be useful in future events.

3.1 INTERVIEW PROCESS

Eleven local meetings were conducted in, and included participation from seven coastal counties and eight inland counties. In addition, a separate meeting was conducted with Houston TranStar to obtain traffic related data. The meeting locations are listed in Table 3-1 and a meeting photo is presented in Figure 3-1. Appendix A lists the participants in attendance at each meeting.

Table 3-1: Local Interview Meeting Locations

Date	Time	Event	Location
July 20, 2009	1:00 p.m.	Liberty and Chambers Counties Local Interview	Liberty County EOC 2400 Beaumont Avenue Jail Administration Bldg. Liberty, Texas 77575
July 21, 2009	8:30 a.m.	Orange County Local Interview	Orange County EOC City Administration Bld. 123 South 6 th Street Orange, Texas 77630
July 21, 2009	1:00 p.m.	Jefferson County Local Interview	Division of Emergency Management and Homeland Security 1149 Pearl Street Beaumont, Texas 77701
July 22, 2009	9:00 a.m.	Hardin, Jasper, Newton Counties Local Interview	Hardin County EOC 300 Monroe Kountze, Texas 77625
July 22, 2009	1:00 p.m.	Tyler, Polk and San Jacinto Counties Local Interview	Polk County EOC 602 East Church Street Livingston, Texas 77351
August 17, 2009	1:00 p.m.	Galveston County Local Interview	Galveston County EOC 1353 FM646 West Suite 201 Dickinson, Texas 77539
August 18, 2009	8:30 a.m.	Harris County Local Interview	Harris County EOC 6922 Old Katy Road Houston, Texas 77024
August 19, 2009	8:30 a.m.	Fort Bend County Local Interview	Fort Bend County EOC 307 Fort Street Richmond, Texas 77469
August 19, 2009	1:00 p.m.	Brazoria and Matagorda Counties Local Interview	Brazoria County Courthouse 111 E. Locust, Suite 102 Angleton, Texas 77515
September 8, 2009	1:30 p.m.	City of Groves and City of Port Arthur Local Interview	ISTC 410 Highway 69 Nederland, Texas 77627
September 9, 2009	9:00 a.m.	Houston TranStar Interview	Texas Department of Transportation 692 Old Katy Road Houston, Texas 7024

3.2 INTERVIEW RESULTS

3.2.1 SUMMARY OF GALVESTON-HOUSTON HES AREA

In general, most jurisdictions within the Galveston-Houston HES area utilize and are satisfied with the HURREVAC program. Brazoria, Galveston and Harris counties stated that the HURREVAC program was very reliable but that the inland winds predicted were inaccurate to the actual force of the winds inland. The counties also reported the use other commercial tracking programs. The decision arc tool in HURREVAC was not used by GSA counties. Many areas use the evacuation zones developed in the older studies. The SLOSH model was used by all jurisdictions.

Emergency management officials in Galveston-Houston felt that evacuation orders were issued in a timely manner and provided adequate time for the public to respond. The general response time to the evacuation notice was average/medium and the traffic volumes were heavy but not overwhelming. However, there were numerous residents of the Bolivar Peninsula who were slow to respond to the evacuation order or chose to stay in their homes despite the call to evacuate. Contra-flow was not activated. The residents of Harris County living in evacuation areas greatly benefited from the development of the zip-zone evacuation maps (based on zip-codes). This method proved invaluable in public education and was a significant factor in the success of the Hurricane Ike evacuation.

Hurricane Ike produced a storm surge far worse than a typical Category 2 storm because of its massive size and track over shallow waters. Immediately post-landfall, almost ninety-eight percent of area residents were left without power. Widespread and excessive rainfall also occurred along the track of Hurricane Ike with an average of six to eight inches across the area.

The overall response and recovery efforts demonstrated an exemplary level of planning, coordination, and collaboration among a large number and diverse set of government organizations and private sector partners. The response was also a testament to the extraordinary results that are achieved when residents invest in their communities through adopting a culture of preparedness.

3.2.2 SUMMARY OF LAKE SABINE HES AREA

During Hurricane Ike, the EM personnel of the three coastal counties (Chambers, Jefferson, and Orange) in the study area used many of the products to assist with their storm preparation and evacuation decisions. HURREVAC, SLOSH and their Local Hurricane Plans were the primary products used while the HES, Evacuation Maps and Clearance Times seemed to be less helpful products for the coastal counties. All SSA counties used HURREVAC for tracking the storm, planning and internal briefings and discussions with public officials. SLOSH, though considered by some to not be user friendly, was used by the three coastal counties to help predict storm tide inundation areas. The age of the HES and increased population in the coastal areas warrant an updated HES for the coastal counties.

The potential for high winds and storm surge prompted countywide evacuations of the coastal counties. Liberty, Jasper and Newton, also issued evacuation orders countywide. Hardin County did not order an evacuation, recommending that their residents shelter in place. Hurricane Ike caused major damage to homes, businesses and water and sewer infrastructures across the area. All coastal counties in the study area evacuated their vulnerable and “special needs” populations to safer locations. After the storm, some hospitals and nursing homes were evacuated due to power outages caused by the high winds and surge. Reported sheltering problems included staff shortages and unanticipated medical needs. Local officials would like to have more shelter hubs that specialize in caring for special needs populations. During the post storm recovery period, the information that was most beneficial to coastal counties was surge impacts, power status, and availability of food, water, gasoline and information from FEMA.

3.2.3 SUMMARY OF MATAGORDA HES AREA

Matagorda County was the only county from the Matagorda HES area that was included in the PSA study area. The Matagorda County PSA interview meeting was held jointly with Brazoria County in the Brazoria County Courthouse and was attended by Emergency Manager, Doug Matthes. Having a population less than 40,000, Matagorda County reported that their evacuation process for Hurricane Ike was carried out smoothly and the evacuation order declared on September 11, 2008 provided adequate time to complete the evacuation. The county judge made the decision to evacuate the entire county although only 25% of the population resides in surge areas. A fast public response to the evacuation order was reported and language barriers were reported with public information dissemination to Vietnamese and Cambodian populations.

HES materials were not consulted during the evacuation decision making process. Matagorda EM reported a lack of confidence in the study materials, particularly the clearance times, due to the age of the study. Matagorda County reported using HURREVAC to track the storm’s development. A lack of familiarity with the SLOSH model prevented most emergency management personnel from utilizing it to predict storm surge inundation for the county. A joint information center (JIC) was established in a local hotel to disseminate information to the media.

Matagorda County provided bus and ambulance transportation to evacuate 560 special needs individuals to shelters in Austin, San Antonio and New Brunswel. The county has a point to point shelter mutual aid agreement with Comal County. Three nursing homes and one hospital were evacuated in Bay City that required government assistance. Private sector municipal utility districts (MUDs) were affected by storm surge in Sargent.

3.2.4 SUMMARY OF NON-HES COUNTIES

During the Hurricane Ike event, decision makers in Fort Bend, Polk, San Jacinto and Tyler counties used information from various sources (i.e., NWS, NHC, websites, local media, etc.) to assist with their storm preparation and evacuation process. Each of these inland counties had access to and utilized HURREVAC to track the storm's progression. It was also the technology tool used most frequently by non-HES counties. All agreed that they were partially trained in using this tool but would require additional instruction to maintain a working knowledge of the program.

All four counties received damaging winds from Hurricane Ike that caused power outages and downed trees. Radio towers were blown down, generators were struck by lightning and power outages lasted for several days. Evacuation routes from the coastal counties through these pass-through counties experienced heavy to congested volume as coastal county residents received mandatory evacuation at the same time. This non-phased evacuation of the coastal communities created bottlenecks where four lane evacuation routes went to two lanes. Also the coastal and lake area tourists filled up the inland county hotels and restaurants, leaving the first responders with housing and food issues. No road reversals or contra-flow was used.

Fort Bend County reported the successful evacuation of their special needs populations, particularly the Richmond State School, using county buses and ambulances. None were aware of any "safe rooms" being utilized but indicated that many of their public schools could potentially be retrofitted for sheltering.

There was little to no awareness of the Hurricane Liaison Team by the Emergency Management Agencies of the inland counties. Fort Bend County initiated a full activation on September 10 and the remaining three counties were fully activated on September 11, 2008.

3.2.5 GENERAL OBSERVATIONS

- HES products are useful to State and local officials, however, officials have little confidence in data contained in outdated studies (i.e., Matagorda HES). Guidelines and responsibilities for performing scheduled maintenance, updates and restudies should be published and provided to local and State officials. Federal contributions to the updating efforts should be programmed well in advance of the need.
- Generally, local officials are using the HES products appropriately. Many of the local officials used the HES products provided, however, the lack of training and familiarity with the HES products contributed to their underutilization. Periodic training should be provided on the use of the HES products, including HURREVAC, clearance times and evacuation zones.

- Inland counties were generally unfamiliar with HES process and concepts, yet inland counties play a major role in the success of an evacuation. They shelter evacuees and manage evacuating traffic to provide thoroughfares to safety. Inland counties need to be properly trained on the HES process and its concepts and products. Other inland county needs should be identified and provided, to the extent appropriate, by the HES process.
- The public has been conditioned to rely on the Federal government for assistance. This practice is not sustainable. Emergency management must stress the public's personal responsibility for their preparedness and evacuation.

3.2.6 HAZARDS, VULNERABILITY AND DECISION MAKING

- Local officials indicated that evacuation zones, as presented in their HES, were too complicated to communicate effectively to the public and were generally not utilized. Where evacuation orders were issued, general descriptions were used to identify areas that needed to evacuate such as “countywide, low lying areas, beachfronts, barrier islands, mobile homes, waterfronts, flood prone areas, etc.” The zip-zone evacuation map that was developed to alleviate communication difficulties was adopted outside of the HES process. As a result, the current clearance times in the HESs are not reflective of the zip-zone evacuation zones. For consistency across the board, evacuation zoning methodologies should be re-evaluated in future evacuation studies.
- In all cases, officials indicated that more training is needed for HURREVAC and SLOSH. HAZUS was not widely utilized by the locals as many felt that the program is not user-friendly. Local EM's reported that they rarely have the time or capacity to run its model scenarios.
- PSA interviews conducted with local emergency management exemplified the need for a storm surge warning product. The current alert is based on wind strength and does not consider potential evacuation needed for pre-storm surge heights. Texas received up to 15' of storm surge in some areas with much of this prior to landfall and before winds were present.

3.2.7 PUBLIC RESPONSE AND MITIGATION

- In general, the behavior of tourists during hurricane threats is not well documented. This is mostly because of the inherent difficulty in collecting the data from tourists during an emergency or in a post-storm setting. In spite of the difficulties, State and local officials continue to need, and request, behavioral information for tourist populations, especially in those areas where vulnerable populations can double (or even triple) during peak tourist season.
- FEMA should consider providing periodic training, taught outside hurricane season, on Public Assistance guidelines, procedures and eligibility.

- More public information is needed to further educate citizens on what personal belongings to bring with them when asked to evacuate. Specifically, procedures for transporting larger items such as wheelchairs, walkers, etc. should be stressed during public outreach activities.

3.2.8 PUBLIC SHELTER

- More shelter hubs that specialize in caring for special needs populations are needed. Additionally, requests have been made to establish specific pet shelters or to increase the capability to care for pets at general population shelters.
- Education on pet sheltering options should be included in local public awareness programs and specified during shelter training.

3.2.9 TRANSPORTATION/CLEARANCE TIME

- Training is needed for local emergency management decision makers on clearance times and decision assistance tools. Concerns were raised about the different interpretations of storm scenarios and the impacts of those differences on the clearance times and overall evacuation process. The various storm scenarios, modeled to predict storm surge and inland wind speeds, that are summarized and presented in the HES, can be confusing and difficult to understand by those without a technical background. Also, the numerous conditional factors that are built into HES clearance times, such as seasonal occupancy, response rates, and background traffic, complicate the decision making process.
- Special needs populations may exceed the transportation resources available to assist them. Local emergency management should prepare evacuation plans that establish mutual aid agreements with the State to ensure the availability of support and vehicles for critical transportation needs populations.

3.2.10 PUBLIC INFORMATION

- A frequent comment from officials on public information was the request that a media or outreach component be added to the HES. The component could include presentation materials, camera ready graphics, photographs or PowerPoint slides of previous and potential hurricane damage, and other materials which will aid in educating the public about the dangers of hurricanes, the need for early evacuation, the importance of mitigation efforts, etc.

- There is a lack of public information tools and materials for inland county use in educating the public on inland preparedness and inland hazards associated with hurricanes. The HES program should provide assistance and materials to inland areas to aid in the education of this target audience.

3.2.11 RECOMMENDATIONS FOR FEMA

- The HLT needs to be allowed to call local emergency managers directly during storm events to provide timely storm information to decision makers, to convey local information back to the NHC forecasters and to develop more rapport with the local county EM teams.
- FEMA needs to arrange overlap in scheduling of DAEs to report to local EOCs to promote consistency of operations. These representatives should be more familiar with the rules and regulations of the Stafford Act, and should be able to make the necessary decisions during the recovery process. Also, it is preferred that DAEs reporting to the EOCs have hurricane experience and, if possible, be familiar with the area.
- There is a need for sustainable Federal funds to help retrofit critical facilities in vulnerable coastal communities.

3.2 MEETING PHOTO



Figure 3-1: Meeting Photo from Local Interview of Galveston County Emergency Management Agency

4 STATE INTERVIEWS

The PSA interview process provided the study team the opportunity to meet with State officials to document the evacuation decision making process, and overall experiences of the Texas EM during Hurricane Ike. Discussions centered on the tools and products that were used by emergency managers at all levels to make evacuation decisions, how they felt the public reacted to the situation, any specific issues and problems that were encountered, their interaction with State and Federal Government officials, and ideas for improved tools and products that would be useful in future events. The State interview meeting was held at the Texas Department of Public Safety in Austin, Texas on September, 10, 2009. A meeting photo is presented in Figure 4-1 and the list of meeting participants can be found in Appendix A.

4.1 INTERVIEW RESULTS

The State of Texas PSA interview was held in the Texas Department of Public Safety in Austin. The meeting was attended by Johnna K. Cantrell, State Coordinator for Preparedness and Operations, and Frank Cantu, State Coordinator for Response and Recovery. The most important products used for decision making were HURREVAC, Storm Surge Maps, Clearance Times, Evacuation Maps and SLOSH. The State rated their communications and support from local emergency management offices as very good. The State conference calls with locals are good, should be continued, but should be kept concise. The State encourages local Mitigation Planning and local evacuation decision making. These plans are reviewed every five years and must be approved as the availability of FEMA disaster funds are tied to approved mitigation plans. One example of successful mitigation planning involved providing shutters for hospitals in coastal areas.

The State EOC was activated during Hurricane Gustav and remained fully activated for the Hurricane Ike event. Texas is divided into Disaster Districts with Regional Liaison Officers (RLO) assigned to support these districts. The RLOs stationed at the Disaster District offices are in communication with the Local EOCs prior to and during a storm. After the storm has passed, the RLOs are deployed to the local EOCs to provide recovery support. The Texas State Highway Patrol is in charge of the Texas Disaster Districts.

The main sources of decision-making information for State were HURREVAC, SLOSH, HAZUS, various weather-related websites, and the University of Texas. HURREVAC and HAZUS were rated most helpful, followed by the SLOSH display tool. Of all of the tools available, HAZUS was the most difficult to use. More training on all of the HES products was requested.

The State assisted local jurisdictions during the evacuation for Hurricane Ike by providing storm related data and by making recommendations for preparedness and response decisions. Clearance Times from previous HES studies were not generally used due to the difference in study formats and age of the studies so estimates of clearance times were generated from historical evacuations. Since evacuation is a local decision in Texas the State assists the locals

by making sure they have proper information such as impact and surge data. The State had contra-flow in place for the evacuation process but did not use it for Hurricane Ike. The Department of Transportation had plans for implementing lane reversal on every major highway leading from the coast. The State, in conjunction with heavy Federal assistance, has an air transport and rail transport plan.

Public information was received and distributed through all available agencies and products including the National Weather Service and Disaster Dish. Information was disseminated to the evacuating public by AM Radio, TXDOT Message Boards, Interstate Rest Stops, and Amtrak Stations. Information dissemination was deemed to be effective and successful.

The State of Texas was able to provide some resources to satisfy the critical transportation needs of several localities but stated that transportation is a national problem because it pits one State against another for resources. Air evacuation is a problem and should be coordinated at the national level due to the level of effort required to obtain aircraft and the cost involved. The State wants the locals to be responsible for retro-fitting their own facilities. The State participated in the HLT conference calls but desires them to be kept shorter.

There are never enough shelter spaces available and there is a growing need for more special needs and medical shelters. The State tries to keep all evacuees in-state but some of its shelters are maxed out and this causes many evacuees to seek shelter out of State. The “Point to Point” sheltering system is well accepted by both the sender and receiving localities and has proven to be an effective method to handle the special needs populations. The sheltering process could be improved by developing State shelter management guidelines and evacuation shelter teams to support sheltering efforts.

4.1.1 GENERAL OBSERVATIONS

- Improved hurricane forecasting and new technologies, combined with increased news media coverage and internet usage has increased personal knowledge of individual storm threats. However, State emergency management officials expressed concern that with increased information, residents may discount the recommendations of local EMs. Officials fear that some coastal residents may wait too long to safely evacuate for approaching storms.
- Government, volunteer organizations and the news media need to develop and expand public awareness information materials. Materials should target vulnerable segments of the population such as residents who live in manufactured housing, have medical special needs or who are without transportation.
- The Governor’s Division of Emergency Management along with TXDOT continues to evaluate evacuation routes. More “real time” traffic counters that feed data to traffic information systems are recommended. Such systems aid transportation and law enforcement officials to manage evacuation traffic flow.

- Many coastal buildings are highly vulnerable to storm surge and flooding. The State recommends that government and insurance companies promote mitigation methods that will reduce property damage.
- The State recommends that the authority of the FCO system be restored. The FCO should be able to make independent decisions on joint field office (JFO), area field office (AFO) and disaster recovery center (DRC) placements, as well as funding requests, without always having to gain approval from FEMA Headquarters.
- The State recommends that there be a nationally coordinated transportation resources program because, at present, states are pitted against one another for transportation resources when a storm threatens a multi-state region.
- The State recognized the need for more special needs/medical shelter hubs.
- The Regional Liaison Officers of the State Disaster Districts are the first line of State support to the counties and cities.

4.2 MEETING PHOTO



Figure 4-1: Photo from the State Interview in Austin, Texas

5 MEDIA INTERVIEWS

The media interview was conducted with two media outlets from the Houston area. Sixteen media outlets were invited but only two attended, both operating out of the Galveston-Houston HES area. A second session was scheduled in Beaumont but no media representatives attended. The intent of these sessions was to gather information about what was broadcast or printed relating to the hurricane threat and how evacuation orders or recommendations from decision makers were communicated and presented to the public. Also, information concerning the coordination that took place with Government Officials and other media outlets and how the media felt their actions impacted the public reaction and response was solicited. The media interview was held at the Harris County EOC on August, 20, 2009. A meeting photo is presented in Figure 5-1 and the list of meeting participants can be found in Appendix A.

5.1 INTERVIEW RESULTS

The Texas Local Media Interview was held in the Harris County EOC with two media representatives in attendance. The meeting was facilitated by FEMA representative, Bill Peterson. Due to the small turnout from the media, it is difficult to make a generalization as to the Houston area media's knowledge of the HES products. Dr. Neil Frank represented KHOU TV and as a past Director of the National Hurricane Center, he possesses a vast knowledge and understanding of the FEMA National Hurricane Program and most of the available HES products. As a result of the small turnout, this section will only make generalizations about the media's impact on the evacuating populations. Local media has access to most EOCs but are not allowed in the EOC situation rooms during a storm event. The media representatives said they would prefer that emergency managers and media personnel stress the impact of storms rather than storm categories. They felt their working relationships with the local EM office was good but could be improved by having an Open House pre-hurricane season, media access to the EOC, streaming Audio/Video and timelier post storm assessments. A suggestion was made to have a media day training session on how the EOC works.

Information from the EOC is disseminated by email to the media and kept in simple verbal messages. Local media derives most of its storm information from the Joint Information Center. The media representatives in attendance stated that they understood the evacuation zip code maps and think the public understands the zip code evacuation system much better than the old risk area zone maps. These zip-zone maps were used in Chambers, Brazoria, Galveston, Harris and Matagorda Counties. During the post storm recovery process the most beneficial piece of information for the local media is information about when evacuees can return and what services are open and available to them.

5.1.1 GENERAL OBSERVATIONS

Often during an emergency situation, the public doesn't understand that evacuation notices apply to them and those misconceptions lead people to make untimely/incorrect evacuation decisions. Many people believe the storm will miss their location, sometimes placing too much faith in the forecast track of the storm, and sometimes those misconceptions are reinforced by similar misconceptions by media outlets. Additional opportunities to assist with public hurricane awareness were most requested by the media. The following list summarizes the observations from the local media in attendance at the media meeting:

- Enhanced planning, coordination and preparation efforts with media representatives are needed at local EOCs.
- Expand the usage of culturally modern tools for information dissemination, such as Twitter, Facebook and Web blogs.
- Texas media personnel would like to get news reporters and weather reporters to training events put on by the EOCs.
- The Joint Information Center (JIC) provides the one voice cohesive dissemination of information for Texas Media and the EOCs.
- The new zip-zone evacuation map used by Galveston, Harris, Brazoria, Matagorda, and Chambers Counties has made evacuation orders easier to explain to the public.
- The TV media representative believes that the evacuation zip-zone map is better understood by the public and they can display the zip codes ordered to evacuate in a crawl box on the TV screen.
- The media representatives would like to work with local emergency management to determine the effectiveness of their evacuation messages. Knowledge of how well the public received its information is critical to Houston area media outlets.
- The media would like the opportunity to convey more post-storm recovery messages to the public instead of having them refer to FEMA.

5.2 MEETING PHOTO



Figure 5-1: Meeting Photo from the Media Interview in Harris County

6 POST-STORM DATA COLLECTION

Available Post-Storm data was collected to assist in the analysis of the NHP's current products and tools, and to identify where gaps in data and information may exist. Existing data relevant to vulnerability, sheltering, behavioral, and transportation analyses, along with evacuation decision making, public information, and other FEMA programs related to hurricanes are gathered and presented in this chapter of the PSA.

hurricane evacuation zonesThe PSA for Hurricane Ike addresses the accuracy and usefulness of the vulnerability data provided in the most recent HES. The counties included in the PSA study area are grouped by HES areas as follows:

Matagorda HES

Matagorda County

Houston-Galveston HES Counties

Brazoria, Galveston, and Harris Counties

Lake Sabine HES Counties

Orange, Jefferson, Chambers, Liberty, Jasper, Newton, and Hardin Counties

PSA Study Counties not part of a prior HES

Fort Bend, San Jacinto, Polk, Tyler

Using information developed from SLOSH Model surge inundation data, the vulnerability analysis provides estimates of the potential damages and casualties that could result from storm surge and wind forces associated with various hurricanes. Traditionally, the vulnerability analyses for the various study areas in Texas have utilized data on surge depth and wind speed to define the boundaries of five risk areas, corresponding to the expected surge inundation from each of the five Saffir-Simpson scale Hurricane Categories. The evacuation zone maps created in 2002 for Matagorda and 1998 for the Lake Sabine Study Areas HES, developed by the Hazard Reduction and Recovery Center at Texas A&M University, are presented in the Hurricane Risk Areas format previously described. The evacuation zones for the Galveston Study Area HES were completed in 2004 and are defined in three categories; Evacuation Zone A (Category 1 and 2), B (Category 3) and C (Category 4 and 5).

Behavioral analyses conducted by Lindell and Prater² at the Hazard Reduction & Recovery Center (HRRC) after Hurricane Rita revealed that the Hurricane Risk Area map format that divides coastal counties into five risk areas are not adequate for many residents to accurately identify their risk areas. Results show the disparities among risk area boundaries, political

² Lindell M.K. and Prater C.S. (2008). *Behavioral Analysis Texas Hurricane Evacuation Study*. College Station TX: Texas A & M University Hazard Reduction & Recovery Center.

boundaries, artificial and natural features make it difficult for the public to accurately locate their households on these maps. Evacuation zones developed for the more recent Houston-Galveston HES update show three evacuation zones instead of the previous five risk areas. The subsequent zip-zone evacuation maps modified (expanded) the area of the three zones and added a fourth zone referred to as “Coastal.”

In an effort to ensure a more orderly evacuation of the Galveston-Houston area when a major hurricane approaches, Galveston, Brazoria and Harris counties along with the City of Houston adopted a “zip code evacuation plan” before the start of the 2007 Hurricane Season. The map was developed through a joint effort of Harris, Brazoria and Galveston County judges and emergency management agencies. The zip-zone map, though not created as part of the Houston-Galveston HES, is comprised of four zip code zones, which generally correspond to the three hurricane storm surge risk areas in the 2004 HES. Zip-zones were chosen as the best, most easily-recognized and understandable method to disseminate evacuation information to the public. This modification was made after the evacuation for Hurricane Rita. The intent of the zip code zone plan was to ease traffic congestion and assist residents of low-lying portions of Chambers, Galveston, Brazoria and Harris counties to evacuate before those outside the risk areas enter the roadways. In 2008 the zip-zone map was expanded to include Matagorda County. Figures 6-1 shows the evacuation zones as they are presented in the 2004 study and Figure 6-2 shows the recently adopted zip-zone map.

The counties of the Houston-Galveston Study Area (including Chambers and Matagorda Counties) utilized the zip-zone map to issue evacuation orders to the public during Hurricane Ike. The evacuation zones designated in the Houston-Galveston Area HES were not utilized during Hurricane Ike. During the interview process, Galveston and Harris Counties and the City of Houston reported that the zip-zone maps were used during the evacuation process. Although Matagorda, Brazoria and Chambers Counties were part of the zip-zone maps, they reported that their countywide evacuation orders were issued by the county judge. Even though not all Houston-Galveston area counties evacuated based on the zip-zones, the prevailing sentiment was that the zip-zones facilitated an efficient evacuation during Hurricane Ike and their use should be continued in the Houston-Galveston area.

Apart from Chambers County, the Sabine Lake HES counties did not utilize zip-zone evacuation maps. The countywide evacuation order for the coastal counties of Jefferson and Orange was issued by the county judge and based on areas of historic flooding and wind damage. Similarly, the inland counties of the Lake Sabine Study Area HES reported that evacuation orders were based on areas of historic flooding and wind damage.

Figure 6-3 presents the evacuation zones for the Matagorda Study Area. Figure 6-4 shows the evacuation zones for the Lake Sabine Study Area. Residents of Fort Bend, San Jacinto, Polk and Tyler Counties were not issued a mandatory evacuation order by emergency management and served primarily as pass-through counties during the evacuation.

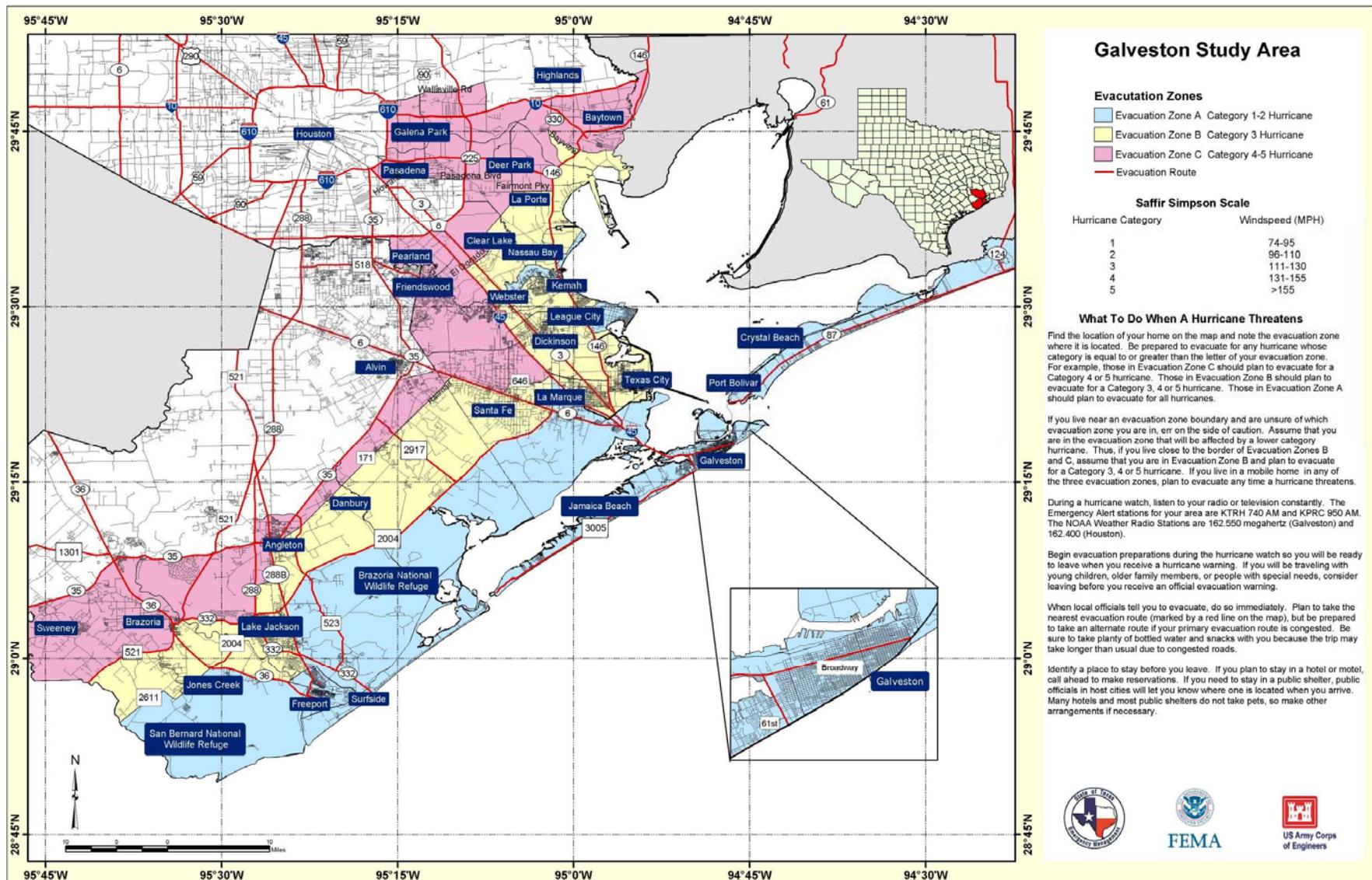


Figure 6-1: Houston-Galveston Study Area Evacuation Zones from 2004 HES

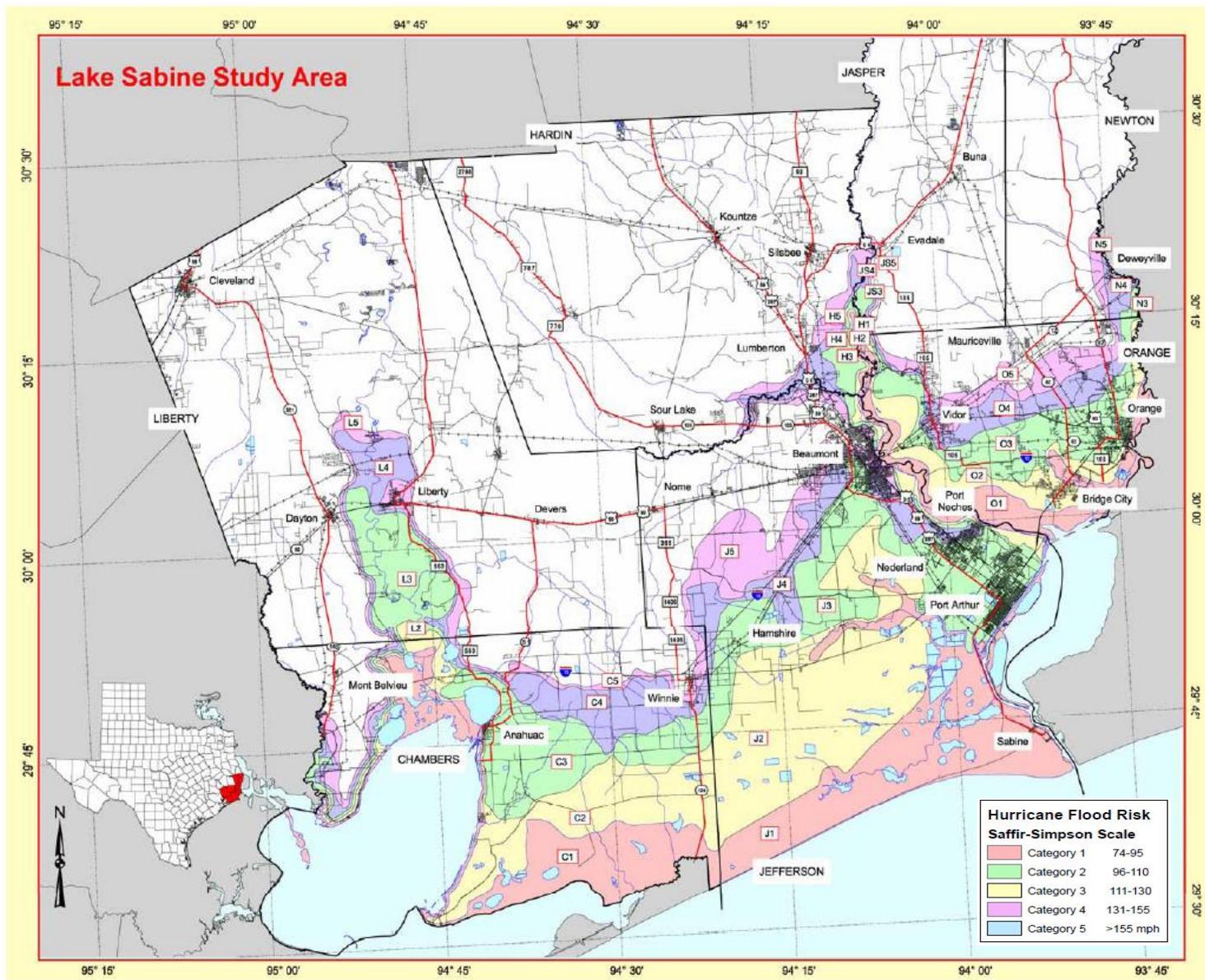


Figure 6-3: Lake Sabine Study Area Evacuation Risk Areas from 1998 HES
ftp://ftp.txdps.state.tx.us/dem/plans_hurr_maps/hurr_map_ssa.pdf

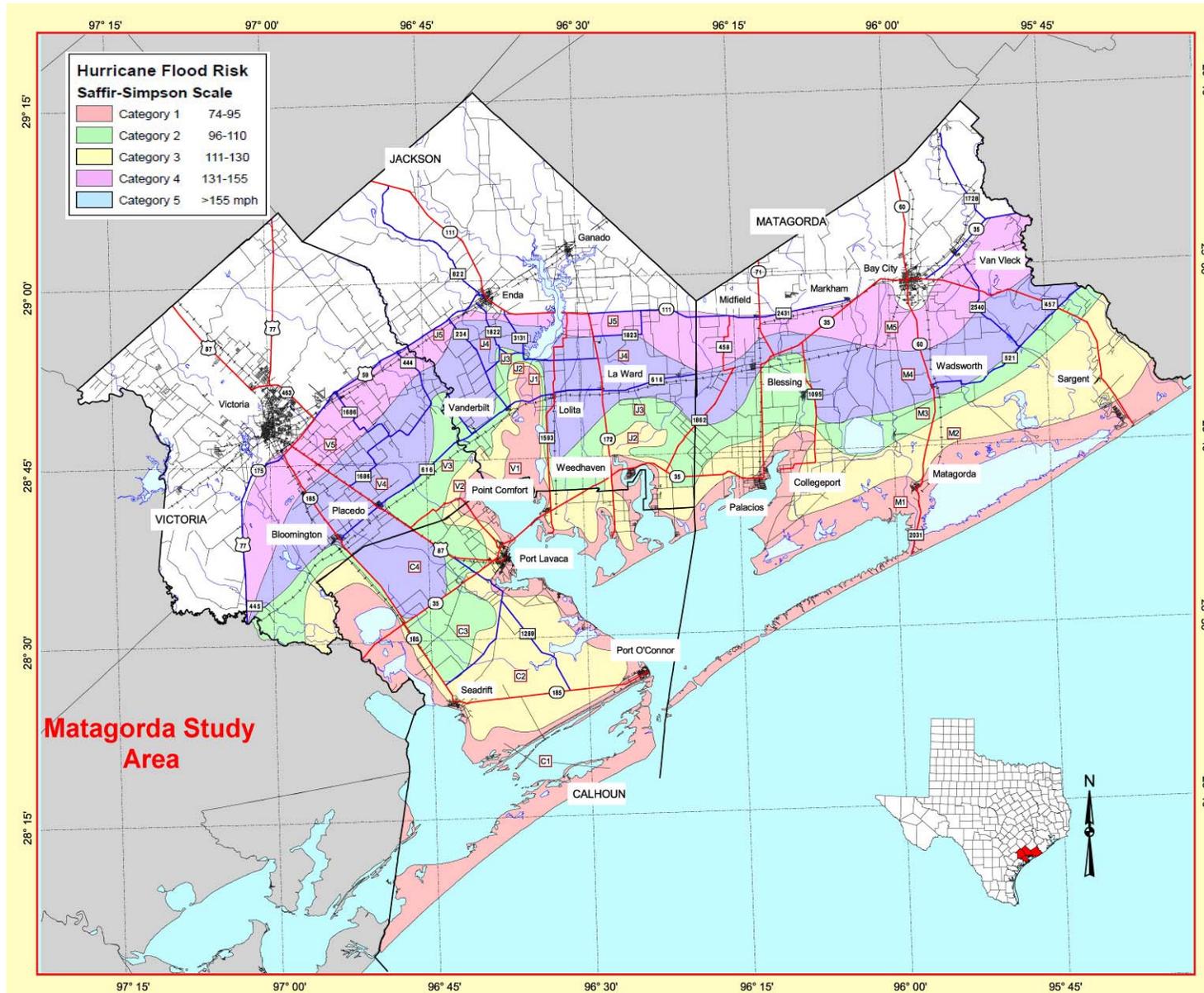


Figure 6-4: Matagorda Study Area Evacuation Risk Areas
<http://www.txdps.state.tx.us/dem/pages/downloadableforms.htm>

6.1.1 VULNERABILITY DATA

The vulnerability analysis of the HES identifies the population potentially at risk to hurricane impacts. The vulnerability related data presented below was gathered from the interview questionnaires and several phone interviews with emergency management personnel throughout the study area. Risk area and evacuation zone populations as well as evacuation compliance estimates for each HES area are presented in Table 6-1. The current MSA HES does not provide population numbers by risk area.

The table displays the percent of each county's population that resides in each risk area and the sum of those percentages to illustrate the total percent of the county population in any risk area (regardless of storm category). The population residing in an HES-designated evacuation zone is compared to the population included in an evacuation zip-zone, where applicable. The percent of the population that was issued an evacuation order and the percentage of that population that complied with the evacuation order are also presented. The percentages shown in the table were computed from the HES Vulnerability Analysis for each study area. It should be noted that the 1998 MSA Contingency Planning Guide does not calculate vulnerable population by risk area and therefore appears as unknown in Table 6-1.

An Evacuation Relevancy Factor (ERF) was created to evaluate the relationship between the evacuating population and the population vulnerable to storm surge. By subtracting the population in a surge zone from the evacuating population, we can observe how evacuation decisions made by the public related to their vulnerability. Positive (negative) values indicate that a population larger (smaller) than the risk area population evacuated for the storm. It should be noted that population numbers presented in the HES were computed from the 2000 Census and may not reflect the exact population in each evacuation zone during Hurricane Ike.

A pattern evidenced in the vulnerability overview is the predominance of countywide evacuation orders. Nine of eleven counties issued a countywide evacuation for Hurricane Ike. With the exception of Harris County, the five counties (Brazoria, Chambers, Galveston, Orange, and Jefferson) with the highest evacuation compliance, and countywide evacuation orders, were those with a population density greater than 50 percent in surge zones. Regardless, the evacuation compliance still fell below the risk area population by as much as 30 percent (i.e., Galveston County). This is evidenced in the negative ERFs presented in Table 6-1 for these six counties. PSA interviews conducted in these HES areas confirms that an insufficient percentage of the population evacuated for the hurricane threat, resulting in excessive resource expenditure, numerous water rescues, and lives lost.

Jasper, Liberty, and Newton counties also ordered a countywide evacuation despite having lower relative population densities in surge areas. However, it is interesting to note that although evacuation orders for these counties were not issued by risk area/evacuation zone, the evacuation compliance generally correlates to the percent of the population in surge zones. If the evacuating population was indeed the population residing in designated surge zones, the relationship may potentially be attributed to the experience of seasoned residents or the success of public outreach/education in these counties. Whatever the reason, the evidence (positive ERFs) suggests that the appropriate percent of population (if not slightly more) evacuated from their respective counties for Hurricane Ike.

Table 6-1: Vulnerability Analysis Summary Table

HES Area	County	Total Population*	% Risk Area 1	% Risk Area 2	% Risk Area 3	% Risk Area 4	% Risk Area 5	% of Population in a Risk Area		% of Population Asked to Evacuate	% of People Asked to Evacuate who Complied	ERF**
								HES	Zip-Zone			
GSA	Brazoria	241,767	< 1	4	23	18	6	51	100	100	30	- 17
	Galveston	250,158	20	13	42	6	10	91	100	100	60	- 31
	Harris	3,400,578	1	< 1	1	2	3	8	29	3	90	- 5
SSA	Chambers	26,031	10	8	7	16	12	53	100	100	60	- 7
	Hardin	48,073	< 1	< 1	< 1	5	2	7	NA	0	Undetermined	NA
	Jasper	35,604	< 1	< 1	< 1	< 1	< 1	1	NA	100	20	+ 19
	Jefferson	252,051	< 1	2	41	19	13	75	NA	100	55	- 20
	Liberty	70,154	0	< 1	5	3	11	19	NA	100	30	+ 11
	Newton	15,072	0	0	< 1	9	3	12	NA	100	20	+ 8
	Orange	84,966	4	15	39	13	15	86	NA	100	75	- 11
MSA	Matagorda	36,928	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	100	50	NA

*Based on 2000 Census data as utilized in the Vulnerability Analysis of the most recent HESs, except Matagorda County which utilized 1990 Census data.

**Evacuation Relevancy Factor (ERF)—Percent Compliance minus Percent Vulnerable.

6.2 SHELTER DATA

The purpose of this section is to show the actual shelter use in Texas during Hurricane Ike and compare it to predicted shelter use and capacity data from existing HES studies. The contractor conducted interviews with relevant shelter providers in Texas including the American Red Cross, Governor's Division of Emergency Management and others. In the Texas sheltering plan, coastal areas are to be evacuated and to not host shelters. Texas operates under an emergency operations plan modeled on the National Response Framework. Shelter operations are organized under ESF6 Mass Care with an hourly matrix to designate key tasks. At H-120 pre-landfall priorities are made based on storm intensity and predicted track and mass care personnel begin to confirm shelter locations. Personnel also monitor 2-1-1 calls to identify potential evacuation needs. Transportation of key assets commences to the shelter locations by H-96; the State re-assesses the storm track and places hubs on standby. By H-72 shelter teams move to the hubs to manage incoming evacuees. By H-12, the pre-landfall efforts cease as coastal evacuations become dangerous to impossible in many locales. General evacuation and shelter procedures, which were used for Hurricane Ike, are described here first followed by data and case examples. Data were collected through in-person interviews as well as through document analysis.

6.2.1 EVACUATION FROM COASTAL AREAS TO SHELTERS

In Texas, two main systems route people out of harm's way. One is called the *Point to Point* (PTP) where a coastal city partners with an inland community of comparable size to host evacuees. PTP is a pre-designated evacuation system to take people lacking transportation from a staging area to a pre-designated shelter. For example, Austin serves as the PTP for Galveston. The Point to Point is handled through a 2-1-1 registry with annual registration. Four levels of individuals can use the Point to Point system. Level 0 includes people with no medical needs but in need of transportation. Level 1 includes people who are dependent on others for routine care. Level 2 includes people with disabilities. Level 3 includes people who need medical care and who will be routed to a medical special needs shelter. Pets are also taken along per State law. Points are pre-determined. For example, Austin serves as the PTP for Galveston.

Evacuees registered with 2-1-1 go to a transportation location, receive a bar coded bracelet, and board the designated bus. The bar code contains basic information that is scanned at various points: going on to the bus, at pre-designated stopping points (for gas, restrooms, and medical checks). Coded information designates the level that the person is currently at, but the State recognizes that the level can change during the evacuation and sheltering experience. The bar code information can be printed by the driver as a manifest, uploaded to a satellite and then sent to the reception point so reception shelters know how many people are coming and the levels of care that will be needed. The University of Texas Center for Space Research receives the data and provides GIS support. The buses have GPS on board. The system was used for the first time with Hurricane Ike. Buses travel in convoys from point to point and stop at pre-designated fueling points for water, fuel and medical checks. Upon arrival, evacuees exit the buses and enter a reception center for triage and shelter assignment.

A *hub system* is used for the larger public. The hub system is a geographic location where there are sufficient numbers of hotels, shelters, convention centers and other areas that can serve certain numbers of expected evacuees along major evacuation routes. The Department of Transportation staffs travel centers at the State border to monitor the arrival of out-of-state evacuees and route them to shelters. A map of the hub system can be found in Section 6.4.

Evacuees are to stop at reception centers where they are registered, triaged and sent to the appropriate shelter. Typically, the reception center only gives out 80% of available tickets in order to anticipate walk-ins. Shelters operate through local jurisdictions with support from voluntary organizations such as the Salvation Army, The American Red Cross, the Baptist Child and Family Services, and Southern Baptist Disaster Relief and others. The American Red Cross operates about half of the shelters with local jurisdictions and Community Emergency Response Teams (CERTs) operating the others. Some areas open up ad hoc shelters, a number that varies with each storm. Additional shelter system support comes from the Texas Departments of Criminal Justice, Health and Human Services, Parks and Wildlife, State Health Services, the Texas Information Referral Services (2-1-1), the Texas Education Agency and the Texas Office of the Attorney General. FEMA Region VI provides an Incident Management Assistance Team and created a Special Needs Assistance Team (SNAT) for Hurricane Ike.

6.2.2 MEDICAL SPECIAL NEEDS (MSN) SHELTERS

It is a State policy to keep evacuees in-state rather than to send them to another state including those with medical or special needs. Given the threat of electrical system failure, tornadoes, and the concern that few buildings can withstand significant hurricane force winds, it is also policy that Texas does not shelter in coastal counties. Additionally, many potential shelter facilities located well outside of a predicted surge zone, and that have a backup generator, usually do not have a secondary backup generator. Instead of hardening facilities closer to coastal areas, Texas has designated specific inland locations.

The Texas Department of State Health Services (Public Health Preparedness Unit, Community Preparedness Section) manages MSN shelters in Texas, an effort that evolved as State management of MSN is relatively new. The State contracts for larger shelter operations through Baptist Child and Family Services (located in San Antonio, contract funded through FEMA) which provides shelter management and behavioral health rehabilitation (aka wraparound) services. Other contracts are in place with other agencies to provide respiratory therapy, physicians, psychologists, nurses and medics. A Texas Medical Assistance Team (TXMAT) provides acute care support. Other teams were placed on a roster to assist with Hurricane Ike including individuals who helped with managing the evacuation, shelters and patient return. MSN sites are located using the hub and point to point system. Evacuation assets are mobilized under a FEMA contract with AMR (including paratransit) and staged out of San Antonio. The Texas Military Force Air Evacuation uses C-130 though the State does not consider these conveyances ideal particularly in hot and humid conditions which could cause patients to deteriorate.

Data provided by the State of Texas Department of State Health Services indicates occupancy of 2,091 individuals in medical special needs shelters out of a total bed availability of 29,307 leaving 14,007 open. Using these numbers approximately 7% of bed space was used. Pre-identified MSN shelters are located for northern or southern coast strikes. The bulk of MSN locations identified by the state that hosted evacuees were in Houston, College Station, San Antonio, and the Temple areas.

Air operations are also possible in priority order to Dallas/Fort Worth (capacity 900); El Paso (500); or to San Antonio (400 or Bryan/College Station (250). Those sent to Dallas/Fort Worth or El Paso are transferred through the NDMS and into the local medical system. Those sent to San Antonio or Bryan/College Station go through the Texas Military Force and are transferred to a location after triage.

Staffing ratios are set for one registered nurse (RN) per 50 patients during the day and one per 150 during the night. Two RN managers provide 24/7 coverage. One nurse assistant is assigned per every 15 patients during the day and one per 45 patients at night. Texas rostered ten such teams for Ike. A recommendation to lower the RN ratio to 10 patients per day is under consideration due to the unexpected number of high risk patients that presented during Hurricane Ike. There is also one shelter manager during the day and two assistants that provide 24/7 coverage. Maintenance staff, registration personnel, drivers, security and volunteer coordinators also support a MSN sheltering between 100 to 150 patients or "guests" as they are called in Texas. Shifts occur in 12 hour periods usually from 8:00 am to 8:00 pm. Extensive lists of caches, policies and procedures are online now for the State's medical special needs shelter efforts at <http://www.dshs.state.tx.us/comp/comp/msn/default.shtm>.

6.2.3 FEDERAL MEDICAL STATIONS

Federal Medical Stations (FMS) are relatively new to sheltering support efforts. The FMS is provided through the U.S. Public Health Service and then given over to a local jurisdiction to use. DMAT units are deployed first to provide support, using the FMS cache, until Federal support arrives. The Public Health Service then arrives as a second layer. FMS include equipment, supplies and staff that can support treatment of 250 low acuity patients (e.g., no intravenous). Approximately 105 staff members are in an FMS and include specialists in medical care, maintenance, set up, tear down and administration. Region VI pre-stages the FMS for Louisiana and Texas in Alexandria. Cache location is based on a northern/southern strike scenario for the coast of Texas.

For Hurricane Ike, the use of the FMS was a fairly new experience. For Hurricane Ike, there was some initial confusion in jurisdictions or DMATs lacking FMS experience including the assumption that the FMS was an "ER in a box." Some local jurisdictions were also overwhelmed with response operations and couldn't provide wraparound services for the FMS (cleaning, security, food, electricity, sanitation). An example of an FMS is shown in Figure 6-5 below. A lack of generators in some locations may compromise the ability of the FMS to provide support. Local jurisdictions are responsible for generators but may not have them on hand.



**Figure 6-5: Centers for Disease Control and Prevention,
An Example of a Federal Medical Station,
<http://www.texasjrac.org/documents/FMSfactsheetv3-1.pdf>**

6.2.4 SHELTER OPERATIONS FOR HURRICANE IKE - CASE EXAMPLES

In this section, selected case examples illustrate shelter operations. Brazos County served as host areas for evacuees and established a full range of shelters. The Greater Houston area accepted large numbers of returning evacuees, prompting the opening of post-landfall shelters.

Brazos County, situated about 145 miles northwest and inland of Galveston includes the cities of College Station and Bryan, and Texas A&M University (TAMU) all participated in shelter efforts, representing a county closest to those at risk but located far enough inland to provide some degree of protection from storms. The area expressed some concern that despite filling up as a first location of choice, they should be viewed as a location of last resort. Brazos County served as a general population hub location for Hurricane Ike, provided a medical special needs shelter (at TAMU), and set up both large and small animal shelters.

Based on square footage of available shelters, the county could theoretically take in 20,000, though their previous peak population was 8,770. However, shelter partners learned early on that the decision on how many people could be sheltered was based on the ability to support the shelters, rather than on the square footage available in a given location. Their comfort zone is

around 5,000 evacuees if schools are used. The American Red Cross determines the order and location of area shelters. Upon arrival evacuees are rapidly triaged and then assigned to a shelter using a card system. When a shelter reaches 85% capacity, it is closed. The County, cities and various voluntary organizations also support approximately 2,000 hotel rooms through food delivery or distribution at a mass care feeding location. When examined by type, there were 17 general population shelters, one special needs shelter at a faith-based location, one special needs shelter at TAMU, two first responder shelters, three point to point shelters and two shelters for local populations. Shelters opened on September 10, peaked on September 13 and closed by September 24. Populations peaked sharply on September 11 and 12 for general population and special needs shelters. The general population shelter peaked at approximately 2360 on September 12. The special needs population peaked at approximately 565 on September 12 and 13. Point to point shelters peaked at about 470 residents on September 11-13. Responders peaked at about 208 on September 10. General population shelter numbers ranged from 30 to 567 at their peak. Point to point shelters housed from 60 to 250 residents. The TAMU medical special needs shelter took in 153 on September 11 peaked at 440 on the 12th and 13th, and declined steadily until closing on September 24.

Medical Special Needs Shelters (MSNS)

Easterwood Airport, capable of hosting commercial aircraft, is located in College Station and is operated by TAMU. Air operations to evacuate those with medical special needs included C-130 planes, helicopters and ambulances, all arriving pre-storm. Once on the tarmac, ambulances were used to bring patients into a 500 bed MSN in Reed Arena. For Hurricane Ike, all categories of patients arrived at the facility (categories 3, 4, 5) as well as some hospice patients and multiple patients from nursing homes and hospitals. All Category 3 through 5 patients are individuals who need medical care; more specifically, Category 4 and 5 patients require treatment facilities having the same capabilities of a hospital. The MSN was open for 22 days, although the original plan was for 72 hours of shelter operations. Problems arose with discharge due to the devastation in patient's home communities as essential services and properties had been lost and many patients could not return home. To discharge patients, the MSNS sought out appropriate locations across the state (e.g., nursing homes) and transported one or two patients out at a time via ambulances.

Pet Sheltering

Texas adheres to Federal and State policies regarding the evacuation and accommodation of pets. The first is a co-location shelter for people and pets. The second is a pet site that receives animals en masse and is physically separated by distance from human shelters. The third type of shelter involves serving as a host facility for animals transferred from other facilities. Brazos County organizes animals into two types of sheltering operations: 1) small, companion animal shelters, and 2) large/livestock shelters at separate sites. For Hurricane Ike, Brazos County used a building at Texas A&M University (TAMU). Brazos County stood up the pet shelter on Wednesday (September 10) before the storm that arrived on Friday night (September 12). The first animals came into the small animal facility on Thursday morning (September 11) and a heavy stream of people arrived by Thursday night. The line peaked early on Friday morning though a few stragglers arrived on Friday night. A few more came after the storm passed, having been caught in it while traveling or by not evacuating. Overall, the County sheltered 350 small and exotic animals and about 170 large animals. Efforts to house large animals have varied and

may continue to do so as resources, facilities, and liability issues are worked out. During Hurricane Ike, the County sheltered about 170 horses, two longhorn cattle, and several hogs at a local exposition center.

Areas of concern

Brazos County conducted extensive and well-organized sheltering efforts. Officials expressed some concern regarding a lack of hardened facilities and funds to strengthen locations and purchase generators. Many residences and businesses would not be hardened enough to withstand a strong hurricane, and therefore, would increase the need for additional shelters for the local population. The logistical support plan would then need to be quickly expanded in order to care for local residents as well as evacuees from coastal communities. Costs associated with operating the pet shelters are not always covered by FEMA assistance.

The Greater Houston Red Cross, which covers 16 counties, does not open pre-landfall shelters south of I-10. Residents evacuate to pre-designated and recommended locations in Austin, Dallas, San Antonio and other communities. Once those shelters fill, smaller shelters are back-filled closer to the coast. The assumption is that about 10% of the evacuating population will need shelter but that 2.5 times the number of evacuees will need food. Shelters did open in the Houston area *after* Hurricane Ike passed, primarily to support returning evacuees and other local area residents lacking power. At peak operations, Houston area shelters provided for 12,000 residents. The shelters were open from landfall to the first week of November. Site selection was based on the availability of power, running water, and availability of shower facilities. Shelter residents included senior citizens, low-income populations, pre-disaster homeless, Vietnamese-Americans and Hispanics. Two and a half weeks after Hurricane Ike, the ARC began to consolidate shelters. A mega-shelter opened in Houston for this purpose with the expectation that 2,000 would arrive, eventually 1,500 did. Of these 1,500, 40% were homeless before the storm. Power outages lasted for 21 days in some areas served by the Greater Houston Red Cross, which influenced which shelters could be used. There was difficulty in obtaining generators to support shelters lacking power.

Buses bringing people back to the area from other parts of the State reportedly dropped off evacuees after the storm at Houston area shelters including those with special needs. In some cases, evacuees had left as the lowest level category for special needs but had transitioned to a 3 or 4 category level. Re-entry was an issue as people could not return easily to damaged areas and homes. Discharge activities included using the ARC Client Services Group (CSG) to visit with individual shelter residents. CSG case managers would help the individual identify and appropriate plan and then refer the individual to an appropriate resource or support organization. Organizations also came to the Houston mega-shelter and assisted individuals. Those who had self-evacuated experienced frustration with FEMA funding as they did not know, sometimes until 24 hours before or less, if FEMA would approve additional nights of housing in hotels and motels. The local 2-1-1 system in the area provided resources and referrals for discharged residents. State and area VOAD partners provided assistance helping people to return home. Other partnering organizations included those that could provide translation services.

6.2.5 HES AREAS

Overview

The State of Texas has created new ways to manage evacuation and sheltering since Katrina and Rita which were used for Hurricane Ike. The introduction of the PTP system where residents of one city travel either on buses or, through the hub system using personal vehicles, to a pre-designated receiving city may have helped with coastal evacuation. The use of bar-coding passengers and uploading data via GPS on evacuation buses also assisted with routing evacuees in appropriate numbers to appropriate locations during Hurricane Ike. Further, experience in local counties (note the example of Brazos County above; a rolling highway exit was used in Travis County, allowing shelters to fill up on a northward progression) has led to carefully managed entry points for evacuees which then routes them to the best shelter location. It is thus highly recommended that studies of shelter residents should be conducted both within shelters and via surveys after sheltering ends in order to capture useful data. The issue of pets has been addressed considerably since 2006, resulting in a State law mandating pet evacuation as well as the evolution of a rapidly developing pet shelter system across the State.

This section reviews data collected for Hurricane Ike, then contrasts it with previous HES studies. A full list of shelter types and populations by county for Hurricane Ike is shown in Table 6-2. Texas coastal counties sheltered minimal numbers for Hurricane Ike due to their proximity to the coast and associated damage potential from both wind and storm surge. Seven counties in the study area reported shelter operations to the Governor's Division of Emergency Management including Brazoria, Fort Bend, Harris, Chambers, Liberty, Orange and Polk. Most of these counties opened a few American Red Cross managed or partnered shelters, the bulk of which opened post-landfall. Most coastal counties hosted numbers less than 200 overall in all types of shelters. Harris and Orange Counties were exceptions. Harris County hosted in excess of 7,000 shelter residents, with most of them returning from evacuations to shelters further inland or moving to shelters from their homes due to loss of power. Orange County hosted approximately 1,300 shelter residents. Those with homes on Galveston Island faced a lack of infrastructure to support residents or returnees. A tent shelter was used but generators for air conditioning and kitchen use had to be brought in. An initial location proved unsuitable because it had multiple stories and was not accessible. The State eventually took over sheltering on the island and the ARC closed their operations. What is most notable about coastal county shelters is that they opened after the storm and stayed open for considerably longer than inland shelters. Post-event sheltering is not a norm in many states and thus merits attention.

The following counties did not report shelter locations or numbers to the Governor's Division of Emergency Management: Matagorda, Galveston, Hardin, Jefferson, Jasper, Newton, Tyler and San Jacinto. However, some emergent sheltering did take place among residents who did not leave and for officials and responders remaining in place during the storm. Some sheltering also developed post-storm as well. For example, Galveston established shelter locations for both first responders and returning residents. Initially, the American Red Cross supported post-disaster Galveston shelters which were far from ideal due to conditions on the island. The State of Texas subsequently took over support for the post-disaster shelters on Galveston.

Table 6-2: Shelter Types and Populations by County in Texas for Hurricane Ike*

Texas County	Shelter Type	Number by type	Population maximum by type	Earliest date shelter open (September)	Last date shelter open (September unless noted)
Anderson	ARC Managed	7	291	11	22
	ARC Partner	1	29	12	22
	Independent	1	37	11	18
Angelina	ARC Managed	3	608	11	21
	ARC Supported	2	231	12	16
	ARC Partner	20	3861	11	NA
	Independent	2	189	11	22
Bell	Independent	5	290	12	23
Bexar	ARC Supported	3	1621	NA	24
	ARC Partner	1	5000	11	10/02
	Independent	13	1481	11	29
Bowie	ARC Managed	1	49	12	21
	ARC Partner	11	670	11	21
Brazoria	ARC Managed	2	127	14	10/01
	ARC Partner	1	61	14	23
Brazos	ARC Managed	8	1829	11	17
	ARC Partner	1	137	11	25
	Independent	17	2264	11	23
Burleson	Independent	2	46	12	23
Burnet	Independent	2	22	14	23
Chambers	ARC Managed	2	153	15	10/11
Cherokee	ARC Managed	2	258	11	21
	ARC Supported	1	94	11	15
Collin	ARC Managed	2	167	11	19
Comal	ARC Managed	1	558	12	13
	ARC Supported	5	572	10	14
	Independent	1	455	12	14
Coryell	ARC Partner	1	61	12	18
Dallas	ARC Managed	5	1632	11	24
	Independent	5	455	12	29
Denton	ARC Managed	3	837	11	18
	ARC Partner	1	175	14	25
Dimmit	ARC Supported	1	33	12	13
Ellis	ARC Managed	1	170	19	21
	Independent	1	47	14	19
Fort Bend	ARC Managed	2	127	14	27
Franklin	ARC Partner	1	89	11	18
Gillespie	ARC Partner	2	67	12	14
Grayson	Independent	1	35	12	17
Gregg	ARC Managed	5	660	12	21

	ARC Partner	3	216	11	21
Guadalupe	ARC Supported	1	288	10	15
	Independent	1	30	12	20
Harris	ARC Managed	11	6383	12	10/19
	ARC Partner	6	630	14	10/04
Harrison	ARC Managed	2	225	12	22
	ARC Partner	1	15	12	13
Hill	ARC Supported	1	550	12	22
Hood	ARC Managed	1	40	15	22
Hopkins	ARC Managed	1	108	13	16
Hunt	ARC Managed	2	165	11	19
Johnson	ARC Managed	1	87	14	22
Kaufman	ARC Managed	2	102	11	19
Kerr	ARC Managed	1	72	11	19
	ARC Partner	1	42	12	15
LaSalle	ARC Partner	1	28	11	24
	Independent	1	1	12	29
Lamar	ARC Managed	2	98	16	20
	ARC Partner	1	28	11	16
Liberty	ARC Managed	2	48	18	10/02
Lubbock	ARC Managed	1	1	NA	9/24
McClennan	ARC Managed	4	712	11	23
	ARC Partner	1	30	10	14
Milam	ARC Managed	3	91	12	18
	ARC Partner	1	100	12	14
	Independent	3	168	12	18
Nacogdoches	ARC Partner	9	2015	12	21
Navarro	ARC Managed	1	159	11	18
	Independent	2	297	12	23
Orange	ARC Managed	1	1223	22	10/07
	ARC Partner	1	50	22	10/14
Parker	ARC Managed	2	120	13	22
Polk	ARC Partner	1	32	16	29
Shelby	ARC Managed	2	241	11	23
	ARC Partner	1	125	12	21
	Independent	9	634	14	27
Smith	ARC Managed	4	603	11	22
	ARC Partner	1	132	11	22
	Independent	12	2489	12	30
Tarrant	ARC Managed	3	293	11	22
	ARC Partner	5	555	12	25
	Independent	13	1123	12	26
Titus	Independent	3	82	11	17
Travis	ARC Managed	6	1990	11	27
	ARC Supported	1	75	11	13

	ARC Partner	10	3921	11	25
	Independent	1	46	16	25
Uvalde	ARC Partner	1	78	10	18
VanZandt	ARC Managed	3	337	11	14
	ARC Partner	3	688	13	20
Walker	ARC Managed	2	117	17	19
	ARC Partner	4	1621	NA	NA
	Independent	1	119	10	28
Webb	ARC Partner	1	108	11	18
Williamson	ARC Partner	8	1882	11	18
	ARC Supported	1	521	12	14
Wood	ARC Managed	1	149	11	22
TOTALS					
		Shelters	Shelter Beds		
Total Used at Max		324	57,571		
Total Available		427	97,954		
Utilization Percentage		76%	59%		

*Data provided by the Governor's Division of Emergency Management. Populations were counted at midnight.

Comparison

Table 6-3 provides an estimation of public shelter usage estimates for the HES areas. Data for actual shelter use were obtained from the Governor's Division of Emergency Management (GDEM). These data, compiled through a WebEOC system, represent population counts at midnight in reporting shelters. The number noted for actual stays indicate the night at which a maximum number of individuals stayed. In several instances, the numbers indicate post-impact shelters as people either returned to affected areas or left their homes for newly-opened shelters.

A total of 324 shelters hosted residents out of a total list of 427 available shelters for Hurricane Ike. The total number of available shelter beds for the 427 locations was 97,954. A total of 57,571 shelter residents were reported at the maximum capacity peak although officials believe that additional, unreported shelters may have opened and not all shelters may have reported resident numbers. Reported numbers may also have varied as consolidation of shelters occurred and people moved to shelters closer to their homes. Based on the numbers collected by the Governor's Division of Emergency Management, approximately 76% of available shelters hosted evacuees and approximately 59% of available beds were used.

All shelters may not have been able to report shelter locations and shelter numbers due to the impact of the hurricane. Further, despite mandatory evacuation notices, people certainly remained in their homes or may have gone to nearby locations perceived to be safer as the storm approached. Such emergent shelters often remain unknown to emergency management officials. Thus, the numbers indicated in Table 6-2 represent what is assumed to be an under-count of those actually using some type of shelter in the HES areas.

The behavioral survey³ conducted by the Hazards Reduction and Recovery Center at Texas A&M University in 2001 serves as the Behavioral Analysis for each HES area. As such, the findings of the 2001 study are utilized to estimate shelter usage. No statistically significant differences were observed among study areas in terms of respondents' intentions to stay in a public shelter, making the estimated percentages applicable to all HES areas. Results show that for those who plan to evacuate, 3.4 percent of respondents indicated that they expect to stay in public shelters. This figure is somewhat lower than the 5 to 20 percent that would be expected from data on previous evacuation research (e.g., Drabek, 1986; Lindell & Perry, 1992; Mileti, Drabek & Haas, 1975; Tierney, Lindell & Perry, 2001).

The Shelter Analysis component of the HES differs for each HES study area. The Houston-Galveston and Matagorda HESs provide the number of available shelters and shelter capacities but do not provide insight on estimated shelter demand. The Lake Sabine HES, on the other hand, provides a concrete estimate of the number of evacuees expected to utilize public shelters and breaks down the estimate by storm category as well as the 5 to 20 percent range that is well documented in behavioral research. Table 6-3 presents the available shelter data from each HES along with the actual shelter usage reported by GDEM.

Inconsistencies in the way shelter data is presented in each HES study area, combined with the sporadic record of actual shelter usage, makes a comparison between them difficult. Exceptions exist for Liberty and Orange Counties. For those areas, both the predicted shelter usage from the HES as well as the public shelter usage estimates are available. The results indicate that far fewer people actually used shelters than expected. For Liberty County, GDEM data indicates only 48 shelter residents where a prediction of 527 to 1,054 based on HES data was expected. For Orange County, 3,140 to 6,281 evacuees were expected to use shelters based on HES data whereas only 1,273 were reported to GDEM.

In the HES study areas without shelter demand estimates, the lower range of the behavioral assumption for predicted shelter use (5 and 10 percent) is applied to the actual number of evacuees for comparison. To illustrate, the 5 to 10 percent assumed shelter usage applied to Brazoria County would indicate that 3,014 to 6,029 evacuees would utilize public shelters where only 188 was reported to GDEM. Between 12,000 to 14,000 of Harris County evacuees could have taken residence in shelters but the maximum recorded was 7,013. Similarly, Polk County could have expected 225 to 450 but reported an actual count of 32.

Despite the challenges associated with obtaining accurate shelter usage in the PSA study area, and the lack of HES data estimating shelter demand, one trend seems clear: Hurricane Ike evacuees under-utilized shelters based on previously published predictions as well as on behavioral assumptions grounded in the existing literature.

³ Lindell, M.K., Prater, C.S., Sanderson, W.G., Jr., Lee, H.M., Zhang, Y., Mohite, A. & Hwang, S.N. (2001). *Texas Gulf Coast Residents' Expectations and Intentions Regarding Hurricane Evacuation*. College Station TX: Texas A&M University Hazard Reduction & Recovery Center.

Table 6-3: HES Estimates Versus Actual Public Shelter Usage for Hurricane Ike

HES Area	County	Number Evacuated	Public Shelter Usage Estimates (Behavioral Assumptions)				Predicted Shelter Usage (from HES)				Actual Shelter Usage in Hurricane Ike
			By County		By HES Area		By County		By HES Area		
			5%	10%	5%	10%	5%	10%	5%	10%	
GSA	Brazoria	60,289	3,014	6,029	23,659	47,319	NA		NA ¹	188	
	Galveston	172,900	8,645	17,290			NA			1250 ⁴	
	Harris	240,000	12,000	24,000			NA			7013	
SSA	Chambers	15,600	780	1,560	12,541	25,082	799	1,599	13,657 ²	25,720 ²	153 ⁴
	Hardin	1,800	90	180			275	551			NA
	Jasper	7,120	356	712			10	20			NA
	Jefferson	138,600	6,930	13,860			8,884	17,769			NA
	Liberty	21,000	1,050	2,100			527	1,054			48
	Newton	3,000	150	300			22	45			NA
	Orange	63,700	3,185	6,370			3,140	6,281			1273
MSA	Matagorda	18,600	930	1,860	930	1,860	NA		175,744 ³	NA	
NA	Polk	4,500	225	450							32
	San Jacinto	500	25	50							NA
	Tyler	7,000	350	700							NA
TOTALS		754,609	37,730	75,461							57,571

¹ Only Shelter Capacity is listed in HES.

² Assumes all risk zones are evacuated since all counties except Hardin issued a countywide evacuation.

³ Total Demand in MSA = 175,774, for storms with wind speeds of 130 mph or less. ~43,936 for Matagorda County assuming shelter demand is equally distributed among the four counties in the study area.

⁴ Reported post-impact.

Note: Information drawn from Texas Department of Emergency Management WebEOC data. Some shelters did not report shelter numbers. Counts were taken at midnight and represent a population max for that night.

6.2.6 HARDENED FACILITIES

Walker County has a 14,400 square foot storm shelter that is considered a hardened facility. The facility was under construction during Hurricane Ike and was completed in early 2009. The major funding for this project was received from the Federal Emergency Management Administration and the Office of Rural & Community Affairs. This shelter will be opened to the general public during severe weather situations and operated by the county. The shelter has an ability to withstand winds of 200 mph as well as airborne projectiles. The building has 14 gauge steel doors. It is an airtight facility with air conditioning and is ADA compliant. The diesel generator is kept in a security cage with heavy duty gauge steel able to withstand 130 mph. There is an individual safe room program in the State that is available on the coast. However, there is little citizen interest as evacuation is the more common response to an impending threat. There are 14 locations across Texas that have some area hardened to varying degrees for tornado risk. Most are in community centers or comparable locations. The square footage of these locations ranges from 250 to over 18,000 square feet with a mean square footage of 6,876. The Walker County Community Shelter and the external generator locations are shown in Figures 6-6 and 6-7. Photos are provided courtesy of the Texas Department of Public Safety.



Figure 6-6: Walker County Community Shelter



Figure 6-7: External Generator at the Walker County Community Shelter

6.3 BEHAVIORAL DATA

The purpose of this section is to collect and analyze all recent behavioral data from surveys performed by Federal, State and Local agencies and/or Universities for the coastal areas of Texas subject to hurricane evacuation. An extensive search uncovered several projects. Their research methods and data analysis are assessed in light of their usefulness for evacuation planning. Preliminary results are presented, but most hold only limited promise for predicting future evacuation behavior either due to their methodology or sample selection and size. However, several have implications for the design of future data collection efforts. As a result of the analysis, a recommendation is made for a new behavioral study with a large, randomized sample covering all of coastal Texas areas.

6.3.1 PROCESS

A literature review of academic and commercial sources was completed in an attempt to locate relevant behavioral studies of evacuation response in Texas. Calls for information were put on several disaster-related newsletters and posted on Internet forums. All of the major disaster centers and disaster researchers were contacted to locate any research that has been done, or is currently in progress. Emails were sent to a total of 31 persons in disaster-related or emergency management fields. Most of these studies are on-going or the data are still being analyzed. All of the reported results are considered preliminary.

6.3.2 HURRICANE IKE BEHAVIORAL RESEARCH PROJECTS

A number of projects have been completed or are underway related to the Hurricane Ike response in Texas.

- **Housing Inequalities and Social Vulnerability to Natural Disasters: Findings from 2008's Hurricane Ike.** Shannon Van Zandt and Walter Gillis Peacock of Texas A & M University's Hazard Reduction & Recovery Center are leading this project funded by a National Science Foundation Small Grant for Exploratory Research. There are three parts to the research. A random sample of 1500 housing units and their neighborhoods Galveston Island/Bolivar Peninsula were examined to determine level of damage. The households were also contacted either in person or by mail to complete a "Household Response & Recovery After Hurricane Ike" survey. At last count 567 had been completed. The focus is on assessing how social vulnerability factors facilitated or impeded decision-making with regard to dislocation and early repair/rebuilding. Nearly half of the Island's detached housing units were vacant two months after the storm. The level of damage to their home was the best predictor of household dislocation, but African American households were more likely to still be living in damaged housing. The quality of insurance appeared to be the best predictor of early repair decisions, but neighborhood characteristics were also important, suggesting a gap in identifying and targeting resources to disadvantaged neighborhoods. Preliminary results from the evacuation portion of the study were

presented at the 2009 National Hurricane Conference. Females, higher income households, Spanish-speakers and homeowners were more likely to have evacuated. The reason for not evacuating most often mentioned was the belief that their homes were safe.

- **Hurricane Ike Evacuation and Re-entry.** This evacuation behavioral study being conducted by researchers at Texas A&M and the University of Utah includes Brazoria, Galveston, Harris and Jefferson counties. Michael Lindell and Carla Prater from Texas A&M and Laura Siebeneck and Thomas Cova from the University of Utah are leading the project. This mail survey focused on respondents' evacuation experiences, particularly related to re-entry. A preliminary report of the re-entry data was presented at the 2009 National Hurricane Conference. Evacuees relied on a variety of information sources about when to return, but especially on information from their peers. About half returned early. Only about 25% reported hearing an official message about re-entry. They were most concerned about not having utilities such as electricity or water if they returned. There was concern about looting if they did not return, and this concern was disproportionate to the actual occurrence of looting.
- **Comparison of Experiences of Harris County Residents during Hurricanes Rita and Ike.** A group of researchers from Rice University, including Robert Stein, Leonardo Dueñas-Osorio, Devika Subramanian Stephanie Post, Lindsay Zwiener, Dana Hoffman and Ian Feldman led this evacuation behavioral study. Questions about responses, including evacuation and factors influencing responses. There were also questions about plans for future hurricanes. The telephone survey included 1503 adults for the Hurricane Ike portion and 405 for Hurricane Rita. A preliminary report is posted on the Rice website (http://www.media.rice.edu/images/media/0312_CCE_HurricaneIke_report.pdf). Over-evacuation was one issue indicated in the preliminary report; of those people not living in evacuation zones, 40% left for Rita and 21% for Hurricane Ike, and these "shadow" evacuees tended to leave later than those leaving from evacuation zones. Fewer people evacuated for Hurricane Ike than Hurricane Rita, and they took fewer vehicles. TV weather reports were the most relied upon source of information for both hurricanes. Of future concern, 75% of Harris County residents reported that they would evacuate if a Category 4 storm threatened Houston, including 70% of those that stayed for Hurricane Ike. This would result in 2.9 million evacuees.
- **Houston Chronicle Evacuation Experience Survey.** An online survey conducted by the Houston Chronicle regarding Hurricane Ike evacuation experiences received 4100 responses. While this is a non-representative sample it nevertheless provides some insights. Compared with Rita, fewer people left, and the experiences of evacuees were much less problematic. The average time to reach their destinations was 4-6 hours and 64% reported that the trip was less difficult than expected.

- **Evacuation Decision-making.** Susan Weller from the University of Texas Medical Branch is conducting qualitative interviews with people from the same neighborhoods in Galveston who did and who did not evacuate for Hurricane Ike. The results are not available yet.
- **Storm Surge and “Certain Death: Texas Coastal Residents’ Risk Perceptions, Decisions and opinions of forecasts in Hurricane Ike.”** This qualitative study was completed by Rebecca Morss and Mary Hayden from the National Center for Atmospheric Research to examine interviewees’ perceptions of hurricane risk, protective decision making leading up to Ike, and opinions of hurricane forecasts. They interviewed 49 people, approximately 5 weeks after landfall. The study illustrates the complex, evolving nature of households’ decisions as the storm approached. Given the storm surge and damage Ike caused, a number of interviewees did not feel that Ike’s classification on the Saffir-Simpson scale adequately communicated the risk Ike posed. The “certain death” statement issued by the National Weather Service was heard by many interviewees, and it helped convince several to evacuate. However, others had strong negative opinions of the statement that may negatively influence their interpretation of and response to future warnings. The results of this study are being submitted to *Weather, Climate and Society*.
- **Study of Price Gouging and Evacuation.** Robert Schwartz from the University of Akron received a Quick Response Grant from the University of Colorado Hazards Center to investigate the Hurricane Ike evacuation and price gouging. The report is under review.
- **Evacuation Experiences.** The Texas Transportation Institute collected surveys on line at the Houston TranStar website for the Texas Department of Transportation after Hurricanes Rita and Ike. Questions were asked about evacuation decision, route, and sources of information. Of the 1,788 responses, 23% had evacuated for Hurricane Ike. About 13% of the total reported living in an evacuation zone, but how many of these evacuated was not reported. Not surprising given this was an Internet survey, after news media the Internet was the next highest source of information during and after the event. Most evacuees reported no particular traffic problems; most delays were less than one hour.
- **Special Needs Populations Impact Assessment.** This report prepared by the U.S. Department of Homeland Security focused on data collected regarding the experiences and status of special needs populations after Hurricane Ike and the current status of special needs populations. (http://www.disabilitypreparedness.gov/pdf/ike_snp.pdf).

- **Hurricane Ike Business Survey.** A Hurricane Ike Business Survey is underway by the Texas A & M University Hazard Reduction & Recovery Center. The survey is administered online, but invitations were mailed to a random sample from a Dun & Bradstreet list of Galveston businesses. Thus far, 249 surveys have been completed which amounts to about 8% of the targeted sample. The goal is to increase the sample through several follow-up rounds over the next two years. Of these businesses, 26% reported extremely severe overall damage and 80% of those with inventory or machinery/equipment reported damage. It provides evidence that preparation made a difference in losses.

6.4 TRANSPORTATION DATA

The purpose of this section is to collect all available real time evacuation data through interviews with emergency management officials, requests to State and Local department of transportation, and law enforcement officers regarding the number of vehicles involved in the evacuations as well as the clearance time required for the overall evacuation. Any traffic control measures were to be noted and any problem areas were to be identified. Results of the findings were to be compared to the HES clearance times and the State’s clearance times where applicable. State officials were to be asked to assess the usefulness of the existing transportation analysis and the possible need for a new analysis.

6.4.1 EVACUATION POINTS OF ORIGIN AND PRIMARY ROUTES

During the Hurricane Ike evacuations, evacuees originated from Zip-Zone Coastal, and Zones A & B” in the Houston-Galveston and Matagorda HES areas (Figure 6-8) and from all five Risk Zones in the Lake Sabine HES area (Figure 6-9). Figure 6-8 illustrates the points of origin for the evacuating vehicles and the critical evacuation routes for the Houston-Galveston Study Area and Matagorda and Chambers Counties. Figure 6-9 shows the risk zones and major routes for the Lake Sabine Study Area (also includes Chambers County). The hurricane evacuation maps listed below were provided courtesy of Texas Division of Emergency Management (<http://www.txdps.state.tx.us/dem/pages/downloadableforms.htm>).

Table 6-4 presents the routes that were advocating to the public for use during the evacuation based on the input from the County Emergency Managers and available responses from the Hurricane Ike Post Storm Assessment Questionnaire.

Table 6-4: Evacuation Routes Advocated by Emergency Management

County	Evacuation Routes
Chambers	State Highway 146, State Highway 61, State Highway 321 and United States Highway 59
Orange	State Highway 87, State Highway 62, and State Highway 105
Matagorda	State Highway 67 and State Highway 71
Galveston	Interstate Highway 45, State Highway 146 and State Highway 6
Jefferson	United States Highway 69, United States Highway 96 and State Highway 287
Harris	Interstate Highway 10 West, Interstate Highway 45, and United States Highway 290

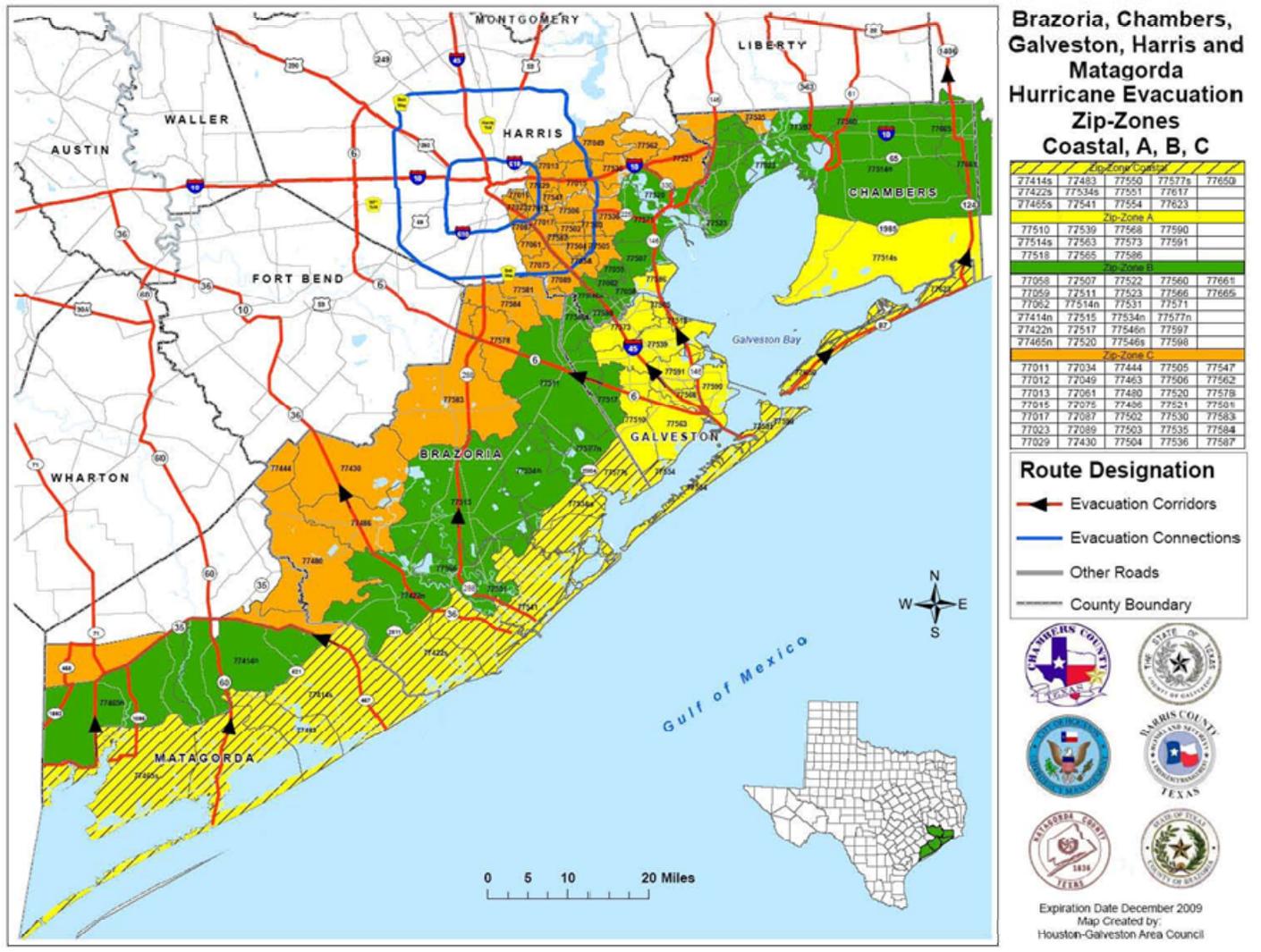


Figure 6-8: Brazoria, Chambers, Galveston, Harris and Matagorda Area Evacuation Zones and Routes

2008 Inland Evacuation Map Beaumont District Flooding Risk Areas

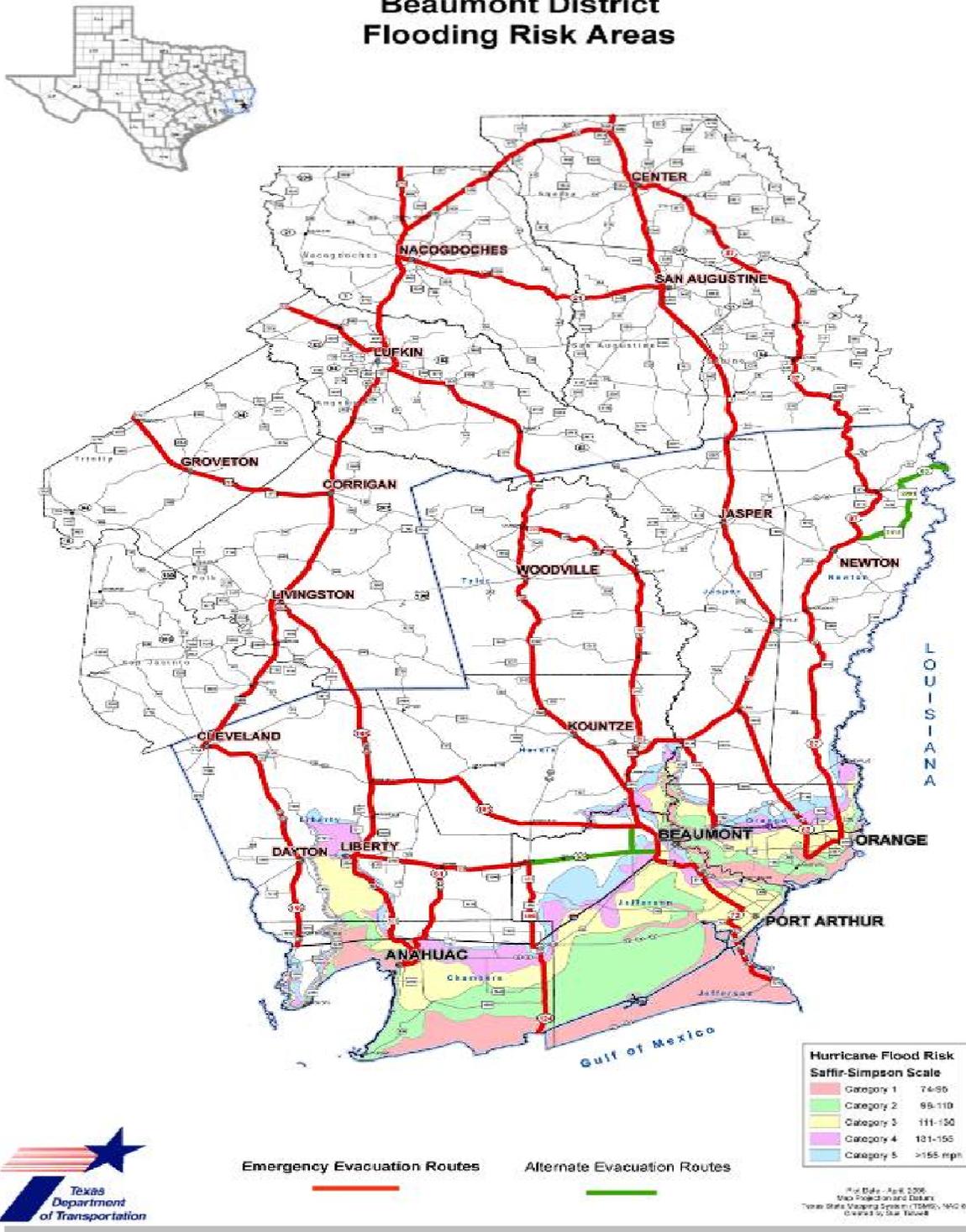


Figure 6-9: Chambers, Liberty and Orange County Evacuation Zones and Routes

6.4.2 EVACUATING VEHICLE VOLUMES

Table 6-5 lists the 24-hour Average Daily Traffic (ADT) and the 24-hour count at each of these collection points. Figure 6-10 from Houston TranStar shows the locations of several evacuation data collection points on the major evacuation routes out of greater Houston Metropolitan Area.

Table 6-5: Comparison of Typical ADT on outbound direction with Hurricane Ike Evacuation Traffic

Data Collection Point	Typical Weekday*	Ike Evacuation 9/11/08	Variance	% Increase
I-45 NB at FM 1488 in Conroe, TX	65,500	68,750	3,250	4.96
US 290 WB at SH 6 in Hempstead	29,250	82,500	53,250	182.05
I-10 WB at FM 1463 in Katy, TX	30,500	52,750	22,250	72.95
I-10 EB at Weigh Station in Anahuac, TX	27,500	33,250	5,750	20.91

*Note: (1) from June 2008 data collected as base data with no evacuation.



Figure 6-10: Location of Traffic Data Collection Points

Based on the data, Northbound Interstate Highway 45 (IH-45) saw only a slight increase in the volume of traffic over that of a normal week during Hurricane Ike evacuation. Eastbound Interstate Highway 10 (IH-10) saw only a moderate increase in the volume of traffic as compared to a normal week during the event. Westbound IH-10 and Westbound United States Highway 290 (US 290) saw the largest increase in traffic due to evacuation related to Hurricane Ike. Westbound US 290 saw almost triple the volume of traffic seen in a normal week and IH-10 saw almost double the volume of traffic seen in a normal week. It can be inferred from this data that US 290 was the preferred route during the evacuation for Hurricane Ike. Further analysis will be required to determine the reason for such a disparity. However, the predicted track of storm at the time of the evacuation, recommended evacuation routes, and evacuee destination most likely account for west-bound routes seeing the increase in traffic counts.

While the 24-hour traffic numbers are important, hourly volumes are an equally important characteristic as they show how well the evacuation is progressing and any impacts on travel speed. Figures 6-11 to 6-18 from Houston TranStar show the hourly volumes along with the travel speeds at each data collection point.

In order to assess the data presented in the Hourly Traffic Volumes and Hourly Traffic Speeds, it is important to look at the data in context of the evacuation orders. On September 10, a few counties in the path of Hurricane Ike had already issued a voluntary evacuation order including Galveston, Chambers, and Brazoria. The data shows that along the major corridors of IH-45, IH-10 and US 290, people in the voluntary evacuations zones began to leave around 6pm that day.

During the day of September 11, 2008, traffic volume continued to be above the average as more counties issued mandatory/ recommended evacuation orders. A peak in traffic volume can be seen on that day between 1pm and 4pm. Although reaching a peak, traffic volumes continued to be elevated for the rest of the day for all of the corridors except IH-10 East Bound. It should be noted around this time Hurricane Ike was projected to move more easterly than previously predicted. Therefore, the traffic volume returns to normal levels around 5pm.

On September 12, the data indicates that people are continuing to evacuate along IH-45, IH-10 Westbound and US 290 until 2pm. IH-10 East of Houston had fallen below average volumes on this day. Most likely this drop on IH-10 east of Houston is due to the news that Hurricane Ike is moving more easterly than previously expected.

Several conclusions can be obtained from reviewing the Hourly Traffic Volumes and Hourly Traffic Speeds Data. First, only a small amount of individuals took advantage of the voluntary evacuation order on September 10, 2008. Secondly, the preferred route for evacuation appears to be US 290 towards Austin, TX. People may have preferred US290 because of the highly publicized traffic congestion on IH-45 and IH-10 during the evacuation for Hurricane Rita. It should be noted that US 290 suffered minor amount of reduced traffic speed as compared to IH-10 and IH-45 during the same periods. Finally, it is it important to note that the evacuation occurred over two days rather than one day during Hurricane Rita.

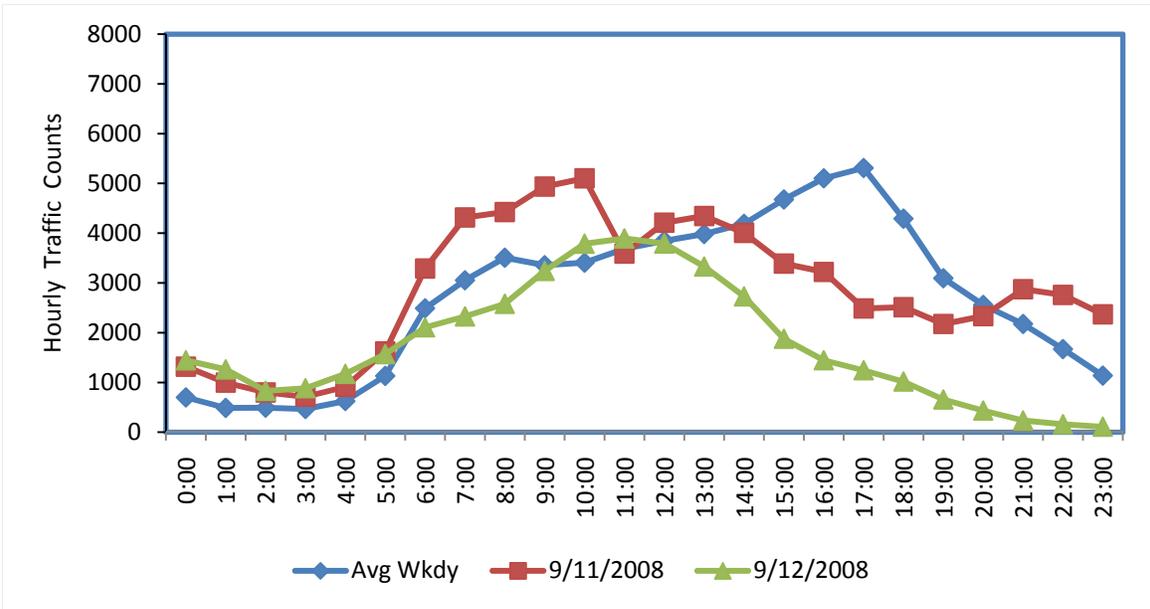


Figure 6-11: Northbound I-45 Hourly Volumes in Conroe, TX

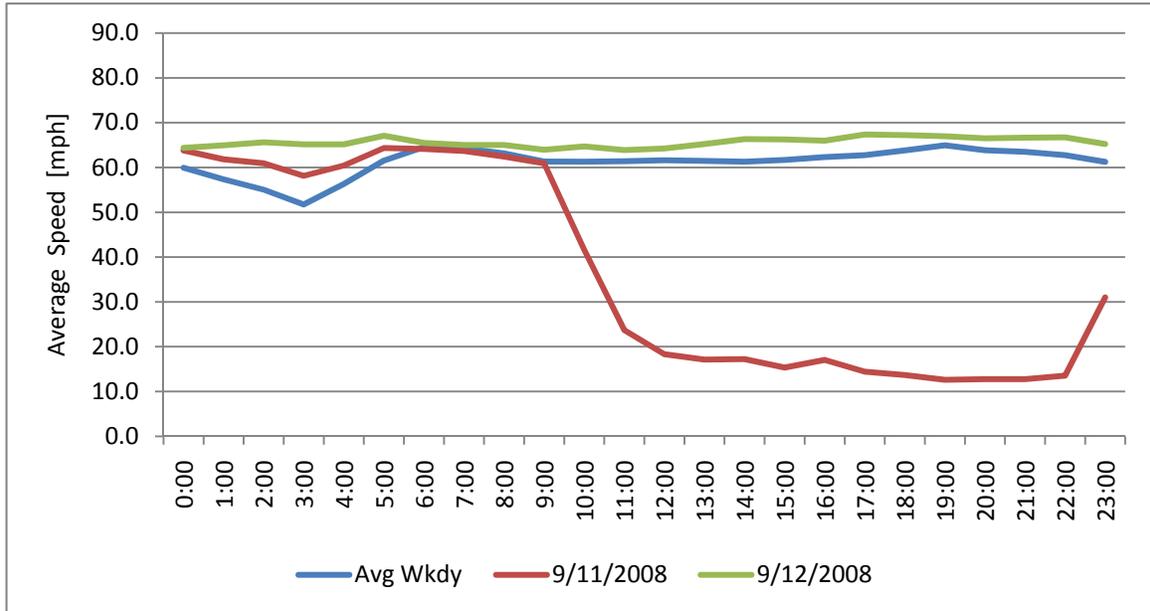


Figure 6-12: Northbound I-45 Hourly Travel Speeds in Conroe, TX

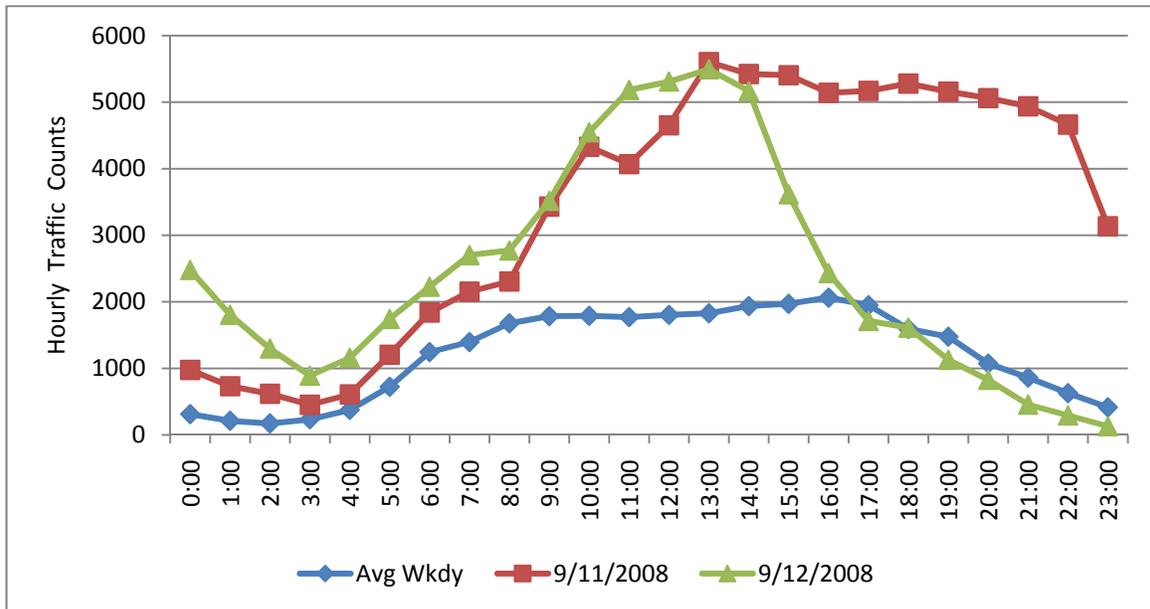


Figure 6-13: Westbound US 290 Hourly Volumes at Hempstead, TX

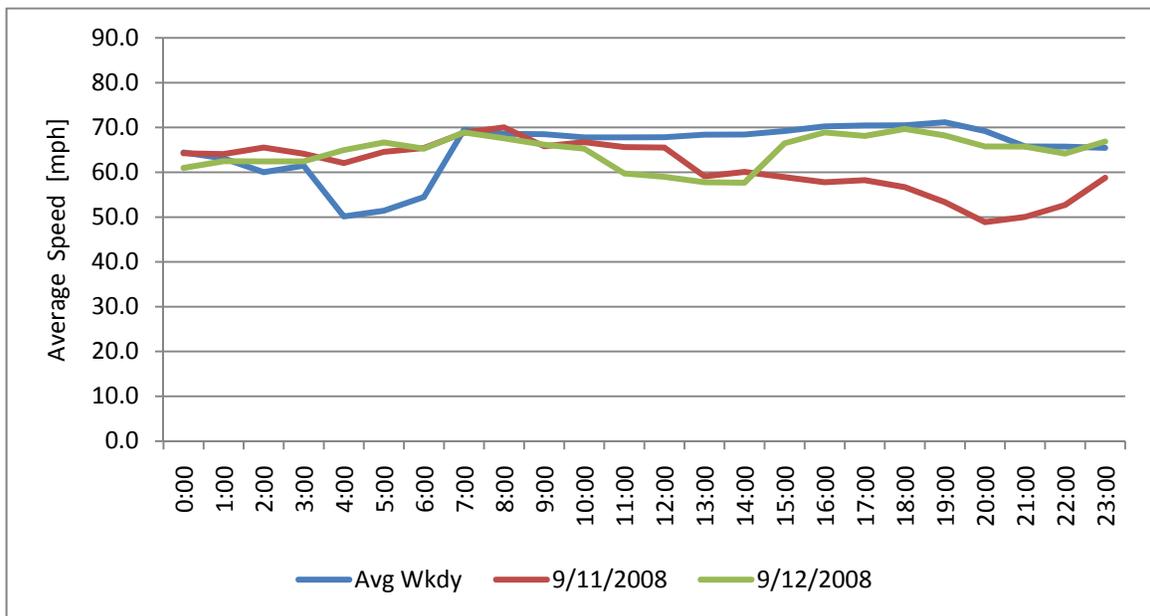


Figure 6-14: Westbound US 290 Hourly Travel Speeds at Hempstead, TX

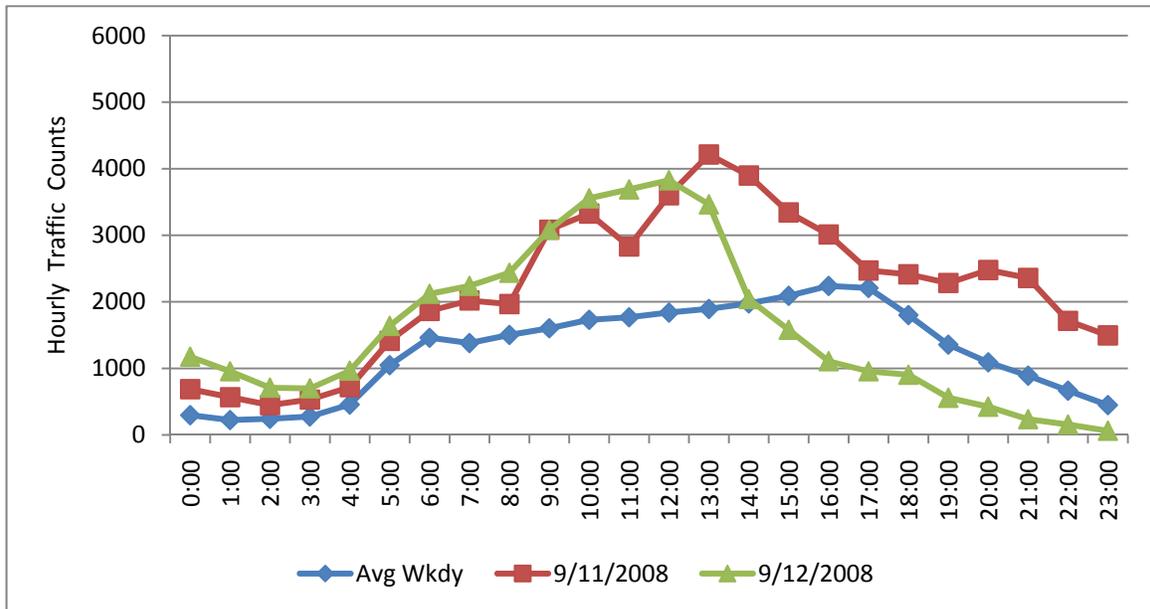


Figure 6-15: Westbound I-10 Hourly Traffic Volumes at Katy, TX

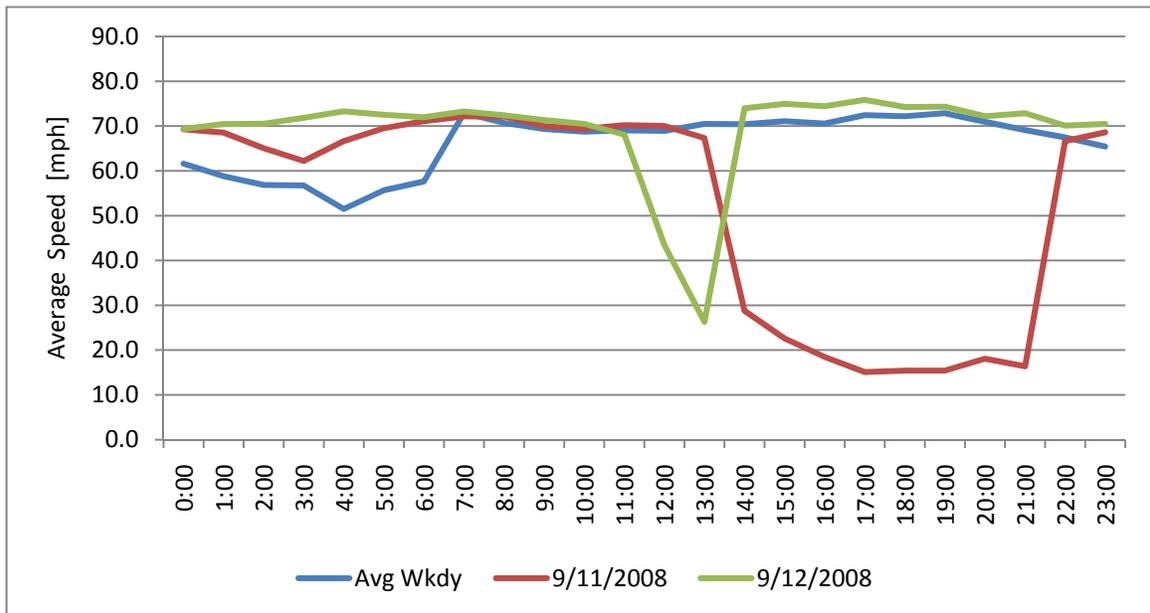


Figure 6-16: Westbound I-10 Hourly Travel Speeds at Katy, TX

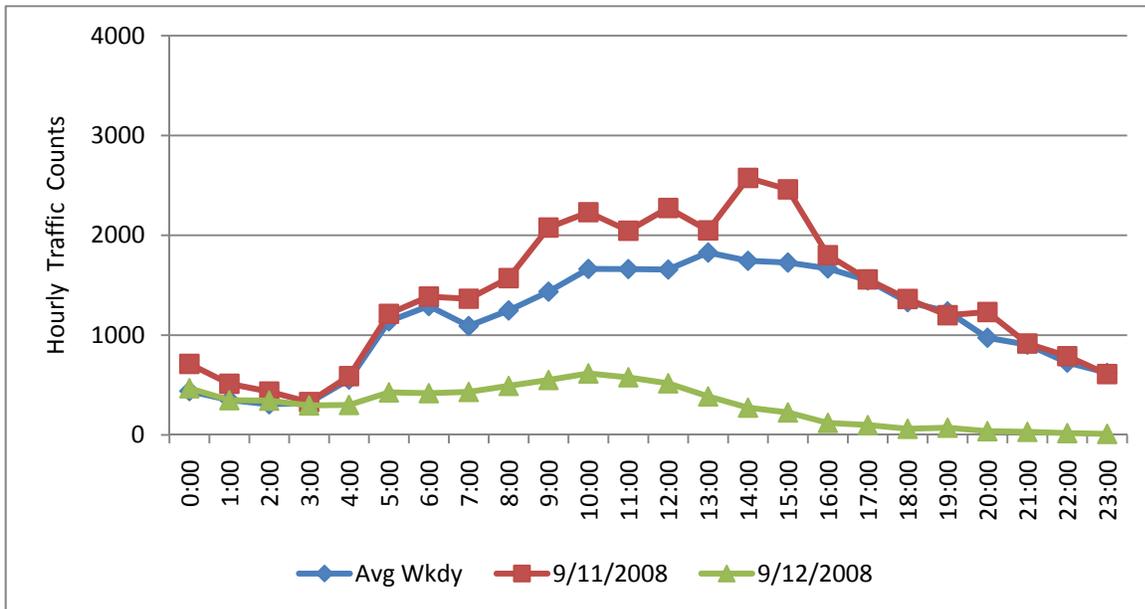


Figure 6-17: Eastbound I-10 Hourly Traffic Volumes at Anahuac, TX

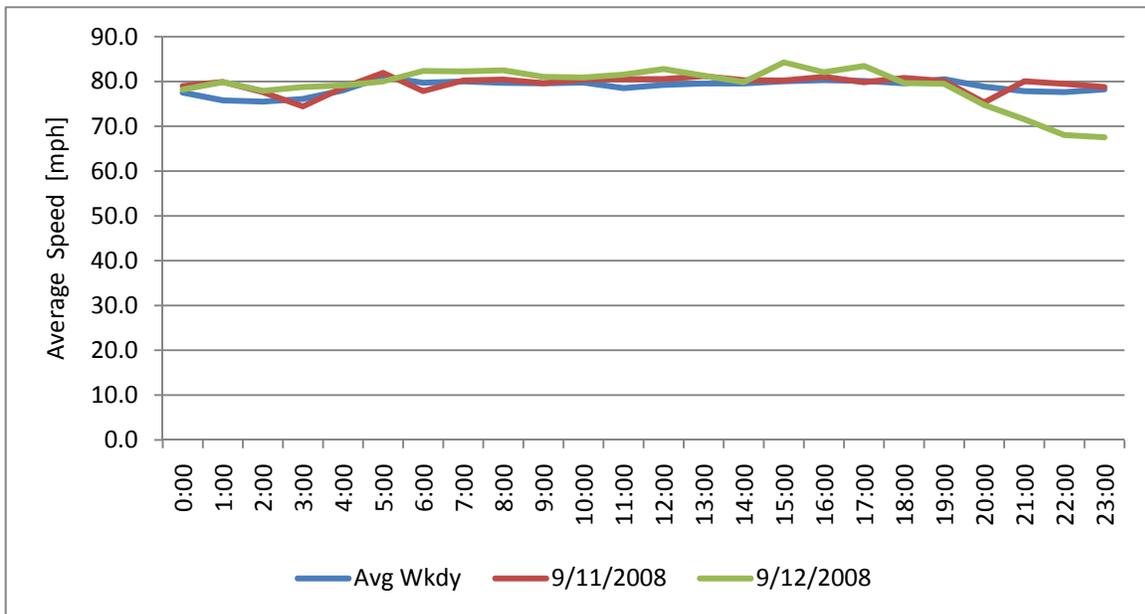


Figure 6-18: Eastbound I-10 Hourly Travel Speeds at Anahuac, TX

6.4.3 CONGESTED ROUTES AND SIGNIFICANT DELAYS

The main routes for the Houston area are IH-45 and IH-10 and to a lesser extent US 290. For the Hurricane Ike event, the primary routes were the IH-45 and IH-10 which did not experience any major delays beyond the estimated delay of one hour at the locations where these freeways reduce to 2 lanes in each direction. The key congestion areas were along IH-45 in the Conroe area where the interstate reduces from 4 travel lanes in each direction to 2 travel lanes in each direction. The same type of congestion occurred on IH-10 at Brookshire to the west of town, where IH-10 reduces from three lanes in each direction to two lanes in each direction.

Galveston, Brazoria, Matagorda, and Chambers Counties stated they had little or no real traffic issues. Harris County experienced some heavy congestion during rush hour along IH-45. Orange County stated they experienced a bottleneck at US 59 and US 69 where the number of lanes drops from two lanes to one lane. In addition, Orange County experienced congestion at the interchange of US 96 and SH 62, and also along SH 87. Jefferson County experienced congestion on most of their evacuation routes, and specifically identified a bottleneck in Beaumont where IH-10 merges with US 96. It should be noted that Galveston County stated they applied previous lessons learned from Hurricane Rita in developing their evacuation routes and procedures.

Figure 6-19 shows the traffic congestion that occurred at 2:00 PM which highlights the congestion that the evacuation traffic experienced. 2:00 PM was selected as it shows what the typical weekday traffic would be like without the impacts of the evening rush hour. Figures 6-20 through 6-23 were produced by Houston TranStar and show the impact on the major routes and the impact to travel speeds on the routes when compared to a typical weekday.

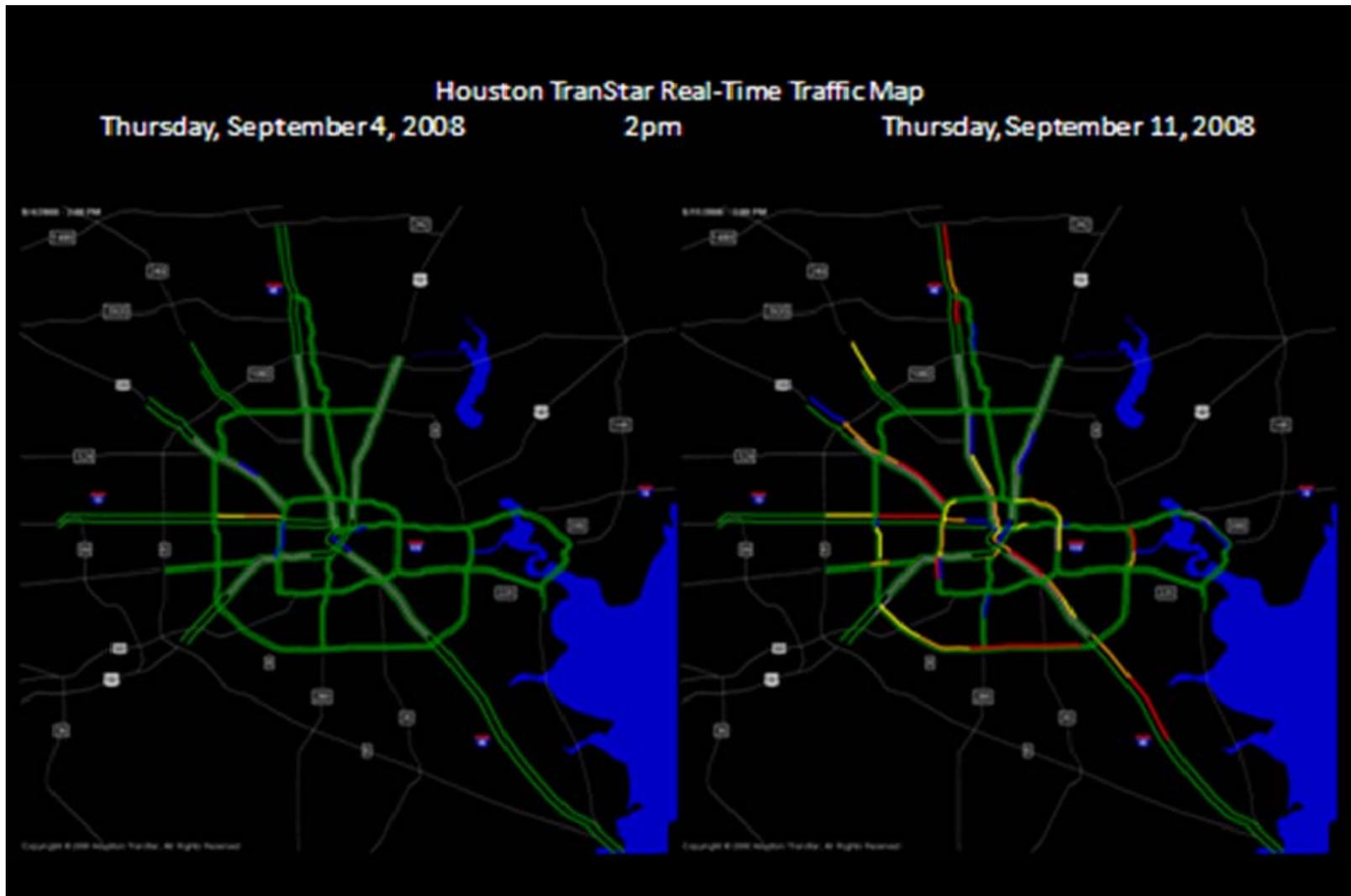


Figure 6-19: Congestion on the Major Freeways during Hurricane Ike Evacuation

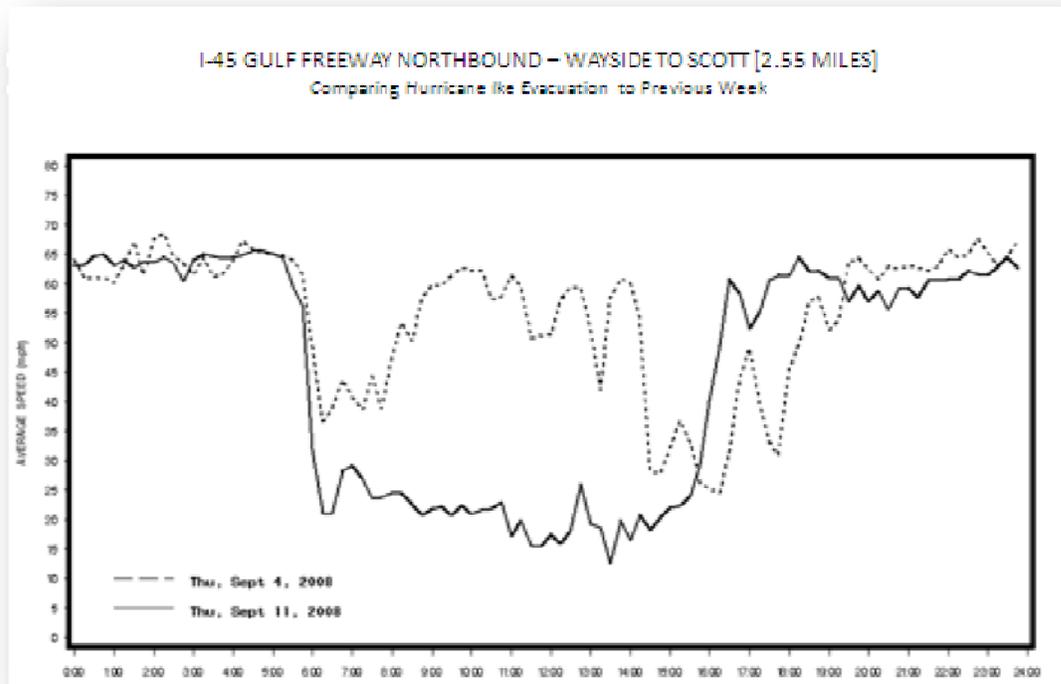


Figure 6-20: Northbound I-45 Travel Speed leading into Houston

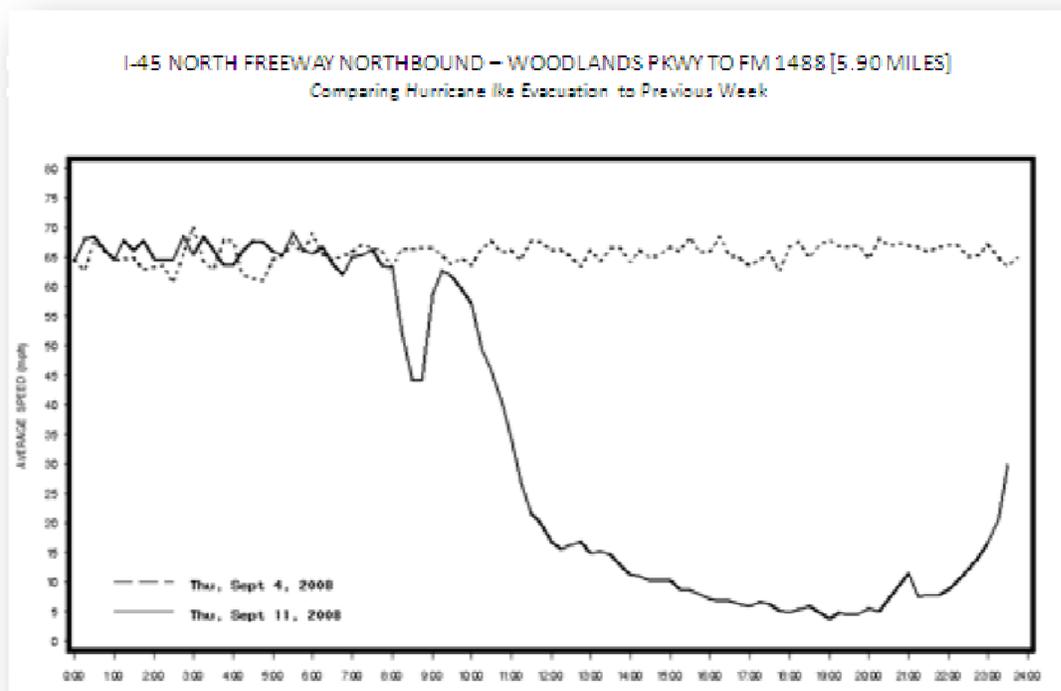


Figure 6-21: Northbound I-45 Travel Speeds leaving Houston

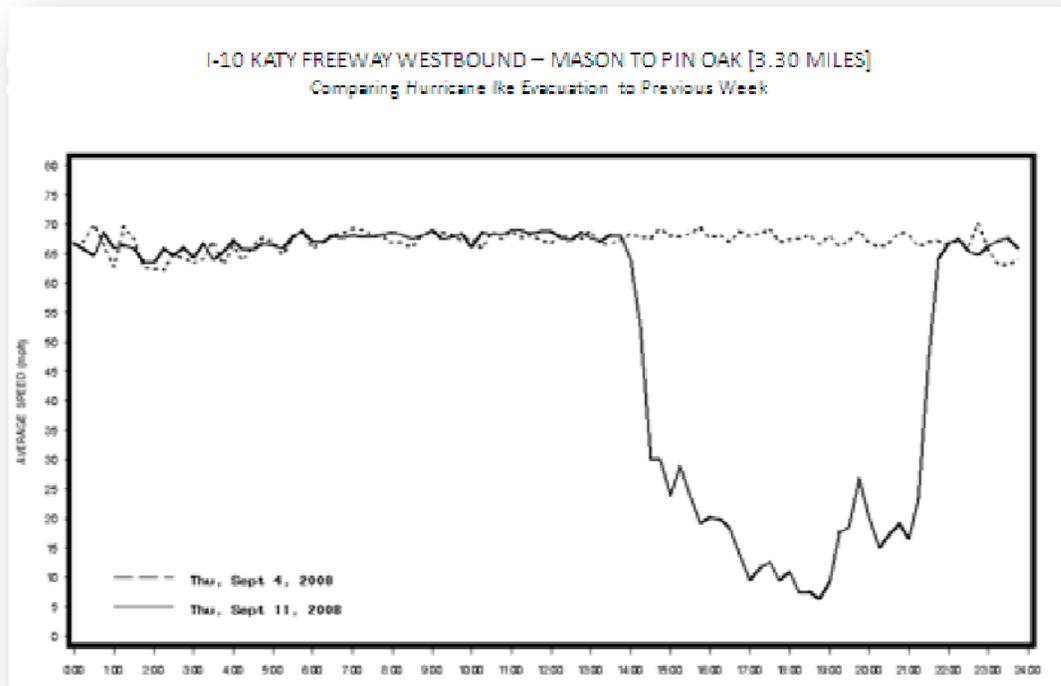


Figure 6-22: Westbound I-10 Travel speeds leaving Houston at Katy, TX

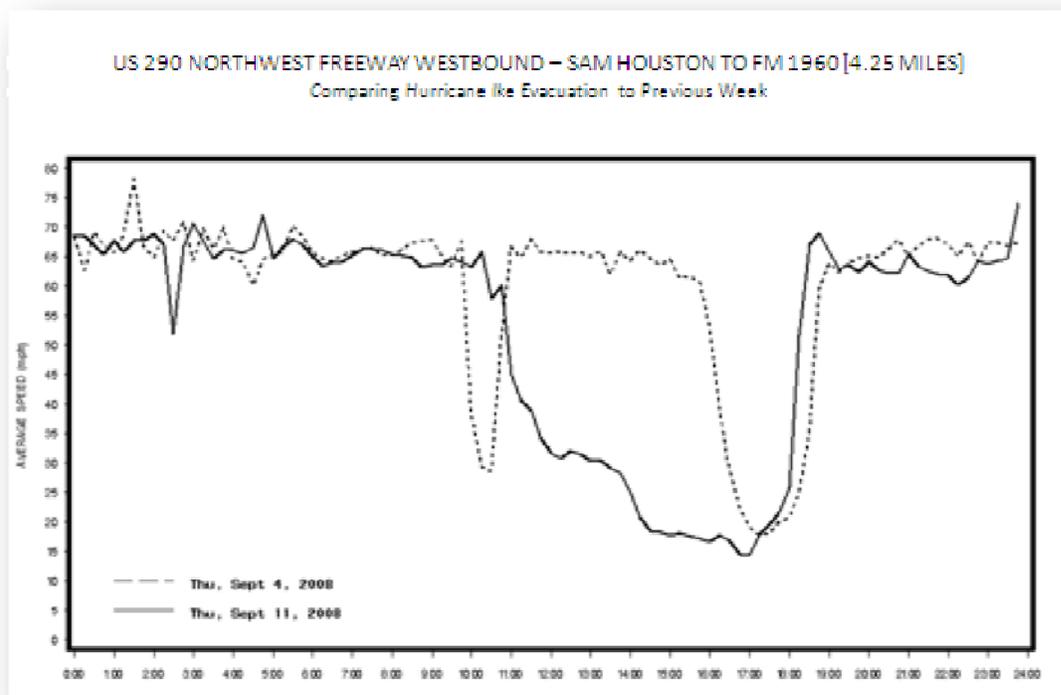


Figure 6-23: Westbound US 290 Travel Speeds leaving Houston

Based on the travel speeds data for September 11, 2008, the impacts of congestion due to the evacuation can be seen along each corridor. IH-45 and IH-10 became severely congested for long periods of time during the primary evacuation times. Some of this is the “typical rush hour traffic” and the rest is the additional evacuation traffic. It is noted that US 290 did suffer some congestion as the other corridors, but appears to correspond to the normal periods of congestion for this corridor.

6.4.4 OTHER TRAFFIC CONTROL MEASURES AND ISSUES

Additional police officers were dispatched to key signalized intersections to help with the traffic flow. Apart from the additional police officers, no other traffic control measures such as contra-flow lanes were used. Figure 6-24 shows the locations of message signs along the Houston areas freeways that were used to convey messages to the evacuating public.

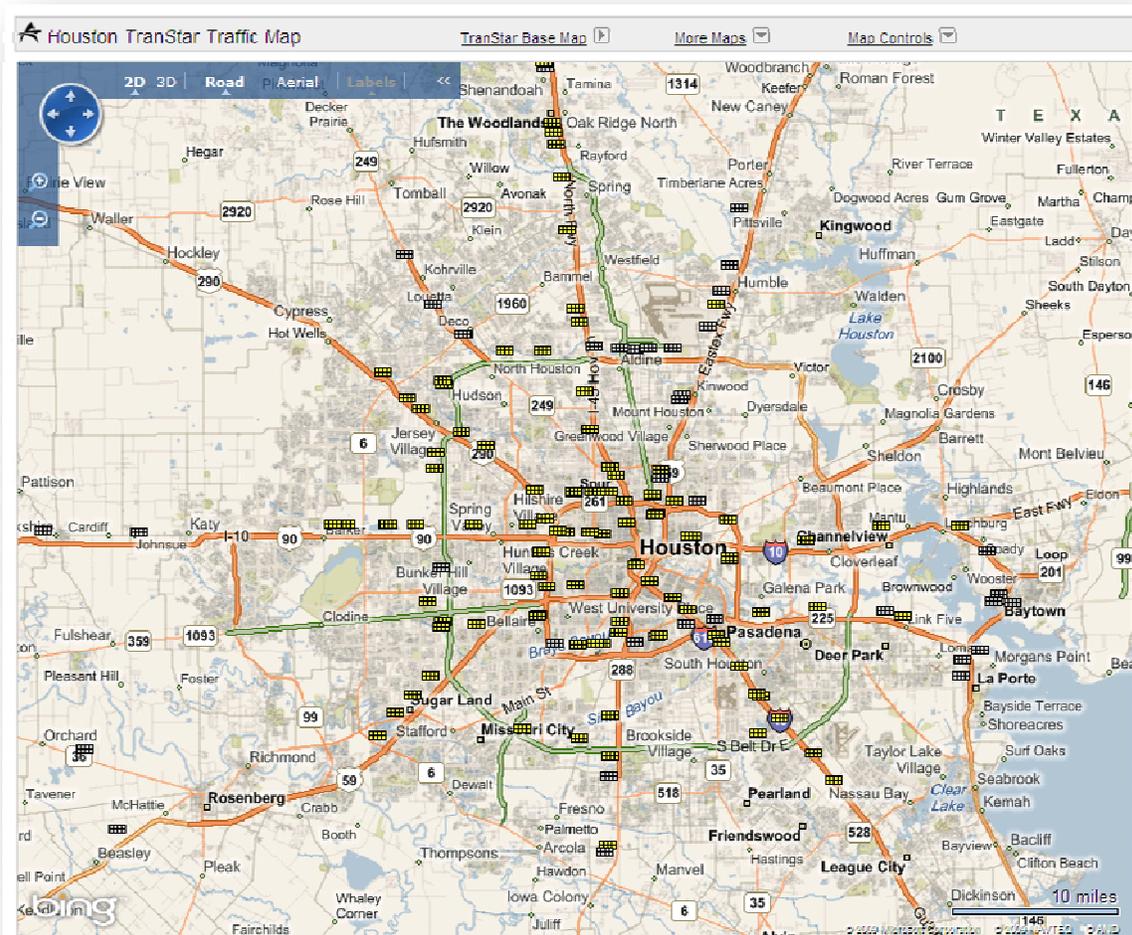


Figure 6-24: Changeable Message Board Sign Locations
(http://traffic.houstontranstar.org/layers/layers_ve.html?&inc=true&rc=true)

The main traffic control issues were associated with the side streets and the signal progression. Better coordination with the local jurisdictions would be helpful as they control the individual traffic signals within their municipal limits. If preference to the evacuating traffic would be given on arterials, then some progression could occur.

Each county had their own suggestions for improving congestion along the advocated evacuation routes. Matagorda, Brazoria, and Galveston Counties agreed that additional roadway improvements along the evacuation routes would help alleviate congestion. Orange and Harris Counties identified the need for improved evacuation route status information. Harris County would like an updated HES which incorporates the zip-zone evacuation map.

6.4.5 DURATION AND LOCATION OF CONGESTION

Voluntary and Recommended Evacuation Orders were given on Wednesday, September 10, 2008 for Brazoria, Chambers and Galveston Counties. By the morning of Thursday, September 11, 2008, the majority of coastal counties had issued Mandatory Evacuation Orders. As the Evacuation Orders were issued, the travel speeds along the evacuation routes decreased. The change in travel speeds is particularly pronounced in the Figure 6-21 (Northbound I-45 Travel Speeds leaving Houston). The primary routes which experienced congestion were I-45 and US 290. In addition, the Sam Houston Toll Way on the south side of the metropolitan area experienced some congestion as shown in Figure 6-25. The reason the Sam Houston Toll Way experienced congestion was because evacuating traffic utilized the Sam Houston Toll Way as an alternate route versus traveling through the urban areas. The Sam Houston Toll Way is therefore known as a route for northbound traffic coming up from Brazoria and Galveston to go around the metro area. The Harris County Toll Road Authority (HCTRA) also suspends tolls during an evacuation. Figure 6-25 shows this congestion well and also documents when it started and ended which supports the estimated clearance time of six hours.

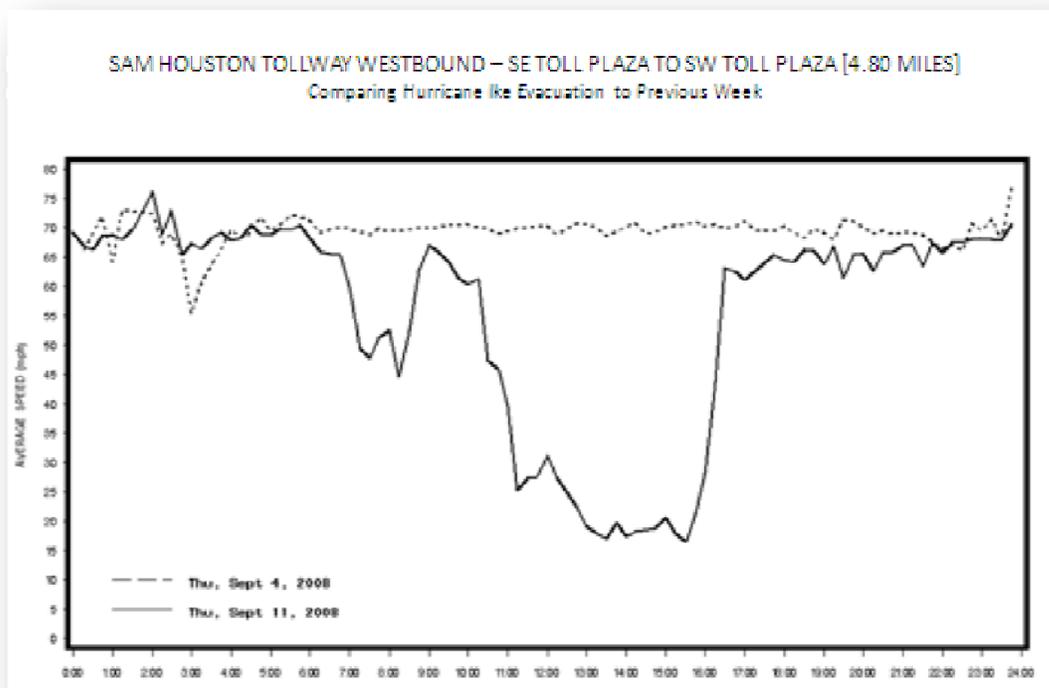


Figure 6-25: Sam Houston Westbound congestion during Hurricane Ike evacuation

6.4.6 CLEARANCE TIMES

Table 6-4 presents the Evacuation Time Estimates (ETEs) as obtained from the “*Hurricane Evacuation Time Estimates for the Texas Gulf Coast*” by Lindell, Prater, and Wu, published in March, 2002. Clearance times were generated by the Empirically Based Large-scale Evacuation time estimate Method (EMBLEM).

Both the Matagorda HES and the Lake Sabine HES derive their respective ETEs from clearance times developed using EMBLEM and shown in the “*Hurricane Evacuation Time Estimates for the Texas Gulf Coast*” by Lindell, Prater, and Wu, published in March, 2002. It should be noted that the clearance times in the Houston/Galveston HES, updated in 2004, do not reflect the ETEs presented in the Lindell, Prater, and Wu study nor do they represent the evacuation zones identified by the zip-zone evacuation maps. The zip-zone evacuation zones are somewhat similar to the 2004 updated USACE Galveston/Houston HES evacuation zones but represent a larger population due to the expansion of 2004 USACE HES evacuation zone boundaries to align with established postal zip-code boundaries. The 2004 USACE HES updated clearance times were generated based on differing intensity strengths of hurricanes, levels of background traffic, and the rapidity of response by evacuees, and different tourist occupancy levels. Clearance times range from 9 and half hours to 26 hours for all counties in the Galveston-Houston region. Table 6-7 presents the hurricane evacuation clearance times developed for the Galveston Region as part of the HES Transportation Analysis. Table 6-8 compares the estimated clearance times in the HES with the observed clearance times reported in the interview questionnaires.

Table 6-6: Evacuation Time Estimates from Lindell, Prater and Wu, 2002

Matagorda Study Area					
	CAT1	CAT2	CAT3	CAT4	CAT5
MSA1: Calhoun/Victoria	8	8	9	10	10
MSA2: Calhoun/Jackson	7	8	8	8	8
MSA3: Matagorda West	7	8	8	9	9
MSA4: Matagorda East	7	8	8	8	8
MSA5: Victoria	n/a	7	7	7	7
Houston/Galveston Study Area					
	CAT1	CAT2	CAT3	CAT4	CAT5
GSA1: Brazoria	7	9	13	15	15
GSA2: Galveston West/Harris South	14	20	28	32	33
GSA3: Harris Central	7	7	9	10	10
GSA4: Harris East	8	12	17	19	20
Lake Sabine Study Area					
	CAT1	CAT2	CAT3	CAT4	CAT5
SSA1: Chambers West	7	7	7	8	8
SSA2: Chambers East/Galveston East	10	13	17	19	19
SSA3: Hardin	7	7	7	7	7
SSA4: Jasper	7	7	7	7	7
SSA5: Jefferson/Orange West*	14	20	29	33	34
SSA6: Liberty	n/a	7	7	7	7
SSA7: Newton	n/a	n/a	7	9	9
SSA8: Orange East*	7	7	10	11	12

*Fall ETEs for SSA5 and SSA8 can be reduced by 0.5 hour because tourist occupancy is assumed to be reduced from 100 percent to 50 percent.

Table 6-7: Evacuation Clearance Times from the 2004 Houston/Galveston HES

	Low Seasonal Occupancy		High Seasonal Occupancy	
	Light Background Traffic	Heavy Background Traffic	Light Background Traffic	Heavy Background Traffic
<u>Category 1 - 2 Hurricane</u>				
Rapid Response	9 ½	10	11 ¼	11 ¾
Medium Response	10 ½	11 ¼	12 ¼	13
Long Response	11 ½	12 ½	13 ¼	14
Worst individual household commute time – 6 hours				

	Low Seasonal Occupancy		High Seasonal Occupancy	
	Light Background Traffic	Heavy Background Traffic	Light Background Traffic	Heavy Background Traffic
<u>Category 3 Hurricane</u>				
Rapid Response	16	16 ¾	17 ¾	18 ¼
Medium Response	16 ½	17 ½	18 ¼	19
Long Response	17 ¾	18 ¾	19 ½	20 ½
Worst individual household commute time – 12 ½ hours				

	Low Seasonal Occupancy		High Seasonal Occupancy	
	Light Background Traffic	Heavy Background Traffic	Light Background Traffic	Heavy Background Traffic
<u>Category 4 – 5 Hurricane</u>				
Rapid Response	22	22 ¼	23 ¾	24
Medium Response	22 ¼	22 ½	24	24 ¾
Long Response	23 ½	24 ½	25	26
Worst individual household commute time – 18 ½ hours				

Note: Commute time refers to how long one vehicle may be caught in traffic making their evacuation movement

6.4.7 USEFULNESS OF EXISTING HURRICANE EVAUCATION STUDIES

While most the counties responding to the Hurricane Ike Post Storm Assessment Questionnaire stated that the HESs provided sufficient ETEs, upon further investigation, ETEs for certain counties were not adequate for the threat. For example, Jefferson County stated that their respective ETE was 33 hours. Based on the Lake Sabine HES and the “*Hurricane Evacuation Time Estimates for the Texas Gulf Coast*” report, 33 hours would be the clearance time for a Category 4 hurricane. At the time evacuation orders were issued, Hurricane Ike was predicted to be a Category 3 hurricane at landfall. The actual ETE for a Category 3 hurricane in Jefferson County would be 29 hours. Therefore, Jefferson County’s observed clearance time of 39 hours would indicate that the clearance time in the HES was not adequate for the observed clearance time during Hurricane Ike. Table 6-8 compares the estimated clearance times in the HES with the observed clearance times reported in the interview questionnaires.

Similarly, local emergency management officials in other counties reported having used the clearance times provided in their respective HESs. However, it appears that many had timed their evacuation decision based on clearance times for various storm categories (Cat 2, Cat 3 and even Cat 4 storms). A common practice has been to plan for one storm category above the expected storm intensity at landfall. Even so, the clearance times reported by local emergency management agencies to be sufficient for the threat, may not have been sufficient if based upon an ETE for a more intense storm.

In addition, clearance times are created in conjunction with the HES designated evacuation zones, which many counties did not use to target areas of evacuation. The decision to evacuate areas other than those outlined in the HES, whether that decision is political or made by emergency management, impacts the clearance time estimate and decreases its effectiveness as a decision assistance tool. Before each hurricane season, education (or re-education) and training is needed for local officials on the HES products, specifically the concept of clearance time development, and the impact that subjective interpretation of those clearance times has on the evacuation process.

Beyond the HESs, the experiences and lessons learned from the Hurricane Rita evacuation were also very helpful during Hurricane Ike. Improved traffic control measures, developed in the aftermath of Rita, were implemented during Ike and made for a more efficient and successful evacuation. For example, the Harris County Hurricane Evacuation Plan called for several intersections along the evacuation routes to be controlled by police officers to assist in the traffic flow. Unlike for Hurricane Rita, the officers at the intersections along the evacuation routes were in place for Hurricane Ike. Also, TXDOT had implemented towing procedures for Hurricane Ike that removed disabled vehicles quickly when they were on evacuation routes.

In summary, the existing HESs were helpful to county officials in the decision making process. However, lessons learned from Hurricane Rita were a larger contributing factor in more seamless evacuation efforts during Hurricane Ike. Much of the general public residing outside of a designated evacuation zone that evacuated during Hurricane Rita (referred to as “shadow evacuees”) heeded the recommendation to shelter in place during Hurricane Ike. Additionally, a portion of the shadow evacuees that did evacuate for Hurricane Ike did so after the majority of evacuees originating from a designated evacuation zone had cleared the area. Also, a number of both shadow evacuees and those within evacuation zones left the area prior to evacuation orders being issued. All of these factors helped reduce the amount of traffic along the evacuation routes.

Table 6-8: HES Evacuation Clearance Times versus Observed Clearance Times

HES Study Area	Study Date*	County	HES Clearance Times (in hours)			Observed Clearance Times	Notes
			Cat 2	Cat 3	Cat 4		
Lake Sabine Study Area (SSA)	2002	Chambers	13	17	19	12	Chambers County estimated clearance time based on Category 4 storm (19 hrs). Reported that the clearance time was sufficient for the threat.
		Hardin	7	7	7	n/a	No Evacuation for Ike
		Jasper	7	7	7	8	
		Jefferson/Orange West	20	29	33	39(Jefferson)/24 (Orange)	Jefferson County reported that their observed clearance time was 39 hrs. Reported that the evacuation order was issued too late and that a countywide evacuation process normally takes over 48 hrs. Orange County reported that their HES clearance time was not sufficient for the threat (Cat 2 storm). They estimated their clearance time based on Category 4 storm (33).
		Liberty	7	7	7	<12	Liberty County reported the longest commute time was approximately 3-4 hours. Believed that the clearance time was sufficient for the threat.
		Newton	n/a	7	9	8	
		Orange East	7	10	11	See Orange West	
Houston-Galveston Study Area (GSA)	2004	Houston/Galveston**	12	18	24	36(Harris)/48(Galveston)	Harris County reported that they did not utilize the predicted clearance time in the HES. Galveston County reported that the HES clearance time was 36 hours but started the evacuation at H-48 to ensure sufficient time.
		Brazoria	9	13	15	36	
	2002	Galveston West/ Harris South	20	28	32	See Houston/ Galveston	
		Harris Central	7	9	10		
		Harris East	12	17	19		
Matagorda (MSA)	2002	Matagorda	8	8	9	10	Matagorda County reported their predicted clearance time of 12 hrs was sufficient for the threat.
Not included in any prior HES	n/a	Fort Bend	n/a	n/a	n/a	12	Fort Bend County reported the evacuation of the Richmond State School took approximately 12 hrs.
		Polk	n/a	n/a	n/a	2-3	Small special needs populations vulnerable to high winds were evacuated to safer locations.
		Tyler	n/a	n/a	n/a		
		San Jacinto	n/a	n/a	n/a		

*Lindell, M.K., Prater, C.S. & Wu, J.Y. (2002). *Hurricane Evacuation Time Estimates for the Texas Gulf Coast*. College Station TX: Texas A&M University Hazard Reduction & Recovery Center and Galveston Region Hurricane Transportation Analysis (2004).

**Assumes Medium Response Rate, Medium Seasonal Occupancy and High Background Traffic

6.4.8 CRITICAL TRANSPORTATION NEEDS (CTN)

In the aftermath of Hurricane Katrina, numerous studies were undertaken; many with Congressional mandates, to examine what could be done to better serve the needs of transportation-dependent and other vulnerable groups during emergency evacuations. Examples include “The Role of Transit in Emergency Evacuation” (Transportation Research Board of the National Academies 2008), “Catastrophic Hurricane Evacuation Plan Evaluation” (U.S. Department of Transportation and U.S. Department of Homeland Security 2006), “Transportation Equity in Emergencies” (Federal Transit Administration 2007), and the “National Study on Carless and Special Needs Evacuation Planning” (Renne, Sanchez et al. 2008). While their foci differed somewhat, all identified weaknesses in current plans. In particular, plans in the Gulf Coast region were described as not being well developed, both for people living at home and for those in institutions (U.S. Department of Transportation and U.S. Department of Homeland Security 2006). Most focused on solutions – finding ways to better evacuate transportation-dependent citizens, including those with special physical and medical needs.

The Texas Health and Human Services Commission maintains a Transportation Assistance Registry of individuals requesting assistance to evacuate during a hurricane event. The 2-1-1 system allows individuals to call and register for assistance during a hurricane evacuation. The following conditions qualify an individual for transportation assistance:

- A person with a disability or special health care need who requires assistance to evacuate.
- A person who cannot drive and cannot arrange transportation.
- A person who does not have a vehicle and cannot arrange transportation.

Individuals who require transportation assistance are a subset of “special needs populations” as they are defined in the National Response Framework (NRF). The NRF defines special needs populations as: *“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, and medical care. Individuals in need of additional response assistance may include those who have disabilities; who live in institutionalized settings; who are elderly; who are children; who are from diverse cultures; who have limited English proficiency or are non-English speaking; or who are transportation disadvantaged.”*

Based on a review of the responses provided in the Hurricane Ike Post Storm Assessment questionnaires, it was determined that the all of the counties and cities that were interviewed utilized buses to transport their respective transportation assistance populations. For certain cases of disabled and health care needs registrants where buses could not be utilized, disabled and certain health care needs registrants, ambulances were utilized for transport. If during an evacuation event, the local county cannot find and employ enough buses, the county can contact the State to provide assistance in the form of additional transportation resources.

In addition, most counties reported that their CTN populations were transported according to the PTP system to their respective “Sister City.” Figure 6-26 shows the shelter locations for the State of Texas and highlights the shelter hubs utilized during Hurricane Ike: Huntsville, Bryan/College Station, Austin, Dallas, and Lufkin/Nacogdoches.

6.5 EVACUATION DATA

Some of the most important products developed as a part of the FEMA/USACE hurricane evacuation studies and delivered to local and State officials have been evacuation decision making tools. These tools include maps and tables as well as computer software such as HURREVAC. These products graphically tie together real-time storm characteristics with HES produced hazards, shelter and clearance time data. Their purpose is to give emergency managers a means of retrieving Technical Data Report information without having to dig through a report during an emergency. Evacuation decision tools provide guidance and assistance to decision makers as to when an evacuation should begin relative to a specific hurricane, its associated wind field, forward speed, probabilities, forecast track, and intensity.

The purpose of this section is to summarize how SLOSH and HURREVAC were used to assist emergency management organizations in their evacuation decision process. Additionally, product improvements to enhance the decision making process and any areas where county and local jurisdictions felt that information was lacking are identified. Collected surveys indicate differing response actions during Hurricane Ike. Of the information collected, there were common themes related to a more coordinated effort in evacuation decision making and evacuation communication is recommended. Table 6-9 provides a summary of response and evacuation information collected from each entity.

6.5.1 EVACUATION DECISION MAKING

All participants utilized HES products in their decision making process. The areas targeted for evacuation were decided by local officials based on historic flooding, storm surge maps, FIRM Maps, and historic wind damaged areas. Harris and Galveston Counties also targeted evacuation areas by zip code. Matagorda County reports the areas targeted for evacuation was excessive for the threat; all other survey participants reported the areas targeted in the evacuation orders were sufficient for the threat.

Evacuation orders were issued by emergency management for all coastal counties within the PSA study area in response to Hurricane Ike. Survey information represents a variety of evacuation efforts ranging from mandatory evacuations along the coast to voluntary evacuations for inland counties. Collectively, evacuation orders were issued for mobile homes; islands and beach front properties; flood prone areas; Category 1, 2 and 3 storm surge zones; and general notices issued countywide.

The evacuation orders were distributed in a variety of formats. Collectively, these formats include television, radio, internet, mass email, newspaper, local telephones calling systems, loudspeaker, meetings, mass fax, and other emergency notifications systems unique to each entity. Matagorda County reported challenges in communicating with persons speaking Vietnamese and Cambodian. Other than this report, language barriers were minimal among all surveyed. Language barriers experienced in Matagorda did not hinder evacuation activities.

Evacuation Decision Making Concerns:

- Some counties are not issuing evacuation orders that match the evacuation zones determined in the HES studies. As a result, the evacuation clearance times may not accurately reflect the time needed to evacuate the area under an evacuation order.
- The terminology used to describe evacuation zones is not consistent from county to county.
- Turnover rates in county EMs results in new personnel unfamiliar with HES products.

6.5.2 EVACUATION DECISION PROCESS IMPROVEMENTS

In general, most counties and local jurisdictions use and are satisfied with the HURREVAC program. Many parishes and counties stated that the HURREVAC program was very reliable but that the inland winds predicted were inaccurate to the actual force of the winds inland. Several counties reported using other commercial tracking programs and websites. No counties reported using decision arc systems developed in older HES studies. The evacuation zones developed in the HES studies were not widely used because the zones were hard to disseminate to the public. Most local jurisdictions desire evacuation zone systems that can be easily described over radio and TV to convey to their residents. The low use of evacuation zones by EM officials implies a misunderstanding of how evacuation clearance times are to be used in HURREVAC. There are many unregistered HURREVAC users running older versions of the program. Unregistered users do not get notices of program updates that provide new features which can greatly benefit EM's when making a decision to evacuate.

Additionally SLOSH models and surge maps were consulted by some jurisdictions. Jefferson and Orange counties were still geared up when Hurricane Ike began to threaten the United States because the storm occurred not long after Hurricane Gustav. Unfortunately this also may have contributed to the lack of response by their residents.

6.5.3 DECISION MAKING IMPROVEMENTS

Since evacuation decisions not only affect public safety, but also have political and socio-economic consequences, decision makers are acutely sensitive to the need for making the most appropriate judgments at just the right time. Controversy over evacuation decisions has often been a major issue, as notably evident in the aftermath of Hurricanes Katrina. While emergency management officials have had an assortment of decision making tools or aids available to them for years (such as Decision Arcs and HURREVAC), ongoing calls for more accurate and user-friendly programs, as well as educational tools for elected officials, still exist. As such, the anticipation among local officials for the release of HURREVAC 2010 was heightened.

HURREVAC Recommendations:

- Although the latest version of HURREVAC has features to alert users if they are using an old version, we should still make every effort to insure older versions are updated.
- Increase public awareness, marketing, and training efforts in inland counties to insure that EM's understand the usefulness and benefits of HURREVAC.

In addition to improved decision making tools, officials at the local and State levels would like direct access to and communication with the Hurricane Liaison Team (HLT) at the National Hurricane Center. The rationale for this is primarily threefold; to obtain more timely information than otherwise available, to maintain "personal contact" with the experts, and to be able to ask questions relating to their specific situation or circumstances. Traditionally, such access was available but, more recently; HLT members have not had the ability to contact the locals directly. Throughout the PSA interview process, a great volume of local officials have made requests that they be able to receive calls from HLT during the hurricane threat. Another mechanism, aside from the often technical NHC briefings, to provide "real-time" access and information to the counties is needed.

Table 6-9: Evacuation Decision Process Summary—Hurricane Ike Evacuation Assessment

HES Area	County	Source of Information to Trigger Evacuation	Time Evacuation Order Was Issued	Number Evacuated*	What Study Products/Decision Aids were Used in Decision Making	Was HES Data Used
GSA	Brazoria County	Local Decision in Consult with Regional and State Partners	Voluntary 09/10/08 0700	60,289	HURREVAC, Storm Surge Maps, Clearance Times, SLOSH, Local Hurricane Plan, Evacuation Route Maps	Yes
	Galveston County	Local Decision in Consult with Regional and State Partners	Voluntary 09/10/08 Morning Mandatory 09/11/08 Morning	172,900	HURREVAC, Storm Surge Maps, Clearance Times, SLOSH, Local Hurricane Plan, Evacuation Route Maps	Yes
	Harris County (City of Houston)	Local Decision in Consult with Regional and State Partners	Recommended 09/11/08 Morning	240,000	HURREVAC, Storm Surge Maps, SLOSH, Local Hurricane Plan, Evacuation Route Maps	Yes
SSA	Chambers County	Local Decision in Consult with Regional and State Partners	Voluntary 09/09/08 Morning Recommend 09/10/08 Morning Mandatory 09/11/08 Morning	15,600	HURREVAC, Storm Surge Maps, Clearance Times, SLOSH, Local Hurricane Plan, Evacuation Route Maps	Yes
	Hardin County	No Evacuation Orders	NA	1,800	HURREVAC, Local Hurricane Plan, Evacuation Route Maps	No
	Jasper County	Local Decision in Consult with Regional and State Partners	Mandatory 09/11/08 Afternoon	7,120	HURREVAC, Local Hurricane Plan, Evacuation Route Maps	No
SSA	Jefferson County	Local Decision in Consult with Regional and State Partners	Mandatory 09/11/08 Morning	138,600	HURREVAC, Storm Surge Maps, Clearance Times, SLOSH, Local Hurricane Plan, Evacuation Route Maps	Yes

HES Area	County	Source of Information to Trigger Evacuation	Time Evacuation Order Was Issued	Number Evacuated*	What Study Products/Decision Aids were Used in Decision Making	Was HES Data Used
	Liberty County	Local Decision in Consult with Regional and State Partners	Voluntary 09/10/08 Morning Mandatory 09/11/08 Morning	21,000	HURREVAC, Local Hurricane Plan, Evacuation Route Maps	No
	Newton County	Local Decision in Consult with Regional and State Partners	Mandatory 09/11/08 Afternoon	3,000	HURREVAC, Storm Surge Maps, Local Hurricane Plan, Evacuation Route Maps	No
	Orange County	Local Decision in Consult with Regional and State Partners	Mandatory 09/11/08 Morning	63,700	HURREVAC, Storm Surge Maps, Clearance Times, SLOSH, Local Hurricane Plan, Evacuation Maps	Yes
MSA	Matagorda County	Local Decision in Consult with Regional and State Partners	Mandatory 09/11/08 Morning	18,600	HURREVAC, Local Hurricane Plan, Evacuation Route Maps	No
NA	Polk County	No Evacuation Orders	NA	4,500	Undetermined	N/A
	San Jacinto County	No Evacuation Orders	NA	500	Undetermined	N/A
	Tyler County	No Evacuation Orders	NA	7,000	Undetermined	N/A

*Based on percentages shown in Table 6-1 except for the Non-HES Counties of Polk, Tyler and San Jacinto.

6.5.4 EVACUATION DECISION MAKING, HES CLEARANCE TIMES AND TROPICAL STORM FORCE (TSF) WINDS

Tables 6-10 and Table 6-11 provide a review of information yielded from HURREVAC and applicable clearance times extracted from the Galveston, Lake Sabine and Matagorda HESs. Information such as the location of the storm center, the TSF winds, the closest point of approach of the eye from each county and the timing of these hazards were derived from the HURREVAC timing applications. This information was compared to the HES clearance times and the timing of evacuation decisions of each county obtained from the questionnaire responses. This data was obtained from Hurricane Ike advisories #37 and #41 and used to interpret the forecast and possible times by which the seven coastal counties in the Hurricane Ike assessment area would be affected. Figures 6-27 and 6-28 are screen shots from HURREVAC 2000 for Hurricane Ike Advisory #37 and #41, respectively. These two advisories were selected because they were the latest official advisories available to the counties during the time frame the evacuation decisions were made. Except for Brazoria County, that reported a specific evacuation decision time of 0700 CDT on September 10, 2008, questionnaire responses from the remaining coastal counties indicated that the evacuation decisions were made in the morning. The official timing of evacuation orders were verified with Galveston (http://www.srh.noaa.gov/data/warn_archive/HGX/HLS/) and Lake Charles (http://www.srh.noaa.gov/data/warn_archive/LCH/HLS/) NWS Hurricane Local Statements (HLS). These tables will serve as a frame of reference for the comparison of the use of HES clearance times in comparison to the forecasted arrival of TSF winds.

The generally accepted goal among hurricane vulnerable jurisdictions is to complete evacuations before the onset of pre-landfall hazards such as tropical storm force (TSF) winds. In comparing the time when the decision to evacuate was made to the forecasted arrival of TSF winds in conjunction with current HES clearance times, assumptions can be reached for each county as to the timeliness of their decisions versus the time needed to complete the evacuation.

Generally, the tables illustrate that the coastal counties in the PSA study area made their evacuation decisions in a timely manner. Voluntary and Recommended evacuation decisions that were made on Wednesday, September 10, 2008 in Brazoria, Chambers and Galveston Counties, conservatively provided approximately two days of evacuation before the forecasted arrival of TSF winds. On the morning of Thursday, September 11, 2008, the majority of coastal counties implemented a mandatory evacuation. The timing of this evacuation decision was sufficient for most counties to complete the evacuation within the specified HES clearance times (whether based on a Cat 3 or Cat 4) and before the arrival of TSF winds. However, in Jefferson and Orange Counties, the HES clearance times for a Category 3 storm exceeded the hours after the evacuation decision before the arrival of TSF winds. In their PSA questionnaire responses, both Jefferson and Orange County reported having insufficient time to evacuate. Table 6-11 confirms that the timing of the evacuation decisions in these counties did not allow for a complete evacuation before the arrival of TSF winds.

Table 6-10: Hurricane Ike Advisory 37 Decision Making Data

County	Distance Storm to County (Statute Miles)		Forecast		Forecast			HES / HURREVAC				Other Data		
	TSF Winds	Storm Center	Arrival of TSF Winds	Hours Away	CPA ¹	Time of CPA	Hours Away	Hours until Decision Time ²		HES Clearance Time (Hours) ³		Time Evacuation Order was Issued	Evacuation Order	Hours Between Evacuation Order and Forecasted Arrival of TSF Winds
								Cat 3	Cat 4	Cat 3	Cat 4			
Brazoria	515	654	9/12 11C	55	77	9/13 08C	76	37	31	18	24	9/10 12C	Voluntary	47
Chambers	497	636	9/12 12C	56	143	9/13 10C	78	39	37	17	19	9/10 12C	Recommended	48
Galveston	503	642	9/12 11C	55	121	9/13 07C	75	37	31	18	24	9/10 12C	Voluntary	47
Harris	525	664	9/12 14C	58	89	9/13 12C	80	40	34	18	24	n/a	n/a	n/a
Jefferson	477	616	9/12 14C	58	175	9/13 08C	76	29	25	29	33	n/a	n/a	n/a
Matagorda	527	666	9/12 11C	55	35	9/13 07C	75	47	46	8	9	9/10 12C	Mandatory	47
Orange	479	622	9/12 11C	55	204	9/13 11C	79	26	22	29	33	n/a	n/a	n/a

1. Closest Point of Approach (CPA) in statute miles using HURREVAC 2000. CPA refers to the eye or center of the storm.
2. The order to evacuate should be announced to the public by the indicated Decision Time to allow enough time to complete the evacuation before the arrival of TSF winds. HURREVAC calculates a Decision Time using the forecasted arrival of TSF winds and the estimated Clearance Time for a scenario from the study area HES. Decision Times can be modified based on storm category (selecting higher category than forecasted), tourist occupancy, background traffic, response time, and by adding an additional safety buffer (up to 10 hours).
3. HES Clearance Times for the Houston-Galveston Study Area reflect the latest FEMA/USACE study times for the areas which correspond to smaller evacuation zones than the zip-zones used during Hurricane Ike. Clearance Times for counties in the Galveston Study Area (Brazoria, Galveston and Harris) assume Medium Response Rate, Medium Seasonal Occupancy and High Background Traffic and no additional safety buffer. For Orange County, the Orange West clearance times were selected over Orange East for inclusion in the table as they are the longer of the two.

Table 6-11: Hurricane Ike Advisory 41 Decision Making Data

County	Distance Storm to County (Statute Miles)		Forecast		Forecast			HES / HURREVAC				Other Data		
	TSF Winds	Storm Center	Arrival of TSF Winds	Hours Away	CPA ¹	Time of CPA	Hours Away	Hours until Decision Time ²		HES Clearance Time (Hours) ³		Time Evacuation Order was Issued	Evacuation Order	Hours Between Evacuation Order and Forecasted Arrival of TSF Winds
								Cat 3	Cat 4	Cat 3	Cat 4			
Brazoria	304	474	9/12 12C	50	0	9/13 06C	32	32	26	18	24	9/11 08C	Mandatory	28
Chambers	286	455	9/12 10C	53	30	9/13 09C	30	36	34	17	19	9/11 12C	Mandatory	22
Galveston	292	461	9/12 11C	51	10	9/13 07C	31	33	27	18	24	9/11 12C	Mandatory	23
Harris	314	483	9/12 13C	52	0	9/13 08C	33	34	28	18	24	9/11 12C	Mandatory	25
Jefferson	261	435	9/12 09C	55	64	9/13 11C	29	26	22	29	33	9/11 06C	Mandatory	27
Matagorda	322	486	9/12 12C	48	15	9/13 04C	32	40	39	8	9	9/11 08C	Mandatory	28
Orange	268	442	9/12 09C	55	87	9/13 11C	29	26	22	29	33	9/11 08C	Mandatory	25

1. Closest Point of Approach (CPA) in statute miles using HURREVAC 2000. CPA refers to the eye or center of the storm.
2. The order to evacuate should be announced to the public by the indicated Decision Time to allow enough time to complete the evacuation before the arrival of TSF winds. HURREVAC calculates a Decision Time using the forecasted arrival of TSF winds and the estimated Clearance Time for a scenario from the study area HES. Decision Times can be modified based on storm category (selecting higher category than forecasted), tourist occupancy, background traffic, response time, and by adding an additional safety buffer (up to 10 hours).
3. HES Clearance Times for the Houston-Galveston Study Area reflect the latest FEMA/USACE study times for the areas which correspond to smaller evacuation zones than the zip-zones used during Hurricane Ike. Clearance Times for counties in the Galveston Study Area (Brazoria, Galveston and Harris) assume Medium Response Rate, Medium Seasonal Occupancy and High Background Traffic and no additional safety buffer. For Orange County, the Orange West clearance times were selected over Orange East for inclusion in the table as they are the longer of the two.

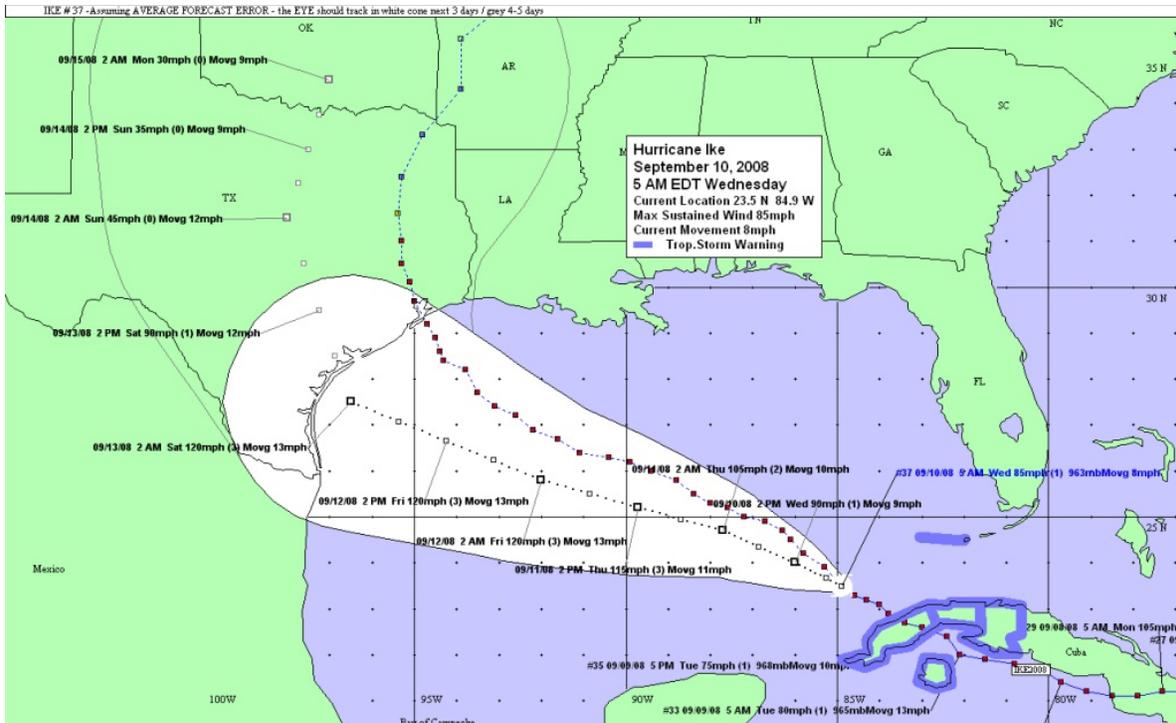


Figure 6-27: HURREVAC 2000 Hurricane Ike Advisory #37*

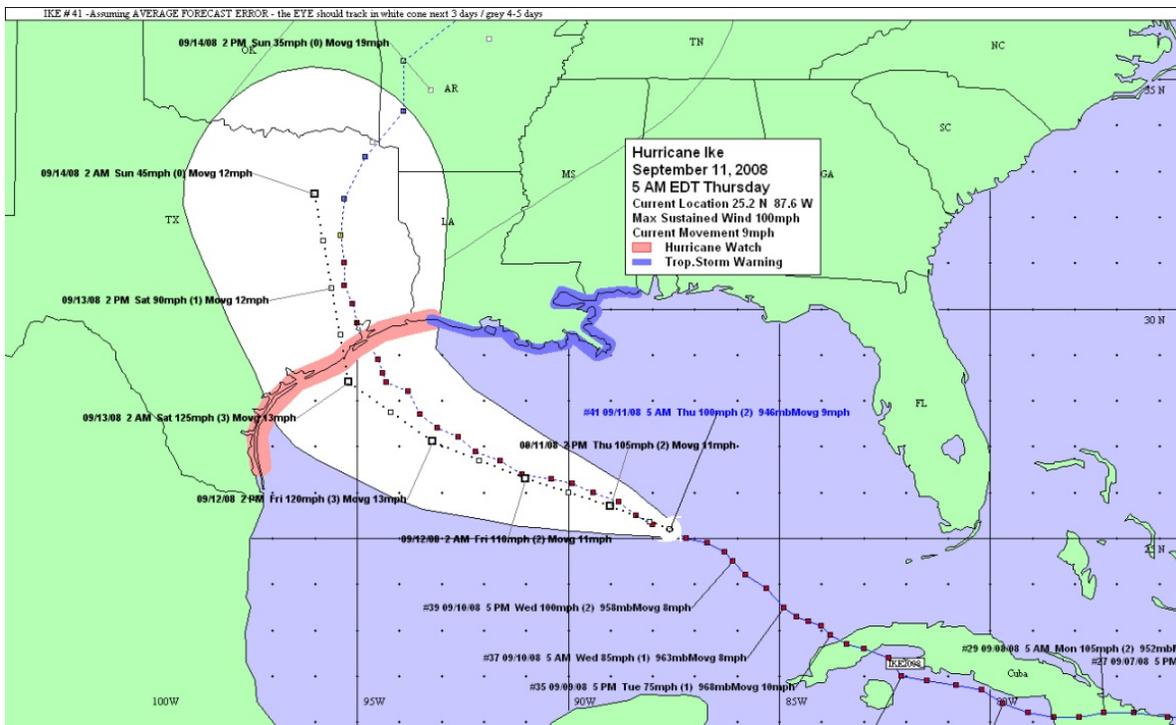


Figure 6-28: HURREVAC 2000 Hurricane Ike Advisory #41*

***Both the forecasted and actual storm tracks are shown**

6.6 PUBLIC INFORMATION/MEDIA DATA

The purpose of this section is to determine the extent of public information that was released to the public and whether messages released were clearly disseminated and understood by the public. Any special public information “tools” that were utilized were to be assessed. Recommendations for any unexplored communication conduits for future storm events will be presented.

6.6.1 INFORMATION RECEIPT

A variety of sources were utilized to receive event information. Sources common to all surveys were the HURREVAC decision assistance software, information from The Weather Channel, information from State agencies, local emergency management officials, local weather offices, and the internet. The Texas Emergency Management Agency also relied on information from the FEMA Regional Office and the Hurricane Liaison Team. Local sources also used information from commercial media. These sources were commonly received utilizing the internet, telephone (land, mobile and satellite), fax, email, radio and television. Common website referenced included the National Hurricane Center, National Weather Service, Crown Weather and Weather Underground. All surveys indicated information received was timely and utilized in the decision making process. Interviews and surveys with media representatives indicate timely information was received through email, web blogs, internet, fax, interviews, and press conferences.

6.6.2 INFORMATION DISSEMINATION

Several methods were employed to maximize information dissemination to the media for notification to the threatened population. The State routed all information through their Public Information Office and also coordinated information dissemination with the local Emergency Management Agencies. The Counties considered the local media market a valuable tool for information dissemination and kept them well informed of local and regional efforts. To facilitate the partnership, media representatives were granted limited access to Galveston, Jefferson, Chambers, Harris, Orange and Matagorda Emergency Operations Centers. Media representatives report information was disseminated to the public through television, radio media, website and newspaper/print. Some challenges were recognized predominately due to limited air time to adequately present the information.

During an emergency, one-voice cohesion is vital to ensure a safe and effective response. Coastal and inland counties report information was coordinated with other local agencies to ensure “one-voice” cohesiveness and to ensure evacuation coordination and communication efforts were synchronized. Additionally, information was shared with inland counties and the State facilitated numerous conference calls to ensure a coordinated response effort.

Galveston-Houston area media representatives in attendance mentioned the success of the Joint Information System and the establishment of the Joint Information Center (JIC). Information was coordinated with local and regional partners and media reported they were comfortable with the information provided during the entire cycle of the storm. The JIC operated from the Harris County EOC and information was provided in real-time from local decision makers. Another successful JIC was established in the Beaumont City EOC for the Lake Sabine HES area. Media representatives present in the Beaumont JIC during Hurricane Ike were complementary about the ease of obtaining and disseminating information.

6.6.3 MEDIA RELATIONS

From a review of the comments submitted by media, county officials, and State officials, it appears that the emergency management agencies and media are working collaboratively to collect and disseminate information to the general public. Coastal counties reported hosting specific pre-season coordination sessions with the media and any emergency management related jargon, acronyms or descriptions were explained to facilitate using the media as a tool for information management. Some inland counties reported hosting specific pre-season coordination sessions with the media.

Inland Counties reported minimal to no challenges experienced disseminating information to the evacuating public. Coastal Counties experienced a few challenges primarily due to population apathy and lack of power.

Interviews and surveys with media representatives indicate support provided by local emergency management offices was excellent and report that several media representatives spent time in the State and local EOCs. Media representatives confirmed participation with local training and coordination sessions, however, recognize the need for better communication and coordination activities throughout the year.

Overall, the Coastal Counties reported an excellent communication and information dissemination experience with the State EOC. Inland and Coastal counties report a slightly above average communication and information dissemination experience between EOC's, within the jurisdiction, with the NWS and with local media partners. The Texas Emergency Management Agency reported an excellent communication and information dissemination experience within the State EOC, with the National Weather Service, local and national media, and FEMA. State-to-State communication between EOCs was reported as slightly above average, and communication with evacuees was reported as above average.

While several of the survey respondents commented that there is still need for improvement in the public information areas of communication and information dissemination, there appears to have been progress made in regard to this need over the years as there were no comments about major failures.

6.7 OTHER FEMA PROGRAMS AND INITIATIVES

The impact of recent storm events such as Hurricanes Ike, Rita and Katrina to the region and the evacuations undertaken in response to these events continue to shape public perception and the response of state and Federal governments. FEMA continually reassesses how to improve the preparedness and response of the general public as well as state and Federal governments and agencies. This section presents FEMA initiatives and programs that assist local communities and states plan and respond to storm events.

6.7.1 PRE-EVENT DECLARATIONS

Assessments of hurricane disasters and “near-misses” in recent years have highlighted that not only are there public sector costs associated with the landfall of a tropical weather event or even the pre-event activities such as sheltering and evacuation, but that there are also economic impacts to the private sector when a hurricane threatens an area. Loss of revenue during a hurricane season can have a significant impact on the viability of a business. The impact would appear to be directly related to the frequency of the event and inversely related to the size of the business. Pre-Event Declarations allow for government and private sector resources to activate early ensuring adequate time is allowed for response and mitigation measures to initiate and finalize. Pre-declaring an event also supports greater public/private partnerships maximizing resources available to respond to the threat.

Response to any event must be managed at the lowest possible level. In large scale and regional events, support to the local communities must be authorized early by the State and Federal governments. In doing so, this allows the local government to initiate actions early and promotes public-private partnerships. Pre-declarations also allow for early evacuation of special needs populations and other persons having critical transportation needs. Due to the sensitivity of these populations, it’s prudent to plan their evacuation prior to the general population evacuation to minimize the commute and ensure a safe evacuation process. This too, however, must be taken into consideration the dynamics of the threat weighed against the local ability the respond and the community’s awareness and responsiveness to the guidance issued by local officials.

6.7.2 HAZARD MITIGATION GRANT PROGRAM (HMGP)

The Hazard Mitigation Grant Program (HMGP) provides grants to States and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The purpose of FEMA Section 404 is to assist states and local communities in implementing long-term hazard mitigation measures following a major disaster declaration. There was only one survey comment noted related to this program; the request was made for more support at the local level to participate in the activity.

The HMGP has helped the State through the years to implement mitigation actions to protect lives and property. Examples include the reinforced bridges, stronger roofing requirements, elevated structures and strengthening of critical facilities and residential homes. HMGP funds directly contributed to the success of many recovery efforts after Hurricane Ike.

6.7.3 GAP ANALYSIS

After Katrina, FEMA initiated a program known as the *Gap Analysis*. Surveys were completed in many coastal communities to gauge the needs of that community versus available resources. These comprehensive surveys compared a community's need with its ability to plan and prepare for and respond to a threat. When the need surpassed the ability, a gap was defined and planning efforts were initiated to mitigate the gap. In some cases, State and/or Federal government assistance was required to mitigate the identified gap. Even though FEMA has now discontinued the program, the goal of the Gap Analysis Program was to improve operational readiness and reduce disaster impacts by identifying and reducing or eliminating shortfalls that exist between estimated requirements, standards, and performance measures and the actual response and short-term recovery capabilities maintained at all levels of government and with nongovernmental organizations and the private sector. GAP is a response tool with a defined focus on specific critical areas necessary for an efficient and effective response, while providing an understanding of the level of Federal support states would potentially require in response to a disaster that stretches their resources.

For Hurricane Ike, some notable factors include:

- Severity of the Storm – A lesser category hurricane results in a lesser response.
- Media Advertisement – The attention or lack of attention given to the threat has a significant impact to the response.
- Previous Events – Repeated response to a threat resulting in a “non-event” results in the “crying wolf” syndrome. Response to repeated events causes a slow response.
- Government Recognition – Confidence in the local government's ability to recommend and direct a response effort is critical. Lack of government confidence results in minimal response.
- Education – Educating the public about the threats potentially affecting the area is critical in the decision making process.

Local, State and Federal partnerships to determine the support required to respond to a threat has produced a sound foundation in ensuring maximum preparedness for the community. Anticipating local needs have resulted in clear communication with the State and Federal government to ensure rapid deployment of those services and resources needed for the community. It does, however, represent a perceived expectation on the State and Federal government to step in and resolve any challenges experienced by the local. It must be clearly understood, these coordination efforts with the State and Federal government must be considered a last resort option.

Once shortfalls have been defined, it is the responsibility of the local government to resolve those shortfalls through planned coordination efforts to reduce the need from State and Federal governments. The primary function of any local government is the protection of lives and property. It's incumbent on the local government to provide all required services for their community to maximize the response effort and to protect lives and property. As the gaps are identified, it is recommended the State guide the local government in soliciting and arranging local contracts and agreements to mitigate those gaps.

6.7.4 PUBLIC AWARENESS

A tremendous amount of planning and preparedness have developed a variety of tools for local communities to utilizing in decision making. Products such as the Hurricane Evacuation Study, HURREVAC, SLOSH modeling, local Gap Analysis, and local emergency management planning clearly document the threat and required actions and resources to mitigated the threat. This information must be clearly and regularly shared with the community in an effort to ensure a comprehensive understanding of the threat and appropriate personal protective measures required to make informed decisions. This information must also be made available in multiple languages and multiple formats to maximize the distribution of material to as many economic and societal demographics as possible. Public education is a critical factor in reducing the dependence on the local government.

A common comment from this post storm assessment and many others from previous reports is the importance of and shortfalls in communicating hazard and protective measure information to the populations. Public education is a key component in ensuring community response and personal decision making. An informed and educated public reduces the necessity on the government to provide support. In the surveyed coastal counties, each community issued similar evacuation orders during the Hurricane Ike threat. Even though the evacuation orders represented unity in the message communicated to the general public, varying degrees of participation were experienced throughout the evacuation. This reiterates the statements above that public perception and public understanding of the threat is paramount to the success of mitigating life safety. The importance of personal responsibility must be emphasized at all levels of government. Educating the public on the potential threats affecting the community and personal protective measures required to respond to the threat will assist in minimizing the need for government support.

The need to more effectively communicate the risk grows as the vulnerable population in coastal areas grows in number and ethnic diversity. It is recommended funding be made available specifically targeting public education campaigns to assist the local government in communicating the threat and the personal protective measures required for a variety of economic and societal demographics.

6.7.5 POTENTIAL FACILITIES FOR RETRO-FITTING

Texas has placed heavy emphasis on evacuating its special needs populations utilizing its “Point to Point” sister city evacuation program. These mass evacuations have been supported by the State and FEMA assistance with air, rail and bus transportation resources. However, the practice of mass evacuations is becoming increasingly expensive, causing FEMA to consider the philosophy of local sheltering and individual responsibility for storm preparedness. A specific breakdown of costs for FEMA-assisted evacuations were not available, but generally amount to tens of millions of dollars per storm. Table 6-12 shows FEMA’s annual hurricane costs from the past six years.

As such, FEMA has expressed particular interest in identifying critical transportation needs origin facilities located outside of surge or evacuation zones that could be retrofitted for use as shelters. Retrofitting these facilities would reduce the need for resource intensive relocation in future hurricane events. Through the Hurricane Ike PSA, FEMA would like to determine how Federal involvement for assistance in evacuation has altered the traditional approach to hurricane evacuation in the Matagorda, Galveston-Houston and Lake Sabine HES areas. Local EMs were asked to identify a series of critical facilities that are vulnerable to hurricane impacts, but could be potentially hardened for use as shelter facilities. The names and locations of the facilities identified are listed in Appendix I. It is important to note however, that facilities located in surge zones do not lend themselves to “sheltering in place” And that potential retrofit projects would be limited to structures located outside of surge zones and areas considered to be at high risk for wind damage and power outages,

Table 6-12: FEMA Annual Hurricane Costs

Year	Annual Hurricane Costs*
2009	\$8.4 Million (No Major Declarations)
2008	\$7 Billion
2007	\$42 Million (No Major Declarations)
2006	\$2.6 Billion
2005	\$41 Billion
2004	\$6.7 Billion

*provided by the National Program Manager of the NHP

6.7.6 “SAFE ROOMS”

Hurricane winds are an important factor as coastal states make decisions on building codes. Extreme winds can create stresses on structures that frequently cause connections between building components to fail. Extensive testing and design by several universities and wind engineering research facilities have led to the development of guidelines and specifications for retrofit and construction of structures called “Safe Rooms.” They can easily be built into new homes and some shelter designs can be added to existing homes provided the homes are not located in a storm surge or flood prone area.

During this study all participants from the coastal and inland counties of Texas were asked if they were aware of the use and success of any “Safe Rooms” during Hurricane Ike. No instances of use or success of use were reported.

7 FINDINGS AND RECOMMENDATIONS

As in past Post Storm Assessments, interviews with Local and State emergency managers and responders were conducted to ascertain if the available HES products and information for the areas affected by the storms was utilized, was accurate, was easy to use and whether the data and products were in need of updating, revising or improving. Questionnaires were developed and utilized to collect appropriate information and assessments of HES data and products. Interview responses were recorded on the questionnaire forms at each meeting. Each participant's responses were consolidated into a summary questionnaire which represents the minutes of that meeting. These summaries were then reviewed and analyzed and consistent themes and recommendations were recorded. Summary questionnaires for each respondent type (Counties, State and Media) by HES area are located in the Appendix.

7.1 VULNERABILITY ASSESSMENT

7.1.1 HES UTILIZATION TO PREDICT VULNERABLE POPULATIONS

The vulnerable population is comprised of all persons residing within the area subject to storm surge in addition to all residents of mobile homes located above expected flood levels. It is important to note the special provisions for those living in mobile and manufactured homes. With development of new zip-zones for Matagorda, Brazoria, Galveston, Harris and Chambers Counties, new populations that may have considered themselves "safe" from hurricane impacts under the old zones should now be targeted and educated about the threat of surge and winds in their area.

Local officials indicated that evacuation zones, as presented in their HES, were too complicated to communicate effectively to the public and were generally not utilized. Where evacuation orders were issued, general descriptions were used to identify areas that needed to evacuate such as "countywide, low lying areas, beachfronts, barrier islands, mobile homes, waterfronts, flood prone areas, etc." The zip-zone evacuation map that was developed to alleviate communication difficulties was adopted outside of the HES process. As a result, the current clearance times in the HESs are not reflective of the zip-zone evacuation zones. For consistency across the board, evacuation zoning methodologies should be re-evaluated in future evacuation studies.

HES products are useful to State and local officials, however, officials have little to no confidence in data contained in outdated studies (i.e., Matagorda HES). Guidelines and responsibilities for performing scheduled maintenance, updates and restudies should be published and provided to local and State officials. Federal contributions to the updating efforts should be programmed well in advance of the need.

Additionally, inland counties were generally unfamiliar with HES process and concepts, yet inland counties play a major role in the success of an evacuation. They shelter evacuees and manage evacuating traffic to provide thoroughfares to safety. Inland counties need to be properly trained on the HES process and its concepts and products. Other inland county needs should be identified and provided, to the extent appropriate, by the HES process.

7.1.2 SURGE MAPS

Many of the areas interviewed for Hurricane Ike feel that updated surge maps are needed. Recent storms have changed the bathymetry of the coastline and new maps should take these changes into account. There are a variety of methods being used to produce the hurricane surge inundation mapping around the country, such as FEMA's Coastal Flood Insurance Model, ADCIRC and SLOSH. The various agencies of the Interagency Coordinating Committee on Hurricanes (ICCOH) should continue to review past and present methodologies and technologies on a regular basis to determine the most cost-effective and user-friendly formats that State and local agencies should consider.

FEMA and other Federal and State agencies, including NOAA and the USACE, are securing and incorporating new data from LIDAR (Light Identification and Detection and Ranging) systems to increase as well as improve quality of the storm surge maps. FEMA's multi-million dollar Map Modernization program should benefit not only floodplain mapping efforts but also storm surge maps.

PSA interviews conducted with local emergency management exemplified the need for a storm surge warning product. The current alert is based on wind strength and does not consider potential evacuation needed for pre-storm surge heights. Texas received up to 15' of storm surge in some areas with much of this prior to landfall and before winds were present.

7.1.3 TRANSPORTATION NEEDS

To the extent possible, population data developed for each evacuation zone should include an estimate of the numbers of persons who do not have access to a private vehicle and, consequently, would have to rely on public transportation in an evacuation. This segment of the population, also known as Critical Transportation Needs (CTN) populations, has become a growing problem for coastal emergency managers as increasing numbers of the population have been requesting transportation assistance in past evacuations. The Texas 211 Registry attempts to address this problem.

Transportation for the elderly and ill residing in Special Needs (health-related) facilities is normally the responsibility of the individual facilities, while the provision of adequate special emergency transportation for those in private homes is usually a responsibility of local emergency management officials. Counties in the PSA study area should continue to update their comprehensive, coordinated hurricane evacuation plans and coordinate with health-related

facilities to address special needs populations, including when to leave, specific destinations, and pre-arranged transportation.

Special needs populations may also exceed the transportation resources available to assist them. Local emergency management should prepare evacuation plans that establish mutual aid agreements with the State to ensure the availability of support and vehicles for critical transportation needs populations.

7.2 SHELTERING ASSESSMENT

A thorough assessment of the activities that took place during these events associated with shelter usage for in-state as well as out-of-state residents was conducted. The results of that assessment and the recommendations that were made are presented in this section.

7.2.1 GENERAL SHELTER RECOMMENDATIONS

The Texas plan to evacuate the coast and shelter inland should be retained. Overall, *The State of Texas Hurricane Evacuation and Mass Care Plan* appears to have worked well; the State continues to review, develop and refine the plan for future events (the plan can be viewed at ftp://ftp.txdps.state.tx.us/dem/plan_state/hurr_evac_shelter_state_plan.pdf, last accessed January 3, 2010; originally published June 5, 2007).

During the course of interviews for this report, several recommendations emerged from respondents and the analysis. First, the large numbers of potential evacuees may strain host areas closest to the coast. Shelter capacity should be determined on ability to provide mass care rather on square footage. A means to shelter host area residents needs to be considered as well should the storm path change at the last moment. Texas evacuates coastal residents via buses and personal vehicles. The bus transportation is essential and needs to be continued. The system of using bracelet identification with GPS and GIS support should be continued so that point-to-point cities can anticipate the needs of arriving evacuees. A centralized reception area should be continued to conduct triage and route evacuees to appropriate shelters.

Respondents noted that some populations merit additional attention. Group homes for those with mental health needs and/or cognitive disabilities may not have evacuation plans. Such plans should be developed, perhaps following a similar point-to-point model to route evacuees to appropriate facilities. Educational outreach by U.S. Public Health Service to educate emergency managers about the Federal Medical Stations should be continued. Concern was also noted for the increasing numbers of citizens over the age of 65, suggesting that additional attention will be needed to plan for their needs in coming years. Shelters specifically for senior citizens may be advisable and could follow the “Safe Center, Senior Center” models under development in both Florida and Alabama (for an example, visit <http://adss.alabama.gov/textOnly/news.cfm?mID=43&from=archives&year=2008>, last accessed January 3, 2010).

Respondents involved with medical special needs shelters all commented on problems with high and low acuity patients. Such shelters are to be used for low acuity patients but patient deterioration or improper routing has placed high acuity patients inappropriately in such locations. The State is examining this issue. The cultural diversity of Texas prompted a number of respondents to suggest that shelters need to pay greater attention to cultural issues, particularly food needs.

Specific types of residents not appropriate for general population shelters (e.g., sex offenders) could be accommodated through partnerships with hotel associations or separate locations. For an example of an emerging plan, see the Louisiana Sex Offender Shelters Plan (<http://www.dss.state.la.us/index.cfm?md=newsroom&tmp=detail&articleID=179>). Additionally, generator support was identified by nearly every interviewee as a clear need.

Moving people out of shelters either back to or closer to home proved challenging in the aftermath of Hurricane Ike, with particular impact on the Greater Houston area. Case management services needs to be formalized to help people transition out of shelters. It is worth noting that donations are down for key agencies that typically provide transitional support and resources which may require additional Federal support. Carefully developed re-entry planning must be developed particularly for the coastal areas that were impacted during the hurricane to avoid having evacuees return to damaged zones with insufficient shelter resources. Shelter managers need additional training on how to record expenses for the purposes of reimbursement, particularly compensation from FEMA.

Evacuation is more likely when pets are evacuated. Texas has a State law mandating pet evacuation. Pet shelters thus represent an area of concern as different animals require varying environments. Respondents for this report suggested that individuals able to assist with pets and livestock should be a part of the reception center. Co-located animal/human shelters are typically considered ideal, so that owners can provide care, though are not always possible. American Veterinary Medical Association standards suggest that 10% of the evacuating population will arrive with pets, a percentage consistent with what was reported by Texas respondents for Ike. Interviewees also indicated that there is a need for FEMA to revisit eligibility of costs related to pet evacuations and sheltering as providers reported considerable losses in supporting pet shelters for Hurricane Ike.

7.2.2 RECOMMENDATIONS FOR HARDENING FACILITIES

There are two known hardened tornado shelter facilities, one in Huntsville, and another one under construction in Centre, Texas. Additional hardened facilities are needed especially for medical special needs shelters used in hurricanes. Interviewees indicated that Federal money is not believed to be available for hardening facilities. Concern was also expressed that FEMA wind retrofit grants increase wind resistance up to 130 mph which is not sufficient, particularly near the coast. Matching Federal grants with State funds are an issue for the State as well. Hardened facilities to protect pets and livestock do not exist. This is a particularly challenging situation for livestock which are usually housed at fairgrounds types of locations which can be vulnerable to high winds. Livestock in particular represent a valuable portion of the Texas economy. Support is often needed for generators at food banks and shelters; some shelters reported a need for water and ice. Medical special needs shelters are a particular concern for provision of these resources, particularly generators.

7.2.3 COASTAL COUNTY RECOMMENDATIONS

It is unlikely that all coastal residents will evacuate as directed. Consequently, it would be viable to conduct a cost-benefit analysis comparing the costs of evacuation and sheltering to building a hardened shelter facility. Due to the cost and general lack of funding for such facilities, as well as the potential hazard they could face, they should be designated as shelters of last resort and used primarily for populations too fragile to move and/or officials who must remain during an evacuation time period.

Shelters in Harris County should be considered shelters of last resort due to the county's vulnerability to both storm surge (along the coast) and extreme winds (throughout the county). Post-disaster sheltering was difficult in Harris County due to the lack of power which compromised both shelter operations and life safety, particularly for people with disabilities dependent on power for oxygen, ventilators, and other critical equipment. Critical facilities in coastal counties and inland sheltering counties should be targeted for immediate provision of generators and other key shelter supplies after the disaster. Shelters are likely to open in coastal counties post-landfall and candidate facilities should be identified and have support plans in place prior to the hurricane season. Federal Medical Station caches and/or Disaster Medical Assistance Teams could be pre-positioned within reasonable and safe location of coastal counties to provide support during recovery, a time period that could extend for months.

Returning evacuees transported by the State (i.e., PTP, MSN, and CTN) to their homes or communities is a concern. Using a central reception center, as done with inland counties during the pre-landfall evacuation could be implemented post-landfall for returning evacuees. Coastal counties should anticipate providing shelter after landfall for up to one month or possibly longer depending on the magnitude and scope of the damage. Involving experienced case managers in post-landfall shelters will expedite moving residents out of shelters and into temporary or permanent housing. Case management must be organized before a hurricane hits in order to build a cadre of trained professionals or volunteers able to help people with post-disaster assistance including housing, job loss, injuries, filling out applications and related activities. Special attention needs to be paid to senior citizens who may need additional help with applications and to people with disabilities who may have lost key resources due to the disaster. FEMA conducted a post-Ike assessment for special needs populations, a strategy that should be continued in future events (see http://www.disabilitypreparedness.gov/pdf/ike_snp.pdf, last accessed January 3, 2010). Multiple locations that could be used for post-landfall shelters need to be pre-identified, assessed and listed with officials in order to reduce time spent searching for such facilities. Due to the possibility of significant damage, multiple locations should be considered. Tent locations should be avoided where at all possible due to climate conditions and continued exposure to weather, particularly for older residents, children and people with disabilities.

7.3 BEHAVIORAL ASSESSMENT

A literature search for behavioral studies conducted in the aftermath of Hurricane Ike in Texas was conducted to determine if there were any behavioral findings or assessments related to evacuation. While considerable research is underway or in the process of analysis, there are few general results at this time that might be used for Texas evacuation planning.

The research underway at the Hazard Reduction & Recovery Center at Texas A&M is providing important data related to the degree of damage of housing units on Galveston Island/Bolivar Peninsula and holds promise for providing important information regarding how recovery is affected by social vulnerability factors. Evacuation-related data indicate that women, higher income households, and homeowners were more likely to leave. The main reason provided by the non-evacuators was that they thought their homes were safe – a dangerous assumption given the surge potential of the area. Another study from the Center is collecting information on the evacuation and re-entry process. A report of the entry data is available and indicates that most people did not hear or did not follow official notices of when to return.

A study from Rice University has collected important information on response in Harris County. The findings reveal over-evacuation by many who did not need to leave, and under-evacuation of those who should have left, but stayed. The finding that 75% of this sample said they would leave for a Category 4 storm – indicating a potential serious over-evacuation problem.

The remaining Hurricane Ike studies in Texas either do not deal with evacuation or are not generalized due to non-random samples. The lack of a randomized telephone survey for all of coastal Texas is a serious shortcoming for evacuation planning. The work that has been done related to Hurricane Ike and evacuation indicates that there could be significant problems of non-compliance with evacuation orders, as well as shadow evacuation.

7.3.1 RECOMMENDATIONS

Based on the interviews and data collected (section 6.3), considerable research has been done or is underway in Texas. However, only one example involves a randomized telephone sample and it is limited to Harris County. The evacuation-related results from the Hazards Reduction and Response Center at TAMU hold promise. However they are being collected via mail. It would be good to see if the same results would be obtained through a telephone survey with a larger sample. All of these studies are related to Hurricane Ike.

In general, the behavior of tourists during hurricane threats is not well documented. This is mostly because of the inherent difficulty in collecting the data from tourists during an emergency or in a post-storm setting. In spite of the difficulties, State and local officials continue to need, and request, behavioral information for tourist populations, especially in those areas where vulnerable populations can double (or even triple) during peak tourist season.

The last PSA involving the State of Texas was conducted in 2003 for Hurricane Lili. This was the last instance that a behavioral analysis conducted via telephone was performed in the post-storm environment. However, since 2003, Texas has been impacted by five hurricanes. It is recommended that an evacuation behavioral analysis is conducted that includes all counties in the Hurricane Ike PSA study area.

- No currently relevant behavioral research involving a large, randomly selected sample that includes all of coastal Texas is available to planners;
- This area has experienced considerable storm activity and evacuations in recent years;
- The area has experienced significant growth and changing demographics in recent years;
- Preliminary results from research being conducted in the coastal areas impacted by Hurricane Ike indicate some potential issues that require further analysis.

For these reasons it is recommended that an empirical study be completed in coastal Texas that includes a large, randomized sample (with perhaps an over-sampling of socially vulnerable groups). The most cost effective way to accomplish this is through a telephone survey. A survey of 1,500 responses would be an appropriate sample size for a regional behavioral analysis.

7.3.2 SUMMARY

Although hurricane forecasts call for many behavioral responses, evacuation has the broadest consequences. Many people wait until the last minute, putting themselves and others at risk. Others may evacuate when they would be safer at home and large numbers of those who should evacuate from storm surge and low-lying areas do not. Facing this complexity, forecasters and emergency managers need to know how and when people will respond to hurricane warnings.

Getting large numbers of people out of densely populated, threatened areas requires knowing how long evacuation will take. Longer clearance times require earlier warnings, although the lower accuracy of longer-lead-time forecasts means more evacuations and more false alarms. Transportation engineers can model clearance times if they have good data on the number of people who will evacuate from each location, as well as where and when they will go. Traffic issues also feed back into the decision process as people learn from past experience and media coverage. Other activities, such as preparation, mitigation, and education, also depend on forecasts in crucial ways and have implications for evacuation itself. New HESs should include variables that predict the effects of all conditions specific to each location.

Further research on evacuation behavior needs to focus on methodologies to integrate different geographic scales (i.e., street level to State or regional level) and time scales (i.e., minute-by-minute to multiple days) into models that incorporate subjective and objective elements. Research with this scope can address such concerns as the effect on evacuation timing of commuting, school schedules, the feedback effects of news about traffic delays on evacuation route selection, and the refusal to evacuate versus shadow evacuation (i.e., people evacuating from outside the official evacuation zone). Above all, evacuation behavior research has to be

multidisciplinary given the complexity of communication and decision making issues, economic and societal impacts, organizational and infrastructure constraints, and the dynamic nature of evacuation responses.

Concern involving the potential impact of a major hurricane on coastal Texas is well founded. According to Phil Bedient, Director of the Rice University center for Severe Storm Prediction, Education and Evacuation from Disasters (SSPEED), “If you project the devastation at Bolivar taking place around NASA and the Clear Lake area instead, you can very quickly imagine a storm that’s more costly and deadly than Katrina”

<http://www.media.rice.edu/media/NewsBot.asp?MODE=VIEW&ID=12701&SnID=1651662921>

A critical factor is the extent to which there is effective evacuation. Better knowledge about the attitudes and potential behavioral response of coastal residents is an important step toward designing relevant educational and evacuation programs.

7.4 TRANSPORTATION ASSESSMENT

Interviews were conducted with the Texas Department of Transportation (TXDOT) and local emergency management officials to attempt to determine actual evacuation clearance times for these two storm events and how the results compared to the published clearance times in the latest HES. Following the assessment, a recommendation was to be made as to whether a new transportation analysis is required for the three HES areas included in the PSA. No traffic modeling or calculations were performed for this assessment.

7.4.1 HES TRANSPORTATION ANALYSIS RECOMMENDATIONS

General (All HES Areas):

- Update the transportation analysis of the HES for all three study areas (SSA, GSA, and MSA).
- The following factors should be considered imperative for updating transportation analysis and clearance times:
 - TXDOT has widened and striped the outside shoulder lanes as travel lanes along some of the evacuation routes indicated by local emergency management. For a two-lane roadway, this increases the capacity by 50%.
 - TXDOT has plans for contra-flow lanes on some of the routes. These take about 4 hours to set up and also are time and material intensive. It would be beneficial to see on which storms these would be most advantageous as these were not used during Hurricane Ike.
 - It would be beneficial to see what the clearance times would be if the evacuation traffic would be added to the roadway network during rush hour and non-rush hour. This would help in making the decision to evacuate based on the storm location and progress as well as the underlying roadway capacity.
- In addition, Texas now has given the local authorities the ability to arrest individuals who fail to heed a mandatory evacuation order. The intent is to reduce the number of people who have to be rescued in dangerous situations and thereby reduce the risk to emergency responders. A potential result of this new law is that we may see increased numbers of evacuees. Therefore, it is important to continue calculating HES clearance times based on the assumption that 100% of the population in an evacuation zones will evacuate.

GSA:

- The clearance times in the Galveston-Houston HES do not reflect the evacuation zones identified by the zip-zone evacuation map. The zip-zone evacuation zones are somewhat similar to the USACE Galveston/Houston HES evacuation zones but represent a larger population due to the expansion of 2004 USACE HES evacuation zone boundaries to align with established postal zip-code boundaries.

MSA:

- The zip-zone evacuation zones for Matagorda County differ completely from the previously used five risk areas outlined in the Matagorda HES.

SSA:

- The zip-zone evacuation zones for Chambers County differ completely from the previously used five risk areas outlined in the Lake Sabine HES.
- Emergency managers in the remaining Lake Sabine HES area, who took part in the PSA interviews, believe that the five risk area evacuation zones are confusing to the public since they appear to be based on the wind speed classification and not surge strength. Local EMs feel that this causes confusion when the public hears evacuation orders for numbered areas that do not correspond to the storm category on the Saffir-Simpson scale. This issue must be addressed in the next HES update.

7.4.2 OTHER RECOMMENDATIONS

The following items were discussed and are listed below by general category in no particular order of priority:

- Traffic
 - More closed circuit television and speed sensors to better assist decision makers on where to employ assets during the storm as well as to help which areas have power and are ready to receiving returning traffic.
 - Improve coordination of traffic lights with the local jurisdictions to allow better flow on the arterial streets.
 - Provide real-time evacuation route status information during evacuations.
 - Develop commuter rail evacuation plan using Union Pacific RR line.
 - Improve the traffic flow on IH-45 N at Conroe by adding additional lanes.
- Contra-flow
 - Respondents suggested they would like a better method for implementing contra-flow measures if they are requested. The current method is time

consuming to set up and has some safety concerns associated in converting the lanes. In addition, there is a shortage of manpower to police and keep people from accessing the freeway.

- Re-entry
 - Develop process for the orderly mass return of evacuees especially to areas deemed unsafe or lacking basic utilities and services.
 -

7.4.3 CRITICAL TRANSPORTATION NEEDS RECOMMENDATIONS

A CTN analysis should be performed for the coastal counties in the State of Texas to determine the number of individuals needing transportation assistance and vehicles necessary to perform the evacuation. This analysis should estimate the number and types of persons needing transportation assistance, the resources needed to safely transport these individuals to safety (buses, ambulances etc.) and an inventory of hardened shelter locations for those evacuated.

Recommendations for a CTN analysis include the following:

- Refine or adopt policies to ensure local evacuation plans and registries for transportation-dependent populations are updated annually.
- Determine the number of transport vehicles available by region and the number that could actually respond to an evacuation.
- Determine the total number of buses per region versus the number of buses committed by contract to facilities.
- Review local bus plans and reliance on the State to provide buses.
- Review the accessibility of shelters to avoid segregation of transportation-dependent individuals from the general population.

Another critical component in evacuation planning for transportation-dependent populations is an effective transportation assistance registry. As such, it is recommended that a review of the State's 2-1-1 registry program be conducted. A recent CTN analysis conducted for the State of Alabama outlined the components of an effective transportation-dependent registry program. An effective program:

- Has a strong educational and outreach program to assist people in finding transportation;
- Is the ultimate responsibility of a government agency;
- Has one simple number to initiate the process, such as 2-1-1;
- Provides forms in appropriate languages and formats;
- Has an easy-to-understand registration form that provides complete information to determine the level of transportation needed;
- Uses a computer database, preferably geo-coded;
- Has a regular system for keeping the data current;
- Has an effective call-down system in an event;
- Follows up with registrants when they return home.

7.5 EVACUATION DECISION MAKING TOOLS ASSESSMENT

Information collected from field surveys resulted in a variety of recommendations for improvements to evacuation coordination, managing the evacuation process and communicating the evacuation message across County boundaries. Utilization of HES products was found to be consistent among all surveys. In addition to utilization of HURREVAC and SLOSH models, other local records of historic flooding were utilized to aid in the decision making process. HURREVAC, however, was reported as the main tool used to communicate storm dynamics to emergency management partners and senior elected officials. Of the HES products used, the surge maps and evacuation zones were reported as the least helpful tools, due in part to their age (SSA) and relevancy (GSA). Confidence in the accuracy of the 1999 Hurricane Storm Atlas was limited among the Lake Sabine HES counties. Galveston, Harris, Brazoria, Chambers and Matagorda Counties made the decision to adopt the zip-zone evacuation map and had implemented it (Galveston, Harris, Galveston Counties) for the Hurricane Ike evacuation, forgoing the surge area evacuation map provided in the 2004 GSA HES.

7.5.1 HURREVAC OPERATION

HURREVAC was used to analyze the conditions and forecast of the storm; and represented the primary medium by which to brief partners and elected officials. The Counties used HURREVAC to track and evaluate the current and forecasted dynamics of each storm (i.e. path, forward movement, wind fields, and wind speed.) This information assisted in evaluating the community's evacuation decision timing through the occasional use of the systems decision making function.

Surveyed participants indicated excellent performance and ease of use from the HURREVAC application with a rank of 5 (scale of 1-5, with 5 representing excellent) and reports that staff has been partially trained to operate the tool. Surveyed participants reports the HURREVAC's program components performed slightly above average (score of 4). The program components include utilization of the clearance time, wind swath, error cone, 5-day forecast, decision arcs, surge maps and SLOSH functions.

User Requested HURREVAC Recommendations-

- Automate updates.
- Update clearance times.
- Provide more training.
- In the Tides feature, add more buoys and observational data.
- Improve graphics.
- Integrate county-specific GIS data into the HURREVAC platform.

7.5.2 SLOSH OPERATION

Utilization of SLOSH was minimal among surveyed participants. When used, SLOSH was used to represent surge heights, potential water depths, and to estimate a worst-case scenario which helps in determining potential search and rescue operational areas. The tool was used for planning purposes but is not easily understood by many respondents interviewed for the PSA. Surveyed participants indicated the ease of use and performance of SLOSH was average to slightly above average (scores of 3 and 4) and confirmed staff has been partially trained on how to use the tool.

Recommendations-

- Recent updates to the SLOSH model have been performed and it is recommended that users visit the NOAA SLOSH webpage <http://slosh.nws.noaa.gov/> to obtain the most current version, product news and instructional materials.
- Make more training opportunities available at local emergency management agencies.

7.6 PUBLIC INFORMATION/MEDIA ASSESSMENT

Overall, communication receipt, coordination and dissemination resulted in few challenges. From survey information, coordination efforts seem to be cohesive and regular. Challenges are recognized quickly and mitigated. Information exchange seemed coordinated and dissemination to Texas residents was efficient.

7.6.1 INFORMATION RECEIPT

Recommendations-

- Have pre-defined maps ready for media dissemination.
- Do not stress storm categories, stress storm impacts.

7.6.2 INFORMATION DISSEMINATION

Recommendations-

- Use more emails versus phone calls.
- Host conference calls with EOC Directors and PIOs.
- Support full participation in Regional joint information systems.
- Increase the use of WebEOC.
- Use emerging technology such as Blackberry and Smartphones.
- Facilitate better communication with the NWS, Local and Regional partners.
- Utilization of more message boards and directional signs.
- Expand AM Radio Station capability.
- Employ new systems such as Twitter and Facebook.

Also, there is a lack of public information tools and materials for inland county use in educating the public on inland preparedness and inland hazards associated with hurricanes. The HES program should provide assistance and materials to inland areas to aid in the education of this target audience.

7.6.3 MEDIA RELATIONS

A frequent comment from officials on public information was the request that a media or outreach component be added to the HES. The component could include presentation materials, camera ready graphics, photographs or PowerPoint slides of previous and potential hurricane damage, and other materials which will aid in educating the public about the dangers of hurricanes, the need for early evacuation, the importance of mitigation efforts, etc.

Recommendation-

- Ensure better accuracy in media reporting and briefing.

7.7 NEW TOOLS AND PRODUCTS

The wealth of base data available within a community is generally not available to a decision maker in a format or in an easy to use tool that can assist decision makers with timely and difficult decisions. Every community would greatly benefit from a tool set that contains base community data applicable to various department roles and functions and that could be queried to provide answers to questions needed to make timely and accurate decisions.

The vulnerability analysis depicts the areas, populations, facilities, infrastructure, critical facilities, institutions and community areas subject to a storm's hazards. Other facets of a community that are vulnerable to the hazards of a particular storm event are also analyzed. Although current HES guidelines and scopes of work for more recent efforts require that the data collected in the Vulnerability Analysis be analyzed and displayed in a GIS format, the bulk of this data may not be readily available to the average emergency manager unless they have access to the appropriate GIS software.

Another method to provide easy and inexpensive access to this data would be through the use of a GeoPDF. A GeoPDF is a highly portable, interactive geo-referenced map that allows non-GIS savvy individuals to access and utilize community-specific maps and images without the need for GIS software. The system utilizes a base map, satellite imagery or aerial photography of the community or study area in a seamless raster file. Overlaid on this would be additional layers, such as streets, lakes and rivers, counties, parishes and city boundaries. Enhanced layers would become more visible as the user zoomed in. These layers could include the 100-year floodplain and SLOSH MEOW/MOM outputs.

Emergency managers could add data layers onto the maps and these images could be displayed and saved on a central server for multiple agency use. Examples of this include calculations of the amount and diversity of the population in various surge and evacuation zones, the breakdown of housing data by residential (mobile home, single family/multi-family, hotel, motel, condo etc.), commercial, (type of business-building supply, grocery, financial. etc), critical facilities, i.e., anything that the decision maker needs to make a better and more informed decision in a critical situation. All data would be able to be queried, allowing such parameters as building value, number of people, land type (allowing the capability of debris parameterization), and transportation capabilities to be viewed and analyzed.

In the field, vehicles and critical personnel's positions could be displayed in real-time, allowing centrally located personnel to make critical decisions in real-time, with knowledge of where their personnel, resources and critical infrastructure is located. Post-storm coordination would be facilitated with emergency managers (EMs) to allow them to be able to predict areas where the worst damage would most likely have occurred, and be able to respond quickly to those areas for search and rescue and infrastructure damage inspections. New cell phone location technologies could be applied to monitor the location and movement of the population.

A web-based tool with maps and analytics containing dashboards for different Emergency Support Functions would be beneficial. Web based GIS mapping tools could be developed from existing sources such as ESRI or other geospatial technologies, to allow both EMs and the general public to view and download critical hurricane information, such as real-time wind fields, storm surge inundation areas, watches and warnings and other real-time NWS data pre, during, and post hurricane landfall events without having to purchase expensive hardware or software. The tool would allow decisions to be made in a timely manner using the web interface, allowing the user to view multiple layers and make real-time queries.

The Comprehensive Hurricane Emergency Management Strategies (CHEMS) concept was introduced to State and Local emergency management agencies during the PSA interview process. All participating parties expressed an interest in the concept and would like to learn more about the idea. The strategy, proposed by the NHP, is to augment the traditional HES process with an expanded suite of products and services known as CHEMS. The CHEMS concept would include the suite of HES analyses and products, but would also offer data and products associated with Community Storm Impact; Business Mitigation & Recovery Analysis; Re-entry Analysis; Communication Assessment; Technology Analysis; and Training. The purpose would be to allow the State and local emergency managers to choose those products and tools that are best suited to meet their evacuation planning needs, and to incorporate Federal level support from outside the traditional HES process as well.

The system described above could be integrated in the overall incident management and decision support tools already in use by the emergency management community (e.g., WebEOC and other programs). Numerous jurisdictions have implemented the incident command system, and have integrated planning activities within defined operational periods during a disaster or emergency. CHEMS data and products will be useful only to the extent that they are consistent with, and complimentary to, the tools already in use by the emergency management community. As described previously, most—if not all—existing decision support tools are easily customized to incorporate new data and information in a useable format. New CHEMS data and products should be “packaged” in a fashion that would allow for use by and through these existing systems.

The utilization of real-time hazards data and additional analyses of the effects a storm has on a community coupled with new, easy to use GIS technology would provide emergency management officials at all levels with the tools needed to better mitigate, prepare, respond and recover from any hazard.

There should be a set of basic standards for any of the tools mentioned above for inputs and outputs to the tools. Any analysis needs to be holistic in nature, but filterable for specific data that is being looked for. Information on demographics, economics (including insurance and costs avoided), visualizations, transportation systems and other community data are needed in order to make global decisions but they need to also be able to be filtered for a particular ESF or ICS function for those doing the basic work. Any new system also needs to have funding for its creation as well as a plan and funding for its maintenance, including training and exercises. More information on this process was requested.

APPENDICIES

APPENDIX A: MEETING ATTENDANCE SHEETS

Table A-1: Kick-Off Meeting Attendance Sheet

First Name	Last Name	Affiliation	State	Phone	Email
Seth	Jones	USACE	TX	409-766-3068	Seth.w.jones@usace.army.mil
Bob	Heinly	USACE	TX	409-766-3992	Robert.w.heinly@usace.army.mil
Jay	Hall	GDEM	TX	409-284-9381	Jay.hall@txdps.state.tx.us
Wendy	Phillips	FEMA	TX	409-898-5133	Wendy.phillips@dhs.gov
Bill	Massey	Dewberry	GA	678-530-0022	bmassey@dewberry.com

Table A-2: Brazoria and Matagorda Counties Local Meeting Attendance Sheet

First	Last	Title	Agency	Phone	Email
Chris	Dahlstrom	Lt.	Angleton PD	979-849-2383	cdahlstrom@angletonpd.net
Mike	Jones		Angleton PD	979-849-2383	mjones@angletonpd.net
Cindy	King		Sweeny	979-548-3321	cking@warpspeed1.net
Seth	Jones		USACE, Galveston	409-766-3068	Seth.w.jones@usace.army.mil
Brent	Hahn	Fire Marshall	Pearland	281-652-1854	bhahn@ci.pearland.tx.us
Doug	Matthes		Matagorda EMC	979-323-0707	dmatthes@co.matagorda.tx.us
Bill	Massey	Director Hurricane Services	Dewberry	678-530-0022	bmasey@dewberry.com
Bill	Peterson		FEMA	972-377-8882	wppfdtx@aol.com
David	Noak		GDRM/RLO	979-541-4505	david.noak@txdps.state.tx.us
Steve	Rosa		BCOEM	979 864-1801	steverosa@brazoria.county.com
Greg	Smith		City of Angleton	979-849-4364	gsmith@angleton.tx.us
Dan	Reilly		NWS/Houston Galveston	832-226-9380	dan.reilly@noaa.gov
K.R.Doc	Adams		Brazoria Co.EOC	979-864-1801	docadams@brazoria.county.com
Shohn	Davison		Pearland FRD	281-652-1965	sdavison@ci.pearland.tx.us

Table A-3: Galveston County Local Meeting Attendance Sheet

First	Last	Title	Agency	Phone	Email
Bob	Heinly		USACE	409-766-3992	robert.w.heinly@SWG02.usace.army.mil
Wendy	Phillips	Hurricane/Earthquake Program Specialist	FEMA	940-898-5133	wendy.phillips@dhs.gov
David	Popoff	RLO	GDEM	409-504-0390	david.popoff@txdps.state.tx.us
Charlie	Kelly		City of Galveston	409-765-3710	kellycha@cityofgalveston.org
Dan	Reilly		NWS Houston	832-226-9380	dan.reilly@noaa.gov
Gene	Hafele		NWS Houston	281-337-5074	gene.hafele@noaa.gov
John	Simsen		City of Galveston	281-309-5003	John.simsen@co.galveston.tx.us
Connie	Nicholson		City of Galveston	281-770-5355	connie.nicholson@co.galveston.tx.us
Dena	Demaret	Assistant EMC	City of League City	281-554-1303	dena.demaret@leaguecity.com
John	Lee Jr.	Mitigation Coordinator	Galveston County	409-770-5357	john.lee@co.galveston.tx.us
Terry	Byrd	EMC	City of Friendswood	281-996-3335	tbyrd@friendswood.com
Bill	Massey	Sr. Proj. Manager	Dewberry	678.530.0022	bmassey@dewberry.com
Lauren	Hand	Geographer	Dewberry	678.530.0022	lhand@dewberry.com

Table A-4: Harris County Local Meeting Attendance Sheet

First	Last	Title	Agency	Phone	Email
Sharon A.	Nalls	CEM	City of Houston OEM	713-884-4500	Sharon.nalls@cityofhouston.net
Terry W.	Moore	CEM	City of Houston OEM	713-884-4500	Terry.moore@cityofhouston.net
Ray	Smiley	EMC	City of Webster	281-910-2603	Rsmiley@websterpd.com
Bob	Heinly	USACE	Galveston District	409-766-3992	Robert.w.heinly@usace.army.mil
Bill	Wheeler		Harris County	713-881-3083	Bill.wheeler@oem.hctx.net
Jenniffer Shields	Hawes	TXDPS TXDEM		281-642-0312	Jenniffer.hawes@txdps.state.tx.us
Bill	Peterson	FEMA			
Bill	Massey	Dewberry	Atlanta	678-530-0022	bmassey@dewberry.com
Wendy	Phillips	FEMA			Wendy.phillips@dhs.gov
Lauren	Hand	Dewberry	Atlanta	678-530-0022	Lhand@dewberry.com

Table A-5: Liberty and Chambers Counties Local Meeting Attendance Sheet

First	Last	Title	Agency	Phone	Email
Robert	Heinly		USACE	281.705.5525	Robert.e.heinly@usace.army.mil
Brian	Hurst	Asst. Fire Chief	Liberty Co. Fire Dept.	936.336.3922	bhurst@cityofliberty.org
Debbie	Nadal	EM Coord.	Chambers Co. EMA	409.267.2445	dnadal@co.chambers.tx.us
Terri	Bivins	EM Coord.	State Rep. Dist. 18	936.258.8135	terri.bivins@house.state.tx.us
Debbie	Scott	EM Deputy Coord.	Liberty Co. EM	936.334.3219	Debbie.scott@co.liberty.tx.us
Tom	Branch	EM Coord.	Liberty Co.	936.334.3219	tom.branch@co.liberty.tx.us
Freddie Reed	EM Coord.	City of Plum Grove	Plum Grove	281.689.3241	plumgroveemc1@aol.com
J. Mike	Purvis	Sr. Proj. Manager	Dewberry	678.530.0022	jpurvis@dewberry.com
Lisa	Pearl	Admin. Asst.	Dewberry	678.530.0022	lpearl@dewberry.com

Table A-6: Hardin, Jasper and Newton Counties Local Meeting Attendance Sheet

First	Last	Title	Agency	Phone	Email
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Scott	Sonnier	Police Sergeant	City of Sour Lake PD	409.287.2059	slpd302@yahoo.com
Larry	Saurage	Police Chief	City of Sour Lake PD	409.287.2059	lsaurage@emagccess.com
Andrew	Trahan	Police Chief	Kountze	409.246.2119	kountzepd@sbcglobal.net
Jeff	LaComb	Fire Chief	Kountze	409.246.3463	jlkch@sbcglobal.net
Roderick	Hutto	City Manager	Kountze	409.246.3463	rhkch@sbcglobal.net
J. Mike	Purvis	Sr. Proj. Manager	Dewberry	678.530.0022	jpurvis@dewberry.com
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Table A-7: Jefferson County Local Meeting Attendance Sheet

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Jay	Hall		Texas DPS	409.284.9381	jay.hall@txdps.state.tx.us
Tom	Warner	Dir. Public Works	Beaumont DPW	409.880.3725	twarner@ci.beaumont.tx.us
Greg	Fountain	EM Coord.	Jefferson County	409.835.8757	gfontain@co.jefferson.tx.us
Michael	White	Asst. EM Coord.	Jefferson County	409.835.8757	mwhite@co.jefferson.tx.us
Tim	Ocnaschek	EM Coord.	City of Beaumont	409.980.7275	tocnaschek@ci.beaumont.tx.us
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Table A-8: Orange County Local Meeting Attendance Sheet

First	Last	Title	Agency	Phone	Email
Robert	Heinly	Planning Asso.	USACE	281.705.5525	Robert.e.heinly@usace.army.mil
Tod	McDowell	Bridge City PD	Bridge City PD	409.735.5020	tmcdowell@bridgecitytex.com
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Carl	Thibodeaux	Cnty. Judge	Orange Co.	409.882.7070	cthibodeaux@co.orange.tx.us
Franklin	Walters	Deputy EM Coord.	Orange Co.	409.670.4120	fwalters@co.orange.tx.us
Michael	Stelly	Police Chief	West Orange County	409.883.7574	mstelly@cityofwestorange.com
Jay	Hall	TX Regional Liaison Officer	EM Region 2	409.284.9381	jay.hall@txdps.state.tx.us
Grady	Gray	Fire Chief	City of Pinehurst	409.886.3873	phvfd@cityofpinehurst.com
Jerald	Ziller	Coord.	Orange Co. EM	409.988.7359	jziller@co.orange.tx.us
J. Mike	Purvis	Sr. Proj. Manager	Dewberry	678.530.0022	jpurvis@dewberry.com
Lisa	Pearl	Admin. Asst.	Dewberry	678.530.0022	lpearl@dewberry.com

Table A-9: Fort Bend County Local Meeting Attendance Sheet

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Sandra	Startz		Red Cross	281-342-9480	sstartz@ghac.org
Caroline	Egan		Red Cross	281-342-9480	cegan@ghac.org
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David	Noak		TDEM/RLO	779-541-4505	David.noak@txdps.tx.us
Jeff	Braun		Fort Bend County OEM	281-342-6185	braunjef@co.fort-bend.tx.us
Alan	Spears		Fort Bend County OEM	281-342-6185	Alan.spears@co.fort-bend.tx.us
Seth	Jones		USACE, Galveston	409.766.3068	seth.w.jones@usace.army.mil
Lauren	Hand		Dewberry	678.530.0022	lhand@dewberry.com
Bill	Massey		Dewberry	678.530.0022	bmassey@dewberry.com

Table A-10: Polk, Tyler and San Jacinto Counties Local Meeting Attendance Sheet

First	Last	Title	Agency	Phone	Email
Wendy	Phillips	Program Manager	FEMA	940.898.5133	wendy.phillips@dhs.gov
Seth	Jones		USACE	409.766.3068	seth.w.jone@usace.army.mil
Steve	Bell	EM Coordinator	Tyler County	409.331.0874	stevebellemg6a@yahoo.com
Ellis	Jones	EM Coordinator	Tyler County	409.331.0874	ewj77660@msn.com
Porter	Stanaland	TX Region Liason Officer	EM Region 2	936.699.7300	porter.stanaland@txdps.state.tx.us
Larry	Shine	EM Coordinator	Polk County	936.327.2686	emcpolk@livingston.net
Judy	Eaton	EM Coordinator	San Jacinto County	936.653.3395	judy.eaton@co.san-jacinto.tx.us
J. Mike	Purvis	Sr. Proj. Manager	Dewberry	678.530.0022	jpurvis@dewberry.com
Lisa	Pearl	Admin. Asst.	Dewberry	678.530.0022	lpearl@dewberry.com

Table A-11: State Meeting Attendance Sheet

First	Last	Title	Agency	Phone	Email
Johnna	Cantrell	State Coordinator for Preparedness and Operations	Governors Division of Emergency Management	512-424-2453	johnna.cantrell@txdps.state.tx.us
Frank	Cantu	State Coordinator for Response and Recovery	Governors Division of Emergency Management	512-424-2455	frank.cantu@txdps.state.tx.us
Wendy	Phillips	Hurricane/Earthquake Program Specialist	FEMA	940-898-5133	wendy.phillips@dhs.gov
Seth	Jones		USACE, Galveston	409-766-3068	Seth.w.jones@usace.army.mil
Bill	Massey	Director Hurricane Services	Dewberry	678-530-0022	bmassey@dewberry.com
Gordon	Wells	Program Manager, Center for Space Research	University of Texas	512-232-7515	gwells@csr.utexas.edu

Table A-12: Local Media Meeting Attendance Sheet

First	Last	Title	Phone	Email Address
Bill	Peterson	FEMA	972-377-8882	wppfdtx@aol.com
Francisco	Sanchez	Harris County	713-843-5432	Francisco.sanchez@oem.hctx.net
Rosio	Torres	Harris Co. OHSEM	713-881-3034	Rosio.torres@oem.hctx.net
Pat	Hernandez	KVHF 88.7 FM	713-743-1823	phernandez@kvhf.org
Mark	Annas	Harris Co. OHSEM	713-881-3100	Mark.annas@oem.hctx.net
Neil	Frank	KHOU-TV	281-346-1730	Nlf1730@aol.com
Bill	Massey	Dewberry	678-530-0022	bmassey@dewberry.com
Bill	Wheeler	Harris Co.	713-881-3083	Bill.wheeler@oem.hctx.net
Gene	Hafele	NWS	281-337-5074	Gene.hafele@noaa.gov
Lauren	Hand	Dewberry	678-530-0022	lhand@dewberry.com
Bob	Heinly	USACE	409-766-3992	robert.w.heinly@SWG02.usace.army.mil

APPENDIX B: GLOSSARY OF SELECT TERMS

More complete lists can be found at
<http://www.nhc.noaa.gov/aboutgloss.shtml> or
www.fema.gov/oer/reference/glossary.shtml

Advisory:

Official information issued by tropical cyclone warning centers describing all tropical cyclone watches and warnings in effect along with details concerning tropical cyclone locations, intensity and movement, and precautions that should be taken. Advisories are also issued to describe: (a) tropical cyclones prior to issuance of watches and warnings and (b) subtropical cyclones.

Cyclone:

An atmospheric closed circulation rotating counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere.

Eye:

The roughly circular area of comparatively light winds that encompasses the center of a severe tropical cyclone. The eye is either completely or partially surrounded by the eyewall cloud.

Eyewall / Wall Cloud:

An organized band or ring of cumulonimbus clouds that surround the eye, or light-wind center of a tropical cyclone. Eyewall and wall cloud are used synonymously.

Extratropical:

A term used in advisories and tropical summaries to indicate that a cyclone has lost its "tropical" characteristics. The term implies both poleward displacement of the cyclone and the conversion of the cyclone's primary energy source from the release of latent heat of condensation to baroclinic (the temperature contrast between warm and cold air masses) processes. It is important to note that cyclones can become extratropical and still retain winds of hurricane or tropical storm force.

Extratropical Cyclone:

A cyclone of any intensity for which the primary energy source is baroclinic, that is, results from the temperature contrast between warm and cold air masses.

Gale Warning:

A warning of 1-minute sustained surface winds in the range 34 kt (39 mph or 63 km/hr) to 47 kt (54 mph or 87 km/hr) inclusive, either predicted or occurring and not directly associated with tropical cyclones.

High Wind Warning:

A high wind warning is defined as 1-minute average surface winds of 35 kt (40 mph or 64 km/hr) or greater lasting for 1 hour or longer, or winds gusting to 50 kt (58 mph or 93 km/hr) or greater regardless of duration that are either expected or observed over land.

Hurricane / Typhoon:

A tropical cyclone in which the maximum sustained surface wind (using the U.S. 1-minute average) is 64 kt (74 mph or 119 km/hr) or more. The term hurricane is used for Northern Hemisphere tropical cyclones east of the International Dateline to the Greenwich Meridian. The term typhoon is used for Pacific tropical cyclones north of the Equator west of the International Dateline.

Hurricane Local Statement:

A public release prepared by local National Weather Service offices in or near a threatened area giving specific details for its county/parish warning area on (1) weather conditions, (2) evacuation decisions made by local officials, and (3) other precautions necessary to protect life and property.

Hurricane Season:

The portion of the year having a relatively high incidence of hurricanes. The hurricane season in the Atlantic, Caribbean, and Gulf of Mexico runs from June 1 to November 30. The hurricane season in the Eastern Pacific basin runs from May 15 to November 30. The hurricane season in the Central Pacific basin runs from June 1 to November 30.

Hurricane Warning:

An announcement that hurricane conditions (sustained winds of 74 mph or higher) are *expected* somewhere within the specified coastal area. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane warning is issued 36 hours in advance of the anticipated onset of tropical-storm-force winds.

Hurricane Watch:

An announcement that hurricane conditions (sustained winds of 74 mph or higher) are *possible* within the specified coastal area. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane watch is issued 48 hours in advance of the anticipated onset of tropical-storm-force winds.

Indirect Hit:

Generally refers to locations that do not experience a direct hit from a tropical cyclone, but do experience hurricane force winds (either sustained or gusts) or tides of at least 4 feet above normal.

Landfall:

The intersection of the surface center of a tropical cyclone with a coastline. Because the strongest winds in a tropical cyclone are not located precisely at the center, it is possible for a cyclone's strongest winds to be experienced over land even if landfall does not occur. Similarly, it is possible for a tropical cyclone to make landfall and have its strongest winds remain over the water. Compare direct hit, indirect hit, and strike.

Major Hurricane:

A hurricane that is classified as Category 3 or higher.

Maximum Envelop of Water (MEOW):

Describes the predicted areas inundated and amount of storm surge for a particular area during the landfall of a hurricane. Used in the SLOSH Model.

Maximum of MEOWS (MOM):

Combination of all the MEOWs of a particular storm category. MOM's depict surge flooding for each intensity, regardless of storm direction or speed.

National Geodetic Vertical Datum of 1929 [NGVD 1929]:

A fixed reference adopted as a standard geodetic datum for elevations determined by leveling. The datum was derived for surveys from a general adjustment of the first-order leveling nets of both the United States and Canada. In the adjustment, mean sea level was held fixed as observed at 21 tide stations in the United States and 5 in Canada. The year indicates the time of the general adjustment. A synonym for Sea-level Datum of 1929. The geodetic datum is fixed and does not take into account the changing stands of sea level. Because there are many variables affecting sea level, and because the geodetic datum represents a best fit over a broad area, the relationship between the geodetic datum and local mean sea level is not consistent from one location to another in either time or space. For this reason, the National Geodetic Vertical Datum should not be confused with mean sea level.

Radius of Maximum Winds:

The distance from the center of a tropical cyclone to the location of the cyclone's maximum winds. In well-developed hurricanes, the radius of maximum winds is generally found at the inner edge of the eyewall.

Storm Surge:

An abnormal rise in sea level accompanying a hurricane or other intense storm, and whose height is the difference between the observed level of the sea surface and the level that would have occurred in the absence of the cyclone. Storm surge is usually estimated by subtracting the normal or astronomic high tide from the observed storm tide.

Storm Tide:

The actual level of sea water resulting from the astronomic tide combined with the storm surge.

Storm Warning:

A warning of 1-minute sustained surface winds of 48 kt (55 mph or 88 km/hr) or greater, either predicted or occurring, not directly associated with tropical cyclones.:

Tropical Cyclone:

A warm-core non-frontal synoptic-scale cyclone, originating over tropical or subtropical waters, with organized deep convection and a closed surface wind circulation about a well-defined center. Once formed, a tropical cyclone is maintained by the extraction of heat energy from the ocean at high temperature and heat export at the low temperatures of the upper troposphere. In this they differ from extratropical cyclones, which derive their energy from horizontal temperature contrasts in the atmosphere (baroclinic effects).

Tropical Depression:

A tropical cyclone in which the maximum sustained surface wind speed (using the U.S. 1-minute average) is 33 kt (38 mph or 62 km/hr) or less.

Tropical Disturbance:

A discrete tropical weather system of apparently organized convection -- generally 100 to 300 nmi in diameter -- originating in the tropics or subtropics, having a nonfrontal migratory character, and maintaining its identity for 24 hours or more. It may or may not be associated with a detectable perturbation of the wind field.

Tropical Storm:

A tropical cyclone in which the maximum sustained surface wind speed (using the U.S. 1-minute average) ranges from 34 kt (39 mph or 63 km/hr) to 63 kt (73 mph or 118 km/hr).

Tropical Storm Warning:

An announcement that tropical storm conditions (sustained winds of 39 to 73 mph) are *expected* somewhere within the specified coastal area within 36 hours.

Tropical Storm Watch:

An announcement that tropical storm conditions (sustained winds of 39 to 73 mph) are *possible* within the specified coastal area within 48 hours.

**APPENDIX C: LOCAL INTERVIEW QUESTIONNAIRE SUMMARY RESPONSES
FOR THE MATAGORDA AND HOUSTON-GALVESTON HES AREAS**

BRAZORIA AND MATAGORDA COUNTIES

Date	Time	City	County	State	Conducted by
8/19/09	1:00 P.M.	Angleton	Brazoria	Texas	Bill Peterson, FEMA

This assessment is designed to evaluate the effectiveness of the National Hurricane Program's Hurricane Evacuation Study (HES) Products within your jurisdiction as it applied to your experience during the recent hurricane threat. It is also intended to identify any specific needs or recommendations that you may wish to share relating to FEMA's overall Hurricane Program. It is not designed to evaluate you nor your response to the event. Rather it is designed to help FEMA better serve you in the future. Please complete this assessment prior to your scheduled interview.

GENERAL

1. Of the following products, which were readily available for your use?

- | | | |
|---|--|--|
| <input checked="" type="checkbox"/> HURREVAC | <input checked="" type="checkbox"/> Evacuation Maps | <input checked="" type="checkbox"/> Clearance Times |
| <input checked="" type="checkbox"/> Shelter Locations | <input checked="" type="checkbox"/> Local Hurricane Plan | <input checked="" type="checkbox"/> Storm Surge Maps |
| <input checked="" type="checkbox"/> SLOSH | <input type="checkbox"/> HES Study | |
| <input type="checkbox"/> Other Documents: _____ | | |

Of the information provided to you, which items were considered most important? Please explain.

- | | | |
|---|--|---|
| <input checked="" type="checkbox"/> HURREVAC | <input checked="" type="checkbox"/> Evacuation Maps | <input type="checkbox"/> Clearance Times |
| <input checked="" type="checkbox"/> Shelter Locations | <input checked="" type="checkbox"/> Local Hurricane Plan | <input type="checkbox"/> Storm Surge Maps |
| <input checked="" type="checkbox"/> SLOSH | <input type="checkbox"/> HES Study | |
| <input type="checkbox"/> Other Documents: _____ | | |

Which items were found to be the least helpful? Please explain.

- | | | |
|---|---|---|
| <input type="checkbox"/> HURREVAC | <input checked="" type="checkbox"/> Evacuation Maps | <input type="checkbox"/> Clearance Times |
| <input type="checkbox"/> Shelter Locations | <input type="checkbox"/> Local Hurricane Plan | <input type="checkbox"/> Storm Surge Maps |
| <input checked="" type="checkbox"/> SLOSH | <input checked="" type="checkbox"/> HES Study | |
| <input type="checkbox"/> Other Documents: _____ | | |

Evacuation maps are least helpful because of limited number of evacuation routed to the North.

Plans to redirect traffic have failed.(traffic management plans)

HES Study outdated.

Please describe your partnerships with private companies and/or civic groups to assist in a public outreach program for your community.

Red Cross, Baptist Men, STP, CERT, HAM radio operators

Discuss how HURREVAC was used during this hurricane event.

Brazoria Co.- Main use is for wind tags. To track the progress of the storm and strength of storm

Matagorda Co. – Used in planning along with the National Weather Service

Discuss how SLOSH or the SLOSH Display Model was used during this hurricane event.

MC – Used in planning along with National Weather Service

BC – Not used. City of Pearland out of surge zone for category 2 storm.

What mitigation efforts, if any, were initiated or participated in before or during this event?

MC - Cleaned drains and cleared debris..

BC. – None were done before Ike.

Of these mitigation efforts, were they successful? Please explain.

BC - Yes

MC – N/A

Please list any critical facilities that were impacted by wind, surge or freshwater flooding.

Wind	Surge	Freshwater Flooding
MC – City Hall	BC – Private MUDs	

Please list the locations, quantity and type of “vulnerable” or “special needs” populations that were impacted by this storm.

Vulnerable or Special	Locations	Quantity
-----------------------	-----------	----------

Needs Population		
Medical Special Needs	Matagorda County	2 nursing homes and 3 hospitals(6)
Medical Special Needs and People w/o transportation	Brazoria County – Pearland	2 nursing homes and 1hospital (35)

Did your community provide transportation resources to special needs populations? Please list the types of transportation provided, the total number transported, and the locations to which these populations were taken.

Types of Transportation	Number Transported	Locations
MC – Buses/Ambulances	560	Austin; San Antonio; New Brunfel
BC – School buses/Ambulances	28	Houston, TX

Are you aware of any instances where “safe rooms” were utilized during this storm and whether their use was successful?

NO

Are there critical facilities within your community (outside the surge area) that could be retrofitted for hurricane protection so residents could “shelter in place”? Please provide a list with locations. Do any of these critical facilities have residents who require government assistance to evacuate?

Critical Facilities That Could Be Retrofitted	Locations	Require Government Assistance (Y/N)
All in surge area	Last resort shelters at schools	
Do not encourage shelter in place		

HURRICANE LIAISON TEAM (HLT)

1. If you utilized FEMA’s Hurricane Liaison Team, how would you rate the service received?

Unsatisfactory -----NA-----

-----Excellent

1 2 3 4 5

2. Did you participate in the HLT teleconferences during this event? Were these conferences helpful? Please explain.

 N/A

3. How could FEMA’s Hurricane Liaison Team improve services to local emergency management agencies?

 N/A

EMERGENCY OPERATIONS CENTER

At what time was the Emergency Operations Center Activated?

<input type="checkbox"/> Not Activated	<input checked="" type="checkbox"/> Partial Activation	<input checked="" type="checkbox"/> Full Activation
	Date MC, 9/9/08 BC, 9/8/08 _____	Date MC, 9/10/08 BC, 9/10/08 _____
	Time MC, 12 Noon, BC, 11:00a.m. _____	Time_MC, 9:00a.m., BC, 7:00 a.m. _____

Did your organization have a presence in, or have access to, the STATE Emergency Operations Center during this event? If so, was this helpful in the information collection process? Please Explain.

 MC, Yes and yes

 BC, No

 Both in contact with RLO deployed to the region via conference calls.

TECHNOLOGICAL

Please identify which tools assisted you in making decisions

HURREVAC Website(s) HAZUS
 Tides SLOSH Tides

Of the tools utilized, how would you rate their performance?

Unsatisfactory -----

--Excellent

HURREVAC	1	2	3	4x	5x
SLOSH	1	2	3	4x	5
TIDES	1	2	3	4x	5
HAZUS	1	2	3	4	5
Other	1	2	3	4	5x

Of the tools utilized, how would you rate their ease of use?

Unsatisfactory -----

--Excellent

HURREVAC	1	2	3	4x	5
SLOSH	1	2	3	4x	5
TIDES (don't use)	1	2	3	4x	5
HAZUS (don't use)	1	2	3	4	5
Other	1	2	3	4x	5

Of the tools utilized, how could they be enhanced or improved?

HURREVAC	Both counties use a lot
SLOSH	Both counties use a little but proficiency is difficult with infrequent use
TIDES	_____
HAZUS	_____
Other	_____

Of the tools utilized, has staff been adequately trained to operate the tools?

HURREVAC	<input checked="" type="checkbox"/> Yes BC	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Partially MC	<input type="checkbox"/> Not Applicable
SLOSH	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Partially MC	<input checked="" type="checkbox"/> Not Applicable BC
TIDES	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Partially MC	<input checked="" type="checkbox"/> Not Applicable BC
HAZUS	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Partially	<input type="checkbox"/> Not Applicable BC
Other	<input checked="" type="checkbox"/> Yes BC	<input type="checkbox"/> No	<input type="checkbox"/> Partially	<input checked="" type="checkbox"/> Not Applicable BC
				<input type="checkbox"/> Not Applicable

How was the public notified of the evacuation orders?

- Television
- Newspaper
- Telephone
- Other Methods:
- Loudspeaker / PA(MC)
- Meetings
- Mass Fax
- Radio
- Internet
- Mass Email

Were the evacuation orders issued in a timely manner? If not, please explain.

Yes, appropriate for the storm.

How were evacuation areas determined?

- HES Products/Storm Surge Maps
- FIRM Maps
- History of Flooding
- History of Wind Damage
- Political Decision
- Other: _____

What percentage of your population was asked to evacuate? Estimate of how many complied?

Percentage Asked to Evacuate	Estimate of How Many Complied
<u>MC</u> 100% _____	50%
BC , 25% _____	15%

About what percentage of your population lives within a designated evacuation zone?

Percentage in designated evacuation zone

MC, 50% BC,75% _____

Of those who evacuated, about what percentage of them used local; shelters instead of leaving the area?

Percentage that used local shelters instead of leaving area

_____ NA _____

In your opinion, what factors increased or decreased the percentage of those choosing to evacuate?

Storm surge and their experiences with previous storms such as Katrina.

Please provide the timetable for each evacuation order given, according to the targeted at risk population (i.e. nursing homes, mobile homes, tourists, flood zones, etc.) By how many hours did each targeted evacuation order precede the onset of tropical storm winds (34 Kt winds)?

At Risk Population	Date & Time Evacuation Order Given	Onset of 34 Kt Winds	Estimated Time to Complete Evacuation
N/A			

Please provide an estimate as to how long the overall evacuation process took. What was the longest commute time reported?

No Problems

What significant traffic problems were experienced during the evacuation for this event?

- Unanticipated Volumes
- Inadequate Traffic Control
- Diversions from Other Areas
- Inadequate Signage
- Downed Trees
- Congestion and Traffic Jams
- Uncoordinated Traffic Signals
- Flooded Roads
- Damaged Roads
- Other: All of these problems existed
- Accidents and Stalled Autos
- Uncoordinated Evac Timing
- Construction
- County Roads Blocked

Please describe when and where major congestion and choke points / bottlenecks occurred on evacuation routes. How long did the congestion last? When did it recede? Describe where any congestion remained at the time of landfall, if any.

None

Was contra-flow used? If so, when and where did it occur?

NO

16a. Should contra-flow have occurred earlier / later? How much earlier / later?

Were there any operational problems or issues with contra flow? Describe them.

If contra-flow was not used, should it have been considered? When should it be initiated and where?

How can the Hurricane Program assist in alleviating some of these problems?

Need more and better evacuation roads and help coordinate with Houston.

Please describe how the evacuation process and traffic management can be improved.

COMMUNICATIONS AND PUBLIC INFORMATION

From which agencies and or products did you receive event information?

- | | | |
|---|--|--|
| <input type="checkbox"/> FEMA Regional Office | <input checked="" type="checkbox"/> Other State Agencies | <input checked="" type="checkbox"/> Local EMAs |
| <input checked="" type="checkbox"/> HURREVAC | <input type="checkbox"/> HLT / ELT | <input checked="" type="checkbox"/> Local Weather Office |
| <input checked="" type="checkbox"/> The Weather Channel | <input checked="" type="checkbox"/> Commercial Media | <input checked="" type="checkbox"/> Internet |
| <input type="checkbox"/> Other: _____ | | |

Please list which website(s) you used to access storm and event information.

NWS, Impact Weather, NOAA, WebEOC

How was local information distributed to you?

- | | | |
|---|--|--|
| <input checked="" type="checkbox"/> Telephone | <input checked="" type="checkbox"/> Fax | <input checked="" type="checkbox"/> Email |
| <input checked="" type="checkbox"/> Website | <input type="checkbox"/> Interview | <input type="checkbox"/> Press Conference |
| <input type="checkbox"/> Video / Tape | <input type="checkbox"/> Pamphlets / Brochures | <input type="checkbox"/> Mass email groups |
| <input type="checkbox"/> | Other | Documents: |

How timely was the information?

Good

How do you distribute local information to the media?

- | | | |
|---|---|--|
| <input checked="" type="checkbox"/> Telephone | <input checked="" type="checkbox"/> Fax | <input checked="" type="checkbox"/> Email |
| <input checked="" type="checkbox"/> Website | <input checked="" type="checkbox"/> Interview | <input checked="" type="checkbox"/> Press Conference |
| <input type="checkbox"/> Video / Tape | <input checked="" type="checkbox"/> Pamphlets / Brochures | <input type="checkbox"/> Mass email groups |
| <input type="checkbox"/> Others: _____ | | |

Was information coordinated with other local agencies to ensure "one-voice" cohesiveness?

Yes, joint information center to State.

Did you allow the media access to the EOC?

Yes, in a separate briefing area of the EOC

Did you conduct specific planning or coordination sessions with the media for the 2008 hurricane season?

- Yes MC No Pre-Season Post-Season

Have you conducted specific planning or coordination sessions with the media this year?

- Yes MC No Pre-Season Post-Season

Had Regional Preparedness Conference

Was technical jargon used in a manner that could be easily understood by the public? If no, please explain.

Yes

How did you disseminate information to the general public?

MC - Phone

BC – Phone, emails, newsletter, commercial media

Did you experience problems disseminating information to the evacuating public? Please explain.

- Information too Complicated
 Information Inaccurate
 Not Enough Information
 Untimely Information
 Population Apathy MC
 Lack of Political Support
 Other Problems: _BC – Lack of power

Do you believe the evacuating public experienced problems in receiving the following information?

- Evacuation Decision Info
 Evacuation Routes
 Evacuation Detours
 Travel Time Estimates
 Traffic Congestion Info
 Storm Information
 Other Problems: __BC – re-entry information

14. What language barriers were experienced as it relates to the evacuation process?

MC - Vietnamese

15. How would you rate overall communications and information dissemination during this event?

		Unsatisfactory-----		
--Excellent				
Within State EOC	1	2	3	4x MC
	5x BC			
Between State EOCs	1	2	3	4x
	5x			
Within Jurisdictions	1	2	3	4x
	5x			
Between Jurisdictions	1	2	3	4x
	5x			
With the NWS	1	2	3	4x
	5x			
With the Media	1	2	3x BC	4x
	5x			

Please define what mutual aid sheltering agreements you have with neighboring jurisdictions.

MC – Residents went to Comal County

BC – Residents went to Bell County

What was the average length of time the shelters remained open?

Average Hours _____ Average Days _____

What problems, if any, were reported in the opened shelters?

Location Confusion

Overcrowding

Shortage of Staff

Flooding

Wind Damage

Loss of Utilities

Lack of Security

Shortage of Shelters

Unanticipated Medical Issues

Shortage of Food

Shortage of Supplies

Transportation

Medical Needs

Other:

Please describe how the statewide sheltering process can be improved.

I.D. process

POST STORM RECOVERY

During the post-disaster recovery process, what information was most beneficial to you?

MC – FEMA information

BC – Availability of food, water, and gasoline

With limited communications capabilities, how was post-disaster information managed in your county / jurisdiction?

BC – We utilized local radio and television and manned phone banks and provided daily public information handouts.

What significant traffic problems experiences during the re-entry for this event?

Unanticipated Volumes Congestion and Traffic Jams Accidents and Stalled Autos

Inadequate Traffic Control Uncoordinated Traffic Signals Uncoordinated Evac. Timing

Diversions from Flooded Roads Construction

Others

Inadequate Signage
 Downed Trees

Damaged Roads

County Roads Blocked
Other:

How can the Hurricane Program assist in alleviating some of the problems encountered?

It would help tremendously to have a constant and consistently defined set of FEMA rules.

During Re-Entry, how was information coordinated and disseminated to the general public?

Phone Bank, Radio, TV

Press releases to newspapers, television stations.

ANALYSIS OF OTHER FEMA PROGRAMS AND EVACUATION ASSISTANCE

Did the results of the FEMA "Gap Analysis" play a role in your planning and evacuation efforts? How and to what extent?

No

Did the Federal assisted evacuation efforts (ie. Aircraft, bus, train, other) help or hinder your efforts to safely evacuate your threatened populations from your community? Do you feel that your populations will expect similar support from the Federal government in the future? Please explain.

State buses were used for Special Needs. Great Help!

OTHER COMMENTS

Please provide other comments that would assist FEMA, Local Emergency Management Offices, and State Emergency Management Offices in preparing for, responding to, and recovering from an event.

Problems arise when the state removes locally assigned resources out of the impact area.

There is varying capability and consistency of FEMA staff assigned to counties.

FEMA staff needs to remain assigned to counties if there are still unresolved issues

Logistics with water and ice shipments. Were usually received after we needed as opposed to when we needed.

Brazoria did not get air support. Could use rail support.

COMPREHENSIVE HURRICANE EMERGENCY MANAGEMENT STRATEGY (CHEMS)

FEMA is broadening the role of the Hurricane Evacuation Study into a more comprehensive approach called the Comprehensive Hurricane Emergency Management Strategy or CHEMS for short. The HES will now become a component of the more comprehensive program.

Please indicate which of the following components of the Hurricane Evacuation Study need improvement and please specify how the component can be improved.

Transportation
Analysis

Behavioral Analysis

Vulnerability Analysis

Hazards Analysis

Shelter Analysis

Decision Making

Please indicate which of the following components of a Re-entry Analysis would benefit the community and specify how the component should be developed.

Decision Making

Communication
Process

Storm Damage Impact

Roadway Network

Consideration/Alternatives

Please indicate which of the following components of a Business Mitigation and Recovery Analysis would benefit the community and specify how the component should be developed.

Mitigation Assessment

Impact Assessment

Economic Impact

Recovery Analysis

Post Storm
Redevelopment
Planning

Please indicate which of the following components of a Community Storm Impact Analysis would benefit the community and specify how the component should be developed.

Coastal Erosion
Mapping / Analysis

Construction/Mitigation
Analysis

Economic Impact

Inland Flooding
Analysis

Utility Damage
Analysis

Critical Facility
Analysis

Post Storm Security
Needs Assessment

Please indicate which of the following components of a Recovery Analysis would benefit the community and specify how the component should be developed.

Debris Management
Planning

Mutual Aid Planning

Long Term Sheltering

Post Storm
Redevelopment
Planning

Public Health Issues

Catastrophic Impact
Planning

Temporary Housing
Assessment

Please indicate which of the following components of a Communication Assessment would benefit the community and specify how the component should be developed.

Real Time
Communication
Assessment

Public Information
Process Analysis

Please indicate which of the following components of a Technology Analysis would benefit the community and specify how the component should be developed.

GIS Application
Assessment

Enhanced Decision

Tool Updates/Creation _____

Please indicate which of the following components of a Disaster Mitigation Analysis would benefit the community and specify how the component should be developed.

Building Code Impact Analysis _____

Zoning Analysis _____

Community Rating System Assessment _____

Facility Performance Assessment _____

HAZUS Implementation _____

THANK YOU FOR YOUR TIME AND ASSISTANCE IN COMPLETING THIS MOST IMPORTANT DOCUMENT.

GALVESTON COUNTY

Date	Time	City	County	State	Conducted by
8/17/09	1:00 p.m.	Dickinson	Galveston	Texas	Wendy Phillips, FEMA

This assessment is designed to evaluate the effectiveness of the National Hurricane Program's Hurricane Evacuation Study (HES) Products within your jurisdiction as it applied to your experience during the recent hurricane threat. It is also intended to identify any specific needs or recommendations that you may wish to share relating to FEMA's overall Hurricane Program. It is not designed to evaluate you nor your response to the event. Rather it is designed to help FEMA better serve you in the future. Please complete this assessment prior to your scheduled interview.

GENERAL

1. Of the following products, which were readily available for your use?

- | | | |
|---|---|--|
| <input type="checkbox"/> Shelter Locations | <input checked="" type="checkbox"/> Evacuation Maps | <input checked="" type="checkbox"/> Clearance Times |
| <input checked="" type="checkbox"/> SLOSH | <input type="checkbox"/> Local Hurricane Plan | <input checked="" type="checkbox"/> HURREVAC |
| <input checked="" type="checkbox"/> Other Documents: _5 year MOU special needs shelter contract with city of Austin | <input type="checkbox"/> HES Study | <input checked="" type="checkbox"/> Storm Surge Maps |
-

Of the information provided to you, which items were considered most important? Please explain.

- | | | |
|--|--|---|
| <input type="checkbox"/> Shelter Locations | <input type="checkbox"/> Evacuation Maps | <input checked="" type="checkbox"/> Clearance Times |
| <input checked="" type="checkbox"/> SLOSH | <input checked="" type="checkbox"/> Local Hurricane Plan | <input checked="" type="checkbox"/> HURREVAC |
| <input type="checkbox"/> | <input type="checkbox"/> HES Study | <input type="checkbox"/> Storm Surge Maps |
| | Other | Documents: |
-

 Good coordination between county and states. Science is relevant and important but not critical.

Which items were found to be the least helpful? Please explain.

- | | | |
|--|---|--|
| <input type="checkbox"/> Shelter Locations | <input type="checkbox"/> Evacuation Maps | <input type="checkbox"/> Clearance Times |
| <input type="checkbox"/> SLOSH | <input type="checkbox"/> Local Hurricane Plan | <input type="checkbox"/> HURREVAC |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> HES Study | <input checked="" type="checkbox"/> Storm Surge Maps |
| | Other | Documents: |
-

 Clearance times are not used. Have not used storm surge maps enough. Didn't use HES data but still helpful/useful information. Started with voluntary evacuation. Other areas waited for Galveston. North end of county didn't clog roadways.

Please describe your partnerships with private companies and/or civic groups to assist in a public outreach program for your community.

Red Cross, CERT, AARP, NWS Workshop, Latter Day Saints, Lutheran Social Services, Pre-event contractors, Chamber, Rotary, Interfaith Ministries

Discuss how HURREVAC was used during this hurricane event. Utilized for evacuation times and tracking. Internal discussion with public officials. Conference call review (Web link) with NWS.

Great relationship between EMA and National Weather Service

Discuss how SLOSH or the SLOSH Display Model was used during this hurricane event. SLOSH was used in webinars and are also over laid over Google Earth. SLOSH is late in the storm event and can help lead to rescue operations and where they should occur.

What mitigation efforts, if any, were initiated or participated in before or during this event?

Multiple – Beach nourishment, dune restoration projects, geo-tubes helpful for recurring smaller storms, Long term construction to reduce flood threats, Pre-positioned contracts for many things (food, shelter, debris cleanup, facility cleanup. A new EOC/NWS shared office under construction at 35 feet with protective measures.

Of these mitigation efforts, were they successful? Please explain.

Yes, all of them.

Please list any critical facilities that were impacted by wind, surge or freshwater flooding. (Surge) County Courthouse and many county buildings. 75% of houses were flooded on Galveston. Seawall prevented catastrophe. Waste water lift stations in League City.

10. Please list the locations, quantity and type of "vulnerable" or "special needs" populations that were impacted by this storm.

___ Elderly, disabled	Bolivar Peninsula	100
_____	San Leon	150
_____	Baclift	150
_____	Freddiesville	100

11. Did your community provide transportation resources to "critical transportation populations?" Please list the types of transportation provided, the amount and the locations to which these populations were taken.

___ Senior buses transported 100 people countywide. The State of Texas transported 1500 countywide. Galveston City transported 250 and League City transported 150 nursing home patients

12. Are you aware of any instances where "safe rooms" were utilized during this storm and whether their use was successful?

___ NO, no interest because elevations too low in the area.

13. Are there critical facilities within your community (outside the surge area) that could be retrofitted for hurricane protection so that their residents could potentially "shelter in place" and not have to be evacuated? Please provide a list with locations. Are any of these "critical transportation needs" origin facilities whose residents require government assistance to evacuate?

___ No large stock of buildings available. Need to be able to use the structure for multiple purposes, not just as a shelter. Many agree with retrofitting over a large scale evacuation.
___ Friendswood_- Could retrofit the Library and Activities Building.

HURRICANE LIAISON TEAM (HLT)

1. If you utilized FEMA's Hurricane Liaison Team, how would you rate the service received?

-----Unsatisfactory -----NA -----
-----Excellent
1 2 3 4 5

2. Did you participate in the HLT teleconferences during this event? Were these conferences helpful? Please explain.

NWS office in same building with Galveston EOC

3. How could FEMA's Hurricane Liaison Team improve services to local emergency management agencies?

EMERGENCY OPERATIONS CENTER

At what time was the Emergency Operations Center Activated?

Not Activated Partial Activation Full Activation
Date Date 9/10/08
9/8/08 Time ___8:00 Time ___8:00
a.m. a.m.

Did your organization have a presence in, or have access to, the STATE Emergency Operations Center during this event?

RLOs come to the local pre-event conference calls with state. No access to State EOC

TECHNOLOGICAL

Please identify which tools assisted you in making decisions

HURREVAC Website(s) HAZUS
 SLOSH Tides
 Other: ___NWS
cooperation_____

Of the tools utilized, how would you rate their performance?

Unsatisfactory -----

--Excellent

HURREVAC	1	2	3	4	5x
SLOSH	1	2	3	4x	5
TIDES	1	2	3x	4	5
HAZUS	1	2	3	4	5
Other	1	2	3	4	5

Very low elevations

Of the tools utilized, how would you rate their ease of use?

Unsatisfactory -----

--Excellent

HURREVAC	1	2	3	4	5
SLOSH	1	2	3	4	5
TIDES	1	2	3	4	5
HAZUS	1x	2	3	4	5
Other	1	2	3	4	5

Of the tools utilized, how could they be enhanced or improved?

HURREVAC	<u>Keep working to simplify</u>
SLOSH	<u>Sooner real time runs</u>
TIDES	<u>More buoys, observational data</u>
HAZUS	<u>Takes time and effort, not easy to train, use is complicated</u>
Other	

Of the tools utilized, has staff been adequately trained to operate the tools?

HURREVAC	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Partially	<input type="checkbox"/> Not Applicable
SLOSH	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Partially	<input type="checkbox"/> Not Applicable
TIDES	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Partially	<input type="checkbox"/> Not Applicable
HAZUS	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Partially	<input type="checkbox"/> Not Applicable
Other	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Partially	<input type="checkbox"/> Not Applicable

How was the public notified of the evacuation orders?

- | | | |
|--|---|--|
| <input checked="" type="checkbox"/> Television | <input type="checkbox"/> Loudspeaker / PA | <input checked="" type="checkbox"/> Radio |
| <input checked="" type="checkbox"/> Newspaper | <input type="checkbox"/> Meetings | <input checked="" type="checkbox"/> Internet |
| <input checked="" type="checkbox"/> Telephone | <input type="checkbox"/> Mass Fax | <input checked="" type="checkbox"/> Mass Email |
| <input type="checkbox"/> Other Methods: | | |

Door to door and local access channels.

Were the evacuation orders issued in a timely manner? If not, please explain.

Locally, yes. Houston, no.

How were evacuation areas determined?

- | | |
|---|---|
| <input type="checkbox"/> HES Products/Storm Surge | <input type="checkbox"/> History of Wind Damage |
| Maps | |
| <input type="checkbox"/> FIRM Maps | <input type="checkbox"/> Political Decision |
| <input type="checkbox"/> History of Flooding | <input checked="" type="checkbox"/> Other: __By Zip Codes |

_____ What language
barriers were

experienced as it relates to the evacuation process?

How can FEMA further assist in the decision making process. Do you have recommendations for tools or products that would assist you?

EVACUATION ROADWAY NETWORK

How would you rate the capacity of the evacuation routes in relation to vehicular demand?

Unsatisfactory -----

-----Excellent

1 2 3 4 5

Do you have traffic management plans that would facilitate the evacuation process? Please define.

What specific measures were taken to facilitate the evacuation process for this event?

- | | | |
|--|---|--|
| <input type="checkbox"/> Barricades | <input type="checkbox"/> Traffic Control Points | <input type="checkbox"/> Lock Down Drawbridges |
| <input type="checkbox"/> Roving Vehicle Assistance | <input type="checkbox"/> Coordinated Traffic Lights | <input type="checkbox"/> AM Radio Messages |
| <input type="checkbox"/> Highways Reversal | <input type="checkbox"/> Message Signs | <input type="checkbox"/> Traffic Redirect |
| <input type="checkbox"/> | | Others: |

What is the estimated number of people and vehicles evacuating for this event?

	Estimated People	Estimated Vehicles
Evacuating WITHIN your Community	_____	_____
Evacuating THROUGH or TO your Community	_____	_____

What percentage of your population was asked to evacuate? Estimate of how many complied?

Percentage Asked to Evacuate	Estimate of How Many Complied
_G(90%),LC(50%), Friendswood (100%)_____	_G(85%), LC(20%)_, Friendswood (35%)_____
-	-

About what percentage of your population lives within a designated evacuation zone? About what percentage of your population used local shelters instead of leaving the area?

Galveston	90%
League City	75%
Friendswood	100%

In your opinion, what factors increased or decreased the percentage of those choosing to evacuate?

Because Ike was so erratic it made the forecast difficult. "Cat 2" storm prediction just did not scare most people. Also, the experience with Rita influenced their decisions.

Was the early evacuation of at-risk populations successful? What were the response rates for these groups (including tourists). What percentage of the total evacuating population did these groups account for?

Successful for those that left. However, many chose to stay and shelter in place, then panicked and called too late. Tourists simply cancelled reservations and didn't need transportation.

How would you rate the general public's response to the evacuation notice?

Slow Response Normal Response Fast Response

Identify which evacuation routes were advocated to the public.

Interstate 45, I-10, Hwy. 146, Hwy.6

How would you rate the traffic volume during this evacuation event?

Light Normal Heavy Congested

Did you have predicted clearance times available from a previous Hurricane Evacuation Study (HES)? If so, what were they?

At 32 hours to clear the county

If clearance times and/or evacuation timelines were not available from a previous HES, how were they determined?

N/A

What was the observed estimated evacuation clearance time? Did you find the clearance times appropriate? Please explain.

Yes, But many factors difficult to control must be considered.

Did the tourist occupancy pose a significant problem not addressed by the clearance times in the HES?

Not particularly. Many cancelled vacations.

Please provide the timetable for each evacuation order given according to a target population (i.e. nursing homes, mobile homes, tourists, flood zones, etc.) By how many hours did each targeted evacuation order precede actual landfall?

Galveston Co.	9/10 6:00p.m.	9/12 3:00p.m.	48 hours
Friendswood	9/10 6:00p.m.	9/12 12:00 noon	36 – 48 hours
League City	9/10 8:00a.m.	9/12 22:00	30 hours

Please provide an overall estimate as to how long the evacuation process took.

What is the longest commute time reported?

What significant traffic problems were experienced during the evacuation for this event?

- | | | |
|---|--|--|
| <input type="checkbox"/> Unanticipated Volumes | <input type="checkbox"/> Congestion and Traffic Jams | <input type="checkbox"/> Accidents and Stalled Autos |
| <input type="checkbox"/> Inadequate Traffic Control | <input type="checkbox"/> Uncoordinated Traffic Signals | <input type="checkbox"/> Uncoordinated Evac Timing |
| <input type="checkbox"/> Diversions from Other Counties or States | <input checked="" type="checkbox"/> Flooded Roads | <input checked="" type="checkbox"/> Construction |
| <input type="checkbox"/> Inadequate Signage | <input type="checkbox"/> Damaged Roads | <input type="checkbox"/> County Roads Blocked |
| <input type="checkbox"/> Downed Trees | <input checked="" type="checkbox"/> Other: | <input type="checkbox"/> Fuel availability |

Please describe when and where major congestion and choke points / bottlenecks occurred on evacuation routes. How long did the congestion last? When did it recede? Describe where any congestion remained at the time of landfall, if any.

No issues with Ike due to experience and lessons learned with Rita.

If roadways were reversed, where and when did this occur? Should it have occurred earlier? How much earlier? Were there any operational problems or issues with the reversible roadways? Describe them. Describe the plan for reversing each roadway. If no roadways were reversed, should roadway reversibility be considered? When?

Was set up, pre-positioned but not used

How can the Hurricane Program assist in alleviating some of these problems?

With funding for construction and continue to pursue public education about storm risks.

Please describe how the evacuation process and traffic management can be improved.

Keep Houston from evacuating. Educate. Stay put if you are not at risk and you live in a secure home.

COMMUNICATIONS AND PUBLIC INFORMATION

From which agencies and or products did you receive event information?

- | | | |
|--|--|--|
| <input checked="" type="checkbox"/> FEMA Regional Office | <input checked="" type="checkbox"/> Other State Agencies | <input checked="" type="checkbox"/> Local EMAs |
| <input checked="" type="checkbox"/> HURREVAC | <input type="checkbox"/> HLT / ELT | <input checked="" type="checkbox"/> Local Weather Office |
| <input checked="" type="checkbox"/> The Weather Channel | <input checked="" type="checkbox"/> Commercial Media | <input checked="" type="checkbox"/> Internet |
| <input type="checkbox"/> Other: _____ | | |

How was local information distributed to you?

- | | | |
|---|--|---|
| <input checked="" type="checkbox"/> Telephone | <input type="checkbox"/> Fax | <input checked="" type="checkbox"/> Email |
| <input checked="" type="checkbox"/> Website | <input type="checkbox"/> Interview | <input checked="" type="checkbox"/> Press Conference |
| <input type="checkbox"/> Video / Tape | <input type="checkbox"/> Pamphlets / Brochures | <input checked="" type="checkbox"/> Mass email groups |
| <input type="checkbox"/> | Other | Documents: |

How timely was the information?

Yes, the timing was good.

How do you distribute local information to the media?

- | | | |
|---|--|--|
| <input checked="" type="checkbox"/> Telephone | <input type="checkbox"/> Fax | <input checked="" type="checkbox"/> Email |
| <input checked="" type="checkbox"/> Website | <input checked="" type="checkbox"/> Interview | <input checked="" type="checkbox"/> Press Conference |
| <input type="checkbox"/> Video / Tape | <input type="checkbox"/> Pamphlets / Brochures | <input type="checkbox"/> Mass email groups |
| <input type="checkbox"/> | Other | Documents: |

Was information coordinated with other local agencies to ensure “one-voice” cohesiveness?

Yes for Galveston No for Houston

Did you allow the media access to the EOC?

Galveston Co. Yes

Friendswood No

Did you conduct specific planning or coordination sessions with the media for the 2008 hurricane season?

- Yes No Pre-Season Post-Season

Have you conducted specific planning or coordination sessions with the media this year?

- Yes No Pre-Season Post-Season

Was technical jargon used in a manner that could be easily understood by the public? If no, please explain.

Yes - designed to be general and simple

Please describe how you disseminate information you received to the general public.

Mass communication service(private company), News Media, Door to door, volunteer fire dept., connect city

Did you experience problems disseminating information to the evacuating public? Please explain.

- Information too Complicated
 Information Inaccurate
 Not Enough Information
 Untimely Information
 Population Apathy
 Lack of Political Support
 Other Problems: _____Not concerned with "Cat 2 "

Do you believe the evacuating public experienced problems in receiving the following information?

- Evacuation Decision Info
 Evacuation Routes
 Evacuation Detours
 Travel Time Estimates
 Traffic Congestion Info
 Storm Information
 _____ Other Problems:
-

13. How would you rate overall communications and information dissemination during this event?

Unsatisfactory-----

--Excellent

Within State EOC	1	2	3	4x	5
Between State EOCs	1	2	3	4	5
Within Jurisdictions	1	2	3	4	5x
Between Jurisdictions	1	2	3	4	5x
With the NWS	1	2	3	4	5x
With the Media	1	2	3	4x	5
With FEMA	1	2	3	4x	5

14. How can information dissemination be improved?

More use of email by agencies. Sometimes much faster than returning phone calls.

How can communication methods be improved?

Email with smart phones and blackberries

SHELTERING

Please define the total number of shelters opened and the estimated number of people who sought shelter during this event in your jurisdiction.

SHELTER	Number Opened	Estimate of People Sheltered
Red Cross	_____	_____
Special Needs	_____	_____
Faith Based	__5 unofficial_____	__200_____
Other	_____	_____

Was the availability of the shelters sufficient for the needs of the evacuating public? If not, please explain.

Yes _____

Were the shelters opened in an adequate time frame as it related to the evacuating public?

Yes _____

Were "Refuges of Last Resort" utilized in addition to public shelters?

Yes _____

Please define what mutual aid sheltering agreements you have with neighboring jurisdictions.

Austin, TX – Contract for 1,500 special needs residents.

What was the average length of time the shelters remained open?

Average	Hours	Average	Days
_24_____		_14_____	

What problems, if any, were reported in the opened shelters?

- | | | |
|---|---|--|
| <input type="checkbox"/> Location Confusion | <input type="checkbox"/> Overcrowding | <input checked="" type="checkbox"/> Shortage of Staff |
| <input type="checkbox"/> Flooding | <input type="checkbox"/> Wind Damage | <input type="checkbox"/> Loss of Utilities |
| <input type="checkbox"/> Lack of Security | <input type="checkbox"/> Shortage of Shelters | <input checked="" type="checkbox"/> Unanticipated Medical Issues |
| <input type="checkbox"/> Shortage of Food | <input type="checkbox"/> Shortage of Supplies | <input type="checkbox"/> Other: |
- Transportation, medical needs,

Please describe how the statewide sheltering process can be improved.

State supports sheltering plan statewide. Inland point to point shelters for special needs.

Need more capacity to provide medical help.

COMPREHENSIVE HURRICANE EMERGENCY MANAGEMENT STRATEGY (CHEMS)

FEMA is broadening the role of the Hurricane Evacuation Study into a more comprehensive approach called the Comprehensive Hurricane Emergency Management Strategy or CHEMS for short. The HES will now become a component of the more comprehensive program.

Please indicate which of the following components of the Hurricane Evacuation Study need improvement and please specify how the component can be improved.

Transportation Analysis Complex factors make evacuation time predictions difficult

Behavioral Analysis

Vulnerability Analysis

Hazards Analysis

Shelter Analysis

Decision Making

Please indicate which of the following components of a Re-entry Analysis would benefit the community and specify how the component should be developed.

Decision Making All would be useful

Communication
Process

Storm Damage Impact

Roadway Network

Consideration/Alternatives

Please indicate which of the following components of a Business Mitigation and Recovery Analysis would benefit the community and specify how the component should be developed.

Mitigation Assessment Legislation or discount on insurance premium to encourage participation

Impact Assessment

Economic Impact

Recovery Analysis

Post Storm
Redevelopment
Planning

Please indicate which of the following components of a Community Storm Impact Analysis would benefit the community and specify how the component should be developed.

Coastal Erosion
Mapping / Analysis

Construction/Mitigation
Analysis

Economic Impact

Inland Flooding
Analysis

Utility Damage Legislative mandate
Analysis

Critical Facility
Analysis

Post Storm Security
Needs Assessment

Please indicate which of the following components of a Recovery Analysis would benefit the community and specify how the component should be developed.

Debris Management
Planning

Mutual Aid Planning Develop boilerplate agreements to encourage participation

Long Term Sheltering Help establish more local shelters

Post Storm
Redevelopment
Planning

Public Health Issues

Catastrophic Impact
Planning

Temporary Housing
Assessment

Please indicate which of the following components of a Communication Assessment would benefit the community and specify how the component should be developed.

- Real Time Communication Assessment _____

- Public Information Process Analysis _____

Please indicate which of the following components of a Technology Analysis would benefit the community and specify how the component should be developed.

- GIS Application Assessment _____

- Enhanced Decision Tool Updates/Creation _____

Please indicate which of the following components of a Disaster Mitigation Analysis would benefit the community and specify how the component should be developed.

- Building Code Impact Analysis _____
Need to lobby state to give counties more authority to restrict construction in high hazard areas

- Zoning Analysis _____

- Community Rating System Assessment _____

- Facility Performance Assessment _____

- HAZUS Implementation _____

POST STORM RECOVERY

During the recovery process, what information was most beneficial to you?

- The emailed information from cities in the county
- Daily updates from shelter host (Austin)
- FEMA liaisons
- Establishment of Area Field Office (AFO) early.

With limited communications capabilities, was information managed?

Daily conference calls, 800 trunk radio, email , internet, FEMA and State Liaison Officer

What significant traffic problems experiences during the re-entry for this event?

- | | | |
|---|---|--|
| <input checked="" type="checkbox"/> Unanticipated Volumes | <input checked="" type="checkbox"/> Congestion and Traffic Jams | <input type="checkbox"/> Accidents and Stalled Autos |
| <input type="checkbox"/> Inadequate Traffic Control | <input type="checkbox"/> Uncoordinated Traffic Signals | <input type="checkbox"/> Uncoordinated Evac Timing |
| <input type="checkbox"/> Diversions from Others | <input type="checkbox"/> Flooded Roads | <input type="checkbox"/> Construction |
| <input type="checkbox"/> Inadequate Signage | <input checked="" type="checkbox"/> Damaged Roads | <input type="checkbox"/> County Roads Blocked |
| <input type="checkbox"/> Downed Trees | <input type="checkbox"/> | Other: |
-

How can the Hurricane Program assist in alleviating some of the problems encountered?

More Public Awareness.

During Re-Entry, how was information coordinated and disseminated to the general public?

Need better communication at checkpoints. TV/radio

ANALYSIS OF OTHER FEMA PROGRAMS AND EVACUATION ASSISTANCE

Did the results of the FEMA "Gap Analysis" play a role in your planning and evacuation efforts? How and to what extent?

N/A

Did the Federal assisted evacuation efforts (ie. Aircraft, bus, train, other) help or hinder your efforts to safely evacuate your threatened populations from your community? Do you feel that your populations will expect similar support from the Federal government in the future? Please explain.

___ Certain populations will always feel “entitled”, to some dependence on state and federal assistance. However, responsibility should shift to individuals and locals

OTHER COMMENTS

Please provide other comments that would assist FEMA, Local Emergency Management Offices, and State Emergency Management Offices in preparing for, responding to, and recovering from an event.

Pre-establish locations for DRC

Shelter Planning

Communication with Special Needs

THANK YOU FOR YOUR TIME AND ASSISTANCE IN COMPLETING THIS MOST IMPORTANT DOCUMENT.

HARRIS COUNTY

Date	Time	City	County	State	Conducted by
8/18/09	8:30 a.m.	Houston	Harris	Texas	Wendy Phillips, FEMA

This assessment is designed to evaluate the effectiveness of the National Hurricane Program's Hurricane Evacuation Study (HES) Products within your jurisdiction as it applied to your experience during the recent hurricane threat. It is also intended to identify any specific needs or recommendations that you may wish to share relating to FEMA's overall Hurricane Program. It is not designed to evaluate you nor your response to the event. Rather it is designed to help FEMA better serve you in the future. Please complete this assessment prior to your scheduled interview.

GENERAL

1. Of the following products, which were readily available for your use?

- | | | |
|--|--|--|
| <input type="checkbox"/> Shelter Locations | <input checked="" type="checkbox"/> Evacuation Maps | <input type="checkbox"/> Clearance Times |
| <input checked="" type="checkbox"/> SLOSH | <input checked="" type="checkbox"/> Local Hurricane Plan | <input checked="" type="checkbox"/> HURREVAC |
| <input checked="" type="checkbox"/> Other Documents: _____ Dallas and San Antonio shelter locations. | <input type="checkbox"/> HES Study | <input checked="" type="checkbox"/> Storm Surge Maps |

Of the information provided to you, which items were considered most important? Please explain.

- | | | |
|--|---|--|
| <input type="checkbox"/> Shelter Locations | <input type="checkbox"/> Evacuation Maps | <input type="checkbox"/> Clearance Times |
| <input checked="" type="checkbox"/> SLOSH | <input type="checkbox"/> Local Hurricane Plan | <input checked="" type="checkbox"/> HURREVAC |
| <input checked="" type="checkbox"/> Other Documents: ___Used to forecast events and times. | <input type="checkbox"/> HES Study | <input type="checkbox"/> Storm Surge Maps |

___HES Study outdated.

Which items were found to be the least helpful? Please explain.

- | | | |
|--|---|---|
| <input type="checkbox"/> Shelter Locations | <input checked="" type="checkbox"/> Evacuation Maps | <input type="checkbox"/> Clearance Times |
| <input type="checkbox"/> SLOSH | <input type="checkbox"/> Local Hurricane Plan | <input type="checkbox"/> HURREVAC |
| <input type="checkbox"/> _____ | <input type="checkbox"/> HES Study | <input type="checkbox"/> Storm Surge Maps |
| | Other | Documents: |

___NO one followed them.

Please describe your partnerships with private companies and/or civic groups to assist in a public outreach program for your community.

Space contractors, HEB, Walmart, Grocery vendors, petroleum industry, Red Cross, chemical companies.

Discuss how HURREVAC was used during this hurricane event. _____Houston used for tracking _____ not timing _____

Discuss how SLOSH or the SLOSH Display Model was used during this hurricane event. _____Used _____ for _____ surge.

What mitigation efforts, if any, were initiated or participated in before or during this event?
65 Million dollar mitigation project - Texas medical center following Allison – Storm water projects – Drainage projects – water diversion channels- raising generators, etc.

Of these mitigation efforts, were they successful? Please explain.

Yes

Please list any critical facilities that were impacted by wind, surge or freshwater flooding. 19 hospitals, 400 Nursing homes were evacuated – too many to list

Please list the locations, quantity and type of “vulnerable” or “special needs” populations that were impacted by this storm.

_Buses, ambulances, -evacuated post storm because of power outages – need 500 ambulances to move hospitals -

Did your community provide transportation resources to “critical transportation populations?” Please list the types of transportation provided, the amount and the locations to which these populations were taken.

_Hospitals

Are you aware of any instances where “safe rooms” were utilized during this storm and whether their use was successful?

_____ No _____

Are there critical facilities within your community (outside the surge area) that could be retrofitted for hurricane protection so that their residents could potentially “shelter in place” and not have to be evacuated? Please provide a list with locations. Are any of these “critical transportation needs” origin facilities whose residents require government assistance to evacuate?

HURRICANE LIAISON TEAM (HLT)

1. If you utilized FEMA's Hurricane Liaison Team, how would you rate the service received?

-----Unsatisfactory -----
-----Excellent NA
1 2 3 4 5

2. Did you participate in the HLT teleconferences during this event? Were these conferences helpful? Please explain.

No, but would like a greater involvement

3. How could FEMA's Hurricane Liaison Team improve services to local emergency management agencies?

EMERGENCY OPERATIONS CENTER

At what time was the Emergency Operations Center Activated? City of Houston

Not Activated Partial Activation x Full Activation
Date Date
9/9 9/12
Time 12:00 p.m. Time 9:00 a.m.

Did your organization have a presence in, or have access to, the STATE Emergency Operations Center during this event?

RLO support team deployed pre-storm

TECHNOLOGICAL

Please identify which tools assisted you in making decisions

HURREVAC Website(s) HAZUS
SLOSH Tides
HurrTrack Other:

Of the tools utilized, how would you rate their performance?

	Unsatisfactory -----				
--Excellent					
HURREVAC	1	2	3	(4)	5
SLOSH	1	2	3	(4)	5
TIDES	1	2	3	4	5
HAZUS	1	2	3	4	5
Other	1	2	3	4	5

Of the tools utilized, how would you rate their ease of use?

	Unsatisfactory -----				
--Excellent					
HURREVAC	1	2	3	(4)	5
SLOSH	1	2	(3)	4	5
TIDES	1	2	3	4	5
HAZUS	1	2	3	4	5
Other	1	2	3	4	5

Of the tools utilized, how could they be enhanced or improved?

HURREVAC	<u>Updated clearance times</u>
SLOSH	_____
TIDES	_____
HAZUS	<u>Need GIS experience to use HAZUS</u>
Other	_____

Of the tools utilized, has staff been adequately trained to operate the tools?

HURREVAC	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Partially	<input type="checkbox"/> Not Applicable
SLOSH	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Partially	<input type="checkbox"/> Not Applicable
TIDES	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Partially	<input type="checkbox"/> Not Applicable
HAZUS	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input type="checkbox"/> Partially	<input type="checkbox"/> Not Applicable
Other	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Partially	<input type="checkbox"/> Not Applicable

6. If HURREVAC were utilized, how would you rate these program components?

	Unsatisfactory -----				
--Excellent					
Decision Arcs	1	2	3	4	5
Surge Maps	1	2	3	4x	5
Clearance Times	1	2	3	4	5
Shelter Information	1	2	3	4	5
Wind Swath	1	2	3	4x	5
Error Cone	1	2	3	4x	5

SLOSH 1 2 3x 4 5
 5-day Forecast 1 2 3 4x 5

Used mostly for tracking. Very political discussion.

EVACUATION AND DECISION MAKING

Did your jurisdiction issue evacuation orders?

Jurisdiction Name	Voluntary		Recommended		Mandatory	
	Date	Time	Date	Time	Date	Time
Houston/Harris Mandatory			9/11/08	9:00 a.m.		

Webster City Mandatory 9/11/08

12 Noon

Issued by Judge and Mayor

Please describe how the State assisted you in the evacuation and decision making process.

Transportation and assets availability

In retrospect, were the appropriate areas evacuated? If insufficient or excessive, please explain.

Insufficient for the Threat Sufficient for the Threat Excessive for the Threat

If evacuation orders were issued, please indicate which areas were targeted. Zip code areas correlated w/1,2,3 surge zones

(Please use "V" for Voluntary, "M" for Mandatory, and "R" for Recommended)

- Mobile Homes/Manufactured Homes
- Healthcare Facilities
- River/Lake Fronts
- Islands
- Beach Fronts
- Flood Prone Areas
- Countywide
- Category 1 Surge Zone
- Category 2 Surge Zone
- Category 3 Surge Zone
- Category 4 Surge Zone
- Category 5 Surge Zone
- Other: _____ zip code areas

Do you have traffic management plans that would facilitate the evacuation process? Please define.

 Yes

What specific measures were taken to facilitate the evacuation process for this event?

Barricades Traffic Control Points Lock Down Drawbridges
 Roving Vehicle Assistance Coordinated Traffic Lights AM Radio Messages
 Highways Reversal Message Signs Traffic Redirect
 _____ Others:

 -

What is the estimated number of people and vehicles evacuating for this event?

Evacuating WITHIN your Community	Estimated People	Estimated Vehicles
Evacuating THROUGH or TO your Community	_____	_____250,000_____

What percentage of your population was asked to evacuate? Estimate of how many complied?

Percentage Asked to Evacuate	to Estimate of How Many Complied
____Houston	3% _____90%_____ (28.5% of Houston in evacuation zone.)
Webster City 100%	90% _____

About what percentage of your population lives within a designated evacuation zone? About what percentage of your population used local shelters instead of leaving the area?

Houston	28.5%
Webster City	100%

In your opinion, what factors increased or decreased the percentage of those choosing to evacuate?

Experiences with terrible traffic during Hurricane Rita – increased availability of risk information to public.

Was the early evacuation of at-risk populations successful? What were the response rates for these groups (including tourists). What percentage of the total evacuating population did these groups account for?

How would you rate the general public's response to the evacuation notice?

- Slow Response Normal Response Fast Response

Identify which evacuation routes were advocated to the public.

I-10W, I-45, 290

How would you rate the traffic volume during this evacuation event?

- Light Normal Heavy Congested

Did you have predicted clearance times available from a previous Hurricane Evacuation Study (HES)? If so, what were they?

Not Used

If clearance times and/or evacuation timelines were not available from a previous HES, how were they determined?

32-36 hours must decide after Tropical Storm force winds arrive at coast

What was the observed estimated evacuation clearance time? Did you find the clearance times appropriate? Please explain.

Failure of certain populations to move at best time ends up clogging roadways.

Did the tourist occupancy pose a significant problem not addressed by the clearance times in the HES?

Please provide the timetable for each evacuation order given according to a target population (i.e. nursing homes, mobile homes, tourists, flood zones, etc.) By how many hours did each targeted evacuation order precede actual landfall?

Please provide an overall estimate as to how long the evacuation process took.

Evac up to landfall 36 hours

What is the longest commute time reported?

36 hours

What significant traffic problems were experienced during the evacuation for this event? 45

- | | | |
|---|---|--|
| <input type="checkbox"/> Unanticipated Volumes | <input checked="" type="checkbox"/> Congestion and Traffic Jams | <input type="checkbox"/> Accidents and Stalled Autos |
| <input type="checkbox"/> Inadequate Traffic Control | <input type="checkbox"/> Uncoordinated Traffic Signals | <input type="checkbox"/> Uncoordinated Evac Timing |
| <input type="checkbox"/> Diversions from Other Counties or States | <input checked="" type="checkbox"/> Flooded Roads (Surge) | <input checked="" type="checkbox"/> Construction |
| <input type="checkbox"/> Inadequate Signage | <input type="checkbox"/> Damaged Roads | <input type="checkbox"/> County Roads Blocked |
| <input type="checkbox"/> Downed Trees | <input checked="" type="checkbox"/> Other: _Delayed evac. Decisions complicated coordination regionally | |
-

Please describe when and where major congestion and choke points / bottlenecks occurred on evacuation routes. How long did the congestion last? When did it recede? Describe where any congestion remained at the time of landfall, if any.

I – 45 rush hour

If roadways were reversed, where and when did this occur? Should it have occurred earlier? How much earlier? Were there any operational problems or issues with the reversible roadways? Describe them. Describe the plan for reversing each roadway. If no roadways were reversed, should roadway reversibility be considered? When?

Mini-contra flow efforts – normal lanes with commuter travel southbound lanes used for evacuation and then traffic redirected back on north bound lanes

How can the Hurricane Program assist in alleviating some of these problems?

Update HES to include contra flow activities. See its affect on clearance times – logistical support and coordination.

Please describe how the evacuation process and traffic management can be improved.

COMMUNICATIONS AND PUBLIC INFORMATION

From which agencies and or products did you receive event information?

<input checked="" type="checkbox"/> FEMA Regional Office	<input checked="" type="checkbox"/> Other State Agencies	<input type="checkbox"/> Local EMAs
<input checked="" type="checkbox"/> HURREVAC	<input type="checkbox"/> HLT / ELT	<input checked="" type="checkbox"/> Local Weather Office
<input checked="" type="checkbox"/> The Weather Channel	<input checked="" type="checkbox"/> Commercial Media	<input checked="" type="checkbox"/> Internet
<input type="checkbox"/> Other: _____		

How was local information distributed to you?

- | | | |
|---|--|--|
| <input checked="" type="checkbox"/> Telephone | <input type="checkbox"/> Fax | <input type="checkbox"/> Email |
| <input type="checkbox"/> Website | <input type="checkbox"/> Interview | <input type="checkbox"/> Press Conference |
| <input type="checkbox"/> Video / Tape | <input type="checkbox"/> Pamphlets / Brochures | <input type="checkbox"/> Mass email groups |
| <input type="checkbox"/> | Other | Documents: |

How timely was the information?

“Timely”

How do you distribute local information to the media?

- | | | |
|---|--|--|
| <input type="checkbox"/> Telephone | <input type="checkbox"/> Fax | <input checked="" type="checkbox"/> Email |
| <input checked="" type="checkbox"/> Website | <input type="checkbox"/> Interview | <input type="checkbox"/> Press Conference |
| <input type="checkbox"/> Video / Tape | <input type="checkbox"/> Pamphlets / Brochures | <input type="checkbox"/> Mass email groups |
| <input type="checkbox"/> | Other | Documents: |

Was information coordinated with other local agencies to ensure “one-voice” cohesiveness?

No, not always. Joint information centers, conference calls multiple times daily.

Did you allow the media access to the EOC?

Yes

Did you conduct specific planning or coordination sessions with the media for the 2008 hurricane season?

- | | | | |
|---|-----------------------------|--|---|
| <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> Pre-Season | <input checked="" type="checkbox"/> Post-Season |
|---|-----------------------------|--|---|

Have you conducted specific planning or coordination sessions with the media this year?

- | | | | |
|---|-----------------------------|--|---|
| <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | <input checked="" type="checkbox"/> Pre-Season | <input checked="" type="checkbox"/> Post-Season |
|---|-----------------------------|--|---|

Was technical jargon used in a manner that could be easily understood by the public? If no, please explain.

Yes

Please describe how you disseminate information you received to the general public.
 Websites, media outlets, radio, t.v., phone, email, reverse 911 to evac areas

Did you experience problems disseminating information to the evacuating public? Please explain.

- Information too Complicated
 Information Inaccurate
 Not Enough Information
 Untimely Information
 Population Apathy
 Lack of Political Support
 Other
- Problems:
-

Do you believe the evacuating public experienced problems in receiving the following information? no

- Evacuation Decision Info
 Evacuation Routes
 Evacuation Detours
 Travel Time Estimates
 Traffic Congestion Info
 Storm Information
 Other
- Problems:
-

13. How would you rate overall communications and information dissemination during this event?

Unsatisfactory-----

--Excellent

Within State EOC	1	2	3	4x	5
Between State EOCs	1	2	3	4	5
Within Jurisdictions	1	2	3	4x	5
Between Jurisdictions	1	2	3	4x	5
With the NWS	1	2	3	4x	5
With the Media	1	2	3	4x	5
With FEMA	1	2	3	4x	5

14. How can information dissemination be improved?
 Too many conference calls -- More direct information during calls – not needed if nothing has changed.

How can communication methods be improved?

SHELTERING

(NOT DONE LOCALLY)

Please define the total number of shelters opened and the estimated number of people who sought shelter during this event in your jurisdiction.

SHELTER	Number Opened	Estimate of People Sheltered
Red Cross	_____	_____
Special Needs	_____	_____
Faith Based	_____	_____
Other	_____	_____

NOT DONE LOCALLY

Was the availability of the shelters sufficient for the needs of the evacuating public? If not, please explain.

Were the shelters opened in an adequate time frame as it related to the evacuating public?

Were "Refuges of Last Resort" utilized in addition to public shelters?

Should not be called a shelter It is a refuge of last resort

Please define what mutual aid sheltering agreements you have with neighboring jurisdictions.

Dallas, Austin, San Antonio host cities pared with them

What was the average length of time the shelters remained open? Webster City closed too early 3 days

Average Hours _____ Average Days
_____ 14 _____ Houston 28
days, DFW region was 5
days

What problems, if any, were reported in the opened shelters?

- | | | |
|---|---|---|
| <input type="checkbox"/> Location Confusion | <input type="checkbox"/> Overcrowding | <input type="checkbox"/> Shortage of Staff |
| <input type="checkbox"/> Flooding | <input type="checkbox"/> Wind Damage | <input type="checkbox"/> Loss of Utilities |
| <input type="checkbox"/> Lack of Security | <input type="checkbox"/> Shortage of Shelters | <input type="checkbox"/> Unanticipated Medical Issues |
| <input type="checkbox"/> Shortage of Food | <input type="checkbox"/> Shortage of Supplies | <input type="checkbox"/> Other: |
- Transportation, medical needs,

Please describe how the statewide sheltering process can be improved.

COMPREHENSIVE HURRICANE EMERGENCY MANAGEMENT STRATEGY (CHEMS)

FEMA is broadening the role of the Hurricane Evacuation Study into a more comprehensive approach called the Comprehensive Hurricane Emergency Management Strategy or CHEMS for short. The HES will now become a component of the more comprehensive program.

Please indicate which of the following components of the Hurricane Evacuation Study need improvement and please specify how the component can be improved.

Transportation Analysis _____

Behavioral Analysis _____

Vulnerability Analysis _____

Hazards Analysis _____

Shelter Analysis _____

Decision Making

Please indicate which of the following components of a Re-entry Analysis would benefit the community and specify how the component should be developed.

Decision Making

Communication
Process

Storm Damage Impact

Roadway Network

Consideration/Alternatives

Please indicate which of the following components of a Business Mitigation and Recovery Analysis would benefit the community and specify how the component should be developed.

Mitigation Assessment

Impact Assessment

Economic Impact

Recovery Analysis

Post Storm
Redevelopment
Planning

Please indicate which of the following components of a Community Storm Impact Analysis would benefit the community and specify how the component should be developed.

Coastal Erosion
Mapping / Analysis

Construction/Mitigation Analysis _____

Economic Impact _____

Inland Flooding Analysis _____

Utility Damage Analysis _____

Critical Facility Analysis _____

Post Storm Security Needs Assessment _____

Please indicate which of the following components of a Recovery Analysis would benefit the community and specify how the component should be developed.

Debris Management Planning _____

Mutual Aid Planning _____

Long Term Sheltering _____

Post Storm Redevelopment Planning _____

Public Health Issues _____

Catastrophic Impact Planning _____

Temporary Housing _____

Assessment

Please indicate which of the following components of a Communication Assessment would benefit the community and specify how the component should be developed.

Real Time
Communication
Assessment

Public Information
Process Analysis

Please indicate which of the following components of a Technology Analysis would benefit the community and specify how the component should be developed.

GIS Application
Assessment

Enhanced Decision
Tool Updates/Creation

Please indicate which of the following components of a Disaster Mitigation Analysis would benefit the community and specify how the component should be developed.

Building Code Impact
Analysis

Zoning Analysis

Community Rating
System Assessment

Facility Performance
Assessment

HAZUS
Implementation

POST STORM RECOVERY

During the recovery process, what information was most beneficial to you?

Surge impact

Power status

With limited communications capabilities, was information managed?

First responders for rescue activities relayed information on surge impacts

Websites relayed data to family and friends in other parts of the country

What significant traffic problems experiences during the re-entry for this event?

- | | | |
|---|--|---|
| <input type="checkbox"/> Unanticipated Volumes | <input type="checkbox"/> Congestion and Traffic Jams | <input type="checkbox"/> Accidents and Stalled Autos |
| <input type="checkbox"/> Inadequate Traffic Control | <input type="checkbox"/> Uncoordinated Traffic Signals | <input checked="" type="checkbox"/> Uncoordinated Evac Timing |
| <input type="checkbox"/> Diversions from Others | <input checked="" type="checkbox"/> Flooded Roads | <input type="checkbox"/> Construction |
| <input type="checkbox"/> Inadequate Signage | <input checked="" type="checkbox"/> Damaged Roads | <input type="checkbox"/> County Roads Blocked |
| <input type="checkbox"/> Downed Trees | <input type="checkbox"/> | Other: |
-

How can the Hurricane Program assist in alleviating some of the problems encountered?

State repatriation website has been promised for re-entry

'Want hosts to disseminate information to evacuees.

During Re-Entry, how was information coordinated and disseminated to the general public?

ANALYSIS OF OTHER FEMA PROGRAMS AND EVACUATION ASSISTANCE

Did the results of the FEMA "Gap Analysis" play a role in your planning and evacuation efforts? How and to what extent?

___ Yes, after Rita. Never obtained from FEDS . Regional CAT plan funding to do local assessments.

Did the Federal assisted evacuation efforts (ie. Aircraft, bus, train, other) help or hinder your efforts to safely evacuate your threatened populations from your community? Do you feel that your populations will expect similar support from the Federal government in the future? Please explain.

___Want public to b own first responders . Keep pushing out that message consistently!
Reinforced year round. .Better use of resources to cut costs. Special needs populations multiplied
in disaster situation. Media declared FEMA as a “catch all”.

OTHER COMMENTS

Please provide other comments that would assist FEMA, Local Emergency Management Offices, and State Emergency Management Offices in preparing for, responding to, and recovering from an event.

Change/Update Stafford Act

FEMA hotline should be referred back to RLO/State if not a declared disaster

Working on CAT Plans for hurricanes, IED, Pandemic Flu

Move shorter distances. Create Medical and Special Needs shelters in local areas.
Having a FEMA representative at the EOC is important. Should be one that can make a decision.

THANK YOU FOR YOUR TIME AND ASSISTANCE IN COMPLETING THIS MOST IMPORTANT DOCUMENT.

**APPENDIX D: LOCAL INTERVIEW QUESTIONNAIRE SUMMARY RESPONSES
FOR LAKE SABINE HES AREA**

LIBERTY AND CHAMBERS COUNTIES

Date	Time	City	County	State	Conducted by
July 20, 2009	1:00 p.m.	Liberty	Liberty and Chambers	Texas	Wendy Phillips-FEMA

This assessment is designed to evaluate the effectiveness of the National Hurricane Program's Hurricane Evacuation Study (HES) Products within your jurisdiction as it applied to your experience during the recent hurricane threat. It is also intended to identify any specific needs or recommendations that you may wish to share relating to FEMA's overall Hurricane Program. It is not designed to evaluate you nor your response to the event. Rather it is designed to help FEMA better serve you in the future. Please complete this assessment prior to your scheduled interview.

GENERAL

1. Of the following products, which were readily available for your use?

- | | | |
|---|--|--|
| <input checked="" type="checkbox"/> HURREVAC | <input type="checkbox"/> Evacuation Maps | <input checked="" type="checkbox"/> Clearance Times |
| <input checked="" type="checkbox"/> Shelter Locations | <input checked="" type="checkbox"/> Local Hurricane Plan | <input checked="" type="checkbox"/> Storm Surge Maps |
| <input checked="" type="checkbox"/> SLOSH | <input type="checkbox"/> HES Study | |
| <input type="checkbox"/> Other Documents: _____ | | |

Of the information provided to you, which items were considered most important? Please explain.

- | | | |
|---|--|--|
| <input checked="" type="checkbox"/> HURREVAC | <input checked="" type="checkbox"/> Evacuation Maps | <input type="checkbox"/> Clearance Times |
| <input type="checkbox"/> Shelter Locations | <input checked="" type="checkbox"/> Local Hurricane Plan | <input checked="" type="checkbox"/> Storm Surge Maps |
| <input type="checkbox"/> SLOSH | <input type="checkbox"/> HES Study | |
| <input type="checkbox"/> Other Documents: _____ | | |
- _____
- _____
- _____

Which items were found to be the least helpful? Please explain.

- | | | |
|---|---|---|
| <input type="checkbox"/> HURREVAC | <input type="checkbox"/> Evacuation Maps | <input type="checkbox"/> Clearance Times |
| <input type="checkbox"/> Shelter Locations | <input type="checkbox"/> Local Hurricane Plan | <input type="checkbox"/> Storm Surge Maps |
| <input type="checkbox"/> SLOSH | <input type="checkbox"/> HES Study | |
| <input type="checkbox"/> Other Documents: _____ | | |

ETIS and SLOSH

Please describe your partnerships with private companies and/or civic groups to assist in a public outreach program for your community.

Red Cross, San Antonio Power, Garland Power, Baptist Men, Lions Club, Mennonites

Discuss how HURREVAC was used during this hurricane event.

Storm tracking and monitoring, SLOSH Models, storm possibilities

Discuss how SLOSH or the SLOSH Display Model was used during this hurricane event.

Liberty used to track surge and tell them what could happen. Chambers didn't use SLOSH much for IKE. Said their people did not understand the storm surge.

What mitigation efforts, if any, were initiated or participated in before or during this event?

Liberty: To batten down the hatches, order supplies, fuel up the equipment, alert and pay all city personnel

Of these mitigation efforts, were they successful? Please explain.

Yes

Please list any critical facilities that were impacted by wind, surge or freshwater flooding.

Wind	Surge	Freshwater Flooding
Liberty: Damage on numerous buildings. Lost police dept., city hall, fire station, roof on power plant, wall of a school	Chambers: Nursing home flooded	
Chambers: numerous buildings damage by wind		

Please list the locations, quantity and type of “vulnerable” or “special needs” populations that were impacted by this storm.

Vulnerable or Special Needs Population	Locations	Quantity
Special Needs	Liberty	1000 registered

Did your community provide transportation resources to special needs populations? Please list the types of transportation provided, the total number transported, and the locations to which these populations were taken.

Types of Transportation	Number Transported	Locations
Liberty: County and State buses	100	Four embarkation points from Liberty to Longview, TX
Chambers: buses		From Chambers to Canton, TX

Are you aware of any instances where “safe rooms” were utilized during this storm and whether their use was successful?

NO

Are there critical facilities within your community (outside the surge area) that could be retrofitted for hurricane protection so residents could “shelter in place”? Please provide a list with locations. Do any of these critical facilities have residents who require government assistance to evacuate?

Critical Facilities That Could Be Retrofitted	Locations	Require Government Assistance (Y/N)
City Hall, Fire Station,	Liberty	Y
Courthouse	Chambers	Y
Yes, county jail cells		

HURRICANE LIAISON TEAM (HLT) Not Participating

1. If you utilized FEMA's Hurricane Liaison Team, how would you rate the service received?

Unsatisfactory -----
-----Excellent
1 2 3 4 5

2. Did you participate in the HLT teleconferences during this event? Were these conferences helpful? Please explain.

NO

3. How could FEMA's Hurricane Liaison Team improve services to local emergency management agencies?

By involving us

EMERGENCY OPERATIONS CENTER

At what time was the Emergency Operations Center Activated?

Not Activated Partial Activation Full Activation
Date _____ Date 9/6/08
Time _____ Time _____ 8:00

Did your organization have a presence in, or have access to, the STATE Emergency Operations Center during this event? If so, was this helpful in the information collection process? Please Explain.

Yes

TECHNOLOGICAL

Please identify which tools assisted you in making decisions

HURREVAC Website(s) HAZUS
 Tides SLOSH Tides
 Other: _____ National Hurricane Center

Of the tools utilized, how would you rate their performance?

Unsatisfactory -----

--Excellent

HURREVAC	1	2	3	4	(5)
SLOSH (very difficult)	1	2	(3)	4	5
TIDES	1	2	3	4	5
HAZUS	1	2	3	4	5
Other	1	2	3	4	5

Of the tools utilized, how would you rate their ease of use?

Unsatisfactory -----

--Excellent

HURREVAC	1	2	3	4	(5)
SLOSH	1	2	3	4	5
TIDES	1	2	3	4	5
HAZUS	1	2	3	4	5
Other	1	2	3	4	5

Of the tools utilized, how could they be enhanced or improved?

HURREVAC More training in our area. Upload information automatically

SLOSH _____

TIDES _____

HAZUS _____

Other _____

Of the tools utilized, has staff been adequately trained to operate the tools?

HURREVAC	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Partially	<input type="checkbox"/> Not Applicable
SLOSH	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Partially	<input type="checkbox"/> Not Applicable
TIDES	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Partially	<input type="checkbox"/> Not Applicable
HAZUS	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Partially	<input type="checkbox"/> Not Applicable
Other	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Partially	<input type="checkbox"/> Not Applicable

If HURREVAC were utilized, how would you rate these program components?

Unsatisfactory -----

--Excellent

Decision Arcs	1	2	3	4	5x
Surge Maps	1	2	3	4	5x
Clearance Times	1	2	3	4	5x
Shelter Information	1	2	3	4	5
Wind Swath	1	2	3	4	5x
Error Cone	1	2	3	4	5x
SLOSH	1	2	3	4	5x
5-day Forecast	1	2	3	4	5x

EVACUATION AND DECISION MAKING

Did your jurisdiction issue evacuation orders?

Jurisdiction Name	Voluntary		Recommended		Mandatory	
	Date	Time	Date	Time	Date	Time
	9/9/08		9/10/08		9/11/08	4:30

Please describe how the State assisted you in the evacuation and decision making process.

With special needs ambulances and a charter bus.

In retrospect, were the appropriate areas evacuated? If insufficient or excessive, please explain.

Insufficient for the Threat Sufficient for the Threat Excessive for the Threat

If evacuation orders were issued, please indicate which areas were targeted.

(Please use "V" for Voluntary, "M" for Mandatory, and "R" for Recommended)

- | | |
|--|--|
| <input type="checkbox"/> Manufactured Homes | <input type="checkbox"/> Category 1 Surge Zone |
| <input type="checkbox"/> Healthcare Facilities | <input type="checkbox"/> Category 2 Surge Zone |
| <input type="checkbox"/> River/Lake Fronts | <input type="checkbox"/> Category 3 Surge Zone |
| <input type="checkbox"/> Islands | <input type="checkbox"/> Category 4 Surge Zone |
| <input type="checkbox"/> Beach Fronts | <input type="checkbox"/> Category 5 Surge Zone |
| <input type="checkbox"/> Flood Prone Areas | <input checked="" type="checkbox"/> Countywide(Individual calls to special needs) |

How was the public notified of the evacuation orders?

- | | | |
|---|---|--|
| <input checked="" type="checkbox"/> Television | <input type="checkbox"/> Loudspeaker / PA | <input checked="" type="checkbox"/> Radio |
| <input type="checkbox"/> Newspaper | <input type="checkbox"/> Meetings | <input checked="" type="checkbox"/> Internet |
| <input checked="" type="checkbox"/> Telephone | <input type="checkbox"/> Mass Fax | <input type="checkbox"/> Mass Email |
| <input type="checkbox"/> Other Methods (Individual calls to special needs) | | |

Were the evacuation orders issued in a timely manner? If not, please explain.

Yes

How were evacuation areas determined?

- HES Products/Storm Surge
- History of Wind Damage
- Maps
- FIRM Maps
- Political Decision
- History of Flooding
- Other: By the Judge

What percentage of your population was asked to evacuate? Estimate of how many complied?

Percentage Asked to Evacuate	Estimate of How Many Complied
_____100%_____	_____30%_to_50%_____
_____	_____

About what percentage of your population lives within a designated evacuation zone?

Percentage in designated evacuation zone
_____100%_____

Of those who evacuated, about what percentage of them used local; shelters instead of leaving the area?

Percentage that used local shelters instead of leaving area
____No shelters in Liberty. A pass through county.

In your opinion, what factors increased or decreased the percentage of those choosing to evacuate?

Because of their experience with Hurricane Rita and because they had no money or help.

Their experiences with Hurricane Katrina and the terrible traffic problems.

Was the early evacuation of at-risk populations successful? What were the response rates for these groups (including tourists). What percentage of the total evacuating population did these groups account for?

1%

How can FEMA further assist in the decision making process. Do you have recommendations for tools or products that would assist you?

By making us more aware of the products available.

More training on HURREVAC

EVACUATION ROADWAY NETWORK

How would you rate the capacity of the evacuation routes in relation to vehicular demand?

Unsatisfactory -----
-----Excellent
1 (2) 3 4 5

Do you have traffic management plans that would facilitate the evacuation process? Please define.

State of Texas plan.

What specific measures were taken to facilitate the evacuation process for this event?

- Checked: Barricades, Traffic Control Points, Coordinated Traffic Lights
Unchecked: Lock Down Drawbridges, Roving Vehicle Assistance, AM Radio Messages, Highways Reversal, Message Signs, Traffic Redirect

What is the estimated number of people and vehicles evacuating for this event?

Evacuating WITHIN your Community: 22,000 people, 5000-6000 vehicles
Evacuating THROUGH or TO your Community: 100,000 people, 25,000 vehicles

How would you rate the general public's response to the evacuation notice?

- Checked: Medium Response
Unchecked: Slow Response, Fast Response

Identify which evacuation routes were advocated to the public.

Hwy. 146 N, 61N, 321, 59

How would you rate the traffic volume during this evacuation event?

Light Normal Heavy Congested

Did you have predicted clearance times available from a previous Hurricane Evacuation Study (HES)? If so, what were they?

Yes, from HURREVAC, Sabine Study

If clearance times and/or evacuation timelines were not available from a previous HES, how were they determined?

Were available

What was the observed evacuation clearance time (estimated)? Did you find the predicted clearance times appropriate? Please explain.

Less than 12 hours
 Yes, appropriate

Did the tourist occupancy pose a significant problem not addressed by the clearance times in the HES?

NO

Please provide the timetable for each evacuation order given, according to the targeted at risk population (i.e. nursing homes, mobile homes, tourists, flood zones, etc.) By how many hours did each targeted evacuation order precede the onset of tropical storm winds (34 Kt winds)?

At Risk Population	Date & Time Evacuation Order Given	Onset of 34 Kt Winds	Estimated Time to Complete Evacuation
Nursing Homes	9/11/08 – 4:30		

Please provide an estimate as to how long the overall evacuation process took. What was the longest commute time reported?

Less than a day, about 10-12 hours.

3 to 4 hours to Longview

What significant traffic problems were experienced during the evacuation for this event?

- Unanticipated Volumes
- Inadequate Traffic Control
- Diversions from Other Areas
- Inadequate Signage
- Downed Trees
- Congestion and Traffic Jams
- Uncoordinated Traffic Signals
- Flooded Roads
- Damaged Roads
- Other: None - Chambers felt need for ambulances. Limitations were a concern.
- Accidents and Stalled Autos
- Uncoordinated Evac Timing
- Construction
- County Roads Blocked

Please describe when and where major congestion and choke points / bottlenecks occurred on evacuation routes. How long did the congestion last? When did it recede? Describe where any congestion remained at the time of landfall, if any.

None we were aware of.

Was contra-flow used? If so, when and where did it occur?

No

16a. Should contra-flow have occurred earlier / later? How much earlier / later?

NA

Were there any operational problems or issues with contraflow? Describe them.

N/A

If contra-flow was not used, should it have been considered? When should it be initiated and where?

N/A

How can the Hurricane Program assist in alleviating some of these problems?

N/A

Please describe how the evacuation process and traffic management can be improved.

N/A

COMMUNICATIONS AND PUBLIC INFORMATION

From which agencies and or products did you receive event information?

- FEMA Regional Office
- HURREVAC
- The Weather Channel
- Other: _____
- Other State Agencies
- HLT / ELT
- Commercial Media
- Local EMAs
- Local Weather Office
- Internet

Please list which website(s) you used to access storm and event information.

How was local information distributed to you?

- Telephone
- Website
- Video / Tape
- Fax
- Interview
- Pamphlets / Brochures
- Other
- Email
- Press Conference
- Mass email groups
- Documents:

How timely was the information?

Up to date and timely.

How do you distribute local information to the media?

- | | | |
|---|--|--|
| <input checked="" type="checkbox"/> Telephone | <input checked="" type="checkbox"/> Fax | <input checked="" type="checkbox"/> Email |
| <input type="checkbox"/> Website | <input checked="" type="checkbox"/> Interview | <input type="checkbox"/> Press Conference |
| <input type="checkbox"/> Video / Tape | <input type="checkbox"/> Pamphlets / Brochures | <input type="checkbox"/> Mass email groups |
| <input checked="" type="checkbox"/> FM | Others: _____ | _____ KSHN |

99.9

Was information coordinated with other local agencies to ensure "one-voice" cohesiveness?

Yes

Did you allow the media access to the EOC?

Yes

Did you conduct specific planning or coordination sessions with the media for the 2008 hurricane season?

- Yes No Pre-Season Post-Season

Have you conducted specific planning or coordination sessions with the media this year?

- Yes No Pre-Season Post-Season
- PSAs

Was technical jargon used in a manner that could be easily understood by the public? If no, please explain.

Yes

How did you disseminate information to the general public?

Answered in number 5

Did you experience problems disseminating information to the evacuating public? Please explain.

Information too Complicated
 Information Inaccurate
 Not Enough Information
 Untimely Information
 Population Apathy
 Lack of Political Support
 Other Problems:

_____NO_____

Do you believe the evacuating public experienced problems in receiving the following information?

Evacuation Decision Info
 Evacuation Routes
 Evacuation Detours
 Travel Time Estimates
 Traffic Congestion Info
 Storm Information
 Other Problems:

_____NO_____

14. What language barriers were experienced as it relates to the evacuation process?

NA

15. How would you rate overall communications and information dissemination during this event?

Unsatisfactory-----

--Excellent

Within State EOC	1	2	3	(4)	(5)
Between State EOCs	1	2	3	4	
Within Jurisdictions	1	2	3	4	(
Between Jurisdictions	1	2	3	4	5
With the NWS	1	2	3	4	(5)
With the Media	1	2	3	4	(5)
With FEMA	1	2	3	4	(5)

16. How can information dissemination be improved?

Earlier notification process

Larger time span

17. How can communication methods be improved?

SHELTERING

Please define the total number of shelters opened and the estimated number of people who sought shelter during this event in your jurisdiction.

Shelter	Number Opened	Estimate of People Sheltered
Red Cross		
Special Needs		
Faith Based		
Other:		

Was the availability of the shelters sufficient for the needs of the evacuating public? If not, please explain.

NA

Were the shelters opened in an adequate time frame as it related to the evacuating public?

NA

Were "Refuges of Last Resort" utilized in addition to public shelters?

NA

Please define what mutual aid sheltering agreements you have with neighboring jurisdictions.

Have had agreement with the city of Longview. Being changed to city of Waco.

What was the average length of time the shelters remained open?

Average Hours _____ Average Days _____

What problems, if any, were reported in the opened shelters?

- | | | |
|---|---|---|
| <input type="checkbox"/> Location Confusion | <input type="checkbox"/> Overcrowding | <input type="checkbox"/> Shortage of Staff |
| <input type="checkbox"/> Flooding | <input type="checkbox"/> Wind Damage | <input type="checkbox"/> Loss of Utilities |
| <input type="checkbox"/> Lack of Security | <input type="checkbox"/> Shortage of Shelters | <input type="checkbox"/> Unanticipated Medical Issues |
| <input type="checkbox"/> Shortage of Food | <input type="checkbox"/> Shortage of Supplies | <input type="checkbox"/> Transportation |
| <input type="checkbox"/> Medical Needs | <input type="checkbox"/> Other: | |
- NA

Please describe how the statewide sheltering process can be improved.

NA

POST STORM RECOVERY

During the post-disaster recovery process, what information was most beneficial to you?

Simplification, Consistency with Federal representatives. Need a clearer message across the board.

With limited communications capabilities, how was post-disaster information managed in your county / jurisdiction?

With text messages – phone and email- 800 MGHTZ- Satellite phone. Used POD sites to disseminate information in pamphlet form.

What significant traffic problems experiences during the re-entry for this event?

- | | | |
|---|--|--|
| <input type="checkbox"/> Unanticipated Volumes | <input type="checkbox"/> Congestion and Traffic Jams | <input type="checkbox"/> Accidents and Stalled Autos |
| <input type="checkbox"/> Inadequate Traffic Control | <input type="checkbox"/> Uncoordinated Traffic Signals | <input type="checkbox"/> Uncoordinated Evac. Timing |
| <input type="checkbox"/> Diversions from Others | <input type="checkbox"/> Flooded Roads | <input type="checkbox"/> Construction |
| <input type="checkbox"/> Inadequate Signage | <input type="checkbox"/> Damaged Roads | <input type="checkbox"/> County Roads Blocked |
| <input type="checkbox"/> Downed Trees | <input checked="" type="checkbox"/> Other: _____ | _____None |

How can the Hurricane Program assist in alleviating some of the problems encountered?

Provide better resources.

During Re-Entry, how was information coordinated and disseminated to the general public?

By radio

ANALYSIS OF OTHER FEMA PROGRAMS AND EVACUATION ASSISTANCE

Did the results of the FEMA “Gap Analysis” play a role in your planning and evacuation efforts? How and to what extent?

Did the Federal assisted evacuation efforts (ie. Aircraft, bus, train, other) help or hinder your efforts to safely evacuate your threatened populations from your community? Do you feel that your populations will expect similar support from the Federal government in the future? Please explain.

Yes, it helped greatly. The only problem was tracing where people went or were taken. Yes, they expect it.

OTHER COMMENTS

Please provide other comments that would assist FEMA, Local Emergency Management Offices, and State Emergency Management Offices in preparing for, responding to, and recovering from an event.

A lot was learned from the past three storms. Mainly, people should understand that they are primarily responsible for themselves

More educational programs. More literature/experiences

COMPREHENSIVE HURRICANE EMERGENCY MANAGEMENT STRATEGY (CHEMS)

FEMA is broadening the role of the Hurricane Evacuation Study into a more comprehensive approach called the Comprehensive Hurricane Emergency Management Strategy or CHEMS for short. The HES will now become a component of the more comprehensive program.

Please indicate which of the following components of the Hurricane Evacuation Study need improvement and please specify how the component can be improved.

- Transportation Analysis _____

- Behavioral Analysis _____

- Vulnerability Analysis _____

- Hazards Analysis _____

- Shelter Analysis _____

- Decision Making _____

Please indicate which of the following components of a Re-entry Analysis would benefit the community and specify how the component should be developed.

- Decision Making _____

- Communication Process _____

- Storm Damage Impact _____

- Roadway Network _____

- Consideration/Alternatives _____

Please indicate which of the following components of a Business Mitigation and Recovery Analysis would benefit the community and specify how the component should be developed.

- Mitigation Assessment _____

- Impact Assessment _____

- Economic Impact _____

- Recovery Analysis _____

- Post Storm
Redevelopment
Planning _____

Please indicate which of the following components of a Community Storm Impact Analysis would benefit the community and specify how the component should be developed.

- Coastal Erosion
Mapping / Analysis _____

- Construction/Mitigation
Analysis _____

- Economic Impact _____

- Inland Flooding
Analysis _____

- Utility Damage
Analysis _____

- Critical Facility
Analysis _____

- Post Storm Security
Needs Assessment _____

Please indicate which of the following components of a Recovery Analysis would benefit the community and specify how the component should be developed.

- Debris Management
Planning _____

- Mutual Aid Planning _____

- Long Term Sheltering _____

- Post Storm
Redevelopment
Planning _____

- Public Health Issues _____

- Catastrophic Impact
Planning _____

- Temporary Housing
Assessment _____

Please indicate which of the following components of a Communication Assessment would benefit the community and specify how the component should be developed.

- Real Time
Communication
Assessment _____

- Public Information
Process Analysis _____

Please indicate which of the following components of a Technology Analysis would benefit the community and specify how the component should be developed.

- GIS Application
Assessment _____

- Enhanced Decision
Tool Updates/Creation _____

Please indicate which of the following components of a Disaster Mitigation Analysis would benefit the community and specify how the component should be developed.

- Building Code Impact
Analysis _____

- Zoning Analysis _____

- Community Rating _____

System Assessment

Facility Performance
Assessment

HAZUS
Implementation

THANK YOU FOR YOUR TIME AND ASSISTANCE IN COMPLETING THIS MOST
IMPORTANT DOCUMENT.

JEFFERSON COUNTY

Date	Time	City	County	State	Conducted by
7/21/09	1:00 p.m.	Beaumont	Jefferson	Texas	Wendy Phillips, FEMA

This assessment is designed to evaluate the effectiveness of the National Hurricane Program's Hurricane Evacuation Study (HES) Products within your jurisdiction as it applied to your experience during the recent hurricane threat. It is also intended to identify any specific needs or recommendations that you may wish to share relating to FEMA's overall Hurricane Program. It is not designed to evaluate you nor your response to the event. Rather it is designed to help FEMA better serve you in the future. Please complete this assessment prior to your scheduled interview.

GENERAL

1. Of the following products, which were readily available for your use?

- | | | |
|---|--|--|
| <input checked="" type="checkbox"/> HURREVAC | <input checked="" type="checkbox"/> Evacuation Maps | <input checked="" type="checkbox"/> Clearance Times |
| <input checked="" type="checkbox"/> Shelter Locations | <input checked="" type="checkbox"/> Local Hurricane Plan | <input checked="" type="checkbox"/> Storm Surge Maps |
| <input checked="" type="checkbox"/> SLOSH | <input checked="" type="checkbox"/> HES Study | |
| <input type="checkbox"/> Other Documents: _____ | | |

Of the information provided to you, which items were considered most important? Please explain.

- | | | |
|---|---|---|
| <input checked="" type="checkbox"/> HURREVAC | <input type="checkbox"/> Evacuation Maps | <input type="checkbox"/> Clearance Times |
| <input type="checkbox"/> Shelter Locations | <input type="checkbox"/> Local Hurricane Plan | <input type="checkbox"/> Storm Surge Maps |
| <input checked="" type="checkbox"/> SLOSH | <input type="checkbox"/> HES Study | |
| <input type="checkbox"/> Other Documents: _____ | | |

Hurrevac used for all briefing and situation reps, etc., Good for visual. Slosh really being expressed through GIS for planning and prioritization and briefing issues.

Which items were found to be the least helpful? Please explain.

- | | | |
|---|---|--|
| <input type="checkbox"/> HURREVAC | <input type="checkbox"/> Evacuation Maps | <input checked="" type="checkbox"/> Clearance Times |
| <input type="checkbox"/> Shelter Locations | <input type="checkbox"/> Local Hurricane Plan | <input checked="" type="checkbox"/> Storm Surge Maps |
| <input type="checkbox"/> SLOSH | <input type="checkbox"/> HES Study | |
| <input type="checkbox"/> Other Documents: _____ | | |

Please describe your partnerships with private companies and/or civic groups to assist in a public outreach program for your community.

VOAD: See Southeast Texas VOAD member list. (Voluntary Organizations Active in Disaster)

Discuss how HURREVAC was used during this hurricane event.

For briefings, visual representation, reaffirmation, storm tracking and the Lake Charles Regional NWS.

Discuss how SLOSH or the SLOSH Display Model was used during this hurricane event.

For prioritizing evacuations, picking up home bound special needs, noting danger areas, potential flooding sites, shelters for first responders, etc. SLOSH is not user friendly.

What mitigation efforts, if any, were initiated or participated in before or during this event?

Calder, Hayes, Fannin, Cartwright/Corley drainage mitigation projects and retention facilities

Of these mitigation efforts, were they successful? Please explain.

Yes for those that are completed. Some still ongoing.

Please list any critical facilities that were impacted by wind, surge or freshwater flooding.

Wind	Surge	Freshwater Flooding
23rd ST. lift station, water treatment plant, salt water intrusion in municipal water system.,	Exxon chemical plant flooded, EOC, Police HQ, Fire Substations, Refinery Energy power station	

Please list the locations, quantity and type of “vulnerable” or “special needs” populations that were impacted by this storm.

Vulnerable or Special Needs Population	Locations	Quantity
Hospitals	(All medical and special needs affected)	9000 County Wide
Elderly		
Handicap		
Low to Moderate Income		
Nursing Homes		

Did your community provide transportation resources to special needs populations? Please list the types of transportation provided, the total number transported, and the locations to which these populations were taken.

Types of Transportation	Number Transported	Locations
School buses and City Transit buses, ambulances with volunteer fire department personnel	4100	City of Beaumont and unincorporated areas of Jefferson County

Are you aware of any instances where “safe rooms” were utilized during this storm and whether their use was successful?

No Safe Rooms

Are there critical facilities within your community (outside the surge area) that could be retrofitted for hurricane protection so residents could “shelter in place”? Please provide a list with locations. Do any of these critical facilities have residents who require government assistance to evacuate?

Critical Facilities That Could Be Retrofitted	Locations	Require Government Assistance (Y/N)
Yes, Baptist and St. Elizabeth Hospitals, AT&T building, Postal Encoding Center and Ford Park		

HURRICANE LIAISON TEAM (HLT)

1. If you utilized FEMA’s Hurricane Liaison Team, how would you rate the service received?

-----Unsatisfactory -----Not Using-----
-----Excellent
1 2 3 4 5

2. Did you participate in the HLT teleconferences during this event? Were these conferences helpful? Please explain.

NO

3. How could FEMA’s Hurricane Liaison Team improve services to local emergency management agencies?

We need the GURU, the actual meteorologist or surge person to answer specifics. Deal with NWS out of Lake Charles , LA now.

EMERGENCY OPERATIONS CENTER

At what time was the Emergency Operations Center Activated?

Not Activated Partial Activation Full Activation
Date _120 hours out Date 9/07/08
Time _____ Time _____ 8:00
a.m. _____

Did your organization have a presence in, or have access to, the STATE Emergency Operations Center during this event? If so, was this helpful in the information collection process? Please Explain.

Yes, with two daily conference calls. Yes, their input was helpful to us as was our input helpful to them.

TECHNOLOGICAL

Please identify which tools assisted you in making decisions

- HURREVAC Website(s) HAZUS
 Tides SLOSH Tides
 Other: __GIS, Golden Triangle Weather, Storm Pulse and 42 other websites. _____

Of the tools utilized, how would you rate their performance?

Unsatisfactory -----

--Excellent

HURREVAC	1	2	3	4	5x
SLOSH	1	x	3	4	
TIDES	1	2	3	4	5
HAZUS	1	2	3	4	5
Other	1	2	3	4	5

Of the tools utilized, how would you rate their ease of use?

Unsatisfactory -----

--Excellent

HURREVAC	1	2	3x	4	
SLOSH	1	2	3x	4	5
TIDES	1	2	3	4	5
HAZUS	1	2	3	4	5
Other	1	2	3	4	5

Of the tools utilized, how could they be enhanced or improved?

HURREVAC	<u>Automatic updates</u>
SLOSH	<u>Made more user friendly ---- GIS mesh</u>
TIDES	_____
HAZUS	_____
Other	_____

Of the tools utilized, has staff been adequately trained to operate the tools?

- HURREVAC Yes No Partially Not Applicable
 SLOSH Yes No Partially Not Applicable
 TIDES Yes No Partially Not Applicable
 HAZUS Yes No Partially Not Applicable
 Other Yes No Partially Not Applicable

If HURREVAC were utilized, how would you rate these program components?

Unsatisfactory -----

--Excellent

Decision Arcs	1	2	3x	4	5
Surge Maps	1	2	3x	4	5
Clearance Times	1	2	3x	4	5
Shelter Information	1	2	3	4	5
Wind Swath	1	2	3	4	5x
Error Cone	1	2	3	4	5x
SLOSH	1	2	3x	4	5
5-day Forecast	1	2	3	4	5x

EVACUATION AND DECISION MAKING

Did your jurisdiction issue evacuation orders?

Jurisdiction Name	Voluntary		Recommended		Mandatory	
	Date	Time	Date	Time	Date	Time
					9/11/08	6:00 a.m.

Please describe how the State assisted you in the evacuation and decision making process.

State secured resources for evacuation and kept us informed by conference call. Sent us help when it was requested.

In retrospect, were the appropriate areas evacuated? If insufficient or excessive, please explain.

Insufficient for the Threat Sufficient for the Threat Excessive for the Threat

If evacuation orders were issued, please indicate which areas were targeted.

(Please use "V" for Voluntary, "M" for Mandatory, and "R" for Recommended)

- | | |
|--|---|
| <input type="checkbox"/> Manufactured Homes | <input type="checkbox"/> Category 1 Surge Zone |
| <input type="checkbox"/> Healthcare Facilities | <input type="checkbox"/> Category 2 Surge Zone |
| <input type="checkbox"/> River/Lake Fronts | <input type="checkbox"/> Category 3 Surge Zone ALL |
| | AREAS MANDATORY |
| <input type="checkbox"/> Islands | <input type="checkbox"/> Category 4 Surge Zone |
| <input type="checkbox"/> Beach Fronts | <input type="checkbox"/> Category 5 Surge Zone |
| <input type="checkbox"/> Flood Prone Areas | <input type="checkbox"/> Countywide |

How was the public notified of the evacuation orders?

- | | | |
|--|--|--|
| <input checked="" type="checkbox"/> Television | <input type="checkbox"/> Loudspeaker / PA | <input checked="" type="checkbox"/> Radio |
| <input checked="" type="checkbox"/> Newspaper | <input checked="" type="checkbox"/> Meetings | <input checked="" type="checkbox"/> Internet |
| <input checked="" type="checkbox"/> Telephone | <input type="checkbox"/> Mass Fax | <input type="checkbox"/> Mass Email |
| <input type="checkbox"/> Other Methods: | | |

Were the evacuation orders issued in a timely manner? If not, please explain.

No. The storm turned right after the previous evacuation of Hurricane Gustav so there was much less time to evacuate than in a normal situation. Ike was not forecast to hit anywhere close within timely clearance time.

How were evacuation areas determined?

- HES Products/Storm Surge Maps
- FIRM Maps
- History of Flooding
- History of Wind Damage
- Political Decision
- Other: City of Beaumont,
all _____ or
none. _____

What percentage of your population was

asked to evacuate? Estimate of how many complied?

Percentage Asked to Evacuate	Estimate of How Many
75%	Complied 55%

About what percentage of your population lives within a designated evacuation zone?

Percentage in designated evacuation zone

100%

Of those who evacuated, about what percentage of them used local; shelters instead of leaving the area?

Percentage that used local shelters instead of leaving area

No local shelters

In your opinion, what factors increased or decreased the percentage of those choosing to evacuate?

Hurricane Gustav experience and having no money

Was the early evacuation of at-risk populations successful? What were the response rates for these groups (including tourists). What percentage of the total evacuating population did these groups account for?

Yes	100%
-----	------

How can FEMA further assist in the decision making process. Do you have recommendations for tools or products that would assist you?

Improve usability of SLOSH

Just help us keep the money for technology and information access so we can maintain communication and response capabilities.

Help establish mitigation facilities.

EVACUATION ROADWAY NETWORK

How would you rate the capacity of the evacuation routes in relation to vehicular demand?

-----Unsatisfactory -----
-----Excellent

1 2 3x 4 5

Do you have traffic management plans that would facilitate the evacuation process? Please define.

Yes, prepared by Texas DOT and DPS

What specific measures were taken to facilitate the evacuation process for this event?

- Barricades
- Traffic Control Points
- Lock Down Drawbridges
- Roving Vehicle Assistance
- Coordinated Traffic Lights
- AM Radio Messages
- Highways Reversal
- Message Signs
- Traffic Redirect

What is the estimated number of people and vehicles evacuating for this event?

	Estimated People	Estimated Vehicles
Evacuating WITHIN your Community	___57,000___	___15,000___
Evacuating THROUGH or TO your Community	_____	_____

How would you rate the general public's response to the evacuation notice?

- Slow Response
- Medium Response
- Fast Response

Identify which evacuation routes were advocated to the public.

Hwy 69 and 96 North Hwy 287 North

How would you rate the traffic volume during this evacuation event?

Light Normal Heavy Congested

Did you have predicted clearance times available from a previous Hurricane Evacuation Study (HES)? If so, what were they?

Yes, Study says 28 hours. Average was 48 hours. Normal 39 hours

If clearance times and/or evacuation timelines were not available from a previous HES, how were they determined?

N/A

What was the observed evacuation clearance time (estimated)? Did you find the predicted clearance times appropriate? Please explain.

24 hours. Late warning, quick clearance, Gustav factor, minimum participation

Did the tourist occupancy pose a significant problem not addressed by the clearance times in the HES?

NO

Please provide the timetable for each evacuation order given, according to the targeted at risk population (i.e. nursing homes, mobile homes, tourists, flood zones, etc.) By how many hours did each targeted evacuation order precede the onset of tropical storm winds (34 Kt winds)?

At Risk Population	Date & Time Evacuation Order Given	Onset of 34 Kt Winds	Estimated Time to Complete Evacuation
Everyone at one time			

Please provide an estimate as to how long the overall evacuation process took. What was the longest commute time reported?

24 hours in Ike. Normally 48 to 72 hours
10 hours for Beaumont, 32 hours for Groves (Double to triple normal time)

What significant traffic problems were experienced during the evacuation for this event?

- | | | |
|--|---|---|
| <input type="checkbox"/> Unanticipated Volumes | <input checked="" type="checkbox"/> Congestion and Traffic Jams | <input checked="" type="checkbox"/> Accidents and Stalled Autos |
| <input checked="" type="checkbox"/> Inadequate Traffic Control | <input checked="" type="checkbox"/> Uncoordinated Traffic Signals | <input type="checkbox"/> Uncoordinated Evac Timing |
| <input type="checkbox"/> Diversions from Other Areas | <input type="checkbox"/> Flooded Roads | <input checked="" type="checkbox"/> Construction |
| <input type="checkbox"/> Inadequate Signage | <input type="checkbox"/> Damaged Roads | <input type="checkbox"/> County Roads Blocked |
| <input type="checkbox"/> Downed Trees | <input type="checkbox"/> | Other: |

Please describe when and where major congestion and choke points / bottlenecks occurred on evacuation routes. How long did the congestion last? When did it recede? Describe where any congestion remained at the time of landfall, if any.

Hwys. 69 96 287 controlled access
Bottleneck at I-10 with southern county residents. Also a bottleneck in Lumberton, Hardin County

Was contra-flow used? If so, when and where did it occur?

NO

16a. Should contra-flow have occurred earlier / later? How much earlier / later?

N/A

Were there any operational problems or issues with contra flow? Describe them.

N/A

If contra-flow was not used, should it have been considered? When should it be initiated and where?

N/A

How can the Hurricane Program assist in alleviating some of these problems?

Build bigger roads or delete HURREVAC lanes where they narrow over bridge etc., Might be o.k. in other jurisdictions but not here on highway 69

Please describe how the evacuation process and traffic management can be improved.

More Notice, More Traffic Cameras, More helicopters MORE WARNING

COMMUNICATIONS AND PUBLIC INFORMATION

From which agencies and or products did you receive event information?

- FEMA Regional Office, HURREVAC, The Weather Channel, Other: Other State Agencies, HLT / ELT, Commercial Media, National, Local EMAs, Local Weather Office, Internet, Weather, Service

Please list which website(s) you used to access storm and event information.

Golden Triangle Weather and 41 other sites observed by Situation Unit

How was local information distributed to you?

- Telephone, Website, Video / Tape, Fax, Interview, Pamphlets / Brochures, Other, Email, Press Conference, Mass email groups, Documents:

How timely was the information?

How do you distribute local information to the media?

- | | | |
|---|--|---|
| <input checked="" type="checkbox"/> Telephone | <input checked="" type="checkbox"/> Fax | <input checked="" type="checkbox"/> Email |
| <input checked="" type="checkbox"/> Website | <input type="checkbox"/> Interview | <input type="checkbox"/> Press Conference |
| <input type="checkbox"/> Video / Tape | <input type="checkbox"/> Pamphlets / Brochures | <input checked="" type="checkbox"/> Mass email groups |
| <input type="checkbox"/> Others: _____ | | |

Was information coordinated with other local agencies to ensure “one-voice” cohesiveness?

Yes, coordinated jointly with Jefferson, Orange and Hardin Counties.

Did you allow the media access to the EOC?

City -Yes, with limited access and a daily press conference in our EOC media room.
County does not allow media access.

Did you conduct specific planning or coordination sessions with the media for the 2008 hurricane season?

- Yes No Pre-Season Post-Season

Have you conducted specific planning or coordination sessions with the media this year?

- Yes No Pre-Season Post-Season

Was technical jargon used in a manner that could be easily understood by the public? If no, please explain.

Yes

How did you disseminate information to the general public?

Through faxes, websites, group email, phone calls

How can communication methods be improved?

By maximizing venues like radio, newspapers, text messages, email, twitter, facebook, etc,

SHELTERING

Please define the total number of shelters opened and the estimated number of people who sought shelter during this event in your jurisdiction.

Shelter	Number Opened	Estimate of People Sheltered
Red Cross		
Special Needs	N/A	
Faith Based		
Other:		

Was the availability of the shelters sufficient for the needs of the evacuating public? If not, please explain.

N/A

Were the shelters opened in an adequate time frame as it related to the evacuating public?

N/A

Were "Refuges of Last Resort" utilized in addition to public shelters?

N/A

Please define what mutual aid sheltering agreements you have with neighboring jurisdictions.

For Ike we had general population in shelters in Tyler and Nacodoches. Several other citie like Mineolo , Texarkana, Longview are used for medical needs

What was the average length of time the shelters remained open?

Average Hours Average Days _____
____ N/A _____

What problems, if any, were reported in the opened shelters?

- | | | |
|---|---|---|
| <input type="checkbox"/> Location Confusion | <input type="checkbox"/> Overcrowding | <input type="checkbox"/> Shortage of Staff |
| <input type="checkbox"/> Flooding | <input type="checkbox"/> Wind Damage | <input type="checkbox"/> Loss of Utilities |
| <input type="checkbox"/> Lack of Security | <input type="checkbox"/> Shortage of Shelters | <input type="checkbox"/> Unanticipated Medical Issues |
| <input type="checkbox"/> Shortage of Food | <input type="checkbox"/> Shortage of Supplies | <input type="checkbox"/> Transportation |
| <input type="checkbox"/> Medical Needs | <input type="checkbox"/> Other: | |

Please describe how the statewide sheltering process can be improved.

Help build hazard shelters in non surge areas so all our people don't have to evacuate hundreds of miles.

POST STORM RECOVERY

During the post-disaster recovery process, what information was most beneficial to you?

With limited communications capabilities, how was post-disaster information managed in your county / jurisdiction?

What significant traffic problems experiences during the re-entry for this event?

- | | | |
|---|--|--|
| <input type="checkbox"/> Unanticipated Volumes | <input type="checkbox"/> Congestion and Traffic Jams | <input type="checkbox"/> Accidents and Stalled Autos |
| <input type="checkbox"/> Inadequate Traffic Control | <input type="checkbox"/> Uncoordinated Traffic Signals | <input type="checkbox"/> Uncoordinated Evac. Timing |
| <input type="checkbox"/> Diversions from Others | <input type="checkbox"/> Flooded Roads | <input type="checkbox"/> Construction |
| <input type="checkbox"/> Inadequate Signage | <input type="checkbox"/> Damaged Roads | <input type="checkbox"/> County Roads Blocked |
| <input type="checkbox"/> Downed Trees | <input type="checkbox"/> | Other: |

How can the Hurricane Program assist in alleviating some of the problems encountered?

During Re-Entry, how was information coordinated and disseminated to the general public?

ANALYSIS OF OTHER FEMA PROGRAMS AND EVACUATION ASSISTANCE

Did the results of the FEMA “Gap Analysis” play a role in your planning and evacuation efforts?
How and to what extent?

Did the Federal assisted evacuation efforts (ie. Aircraft, bus, train, other) help or hinder your efforts to safely evacuate your threatened populations from your community? Do you feel that your populations will expect similar support from the Federal government in the future? Please explain.

OTHER COMMENTS

Please provide other comments that would assist FEMA, Local Emergency Management Offices, and State Emergency Management Offices in preparing for, responding to, and recovering from an event.

COMPREHENSIVE HURRICANE EMERGENCY MANAGEMENT STRATEGY (CHEMS)

FEMA is broadening the role of the Hurricane Evacuation Study into a more comprehensive approach called the Comprehensive Hurricane Emergency Management Strategy or CHEMS for short. The HES will now become a component of the more comprehensive program.

Please indicate which of the following components of the Hurricane Evacuation Study need improvement and please specify how the component can be improved.

- Transportation Analysis _____

- Behavioral Analysis _____

- Vulnerability Analysis _____

- Hazards Analysis _____

- Shelter Analysis _____

- Decision Making _____

Please indicate which of the following components of a Re-entry Analysis would benefit the community and specify how the component should be developed.

- Decision Making _____

- Communication Process _____

- Storm Damage Impact _____

- Roadway Network _____

- Consideration/Alternatives _____

Please indicate which of the following components of a Business Mitigation and Recovery Analysis would benefit the community and specify how the component should be developed.

- Mitigation Assessment _____

- Impact Assessment _____

- Economic Impact _____

- Recovery Analysis _____

- Post Storm
Redevelopment
Planning _____

Please indicate which of the following components of a Community Storm Impact Analysis would benefit the community and specify how the component should be developed.

- Coastal Erosion
Mapping / Analysis _____

- _____
Construction/Mitigation
Analysis _____

- Economic Impact _____

- Inland Flooding
Analysis _____

- Utility Damage
Analysis _____

- Critical Facility
Analysis _____

- Post Storm Security
Needs Assessment _____

Please indicate which of the following components of a Recovery Analysis would benefit the community and specify how the component should be developed.

- Debris Management Planning _____
- Mutual Aid Planning _____
- Long Term Sheltering _____
- Post Storm Redevelopment Planning _____
- Public Health Issues _____
- Catastrophic Impact Planning _____
- Temporary Housing Assessment _____

Please indicate which of the following components of a Communication Assessment would benefit the community and specify how the component should be developed.

- Real Time Communication Assessment _____
- Public Information Process Analysis _____

Please indicate which of the following components of a Technology Analysis would benefit the community and specify how the component should be developed.

- GIS Application Assessment _____
- Enhanced Decision Tool Updates/Creation _____

Please indicate which of the following components of a Disaster Mitigation Analysis would benefit the community and specify how the component should be developed.

- Building Code Impact Analysis _____

Zoning Analysis

Community Rating
System Assessment

Facility Performance
Assessment

HAZUS
Implementation

THANK YOU FOR YOUR TIME AND ASSISTANCE IN COMPLETING THIS MOST
IMPORTANT DOCUMENT.

ORANGE COUNTY

Date	Time	City	County	State	Conducted by
7/21/09	9:00 a.m.	Orange	Orange	Texas	Wendy Phillips, FEMA

This assessment is designed to evaluate the effectiveness of the National Hurricane Program's Hurricane Evacuation Study (HES) Products within your jurisdiction as it applied to your experience during the recent hurricane threat. It is also intended to identify any specific needs or recommendations that you may wish to share relating to FEMA's overall Hurricane Program. It is not designed to evaluate you nor your response to the event. Rather it is designed to help FEMA better serve you in the future. Please complete this assessment prior to your scheduled interview.

GENERAL

1. Of the following products, which were readily available for your use?

- | | | |
|---|--|--|
| <input checked="" type="checkbox"/> HURREVAC | <input checked="" type="checkbox"/> Evacuation Maps | <input checked="" type="checkbox"/> Clearance Times |
| <input checked="" type="checkbox"/> Shelter Locations | <input checked="" type="checkbox"/> Local Hurricane Plan | <input checked="" type="checkbox"/> Storm Surge Maps |
| <input checked="" type="checkbox"/> SLOSH | <input checked="" type="checkbox"/> HES Study | |
| <input type="checkbox"/> Other Documents: _____ | | |

Of the information provided to you, which items were considered most important? Please explain.

- | | | |
|---|--|---|
| <input checked="" type="checkbox"/> HURREVAC | <input type="checkbox"/> Evacuation Maps | <input type="checkbox"/> Clearance Times |
| <input type="checkbox"/> Shelter Locations | <input checked="" type="checkbox"/> Local Hurricane Plan | <input type="checkbox"/> Storm Surge Maps |
| <input checked="" type="checkbox"/> SLOSH | <input type="checkbox"/> HES Study | |
| <input type="checkbox"/> Other Documents: _____ | | |
- _____
- _____
- _____

Which items were found to be the least helpful? Please explain.

- | | | |
|---|---|---|
| <input type="checkbox"/> HURREVAC | <input type="checkbox"/> Evacuation Maps | <input type="checkbox"/> Clearance Times |
| <input type="checkbox"/> Shelter Locations | <input type="checkbox"/> Local Hurricane Plan | <input type="checkbox"/> Storm Surge Maps |
| <input type="checkbox"/> SLOSH | <input type="checkbox"/> HES Study | |
| <input type="checkbox"/> Other Documents: _____ | | |

ETIS

Please describe your partnerships with private companies and/or civic groups to assist in a public outreach program for your community.

LEPC, Red Cross, VOAD, Public Education with Industry, Salvation Army

Discuss how HURREVAC was used during this hurricane event.

Always on display during storm events. Always needs updates. Need locally available training.

Discuss how SLOSH or the SLOSH Display Model was used during this hurricane event.

Local County Judge says this a great tool to illustrate the impact. Provides them with the worse case scenario and is usually right on the money.

What mitigation efforts, if any, were initiated or participated in before or during this event?

Residential buyouts in the county. Hardening measures for critical facilities such as schools and government structures. Adding hardware such as generators. Two detention ponds built in the last six years with a third planned.

Of these mitigation efforts, were they successful? Please explain.

Takes away Adams Bayou

Please list any critical facilities that were impacted by wind, surge or freshwater flooding.

Wind	Surge	Freshwater Flooding
	County Buildings- over 2 million dollars damage – 25% people displaced - 3500 residences had 3-4 feet of water – water and sewerage, fire station, city hall, all schools flooded. Most all county buildings impacted by surge	

Please list the locations, quantity and type of “vulnerable” or “special needs” populations that were impacted by this storm.

Vulnerable or Special Needs Population	Locations	Quantity
Assisted Living	Orange County	2000

Did your community provide transportation resources to special needs populations? Please list the types of transportation provided, the total number transported, and the locations to which these populations were taken.

Types of Transportation	Number Transported	Locations
School buses, Church buses - 60		Orange Co. to Marshall, TX. Hub from Tyler to various locations/aircraft
FEMA contract for airlift/ambulances		

Are you aware of any instances where “safe rooms” were utilized during this storm and whether their use was successful?

NO

Are there critical facilities within your community (outside the surge area) that could be retrofitted for hurricane protection so residents could “shelter in place”? Please provide a list with locations. Do any of these critical facilities have residents who require government assistance to evacuate?

Critical Facilities That Could Be Retrofitted	Locations	Require Government Assistance (Y/N)
All in surge area	Last resort shelters at schools	
Do not encourage shelter in place		

HURRICANE LIAISON TEAM (HLT)

1. If you utilized FEMA's Hurricane Liaison Team, how would you rate the service received?

Unsatisfactory -----NA-----
-----Excellent
1 2 3 4 5

2. Did you participate in the HLT teleconferences during this event? Were these conferences helpful? Please explain.

DON'T KNOW WHO THEY ARE!!!

3. How could FEMA's Hurricane Liaison Team improve services to local emergency management agencies?

Consider this to be another layer of government. Don't need them.

EMERGENCY OPERATIONS CENTER

At what time was the Emergency Operations Center Activated?

Not Activated Partial Activation Full Activation
Date _____ Date _____
Time _____ Time ___8:00 a.m.
Stand down – 9/05/08

Did your organization have a presence in, or have access to, the STATE Emergency Operations Center during this event? If so, was this helpful in the information collection process? Please Explain.

Yes

Yes

TECHNOLOGICAL

Please identify which tools assisted you in making decisions

- HURREVAC Website(s) HAZUS
 Tides SLOSH Tides
 Other: __Storm Pulse, Golden Triangle Weather, One Stop Shop, Ira Wilsker, Lamar
 Tech Professor _____

Of the tools utilized, how would you rate their performance?

Unsatisfactory -----

--Excellent

HURREVAC	1	2	3 x	4	5
SLOSH	1	2	3 x	4	5
TIDES (don't use)	1	2	3	4	5
HAZUS(don't use)	1	2	3	4	5
Other	1	2	3	4	5

Of the tools utilized, how would you rate their ease of use?

Unsatisfactory -----

--Excellent

HURREVAC	1	2	3	4x	5
SLOSH	1	2	3	4x	5
TIDES (don't use)	1	2	3	4	5
HAZUS (don't use)	1	2	3	4	5
Other	1	2	3	4	5

Of the tools utilized, how could they be enhanced or improved?

- HURREVAC Better resolution and graphics with GIS app. to see what is on the ground.

 SLOSH Needs auto-update feature and satellite imagery overview.

 TIDES

 HAZUS

 Other

Of the tools utilized, has staff been adequately trained to operate the tools?

- HURREVAC Yes No Partially Not Applicable
 SLOSH Yes No Partially Not Applicable
 TIDES Yes No Partially Not Applicable
 HAZUS Yes No Partially Not Applicable
 Other Yes No Partially Not Applicable

If HURREVAC were utilized, how would you rate these program components?

Unsatisfactory -----

--Excellent

Decision Arcs	1	2	3	4x	5
Surge Maps	1	2	3	4x	5
Clearance Times	1	2	3x	4	5
Shelter Information	1	2	3	4	5
Wind Swath	1	2	3	4	5
Error Cone	1	2	3	4	5
SLOSH	1	2	3	4	5
5-day Forecast	1	2	3	4	5

EVACUATION AND DECISION MAKING

Did your jurisdiction issue evacuation orders?

Jurisdiction Name	Voluntary		Recommended		Mandatory	
	Date	Time	Date	Time	Date	Time
					9/11/08	6:00 a.m.

Please describe how the State assisted you in the evacuation and decision making process.

Conference Calls

In retrospect, were the appropriate areas evacuated? If insufficient or excessive, please explain.

Insufficient for the Threat Sufficient for the Threat Excessive for the Threat
 Yes

If evacuation orders were issued, please indicate which areas were targeted.

(Please use "V" for Voluntary, "M" for Mandatory, and "R" for Recommended)

- Manufactured Homes
 - Healthcare Facilities
 - River/Lake Fronts
 - Islands
 - Beach Fronts
 - Flood Prone Areas
 - Category 1 Surge Zone
 - Category 2 Surge Zone
 - Category 3 Surge Zone
 - Category 4 Surge Zone
 - Category 5 Surge Zone
 - Countywide
- MANDATORY COUNTY WIDE

How was the public notified of the evacuation orders?

- Television
- Newspaper
- Telephone
- Other Methods:
- Loudspeaker / PA
- Meetings
- Mass Fax
- Radio
- Internet
- Mass Email

Reverse 911

Were the evacuation orders issued in a timely manner? If not, please explain.

Yes, appropriate for the storm.

How were evacuation areas determined?

- HES Products/Storm Surge Maps
- History of Wind Damage
- FIRM Maps
- Political Decision
- History of Flooding
- Other: ___All or nothing in the coastal area

_____ What percentage of your population was

asked to evacuate? Estimate of how many complied?

Percentage Asked to Evacuate

Estimate of How Many Complied

_____100%_____

_____70-80%_____

About what percentage of your population lives within a designated evacuation zone?

Percentage in designated evacuation zone

_____100%_____

Of those who evacuated, about what percentage of them used local; shelters instead of leaving the area?

Percentage that used local shelters instead of leaving area

_____NA_____

In your opinion, what factors increased or decreased the percentage of those choosing to evacuate?

Financial problems keeping them from going. Also their experiences with previous storms. Evacuation fatigue.

Was the early evacuation of at-risk populations successful? What were the response rates for these groups (including tourists). What percentage of the total evacuating population did these groups account for?

Yes, about 10%

How can FEMA further assist in the decision making process. Do you have recommendations for tools or products that would assist you?

EVACUATION ROADWAY NETWORK

How would you rate the capacity of the evacuation routes in relation to vehicular demand?

Unsatisfactory -----
-----Excellent
1 (2) 3 4 5

Do you have traffic management plans that would facilitate the evacuation process? Please define.

Yes, a state public safety plan is in place. There is a lack of capacity on the roadways. People are encouraged to leave early if possible.

What specific measures were taken to facilitate the evacuation process for this event? All of these!

- Barricades
- Traffic Control Points
- Lock Down Drawbridges
- Roving Vehicle Assistance
- Coordinated Traffic Lights
- AM Radio Messages
- Highways Reversal
- Message Signs
- Traffic Redirect

What is the estimated number of people and vehicles evacuating for this event?

Evacuating WITHIN your Community	Estimated People	Estimated Vehicles
Evacuating THROUGH or TO your Community	60,000 _____	___30,000 to 40,000 _____
	___Unknown, depends on storm approach	_____

How would you rate the general public's response to the evacuation notice?

- Slow Response
- Medium Response
- Fast Response

Identify which evacuation routes were advocated to the public.

Hwy.87 N, 62 N, 105 N

How would you rate the traffic volume during this evacuation event?

Light

Normal

Heavy

Congested

Did you have predicted clearance times available from a previous Hurricane Evacuation Study (HES)? If so, what were they?

Yes, from 2000 Study – 33 hours

If clearance times and/or evacuation timelines were not available from a previous HES, how were they determined?

In real time

What was the observed evacuation clearance time (estimated)? Did you find the predicted clearance times appropriate? Please explain.

27 hours. A lot of things with Hurricane IKE were in our favor.

Did the tourist occupancy pose a significant problem not addressed by the clearance times in the HES?

NO

Please provide the timetable for each evacuation order given, according to the targeted at risk population (i.e. nursing homes, mobile homes, tourists, flood zones, etc.) By how many hours did each targeted evacuation order precede the onset of tropical storm winds (34 Kt winds)?

At Risk Population	Date & Time Evacuation Order Given	Onset of 34 Kt Winds	Estimated Time to Complete Evacuation
Special Needs and Mandatory ran concurrent. We don't usually evacuate on a Cat 2			

storm but the surge made it like a Cat 4.			

Please provide an estimate as to how long the overall evacuation process took. What was the longest commute time reported?

What significant traffic problems were experienced during the evacuation for this event?

- | | | |
|--|---|--|
| <input type="checkbox"/> Unanticipated Volumes | <input type="checkbox"/> Congestion and Traffic Jams | <input type="checkbox"/> Accidents and Stalled Autos |
| <input type="checkbox"/> Inadequate Traffic Control | <input type="checkbox"/> Uncoordinated Traffic Signals | <input type="checkbox"/> Uncoordinated Evac Timing |
| <input type="checkbox"/> Diversions from Other Areas | <input type="checkbox"/> Flooded Roads | <input type="checkbox"/> Construction |
| <input type="checkbox"/> Inadequate Signage | <input type="checkbox"/> Damaged Roads | <input type="checkbox"/> County Roads Blocked |
| <input type="checkbox"/> Downed Trees | <input checked="" type="checkbox"/> Other: <u> All </u> of these problems existed | |

Please describe when and where major congestion and choke points / bottlenecks occurred on evacuation routes. How long did the congestion last? When did it recede? Describe where any congestion remained at the time of landfall, if any.

Hwy. 59 and 69 where lanes go from two lanes to one.

Hwy. 96 and 62

Hwy. 87

Was contra-flow used? If so, when and where did it occur?

NO

16a. Should contra-flow have occurred earlier / later? How much earlier / later?

Were there any operational problems or issues with contra flow? Describe them.

If contra-flow was not used, should it have been considered? When should it be initiated and where?

How can the Hurricane Program assist in alleviating some of these problems?

Need more live traffic cameras.

Please describe how the evacuation process and traffic management can be improved.

With more traffic cameras.

COMMUNICATIONS AND PUBLIC INFORMATION

From which agencies and or products did you receive event information?

- | | | |
|--|--|--|
| <input checked="" type="checkbox"/> FEMA Regional Office | <input checked="" type="checkbox"/> Other State Agencies | <input type="checkbox"/> Local EMAs |
| <input checked="" type="checkbox"/> HURREVAC | <input type="checkbox"/> HLT / ELT | <input checked="" type="checkbox"/> Local Weather Office |
| <input checked="" type="checkbox"/> The Weather Channel | <input type="checkbox"/> Commercial Media | <input checked="" type="checkbox"/> Internet |
| <input type="checkbox"/> Other: _____ | | |

Please list which website(s) you used to access storm and event information.

How was local information distributed to you?

- | | | |
|---|------------------------------------|---|
| <input checked="" type="checkbox"/> Telephone | <input type="checkbox"/> Fax | <input checked="" type="checkbox"/> Email |
| <input checked="" type="checkbox"/> Website | <input type="checkbox"/> Interview | <input type="checkbox"/> Press Conference |

Video / Tape
 Pamphlets / Brochures
 Mass email groups
 Other Documents:

How timely was the information?

Very timely. Excellent.

How do you distribute local information to the media?

Telephone
 Website
 Video / Tape
 Others: _____
 Fax
 Interview
 Pamphlets / Brochures
 Email
 Press Conference
 Mass email groups

Was information coordinated with other local agencies to ensure "one-voice" cohesiveness?

Yes, joint information center to State.

Did you allow the media access to the EOC?

Yes, controlled open door policy.

Did you conduct specific planning or coordination sessions with the media for the 2008 hurricane season?

Yes
 No
 Pre-Season
 Post-Season

Have you conducted specific planning or coordination sessions with the media this year?

Yes
 No
 Pre-Season
 Post-Season

Had Regional Preparedness Conference

Was technical jargon used in a manner that could be easily understood by the public? If no, please explain.

Yes

How did you disseminate information to the general public?

Did you experience problems disseminating information to the evacuating public? Please explain.

Information too Complicated
 Information Inaccurate
 Not Enough Information
 Untimely Information
 Population Apathy
 Lack of Political Support
 Other Problems:

_____NO_____

Do you believe the evacuating public experienced problems in receiving the following information?

Evacuation Decision Info
 Evacuation Routes
 Evacuation Detours
 Travel Time Estimates
 Traffic Congestion Info
 Storm Information
 Other Problems:

_____NO_____

14. What language barriers were experienced as it relates to the evacuation process?

Have Spanish radio station. Did not experience any problems.

15. How would you rate overall communications and information dissemination during this event?

Unsatisfactory-----

--Excellent

Within State EOC	1	2	3	4	5x
Between State EOCs	1	2	3	4	5x
Within Jurisdictions	1	2	3	4	5x
Between Jurisdictions	1	2	3	4	5x
With the NWS	1	2	3	4	5x
With the Media	1	2	3	4	5x
With FEMA	1x	2	3	4	5

Only contact with FEMA is during conference call on pre land fall.

16. How can information dissemination be improved?

NA

How can communication methods be improved?

Said they are excellent now.

SHELTERING

Please define the total number of shelters opened and the estimated number of people who sought shelter during this event in your jurisdiction.

Shelter	Number Opened	Estimate of People Sheltered
Red Cross		
Special Needs	NO SHELTERS ARE OFFICIAL AND ARE NOT ENCOURAGED	
Faith Based		
Other:		

Was the availability of the shelters sufficient for the needs of the evacuating public? If not, please explain.

Were the shelters opened in an adequate time frame as it related to the evacuating public?

Were "Refuges of Last Resort" utilized in addition to public shelters?

Please define what mutual aid sheltering agreements you have with neighboring jurisdictions.

What was the average length of time the shelters remained open?
 Average Hours _____ Average Days _____

What problems, if any, were reported in the opened shelters?

- | | | |
|---|---|---|
| <input type="checkbox"/> Location Confusion | <input type="checkbox"/> Overcrowding | <input type="checkbox"/> Shortage of Staff |
| <input type="checkbox"/> Flooding | <input type="checkbox"/> Wind Damage | <input type="checkbox"/> Loss of Utilities |
| <input type="checkbox"/> Lack of Security | <input type="checkbox"/> Shortage of Shelters | <input type="checkbox"/> Unanticipated Medical Issues |
| <input type="checkbox"/> Shortage of Food | <input type="checkbox"/> Shortage of Supplies | <input type="checkbox"/> Transportation |
| <input type="checkbox"/> Medical Needs | <input type="checkbox"/> Other: | |

Please describe how the statewide sheltering process can be improved.

POST STORM RECOVERY

During the post-disaster recovery process, what information was most beneficial to you?

There was a lack of validated information from FEMA. Different FEMA people provided different answers. Usually just Public Assistance people with no good information and could not make decisions. No Continuity. Unclear. Entire teams were demobilized so you had to start from scratch. Part time volunteers ruin working relationship for full time people. Need professional person there from day one for continuity and to keep misinformation from getting out to the public.

With limited communications capabilities, how was post-disaster information managed in your county / jurisdiction?

What significant traffic problems experiences during the re-entry for this event?

- | | | |
|---|--|--|
| <input type="checkbox"/> Unanticipated Volumes | <input type="checkbox"/> Congestion and Traffic Jams | <input type="checkbox"/> Accidents and Stalled Autos |
| <input type="checkbox"/> Inadequate Traffic Control | <input type="checkbox"/> Uncoordinated Traffic Signals | <input type="checkbox"/> Uncoordinated Evac. Timing |
| <input type="checkbox"/> Diversions from Others | <input type="checkbox"/> Flooded Roads | <input type="checkbox"/> Construction |
| <input type="checkbox"/> Inadequate Signage | <input type="checkbox"/> Damaged Roads | <input type="checkbox"/> County Roads Blocked |

Downed Trees

Other:

How can the Hurricane Program assist in alleviating some of the problems encountered?

During Re-Entry, how was information coordinated and disseminated to the general public?

ANALYSIS OF OTHER FEMA PROGRAMS AND EVACUATION ASSISTANCE

Did the results of the FEMA "Gap Analysis" play a role in your planning and evacuation efforts?
How and to what extent?

Did the Federal assisted evacuation efforts (ie. Aircraft, bus, train, other) help or hinder your efforts to safely evacuate your threatened populations from your community? Do you feel that your populations will expect similar support from the Federal government in the future? Please explain.

OTHER COMMENTS

Please provide other comments that would assist FEMA, Local Emergency Management Offices, and State Emergency Management Offices in preparing for, responding to, and recovering from an event.

Having PA paperwork done

Reimbursement eligibility

R S ;means was not useful

Did not submit anything that was ineligible according to FEMA rules but was still denied.

Judge says, "Build me a levee".

FEMA needs to come in and make things easier, not more difficult.

COMPREHENSIVE HURRICANE EMERGENCY MANAGEMENT STRATEGY (CHEMS)

FEMA is broadening the role of the Hurricane Evacuation Study into a more comprehensive approach called the Comprehensive Hurricane Emergency Management Strategy or CHEMS for short. The HES will now become a component of the more comprehensive program.

Please indicate which of the following components of the Hurricane Evacuation Study need improvement and please specify how the component can be improved.

Transportation
Analysis

Behavioral Analysis

Vulnerability Analysis

Hazards Analysis

Shelter Analysis

Decision Making

Please indicate which of the following components of a Re-entry Analysis would benefit the community and specify how the component should be developed.

Decision Making

Communication
Process

Storm Damage Impact

Roadway Network

Consideration/Alternatives

Please indicate which of the following components of a Business Mitigation and Recovery Analysis would benefit the community and specify how the component should be developed.

Mitigation Assessment

Impact Assessment

Economic Impact

Recovery Analysis

Post Storm
Redevelopment
Planning

Please indicate which of the following components of a Community Storm Impact Analysis would benefit the community and specify how the component should be developed.

Coastal Erosion
Mapping / Analysis

Construction/Mitigation
Analysis

Economic Impact

Inland Flooding
Analysis

Utility Damage
Analysis

Critical Facility
Analysis

Post Storm Security
Needs Assessment

Please indicate which of the following components of a Recovery Analysis would benefit the community and specify how the component should be developed.

- Debris Management Planning _____

- Mutual Aid Planning _____

- Long Term Sheltering _____

- Post Storm Redevelopment Planning _____

- Public Health Issues _____

- Catastrophic Impact Planning _____

- Temporary Housing Assessment _____

Please indicate which of the following components of a Communication Assessment would benefit the community and specify how the component should be developed.

- Real Time Communication Assessment _____

- Public Information Process Analysis _____

Please indicate which of the following components of a Technology Analysis would benefit the community and specify how the component should be developed.

- GIS Application Assessment _____

- Enhanced Decision Tool Updates/Creation _____

Please indicate which of the following components of a Disaster Mitigation Analysis would benefit the community and specify how the component should be developed.

- Building Code Impact Analysis _____

Zoning Analysis

Community Rating
System Assessment

Facility Performance
Assessment

HAZUS
Implementation

THANK YOU FOR YOUR TIME AND ASSISTANCE IN COMPLETING THIS MOST
IMPORTANT DOCUMENT.

HARDIN, JASPER, NEWTON COUNTIES

Date	Time	City	County	State	Conducted by
7/22/09	9:00 a.m.	Kountze	Hardin	Texas	Wendy Phillips, FEMA

This assessment is designed to evaluate the effectiveness of the National Hurricane Program's Hurricane Evacuation Study (HES) Products within your jurisdiction as it applied to your experience during the recent hurricane threat. It is also intended to identify any specific needs or recommendations that you may wish to share relating to FEMA's overall Hurricane Program. It is not designed to evaluate you nor your response to the event. Rather it is designed to help FEMA better serve you in the future. Please complete this assessment prior to your scheduled interview.

GENERAL

1. Of the following products, which were readily available for your use?

- | | | |
|---|--|--|
| <input checked="" type="checkbox"/> HURREVAC | <input checked="" type="checkbox"/> Evacuation Maps | <input type="checkbox"/> Clearance Times |
| <input type="checkbox"/> Shelter Locations | <input checked="" type="checkbox"/> Local Hurricane Plan | <input checked="" type="checkbox"/> Storm Surge Maps |
| <input type="checkbox"/> SLOSH | <input type="checkbox"/> HES Study | |
| <input type="checkbox"/> Other Documents: _____ | | |

Of the information provided to you, which items were considered most important? Please explain.

- | | | |
|---|--|--|
| <input checked="" type="checkbox"/> HURREVAC | <input checked="" type="checkbox"/> Evacuation Maps | <input type="checkbox"/> Clearance Times |
| <input type="checkbox"/> Shelter Locations | <input checked="" type="checkbox"/> Local Hurricane Plan | <input checked="" type="checkbox"/> Storm Surge Maps |
| <input type="checkbox"/> SLOSH | <input type="checkbox"/> HES Study | |
| <input type="checkbox"/> Other Documents: _____ | | |
| _____ | | |
| _____ | | |
| _____ | | |

Which items were found to be the least helpful? Please explain.

- | | | |
|---|---|--|
| <input type="checkbox"/> HURREVAC | <input type="checkbox"/> Evacuation Maps | <input type="checkbox"/> Clearance Times |
| <input type="checkbox"/> Shelter Locations | <input type="checkbox"/> Local Hurricane Plan | <input checked="" type="checkbox"/> Storm Surge Maps |
| <input type="checkbox"/> SLOSH | <input type="checkbox"/> HES Study | |
| <input type="checkbox"/> Other Documents: _____ | | |
| _____ | | |
| _____ | | |
| _____ | | |

Please describe your partnerships with private companies and/or civic groups to assist in a public outreach program for your community.

Fire Department, Super Market Brooks Brothers, Area Churches, Salvation Army , Red Cross

(Jasper, Newton) School District, Utility Companies, Walmart,

Discuss how HURREVAC is generally used during a hurricane event.

Conference calls pulled up to show view track of the storm. Just got program into computer

Discuss how SLOSH or the SLOSH Display Model is generally used during a hurricane event.

N/A

What mitigation efforts, if any, were initiated or participated in before or during this event?

No funding

Of these mitigation efforts, were they successful? Please explain.

N/A for Hardin

Jasper and Newton- Generators for water and sewerage plants and county infrastructure

Please list any critical facilities that were impacted by wind, surge or freshwater flooding by

Lost power for 3 days. Water wells. Sewer Plants. Generators burned by lightning.

Please list the locations, quantity and type of “vulnerable” or “special needs” populations that were impacted by this storm.

No evacuation for Ike. One nursing home was impacted in Hardin. Eight facilities in Jasper and Newton but were not all evacuated. About 600 people affected.

Did your community provide transportation resources to “critical transportation populations?” Please list the types of transportation provided, the amount and the locations to which these populations were taken.

Hardin – Sheltered in place.

Jasper – Newton – Used buses for Mandatory Evacuation of critical needs populations

Are you aware of any instances where “safe rooms” were utilized during this storm and whether their use was successful? NO

Are there critical facilities within your community (outside the surge area) that could be retrofitted for hurricane protection so that their residents could potentially “shelter in place” and not have to be evacuated? Please provide a list with locations. Are any of these “critical transportation needs” origin facilities whose residents require government assistance to evacuate?

Non-sheltering county

Sylsbe High School, Kountz Middle and High School

HURRICANE LIAISON TEAM (HLT)

1. If you utilized FEMA’s Hurricane Liaison Team, how would you rate the service received?

Unsatisfactory -----
-----Excellent
1 2 3 4 5
NO CONTACT WITH HLT

2. Did you participate in the HLT teleconferences during this event? Were these conferences helpful? Please explain.

N/A

3. How could FEMA’s Hurricane Liaison Team improve services to local emergency management agencies?

N/A

EMERGENCY OPERATIONS CENTER

At what time was the Emergency Operations Center Activated?

Not Activated
 Partial Activation
 Full Activation
 Date _____ Date 9/11/08 For all
 three
 counties _____
 Time _____ Time _____

Did your organization have a presence in, or have access to, the STATE Emergency Operations Center during this event? If so, was this helpful in the information collection process? Please Explain.

 Yes, with conference call

 Very helpful

TECHNOLOGICAL

Please identify which tools assisted you in making decisions

HURREVAC Website(s) HAZUS Jasper/Newton
 Tides SLOSH Tides
 Other: ___Impact Weather (J, N), NWS

Of the tools utilized, how would you rate their performance and/or ease of use?

Unsatisfactory -----

--Excellent

HURREVAC	1	2x	3	4x J,N	5
SLOSH	1	2	3	4	5
TIDES	1	2	3	4	5
HAZUS	1	2x J,N	3	4	5
Other	1	2	3	4	5

Of the tools utilized, how could they be enhanced or improved?

HURREVAC Better graphics - Integrate into GIS
 SLOSH _____
 TIDES _____
 HAZUS _____
 Other _____

Of the tools utilized, has staff been adequately trained to operate the tools? Need More Training

HURREVAC Yes No Partially Not Applicable
 SLOSH Yes No Partially Not Applicable

TIDES Yes No Partially Not Applicable
 HAZUS Yes No Partially Not Applicable
 Other Yes No Partially Not Applicable

6. If HURREVAC were utilized, how would you rate these program components?

Unsatisfactory -----

--Excellent

Decision Arcs	1	2	3	4	5
Surge Maps	1	2	3	4	5
Clearance Times	1	2	3	4	5
Shelter Information	1	2	3	4	5
Wind Swath	1	2	3	4	5
Error Cone	1	2	3	4	5
SLOSH	1	2	3	4	5
5-day Forecast	1	2	3	4	5x

EVACUATION AND DECISION MAKING

Did your jurisdiction issue evacuation orders?

Jurisdiction Name	Voluntary		Recommended		Mandatory	
	Date	Time	Date	Time	Date	Time
Jasper and Newton					9/11/08	6:00 a.m.

Hardin did not evacuate

Please describe how the State assisted you in the evacuation and decision making process.

Worked with RLOs and NWS helped with decision

In retrospect, were the appropriate areas evacuated? If insufficient or excessive, please explain.

Insufficient for the Threat Sufficient for the Threat Excessive for the Threat

If evacuation orders were issued, please indicate which areas were targeted.

(Please use "V" for Voluntary, "M" for Mandatory, and "R" for Recommended)

- | | |
|--|---|
| <input type="checkbox"/> Manufactured Homes | <input type="checkbox"/> Category 1 Surge Zone |
| <input type="checkbox"/> Healthcare Facilities | <input type="checkbox"/> Category 2 Surge Zone |
| <input type="checkbox"/> River/Lake Fronts | <input type="checkbox"/> Category 3 Surge Zone |
| <input type="checkbox"/> Islands | <input type="checkbox"/> Category 4 Surge Zone |
| <input type="checkbox"/> Beach Fronts | <input type="checkbox"/> Category 5 Surge Zone |
| <input type="checkbox"/> Flood Prone Areas | <input type="checkbox"/> Other: _____ All mandatory for Jasper and Newton _____ |
| <input type="checkbox"/> Countywide | |

How was the public notified of the evacuation orders?

Television Loudspeaker / PA Radio

- Newspaper
- Telephone
- Other Methods:
- Meetings
- Mass Fax
- Internet
- Mass Email

Were the evacuation orders issued in a timely manner? If not, please explain.

 Yes, based on the information available at the time

How were evacuation areas determined?

- HES Products/Storm Surge
- History of Wind Damage
- FIRM Maps
- Political Decision
- History of Flooding
- Other: _____Used

HURREVAC/evacuation zone maps _____
 What language barriers were experienced as it

relates to the evacuation process?

 No problem we are aware of. Used 211

How can FEMA further assist in the decision making process. Do you have recommendations for tools or products that would assist you?

 Integrate something into HAZUS

EVACUATION ROADWAY NETWORK

How would you rate the capacity of the evacuation routes in relation to vehicular demand?

-----Unsatisfactory -----
 -----Excellent
 5 1xHardin 2 3x J, N 4

Do you have traffic management plans that would facilitate the evacuation process? Please define.

 Using Regional Highway Patrol Management Plan

 Texas DOT camera system used by Jasper and Newton

Jasper – Newton Hwys. 87 and 96
Hardin - Hwys. 69 and 96

How would you rate the traffic volume during this evacuation event?

Light Normal Heavy Congested

Did you have predicted clearance times available from a previous Hurricane Evacuation Study (HES)? If so, what were they?

Yes Jasper and Newton = 8 hours clearance time

If clearance times and/or evacuation timelines were not available from a previous HES, how were they determined?

N/A

What was the observed estimated evacuation clearance time? Did you find the clearance times appropriate? Please explain.

8 hours observed by Jasper and Newton

10 - 12 hours passing through Hardin

Did the tourist occupancy pose a significant problem not addressed by the clearance times in the HES?

Hardin=N/A Yes for the lake areas of Jasper and Newton

Please provide the timetable for each evacuation order given according to a target population (i.e. nursing homes, mobile homes, tourists, flood zones, etc.) By how many hours did each targeted evacuation order precede actual landfall?

Jasper/Newton = H – 48 hours One nursing home did not evacuate at all.

All one time mandatory, no staggered times. Need to be staggered in future

Please provide an overall estimate as to how long the evacuation process took.

Jasper/Newton - 8 hours, special needs – 24 hours

What is the longest commute time reported?

Jasper/Newton – 16 hours

What significant traffic problems were experienced during the evacuation for this event?

- Unanticipated Volumes
- Inadequate Traffic Control
- Diversions from Others
- Inadequate Signage
- Downed Trees
- Congestion and Traffic Jams
- Uncoordinated Traffic Signals
- Flooded Roads
- Damaged Roads
-
- Accidents and Stalled Autos
- Uncoordinated Evac Timing
- Construction
- County Roads Blocked
- Other:

Please describe when and where major congestion and choke points / bottlenecks occurred on evacuation routes. How long did the congestion last? When did it recede? Describe where any congestion remained at the time of landfall, if any.

190 and 96 when E-W intersects north bound traffic
When traffic from Beaumont on two lanes goes to one lane in Lumberton
Hwy. 69 at Lufkin, TX

If roadways were reversed, where and when did this occur? Should it have occurred earlier? How much earlier? Were there any operational problems or issues with the reversible roadways? Describe them. Describe the plan for reversing each roadway. If no roadways were reversed, should roadway reversibility be considered? When?

N/A

How can the Hurricane Program assist in alleviating some of these problems?

More traffic message boards and additional AM radio stations

Please describe how the evacuation process and traffic management can be improved.

N/A

COMMUNICATIONS AND PUBLIC INFORMATION

From which agencies and or products did you receive event information?

- | | | |
|---|--|--|
| <input type="checkbox"/> FEMA Regional Office | <input checked="" type="checkbox"/> Other State Agencies | <input checked="" type="checkbox"/> Local EMAs |
| <input checked="" type="checkbox"/> HURREVAC | <input type="checkbox"/> HLT / ELT | <input checked="" type="checkbox"/> Local Weather Office |
| <input checked="" type="checkbox"/> The Weather Channel | <input type="checkbox"/> Commercial Media | <input checked="" type="checkbox"/> Internet |
| <input checked="" type="checkbox"/> Other: __SOC, National Guard, Conference Calls, established MAC | | |
-

How was local information distributed to you?

- | | | |
|---|--|--|
| <input checked="" type="checkbox"/> Telephone | <input checked="" type="checkbox"/> Fax | <input checked="" type="checkbox"/> Email |
| <input checked="" type="checkbox"/> Website | <input type="checkbox"/> Interview | <input checked="" type="checkbox"/> Press Conference |
| <input type="checkbox"/> Video / Tape | <input type="checkbox"/> Pamphlets / Brochures | <input type="checkbox"/> Mass email groups |
| <input type="checkbox"/> | | Other |
- Document _____

How timely was the information?

Good most of the time. Jasper/Newton had to ask for information from NWS and SOC

How do you distribute local information to the media?

- | | | |
|---|--|---|
| <input type="checkbox"/> Telephone | <input type="checkbox"/> Fax | <input type="checkbox"/> Email |
| <input type="checkbox"/> Website | <input type="checkbox"/> Interview | <input checked="" type="checkbox"/> Press Conference (Hardin) |
| <input type="checkbox"/> Video / Tape | <input type="checkbox"/> Pamphlets / Brochures | <input type="checkbox"/> Mass email groups |
| <input checked="" type="checkbox"/> Other | Documents: ___Press | Briefing for Jasper__ |
-

Was information coordinated with other local agencies to ensure "one-voice" cohesiveness?

Used joint information center through MAC

Do you allow the media access to the EOC?

Hardin – none allowed access

Jasper/Newton – Not in EOC – Separate area set up for media

Did you conduct specific planning or coordination sessions with the media for the 2008 hurricane season?

Yes No Pre-Season Post-Season

Have you conducted specific planning or coordination sessions with the media this year?

Yes No Pre-Season Post-Season

Was technical jargon explained in a manner that could be easily communicated to the public? If no, please explain.

Yes

Did you experience problems disseminating information to the evacuating public? Please explain.

Information too Complicated Information Inaccurate Not Enough Information
 Untimely Information Population Apathy Lack of Political Support
 Other Problems: _____ No Problems

Do you believe the evacuating public experienced problems in receiving the following information?

Evacuation Decision Info Evacuation Routes Evacuation Detours
 Travel Time Estimates Traffic Congestion Info Storm Information
 Other Problems: ___ Problem with no AM radio stations not being up and with lack of information on shelters being readily available

13. How would you rate overall communications and information dissemination during this event?

			Unsatisfactory-----		
--Excellent					
Within State EOC	1	2	3	4x	5
Between State EOCs	1	2x	3	4	5
Within Jurisdictions	1	2	3	4x	5
Between Jurisdictions	1	2	3x	4	5
With the NWS	1	2	3	4	5x
With the Media	1	2	3	4x	5
With FEMA	1	2	3	4	5
Response (5) Recovery(3)					

14. How can information dissemination be improved?

With better communication between local weather and Dallas/Ft.Worth. Turn over to local weather.

How can communication methods be improved?

By changing website server out of Austin and involving the HLT

SHELTERING

Please define the total number of shelters opened and the estimated number of people who sought shelter during this event in your jurisdiction.

SHELTER	Number Opened	Estimate of People Sheltered
Red Cross	_____	_____
Special Needs	_____	_____
Faith Based	J/N one _____	100 _____
Other	_____	_____

None in Hardin

Was the availability of the shelters sufficient for the needs of the evacuating public? If not, please explain.

Yes – Jasper/Newton
N/A - Hardin

Were the shelters opened in an adequate time frame as it related to the evacuating public?

Yes for the need of purpose

Were “Refuges of Last Resort” utilized in addition to public shelters?

Yes

Please define what mutual aid sheltering agreements you have with neighboring jurisdictions.

Jasper/Newton – Point to Point with Canton, TX

Hardin – Point to Point with Carthage, TX

What was the average length of time the shelters remained open?

Average Hours _____ Average Days ___one week
for Jasper/Newton _____

What problems, if any, were reported in the opened shelters?

- | | | |
|---|---|---|
| <input type="checkbox"/> Location Confusion | <input type="checkbox"/> Overcrowding | <input type="checkbox"/> Shortage of Staff |
| <input type="checkbox"/> Flooding | <input type="checkbox"/> Wind Damage | <input type="checkbox"/> Loss of Utilities |
| <input type="checkbox"/> Lack of Security | <input type="checkbox"/> Shortage of Shelters | <input type="checkbox"/> Unanticipated Medical Issues |
| <input type="checkbox"/> Shortage of Food | <input type="checkbox"/> Shortage of Supplies | <input type="checkbox"/> Other: |

Please describe how the state wide sheltering process can be improved.

POST STORM RECOVERY

During the recovery process, what information would be most beneficial to you?

Hardin – Make process for reimbursements basic and give us the information

Jasper/Newton – Have pre-hurricane meetings to inform of changes in reimbursement process. The process seems to change with each storm.

Help review pre existing contracts

With limited communications capabilities, how is information managed?

HAMM Radios, Handheld radios, interoperable radios, ACU 1000 tie into every frequency needs training

What significant traffic problems experiences during the re-entry for this event?

- | | | |
|---|--|--|
| <input type="checkbox"/> Unanticipated Volumes | <input type="checkbox"/> Congestion and Traffic Jams | <input type="checkbox"/> Accidents and Stalled Autos |
| <input type="checkbox"/> Inadequate Traffic Control | <input type="checkbox"/> Uncoordinated Traffic Signals | <input type="checkbox"/> Uncoordinated Evac. Timing |
| <input type="checkbox"/> Diversions from Others | <input type="checkbox"/> Flooded Roads | <input type="checkbox"/> Construction |
| <input type="checkbox"/> Inadequate Signage | <input type="checkbox"/> Damaged Roads | <input type="checkbox"/> County Roads Blocked |

Downed Trees

Other: problems with medical and recreational use of drugs

How can the Hurricane Program assist in alleviating some of the problems encountered?

Pre – position resources earlier. Set up before evacuees arrive.

During Re-Entry, how will information be coordinated and disseminated to the general public?

ANALYSIS OF OTHER FEMA PROGRAMS AND EVACUATION ASSISTANCE

Did the results of the FEMA “Gap Analysis” plan a role in your planning and evacuation efforts?
How and to what extent?

Not familiar with

Did the Federal assisted evacuation efforts (ie. Aircraft, bus, train, other) help or hinder your efforts to safely evacuate your threatened populations from your community? Do you feel that your populations will expect similar support from the Federal government in the future? Please explain.

Did not get buses in a timely manner from the State and were not positioned properly.
Yes, and the population continues to expect same support as Katrina received and want temporary housing.

COMPREHENSIVE HURRICANE EMERGENCY MANAGEMENT STRATEGY (CHEMS)

FEMA is broadening the role of the Hurricane Evacuation Study into a more comprehensive approach called the Comprehensive Hurricane Emergency Management Strategy or CHEMS for short. The HES will now become a component of the more comprehensive program.

Please indicate which of the following components of the Hurricane Evacuation Study need improvement and please specify how the component can be improved.

- Transportation Analysis _____

- Behavioral Analysis _____

- Vulnerability Analysis _____

- Hazards Analysis _____

- Shelter Analysis _____

- Decision Making _____

Please indicate which of the following components of a Re-entry Analysis would benefit the community and specify how the component should be developed.

- Decision Making _____

- Communication Process _____

- Storm Damage Impact _____

- Roadway Network _____

- Consideration/Alternatives _____

Please indicate which of the following components of a Business Mitigation and Recovery Analysis would benefit the community and specify how the component should be developed.

- Mitigation Assessment _____

- Impact Assessment _____

- Economic Impact _____

- Recovery Analysis _____

- Post Storm
Redevelopment
Planning _____

Please indicate which of the following components of a Community Storm Impact Analysis would benefit the community and specify how the component should be developed.

- Coastal Erosion
Mapping / Analysis _____

- Construction/Mitigation
Analysis _____

- Economic Impact _____

- Inland Flooding
Analysis _____

- Utility Damage
Analysis _____

- Critical Facility
Analysis _____

- Post Storm Security
Needs Assessment _____

Please indicate which of the following components of a Recovery Analysis would benefit the community and specify how the component should be developed.

- Debris Management Planning _____
- Mutual Aid Planning _____
- Long Term Sheltering _____
- Post Storm Redevelopment Planning _____
- Public Health Issues _____
- Catastrophic Impact Planning _____
- Temporary Housing Assessment _____

Please indicate which of the following components of a Communication Assessment would benefit the community and specify how the component should be developed.

- Real Time Communication Assessment _____
- Public Information Process Analysis _____

Please indicate which of the following components of a Technology Analysis would benefit the community and specify how the component should be developed.

- GIS Application Assessment _____
- Enhanced Decision Tool Updates/Creation _____

Please indicate which of the following components of a Disaster Mitigation Analysis would benefit the community and specify how the component should be developed.

- Building Code Impact Analysis _____

- Zoning Analysis _____

- Community Rating
System Assessment _____

- Facility Performance
Assessment _____

- HAZUS
Implementation _____

OTHER COMMENTS

Please provide other comments that would assist FEMA, Local Emergency Management Offices, and State Emergency Management Offices in preparing for, responding to, and recovering from an event.

THANK YOU FOR YOUR TIME AND ASSISTANCE IN COMPLETING THIS MOST
IMPORTANT DOCUMENT.

**APPENDIX E: LOCAL INTERVIEW QUESTIONNAIRE SUMMARY RESPONSES
FOR NON-HES COUNTIES**

FORT BEND COUNTY

Date	Time	City	County	State	Conducted by
8/19/09	.8:30 a.m.	Richmond	Fort Bend	Texas	Bill Peterson, FEMA

This assessment is designed to evaluate the effectiveness of the National Hurricane Program’s Hurricane Evacuation Study (HES) Products within your jurisdiction as it applied to your experience during the recent hurricane threat. It is also intended to identify any specific needs or recommendations that you may wish to share relating to FEMA’s overall Hurricane Program. It is not designed to evaluate you nor your response to the event. Rather it is designed to help FEMA better serve you in the future. Please complete this assessment prior to your scheduled interview.

GENERAL

1. Of the following products, which were readily available for your use?

- | | | |
|---|--|---|
| <input checked="" type="checkbox"/> HURREVAC | <input checked="" type="checkbox"/> Evacuation Maps | <input type="checkbox"/> Clearance Times |
| <input type="checkbox"/> Shelter Locations | <input checked="" type="checkbox"/> Local Hurricane Plan | <input type="checkbox"/> Storm Surge Maps |
| <input type="checkbox"/> SLOSH | <input type="checkbox"/> HES Study | |
| <input type="checkbox"/> Other Documents: WebEOC | | |

Of the information provided to you, which items were considered most important? Please explain.

- | | | |
|--|--|---|
| <input checked="" type="checkbox"/> HURREVAC | <input checked="" type="checkbox"/> Evacuation Maps | <input type="checkbox"/> Clearance Times |
| <input type="checkbox"/> Shelter Locations | <input checked="" type="checkbox"/> Local Hurricane Plan | <input type="checkbox"/> Storm Surge Maps |
| <input type="checkbox"/> SLOSH | <input type="checkbox"/> HES Study | |
| <input type="checkbox"/> Other Documents: HURREVAC gave the county a more accurate prediction of the storm path | | |

Which items were found to be the least helpful? Please explain.

- | | | |
|---|---|---|
| <input checked="" type="checkbox"/> HURREVAC | <input type="checkbox"/> Evacuation Maps | <input type="checkbox"/> Clearance Times |
| <input type="checkbox"/> Shelter Locations | <input type="checkbox"/> Local Hurricane Plan | <input type="checkbox"/> Storm Surge Maps |
| <input type="checkbox"/> SLOSH | <input type="checkbox"/> HES Study | |
| <input type="checkbox"/> Other Documents: _____ | | |

Please describe your partnerships with private companies and/or civic groups to assist in a public outreach program for your community.

Center Point Energy kept the EOC informed about power outages. AOC provided oxygen to special needs patients without any previous agreement. Civic Groups helped man points of distribution.

Discuss how HURREVAC is generally used during a hurricane event.

HURREVAC was running in the EOC during and after the storm. Based policy decisions on it.

Discuss how SLOSH or the SLOSH Display Model is generally used during a hurricane event.

N/A – Being a pass through county, SLOSH was not applicable.

What mitigation efforts, if any, were initiated or participated in before or during this event?

Debris removal contracts were in place prior to storm. Conference calls and meetings were conducted with numerous agencies. Evacuation plan was established prior to the storm. Fuel contracts were in place prior to t the storm.

Of these mitigation efforts, were they successful? Please explain.

YES

Please list any critical facilities that were impacted by wind, surge or freshwater flooding by MUD pump stations, MUD lift stations, Radio tower at EOC

Please list the locations, quantity and type of “vulnerable” or “special needs” populations that were impacted by this storm.

Medical special needs from Richmond State School (about 10)

EMERGENCY OPERATIONS CENTER

At what time was the Emergency Operations Center Activated?

Not Activated
 Partial Activation
 Full Activation
 Date _____ Date Sept. 10, 2008
 Time _____ Time 7:00 p.m.

Did your organization have a presence in, or have access to, the STATE Emergency Operations Center during this event? If so, was this helpful in the information collection process? Please Explain.

Yes through conference calls - Also able to make requests of State of Texas. Helpful.

TECHNOLOGICAL

Please identify which tools assisted you in making decisions

HURREVAC
 Website(s)
 HAZUS – In debris plan
 Tides
 SLOSH
 Tides
 Other _____

Of the tools utilized, how would you rate their performance and/or ease of use?

		Unsatisfactory -----				
--Excellent						
HURREVAC	1	2	3	4x	5	
SLOSH	1	2	3	4	5	
TIDES	1	2	3	4	5	
HAZUS	1	2	3	4	5	
Other	1	2	3	4	5	

Of the tools utilized, how could they be enhanced or improved?

HURREVAC Need more training
 SLOSH _____
 TIDES _____
 HAZUS _____
 Other _____

Of the tools utilized, has staff been adequately trained to operate the tools?

HURREVAC Yes No Partially Not Applicable
 SLOSH Yes No Partially Not Applicable

TIDES Yes No Partially Not Applicable
 HAZUS Yes No Partially Not Applicable
 Other Yes No Partially Not Applicable

6. If HURREVAC were utilized, how would you rate these program components?

Unsatisfactory -----

--Excellent

Decision Arcs	1	2	3	4	5
Surge Maps	1	2	3	4	5
Clearance Times	1	2	3	4	5
Shelter Information	1	2	3	4	5
Wind Swath	1	2	3	4	5
Error Cone	1	2	3	4	5
SLOSH	1	2	3	4	5
5-day Forecast	1	2	3	4	5

EVACUATION AND DECISION MAKING

Did your jurisdiction issue evacuation orders? NO

Jurisdiction Name	Voluntary		Recommended		Mandatory	
	Date	Time	Date	Time	Date	Time

Please describe how the State assisted you in the evacuation and decision making process.

State sent buses for Richmond State School. It took much too long for the state to make a decision to evacuate the school. Only sent about 12% of total buses required.

In retrospect, were the appropriate areas evacuated? If insufficient or excessive, please explain.

Insufficient for the Threat Sufficient for the Threat Excessive for the Threat

N/A

PASS THROUGH COUNTY. NO EVACUATION ORDER

If evacuation orders were issued, please indicate which areas were targeted.

(Please use "V" for Voluntary, "M" for Mandatory, and "R" for Recommended)

- Manufactured Homes
- Healthcare Facilities
- River/Lake Fronts
- Islands
- Beach Fronts
- Flood Prone Areas
- Countywide
- Category 1 Surge Zone
- Category 2 Surge Zone
- Category 3 Surge Zone
- Category 4 Surge Zone
- Category 5 Surge Zone
- Other: _____

How was the public notified of the evacuation orders?

- Television
- Newspaper
- Telephone
- Other Methods:
- Loudspeaker / PA
- Meetings
- Mass Fax
- Radio
- Internet
- Mass Email

Were the evacuation orders issued in a timely manner? If not, please explain.

How were evacuation areas determined?

- HES Products/Storm Surge
- History of Wind Damage
- Maps
- FIRM Maps
- History of Flooding
- Political Decision
- Other:

_____ What language
barriers were

experienced as it relates to the evacuation process?

How can FEMA further assist in the decision making process. Do you have recommendations for tools or products that would assist you?

EVACUATION ROADWAY NETWORK

How would you rate the capacity of the evacuation routes in relation to vehicular demand?

Unsatisfactory -----

-----Excellent

1 2 3 4x 5

Do you have traffic management plans that would facilitate the evacuation process? Please define.

All use the State Plan

What specific measures were taken to facilitate the evacuation process for this event?

- Barricades
- Traffic Control Points
- Lock Down Drawbridges
- Roving Vehicle Assistance
- Coordinated Traffic Lights
- AM Radio Messages
- Highways Reversal
- Message Signs
- Traffic Redirect

What is the estimated number of people and vehicles evacuating for this event?

	Estimated People	Estimated Vehicles
Evacuating WITHIN your Community	_____ UNKNOWN _____	___Unknown_____
Evacuating THROUGH TO your Community	— _____ or _____	

What percentage of your population was asked to evacuate? Estimate of how many complied?

Percentage Asked to Evacuate	Estimate of How Many Complied
_____	_____

About what percentage of your population lives within a designated evacuation zone? About what percentage of your population used local shelters instead of leaving the area?

Percentage in designated evacuation zone	Percentage that used local shelters instead of leaving area
_____	_____

In your opinion, what factors increased or decreased the percentage of those choosing to evacuate?

Was the early evacuation of at-risk populations successful? What were the response rates for these groups (including tourists). What percentage of the total evacuating population did these groups account for?

N/A

How would you rate the general public's response to the evacuation notice?

- Slow Response
 Normal Response
 Fast Response

Identify which evacuation routes were advocated to the public.

Hwy. 6 and 36

How would you rate the traffic volume during this evacuation event?

Light Normal Heavy Congested

Did you have predicted clearance times available from a previous Hurricane Evacuation Study (HES)? If so, what were they?

N/A

If clearance times and/or evacuation timelines were not available from a previous HES, how were they determined?

N/A

What was the observed estimated evacuation clearance time? Did you find the clearance times appropriate? Please explain.

N/A

Did the tourist occupancy pose a significant problem not addressed by the clearance times in the HES?

Please provide the timetable for each evacuation order given according to a target population (i.e. nursing homes, mobile homes, tourists, flood zones, etc.) By how many hours did each targeted evacuation order precede actual landfall?

Richmond State School	9/10 7p.m.	9/12 3 p.m.	11 – 13 hours
Completed 9/11	11:00 p.m.		

Please provide an overall estimate as to how long the evacuation process took.

N/A

What is the longest commute time reported?

N/A

What significant traffic problems were experienced during the evacuation for this event?

- Unanticipated Volumes
- Inadequate Traffic Control
- Diversions from Others
- Inadequate Signage
- Downed Trees
- Congestion and Traffic Jams
- Uncoordinated Traffic Signals
- Flooded Roads
- Damaged Roads
- Other: _Fuel shortages, Keys for signal boxes.
- Accidents and Stalled Autos
- Uncoordinated Evac Timing
- Construction
- County Roads Blocked

Please describe when and where major congestion and choke points / bottlenecks occurred on evacuation routes. How long did the congestion last? When did it recede? Describe where any congestion remained at the time of landfall, if any.

State hwy.6 due to lack of fuel.

If roadways were reversed, where and when did this occur? Should it have occurred earlier? How much earlier? Were there any operational problems or issues with the reversible roadways? Describe them. Describe the plan for reversing each roadway. If no roadways were reversed, should roadway reversibility be considered? When?

No

How can the Hurricane Program assist in alleviating some of these problems?

N/A

Please describe how the evacuation process and traffic management can be improved.

Cities need to communicate better between themselves and the county EOC. Need to be more uniform in manning their designated traffic control points.

COMMUNICATIONS AND PUBLIC INFORMATION

From which agencies and or products did you receive event information?

- | | | |
|--|--|--|
| <input type="checkbox"/> FEMA Regional Office | <input checked="" type="checkbox"/> Other State Agencies | <input checked="" type="checkbox"/> Local EMAs |
| <input checked="" type="checkbox"/> HURREVAC | <input type="checkbox"/> HLT / ELT | <input checked="" type="checkbox"/> Local Weather Office |
| <input checked="" type="checkbox"/> The Weather Channel | <input checked="" type="checkbox"/> Commercial Media | <input checked="" type="checkbox"/> Internet |
| <input checked="" type="checkbox"/> Other: _WebEOC, Impact Weather, Barron Weather Services , PIER(Public Information Emergency Responder), Local Media Outlets, Red Cross, NOAA | | |

How was local information distributed to you?

- | | | |
|---|--|---|
| <input checked="" type="checkbox"/> Telephone | <input checked="" type="checkbox"/> Fax | <input checked="" type="checkbox"/> Email |
| <input checked="" type="checkbox"/> Website | <input type="checkbox"/> Interview | <input checked="" type="checkbox"/> Press Conference |
| <input type="checkbox"/> Video / Tape | <input type="checkbox"/> Pamphlets / Brochures | <input checked="" type="checkbox"/> Mass email groups |
| <input type="checkbox"/> | Other | Documents: |

How timely was the information?

For the most part it was up to date, especially conference calls with the National Weather Service in Houston and Galveston.

How do you distribute local information to the media?

- | | | |
|---|--|---|
| <input checked="" type="checkbox"/> Telephone | <input checked="" type="checkbox"/> Fax | <input checked="" type="checkbox"/> Email |
| <input checked="" type="checkbox"/> Website | <input checked="" type="checkbox"/> Interview | <input checked="" type="checkbox"/> Press Conference |
| <input type="checkbox"/> Video / Tape | <input type="checkbox"/> Pamphlets / Brochures | <input checked="" type="checkbox"/> Mass email groups |
| <input checked="" type="checkbox"/> Other | Documents: | ___A.M. Radio |

Was information coordinated with other local agencies to ensure "one-voice" cohesiveness?

Yes through meetings with the mayors, but no formal JIC established.

Do you allow the media access to the EOC?

Yes in the EOC Media Room

Did you conduct specific planning or coordination sessions with the media for the 2008 hurricane season?

Yes No Pre-Season Post-Season

Have you conducted specific planning or coordination sessions with the media this year?

Yes No Pre-Season Post-Season

Was technical jargon explained in a manner that could be easily communicated to the public? If no, please explain.

Yes

Did you experience problems disseminating information to the evacuating public? Please explain.

Information too Complicated Information Inaccurate Not Enough Information
 Untimely Information Population Apathy Lack of Political Support
 Other Problems: _____ No

Do you believe the evacuating public experienced problems in receiving the following information?

Evacuation Decision Info Evacuation Routes Evacuation Detours
 Travel Time Estimates Traffic Congestion Info Storm Information
 Other Problems: _____
 _NO_____

13. How would you rate overall communications and information dissemination during this event?

		Unsatisfactory-----		
--Excellent				
Within State EOC	1	2	3	4
	5N/A			
Between State EOCs	1	2	3	4
	5N/A			
Within Jurisdictions	1	2	3	4
	5N/A			

Between Jurisdictions	1	2	3	4x	5
With the NWS	1	2	3	4	5x
With the Media	1	2	3	4	5x
With FEMA	1	2	3x	4	5

How can information dissemination be improved?

Quit changing FEMA reps assigned to county.
Twitter and Facebook

How can communication methods be improved?

Need to address additional languages
Fort Bend County population tends to listen to Harris County Judge instead of FBC Judge.

SHELTERING

Please define the total number of shelters opened and the estimated number of people who sought shelter during this event in your jurisdiction.

SHELTER	Number Opened	Estimate of People Sheltered
Red Cross	2 Post Storm	__150 - 200_____
Special Needs	_____	_____
Faith Based	_____	_____
Other (Schools)	_____	_____

Was the availability of the shelters sufficient for the needs of the evacuating public? If not, please explain.

N/A

Were the shelters opened in an adequate time frame as it related to the evacuating public?

N/A

Were "Refuges of Last Resort" utilized in addition to public shelters? NO

Fort Bend ISD can open school campus if necessary.

Please define what mutual aid sheltering agreements you have with neighboring jurisdictions.

None

What was the average length of time the shelters remained open?

Average Hours _____ Average Days 13 -15
days _____

What problems, if any, were reported in the opened shelters?

- | | | |
|--|---|---|
| <input type="checkbox"/> Location Confusion | <input type="checkbox"/> Overcrowding | <input type="checkbox"/> Shortage of Staff |
| <input type="checkbox"/> Flooding | <input type="checkbox"/> Wind Damage | <input type="checkbox"/> Loss of Utilities |
| <input checked="" type="checkbox"/> Lack of Security | <input type="checkbox"/> Shortage of Shelters | <input type="checkbox"/> Unanticipated Medical Issues |
| <input checked="" type="checkbox"/> Shortage of Food | <input type="checkbox"/> Shortage of Supplies | <input type="checkbox"/> Other: |

Please describe how the state wide sheltering process can be improved.

Training! Get FEMA Centers(laptop and phones) for residents up and running earlier for people in shelters.

POST STORM RECOVERY

During the recovery process, what information would be most beneficial to you?

DRC locations and hours. Services provided Blue Roof program. (1-800 FEMA numbers)

With limited communications capabilities, how is information managed?

N/A

What significant traffic problems experiences during the re-entry for this event?

- | | | |
|---|--|--|
| <input type="checkbox"/> Unanticipated Volumes | <input type="checkbox"/> Congestion and Traffic Jams | <input type="checkbox"/> Accidents and Stalled Autos |
| <input type="checkbox"/> Inadequate Traffic Control | <input type="checkbox"/> Uncoordinated Traffic Signals | <input type="checkbox"/> Uncoordinated Evac. Timing |
| <input type="checkbox"/> Diversions from Others | <input type="checkbox"/> Flooded Roads | <input type="checkbox"/> Construction |
| <input type="checkbox"/> Inadequate Signage | <input type="checkbox"/> Damaged Roads | <input checked="" type="checkbox"/> County Roads Blocked |
| <input checked="" type="checkbox"/> Downed Trees | <input checked="" type="checkbox"/> Other: _____ | <input type="checkbox"/> Damaged traffic signals |

How can the Hurricane Program assist in alleviating some of the problems encountered?

Improvement and coordination with FEMA DAES. Need reps to stay longer!

During Re-Entry, how will information be coordinated and disseminated to the general public?

AM Alert, press conference, phone bank, PIER, county website,email

ANALYSIS OF OTHER FEMA PROGRAMS AND EVACUATION ASSISTANCE

Did the results of the FEMA "Gap Analysis" plan a role in your planning and evacuation efforts? How and to what extent?

NO

Did the Federal assisted evacuation efforts (ie. Aircraft, bus, train, other) help or hinder your efforts to safely evacuate your threatened populations from your community? Do you feel that your populations will expect similar support from the Federal government in the future? Please explain.

N/A

COMPREHENSIVE HURRICANE EMERGENCY MANAGEMENT STRATEGY (CHEMS)

FEMA is broadening the role of the Hurricane Evacuation Study into a more comprehensive approach called the Comprehensive Hurricane Emergency Management Strategy or CHEMS for short. The HES will now become a component of the more comprehensive program.

Please indicate which of the following components of the Hurricane Evacuation Study need improvement and please specify how the component can be improved.

- Transportation Analysis _____

- Behavioral Analysis _____

- Vulnerability Analysis _____

- Hazards Analysis _____

- Shelter Analysis _____

- Decision Making _____

Please indicate which of the following components of a Re-entry Analysis would benefit the community and specify how the component should be developed.

- Decision Making _____

- Communication Process _____

- Storm Damage Impact _____

- Roadway Network _____

- Consideration/Alternatives _____

Please indicate which of the following components of a Business Mitigation and Recovery Analysis would benefit the community and specify how the component should be developed.

- Mitigation Assessment _____

- Impact Assessment _____

- Economic Impact _____

- Recovery Analysis _____

- Post Storm
Redevelopment
Planning _____

Please indicate which of the following components of a Community Storm Impact Analysis would benefit the community and specify how the component should be developed.

- Coastal Erosion
Mapping / Analysis _____

- Construction/Mitigation
Analysis _____

- Economic Impact _____

- Inland Flooding
Analysis _____

- Utility Damage
Analysis _____

- Critical Facility
Analysis _____

- Post Storm Security
Needs Assessment _____

Please indicate which of the following components of a Recovery Analysis would benefit the community and specify how the component should be developed.

- Debris Management Planning _____

- Mutual Aid Planning _____

- Long Term Sheltering _____

- Post Storm Redevelopment Planning _____

- Public Health Issues _____

- Catastrophic Impact Planning _____

- Temporary Housing Assessment _____

Please indicate which of the following components of a Communication Assessment would benefit the community and specify how the component should be developed.

- Real Time Communication Assessment _____

- Public Information Process Analysis _____

Please indicate which of the following components of a Technology Analysis would benefit the community and specify how the component should be developed.

- GIS Application Assessment _____

- Enhanced Decision Tool Updates/Creation _____

Please indicate which of the following components of a Disaster Mitigation Analysis would benefit the community and specify how the component should be developed.

- Building Code Impact Analysis _____

- Zoning Analysis _____

- Community Rating System Assessment _____

- Facility Performance Assessment _____

- HAZUS Implementation _____

OTHER COMMENTS

Please provide other comments that would assist FEMA, Local Emergency Management Offices, and State Emergency Management Offices in preparing for, responding to, and recovering from an event.

The resource request process with the state needs to be improved. Blue Roof program was late getting started in the county. (approximately 10 days after the event)

Need to plan for traffic control, fuel shortages, emergency sheltering

Need better consideration of pass through communities in emergency plans.

THANK YOU FOR YOUR TIME AND ASSISTANCE IN COMPLETING THIS MOST IMPORTANT DOCUMENT.

TYLER, POLK AND SAN JACINTO COUNTIES

Date	Time	City	County	State	Conducted by
7/22/09	1:00 P.M.	Livingston	Polk	Texas	Wendy Phillips, FEMA

This assessment is designed to evaluate the effectiveness of the National Hurricane Program's Hurricane Evacuation Study (HES) Products within your jurisdiction as it applied to your experience during the recent hurricane threat. It is also intended to identify any specific needs or recommendations that you may wish to share relating to FEMA's overall Hurricane Program. It is not designed to evaluate you nor your response to the event. Rather it is designed to help FEMA better serve you in the future. Please complete this assessment prior to your scheduled interview.

GENERAL

1. Of the following products, which were readily available for your use?

- | | | |
|---|--|---|
| <input checked="" type="checkbox"/> HURREVAC | <input checked="" type="checkbox"/> Evacuation Maps | <input checked="" type="checkbox"/> Clearance Times |
| <input checked="" type="checkbox"/> Shelter Locations | <input checked="" type="checkbox"/> Local Hurricane Plan | <input type="checkbox"/> Storm Surge Maps |
| <input type="checkbox"/> SLOSH | <input type="checkbox"/> HES Study | |
| <input type="checkbox"/> Other Documents: _____ | | |

Of the information provided to you, which items were considered most important? Please explain.

- | | | |
|---|--|---|
| <input type="checkbox"/> HURREVAC | <input type="checkbox"/> Evacuation Maps | <input type="checkbox"/> Clearance Times |
| <input checked="" type="checkbox"/> Shelter Locations | <input checked="" type="checkbox"/> Local Hurricane Plan | <input type="checkbox"/> Storm Surge Maps |
| <input type="checkbox"/> SLOSH | <input type="checkbox"/> HES Study | |
| <input type="checkbox"/> Other Documents: _____ | | |
- _____
- _____
- _____

Which items were found to be the least helpful? Please explain.

- | | | |
|---|---|---|
| <input checked="" type="checkbox"/> HURREVAC | <input type="checkbox"/> Evacuation Maps | <input type="checkbox"/> Clearance Times |
| <input type="checkbox"/> Shelter Locations | <input type="checkbox"/> Local Hurricane Plan | <input type="checkbox"/> Storm Surge Maps |
| <input type="checkbox"/> SLOSH | <input type="checkbox"/> HES Study | |
| <input type="checkbox"/> Other Documents: _____ | | |
- _____
- _____
- _____

Please describe your partnerships with private companies and/or civic groups to assist in a public outreach program for your community.

Texas VOAD, Contracts with electrical companies, generator companies, port-a-pottie companies, fuel distributors, State busing service, Brookshires, HEB, Walmart, local restaurants, Carner Environmental

Discuss how HURREVAC is generally used during a hurricane event.

Tyler used to track the storm

San Jacinto used to track the storm

Polk used NOAA that operates on a MAC

Discuss how SLOSH or the SLOSH Display Model is generally used during a hurricane event.

N/A

What mitigation efforts, if any, were initiated or participated in before or during this event?

San Jacinto- Work on Lake Livingston Dam, generators in EOC and Senior Citizens bldgs.

Tyler- Generators on water wells

Polk- Permanent generators at six schools, lift stations and water station and Livingston Memorial Hospital (one of the only hospitals visible on the evacuation routes 59 and 190)

Of these mitigation efforts, were they successful? Please explain.

YES

Please list any critical facilities that were impacted by wind, surge or freshwater flooding by

Polk – Radio tower and Sheriff’s office

100% of power in all three counties

Please list the locations, quantity and type of “vulnerable” or “special needs” populations that were impacted by this storm.

Polk – One nursing homes

San Jacinto – One nursing home and one doctors office

Did your community provide transportation resources to “critical transportation populations?” Please list the types of transportation provided, the amount and the locations to which these populations were taken.

Polk – Yes, Ambulances and POVs
San Jacinto – Yes, School buses, State buses, and ambulances from Polk Co.
Tyler – Yes, Fire Department and Constable, Aircraft

Are you aware of any instances where “safe rooms” were utilized during this storm and whether their use was successful?

No for all three counties

Are there critical facilities within your community (outside the surge area) that could be retrofitted for hurricane protection so that their residents could potentially “shelter in place” and not have to be evacuated? Please provide a list with locations. Are any of these “critical transportation needs” origin facilities whose residents require government assistance to evacuate?

Yes – The schools in all three counties

HURRICANE LIAISON TEAM (HLT)

1. If you utilized FEMA’s Hurricane Liaison Team, how would you rate the service received?

Unsatisfactory -----
-----Excellent
1 2 3 4 5

2. Did you participate in the HLT teleconferences during this event? Were these conferences helpful? Please explain.

NOT AWARE OF HLT

3. How could FEMA’s Hurricane Liaison Team improve services to local emergency management agencies?

N/A

EMERGENCY OPERATIONS CENTER

At what time was the Emergency Operations Center Activated?

Not Activated
 Partial Activation
 Full Activation
 Date _____ Date Sept. 11, 2008
Sept. 10, 2008 _____
 Time _____ Time _____

Did your organization have a presence in, or have access to, the STATE Emergency Operations Center during this event? If so, was this helpful in the information collection process? Please Explain.

Yes through conference calls - 12 counties operated out of MAC while all the Judges were at the Polk County EOC

TECHNOLOGICAL

Please identify which tools assisted you in making decisions

HURREVAC
 Website(s)
 HAZUS
 Tides
 SLOSH
 Tides
 Other: _NOAA, Weather Underground, Channel 6 News, KFBM (Beaumont)

Of the tools utilized, how would you rate their performance and/or ease of use?

Unsatisfactory -----

--Excellent

HURREVAC	1	2x Polk	3	4
	5x SJ, Tyler			
SLOSH	1	2	3	4
TIDES	1	2	3	4
HAZUS	1	2	3	4
Other	1	2	3	4

Of the tools utilized, how could they be enhanced or improved?

HURREVAC Need more training
 SLOSH _____
 TIDES _____
 HAZUS _____
 Other _____

Of the tools utilized, has staff been adequately trained to operate the tools?

- | | | | | |
|----------|------------------------------|--|------------------------------------|---|
| HURREVAC | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No | <input type="checkbox"/> Partially | <input type="checkbox"/> Not Applicable |
| SLOSH | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Partially | <input type="checkbox"/> Not Applicable |
| TIDES | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Partially | <input type="checkbox"/> Not Applicable |
| HAZUS | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Partially | <input type="checkbox"/> Not Applicable |
| Other | <input type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> Partially | <input type="checkbox"/> Not Applicable |

6. If HURREVAC were utilized, how would you rate these program components?

Unsatisfactory -----

--Excellent

Decision Arcs	1	2	3	4x	5
Surge Maps	1	2	3x	4	5
Clearance Times	1	2	3x	4	5
Shelter Information	1	2	3	4	5
Wind Swath	1	2	3	4	5x
Error Cone	1	2	3	4	5x
SLOSH	1	2	3	4	5
5-day Forecast	1	2	3x	4	5

Polk County Only

EVACUATION AND DECISION MAKING

Did your jurisdiction issue evacuation orders?

Jurisdiction Name	Voluntary		Recommended		Mandatory	
	Date	Time	Date	Time	Date	Time

Please describe how the State assisted you in the evacuation and decision making process.

Local Judges Call

In retrospect, were the appropriate areas evacuated? If insufficient or excessive, please explain.

- Insufficient for the Threat Sufficient for the Threat Excessive for the Threat

If evacuation orders were issued, please indicate which areas were targeted.

(Please use "V" for Voluntary, "M" for Mandatory, and "R" for Recommended)

- | | |
|--|--|
| <input checked="" type="checkbox"/> Manufactured Homes | <input type="checkbox"/> Category 1 Surge Zone |
| <input type="checkbox"/> Healthcare Facilities | <input type="checkbox"/> Category 2 Surge Zone |
| <input type="checkbox"/> River/Lake Fronts | <input type="checkbox"/> Category 3 Surge Zone |
| <input type="checkbox"/> Islands | <input type="checkbox"/> Category 4 Surge Zone |
| <input type="checkbox"/> Beach Fronts | <input type="checkbox"/> Category 5 Surge Zone |
| <input checked="" type="checkbox"/> Flood Prone Areas | <input type="checkbox"/> Other: _____ |

All use the State Plan

What specific measures were taken to facilitate the evacuation process for this event?

- Barricades Traffic Control Points Lock Down
Drawbridges
- Roving Vehicle Coordinated Traffic AM Radio Messages
Assistance Lights
- Highways Reversal Message Signs Traffic Redirect

What is the estimated number of people and vehicles evacuating for this event?

	Estimated People	Estimated Vehicles
Evacuating WITHIN your Community	Polk 4500, Tyler 7000, SJ 500	_____
Evacuating THROUGH or TO your Community	_____ SJ 10,000	Polk 150,000, Tyler_350,000

What percentage of your population was asked to evacuate? Estimate of how many complied?

Percentage Asked to Evacuate	Estimate of How Many Complied
_____100%_____	P(15%) Ty (50%) SJ (3%)

About what percentage of your population lives within a designated evacuation zone? About what percentage of your population used local shelters instead of leaving the area?

Percentage in designated evacuation zone	Percentage that used local shelters instead of leaving area
_____	_____

In your opinion, what factors increased or decreased the percentage of those choosing to evacuate?

N/A
Polk(15%) Tyler(15%) San Jacinto (10%)

Was the early evacuation of at-risk populations successful? What were the response rates for these groups (including tourists). What percentage of the total evacuating population did these groups account for?

N/A

Please provide an overall estimate as to how long the evacuation process took.

N/A

What is the longest commute time reported?

N/A

What significant traffic problems were experienced during the evacuation for this event?

- | | | |
|--|---|--|
| <input checked="" type="checkbox"/> Unanticipated Volumes | <input checked="" type="checkbox"/> Congestion and Traffic Jams | <input type="checkbox"/> Accidents and Stalled Autos |
| <input type="checkbox"/> Inadequate Traffic Control | <input type="checkbox"/> Uncoordinated Traffic Signals | <input type="checkbox"/> Uncoordinated Evac Timing |
| <input checked="" type="checkbox"/> Diversions from Others | <input type="checkbox"/> Flooded Roads | <input checked="" type="checkbox"/> Construction |
| <input type="checkbox"/> Inadequate Signage | <input type="checkbox"/> Damaged Roads | <input type="checkbox"/> County Roads Blocked |
| <input type="checkbox"/> Downed Trees | <input type="checkbox"/> | Other: |

Please describe when and where major congestion and choke points / bottlenecks occurred on evacuation routes. How long did the congestion last? When did it recede? Describe where any congestion remained at the time of landfall, if any.

Polk - Hwy. 59 and 287 Corrigan, TX - Receded in 8 hours

Tyler - Warren, Woodville, Colmsneil - Four lanes going down to two lanes – Receded in 12-14 hrs.

San Jacinto – Hwy. 190, 156, 150 and 45 – Receded in 10-12 hours

If roadways were reversed, where and when did this occur? Should it have occurred earlier? How much earlier? Were there any operational problems or issues with the reversible roadways? Describe them. Describe the plan for reversing each roadway. If no roadways were reversed, should roadway reversibility be considered? When?

No Reversals

How can the Hurricane Program assist in alleviating some of these problems?

Polk – Finish building the crossover at Corrigan, TX on highway 289

Tyler – Finish building the highway 69 corridor.

Please describe how the evacuation process and traffic management can be improved.

N/A

COMMUNICATIONS AND PUBLIC INFORMATION

From which agencies and or products did you receive event information?

<input type="checkbox"/> FEMA Regional Office	<input checked="" type="checkbox"/> Other State Agencies	<input type="checkbox"/> Local EMAs
<input checked="" type="checkbox"/> HURREVAC	<input type="checkbox"/> HLT / ELT	<input checked="" type="checkbox"/> Local Weather Office
<input type="checkbox"/> The Weather Channel	<input checked="" type="checkbox"/> Commercial Media	<input checked="" type="checkbox"/> Internet
<input checked="" type="checkbox"/> Other: _____	Satellite	Houston and Galveston

How was local information distributed to you?

<input checked="" type="checkbox"/> Telephone	<input checked="" type="checkbox"/> Fax	<input checked="" type="checkbox"/> Email
<input checked="" type="checkbox"/> Website	<input type="checkbox"/> Interview	<input type="checkbox"/> Press Conference
<input checked="" type="checkbox"/> Video / Tape	<input type="checkbox"/> Pamphlets / Brochures	<input checked="" type="checkbox"/> Mass email groups
<input type="checkbox"/>	Other	Documents:

How timely was the information?

Polk – Faxes were timely

Tyler - Yes

SJ - Yes

How do you distribute local information to the media?

<input checked="" type="checkbox"/> Telephone	<input type="checkbox"/> Fax	<input checked="" type="checkbox"/> Email
<input type="checkbox"/> Website	<input type="checkbox"/> Interview	<input type="checkbox"/> Press Conference
<input type="checkbox"/> Video / Tape	<input checked="" type="checkbox"/> Pamphlets / Brochures	<input type="checkbox"/> Mass email groups
<input type="checkbox"/>	Other	Documents:

Was information coordinated with other local agencies to ensure “one-voice” cohesiveness?

Polk – Yes through MAAC conference calls

Tyler – Yes with emails

SJ – Yes with emails

Do you allow the media access to the EOC?

Yes for all three counties

Did you conduct specific planning or coordination sessions with the media for the 2008 hurricane season?

Yes No Pre-Season Post-Season
All three counties

Have you conducted specific planning or coordination sessions with the media this year?

Yes No Pre-Season Post-Season
San Jacinto Polk and Tyler

Was technical jargon explained in a manner that could be easily communicated to the public? If no, please explain.

Yes

Did you experience problems disseminating information to the evacuating public? Please explain.

Information too Complicated Information Inaccurate Not Enough Information
 Untimely Information Population Apathy Lack of Political Support
 Other Problems: ___ No except when we lost our electrical power

Do you believe the evacuating public experienced problems in receiving the following information?

Evacuation Decision Info Evacuation Routes Evacuation Detours
 Travel Time Estimates Traffic Congestion Info Storm Information
 Other Problems: ___ San Jacinto has no local radio station. Made it difficult to communicate to the evacuees passing through

13. How would you rate overall communications and information dissemination during this event?

Unsatisfactory-----

--Excellent

Within State EOC	1	2	3	4	5
Between State EOCs	1	2	3	4	5
Within Jurisdictions	1	2	3	4	5
Between Jurisdictions	1	2	3	4	5
With the NWS	1	2	3	4	5
With the Media	1	2	3	4	5

With FEMA 1 2 3 4 5

14. How can information dissemination be improved?
 By having the Media report what they are told and not what they believe (improve accuracy)

More road signage and more a.m. radio stations

How can communication methods be improved?

More a.m. radio stations
EVERBRIDGE – phone ring down system – phone tree

SHELTERING

Please define the total number of shelters opened and the estimated number of people who sought shelter during this event in your jurisdiction.

SHELTER	Number Opened	Estimate of People Sheltered
Red Cross	P(3)_____	280_____
Special Needs	SJ(1)_____	40_____
Faith Based	T(3)_____	100_____
Other (Schools)	P(7)_____	P(1500-2000) SJ(500)
	SJ(2)_____	_____

Was the availability of the shelters sufficient for the needs of the evacuating public? If not, please explain.

Yes for all three counties

Were the shelters opened in an adequate time frame as it related to the evacuating public?

Tyler – The residents opened the shelters YES
San Jacinto – No Red Cross presence. Opened their shelters late - NO
Polk - YES

Were “Refuges of Last Resort” utilized in addition to public shelters? YES

Polk – Fire station, Municipal City Hall, any brick building
Tyler – Camp Taculla
SJ – Waterwood Cabins and Churches

Please define what mutual aid sheltering agreements you have with neighboring jurisdictions.

No agreements – These are pass through counties

What was the average length of time the shelters remained open?

Average Hours _____ Average Days P(6) T(4-10)
SJ(4) _____

What problems, if any, were reported in the opened shelters?

- | | | |
|--|--|---|
| <input type="checkbox"/> Location Confusion | <input type="checkbox"/> Overcrowding | <input checked="" type="checkbox"/> Shortage of Staff |
| <input type="checkbox"/> Flooding | <input type="checkbox"/> Wind Damage | <input checked="" type="checkbox"/> Loss of Utilities |
| <input checked="" type="checkbox"/> Lack of Security | <input type="checkbox"/> Shortage of Shelters | <input type="checkbox"/> Unanticipated Medical Issues |
| <input checked="" type="checkbox"/> Shortage of Food | <input checked="" type="checkbox"/> Shortage of Supplies | <input type="checkbox"/> Other: |

Please describe how the state wide sheltering process can be improved.

Don't apply coastal rules to inland counties

Need professional shelter teams for guidance on running shelters

FEMA could provide a Shelter Operational Course

POST STORM RECOVERY

During the recovery process, what information would be most beneficial to you?

Put a FEMA rep in the EOC that is familiar with project work sheets to research rules.
Help capture the needs Help review pre-existing contracts. Need a FEMA person in the
"know" who has some authority to make approvals. FEMA pre review on PWs.

Help from FEMA on debris removal process

Make the process easier and give us the information we need.

With limited communications capabilities, how is information managed?

HAMM radios, bull horns, cell phones, grapevine

What significant traffic problems experiences during the re-entry for this event?

- | | | |
|---|--|--|
| <input type="checkbox"/> Unanticipated Volumes | <input type="checkbox"/> Congestion and Traffic Jams | <input type="checkbox"/> Accidents and Stalled Autos |
| <input type="checkbox"/> Inadequate Traffic Control | <input type="checkbox"/> Uncoordinated Traffic Signals | <input type="checkbox"/> Uncoordinated Evac. Timing |

- | | | | |
|--|------|---|---|
| <input type="checkbox"/> Diversions | from | <input type="checkbox"/> Flooded Roads | <input type="checkbox"/> Construction |
| Others | | | |
| <input type="checkbox"/> Inadequate Signage | | <input checked="" type="checkbox"/> Damaged Roads | <input type="checkbox"/> County Roads Blocked |
| <input checked="" type="checkbox"/> Downed Trees | | <input type="checkbox"/> | Other: |
-

How can the Hurricane Program assist in alleviating some of the problems encountered?

No major issues

During Re-Entry, how will information be coordinated and disseminated to the general public?

Tyler - Call EOC Information Center, website and local radio station
Polk – Website and local radio station
SJ – Local television in nearby towns of Houston and Beaumont

ANALYSIS OF OTHER FEMA PROGRAMS AND EVACUATION ASSISTANCE

Did the results of the FEMA “Gap Analysis” plan a role in your planning and evacuation efforts?
 How and to what extent?

Did the Federal assisted evacuation efforts (ie. Aircraft, bus, train, other) help or hinder your efforts to safely evacuate your threatened populations from your community? Do you feel that your populations will expect similar support from the Federal government in the future? Please explain.

COMPREHENSIVE HURRICANE EMERGENCY MANAGEMENT STRATEGY (CHEMS)

FEMA is broadening the role of the Hurricane Evacuation Study into a more comprehensive approach called the Comprehensive Hurricane Emergency Management Strategy or CHEMS for short. The HES will now become a component of the more comprehensive program.

Please indicate which of the following components of the Hurricane Evacuation Study need improvement and please specify how the component can be improved.

- Transportation Analysis _____

- Behavioral Analysis _____

- Vulnerability Analysis _____

- Hazards Analysis _____

- Shelter Analysis _____

- Decision Making _____

Please indicate which of the following components of a Re-entry Analysis would benefit the community and specify how the component should be developed.

- Decision Making _____

- Communication Process _____

- Storm Damage Impact _____

- Roadway Network _____

- Consideration/Alternatives _____

Please indicate which of the following components of a Business Mitigation and Recovery Analysis would benefit the community and specify how the component should be developed.

- Mitigation Assessment _____

- Impact Assessment _____

- Economic Impact _____

- Recovery Analysis _____

- Post Storm
Redevelopment
Planning _____

Please indicate which of the following components of a Community Storm Impact Analysis would benefit the community and specify how the component should be developed.

- Coastal Erosion
Mapping / Analysis _____

- Construction/Mitigation
Analysis _____

- Economic Impact _____

- Inland Flooding
Analysis _____

- Utility Damage
Analysis _____

- Critical Facility
Analysis _____

- Post Storm Security
Needs Assessment _____

Please indicate which of the following components of a Recovery Analysis would benefit the community and specify how the component should be developed.

- Debris Management Planning _____
- Mutual Aid Planning _____
- Long Term Sheltering _____
- Post Storm Redevelopment Planning _____
- Public Health Issues _____
- Catastrophic Impact Planning _____
- Temporary Housing Assessment _____

Please indicate which of the following components of a Communication Assessment would benefit the community and specify how the component should be developed.

- Real Time Communication Assessment _____
- Public Information Process Analysis _____

Please indicate which of the following components of a Technology Analysis would benefit the community and specify how the component should be developed.

- GIS Application Assessment _____
- Enhanced Decision Tool Updates/Creation _____

Please indicate which of the following components of a Disaster Mitigation Analysis would benefit the community and specify how the component should be developed.

- Building Code Impact Analysis _____

Zoning Analysis

Community Rating
System Assessment

Facility Performance
Assessment

HAZUS
Implementation

OTHER COMMENTS

Please provide other comments that would assist FEMA, Local Emergency Management Offices, and State Emergency Management Offices in preparing for, responding to, and recovering from an event.

**THANK YOU FOR YOUR TIME AND ASSISTANCE IN COMPLETING THIS MOST
IMPORTANT DOCUMENT.**

APPENDIX F: MEDIA INTERVIEW QUESTIONNAIRE SUMMARY RESPONSES

**HURRICANE IKE POST STORM ASSESSMENT
HOUSTON / HARRIS COUNTY LOCAL MEDIA COMPONENT**

*This assessment is designed to evaluate the effectiveness of the National Hurricane Program Hurricane Evacuation Study (HES) products within your jurisdiction as it applied to your experience during the recent hurricane threat. It is also intended to identify any specific needs or recommendations that you may wish to share relating to FEMA's overall Hurricane Program. It is not designed to evaluate you nor your response to the event. Rather it is designed to help FEMA better serve you in the future. **Please complete this assessment prior to your scheduled interview.***

GENERAL SUPPORT

1. What type of support was provided by the local emergency management office for this event?

The JIC operated in the EOC and pushed out information from local and Regional PIOs to media outlets to disseminate to the public. Reports in the JIC relayed information in real time line broadcast. First hand info from decision makers.

2. How would you rate the support provided to you by your local emergency management office?

OK -----Excellent
1 2 3 4 (5)

2. Did the counties make HURREVAC graphics available to your organization? If so, was it useful?
__Not made available. Not familiar with it. They refer to the experts at NHC and NWS
-
-
-

3. Of the following products, which were readily available for your use?

<input type="checkbox"/> Evacuation Zones/Areas	<input type="checkbox"/> Evacuation Maps	<input type="checkbox"/> Clearance Times
<input type="checkbox"/> Shelter Locations	<input type="checkbox"/> Local Hurricane Plan	
<input type="checkbox"/> SLOSH	<input type="checkbox"/> HE Technical Data Report	<input type="checkbox"/> Storm Surge Maps
<input checked="" type="checkbox"/> Other Documents: Relied on experts to describe on air. Don't want to get too technical for the public. _____		

4. Of the information available to you, which items were considered most important and why?

<input checked="" type="checkbox"/> Evacuation Zones/Areas	<input type="checkbox"/> Evacuation Maps	<input type="checkbox"/> Clearance Times
<input type="checkbox"/> Shelter Locations	<input type="checkbox"/> Local Hurricane Plan	
<input checked="" type="checkbox"/> SLOSH	<input type="checkbox"/> HE Technical Data Report	<input type="checkbox"/> Storm Surge Maps
<input checked="" type="checkbox"/> Other	Documents: _____	_Zip Code Maps

5. Which items were found to be the least helpful?

<input checked="" type="checkbox"/> Evacuation Zones/Areas	<input checked="" type="checkbox"/> Evacuation Maps	<input checked="" type="checkbox"/> Clearance Times
<input type="checkbox"/> Shelter Locations	<input type="checkbox"/> Local Hurricane Plan	
<input type="checkbox"/> SLOSH	<input type="checkbox"/> HE Technical Data Report	<input type="checkbox"/> Storm Surge Maps

Other Documents: Zip-zones map was shown on 'TV

6. Does your organization participate in specific training or coordination sessions with the local emergency management office? How often are these scheduled? Please identify.

To the extent that it can, yes. Need to get both news guys and weather guys to the training and coordinate events that are put on by the EOCs.

7. What can be done to improve your working relationship with the local emergency management office?

Good communication loop and relationship currently exists.

8. Did your organization have a presence in the Emergency Operations Center during this event? If so, was this helpful?

Not in the EOC, but in the JIC, housed in the dame facility.

INFORMATION DISSEMINATION

1. When deciding what local evacuation information data to disseminate concerning the approaching storm, was the information coordinated with the local emergency management agency to ensure "one-voice" cohesiveness and coordination?

Yes, through the JIC

2. How was emergency management and HES information made available to your organization?

Telephone

Fax

Email

Website

Interview

Press Conference

Video / Tape

Pamphlets / Brochures

Mass email groups

Other Documents: Most media is not familiar with HES products

3. How timely was the information?

Good, ongoing hourly, constant presence at JIC

4. Please describe which methods you utilize to disseminate received information to the general public.

Television

Radio Media

Website

Mass Email

Mass Fax

Sponsor Program

Other Methods: _____ newspapers/print

5. Did you experience problems disseminating information to the evacuating public? Please explain.
- Information too Complicated Information Inaccurate Not Enough Information
 Untimely Information Population Apathy Lack of Political Support
 Other Problems: ___Not given enough time on air to present information

6. Do you believe the evacuating public experienced problems in receiving the following information?
- Evacuation Decision Info Evacuation Routes Evacuation Detours
 Travel Time Estimates Traffic Congestion Info Storm Information
 Other Problems: _Don't get good feedback for public response

7. Please list the general types of public information on the approaching storm and the local emergency management evacuation information you disseminated. Do you think this information was understood by the public? Please explain.
- Maps, evacuation routes, graphics, warning, zip codes needing to evacuate.
Don't know how well information was received by the public.

8. Were any specific public information tools utilized during the event? If so, please explain.
- NO

9. How can the local emergency management office improve their data distribution methods for the media outlets? Are there any other communication conduits that could be utilized for future events?
- The JIC is a good tool. Kept area informed during the entire cycle of the storm.
- More planning. Better preparedness.

RESEARCH AND STATISTICS

1. Are you aware of and understand the different evacuation zones for the variety of different storms for each jurisdiction in your media market? Do you have the evacuation zone maps for your coverage area? What format is best for you?
- Zip-zone map covers most of broadcast area used for all local jurisdictions.

2. If so, are these evacuation zones easy to explain to the general public? What suggestions do you have for improving the zones?

Yes. It is easy to explain zip codes. Most know their zip code better than they do their location on a map.

By placing visual zip codes in a crawl box on a screen.

3. Are you familiar with any current Mitigation projects occurring in your jurisdiction that will reduce the storm risk factors?

No discussion

4. Would past statistics on hurricane evacuations and post storm damages assist you in informing the public? How?

The public uses past statistics/experiences to base their decisions on how they will react with the next storm.

POST STORM RECOVERY

1. During the recovery process what information would be most beneficial to your media market?

How it affects me! What is the most affected area? When can I return?

2. With limited communications capabilities, how would information dissemination be managed?

Must rely on radio or fringe media outlets. Most TV stations have agreements with radio stations, satellite radio stations like XM and Sirius can be used without subscriptions.

3. How can you assist local officials in disseminating information during the recovery process? Do you have a presence in the local Emergency Operating Center AFTER the storm?

Never allowed in the EOC. Set up shop in the same building in JIC.

Where can public go for "comforts" like air, water and ice. Could have media cover these messages instead of having to refer to FEMA.

OTHER COMMENTS

- 1. Please provide other comments, which would assist FEMA, the local emergency management office, and other media outlets in preparing for, responding to, and recovery from an event.

Have local GIS map created with all PODs, Walmarts, grocery stores, etc. on it.

Do not stress the STORM categories, stress the Impact of the STORM!

PODS provide information and resources but just as important is that they show the government is working to help establish order and provide for its people.

Points are geo coded and mapped across Harris County. Can be displayed and over laid with outage areas to determine best locations to establish service teams.

Need Behavioral Study to ask questions of the public.

THANK YOU FOR YOUR ASSISTANCE IN THE POST STORM SURVEY

APPENDIX G: STATE INTERVIEW QUESTIONNAIRE SUMMARY RESPONSES

**HURRICANE IKE POST STORM ASSESSMENT
STATE EMERGENCY MANAGEMENT COMPONENT**

This assessment is designed to evaluate the effectiveness of the National Hurricane Program Hurricane Evacuation Study (HES) products within your jurisdiction as it applied to your experience during the recent hurricane threat. It is also intended to identify any specific needs or recommendations that you may wish to share relating to FEMA's overall Hurricane Program. It is not designed to evaluate you nor your response to the event. Rather it is designed to help FEMA better serve you in the future. Please complete this assessment prior to your scheduled interview.

GENERAL

Of the following products, which were readily available for your use?

- | | | |
|--|---|--|
| <input type="checkbox"/> ETIS | <input checked="" type="checkbox"/> Evacuation Maps | <input checked="" type="checkbox"/> Clearance Times |
| <input type="checkbox"/> Shelter Locations | <input type="checkbox"/> Local Hurricane Plan | <input checked="" type="checkbox"/> HURREVAC |
| <input checked="" type="checkbox"/> SLOSH | <input type="checkbox"/> HES Study | <input checked="" type="checkbox"/> Storm Surge Maps |
| <input type="checkbox"/> | Other | Documents: |

Of the information provided to you, which items were considered most important? Please explain.

- | | | |
|--|---|--|
| <input type="checkbox"/> ETIS | <input checked="" type="checkbox"/> Evacuation Maps | <input checked="" type="checkbox"/> Clearance Times |
| <input type="checkbox"/> Shelter Locations | <input type="checkbox"/> Local Hurricane Plan | <input checked="" type="checkbox"/> HURREVAC |
| <input type="checkbox"/> SLOSH | <input type="checkbox"/> HES Study | <input checked="" type="checkbox"/> Storm Surge Maps |
| <input type="checkbox"/> | Other | Documents: |

Which items were found to be the least helpful? Please explain.

- | | | |
|--|---|---|
| <input type="checkbox"/> ETIS | <input type="checkbox"/> Evacuation Maps | <input type="checkbox"/> Clearance Times |
| <input type="checkbox"/> Shelter Locations | <input type="checkbox"/> Local Hurricane Plan | <input type="checkbox"/> HURREVAC |
| <input type="checkbox"/> SLOSH | <input type="checkbox"/> HES Study | <input type="checkbox"/> Storm Surge Maps |
| <input type="checkbox"/> | Other | Documents: |

NA

4. How would you rate the communication and support provided by you to the local emergency management offices?

Unsatisfactory -----Excellent
 2 3 (4) 5

5. What can be done to improve the communication flow with the local emergency management offices during storm events?

Continue State conference calls with locals and try to keep them concise.

Did the State recommend any mitigation efforts before or during these events? Please explain.

The State pushes mitigation plans. There is a five year review. Must have approved plans because disaster funds are tied to mitigation plans.

Of these mitigation efforts, were they successful? Please Explain.

Yes

Shutters for hospitals

Discuss how HURREVAC is generally used during an event.

For tracking the storm

Discuss how SLOSH or the SLOSH Display Model is generally used during a hurricane event.

National Weather Service

Did the State provide any evacuation transportation support to the counties for the purpose of evacuating “critical transportation needs” populations or “special needs” populations? Please explain.

Transportation is a national problem because it pits one state against another for resources. Air Evac a problem. Should be coordinated at the national level.

Are there State owned critical facilities (outside the surge area) that could be retrofitted for hurricane protection so that their residents could potentially “shelter in place” and not have to be evacuated? Please provide a list with locations (as separate attachment if needed). Are any of these “critical transportation needs” origin facilities whose residents require government assistance to evacuate?

The State wants the locals to be responsible for retro fitting their own facilities. The Valley, Brownsville area is a major problem. The State is looking at a plan for the Valley because they need Federal and State dollars to build facilities. Three State facilities routinely get evacuated.

HURRICANE LIAISON TEAM (HLT) and EVACUATION LIAISON TEAM (ELT)

1. How would you rate the support received from the Hurricane Liaison Team?
Unsatisfactory -----Excellent
1 2 (3) 4 5

2. How could FEMA's Hurricane Liaison Team improve services to the State?

Keep the HLT calls short. Contact the State directly off line.

Did the ELT activate for IKE YES___ NO___ Did your agency establish an HLT / ELT point of contact for this event?

Yes No Not
Applicable

Did you participate in the HLT and ELT teleconferences during IKE? Were these conferences helpful? Please explain.

HLT Yes

ELT

Please list which State agencies were involved in the conference calls.

All of them.

6. If you utilized FEMA's Evacuation Liaison Team, how would you rate the service received?

Unsatisfactory -----Excellent
1 2 (3) 4 5

7. How could FEMA's Evacuation Liaison Team improve services to the State?

EMERGENCY OPERATIONS CENTER

At what time was the State Emergency Operations Center Activated?

Not Activated

Partial Activation

Full Activation

Date _____

Date _Continued from

Gustav _____

Time ____/____

Time _____

Did your organization have a presence in, or have access to, LOCAL Emergency Operations Centers during this event? If so, how was this accomplished?

Texas is divided into Disaster Districts. The Regional is the first line of State support. RLOs (Regional Liaison Officers) are stationed at the Disaster District office and are in communication with the Local EOCs prior to the storm. After the storm the RLOs are deployed to the local EOCs.

If so, was this helpful in the information collection process? Please Explain.

The Highway Patrol is in charge of the Texas Disaster Districts

If so, did you feel your organization was made part of the local EOC team? Please Explain.

Yes

TECHNOLOGICAL

Please identify which tools assisted you in making decisions for this event.

HURREVAC Website HAZUS
 ETIS SLOSH Tides
 Other ___ University of Texas, DeWerts

Of the tools utilized, how would you rate their performance?

		Unsatisfactory -----				
--Excellent						
HURREVAC	1	2	3	(4)	5	
SLOSH	1	2		(3)-----	(4)	
	5					
TIDES	1	2	(3)	4	5	
ETIS	1	2	3	4	5	
HAZUS	1	2	3	(4)	5	
Other	1	2	3	4	5	

Of the tools utilized, how would you rate their ease of use?

Unsatisfactory -----

--Excellent

HURREVAC	1	2	3x	4x	5
SLOSH	1	2	3x	4	5
TIDES	1	2	3x	4x	5
ETIS	1	2	3	4	5
HAZUS	1x	2	3	4	5
Other	1	2	3	4	5

Of the tools utilized, how could they be enhanced or improved?

HURREVAC	_____
SLOSH	_____
TIDES	_____
ETIS	_____
HAZUS	_____
Other	_____

Of the tools utilized, has staff been adequately trained to operate the tools?

HURREVAC	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Partially	<input type="checkbox"/> Applicable	Not	<input checked="" type="checkbox"/> Training	Need	More
SLOSH	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Partially	<input type="checkbox"/> Applicable	Not	<input checked="" type="checkbox"/> Training	Need	More
TIDES	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Partially	<input type="checkbox"/> Applicable	Not	<input checked="" type="checkbox"/> Training	Need	More
ETIS	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Partially	<input type="checkbox"/> Applicable	Not	<input type="checkbox"/> Training	Need	More
HAZUS	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Partially	<input type="checkbox"/> Applicable	Not	<input checked="" type="checkbox"/> Training	Need	More
Other	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Partially	<input type="checkbox"/> Applicable	Not	<input type="checkbox"/> Training	Need	More

Want HURREVAC training at Texas Hurricane Center

If HURREVAC was utilized, how would you rate these program components?

Unsatisfactory -----

--Excellent

Decision Arcs	1	2	3	4x	5x
Surge Maps	1	2	3x	4x	5
Clearance Times	1	2x	3	4	5
ETIS	1	2	3	4	5
Shelter Information	1	2	3	4	5
Wind Swath	1	2	3	4x	5
Error Cone	1	2	3	4x	5
SLOSH	1	2	3x	4	5
5-day Forecast	1	2	3	4x	5

EVACUATION AND DECISION MAKING

Did any of the jurisdictions in the State issue evacuation orders? Attach separate sheet if necessary.

Jurisdiction Name	Voluntary		Recommended		Mandatory	
	Date	Time	Date	Time	Date	Time

Please describe how the State assisted jurisdictions in the evacuation and decision making process.

Provide data and make recommendations

Does the State have predicted clearance times available from a previous Hurricane Evacuation Study (HES)? If so, what were they?

Still use old HES times

Valley did a study to estimate evacuating population last year.

If clearance times and/or evacuation timelines were not available from a previous HES, how were they determined?

Previous evacuations

Please describe how the State can assist in improving the decision making process.

Local Decision – Make sure locals have proper information

Encourage locals to make decisions

Provide impact and surge data
More graphics are needed

EVACUATION ROADWAY NETWORK

How would you rate the capacity of the evacuation routes in relation to vehicular demand?

-----Unsatisfactory -----
-----Excellent
1 2 3x 4x 5

Please define which measures the State initiated or participated in to facilitate the evacuation.

Had contra-flow in place but did not use it for IKE

Does the State have plans to implement lane reversal on any major evacuation corridor?
If yes, where and when did this occur? Should it have occurred earlier? How much earlier?

On every major highway leading from the coast according to the Texas Department of Transportation Plan
I-10 West

Were there any operational problems or issues with the reversible roadways? Describe them. Describe the plan for reversing each roadway. If no roadways were reversed, should roadway reversibility be considered? When?

Not implemented during IKE

Does the State have any other traffic management plans that would facilitate the evacuation process?

If yes, please define.

Air Transport of evacuees with heavy Federal assistance.
Houston – Rail support

What traffic problems were experienced during the evacuation for this event?

No major problems, some congestion.

Do you have an estimate of the number of people and vehicles evacuating for this event.

	Estimated People	Estimated Vehicles
Evacuating WITHIN the State	_____	_____
Evacuating THROUGH or TO the State	_____	_____

See Transtar Documents

Please describe how the State can assist in improving the evacuation process and traffic management.

COMMUNICATIONS AND PUBLIC INFORMATION

From which agencies and or products did you receive event information?

<input checked="" type="checkbox"/> FEMA Regional Office	<input checked="" type="checkbox"/> Other State Agencies	<input checked="" type="checkbox"/> Local EMAs
<input checked="" type="checkbox"/> HURREVAC	<input checked="" type="checkbox"/> HLT / ELT	<input checked="" type="checkbox"/> Local Weather Office
<input checked="" type="checkbox"/> The Weather Channel	<input type="checkbox"/> Commercial Media	<input checked="" type="checkbox"/> Internet
<input checked="" type="checkbox"/> Other: _____NWS_____		

How did you receive local event information?

<input checked="" type="checkbox"/> Telephone	<input checked="" type="checkbox"/> Fax	<input checked="" type="checkbox"/> Email
<input checked="" type="checkbox"/> Website	<input checked="" type="checkbox"/> Interview	<input checked="" type="checkbox"/> Press Conference
<input checked="" type="checkbox"/> Video / Tape	<input checked="" type="checkbox"/> Pamphlets / Brochures	<input checked="" type="checkbox"/> Mass email groups
<input checked="" type="checkbox"/> Other	Documents: _____Disaster	Dish - RLOs

How did you distribute information to the media?

<input checked="" type="checkbox"/> Telephone	<input checked="" type="checkbox"/> Fax	<input checked="" type="checkbox"/> Email
<input checked="" type="checkbox"/> Website	<input checked="" type="checkbox"/> Interview	<input checked="" type="checkbox"/> Press Conference
<input checked="" type="checkbox"/> Video / Tape	<input checked="" type="checkbox"/> Pamphlets / Brochures	<input checked="" type="checkbox"/> Mass email groups
<input checked="" type="checkbox"/>	Other	Documents:

How timely was the information?

Please list which website(s) you use to access storm and event information.

Between Jurisdictions	1 5	2	3x	4x
With the NWS	1 5	2	3	4x
With the Media	1 5	2	3	4x
With FEMA	1 5	2	3	4x
With Evacuees	1 5	2	3	4x

11. How can information dissemination be improved?

Good as is!

FEMA needs to coordinate with SJOC prior to meeting with locals.

State/FCO bypassed by National IMAT Teams.

SHELTERING

Please estimate the total number of shelters opened State wide and the estimated number of people who sought shelter during IKE. .

SHELTER	Number Opened	Estimate of Sheltered	of	People
Red Cross	_____	_____		
Special Needs	_____	_____		
Faith Based	_____	_____		
Other	_____	_____		

Was the availability of the shelters sufficient for the needs of the evacuating public? If not, please explain.

Never enough shelter spaces

Need many more special needs/medical shelters

State tries to keep evacuees in State but some shelters are maxed out.

Were the shelters opened in an adequate time frame as it related to the evacuating public?

Yes, I-45 Huntsville

Point to Point Shelter System set up by the State for evacuees being transported. Special Needs and anybody that needs a ride.

Were any shelters affected by storm damage?

Please describe how the state wide sheltering process can be improved.

Need Shelter Teams from EVAC to support sheltering.

Shelter Management text needed.

HURRICANE EVACUATION STUDY (HES) COMPONENT EVALUATION

Did the State utilize any element of the Hurricane Evacuation Study in your decision making process? Please Explain.

Clearance Times

Surge Maps

What problems, if any, did you experience with the Hurricane Evacuation Study technical data?

Inland wind zones a big issue in Texas

Please provide recommendations for improvements to the elements of the Hurricane Evacuation Study.

Transportation Analysis

Behavioral Analysis

Vulnerability Analysis

Hazards Analysis

Shelter Analysis

Decision Making

COMPREHENSIVE HURRICANE EMERGENCY MANAGEMENT STRATEGY (CHEMS)

FEMA is broadening the role of the Hurricane Evacuation Study into a more comprehensive approach called the Comprehensive Hurricane Emergency Management Strategy or CHEMS for short. The HES will now become a component of the more comprehensive program.

Please indicate following components of a comprehensive Hurricane Preparedness Study would benefit the State and indicate how the component can be developed.

- Re-entry Analysis

- Business Mitigation and Recovery Analysis

- Community Storm Impact Analysis

- Recovery Analysis

- Communications Assessment

- Technology Analysis

- Disaster Mitigation Analysis

ANALYSIS OF OTHER FEMA PROGRAMS AND EVACUATION ASSISTANCE

Did the results of the FEMA “Gap Analysis” plan a role in your planning and evacuation efforts? How and to what extent.

Did the Federal assisted evacuation efforts (ie. Aircraft, bus, train, other) help or hinder your efforts to safely evacuate the State’s threatened populations from your communities? Do you

feel that your populations will expect similar support from the Federal; Government in the future? Please explain.

OTHER COMMENTS

Please provide other needs that would assist FEMA, local emergency management offices, and State Emergency Management Offices in preparing for, responding to, and recovering from an event.

Please provide additional comments/recommendations you have to improve FEMA's National Hurricane Program.

THANK YOU FOR YOUR TIME AND ASSISTANCE IN COMPLETING THIS QUESTIONNAIRE

APPENDIX H: DATA COLLECTION CORRESPONDENCE DVD

APPENDIX I: COLLECTED DATA
POTENTIAL RETROFIT FACILITIES



POTENTIAL RETROFIT FACILITIES

County	Name	Address	Lat/Lon	Type	Owner	Capacity
Galveston, TX	Edgewater Retirement Community	2228 Seawall Blvd. Galveston, TX 77550	29° 17' 27.6504"N -94° 47' 17.858"W	Retirement High Rise Facility	Private	200 - 300
	Gulf Coast Water Authority	3630 Hwy.1765 Texas City, TX 77591	29° 22' 53.7193" N -94° 56' 34.5397" W	Fresh Water Supply Station	Government Authority	N/A
Fort Bend County, TX	Richmond State Supported Living Center	2100 Preston Richmond, TX 77469	29.35°22.349N 95.46°58.947W	Special Needs Facility	Government	600
Chambers County, TX	Arboretum	1215 Highway 124 Winnie, TX 77665	29° 51' 29.9862"N -94° 18' 32.9918"W	Nursing Home	Private	120 beds
Liberty County, TX	Galaxy Manor Nursing Home	903 E. Houston St. Cleveland, TX 77327	30° 20' 27.8938"N -95° 4' 45.7014"W	Nursing Home	Private	N/A
Jefferson County, TX	Ford Park Event Center	5115 IH-10 South Beaumont Texas 77705	30° 5' 9.7652"N -94° 6' 6.646"W	Event Center	Government	9500
Orange County, TX	Orange County Special Needs Facility (Under Construction)	Hwy. 1442, ½ mile south of Interstate 10	30° 7' 12.00"N -93° 52' 48.00"W	Special Needs	County Government	N/A
Hardin County, TX	Old Hospital	Highway 418 Silsbee, TX	30° 23' 7.1873"N -94° 13' 0.1855"W	Hospital	Government	80 - 90
	Court House Annex	400 Monroe Kountze, TX 77625	30° 22' 5.3807"N -94° 19' 4.5714"W	Wing of Annex	Government	60

Tyler County, TX	Tyler Nutrition Center	201 Veterans Way Woodville, TX 75979	30° 46' 30.724"N -94° 24' 55.7129"W	Warehouse	County Government	200/300
	Warren ISD	307 FM 3290 S Warren, TX 77664	30° 36' 44.3743"N -94° 23' 35.6597"W	Gymnasium	County Government	200/300
Polk County, TX	Livingston Convalescent Center	1810 North Washington Avenue Livingston, TX 77351	30° 43' 25.9597"N -94° 55' 57.8338"W	Old Nursing Home	Private (For Sale) Not in use	75/100 Special Needs
	Dunbar School	1103 Dunbar Avenue Livingston, TX 77351	30° 43' 0.75"N -94° 56' 45.1086"W	Old Gymnasium	County Government	00
San Jacinto County, TX	Seniors Center I	60 Butler Street Coldspring, TX 77331	30° 35' 31.3984"N -95° 7' 40.7629"W	Community Center	Private	50/100
	Senior Center/EOC	51 East Pine Avenue Coldspring, TX 77331	30° 35' 33.1915"N -95° 7' 28.4592"W	EOC/Elections Office	County Government	25/50
Brazoria County, TX	Columbia High School	516 South 16 th Street West Columbia, TX 77486	29° 8' 15.7595"N -95° 25' 7.4063"W	School	County Government	950
	Angleton High School	1201 East Henderson Road Angleton, TX 77515	29° 11' 38.4107"N -95° 25' 7.4063"W	School	County Government	1700
Newton County, TX	Gulf Coast Health Center	1010 Hwy 87 South Newton, TX 75966	30° 49' 52.2794"N -93° 44' 4.3313"W	Health Center	Proprietary	75
Jasper County, TX	Dickerson Memorial Hospital	1001 Dickerson Dr. Jasper, TX 75951	30° 55' 12.7182"N -93° 59' 32.4049"W	Hospital	Proprietary	24 Beds

APPENDIX J: PROJECT DVD (PDF OF REPORT, MAPS, AND COLLECTED DATA)