

**HAZARD MITIGATION TECHNICAL ASSISTANCE PROGRAM
CONTRACT NO. EMW-2000-CO-0247
TASK ORDERS 445 & 450
HURRICANE RITA RAPID RESPONSE
LOUISIANA COASTAL & RIVERINE HIGH WATER MARK COLLECTION
FEMA-1607-DR-LA**

**FINAL REPORT
JANUARY 27, 2006**

SUBMITTED TO:



FEMA

**FEDERAL EMERGENCY MANAGEMENT AGENCY
REGION IV
ATLANTA, GA**

PREPARED BY:

URS

**URS GROUP, INC.
200 ORCHARD RIDGE DRIVE
SUITE 101
GAITHERSBURG, MD 20878**

FOR PUBLIC RELEASE

TABLE OF CONTENTS

AUTHORITY AND PURPOSE	1
BACKGROUND	2
AREA OF STUDY	7
HIGH WATER MARK TYPES	13
MARKING AND SURVEY METHODOLOGY	19
ELEVATION CONVERSION FROM NAVD 88 TO NGVD 29 USING CORPSCON	21
OTHER DATA AND STUDIES	22
FINDINGS AND OBSERVATIONS	30

APPENDICES

APPENDIX A. FIELD DATA COLLECTION FORMS
APPENDIX B. MAPS
APPENDIX C. SURVEY SHEETS FROM ACADIA PARISH
APPENDIX D. SURVEY SHEETS FROM ALLEN PARISH
APPENDIX E. SURVEY SHEETS FROM ASSUMPTION PARISH
APPENDIX F. SURVEY SHEETS FROM AVOYELLES PARISH
APPENDIX G. SURVEY SHEETS FROM BEAUREGARD PARISH
APPENDIX H. SURVEY SHEETS FROM CALCASIEU PARISH
APPENDIX I. SURVEY SHEETS FROM CAMERON PARISH
APPENDIX J. SURVEY SHEETS FROM EVANGELINE PARISH
APPENDIX K. SURVEY SHEETS FROM IBERIA PARISH
APPENDIX L. SURVEY SHEETS FROM JEFFERSON PARISH
APPENDIX M. SURVEY SHEETS FROM JEFFERSON DAVIS PARISH
APPENDIX N. SURVEY SHEETS FROM LAFAYETTE PARISH
APPENDIX O. SURVEY SHEETS FROM LAFOURCHE PARISH
APPENDIX P. SURVEY SHEETS FROM LIVINGSTON PARISH

- APPENDIX Q. SURVEY SHEETS FROM ORLEANS PARISH
- APPENDIX R. SURVEY SHEETS FROM PLAQUEMINES PARISH
- APPENDIX S. SURVEY SHEETS FROM POINTE COUPEE PARISH
- APPENDIX T. SURVEY SHEETS FROM RAPIDES PARISH
- APPENDIX U. SURVEY SHEETS FROM ST. BERNARD PARISH
- APPENDIX V. SURVEY SHEETS FROM ST. CHARLES PARISH
- APPENDIX W. SURVEY SHEETS FROM ST. JOHN THE BAPTIST PARISH
- APPENDIX X. SURVEY SHEETS FROM ST. LANDRY PARISH
- APPENDIX Y. SURVEY SHEETS FROM ST. MARTIN PARISH
- APPENDIX Z. SURVEY SHEETS FROM ST. MARY PARISH
- APPENDIX AA. SURVEY SHEETS FROM ST. TAMMANY PARISH
- APPENDIX AB. SURVEY SHEETS FROM TANGIPAHOA PARISH
- APPENDIX AC. SURVEY SHEETS FROM TERREBONNE PARISH
- APPENDIX AD. SURVEY SHEETS FROM VERMILLION PARISH
- APPENDIX AE. SURVEY SHEETS FROM VERNON PARISH

LIST OF FIGURES

FIGURE 1. HURRICANE RITA STORM-TRACK.....	2
FIGURE 2. HURRICANE RITA APPROACHES	3
FIGURE 3. DISASTER DECLARATION MAP	5
FIGURE 4. LOUISIANA HURRICANE RITA HWM LOCATIONS	9
FIGURE 5. A SIMPLE SURGE-ONLY CHWM.....	14
FIGURE 6. A COASTAL STORM SURGE WITH A LEVEL WATER SURFACE	14
FIGURE 7. TWO CASES OF STORM SURGES WITH SLOPED WATER SURFACES	15
FIGURE 8. THE FORMATION OF SURGE AND WAVE HEIGHT CHWM TYPES.....	15
FIGURE 9. THE FORMATION OF A WAVE RUNUP CHWM	16
FIGURE 10. VARIATIONS IN COASTAL FLOODING LEVELS DUE TO WASHOVER OF COASTAL DUNES.....	16

FIGURE 11. INTERACTION OF PROFILE EROSION AND COASTAL FLOODING	17
FIGURE 12. NOAA HURRICANE KATRINA WATER LEVEL STATION LOCATIONS.....	22
FIGURE 13. LOCATION OF USACE AND NOAA STATIONS IN AREAS IMPACTED BY HURRICANES KATRINA AND RITA.....	24
FIGURE 14. NOAA RITA COASTAL SLOSH DATA – VERMILLION, IBERIA, AND TERREBONNE PARISHES	26
FIGURE 15. NOAA RITA COASTAL SLOSH DATA – SE LOUISIANA.....	26
FIGURE 16. NOAA RITA COASTAL SLOSH DATA – GALVESTON BAY AREA.....	27
FIGURE 17. NOAA RITA COASTAL SLOSH DATA – SOUTHERN LOUISIANA	27
Figure A-1. Flagger HWM Data Collection Form	
Figure A-2. Surveyor HWM Data Collection Form	
Figure Appendix B. Overview & Inset Index Map	
Figure B-1. Inset Map 1 Hurricane Rita, Louisiana	
Figure B-2. Inset Map 2 Hurricane Rita, Louisiana	
Figure B-3. Inset Map 3 Hurricane Rita, Louisiana	
Figure B-4. Inset Map 4 Hurricane Rita, Louisiana	
Figure B-5. Inset Map 5 Hurricane Rita, Louisiana	
Figure B-6. Inset Map 6 Hurricane Rita, Louisiana	
Figure B-7. Inset Map 7 Hurricane Rita, Louisiana	
Figure B-8. Inset Map 8 Hurricane Rita, Louisiana	
Figure B-9. Inset Map 9 Hurricane Rita, Louisiana	
Figure B-10. Inset Map 10 Hurricane Rita, Louisiana	

LIST OF TABLES

TABLE 1. FEDERAL ASSISTANCE TO NOVEMBER 28, 2005 – HURRICANE RITA.....	6
TABLE 2. HWMS SURVEYED BY PARISH	7
TABLE 3. FEMA REPETITIVE LOSS PROPERTIES VISITED, BUT NO AVAILABLE HIGH WATER MARK.....	11
TABLE 4A. FEMA MITIGATION PROPERTIES WITH HIGH WATER MARKS.....	12

TABLE 4B. FEMA MITIGATION PROPERTIES VISITED, BUT NO AVAILABLE HIGH WATER MARKS.....	12
TABLE 5. NOAA CO-OPS MAXIMUM WATER LEVELS FOR HURRICANE RITA, SEPTEMBER 2005. ALL PRELIMINARY DATA IS SUBJECT TO NOS VERIFICATION.....	23
TABLE 6. HURRICANE RITA MAXIMUM HEIGHT AT SELECTED USACE STATIONS.....	24
TABLE 7. USGS LOUISIANA FLOOD STAGE GAGES FROM SEPTEMBER 21 – SEPTEMBER 30, 2005.....	29
TABLE 8. HURRICANE RITA LOUISIANA HWM DATA SUMMARY	32
TABLE B-1 APPENDIX B FIGURES	B-1
TABLE B-2 HURRICANE RITA LOUISIANA HWM DATA SUMMARY (SAME AS TABLE 8, SORTED BY HWM-ID).....	B-2

AUTHORITY AND PURPOSE

This study documents a high water mark (HWM) survey conducted along the Louisiana coast and streams following Hurricane Rita that began affecting states on September 23, 2005. The study was performed to assist Federal Emergency Management Agency (FEMA) Mitigation Program efforts to assess storm conditions and aid people victimized by the storm. Time-sensitive surveys were performed to investigate evidence of high water conditions and to collect coastal high water marks (CHWMs) and riverine high water marks (RHWMs).

President George W. Bush issued a major disaster declaration on September 24, 2005, under the authority of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), for damage in certain areas in Louisiana resulting from Hurricane Rita (FEMA-1607-DR-Louisiana). The disaster declaration ordered the Federal Government to provide all necessary resources and assets for Louisiana to aid people devastated by Hurricane Rita, which made landfall early on September 24, 2005, just 4 weeks after Hurricane Katrina. URS Group, Inc. (URS) was contracted by FEMA under Task Orders 445 and 450 of the Hazard Mitigation Technical Assistance Program (HMTAP) contract to assist in the disaster recovery by conducting HWM studies for Louisiana after Hurricane Rita. The URS team for these Task Orders includes URS and its subconsultants, ESP Associates, Michael Baker Jr., Inc., Dewberry, and BFM Consultants, Inc.

The purpose of this project is to conduct field surveys to find evidence of high water levels in coastal and riverine areas and areas impacted by levee breaches or overtopping; to document, photograph, and survey HWMs; and to provide a report explaining the work and results. This report includes a summary of Hurricane Rita storm conditions, descriptions of the disaster declaration and federal assistance, and descriptions of the HWM study methodologies and results. The information contained in this report is an important step in assisting communities in establishing high water marks to be used in flood hazard mitigation and for further studies for wind and water damage line assessment, flood inundation mapping, and flood frequency analyses. This report supersedes all submissions of preliminary HWM data prepared under this contract for the Louisiana coast.

BACKGROUND

Hurricane Rita was the seventeenth named tropical storm, ninth hurricane, fifth major hurricane, and second Category 5 hurricane of the 2005 Atlantic hurricane season. Hurricane Rita was one of the strongest storms to impact the coast of the United States during the last 100 years. While in open water, it was rated as being the third most intense storm on record in the Atlantic Basin and the strongest to enter the Gulf of Mexico. The National Oceanic and Atmospheric Administration (NOAA) reported Rita's record-setting Category 5 strength as a result of achieving a minimum central pressure of 897 millibars (mb) (26.49 inches of mercury) on the afternoon of September 21, 2005. This record strength steadily diminished prior to landfall after Rita moved over cooler waters in the northern Gulf of Mexico (source: http://en.wikipedia.org/wiki/Hurricane_rita).

Hurricane Rita made landfall at 2:38 a.m. local time on September 24, 2005, between Sabine Pass, Texas and Johnson's Bayou, Louisiana. At landfall, the storm was Category 3 with sustained winds of 120 mph and barometric pressure of 937 mb. The Hurricane Rita storm track is shown in Figure 1. (<http://cimss.ssec.wisc.edu/tropic/archive/2005/storms/rita/RITA.track.gif>)

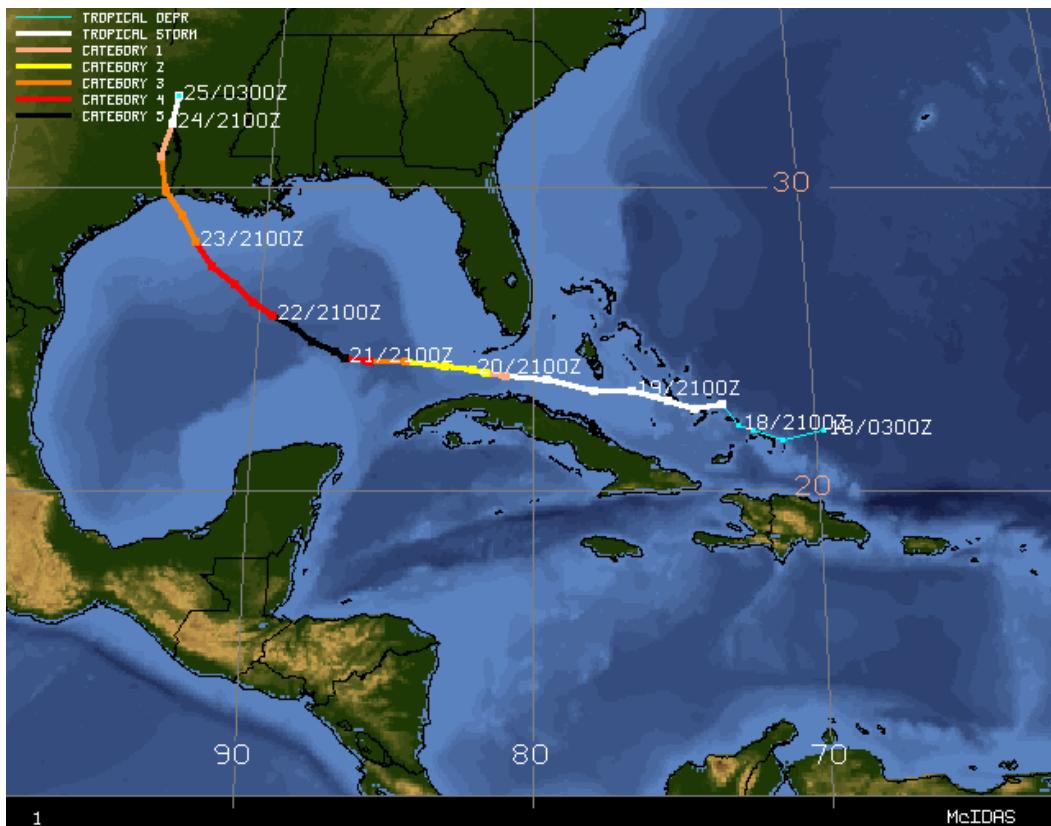


Figure 1. Hurricane Rita Storm-Track

Figure 2 shows a composite image of Hurricane Rita. Figure 2 is an Advanced Very High Resolution Radiometer/Multi-channel Visible and Infrared Radiometer composite image provided by the Cooperative Institute for Meteorological Satellite Studies (CIMSS) obtained from NOAA and the Joint Typhoon Warning Center. (<http://cimss.ssec.wisc.edu/tropic/archive/2005/storms/rita/avhrr/N18L.html>).

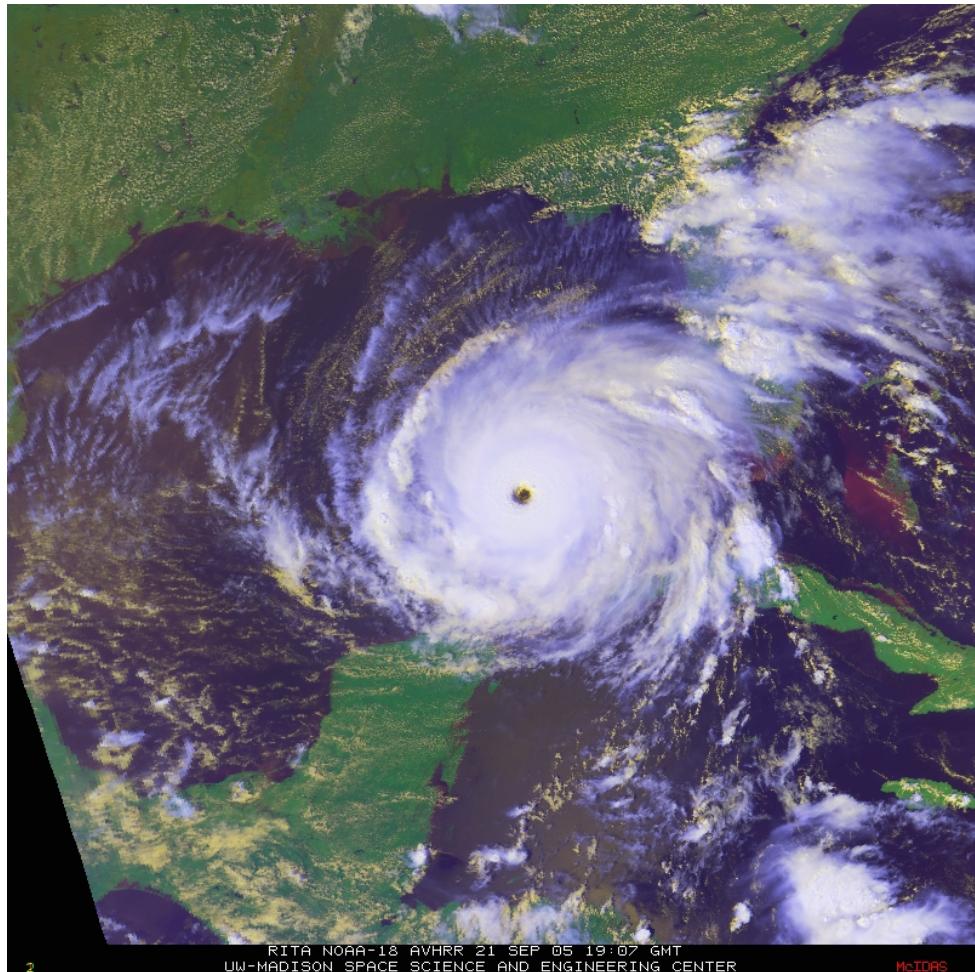


Figure 2. Hurricane Rita Approaches

Hurricane Rita caused widespread devastation due to loss of life and property along the central Gulf Coast states with significant damage to the coastal region of Louisiana. The levee system of New Orleans had already sustained heavy damage from Hurricane Katrina before the outer bands of rain from Hurricane Rita fell on the city. On Friday, September 23, the day before Hurricane Rita hit, water poured through breaches in the patched Industrial Canal levee from Lake Pontchartrain into the already hard-hit Ninth Ward, as reported by the U. S. Army Corps of Engineers. Widespread flooding was reported in coastal parishes. In Terrebonne Parish, west of Lafourche Parish, virtually every levee was breached by the surge (http://en.wikipedia.org/wiki/Hurricane_rita).

Damage in southwestern Louisiana was extensive. In Cameron Parish, the communities of Cameron, Creole, Grand Chenier, Hackberry, and Holly Beach were heavily damaged or entirely destroyed. A casino boat and several barges broke loose from their moorings in Lake Charles and damaged a bridge spanning Interstate 10 across the Calcasieu River. Lake Charles experienced severe flooding. There was also extensive damage to the regional airport. Damage to the municipal electrical system was so severe that authorities warned that power would not be returned for two weeks or longer (http://en.wikipedia.org/wiki/Hurricane_rita).

Federal Assistance

Notice was given in a letter to Louisiana, dated September 24, 2005, that the President declared a major disaster under authority of the Stafford Act for damage in certain areas in Louisiana resulting from Hurricane Rita (FEMA-1607-DR-Louisiana; <http://www.fema.gov/news/dfrn.fema?id=4746>). The declaration provides the necessary Federal assistance to meet immediate needs and to help recover as quickly as possible. The Louisiana parishes that were designated for Disaster Declaration FEMA-1607-DR-LA, as of October 18, 2005, are shown in Figure 3.

FEMA-1607-DR, Louisiana Disaster Declaration as of 10/18/2005

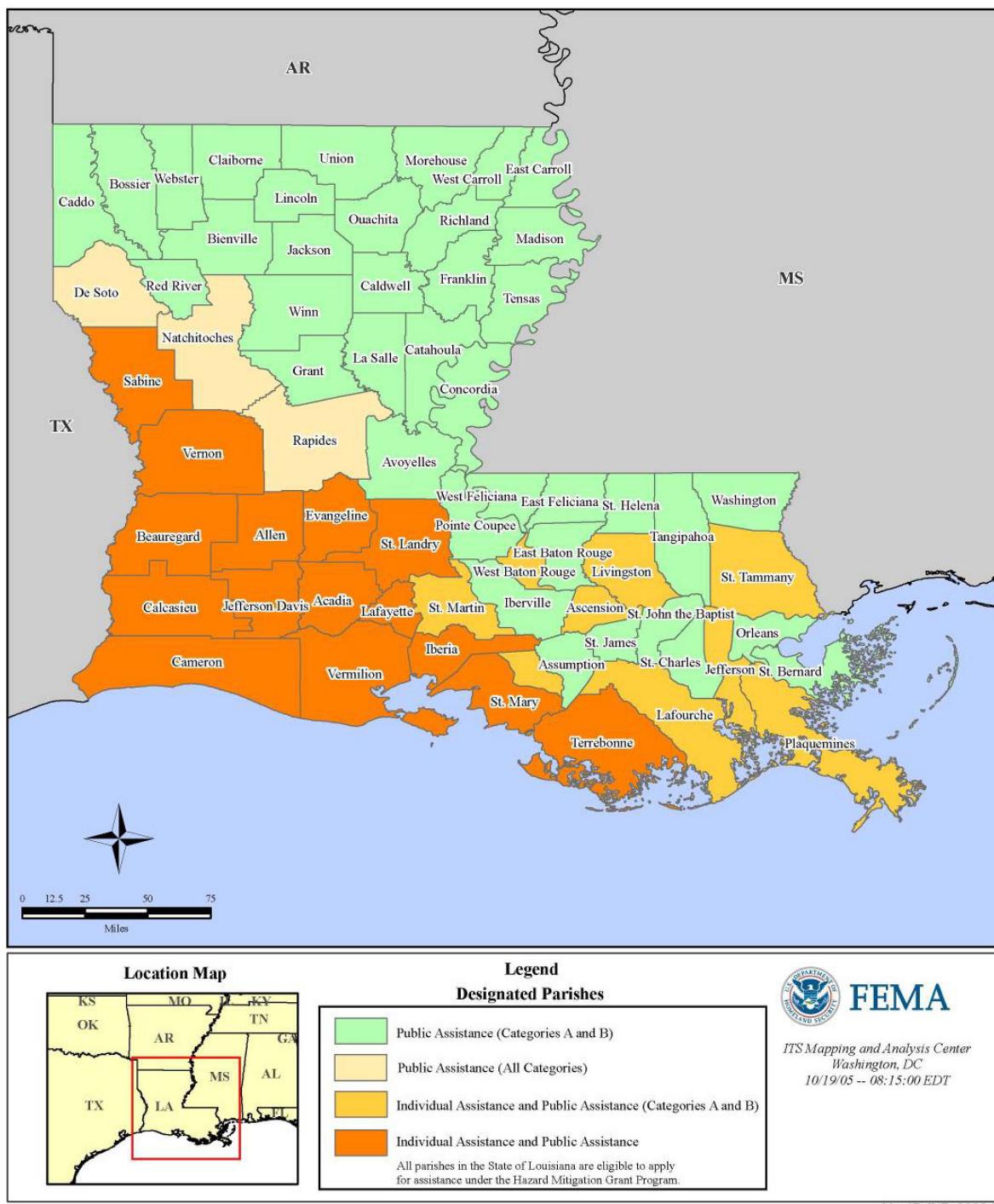


Figure 3. Disaster Declaration Map

Federal assistance, including Individual Assistance, Public Assistance, and the Hazard Mitigation Grant Program was made available to parishes as they are listed in the original declaration and as amendments are made. The declared parishes and levels of assistance as of the last update shown on the FEMA Web site on November 28, 2005 (<http://www.fema.gov/news/eventcounties.fema?id=5025>) are described in Table 1.

Table 1. Federal Assistance to November 28, 2005 – Hurricane Rita

Federal Assistance	Assistance Provided
Individual Assistance Assistance to individuals and households:	Acadia, Allen, Ascension, Cameron, Calcasieu, Beauregard, Evangeline, Iberia, Jefferson, Jefferson Davis, Lafayette, Lafourche, Livingston, Plaquemines, Sabine, St. Landry, St. Martin, St. Mary, Terrebonne, Vermilion, Vernon, and West Baton Rouge Parishes
Public Assistance Assistance to State and local governments and certain private nonprofit organizations for the repair or replacement of disaster-damaged facilities:	All Parishes for debris removal and emergency protective measures, including direct Federal assistance (categories A and B). Acadia, Allen, Beauregard, Calcasieu, Cameron, De Soto, Evangeline, Iberia, Jefferson Davis, Lafayette, Natchitoches, Rapides, Sabine, St. Landry, St. Mary, Terrebonne, Vermilion, and Vernon Parishes for Public Assistance (Categories C-G).
Hazard Mitigation Grant Program (HMGP) Assistance to State and local governments and certain private nonprofit organizations for actions taken to prevent or reduce long-term risk to life and property from natural hazards:	All parishes in the State of Louisiana are eligible to apply for assistance under the HMGP.
Other:	Additional designations may be made at a later date after further evaluation.

AREA OF STUDY

The area FEMA identified to be covered by the Rita Louisiana HWM Study Team extended throughout southern Louisiana and included 29 parishes. Study area selections were based on preliminary water level reports, directions from FEMA, and input from other federal, state, and local agencies. The spacing of the observation points are irregular due to a number of factors, including the objective to adequately show the surge levels and how they vary across the area. Points are distributed along coastal areas along the Gulf of Mexico and along rivers. The presence of low marshy ground often makes determinations of the limit of the coastal storm surge all along the coast and up river courses difficult to establish. Where possible, points have been established in these areas, but it was not practical in all of the coastal rivers. The HWMs flagged and surveyed by the URS team are listed in Table 2 and shown graphically in Figure 5.

Table 2. HWMs Surveyed by Parish

Parish	Number of HWMs Surveyed
Acadia	9
Allen	4
Assumption	2
Avoyelles	1
Beauregard	8
Calcasieu	61
Cameron	39
Evangeline	1
Iberia	15
Jefferson	13
Jefferson Davis	11
Lafayette	17
Lafourche	7
Livingston	14
Orleans	5
Plaquemines	14
Pointe Coupee	6
Rapides	3
St. Bernard	4
St. Charles	1
St. John the Baptist	1
St. Landry	11
St. Martin	7
St. Mary	16

Parish	Number of HWMs Surveyed
St. Tammany	23
Tangipahoa	9
Terrebonne	17
Vermillion	36
Vernon	9
Total	364

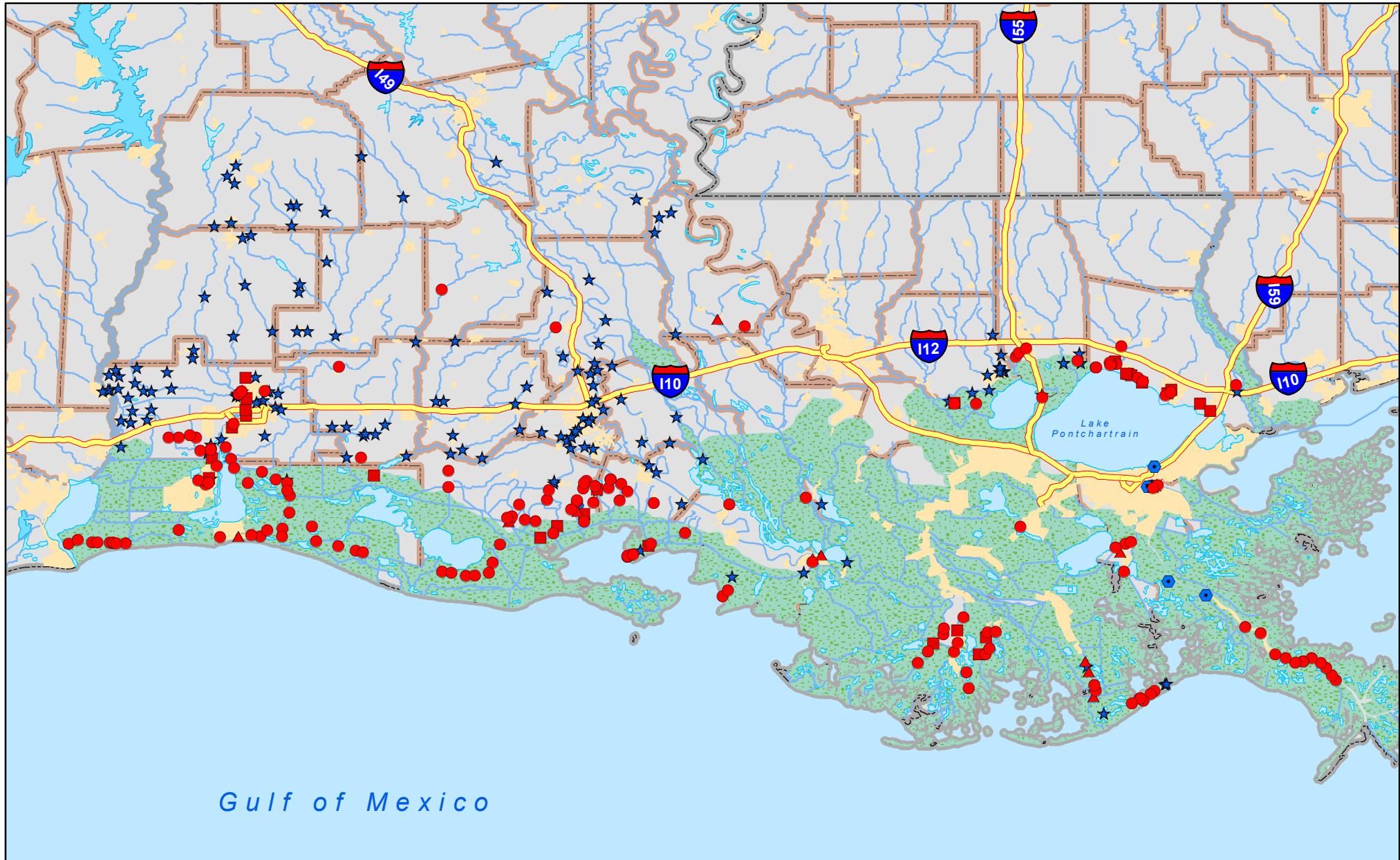
HWMS for FEMA's HMTAP are typically collected in areas with impacted buildings. Figure 4 shows that there are several "holes" in the flagging, where HWMS could not be collected for the following reasons:

St. Bernard Parish - This Parish was completely flooded by Hurricane Katrina. HWM teams were unable to differentiate between Hurricanes Rita and Katrina flooding. Since the area was evacuated for Hurricane Katrina, there are no witness accounts from residents.

Terrebonne Parish - Between Morgan City and Houma, the surge never reached as far north as Louisiana State Highway 182. This entire western section of Terrebonne has no roads south of Louisiana State Highway 182.

Lafourche Parish - The parish is extremely rural with only one road running through to the coastal area. HWMS were identified only up to the flood control gate at Golden Meadow. Due to the flood control, it appears coastal flooding did not affect the communities inside the South Lafourche levee system (Larose, Cutoff, Galiano, and Golden Meadow). Some very low-lying structures in Larose outside the levee system reportedly experienced a surge that affected structures outside the levee.

St. James, St. John the Baptist, and St. Charles Parishes - The surveyors were unable to differentiate Rita HWMS from Katrina HWMS inside the Mississippi River levees. Reportedly, increased water levels in Lake Pontchartrain and Lake Maurepas, north of the east bank of the Mississippi River, inundated low areas in St. Charles, St. John the Baptist, St. James, Ascension, and Livingston Parishes. The surge in Lake Maurepas for Hurricane Rita exceeded levels from Hurricane Katrina. South of the Mississippi River (west bank) the surge in Barataria Bay, Louisiana reportedly caused slight rises in Salvador Lake, Catacuatche Lake and Lac Des Allemands, causing some minor flooding in low-lying areas of St. Charles and St. John the Baptist Parishes.



**Figure 4 : Hurricane Rita, Louisiana
Surveyed Locations of High Water Mark Elevations**

- | | | | |
|-----------------------|-------------------|----------------|---------------------|
| ● Coastal-Surge Only | Inset | Water Body | Road Classification |
| ▲ Coastal-Wave Height | Municipalities | Hydrology | Limited Access |
| ■ Coastal-Wave Runup | County Boundaries | Swamp or Marsh | Highway |
| ◆ Levee Break | | | Major Road |



FEMA

0 3.5 7 14 21 28
Miles
0 4.5 9 18 27 36
Kilometers

St. James and Assumption Parishes - Significant flooding from Hurricane Rita could not be identified. However, there were reports of “catchment flooding” in poorly drained subdivisions outside the east bank, partly due to backwater surges in Lake Maurepas.

Site investigations for high water conditions were also conducted at FEMA Repetitive Loss (Rep Loss) and Mitigation properties. “Repetitive loss structure” is a term that is usually associated with the National Flood Insurance Program (NFIP). For Flood Mitigation Assistance program purposes, this is a structure covered by the NFIP that has suffered flood damage on two or more occasions over a 10-year period, and the cost to repair the flood damage, on average, equals or exceeds 25 percent of the market value of the structure at the time of each flood loss event. For the Community Rating System of the NFIP, a repetitive loss property is any property that the NFIP has paid two or more flood claims of \$1,000 or more in any 10-year period since 1978.

Mitigation properties are those where federal funding has been requested and granted through the HMGP. Authorized under Section 404 of the Stafford Act, the HMGP is administered by FEMA and provides grants to state and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the program 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. FEMA provided a list of mitigation properties for use on this project. It should be noted that the list includes all HMGP properties, but many of the mitigation projects had not been implemented at the time of the hurricane.

A sampling of Rep Loss and Mitigation sites were visited during the HWM flagging operations. Where HWMs were available, they were flagged and surveyed. Rep Loss sites that were visited, but no HWMs observed are shown in Table 3. Mitigated property sites visited where HWMs were recorded and not available are shown in Tables 4a and 4b. .

Table 3. FEMA Repetitive Loss Properties Visited, But No Available High Water Mark

Address¹	Latitude	Longitude	City	Parish	Comments
	29.81892	-91.51458	Franklin	St. Mary	No Visible Flooding
	29.81837	-91.51443	Franklin	St. Mary	No Visible Flooding
	29.81745	-91.51469	Franklin	St. Mary	No Visible Flooding
	29.81779	-91.51493	Franklin	St. Mary	No Visible Flooding
	29.81822	-91.51506	Franklin	St. Mary	No Visible Flooding
	29.80283	-91.50619	Franklin	St. Mary	No Visible Flooding
	29.80405	-91.50809	Franklin	St. Mary	No Visible Flooding
	29.80452	-91.50755	Franklin	St. Mary	No Visible Flooding
	29.80390	-91.50761	Franklin	St. Mary	No Visible Flooding
	29.80367	-91.49927	Franklin	St. Mary	No Visible Flooding
	29.80364	-91.49826	Franklin	St. Mary	No Visible Flooding
	29.79019	-91.50381	Franklin	St. Mary	No Visible Flooding
	29.78594	-91.52444	Franklin	St. Mary	No Visible Flooding
	29.78814	-91.52046	Franklin	St. Mary	No Visible Flooding
	29.78873	-91.51994	Franklin	St. Mary	No Visible Flooding
	29.78781	-91.51895	Franklin	St. Mary	No Visible Flooding
	29.72032	-91.86888	Franklin	St. Mary	Flooded
	29.71966	-91.86818	Cypremont Point	St. Mary	Flooded
	30.29850	-91.99755	Lafayette	Lafayette	No Visible Flooding
	30.29849	-91.99688	Lafayette	Lafayette	No Visible Flooding
	30.29273	-91.99834	Lafayette	Lafayette	No Visible Flooding
	30.29304	-91.99737	Lafayette	Lafayette	No Visible Flooding
	30.26931	-91.99952	Lafayette	Lafayette	No Visible Flooding
	30.26972	-91.99787	Lafayette	Lafayette	No Visible Flooding
	30.23764	-92.04180	Lafayette	Lafayette	No Visible Flooding
	30.19043	-92.02986	Lafayette	Lafayette	No Visible Flooding
	30.18812	-92.02905	Lafayette	Lafayette	No Visible Flooding
	30.15048	-91.9824	Lafayette	Lafayette	No Visible Flooding
	29.97459	-91.8417	New Iberia	Iberia	No Visible Flooding
	29.97495	-91.84117	New Iberia	Iberia	No Visible Flooding
	30.01773	-91.79002	New Iberia	Iberia	No Visible Flooding

¹ Addresses deleted to protect privacy of residents.

Table 4a. FEMA Mitigation Properties with High Water Marks

Address ¹	Proposed Property Action		Latitude	Longitude	City	Parish	HWM
	Elevation	Acquisition					
	Elevation	30.3749	-90.5405	Killian	Livingston	RLAR-14-02	
	Acquisition	30.3897	-90.5536	Springfield	Livingston	RLAR-14-03	

¹ Addresses deleted to protect privacy of residents.

Table 4b. FEMA Mitigation Properties Visited, But No Available High Water Marks

Address ¹	Proposed Property Action		Latitude	Longitude	City	Parish	Flagger Comments
	Elevation	Acquisition					
	Acquisition	30.2215	-90.9094	Gonzales	Ascension	Flooded (denied access)	
	Acquisition	30.2337	-90.9226	Gonzales	Ascension	Building No Longer Exists	
	Elevation	30.2374	-90.9187	Gonzales	Ascension	Flooded (denied access)	
	Acquisition	30.2750	-90.9128	Gonzales	Ascension	Building No Longer Exists	
	Acquisition	30.3040	-90.9255	Prairieville	Ascension	Building No Longer Exists	
	Acquisition	30.3040	-90.9255	Prairieville	Ascension	Building No Longer Exists	
	Elevation	30.3263	-90.9585	Prairieville	Ascension	No Visible Flooding	
	Elevation	30.3437	-90.9667	Prairieville	Ascension	Flooded (denied access)	
	Elevation	30.3460	-90.9645	Prairieville	Ascension	Building No Longer Exists	
	Elevation	30.2694	-90.7327	Maurepas	Livingston	No Visible Flooding	
	Acquisition/Elevation	30.25690	-90.7154	Maurepas	Livingston	Building No Longer Exists	
	Elevation	30.2817	-90.7351	Maurepas	Livingston	Building No Longer Exists	

¹ Addresses deleted to protect privacy of residents.

HIGH WATER MARK TYPES

High water mark types associated with hurricanes vary based on the intensity of the hurricane, the extent which it covers and the land conditions. Typically, high water conditions are identified by CHWMs and by RHWMs. With Hurricane Rita in Louisiana, high water conditions were also identified by HWMs impacted by levee systems. The following descriptions provided an understanding of the conditions that generate these 3 main types of HWMs.

Coastal HWMs

CHWMs are more varied in their origin than those associated with riverine floods. In the Louisiana Rita HWM study, CHWMs are classified as either surge only, wave height, or wave runup, whereas RHWMs are classified as riverine. Conditions associated with CHWMs can be defined with an understanding of the various types of CHWMs. CHWM types are described in this section and presented graphically in Figures 6 through 12 shown below. The series of CHWM schematics were provided to aid in the understanding of how CHWMs are formed. These schematics illustrate ideal situations that lead to the formation of coastal high water conditions, and do not all necessarily occur in any one particular storm event.

The Louisiana Rita CHWM survey was conducted under HMTAP Rapid Response Task Orders that involved the timely collection of perishable high water mark data at field-observed, point locations. Determination of conditions of areas around CHWMs, such as topography, bathymetry, locations of dunes, sloped water surface, overwash or breaching, which might aid in determining the corresponding CHWM scenario or how surges differ, was not included within the scope of work for these Task Orders. Therefore, all classifications are estimates based on the best data available at the time.

Figure 5 shows the simplest form of a CHWM. As the water level during the storm rises to a maximum level, it can leave marks on both the interior and exterior walls of a structure that are of equal elevation. Both of these water marks indicate a surge level that is not complicated by other factors. However, these situations occur only where the structure is at a location sheltered from waves. In all cases, even very simple ones, it is important for the teams finding the CHWMs to distinguish between flooding caused by the direct effects of rainfall and that caused by rising ocean water. High water marks from rainfall flooding are not considered valid CHWMs.

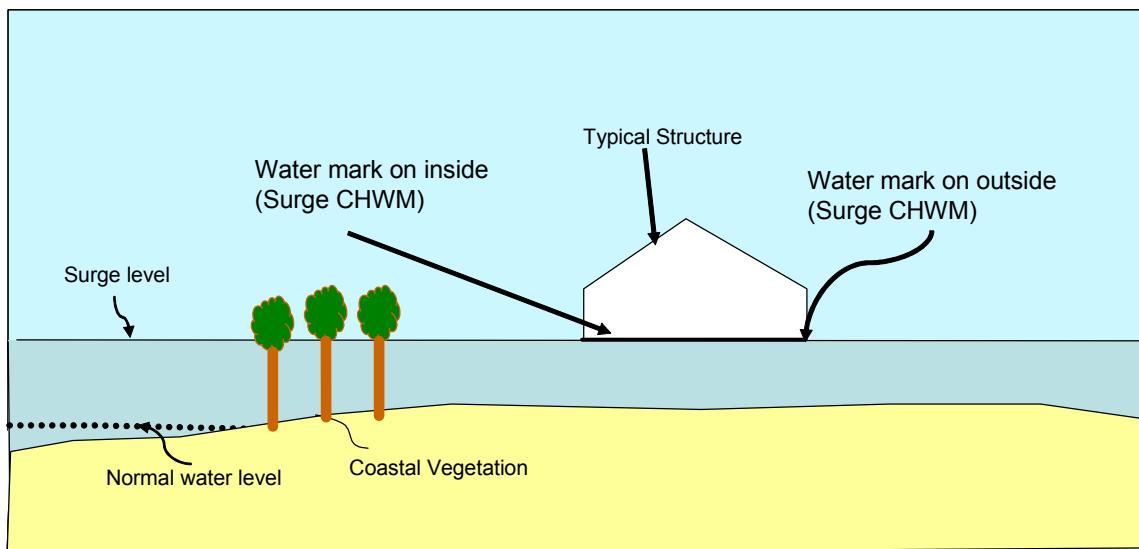


Figure 5. A Simple Surge-Only CHWM

In most common situations, coastal surge is either level or has a slight slope that is not easily detected visually. This is shown schematically in Figure 6. However, this is not always the case in the coastal zone. High water caused by a hurricane storm surge is brought about by the combination of rapidly changing factors such as wind speed, wind direction, and low atmospheric pressure. In some cases the surge develops in open water areas and spreads inland over large distances because the coastal lands have minimal-to-no increase in elevation. The overland flow can be retarded by inland marsh areas and other obstructions so that the water surface slopes and the maximum inland CHWM is lower than those nearer the coast. Case A shown in Figure 7 illustrates this condition. Under other circumstances, a strong onshore wind can force the overland flow inland, forming an upward slope as shown in Case B in Figure 7.

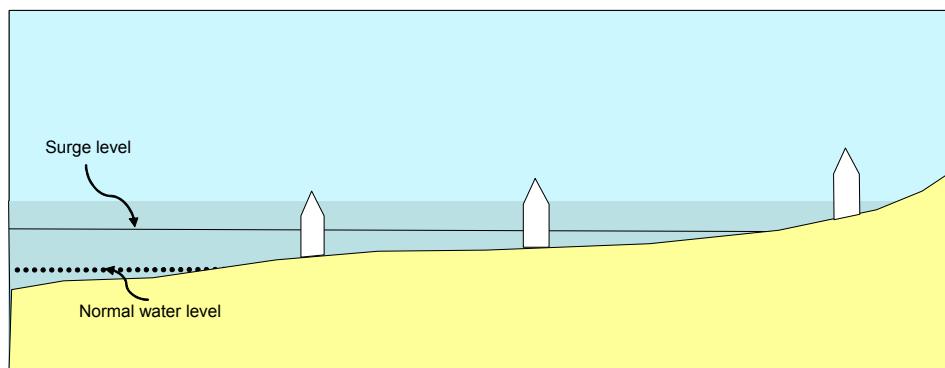


Figure 6. A Coastal Storm Surge With a Level Water Surface

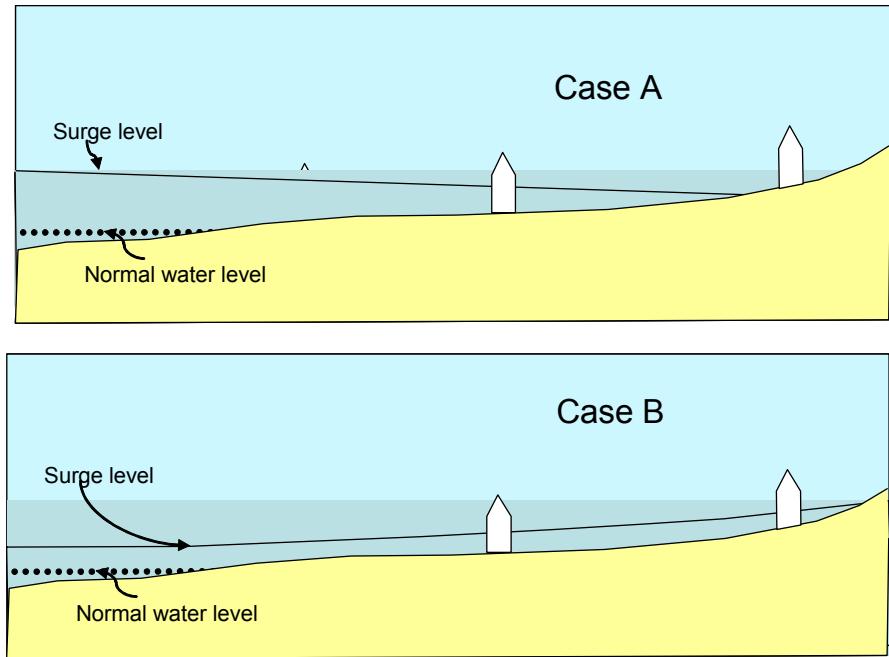


Figure 7. Two Cases of Storm Surges With Sloped Water Surfaces

Waves complicate these conditions even further. Figure 8 shows how HWMs found inside and outside of a structure can differ considerably. These two types of water marks are distinguished in this report. CHWMs corresponding to the conditions shown on the exterior wall in Figure 8 are designated as **wave height** points because the crests of the waves that are riding on the surge leave the highest mark. CHWMs corresponding to the situation shown on the interior wall in Figure 8 are designated as **surge only** points because the whole structure acts as a stilling-well, and the HWM corresponds to water level unaffected by the waves.

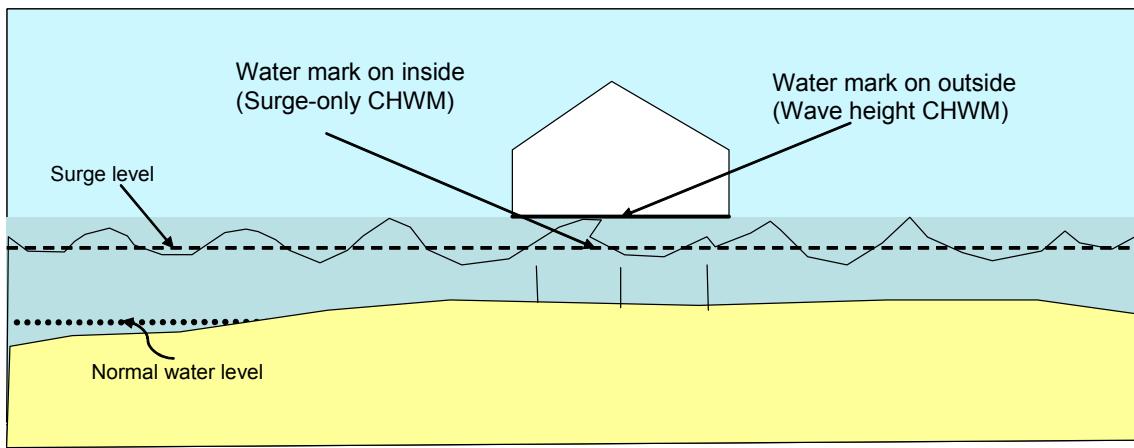


Figure 8. The Formation of Surge and Wave Height CHWM Types

The third basic type of CHWM is illustrated in Figure 9. Here the situation is complicated by the presence of a surf zone, which is the broad zone of spilling and breaking waves between the open Gulf (or other water body) and the beach. The processes associated with the way that the waves

diminish in height as they move across the surf zone cause the average water level to rise against the shore. At the very top of the surf zone, the last remains of the waves wash up and then down the beach slope. As shown in Figure 10, this is referred to as wave runup. Wave runup often pushes debris to its maximum limit where it is left as a wrack line. CHWMs of this type are designated as **wave runup** points.

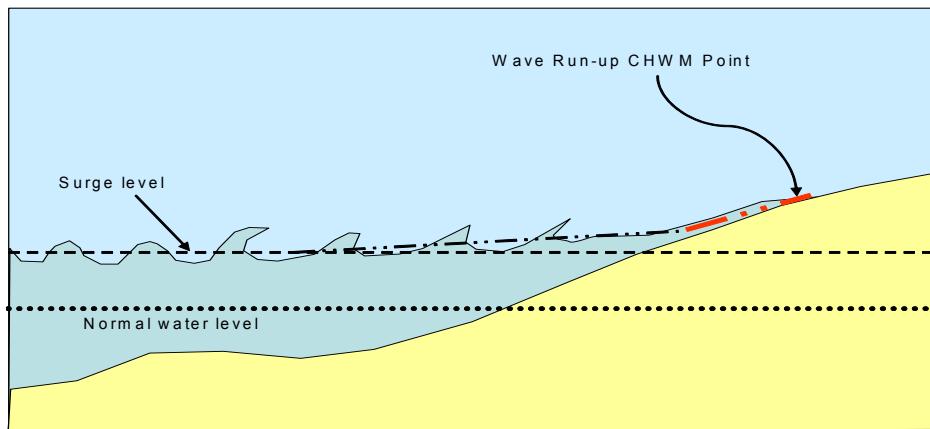


Figure 9. The Formation of a Wave Runup CHWM

Each of the three basic types of CHWMs, **surge only**, **wave height**, and **wave runup**, could be, and often are, found close to each other. These CHWM types can differ in elevation, and each provides information that describes the nature and behavior of the coastal flooding.

Figure 10 shows more variable conditions in the way that CHWMs are formed. It is not uncommon for the wave runup in a storm to be so large that it completely crosses the beach and surges through gaps in the coastal dunes. These are called “washover channels,” and they convey the water over the area of the dunes and downhill to low areas behind the dunes. Figure 11 shows three structures at three different locations along the dune, each impacted by a different high water level at the height of the storm. When the corresponding CHWMs are found, marked, and surveyed, the elevations can be different by as much as several feet over a relatively short distance (e.g., about 1,000 feet).

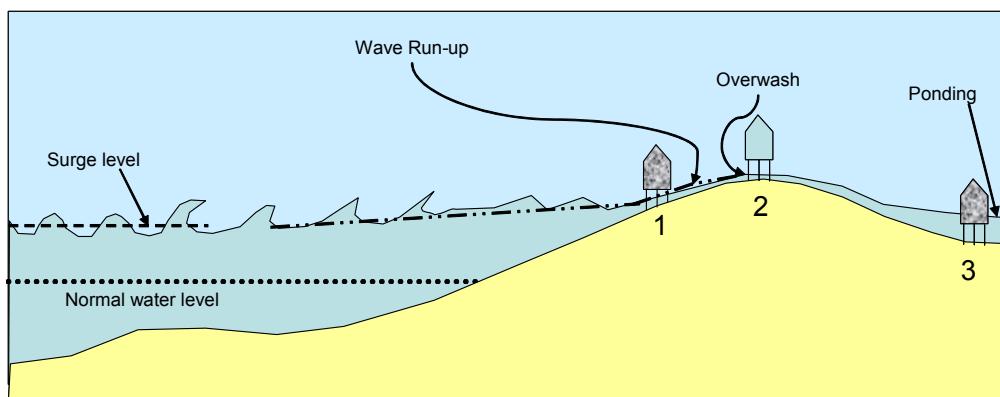


Figure 10. Variations in Coastal Flooding Levels Due to Washover of Coastal Dunes

During some hurricanes, changes in the shape of the beach and dunes can substantially affect the CHWMs. Typically, beaches erode in a storm. The combined effects of this erosion and the rise of the storm surge that brings the breaking waves into the dunes can cause so much erosion that the coastal protection is substantially reduced, resulting in inland inundation and flooding that would not have occurred if the coastal dunes had held. Figure 11 illustrates this situation. Coastal inundation elevation in these areas can depend on how long the dune line held the ocean back compared to the rate that the storm moved inland. If the dunes held back the ocean long enough, the backshore flooding may have occurred after the maximum surge height occurred.

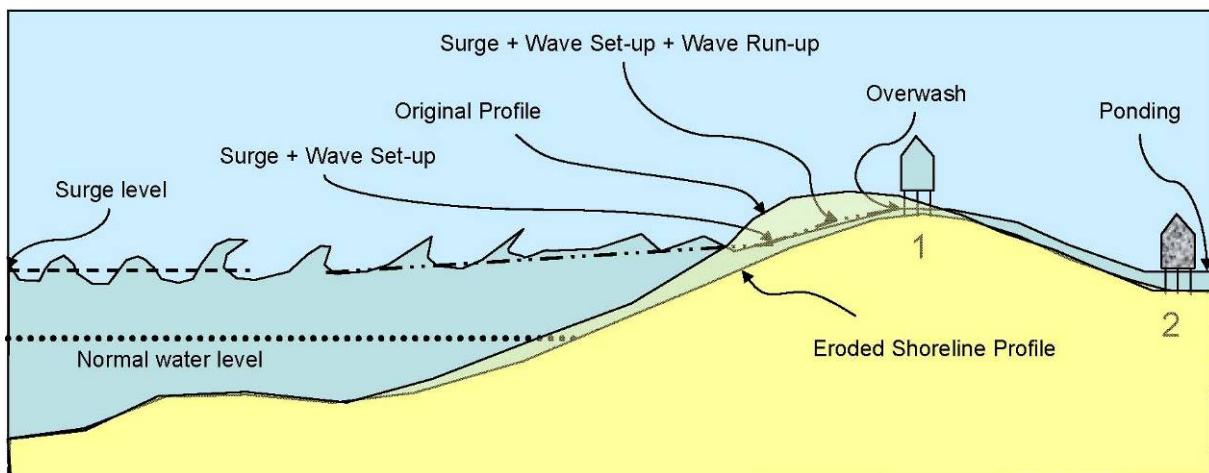


Figure 11. Interaction of Profile Erosion and Coastal Flooding

There are other factors to consider related to local conditions. On barrier islands the CHWMs on the seaward side may differ in elevation from those on the bay side because the maximum surge levels formed at different times during the storm. Within bays, the surge may be amplified by the effect of wind acting on broad, shallow areas. In other cases, the tidal inlet may retard the flow of water into the bay so that its level cannot rise up to the level of the ocean. Conversely, it is common to find that where the shorelines of the bay converge towards the head of the bay, there is a funneling action that amplifies the surge level.

Riverine HWMs

RHWMS, the second main type of HWMs, are points that document high water conditions in riverine areas inland of coastal areas. High water in these areas is mainly driven by rainfall associated with the intensity, speed and progression of the hurricane as it moves inland. Often the peak water elevations from riverine flooding along major rivers occurs on one or more days after the hurricane has made landfall, as the rainfall from the hurricane impacts the watershed and makes its way through downstream rivers. Riverine high water conditions are also affected by the extent of downstream coastal flooding or surge. As riverine high water conditions are less varied in origin than those associated with coastal conditions, these points are identified as one type, RHWMS.

Levee-Related HWMs

A third main type of HWM is those collected to document high water conditions in areas with levee systems. These HWMs are taken in areas inside the levee systems to document high water conditions in the general areas. These HWMs focus on water conditions associated with levee overtopping, levee breaks and levee interior drainage.

MARKING AND SURVEY METHODOLOGY

The Louisiana Rita HWMs were investigated and flagged by URS HWM flagger teams. The HWM flagging teams started work with an organization and training meeting held in Houston, Texas on September 30, 2005. Flagger teams were deployed to Louisiana on October 1, 2005.

Flaggers investigated high water conditions in coastal and riverine study areas. For each HWM, the flaggers completed a standardized form including detailed information about the data point, as shown in Figure A-1 in Appendix A. To the extent possible, flaggers noted RHWM conditions and CHWM conditions and types including surge, wave height, and wave runup. HWMs were located with latitude and longitude coordinates using hand-held Global Positioning System (GPS) units. A total of over 400 HWMs were flagged by URS teams for Hurricane Rita in Louisiana. HWMs are based on the flagger team's best judgment of height of flood waters at the location. Since many structures were severely damaged during Hurricanes Rita and Katrina, which often made locating HWMs difficult, and since the height of floodwaters can be impacted by outside forces such as wind and shielding by other structures, all HWMs should be used to identify trends and not to extrapolate exact height of water throughout the area.

URS team survey crews followed the flagging teams to survey the HWMs flagged by the flagger teams. The survey crews used static GPS methods and conventional leveling to determine an accurate horizontal coordinate (latitude and longitude) and elevation for each HWM. Data were recorded in a standardized format as shown by the example Surveyor High Water Mark Data Collection Report Form, Figure A-2 in Appendix A. HWMs were surveyed horizontally on the North American Datum of 1983 (NAD 83), Louisiana State Plane Coordinates (South Zone), and vertically in the North American Vertical Datum of 1988 (NAVD 88), both in U.S. survey feet. The HWM elevations were also converted to the National Geodetic Vertical Datum of 1929 (NGVD 29) to aid review of data and maps available only in the NGVD 29 datum. The datum conversion was performed using Corpscon ver. 5.11.08, as described in the following report section. The HWM locations were surveyed to within accuracies of 0.25 foot vertically and 10 feet horizontally with a 95-percent confidence level. Any inclement weather that would have an adverse effect on the GPS surveys was avoided to ensure this level of accuracy. Wherever possible, a building floor elevation of structures was collected. These floor elevations were taken adjacent to the HWM where available and may or may not represent the first floor of the structure. This information was obtained as it may be used at a later date for possible damage assessments or Hazard Mitigation Grant Program (HMGP) applications.

To address subsidence conditions in Louisiana, different control networks were used to survey the HWMs. In the coastal areas of Louisiana, where subsidence exists, survey control was originally set up using Louisiana Department of Natural Resources (DNR) primary and secondary GPS control. This control network conveniently encompassed the HWM study area. The Louisiana DNR monuments were accurately referenced and easily found. Choice of survey control was further discussed with the Louisiana DNR and NOAA National Geodetic Survey (NGS). NOAA NGS had a recent set of 86 NGS benchmarks spread throughout coastal Louisiana. Discussions resulted in the direction to use the NOAA NGS benchmarks for the HWM survey. The original Louisiana DNR control was tied into and adjusted to the new NGS

control via static GPS to ensure that all elevations and positions are based on the new NGS benchmark control network. In order to process the GPS data using the elevations established on the new NGS benchmarks, a new geoid file, provided by NOAA NGS, was used. This geoid model differs from the original 2003 Geoid Model, in that it is reportedly isolated to work primarily with the newly published NGS control network in the coastal Louisiana area. NOAA NGS indicated that the relative accuracy of the newly established NGS benchmarks is roughly 5 cm (0.16 feet).

Data collected for the HWMs are stored in a digital database and presented on one-page forms that are organized by parish in the appendices of this report. The HWMs are identified with a unique point number identifier, the High Water Mark Identifier (HWM ID) as shown on the one-page HWM form (e.g. RLAC-09-25). The 1-page HWM reports include data for the storm event, flood type, location, point description, and surveyed point coordinates (LAT/LON and state plane) and elevations. A summary of basic data for all HWMs collected is presented in Table 8, sorted by Parish and HWM sheet number, and again in Table B-2, sorted by HWM-ID.

Basic data collected for Hurricane Rita Louisiana HWMs, are shown graphically on Figures B-1 through B-10 included in Appendix B. Refer also to Table B-1 for a listing of Parishes and the corresponding figures. These figures present the location, HWM ID and the field-surveyed HWM elevations in feet in the NAVD 88 vertical datum. The symbol representing the HWM point on the map is graphically coded, designating whether the HWM is riverine or coastal (i.e., surge, wave height, or wave runup).

**ELEVATION CONVERSION FROM NAVD 88 TO NGVD 29
USING CORPSCON**

The HWM elevations surveyed in NAVD 88 datum were converted to the NGVD 1929 datum using the Corpscon program version 5.11.08,

<http://www.cae.wisc.edu/site/software/?title=app199>. The Corpscon program utilizes the VERTCON software internally. The VERTCON software was developed by the NGS office to convert data between different vertical data scales. VERTCON is available as an element of the NGS Geodetic Toolkit and can be downloaded from the NGS website:
<http://www.ngs.noaa.gov/TOOLS/Vertcon/vertcon.html>.

The VERTCON software allows the user to compute the modeled difference, or datum shift, in orthometric height for a given location specified by its latitude and longitude. Applying the computed datum difference value to a specific elevation converts from one datum to another.

For converting elevations in the NAVD 88 datum to the NGVD 29 datum, the datum shift has to be subtracted from the NAVD 88 elevation. This can be demonstrated by two examples, one with a positive shift and one with a negative shift:

	<u>Case 1</u>	<u>Case 2</u>
NAVD 88 Elevation	5.33	5.33
Datum shift	(+0.50 feet)	(-1.17 feet, negative shift)
NGVD 29 Elevation	$5.33 - (0.50 \text{ feet})$ = 4.83	$5.33 - (-1.17)$ = 6.50

OTHER DATA AND STUDIES

Gage data and coastal surge modeling, prepared by other sources, were investigated to help define the conditions experienced with Hurricane Rita. The reference data collected are presented in this section. It should be noted that many established benchmarks, gages, and other reference points may have elevations surveyed to the NAVD 88 and NGVD 29 datum scales, however, elevations may not adequately address subsidence. Datum references are noted for data sources mentioned in this section.

Tide Gage Data

Tidal data were collected from the NOAA Center for Operational Oceanographic Products and Services (CO-OPS) (<http://co-ops.nos.noaa.gov>). The CO-OPS stations recorded elevated water levels, primarily from Galveston, Texas to Port Fourchon, Louisiana (Figure 12). Maximum water levels for Hurricane Rita in Louisiana are provided in Table 5. All water level observations are measured in the amount above the standard tidal charting datum, Mean Lower Low Water (MLLW), based on the National Tidal Datum Epoch 1983-2001. Reported water levels include highest observed water levels, which is the sum of the storm surge only and the astronomic tide. Also included in the table is the difference between observed water levels and predicted astronomic tides. These measurements are for storm surge only and do not include wave effects.

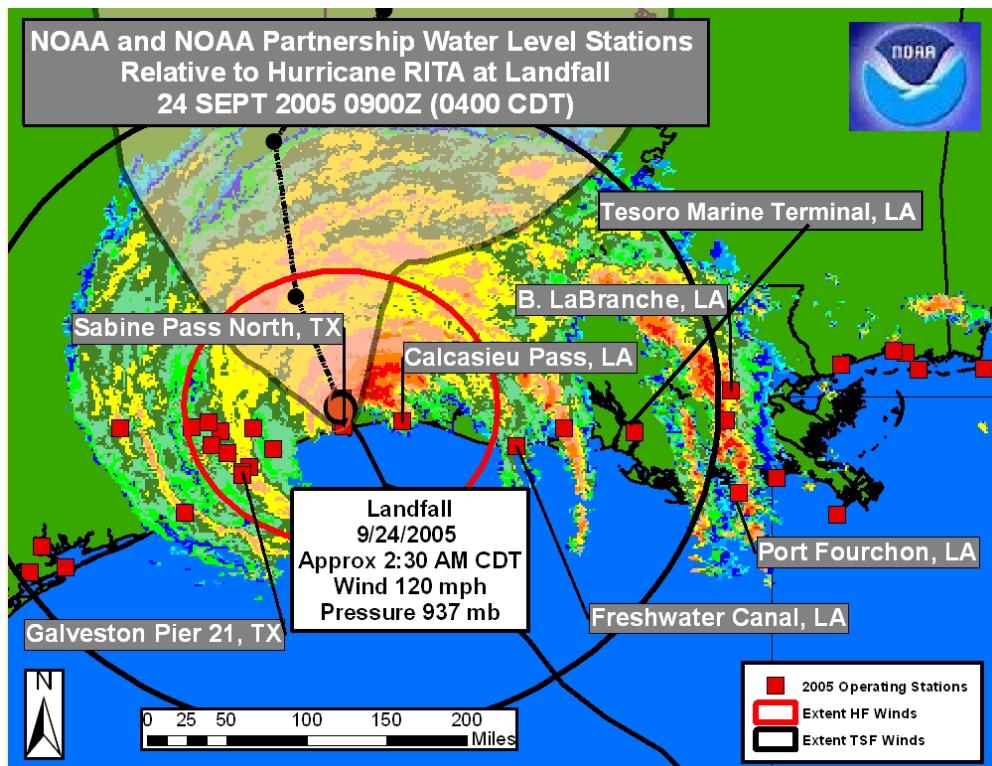


Figure 12. NOAA Hurricane Katrina Water Level Station Locations

The Bayou LaBranche station recorded the highest storm tide, followed by gradually lower levels at Tesoro Marine Terminal and Port Fourchon. All recorded levels were above the predicted astronomical tide.

Table 5. NOAA CO-OPS Maximum Water Levels for Hurricane Rita, September 2005. All preliminary data is subject to NOS verification.

Station Name	Station ID	Date & Time GMT	Max Water Level (ft above MLLW)	Predicted Normal Tide Water Levels (ft)	Difference (ft)
Bayou LaBranche, LA	8762372	9/24/2005 22:18	4.42	0.12	4.3
Tesoro Marine Terminal, LA	8764044	9/24/2005 18:54	4.07	0.11	3.96
Port Fourchon, LA	8762075	9/24/2005 16:54	1.79	0.55	1.24

Under a separate HMTAP Task Order, URS was tasked to prepare Flood Advisory Maps for the several parishes in Louisiana. As part of this task, Michael Baker Jr., Inc performed a flood frequency analysis of tide gage data to quickly provide information to assist in the planning and rebuilding efforts while more detailed analyses are being conducted. The results of this study are provided in "Preliminary Flood Frequency Analysis for Hurricanes Katrina and Rita in Louisiana," dated December 2005. For this task, maximum elevations were obtained from the New Orleans District United States Army Corps of Engineers (USACE) Web site (<http://www.mvn.usace.army.mil/eng/edhd/watercon.htm>) and NOAA CO-OPS. Supplemental elevation data for Hurricane Rita was obtained from the NOAA "Preliminary Report Hurricane Storm Tide Summary," 2005. Selected USACE and NOAA stations and their locations are shown in Figure 13. The peak elevations at the USACE stations are given in Table 6.

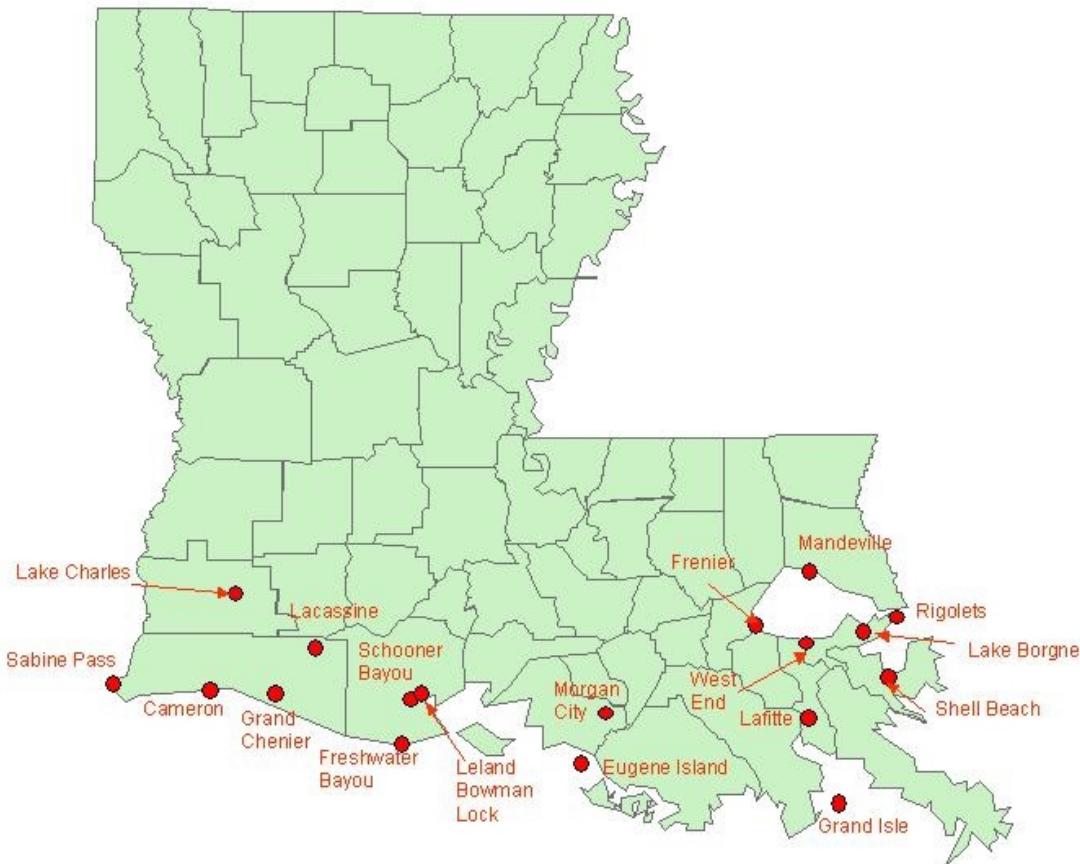


Figure 13. Location of USACE and NOAA stations in areas impacted by Hurricanes Katrina and Rita

Table 6. Hurricane Rita Maximum Height at Selected USACE Stations

Location (USACE Station ID)	County/Parish	Lat	Long	Rita Maximum Height (feet NGVD)
Calcasieu River and Pass Near Cameron, LA (73650)	Cameron	29.78 N	93.35 W	11.5**
Calcasieu River Salt Water Barrier Channel, Lake Charles, LA (73472)	Calcasieu	30.25 N	93.22 W	8.65
Mermentau River at Grand Chenier, LA (70900)	Cameron	29.77 N	92.99 W	10.5**
Lacassine Wildlife Refuge Headquarters, LA (70600)	Cameron	30.00 N	92.78 W	6.44 *
Freshwater Canal at Freshwater Bayou Lock, LA (76592)	Vermilion	29.55 N	92.31 W	12.1**
Schooner Bayou, LA (76600)	Vermilion	29.76 N	92.26 W	7.50
Leland Bowman Lock, LA (76720)	Vermilion	29.78 N	92.20 W	9.65
Atchafalaya Bay NE of Eugene Island, LA (88550)	St. Mary	29.46 N	91.34 W	10.09
Lower Atchafalaya River at Morgan City, LA (03780)	St. Mary	29.70 N	91.21 W	7.02
Barataria Waterway at Lafitte, LA (82875)	Jefferson	29.67 N	90.11 W	5.91

* Indicates USACE gage failed during storm

** Indicates peak elevation based on high water marks provided by Louisiana State University

Surge Models

The NOAA National Hurricane Center (NHC) prepared a preliminary Sea, Lake and Overland Surges from Hurricanes (SLOSH) model of the Hurricane Rita coastal surge. The NHC provided output from the model, which was run just before Hurricane Rita made landfall. The SLOSH model output, shown in Figures 14 through 17, includes graphical, color-designated maximum surge-only levels in feet relative to the NGVD 29 vertical datum that occurred at any time during the modeled storm. The SLOSH model calculations incorporate the unique bay and river configurations, water depths, bridges, roads and other physical features. The SLOSH model is generally accurate within plus or minus 20 percent. For example, if the model calculates a peak 10 foot storm surge for the event, you can expect the observed peak to range from 8 to 12 feet. The model accounts for astronomical tides (which can add significantly to the water height) by specifying an initial tide level, but does not include rainfall amounts, river flow, or wind-driven waves.

For Hurricane Rita in Louisiana, NHC SLOSH model output shows maximum values which reached the figure color chart limit of about 12 feet NGVD 29. Model output values, shown in Figures 14 to 17, need to be adjusted before being used for comparison to HWM values in this report. First, NHC SLOSH model values need to be adjusted from the initial NOAA tide level to actual tidal conditions. Secondly, values need to be converted from the NGVD 29 datum to the study datum of NAVD88.

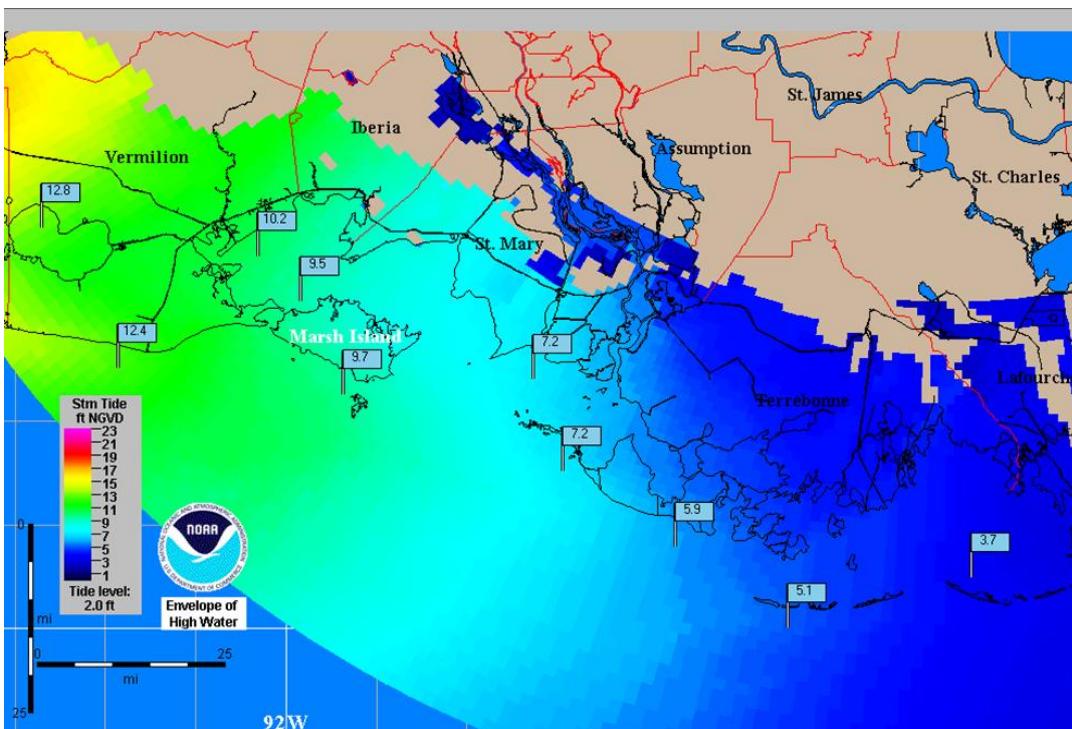


Figure 14. NOAA Rita Coastal SLOSH Data – Vermillion, Iberia, and Terrebonne Parishes

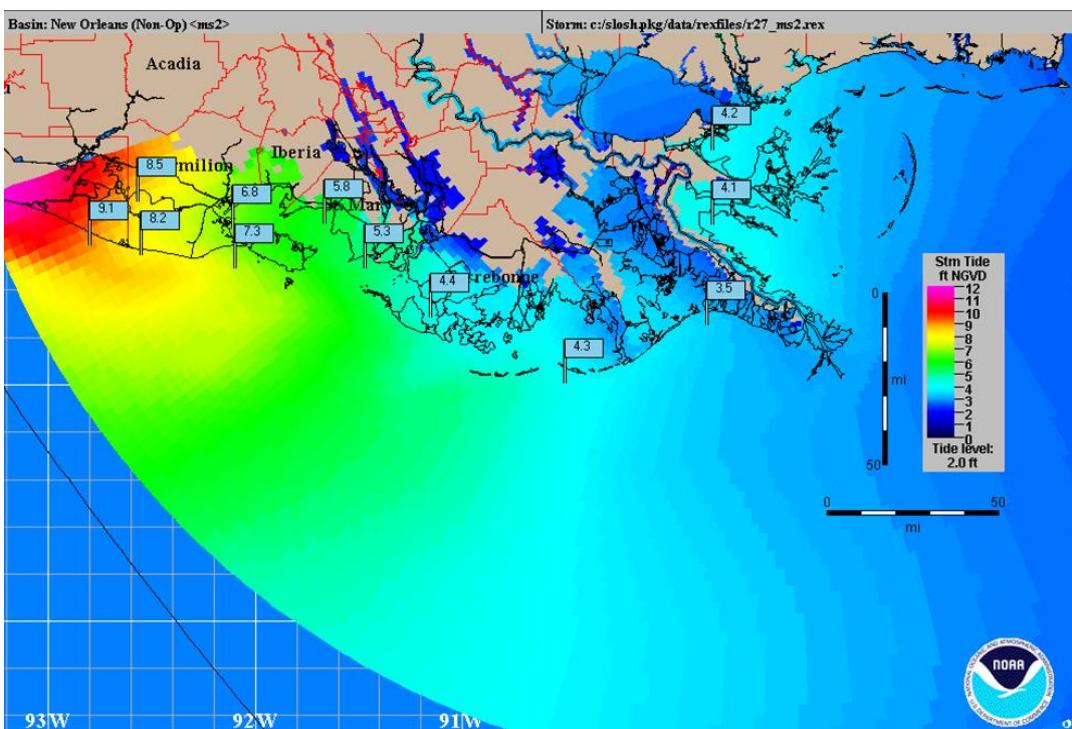


Figure 15. NOAA Rita Coastal SLOSH Data – SE Louisiana

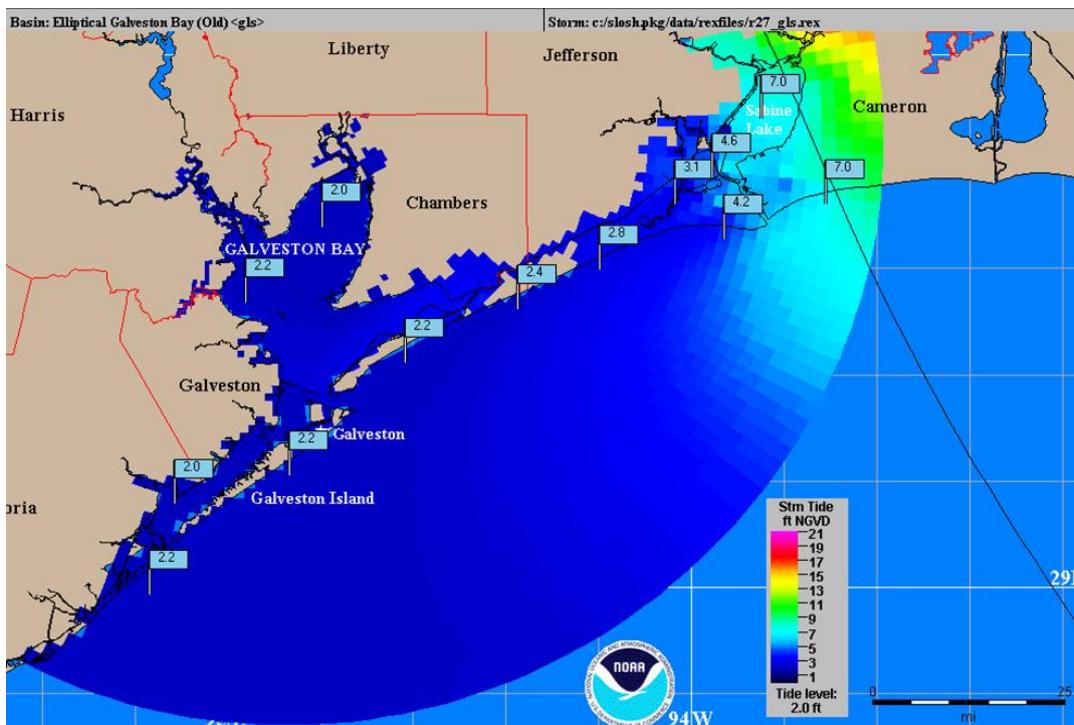


Figure 16. NOAA Rita Coastal SLOSH Data – Galveston Bay Area

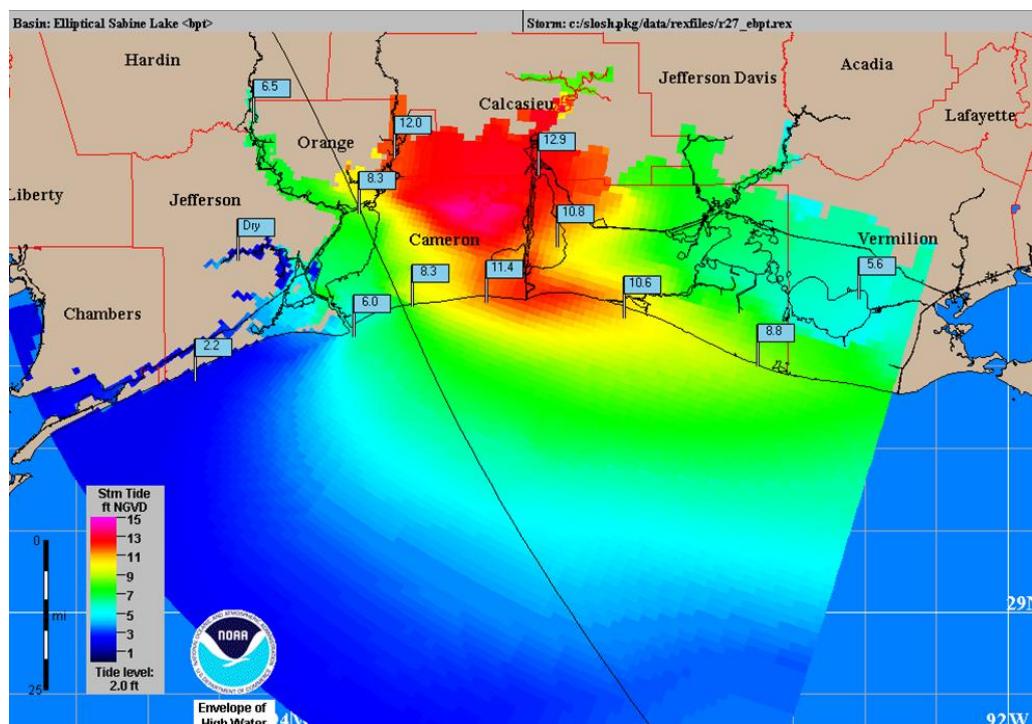


Figure 17. NOAA Rita Coastal SLOSH Data – Southern Louisiana

Another comparable model used to determine the surge outputs from Hurricane Rita was developed by Louisiana State University's (LSU) Hurricane Center. The results were produced using a modified version of the Advanced Circulation Model (ADCIRC) hydrodynamic code.

Coastal Flood Frequency Analysis

As discussed above, under a separate HMTAP Task Order, URS was tasked to prepare Flood Advisory Maps for several parishes in Louisiana. Part of this task involved performing a flood frequency analysis of tide gage data to quickly provide information to assist in the planning and rebuilding efforts while more detailed analyses are being conducted. The results of this study are provided in "Preliminary Flood Frequency Analysis for Hurricanes Katrina and Rita in Louisiana," dated December 2005, and are summarized below.

The above-referenced long-term gage analysis was based on Hurricane Rita gage data from select NOAA and USACE stations. While the best data available was used at the time of the flood frequency analysis, the reference data had limitations. Some stations were damaged or destroyed or malfunctioned during Hurricane Rita and did not record the peak stage. Another limitation was that gages with long records of data are sparsely distributed. These gages provided useful records of a long sequence of historic storm surge peak heights. Where a useful gage record was available but the gage had failed during Hurricane Rita, the analysis was based on the closest supplemental HWM data from NOAA *Preliminary Report Hurricane Storm Tide Summary* (NOAA, 2005b). The flood frequency analysis only represents conditions at and near the gage.

Based on the analysis in "Preliminary Flood Frequency Analysis for Hurricanes Katrina and Rita in Louisiana," it appears that along the coast of Louisiana, Hurricane Rita is approximately a 100-year event west of Leland Bowman Lock and less than a 100-year event east of Leland Bowman Lock.

River Stage Gage Data

River gage data prepared by other sources were also investigated and provided here to document reported conditions experienced with Hurricane Rita. It should be noted that many established gages and other reference points may have elevations provided in NAVD 88 and NGVD 29 datum scales, however, elevations may not adequately address subsidence issues in Louisiana.

Hurricane Rita river stage, or flood elevation, data was available from six U.S. Geological Survey (USGS) gage stations as shown in Table 7. Flood stage is defined by the gage height at which a watercourse overtops its banks and begins to cause damage to any portion of the defined reach, an elevation which is usually higher than or equal to bankfull stage. Data provided includes the elevation established by the National Weather Service (NWS) for each gage at which the river is considered to reach flood stage. In addition, the maximum measured water elevation at each gage during or immediately after Hurricane Rita and the date this maximum occurred is provided. As shown, several USGS gages recorded Hurricane Rita stages that exceeded the published NWS flood stage.

Table 7. USGS Louisiana Flood Stage Gages from September 21 – September 30, 2005

GAGE_ID	Station Name	County	NWS Flooding Stage (feet)	Measured Stage (feet)	Flooding Date
8012150	Mermentau River At Mermentau, LA	Acadia	4	6	9/27/2005
7386940	Vermilion River at Hwy 733 near Lafayette, LA	Lafayette	7	13	9/24/2005
7386600	Vermilion River (B. Vermilion) near Carencro, LA	St. Martin	16	17	9/25/2005
7381605	Lower Atchafalaya River at Morgan City, LA	St. Mary	4	7	9/24/2005
7375175	Bogue Falaya River at Boston St. at Covington, LA	St. Tammany	6	7	9/24/2005
7386980	Vermilion River at Perry, LA	Vermilion	9	11	9/26/2005

In addition, Hurricane Rita flood stage gage data from the NWS Advanced Hydrologic Prediction Service (AHPS) was viewed. NWS AHPS gage data results for Hurricane Rita were generally similar to the USGS data. Data did include a gage for Calcasieu River Salt Water Barrier near West Lake as having peak crest of 9.43 feet on September 24, 2005, which that was categorized as a major flood.

River Flow Gage Data

In addition to the river stage data discussed above, river flows or discharge data is available at some locations throughout the impacted area. Michael Baker Jr., Inc. conducted a preliminary analysis of the river flow data associated with Hurricane Rita for the three western parishes of Vermillion, Jefferson Davis, and Lafayette, where relatively heavy rainfall occurred on September 25 and 26, 2005. All real-time flow data were from USGS Web site <http://waterdata.usgs.gov/nwis/rt> and all peak data were from <http://nwis.waterdata.usgs.gov/usa/nwis/peak>. The real-time data are provisional and subject to revision by USGS. While the frequency analysis for this select area does not provide comparison with elevations of HWMS collected in this study, it does estimate the approximate frequency of flooding that resulted in the HWMS.

Real-time peak data for selected locations in the period of September 23 through September 27 were used to compare with the frequency curves developed for USGS gaging stations where long-term peak flow data are available. Stations where the flow was affected by reservoir regulations were excluded from the frequency analysis. For stations where only stage data are available, stage-frequency curves were estimated by using graphic plotting positions, and the peak stages of Hurricane Rita were used to compare with the stage frequency curves. Changes in gage data due to sediment or erosion over time were not considered.

Preliminary analysis results reported that the riverine flooding was estimated in the range of a 10- to 25-year event at the Louisiana stations in the three parishes of Vermillion, Jefferson Davis, and Lafayette. There was no functional flow gage data available in Calcasieu and Cameron Parishes.

FINDINGS AND OBSERVATIONS

The HWM data collected for this study demonstrate that the Hurricane Rita coastal storm surge and wave-related high water conditions reached historical proportions and covered significant portions of the Louisiana study area. The following observations pertain to the data and figures in this report and are referenced in the NAVD 88 datum.

A total of 364 HWMs were surveyed in the 29 parishes investigated. Site visits were also made at 31 FEMA Rep Loss properties and 14 FEMA Mitigated properties, two of which resulted in HWMs. The Hurricane Rita Louisiana HWM data is summarized in Table 8, sorted by Parish and Appendix sheet number. For convenience, a second table, Table B-2, containing the same data but sorted by HWM ID number, has been included in Appendix B.

The landfall of Hurricane Rita between Johnson's Bayou and Sabine Pass placed the central and western Louisiana coast within the right front quadrant of the storm. In this section of the anticlockwise wind circulation, the forward speed of the storm added to the magnitude of the maximum wind speeds. This explains the higher and more extensive coastal storm surge in Louisiana compared to Texas.

The Gulf of Mexico is shallow along this portion of the Louisiana coast with a very gentle offshore slope. This extensive shallow portion of the inner continental shelf added to the development of the hurricane storm surge.

Storm surge along the open Gulf was measured above 10 feet from Johnson's Bayou to Marsh Island, a distance of about 100 miles. The open coast along this reach of the Northern Gulf of Mexico is made up of a muddy shoreline and both coastal and freshwater marshes stretch five to twenty miles inland. The coast is largely deserted with very few roads. The maps in Appendix B clearly show this limited access to the general coastal area.

The highest coastal HWMs were measured along State Highway 82 in the general reach between Cameron and Grand Chenier. These values range between approximately 13 and 18 feet. However, this road is generally one-to-several miles inland so higher values may have occurred along the open coast.

The lack of access to the shoreline at most places causes the locations of coastal HWMs to be widely distributed east of Grand Chenier. In St. Mary Parish, east of Marsh Island, the maximum surge near the shoreline was in the order of 7 to 8 feet. This decreased to the 4- to 5-foot range in the area of Grand Isle.

Most of the industry and settlements in central and western Louisiana are located well inland and sheltered by the extensive coastal marshes. The coastal water bodies are called 'lakes' even though they have narrow channels connecting them to the Gulf. These limited tidal connections appeared to have also served to reduce the impact of the coastal storm surge compared to where

bays and estuaries have wide mouths. Sabine Lake, on the Texas Louisiana border, was just to the west of the location where the storm made landfall. This location protected it from a high surge. Calcasieu Lake is about 30 miles east of the landfall location and thus close to where the winds were most intense. Due to the shallow depths in this coastal lake the maximum surge heights approached the 9.5– to 10-foot range along its northern shoreline several miles south of the City of Lake Charles. This surge reduced to the 6- to 8-foot range in the Lake Charles area.

The inland coastal surge, north of Grand Lake near the City of Lake Arthur, 30 miles east of Lake Charles, was reduced to the 4-foot range. This contrasts to the coastal surge levels in the range of 11 to 14 feet along the north shore of Vermilion and West Cote Blanche Bays. These bays, located behind Marsh Island, are more open to the Gulf. A similar value, about 9 feet, was measured on the north shore of Terrebonne Bay at Cocodrie. Further east, the maximum surge level in Barataria Bay was in the 4 to 5 foot range.

It is interesting to note that, although Lake Pontchartrain is well to the east of the landfall location, there were measured surges in the order of 5 to 7 feet along its northern shore. The broad open character of this shallow water body undoubtedly contributed to these relatively higher values.

Overall, the pattern of the coastal storm surge caused by Hurricane Rita followed a predictable pattern. High values occurred along the thinly settled open Gulf shoreline east of the landfall location. This surge diminished eastward. The extensive coastal marshes and narrow tidal channels of the many coastal bays significantly attenuated the maximum surge at the upland areas that are settled and industrialized. East of Marsh Island the bays have better connections to the Gulf and relatively higher surge levels occurred.

The HWMs from riverine flooding were found throughout southern Louisiana. However, many of these HWMs were found within the stream channels beneath bridges. It appears the riverine flooding had significant impact on buildings only in some areas of the state such as parts of Calcasieu and Livingston Parishes.

Table 8. Hurricane Rita Louisiana HWM Data Summary¹

HWM ID	County	Flooding Type	HWM Flood Elevation - NAVD 88			Survey Latitude	Survey Longitude	HWM Report Sheet No.
			Survey Latitude	Survey Longitude	HWM Report Sheet No.			
RLAR-07-19	Acadia	Riverine - Hurricane	18.5	30.167492	-92.260702	Acadia-1		
RLAR-12-03	Acadia	Riverine - Hurricane	5.2	30.081767	-92.506096	Acadia-2		
RLAR-12-05	Acadia	Riverine - Hurricane	6.8	30.148379	-92.498327	Acadia-3		
RLAR-12-25	Acadia	Riverine - Hurricane	20.3	30.260398	-92.277024	Acadia-4		
RLAR-12-26	Acadia	Riverine - Hurricane	28.6	30.321629	-92.235413	Acadia-5		
RLAR-12-27	Acadia	Riverine - Hurricane	7.3	30.066532	-92.394560	Acadia-6		
RLAR-12-28	Acadia	Riverine - Hurricane	7.8	30.097335	-92.463604	Acadia-7		
RLAR-12-29	Acadia	Riverine - Hurricane	8.1	30.270475	-92.531019	Acadia-8		
RLAR-12-30	Acadia	Riverine - Hurricane	5.8	30.269082	-92.557852	Acadia-9		
RLAR-07-32	Allen	Riverine - Hurricane	21.8	30.502520	-92.915193	Allen-1		
RLAR-08-06	Allen	Riverine - Hurricane	79.9	30.766806	-92.947417	Allen-2		
RLAR-08-08	Allen	Riverine - Hurricane	38.2	30.518750	-93.015194	Allen-3		
RLAR-10-46	Allen	Riverine - Hurricane	33.2	30.519583	-93.053222	Allen-4		
RLAR-15-09	Assumption	Riverine - Hurricane	2.9	29.901226	-91.185605	Assumpti-1		
RLAR-15-11	Assumption	Riverine - Hurricane	2.7	29.697117	-91.094232	Assumpti-2		
RLAR-04-01	Avoyelles	Riverine - Hurricane	40.0	30.988450	-91.844291	Avoyelle-1		
RLAR-07-31	Beauregard	Riverine - Hurricane	42.6	30.517436	-93.140948	Beaurega-1		
RLAR-08-04	Beauregard	Riverine - Hurricane	140.0	30.860972	-93.216139	Beaurega-2		
RLAR-08-07	Beauregard	Riverine - Hurricane	70.4	30.657417	-93.046083	Beaurega-3		
RLAR-10-41	Beauregard	Riverine - Hurricane	45.0	30.501417	-93.279917	Beaurega-4		
RLAR-10-42	Beauregard	Riverine - Hurricane	98.3	30.642528	-93.382361	Beaurega-5		
RLAR-10-43	Beauregard	Riverine - Hurricane	111.4	30.683194	-93.238111	Beaurega-6		
RLAR-10-44	Beauregard	Riverine - Hurricane	150.1	30.851139	-93.245972	Beaurega-7		
RLAR-10-45	Beauregard	Riverine - Hurricane	68.1	30.685444	-93.043111	Beaurega-8		
RLAC-03-03	Calcasieu	Coastal - Wave Run-up	6.1	30.113895	-93.359461	Calcasie-1		
RLAC-09-17	Calcasieu	Coastal - Surge Only	11.8	30.139202	-93.473439	Calcasie-10		
RLAC-09-18	Calcasieu	Coastal - Surge Only	9.2	30.146397	-93.434901	Calcasie-11		
RLAC-10-02	Calcasieu	Coastal - Surge Only	8.2	30.132226	-93.322348	Calcasie-12		
RLAC-10-03	Calcasieu	Coastal - Surge Only	9.5	30.104331	-93.306734	Calcasie-13		
RLAC-10-07	Calcasieu	Coastal - Surge Only	9.9	30.062072	-93.287789	Calcasie-14		

¹ Note – For HWM data summary listing sorted by HWM-ID, refer to Appendix B, Table B-2

HWM ID	County	Flooding Type	HWM Flood Elevation - NAVD 88	Survey Latitude	Survey Longitude	HWM Report Sheet No.
RLAC-11-01	Calcasieu	Coastal - Wave Runup	7.2	30.099646	-93.359046	Calcasie-15
RLAC-11-02	Calcasieu	Coastal - Wave Run-up	6.7	30.094660	-93.360190	Calcasie-16
RLAC-11-03	Calcasieu	Coastal - Surge Only	6.2	30.064408	-93.354743	Calcasie-17
RLAC-04-01	Calcasieu	Riverine - Hurricane	14.6	30.351813	-93.235657	Calcasie-18
RLAC-04-02	Calcasieu	Riverine - Hurricane	21.3	30.354729	-93.200577	Calcasie-19
RLAC-08-01	Calcasieu	Coastal - Wave Run-up	8.2	30.187479	-93.278122	Calcasie-2
RLAC-07-01	Calcasieu	Riverine - Hurricane	6.9	30.294645	-93.265481	Calcasie-20
RLAC-07-02	Calcasieu	Riverine - Hurricane	6.7	30.293900	-93.261137	Calcasie-21
RLAC-08-05	Calcasieu	Riverine - Hurricane	7.6	30.278852	-93.232377	Calcasie-22
RLAC-09-20	Calcasieu	Riverine - Hurricane	10.4	30.304807	-93.168260	Calcasie-23
RLAC-09-21	Calcasieu	Riverine - Hurricane	5.8	30.303611	-93.160247	Calcasie-24
RLAC-09-25	Calcasieu	Riverine - Hurricane	7.4	30.272269	-93.175029	Calcasie-25
RLAC-09-26	Calcasieu	Riverine - Hurricane	7.5	30.271858	-93.173986	Calcasie-26
RLAC-09-27	Calcasieu	Riverine - Hurricane	9.9	30.106303	-93.679862	Calcasie-27
RLAC-09-41	Calcasieu	Riverine - Hurricane	14.2	30.282114	-93.654903	Calcasie-28
RLAC-09-42	Calcasieu	Riverine - Hurricane	23.5	30.358208	-93.685652	Calcasie-29
RLAC-08-02	Calcasieu	Coastal - Wave Run-up	7.8	30.174028	-93.284579	Calcasie-3
RLAC-09-43	Calcasieu	Riverine - Hurricane	21.7	30.305705	-93.599669	Calcasie-30
RLAC-09-44	Calcasieu	Riverine - Hurricane	35.3	30.387998	-93.623261	Calcasie-31
RLAC-09-45	Calcasieu	Riverine - Hurricane	32.8	30.372885	-93.516421	Calcasie-32
RLAC-12-05	Calcasieu	Riverine - Hurricane	7.5	30.303425	-93.249390	Calcasie-33
RLAC-12-06	Calcasieu	Riverine - Hurricane	9.0	30.303685	-93.249084	Calcasie-34
RLAC-12-07	Calcasieu	Riverine - Hurricane	7.2	30.293699	-93.261283	Calcasie-35
RLAR-02-05	Calcasieu	Riverine - Hurricane	5.8	30.295206	-93.121450	Calcasie-36
RLAR-02-06	Calcasieu	Riverine - Hurricane	4.0	30.265716	-93.197675	Calcasie-37
RLAR-02-07	Calcasieu	Riverine - Hurricane	5.6	30.286072	-93.270520	Calcasie-38
RLAR-02-08	Calcasieu	Riverine - Hurricane	6.8	30.291998	-93.267428	Calcasie-39
RLAC-08-03	Calcasieu	Coastal - Wave Run-up	7.8	30.217121	-93.233952	Calcasie-4
RLAR-02-12	Calcasieu	Riverine - Hurricane	42.6	30.423275	-93.424744	Calcasie-40
RLAR-04-03	Calcasieu	Riverine - Hurricane	6.8	30.287193	-93.257807	Calcasie-41
RLAR-07-01	Calcasieu	Riverine - Hurricane	4.4	30.200434	-93.679369	Calcasie-42
RLAR-07-02	Calcasieu	Riverine - Hurricane	25.1	30.380346	-93.698407	Calcasie-43
RLAR-07-28	Calcasieu	Riverine - Hurricane	52.2	30.451379	-93.421972	Calcasie-44
RLAR-09-19	Calcasieu	Riverine - Hurricane	12.3	30.145999	-93.167261	Calcasie-45
RLAR-09-32	Calcasieu	Riverine - Hurricane	15.6	30.234477	-93.639204	Calcasie-46

HWM ID	County	Flooding Type	HWM Flood Elevation - NAVD 88	Survey Latitude	Survey Longitude	HWM Report Sheet No.
RLAR-09-33	Calcasieu	Riverine - Hurricane	7.6	30.193269	-93.645582	Calcasie-47
RLAR-09-34	Calcasieu	Riverine - Hurricane	16.8	30.239587	-93.571398	Calcasie-48
RLAR-09-35	Calcasieu	Riverine - Hurricane	8.7	30.203438	-93.587374	Calcasie-49
RLAC-08-04	Calcasieu	Coastal - Wave Run-up	8.4	30.236664	-93.235109	Calcasie-5
RLAR-09-36	Calcasieu	Riverine - Hurricane	17.2	30.303599	-93.744066	Calcasie-50
RLAR-09-37	Calcasieu	Riverine - Hurricane	20.1	30.304040	-93.571578	Calcasie-51
RLAR-12-01	Calcasieu	Riverine - Hurricane	12.0	30.308183	-93.718638	Calcasie-52
RLAR-12-31	Calcasieu	Riverine - Hurricane	14.5	30.313742	-93.501163	Calcasie-53
RLAR-12-32	Calcasieu	Riverine - Hurricane	6.9	30.193193	-93.645513	Calcasie-54
RLAR-12-33	Calcasieu	Riverine - Hurricane	10.3	30.312406	-93.689848	Calcasie-55
RLAR-12-34	Calcasieu	Riverine - Hurricane	13.0	30.307374	-93.724905	Calcasie-56
RLAR-12-35	Calcasieu	Riverine - Hurricane	16.6	30.362666	-93.722066	Calcasie-57
RLAR-12-36	Calcasieu	Riverine - Hurricane	28.0	30.333001	-93.630206	Calcasie-58
RLAR-12-38	Calcasieu	Riverine - Hurricane	5.5	30.304648	-93.151687	Calcasie-59
RLAC-09-13	Calcasieu	Coastal - Surge Only	6.4	30.085172	-93.371600	Calcasie-6
RLAR-12-39	Calcasieu	Riverine - Hurricane	5.8	30.248371	-93.129542	Calcasie-60
RLAR-12-40	Calcasieu	Riverine - Hurricane	7.9	30.239742	-93.110251	Calcasie-61
RLAC-09-14	Calcasieu	Coastal - Surge Only	5.3	30.092428	-93.396653	Calcasie-7
RLAC-09-15	Calcasieu	Coastal - Surge Only	8.2	30.139303	-93.411395	Calcasie-8
RLAC-09-16	Calcasieu	Coastal - Surge Only	8.5	30.139139	-93.510524	Calcasie-9
RLAC-03-02	Cameron	Coastal - Wave Run-up	4.6	29.988917	-93.088483	Cameron-1
RLAC-09-10	Cameron	Coastal - Surge Only	7.7	29.971096	-93.377918	Cameron-10
RLAC-09-11	Cameron	Coastal - Surge Only	7.5	29.981009	-93.371773	Cameron-11
RLAC-09-12	Cameron	Coastal - Surge Only	4.9	29.986049	-93.403823	Cameron-12
RLAC-09-23	Cameron	Coastal - Surge Only	6.7	29.761327	-93.865615	Cameron-13
RLAC-09-24	Cameron	Coastal - Surge Only	9.9	29.773408	-93.833338	Cameron-14
RLAC-10-04	Cameron	Coastal - Surge Only	17.8	29.786650	-93.183722	Cameron-15
RLAC-10-05	Cameron	Coastal - Surge Only	12.7	29.790792	-93.214963	Cameron-16
RLAC-10-08	Cameron	Coastal - Surge Only	9.5	30.030626	-93.275977	Cameron-17
RLAC-10-10	Cameron	Coastal - Wave Height	16.2	29.784981	-93.326403	Cameron-18
RLAC-10-11	Cameron	Coastal - Surge Only	15.1	29.788275	-93.262857	Cameron-19
RLAC-09-01	Cameron	Coastal - Surge Only	6.9	29.993480	-93.360210	Cameron-2
RLAC-10-12	Cameron	Coastal - Surge Only	4.7	29.989338	-93.128393	Cameron-20
RLAC-10-16	Cameron	Coastal - Surge Only	4.7	30.016642	-93.176925	Cameron-21
RLAC-10-18	Cameron	Coastal - Surge Only	8.1	29.977557	-93.227947	Cameron-22

HWM ID	County	Flooding Type	HWM Flood Elevation - NAVD 88	Survey Latitude	Survey Longitude	HWM Report Sheet No.
RLAC-11-04	Cameron	Coastal - Wave Run-up	7.8	29.038719	-93.340177	Cameron-23
RLAC-11-05	Cameron	Coastal - Surge Only	6.9	29.993585	-93.365722	Cameron-24
RLAC-11-06	Cameron	Coastal - Surge Only	16.4	29.809964	-93.474262	Cameron-25
RLAC-11-08	Cameron	Coastal - Surge Only	8.0	29.977234	-93.367558	Cameron-26
RLAC-11-09	Cameron	Coastal - Surge Only	12.7	29.808685	-93.158719	Cameron-27
RLAC-11-10	Cameron	Coastal - Surge Only	12.3	29.814851	-93.105732	Cameron-28
RLAC-11-11	Cameron	Coastal - Surge Only	7.3	29.931766	-93.078602	Cameron-29
RLAC-09-03	Cameron	Coastal - Surge Only	12.4	29.762741	-93.662900	Cameron-3
RLAC-11-12	Cameron	Coastal - Surge Only	3.7	29.977728	-93.088128	Cameron-30
RLAC-11-13	Cameron	Coastal - Surge Only	5.7	29.950531	-93.088116	Cameron-31
RLAC-11-14	Cameron	Coastal - Surge Only	10.8	29.822907	-92.999112	Cameron-32
RLAC-11-15	Cameron	Coastal - Surge Only	13.4	29.786466	-93.107169	Cameron-33
RLAC-11-16	Cameron	Coastal - Surge Only	14.5	29.768675	-92.985555	Cameron-34
RLAC-11-17	Cameron	Coastal - Surge Only	15.0	29.751535	-92.905844	Cameron-35
RLAC-11-18	Cameron	Coastal - Surge Only	11.9	29.736269	-92.844097	Cameron-36
RLAC-11-19	Cameron	Coastal - Surge Only	13.2	29.729592	-92.817686	Cameron-37
RLAC-11-20	Cameron	Coastal - Surge Only	9.0	29.870872	-93.079508	Cameron-38
RLAC-08-06	Cameron	Riverine - Hurricane	3.9	30.004133	-92.779352	Cameron-39
RLAC-09-04	Cameron	Coastal - Surge Only	9.1	29.765254	-93.781730	Cameron-4
RLAC-09-05	Cameron	Coastal - Surge Only	10.9	29.765285	-93.764017	Cameron-5
RLAC-09-06	Cameron	Coastal - Surge Only	10.0	29.763964	-93.718943	Cameron-6
RLAC-09-07	Cameron	Coastal - Surge Only	9.4	29.763590	-93.708700	Cameron-7
RLAC-09-08	Cameron	Coastal - Surge Only	11.1	29.763500	-93.707518	Cameron-8
RLAC-09-09	Cameron	Coastal - Surge Only	11.4	29.763094	-93.697283	Cameron-9
RLAR-08-13	Evangeline	Riverine - Hurricane	48.7	30.666054	-92.538284	Evangeli-1
RLAC-03-05	Iberia	Coastal - Surge Only	6.9	29.909657	-91.784621	Iberia-1
RLAR-12-11	Iberia	Riverine - Hurricane	8.6	29.988949	-91.936180	Iberia-10
RLAR-12-12	Iberia	Riverine - Hurricane	6.4	30.016148	-91.773994	Iberia-11
RLAR-12-13	Iberia	Riverine - Hurricane	9.9	30.041000	-91.800786	Iberia-12
RLAR-12-14	Iberia	Riverine - Hurricane	7.5	29.902539	-91.683980	Iberia-13
RLAR-12-17	Iberia	Riverine - Hurricane	5.7	30.122108	-91.726521	Iberia-14
RLAR-12-18	Iberia	Riverine - Hurricane	3.6	30.061649	-91.608653	Iberia-15
RLAC-12-03	Iberia	Coastal - Surge Only	9.4	29.951093	-91.983084	Iberia-2
RLAC-14-21	Iberia	Coastal - Surge Only	9.2	29.953788	-91.984170	Iberia-3
RLAC-16-11	Iberia	Coastal - Surge Only	9.6	29.960420	-91.943439	Iberia-4

HWM ID	County	Flooding Type	HWM Flood Elevation - NAVD 88	Survey Latitude	Survey Longitude	HWM Report Sheet No.
RLAC-16-12	Iberia	Coastal - Surge Only	8.7	29.974172	-91.898810	Iberia-5
RLAC-16-13	Iberia	Coastal - Surge Only	9.3	29.914694	-91.904482	Iberia-6
RLAC-16-14	Iberia	Coastal - Surge Only	9.1	29.947611	-91.875430	Iberia-7
RLAC-16-17	Iberia	Coastal - Surge Only	8.2	29.906463	-91.783830	Iberia-8
RLAR-12-10	Iberia	Riverine - Hurricane	8.6	29.988893	-91.936193	Iberia-9
RLAC-13-23	Jefferson	Coastal - Surge Only	4.2	29.260584	-89.963170	Jefferso-1
RLAC-15-03	Jefferson	Coastal - Surge Only	3.6	29.731384	-90.123041	Jefferso-10
RLAC-15-04	Jefferson	Coastal - Surge Only	2.8	29.760826	-90.102972	Jefferso-11
RLAC-15-05	Jefferson	Coastal - Surge Only	3.6	29.767612	-90.083568	Jefferso-12
RLAR-15-01	Jefferson	Coastal - Surge Only	3.6	29.746711	-90.138928	Jefferso-13
RLAC-14-03	Jefferson	Coastal - Surge Only	4.8	29.263374	-89.957239	Jefferso-2
RLAC-14-04	Jefferson	Coastal - Surge Only	5.3	29.235907	-89.999195	Jefferso-3
RLAC-14-05	Jefferson	Coastal - Surge Only	4.6	29.224759	-90.013721	Jefferso-4
RLAC-14-06	Jefferson	Coastal - Surge Only	4.4	29.202063	-90.039667	Jefferso-5
RLAC-14-07	Jefferson	Coastal - Surge Only	4.8	29.209261	-90.053672	Jefferso-6
RLAC-14-08	Jefferson	Coastal - Surge Only	4.1	29.211908	-90.049392	Jefferso-7
RLAC-14-09	Jefferson	Coastal - Wave Height	4.8	29.193023	-90.079938	Jefferso-8
RLAC-15-02	Jefferson	Coastal - Surge Only	4.6	29.662125	-90.109081	Jefferso-9
RLAR-02-03	Jeff. Davis	Riverine - Hurricane	22.7	30.390525	-92.903358	Jeff. Da-1
RLAR-07-50	Jeff. Davis	Riverine - Hurricane	3.7	30.176870	-92.928622	Jeff. Da-10
RLAR-12-02	Jeff. Davis	Riverine - Hurricane	4.0	30.074822	-92.663378	Jeff. Da-11
RLAR-07-05	Jeff. Davis	Riverine - Hurricane	3.5	30.066710	-92.824815	Jeff. Da-2
RLAR-07-35	Jeff. Davis	Riverine - Hurricane	23.4	30.480733	-92.631528	Jeff. Da-3
RLAR-07-42	Jeff. Davis	Riverine - Hurricane	6.2	30.187152	-92.739284	Jeff. Da-4
RLAR-07-43	Jeff. Davis	Riverine - Hurricane	3.6	30.151543	-92.774651	Jeff. Da-5
RLAR-07-45	Jeff. Davis	Riverine - Hurricane	3.4	30.146834	-92.817359	Jeff. Da-6
RLAR-07-46	Jeff. Davis	Riverine - Hurricane	17.5	30.153342	-92.809600	Jeff. Da-7
RLAR-07-47	Jeff. Davis	Riverine - Hurricane	3.6	30.069789	-92.876570	Jeff. Da-8
RLAR-07-49	Jeff. Davis	Riverine - Hurricane	4.3	30.177244	-92.876040	Jeff. Da-9
RLAR-07-06	Lafayette	Riverine - Hurricane	11.8	30.103449	-92.078797	Lafayett-1
RLAR-07-17	Lafayette	Riverine - Hurricane	18.0	30.107203	-92.029298	Lafayett-10
RLAR-07-18	Lafayette	Riverine - Hurricane	21.0	30.099940	-91.998795	Lafayett-11
RLAR-07-20	Lafayette	Riverine - Hurricane	19.9	30.159262	-92.181040	Lafayett-12
RLAR-07-58	Lafayette	Riverine - Hurricane	11.9	30.142247	-92.076161	Lafayett-13
RLAR-07-59	Lafayette	Riverine - Hurricane	11.7	30.163187	-92.061471	Lafayett-14

HWM ID	County	Flooding Type	HWM Flood Elevation - NAVD 88	Survey Latitude	Survey Longitude	HWM Report Sheet No.
RLAR-07-60	Lafayette	Riverine - Hurricane	9.6	30.195044	-92.016868	Lafayett-15
RLAR-07-61	Lafayette	Riverine - Hurricane	9.6	30.195088	-92.015347	Lafayett-16
RLAR-07-62	Lafayette	Riverine - Hurricane	13.7	30.325692	-91.999659	Lafayett-17
RLAR-07-07	Lafayette	Riverine - Hurricane	11.7	30.141280	-92.076837	Lafayett-2
RLAR-07-08	Lafayette	Riverine - Hurricane	10.3	30.170055	-92.050732	Lafayett-3
RLAR-07-09	Lafayette	Riverine - Hurricane	9.0	30.207565	-92.004862	Lafayett-4
RLAR-07-12	Lafayette	Riverine - Hurricane	16.5	30.209189	-92.034576	Lafayett-5
RLAR-07-13	Lafayette	Riverine - Hurricane	12.6	30.274809	-91.989308	Lafayett-6
RLAR-07-14	Lafayette	Riverine - Hurricane	16.1	30.265108	-92.002985	Lafayett-7
RLAR-07-15	Lafayette	Riverine - Hurricane	14.7	30.143942	-92.114569	Lafayett-8
RLAR-07-16	Lafayette	Riverine - Hurricane	11.7	30.127924	-92.091800	Lafayett-9
RLAC-13-02	Lafourche	Coastal - Surge Only	6.2	29.325402	-90.241147	Lafourch-1
RLAC-14-02	Lafourche	Coastal - Surge Only	4.9	29.155817	-90.180272	Lafourch-2
RLAC-15-14	Lafourche	Coastal - Wave Height	6.3	29.238479	-90.209128	Lafourch-3
RLAC-15-15	Lafourche	Coastal - Wave Height	5.8	29.257622	-90.214718	Lafourch-4
RLAC-15-16	Lafourche	Coastal - Wave Height	6.4	29.306549	-90.235187	Lafourch-5
RLAC-15-17	Lafourche	Coastal - Wave Run-up	5.9	29.342626	-90.247451	Lafourch-6
RLAR-15-13	Lafourche	Coastal - Surge Only	6.6	29.216708	-90.216384	Lafourch-7
RLAC-13-19	Livingston	Riverine - Hurricane	2.7	30.261467	-90.712397	Livingst-1
RLAR-15-04	Livingston	Riverine - Hurricane	4.2	30.258559	-90.712475	Livingst-10
RLAR-20-01	Livingston	Riverine - Hurricane	5.0	30.372872	-90.550517	Livingst-11
RLAR-20-02	Livingston	Riverine - Hurricane	5.0	30.362225	-90.595989	Livingst-12
RLAR-20-03	Livingston	Riverine - Hurricane	4.3	30.299975	-90.648706	Livingst-13
RLR1-15-06	Livingston	Riverine - Hurricane	5.2	30.390386	-90.549345	Livingst-14
RLAC-13-20	Livingston	Riverine - Hurricane	4.3	30.258200	-90.634950	Livingst-2
RLAC-13-21	Livingston	Riverine - Hurricane	4.8	30.308021	-90.588811	Livingst-3
RLAC-13-22	Livingston	Riverine - Hurricane	3.3	30.375107	-90.534897	Livingst-4
RLAR-14-01	Livingston	Riverine - Hurricane	4.0	30.269242	-90.732822	Livingst-5
RLAR-14-02	Livingston	Riverine - Hurricane	4.2	30.374933	-90.540525	Livingst-6
RLAR-14-03	Livingston	Riverine - Hurricane	4.0	30.389706	-90.553633	Livingst-7
RLAR-15-02	Livingston	Riverine - Hurricane	4.1	30.433657	-90.546000	Livingst-8
RLAR-15-03	Livingston	Riverine - Hurricane	3.1	30.504614	-90.576886	Livingst-9
RLAC-11-29	Orleans	Levee break	2.8	29.967673	-90.008584	Orleans-1
RLAC-11-30	Orleans	Levee break	3.0	29.965813	-90.009452	Orleans-2
RLAC-14-22	Orleans	Levee break	3.0	29.966649	-90.009025	Orleans-3

HWM ID	County	Flooding Type	HWM Flood Elevation - NAVD 88	Survey Latitude	Survey Longitude	HWM Report Sheet No.
RLAC-14-23	Orleans	Levee break	5.6	29.964350	-90.025619	Orleans-4
RLAC-15-18	Orleans	Levee break	-1.9	30.032910	-90.000898	Orleans-5
RLAC-13-01	Plaquemines	Coastal - Surge Only	4.2	29.626565	-89.951497	Plaquemi-1
RLAC-17-16	Plaquemines	Coastal - Surge Only	-1.3	29.337127	-89.498079	Plaquemi-10
RLAC-17-17	Plaquemines	Coastal - Surge Only	1.2	29.353417	-89.533231	Plaquemi-11
RLAC-17-18	Plaquemines	Coastal - Surge Only	0.6	29.367829	-89.569263	Plaquemi-12
RLAC-17-19	Plaquemines	Coastal - Surge Only	6.3	29.440721	-89.621595	Plaquemi-13
RLAC-17-20	Plaquemines	Coastal - Wave Height	7.3	29.464696	-89.677407	Plaquemi-14
RLAC-14-01	Plaquemines	Coastal - Surge Only	3.2	29.577049	-89.816777	Plaquemi-2
RLAC-17-09	Plaquemines	Coastal - Surge Only	0.7	29.273584	-89.354106	Plaquemi-3
RLAC-17-10	Plaquemines	Coastal - Surge Only	-1.2	29.290896	-89.368476	Plaquemi-4
RLAC-17-11	Plaquemines	Coastal - Surge Only	0.4	29.318055	-89.388678	Plaquemi-5
RLAC-17-12	Plaquemines	Coastal - Surge Only	2.6	29.336085	-89.406724	Plaquemi-6
RLAC-17-13	Plaquemines	Coastal - Surge Only	1.1	29.352654	-89.440705	Plaquemi-7
RLAC-17-14	Plaquemines	Coastal - Surge Only	1.2	29.341395	-89.470965	Plaquemi-8
RLAC-17-15	Plaquemines	Coastal - Surge Only	-1.2	29.341027	-89.470897	Plaquemi-9
RLAR-07-51	Pointe Coupee	Riverine - Hurricane	12.0	30.534936	-91.458506	Pointe C-1
RLAR-07-53	Pointe Coupee	Riverine - Hurricane	12.1	30.559260	-91.556227	Pointe C-2
RLAR-07-55	Pointe Coupee	Riverine - Hurricane	14.2	30.507845	-91.706363	Pointe C-3
RLAR-12-42	Pointe Coupee	Riverine - Hurricane	38.1	30.940444	-91.721600	Pointe C-4
RLAR-12-43	Pointe Coupee	Riverine - Hurricane	41.1	30.923881	-91.764403	Pointe C-5
RLAR-12-44	Pointe Coupee	Riverine - Hurricane	28.9	30.869653	-91.780492	Pointe C-6
RLAR-02-10	Rapides	Riverine - Hurricane	169.3	31.141564	-92.824598	Rapides-1
RLAR-04-06	Rapides	Riverine - Hurricane	59.9	31.119978	-92.343842	Rapides-2
RLAR-08-10	Rapides	Riverine - Hurricane	119.5	30.996861	-92.674648	Rapides-3
RLAC-14-24	St. Bernard	Coastal - Surge Only	4.4	29.968677	-89.992586	St. Bern-1
RLAC-14-25	St. Bernard	Coastal - Surge Only	5.5	29.964807	-90.000478	St. Bern-2
RLAC-14-26	St. Bernard	Coastal - Surge Only	2.0	29.968496	-89.988662	St. Bern-3
RLAC-11-34	St. Bernard	Levee break	5.3	29.959075	-90.004992	St. Bern-4
RLAR-15-12	St. Charles	Riverine - Hurricane	2.8	29.821591	-90.476381	St. Char-1
RLAC-13-18	St. John the Baptist	Coastal - Surge Only	4.8	30.281081	-90.399921	St. John-1
RLAR-07-36	St. Landry	Riverine - Hurricane	32.3	30.482968	-92.490471	St. Land-1
RLAR-12-22	St. Landry	Riverine - Hurricane	17.0	30.405301	-91.994228	St. Land-10
RLAR-12-24	St. Landry	Riverine - Hurricane	17.8	30.367788	-92.008889	St. Land-11
RLAR-07-38	St. Landry	Riverine - Hurricane	57.9	30.531969	-92.130765	St. Land-2

HWM ID	County	Flooding Type	HWM Flood Elevation - NAVD 88	Survey Latitude	Survey Longitude	HWM Report Sheet No.
RLAR-08-11	St. Landry	Riverine - Hurricane	29.1	30.701678	-92.013608	St. Land-3
RLAR-08-12	St. Landry	Riverine - Hurricane	47.4	30.658588	-92.163108	St. Land-4
RLAR-09-46	St. Landry	Riverine - Hurricane	41.5	30.429422	-92.106713	St. Land-5
RLAR-09-47	St. Landry	Riverine - Hurricane	27.4	30.379127	-92.053524	St. Land-6
RLAR-12-19	St. Landry	Riverine - Hurricane	20.3	30.559022	-91.955258	St. Land-7
RLAR-12-20	St. Landry	Riverine - Hurricane	18.0	30.473629	-91.980184	St. Land-8
RLAR-12-21	St. Landry	Riverine - Hurricane	16.6	30.396814	-91.931694	St. Land-9
RLAR-07-21	St. Martin	Riverine - Hurricane	10.1	30.123217	-91.826194	St. Mart-1
RLAR-07-22	St. Martin	Riverine - Hurricane	3.7	30.211647	-91.702678	St. Mart-2
RLAR-07-26	St. Martin	Riverine - Hurricane	11.5	30.276523	-91.900012	St. Mart-3
RLAR-07-27	St. Martin	Riverine - Hurricane	8.4	30.239350	-91.962603	St. Mart-4
RLAR-12-16	St. Martin	Riverine - Hurricane	9.5	30.104262	-91.882586	St. Mart-5
RLAR-12-23	St. Martin	Riverine - Hurricane	16.5	30.380065	-91.982603	St. Mart-6
RLAR-15-10	St. Martin	Riverine - Hurricane	3.9	29.924212	-91.240803	St. Mart-7
RLAC-01-04	St. Mary	Coastal - Surge Only	5.0	29.658254	-91.248697	St. Mary-1
RLAC-18-08	St. Mary	Coastal - Surge Only	12.2	29.722899	-91.856110	St. Mary-10
RLAC-18-09	St. Mary	Coastal - Surge Only	11.9	29.761133	-91.791923	St. Mary-11
RLAC-18-10	St. Mary	Coastal - Wave Height	6.6	29.573491	-91.537235	St. Mary-12
RLAC-18-11	St. Mary	Coastal - Wave Height	7.9	29.594306	-91.518419	St. Mary-13
RLAR-15-06	St. Mary	Coastal - Wave Run-up	5.7	29.695191	-91.216895	St. Mary-14
RLAR-15-07	St. Mary	Coastal - Wave Run-up	6.1	29.707681	-91.217522	St. Mary-15
RLAR-15-08	St. Mary	Riverine - Hurricane	3.5	29.721692	-91.187977	St. Mary-16
RLAC-01-05	St. Mary	Coastal - Surge Only	4.5	29.643646	-91.504773	St. Mary-2
RLAC-01-06	St. Mary	Coastal - Surge Only	12.0	29.737185	-91.831137	St. Mary-3
RLAC-01-07	St. Mary	Coastal - Surge Only	11.7	29.721061	-91.863558	St. Mary-4
RLAC-03-06	St. Mary	Coastal - Wave Run-up	9.6	29.799147	-91.671762	St. Mary-5
RLAC-12-04	St. Mary	Coastal - Surge Only	5.7	29.902087	-91.513405	St. Mary-6
RLAC-16-15	St. Mary	Coastal - Surge Only	12.1	29.713780	-91.876723	St. Mary-7
RLAC-16-16	St. Mary	Coastal - Surge Only	12.0	29.753394	-91.802621	St. Mary-8
RLAC-18-07	St. Mary	Coastal - Surge Only	11.2	29.716287	-91.875978	St. Mary-9
RLAC-11-40	St. Tammany	Coastal - Surge Only	6.5	30.409118	-90.140446	St. Tamm-1
RLAC-13-11	St. Tammany	Coastal - Surge Only	6.0	30.307464	-89.940598	St. Tamm-10
RLAC-13-12	St. Tammany	Coastal - Surge Only	6.7	30.400344	-90.136012	St. Tamm-11
RLAC-13-13	St. Tammany	Coastal - Surge Only	6.5	30.400113	-90.152757	St. Tamm-12
RLAC-13-14	St. Tammany	Coastal - Surge Only	6.5	30.404900	-90.158342	St. Tamm-13

HWM ID	County	Flooding Type	HWM Flood Elevation - NAVD 88	Survey Latitude	Survey Longitude	HWM Report Sheet No.
RLAC-13-15	St. Tammany	Coastal - Wave Run-up	7.2	30.387735	-90.209298	St. Tamm-14
RLAC-17-03	St. Tammany	Coastal - Wave Run-up	6.6	30.388895	-90.207204	St. Tamm-15
RLAC-17-04	St. Tammany	Coastal - Surge Only	6.3	30.396997	-90.157590	St. Tamm-16
RLAC-17-06	St. Tammany	Coastal - Surge Only	8.7	30.359850	-90.082069	St. Tamm-17
RLAC-17-07	St. Tammany	Coastal - Surge Only	6.8	30.366881	-90.101256	St. Tamm-18
RLAC-17-08	St. Tammany	Coastal - Surge Only	6.3	30.339046	-90.040818	St. Tamm-19
RLAC-13-03	St. Tammany	Coastal - Wave Run-up	8.2	30.364501	-90.092974	St. Tamm-2
RLAR-13-02	St. Tammany	Coastal - Surge Only	5.6	30.299155	-89.941758	St. Tamm-20
RLAR-11-01	St. Tammany	Riverine - Hurricane	6.7	30.463382	-90.118141	St. Tamm-21
RLAR-20-11	St. Tammany	Riverine - Hurricane	6.9	30.325457	-89.710032	St. Tamm-22
RLAR-20-13	St. Tammany	Riverine - Hurricane	5.2	30.303100	-89.706707	St. Tamm-23
RLAC-13-04	St. Tammany	Coastal - Wave Run-up	6.6	30.364935	-90.091837	St. Tamm-3
RLAC-13-05	St. Tammany	Coastal - Wave Run-up	6.0	30.351676	-90.058783	St. Tamm-4
RLAC-13-06	St. Tammany	Coastal - Surge Only	5.0	30.335225	-90.044410	St. Tamm-5
RLAC-13-07	St. Tammany	Coastal - Wave Run-up	5.3	30.258574	-89.836782	St. Tamm-6
RLAC-13-08	St. Tammany	Coastal - Wave Run-up	6.1	30.233696	-89.801518	St. Tamm-7
RLAC-13-09	St. Tammany	Coastal - Surge Only	4.8	30.289546	-89.960199	St. Tamm-8
RLAC-13-10	St. Tammany	Coastal - Surge Only	5.2	30.297402	-89.953586	St. Tamm-9
RLAC-13-16	Tangipahoa	Coastal - Surge Only	6.0	30.411197	-90.273497	Tangipah-1
RLAC-13-17	Tangipahoa	Coastal - Surge Only	3.8	30.290135	-90.401377	Tangipah-2
RLAC-17-01	Tangipahoa	Coastal - Surge Only	5.9	30.404079	-90.324012	Tangipah-3
RLAR-17-02	Tangipahoa	Coastal - Surge Only	6.1	30.405773	-90.262556	Tangipah-4
RLAR-20-10	Tangipahoa	Coastal - Surge Only	5.7	30.404185	-90.323669	Tangipah-5
RLAR-20-14	Tangipahoa	Coastal - Surge Only	5.4	30.438668	-90.267666	Tangipah-6
RLAR-16-01	Tangipahoa	Riverine - Hurricane	5.0	30.425380	-90.493295	Tangipah-7
RLAR-16-02	Tangipahoa	Riverine - Hurricane	5.8	30.439765	-90.482758	Tangipah-8
RLAR-16-03	Tangipahoa	Riverine - Hurricane	9.0	30.456412	-90.456648	Tangipah-9
RLAC-16-06	Terrebonne	Coastal - Wave Height	6.7	29.302506	-90.669808	Terrebon-1
RLAC-03-07	Terrebonne	Levee issue	2.0	29.446105	-90.593838	Terrebon-10
RLAC-16-01	Terrebonne	Levee issue	5.3	29.336005	-90.842419	Terrebon-11
RLAC-16-02	Terrebonne	Levee issue	5.5	29.376462	-90.805707	Terrebon-12
RLAC-16-03	Terrebonne	Levee issue	6.3	29.405502	-90.787658	Terrebon-13
RLAC-16-04	Terrebonne	Levee issue	8.0	29.438710	-90.751560	Terrebon-14
RLAC-16-05	Terrebonne	Levee issue	6.2	29.457892	-90.749956	Terrebon-15
RLAC-18-03	Terrebonne	Levee issue	4.3	29.446880	-90.565351	Terrebon-16

HWM ID	County	Flooding Type	HWM Flood Elevation - NAVD 88	Survey Latitude	Survey Longitude	HWM Report Sheet No.
RLAC-18-06	Terrebonne	Levee issue	3.9	29.426602	-90.600292	Terrebon-17
RLAC-16-07	Terrebonne	Coastal - Surge Only	7.2	29.375847	-90.712811	Terrebon-2
RLAC-16-08	Terrebonne	Coastal - Surge Only	6.8	29.407842	-90.700515	Terrebon-3
RLAC-16-09	Terrebonne	Coastal - Surge Only	7.4	29.452947	-90.702649	Terrebon-4
RLAC-16-10	Terrebonne	Coastal - Surge Only	4.0	29.498044	-90.679589	Terrebon-5
RLAC-18-01	Terrebonne	Coastal - Surge Only	8.3	29.367308	-90.600972	Terrebon-6
RLAC-18-02	Terrebonne	Coastal - Wave Run-up	7.6	29.387511	-90.586947	Terrebon-7
RLAC-18-04	Terrebonne	Coastal - Wave Height	9.2	29.245935	-90.662049	Terrebon-8
RLAC-18-05	Terrebonne	Coastal - Surge Only	7.3	29.367480	-90.625131	Terrebon-9
RLAC-01-01	Vermilion	Coastal - Surge Only	4.2	29.840679	-92.299351	Vermilio-1
RLAC-11-21	Vermilion	Coastal - Surge Only	10.4	29.662433	-92.536392	Vermilio-10
RLAC-11-22	Vermilion	Coastal - Surge Only	12.2	29.656636	-92.503265	Vermilio-11
RLAC-11-23	Vermilion	Coastal - Surge Only	9.7	29.646835	-92.451887	Vermilio-12
RLAC-11-24	Vermilion	Coastal - Surge Only	8.0	29.899173	-92.262505	Vermilio-13
RLAC-11-25	Vermilion	Coastal - Surge Only	6.1	29.757777	-92.329860	Vermilio-14
RLAC-11-26	Vermilion	Coastal - Surge Only	7.2	29.692733	-92.356038	Vermilio-15
RLAC-11-27	Vermilion	Coastal - Surge Only	8.7	29.657394	-92.369294	Vermilio-16
RLAC-11-31	Vermilion	Coastal - Surge Only	9.7	29.842164	-92.203134	Vermilio-17
RLAC-11-32	Vermilion	Coastal - Surge Only	8.5	29.846990	-92.241447	Vermilio-18
RLAC-11-33	Vermilion	Coastal - Wave Height	10.4	29.647735	-92.419157	Vermilio-19
RLAC-01-02	Vermilion	Coastal - Surge Only	7.4	29.845941	-92.295195	Vermilio-2
RLAC-12-01	Vermilion	Coastal - Surge Only	6.9	29.852591	-92.305400	Vermilio-20
RLAC-14-10	Vermilion	Coastal - Surge Only	12.3	29.875477	-92.053468	Vermilio-21
RLAC-14-11	Vermilion	Coastal - Surge Only	11.6	29.897080	-92.055203	Vermilio-22
RLAC-14-12	Vermilion	Coastal - Surge Only	11.5	29.911310	-92.055895	Vermilio-23
RLAC-14-13	Vermilion	Coastal - Wave Run-up	10.9	29.915453	-92.056112	Vermilio-24
RLAC-14-15	Vermilion	Coastal - Surge Only	8.8	29.957331	-92.034284	Vermilio-25
RLAC-14-16	Vermilion	Coastal - Surge Only	11.2	29.907788	-91.997738	Vermilio-26
RLAC-14-17	Vermilion	Coastal - Surge Only	12.5	29.866309	-92.029872	Vermilio-27
RLAC-14-18	Vermilion	Coastal - Surge Only	12.1	29.882992	-92.075513	Vermilio-28
RLAC-14-19	Vermilion	Coastal - Surge Only	8.3	29.976585	-92.030239	Vermilio-29
RLAC-01-03	Vermilion	Coastal - Surge Only	7.8	29.917425	-92.163258	Vermilio-3
RLAC-14-20	Vermilion	Coastal - Surge Only	8.9	29.966011	-91.991645	Vermilio-30
RLAR-07-57	Vermilion	Riverine - Hurricane	9.4	30.103916	-92.080211	Vermilio-31
RLAR-12-04	Vermilion	Riverine - Hurricane	8.7	30.021661	-92.513823	Vermilio-32

HWM ID	County	Flooding Type	HWM Flood Elevation - NAVD 88	Survey Latitude	Survey Longitude	HWM Report Sheet No.
RLAR-12-06	Vermilion	Riverine - Hurricane	3.5	29.962562	-92.514317	Vermilio-33
RLAR-12-07	Vermilion	Riverine - Hurricane	8.0	29.950999	-92.156578	Vermilio-34
RLAR-12-08	Vermilion	Riverine - Hurricane	9.6	29.975136	-92.139499	Vermilio-35
RLAR-12-09	Vermilion	Riverine - Hurricane	9.8	29.983437	-92.137118	Vermilio-36
RLAC-03-01	Vermilion	Coastal - Wave Run-up	6.8	29.856647	-92.287841	Vermilio-4
RLAC-03-04	Vermilion	Coastal - Wave Run-up	8.0	29.984791	-92.023379	Vermilio-5
RLAC-10-19	Vermilion	Coastal - Surge Only	14.0	29.839444	-92.030350	Vermilio-6
RLAC-10-21	Vermilion	Coastal - Surge Only	11.0	29.824720	-92.126348	Vermilio-7
RLAC-10-22	Vermilion	Coastal - Surge Only	11.0	29.781378	-92.187163	Vermilio-8
RLAC-10-23	Vermilion	Coastal - Surge Only	10.7	29.798028	-92.141153	Vermilio-9
RLAR-08-02	Vernon	Riverine - Hurricane	199.0	30.964361	-93.074528	Vernon-1
RLAR-08-03	Vernon	Riverine - Hurricane	175.5	30.965000	-93.054861	Vernon-2
RLAR-08-05	Vernon	Riverine - Hurricane	142.7	30.894278	-93.072028	Vernon-3
RLAR-08-09	Vernon	Riverine - Hurricane	142.4	30.943056	-92.953333	Vernon-4
RLAR-09-30	Vernon	Riverine - Hurricane	203.0	31.107583	-93.270500	Vernon-5
RLAR-10-37	Vernon	Riverine - Hurricane	196.1	31.043639	-93.275778	Vernon-6
RLAR-10-38	Vernon	Riverine - Hurricane	174.1	30.904639	-93.288250	Vernon-7
RLAR-10-39	Vernon	Riverine - Hurricane	152.8	30.891694	-93.346861	Vernon-8
RLAR-10-40	Vernon	Riverine - Hurricane	181.2	31.072139	-93.302000	Vernon-9

APPENDICES

Appendix A. Field Data Collection Forms

FLAGGER HIGH WATER MARK – COASTAL and RIVERINE
DATA COLLECTION REPORT FORM
(For Use By Flaggers) **HMTAP TO No.** _____

HWM ID (e.g. DFLC-07-01) (Repeat in case forms are separated)		
HWM Street Address		
Rep Loss Number		
Multiple HWM	(Circle One): Yes No	
HWM Area Identifier		
Subdivision / Industrial Park		
Date of Flagging/Interview		
Date of Flood Event		
Type/Name of Storm Event	(Circle One): Hurricane, Tropical Storm, Tropical Depression, Other:	Name of storm event (e.g., Dennis)
Disaster Number (e.g.: DR-1539-FL)		
Date of Peak		
Source for Date of Peak		
Stream Name/Flood Source (Closest/responsible water body)		
Municipality, City or Town (Circle One: Known, closest)		
County		
State		
Type of HWM – (Circle One) If Personal Account or Other, you MUST provide comment	Mud Line Wrack Line Debris Line Water Line Personal Account Other Comment	
Wind Water Debris Line	(Circle One): Yes No	
HWM Object, Surface (What object, surface is the HWM on? An interior/exterior wall, tree, fence, etc...)		

FLAGGER HIGH WATER MARK – COASTAL and RIVERINE
DATA COLLECTION REPORT FORM
(For Use By Flaggers) HMTAP TO No. _____

HWM ID (e.g. DFLC-07-01) (Repeat in case forms are separated)			
Location/Directions to HWM Object			
Was a Vertical Offset Measurement used for HWM (Circle Yes, No. If Yes, enter data)	Yes No	If Yes: Measurement: Description of offset point:	
Vertical Distance HWM to existing ground (feet) (Required)			
HWM Quality – (Circle One)	GOOD	FAIR	POOR
Description of Marker Used To Flag HWM (e.g. red paint, tape. NOTE: HWM IS LINE AT BOTTOM OF TAPE OR PAINT. UNLESS the Flagger indicates that there is a vertical offset from the marked point)			
Survey of HWM Needed	YES	NO	
Flagger HWM Latitude (Decimal Degrees ex: 29.12345 (5 places))	N		DECIMAL DEGREES
Flagger HWM Longitude (Decimal Degrees ex: 84.12345 (5 places))	W		DECIMAL DEGREES
Flooding Type – (Circle One)	Riverine Choices are: - Riverine - Heavy Rain - Riverine - Hurricane	Coastal Choices are: - Coastal - surge only - Coastal - wave height - Coastal - wave runup	Breached Levee
Estimated HWM Surge Level and what is this based on (Coastal HWM Only)	Elevation (Feet) Based On:		
Timestamp of Surge Estimate (Coastal HWM Only)	____ : ____ AM / PM CENTRAL / EASTERN		
Photo ID (HWM ID)-(Photo file name from camera)	Photo 1 (HWM mark from 20 feet away)		Photo 2 (Structure / Area from 50 feet away)
Photos Location/Orientation			
Photos Description/Subject			
Unit Number (2-digit number)			

FLAGGER HIGH WATER MARK – COASTAL and RIVERINE
DATA COLLECTION REPORT FORM
(For Use By Flaggers) **HMTAP TO No.** _____

HWM ID (e.g. DFLC-07-01) (Repeat in case forms are separated)		
Name of Flagger 1/Flagger 2	1	2
Flagger 1 Company/Flagger 2 Company	1	2
Flagger's Comments		
Resident/Eyewitness Information		
Name		
Address		
Obtained Permission to Survey	Yes	No
Phone		
Length of residence or familiarity with area		
Relevant witness Information (Document only if witness is willing to have personal information included in record)		
Wind Damage Data		
Structure Damage (Circle as applicable)	1) No Damage; 2) Structure type (use): residential, commercial, agricultural, mobile home; 3) Cause: wind, fallen objects, blown debris; 4) Severity (subjective): light, moderate, severe	
Tree Damage (Circle as applicable)	1) No Damage; 2) Tree Species: oak, pine, palm, other; 3) Damage: uprooted, snapped, twisted; 4) Severity (subjective): light (single tree), moderate, severe	
Overhead Utility Damage (Circle as applicable)	1) No Damage; 2) Materials: wood, metal, concrete; 3) Utility Type: power, telephone, cable; 4) Cause: wind, fallen objects, blown debris; 5) Severity (subjective): light, moderate, sever	

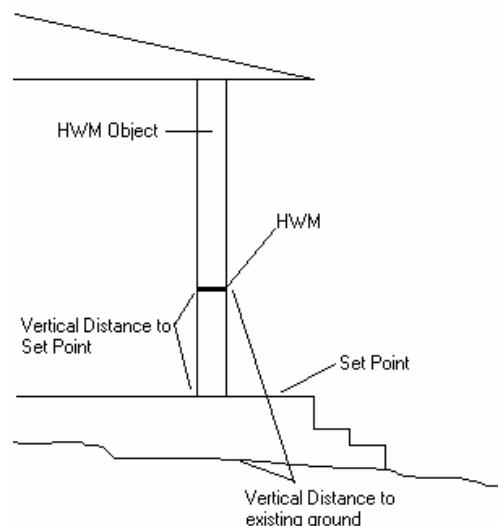
**FLAGGER HIGH WATER MARK – COASTAL and RIVERINE
DATA COLLECTION REPORT FORM**
(For Use By Flaggers) HMTAP TO No. _____

HWM ID (e.g. DFLC-07-01) (Repeat in case forms are separated)	
Other Damage/Comments	

Required Plan/ Elevation View Sketches (use back if needed)

- Required: 1) Sketch/Plan of nearest cross roads, directions to get to the HWM
2) Plan and Elevation views of the HWM

Example Measurements



**SURVEYOR'S
HIGH WATER MARK (HWM) – COASTAL AND RIVERINE
DATA COLLECTION REPORT FORM**

HMTAP TO No.

HWM ID (Repeat in case forms are separated)		
HWM Street Address		
Municipality, City or Town (Known, closest)		
County		
State		
Exact Mark To Survey		
HWM Flood Elevation (NAVD 88 Datum) (1)		
HWM Flood Elevation (NGVD 29) (1)		
Was Flagger's Vertical Offset Measurement used to survey HWM Elevation (1)		No Yes
If Yes, then:	Flagger Vertical Offset Distance	
	Surveyed Elevation of Reference Point (NAVD 88)	
Survey Latitude Must Use Decimal Degrees (6 Decimal places)		N
Survey Longitude Must Use Decimal Degrees (6 Decimal places)		W
Northing (feet)		
Easting (feet)		
Approx. First Floor Elevation (NAVD 88)		
Map Projection Used During Survey		
Vertical Datum		NAVD 88 NGVD 29 OTHER:
Horizontal Datum		NAD 83 OTHER:
Survey Crew		
Responsible Licensed Professional Land Surveyor Name and Number		PLS Name:
Survey Company / Office Location		

URS

FigA-2_445 - Surveyor Form Rev September 1, 2005.doc

Storm _____

**SURVEYOR'S
HIGH WATER MARK (HWM) – COASTAL AND RIVERINE
DATA COLLECTION REPORT FORM**

HMTAP TO No.

HWM ID

(Repeat in case forms are separated)

Survey Date (e.g. 07/15/2005)	
Surveyor's Comments	

(1) note that the HWM is the line at the bottom of the tape or paint UNLESS the Flagger indicates that there is a vertical offset from the marked point

Surveyor Plan/ Elevation View Sketches (if needed)

APPENDICES

Appendix B. Maps

Table B-1 Appendix B Figures

Parish	Figure	Parish	Figure
ACADIA PARISH	B-6	ORLEANS PARISH	B-2
ALLEN PARISH	B-10	PLAQUEMINES PARISH	B-1
ASSUMPTION PARISH	B-4	POINTE COUPEE PARISH	B-3
AVOYELLES PARISH	B-3	RAPIDES PARISH	B-10
BEAUREGARD PARISH	B-10	ST. BERNARD PARISH	B-2
CALCASIEU PARISH (eastern)	B-7	ST. CHARLES PARISH	B-1
CALCASIEU PARISH (western)	B-9	ST. JOHN THE BAPTIST PARISH	B-2
CAMERON PARISH (eastern)	B-7	ST. LANDRY PARISH	B-6
CAMERON PARISH (western)	B-8	ST. MARTIN PARISH (south)	B-4
EVANGELINE PARISH	B-6	ST. MARTIN PARISH (north)	B-6
IBERIA PARISH (eastern)	B-4	ST. MARY PARISH	B-4
IBERIA PARISH (western)	B-5	ST. TAMMANY PARISH	B-2
JEFFERSON PARISH	B-1	TANGIPAHOA PARISH	B-2
JEFFERSON DAVIS PARISH	B-7	TERREBONNE PARISH	B-4
LAFAYETTE PARISH	B-6	VERMILLION PARISH	B-5
LAFOURCHE PARISH	B-1	VERNON PARISH	B-10
LIVINGSTON PARISH	B-3		

Table B-2 Hurricane Rita Louisiana HWM Data Summary (same as Table 8, sorted by HWM-ID)¹

HWM ID	County	Flooding Type	HWM				HWM Report Sheet No.
			Flood Elevation - NAVD 88	Survey Latitude	Survey Longitude		
RLAC-01-01	Vermilion	Coastal - Surge Only	4.2	29.840679	-92.299351	Vermilio-1	
RLAC-01-02	Vermilion	Coastal - Surge Only	7.4	29.845941	-92.295195	Vermilio-2	
RLAC-01-03	Vermilion	Coastal - Surge Only	7.8	29.917425	-92.163258	Vermilio-3	
RLAC-01-04	St. Mary	Coastal - Surge Only	5.0	29.658254	-91.248697	St. Mary-1	
RLAC-01-05	St. Mary	Coastal - Surge Only	4.5	29.643646	-91.504773	St. Mary-2	
RLAC-01-06	St. Mary	Coastal - Surge Only	12.0	29.737185	-91.831137	St. Mary-3	
RLAC-01-07	St. Mary	Coastal - Surge Only	11.7	29.721061	-91.863558	St. Mary-4	
RLAC-03-01	Vermilion	Coastal - Wave Run-up	6.8	29.856647	-92.287841	Vermilio-4	
RLAC-03-02	Cameron	Coastal - Wave Run-up	4.6	29.988917	-93.088483	Cameron-1	
RLAC-03-03	Calcasieu	Coastal - Wave Run-up	6.1	30.113895	-93.359461	Calcasie-1	
RLAC-03-04	Vermilion	Coastal - Wave Run-up	8.0	29.984791	-92.023379	Vermilio-5	
RLAC-03-05	Iberia	Coastal - Surge Only	6.9	29.909657	-91.784621	Iberia-1	
RLAC-03-06	St. Mary	Coastal - Wave Run-up	9.6	29.799147	-91.671762	St. Mary-5	
RLAC-03-07	Terrebonne	Levee issue	2.0	29.446105	-90.593838	Terrebon-10	
RLAC-04-01	Calcasieu	Riverine - Hurricane	14.6	30.351813	-93.235657	Calcasie-18	
RLAC-04-02	Calcasieu	Riverine - Hurricane	21.3	30.354729	-93.200577	Calcasie-19	
RLAC-07-01	Calcasieu	Riverine - Hurricane	6.9	30.294645	-93.265481	Calcasie-20	
RLAC-07-02	Calcasieu	Riverine - Hurricane	6.7	30.293900	-93.261137	Calcasie-21	
RLAC-08-01	Calcasieu	Coastal - Wave Run-up	8.2	30.187479	-93.278122	Calcasie-2	
RLAC-08-02	Calcasieu	Coastal - Wave Run-up	7.8	30.174028	-93.284579	Calcasie-3	
RLAC-08-03	Calcasieu	Coastal - Wave Run-up	7.8	30.217121	-93.233952	Calcasie-4	
RLAC-08-04	Calcasieu	Coastal - Wave Run-up	8.4	30.236664	-93.235109	Calcasie-5	
RLAC-08-05	Calcasieu	Riverine - Hurricane	7.6	30.278852	-93.232377	Calcasie-22	
RLAC-08-06	Cameron	Riverine - Hurricane	3.9	30.004133	-92.779352	Cameron-39	
RLAC-09-01	Cameron	Coastal - Surge Only	6.9	29.993480	-93.360210	Cameron-2	
RLAC-09-03	Cameron	Coastal - Surge Only	12.4	29.762741	-93.662900	Cameron-3	
RLAC-09-04	Cameron	Coastal - Surge Only	9.1	29.765254	-93.781730	Cameron-4	
RLAC-09-05	Cameron	Coastal - Surge Only	10.9	29.765285	-93.764017	Cameron-5	
RLAC-09-06	Cameron	Coastal - Surge Only	10.0	29.763964	-93.718943	Cameron-6	
RLAC-09-07	Cameron	Coastal - Surge Only	9.4	29.763590	-93.708700	Cameron-7	
RLAC-09-08	Cameron	Coastal - Surge Only	11.1	29.763500	-93.707518	Cameron-8	

¹ Note – For HWM data summary listing sorted by Parish and HWM sheet number, refer to Table 8

HWM ID	County	Flooding Type	HWM Flood Elevation - NAVD 88	Survey Latitude	Survey Longitude	HWM Report Sheet No.
RLAC-09-09	Cameron	Coastal - Surge Only	11.4	29.763094	-93.697283	Cameron-9
RLAC-09-10	Cameron	Coastal - Surge Only	7.7	29.971096	-93.377918	Cameron-10
RLAC-09-11	Cameron	Coastal - Surge Only	7.5	29.981009	-93.371773	Cameron-11
RLAC-09-12	Cameron	Coastal - Surge Only	4.9	29.986049	-93.403823	Cameron-12
RLAC-09-13	Calcasieu	Coastal - Surge Only	6.4	30.085172	-93.371600	Calcasie-6
RLAC-09-14	Calcasieu	Coastal - Surge Only	5.3	30.092428	-93.396653	Calcasie-7
RLAC-09-15	Calcasieu	Coastal - Surge Only	8.2	30.139303	-93.411395	Calcasie-8
RLAC-09-16	Calcasieu	Coastal - Surge Only	8.5	30.139139	-93.510524	Calcasie-9
RLAC-09-17	Calcasieu	Coastal - Surge Only	11.8	30.139202	-93.473439	Calcasie-10
RLAC-09-18	Calcasieu	Coastal - Surge Only	9.2	30.146397	-93.434901	Calcasie-11
RLAC-09-20	Calcasieu	Riverine - Hurricane	10.4	30.304807	-93.168260	Calcasie-23
RLAC-09-21	Calcasieu	Riverine - Hurricane	5.8	30.303611	-93.160247	Calcasie-24
RLAC-09-23	Cameron	Coastal - Surge Only	6.7	29.761327	-93.865615	Cameron-13
RLAC-09-24	Cameron	Coastal - Surge Only	9.9	29.773408	-93.833338	Cameron-14
RLAC-09-25	Calcasieu	Riverine - Hurricane	7.4	30.272269	-93.175029	Calcasie-25
RLAC-09-26	Calcasieu	Riverine - Hurricane	7.5	30.271858	-93.173986	Calcasie-26
RLAC-09-27	Calcasieu	Riverine - Hurricane	9.9	30.106303	-93.679862	Calcasie-27
RLAC-09-41	Calcasieu	Riverine - Hurricane	14.2	30.282114	-93.654903	Calcasie-28
RLAC-09-42	Calcasieu	Riverine - Hurricane	23.5	30.358208	-93.685652	Calcasie-29
RLAC-09-43	Calcasieu	Riverine - Hurricane	21.7	30.305705	-93.599669	Calcasie-30
RLAC-09-44	Calcasieu	Riverine - Hurricane	35.3	30.387998	-93.623261	Calcasie-31
RLAC-09-45	Calcasieu	Riverine - Hurricane	32.8	30.372885	-93.516421	Calcasie-32
RLAC-10-02	Calcasieu	Coastal - Surge Only	8.2	30.132226	-93.322348	Calcasie-12
RLAC-10-03	Calcasieu	Coastal - Surge Only	9.5	30.104331	-93.306734	Calcasie-13
RLAC-10-04	Cameron	Coastal - Surge Only	17.8	29.786650	-93.183722	Cameron-15
RLAC-10-05	Cameron	Coastal - Surge Only	12.7	29.790792	-93.214963	Cameron-16
RLAC-10-07	Calcasieu	Coastal - Surge Only	9.9	30.062072	-93.287789	Calcasie-14
RLAC-10-08	Cameron	Coastal - Surge Only	9.5	30.030626	-93.275977	Cameron-17
RLAC-10-10	Cameron	Coastal - Wave Height	16.2	29.784981	-93.326403	Cameron-18
RLAC-10-11	Cameron	Coastal - Surge Only	15.1	29.788275	-93.262857	Cameron-19
RLAC-10-12	Cameron	Coastal - Surge Only	4.7	29.989338	-93.128393	Cameron-20
RLAC-10-16	Cameron	Coastal - Surge Only	4.7	30.016642	-93.176925	Cameron-21
RLAC-10-18	Cameron	Coastal - Surge Only	8.1	29.977557	-93.227947	Cameron-22
RLAC-10-19	Vermilion	Coastal - Surge Only	14.0	29.839444	-92.030350	Vermilio-6
RLAC-10-21	Vermilion	Coastal - Surge Only	11.0	29.824720	-92.126348	Vermilio-7

HWM ID	County	Flooding Type	HWM Flood Elevation - NAVD 88	Survey Latitude	Survey Longitude	HWM Report Sheet No.
RLAC-10-22	Vermilion	Coastal - Surge Only	11.0	29.781378	-92.187163	Vermilio-8
RLAC-10-23	Vermilion	Coastal - Surge Only	10.7	29.798028	-92.141153	Vermilio-9
RLAC-11-01	Calcasieu	Coastal - Wave Runup	7.2	30.099646	-93.359046	Calcasie-15
RLAC-11-02	Calcasieu	Coastal - Wave Run-up	6.7	30.094660	-93.360190	Calcasie-16
RLAC-11-03	Calcasieu	Coastal - Surge Only	6.2	30.064408	-93.354743	Calcasie-17
RLAC-11-04	Cameron	Coastal - Wave Run-up	7.8	30.038719	-93.340177	Cameron-23
RLAC-11-05	Cameron	Coastal - Surge Only	6.9	29.993585	-93.365722	Cameron-24
RLAC-11-06	Cameron	Coastal - Surge Only	16.4	29.809964	-93.474262	Cameron-25
RLAC-11-08	Cameron	Coastal - Surge Only	8.0	29.977234	-93.367558	Cameron-26
RLAC-11-09	Cameron	Coastal - Surge Only	12.7	29.808685	-93.158719	Cameron-27
RLAC-11-10	Cameron	Coastal - Surge Only	12.3	29.814851	-93.105732	Cameron-28
RLAC-11-11	Cameron	Coastal - Surge Only	7.3	29.931766	-93.078602	Cameron-29
RLAC-11-12	Cameron	Coastal - Surge Only	3.7	29.977728	-93.088128	Cameron-30
RLAC-11-13	Cameron	Coastal - Surge Only	5.7	29.950531	-93.088116	Cameron-31
RLAC-11-14	Cameron	Coastal - Surge Only	10.8	29.822907	-92.999112	Cameron-32
RLAC-11-15	Cameron	Coastal - Surge Only	13.4	29.786466	-93.107169	Cameron-33
RLAC-11-16	Cameron	Coastal - Surge Only	14.5	29.768675	-92.985555	Cameron-34
RLAC-11-17	Cameron	Coastal - Surge Only	15.0	29.751535	-92.905844	Cameron-35
RLAC-11-18	Cameron	Coastal - Surge Only	11.9	29.736269	-92.844097	Cameron-36
RLAC-11-19	Cameron	Coastal - Surge Only	13.2	29.729592	-92.817686	Cameron-37
RLAC-11-20	Cameron	Coastal - Surge Only	9.0	29.870872	-93.079508	Cameron-38
RLAC-11-21	Vermilion	Coastal - Surge Only	10.4	29.662433	-92.536392	Vermilio-10
RLAC-11-22	Vermilion	Coastal - Surge Only	12.2	29.656636	-92.503265	Vermilio-11
RLAC-11-23	Vermilion	Coastal - Surge Only	9.7	29.646835	-92.451887	Vermilio-12
RLAC-11-24	Vermilion	Coastal - Surge Only	8.0	29.899173	-92.262505	Vermilio-13
RLAC-11-25	Vermilion	Coastal - Surge Only	6.1	29.757777	-92.329860	Vermilio-14
RLAC-11-26	Vermilion	Coastal - Surge Only	7.2	29.692733	-92.356038	Vermilio-15
RLAC-11-27	Vermilion	Coastal - Surge Only	8.7	29.657394	-92.369294	Vermilio-16
RLAC-11-29	Orleans	Levee break	2.8	29.967673	-90.008584	Orleans-1
RLAC-11-30	Orleans	Levee break	3.0	29.965813	-90.009452	Orleans-2
RLAC-11-31	Vermilion	Coastal - Surge Only	9.7	29.842164	-92.203134	Vermilio-17
RLAC-11-32	Vermilion	Coastal - Surge Only	8.5	29.846990	-92.241447	Vermilio-18
RLAC-11-33	Vermilion	Coastal - Wave Height	10.4	29.647735	-92.419157	Vermilio-19
RLAC-11-34	St. Bernard	Levee break	5.3	29.959075	-90.004992	St. Bern-4
RLAC-11-40	St. Tammany	Coastal - Surge Only	6.5	30.409118	-90.140446	St. Tamm-1

HWM ID	County	Flooding Type	HWM Flood Elevation - NAVD 88	Survey Latitude	Survey Longitude	HWM Report Sheet No.
RLAC-12-01	Vermilion	Coastal - Surge Only	6.9	29.852591	-92.305400	Vermilio-20
RLAC-12-03	Iberia	Coastal - Surge Only	9.4	29.951093	-91.983084	Iberia-2
RLAC-12-04	St. Mary	Coastal - Surge Only	5.7	29.902087	-91.513405	St. Mary-6
RLAC-12-05	Calcasieu	Riverine - Hurricane	7.5	30.303425	-93.249390	Calcasie-33
RLAC-12-06	Calcasieu	Riverine - Hurricane	9.0	30.303685	-93.249084	Calcasie-34
RLAC-12-07	Calcasieu	Riverine - Hurricane	7.2	30.293699	-93.261283	Calcasie-35
RLAC-13-01	Plaquemines	Coastal - Surge Only	4.2	29.626565	-89.951497	Plaquemi-1
RLAC-13-02	Lafourche	Coastal - Surge Only	6.2	29.325402	-90.241147	Lafourch-1
RLAC-13-03	St. Tammany	Coastal - Wave Run-up	8.2	30.364501	-90.092974	St. Tamm-2
RLAC-13-04	St. Tammany	Coastal - Wave Run-up	6.6	30.364935	-90.091837	St. Tamm-3
RLAC-13-05	St. Tammany	Coastal - Wave Run-up	6.0	30.351676	-90.058783	St. Tamm-4
RLAC-13-06	St. Tammany	Coastal - Surge Only	5.0	30.335225	-90.044410	St. Tamm-5
RLAC-13-07	St. Tammany	Coastal - Wave Run-up	5.3	30.258574	-89.836782	St. Tamm-6
RLAC-13-08	St. Tammany	Coastal - Wave Run-up	6.1	30.233696	-89.801518	St. Tamm-7
RLAC-13-09	St. Tammany	Coastal - Surge Only	4.8	30.289546	-89.960199	St. Tamm-8
RLAC-13-10	St. Tammany	Coastal - Surge Only	5.2	30.297402	-89.953586	St. Tamm-9
RLAC-13-11	St. Tammany	Coastal - Surge Only	6.0	30.307464	-89.940598	St. Tamm-10
RLAC-13-12	St. Tammany	Coastal - Surge Only	6.7	30.400344	-90.136012	St. Tamm-11
RLAC-13-13	St. Tammany	Coastal - Surge Only	6.5	30.400113	-90.152757	St. Tamm-12
RLAC-13-14	St. Tammany	Coastal - Surge Only	6.5	30.404900	-90.158342	St. Tamm-13
RLAC-13-15	St. Tammany	Coastal - Wave Run-up	7.2	30.387735	-90.209298	St. Tamm-14
RLAC-13-16	Tangipahoa	Coastal - Surge Only	6.0	30.411197	-90.273497	Tangipah-1
RLAC-13-17	Tangipahoa	Coastal - Surge Only	3.8	30.290135	-90.401377	Tangipah-2
RLAC-13-18	St. John the Baptist	Coastal - Surge Only	4.8	30.281081	-90.399921	St. John-1
RLAC-13-19	Livingston	Riverine - Hurricane	2.7	30.261467	-90.712397	Livingst-1
RLAC-13-20	Livingston	Riverine - Hurricane	4.3	30.258200	-90.634950	Livingst-2
RLAC-13-21	Livingston	Riverine - Hurricane	4.8	30.308021	-90.588811	Livingst-3
RLAC-13-22	Livingston	Riverine - Hurricane	3.3	30.375107	-90.534897	Livingst-4
RLAC-13-23	Jefferson	Coastal - Surge Only	4.2	29.260584	-89.963170	Jefferso-1
RLAC-14-01	Plaquemines	Coastal - Surge Only	3.2	29.577049	-89.816777	Plaquemi-2
RLAC-14-02	Lafourche	Coastal - Surge Only	4.9	29.155817	-90.180272	Lafourch-2
RLAC-14-03	Jefferson	Coastal - Surge Only	4.8	29.263374	-89.957239	Jefferso-2
RLAC-14-04	Jefferson	Coastal - Surge Only	5.3	29.235907	-89.999195	Jefferso-3
RLAC-14-05	Jefferson	Coastal - Surge Only	4.6	29.224759	-90.013721	Jefferso-4
RLAC-14-06	Jefferson	Coastal - Surge Only	4.4	29.202063	-90.039667	Jefferso-5

HWM ID	County	Flooding Type	HWM Flood Elevation - NAVD 88	Survey Latitude	Survey Longitude	HWM Report Sheet No.
RLAC-14-07	Jefferson	Coastal - Surge Only	4.8	29.209261	-90.053672	Jefferso-6
RLAC-14-08	Jefferson	Coastal - Surge Only	4.1	29.211908	-90.049392	Jefferso-7
RLAC-14-09	Jefferson	Coastal - Wave Height	4.8	29.193023	-90.079938	Jefferso-8
RLAC-14-10	Vermilion	Coastal - Surge Only	12.3	29.875477	-92.053468	Vermilio-21
RLAC-14-11	Vermilion	Coastal - Surge Only	11.6	29.897080	-92.055203	Vermilio-22
RLAC-14-12	Vermilion	Coastal - Surge Only	11.5	29.911310	-92.055895	Vermilio-23
RLAC-14-13	Vermilion	Coastal - Wave Run-up	10.9	29.915453	-92.056112	Vermilio-24
RLAC-14-15	Vermilion	Coastal - Surge Only	8.8	29.957331	-92.034284	Vermilio-25
RLAC-14-16	Vermilion	Coastal - Surge Only	11.2	29.907788	-91.997738	Vermilio-26
RLAC-14-17	Vermilion	Coastal - Surge Only	12.5	29.866309	-92.029872	Vermilio-27
RLAC-14-18	Vermilion	Coastal - Surge Only	12.1	29.882992	-92.075513	Vermilio-28
RLAC-14-19	Vermilion	Coastal - Surge Only	8.3	29.976585	-92.030239	Vermilio-29
RLAC-14-20	Vermilion	Coastal - Surge Only	8.9	29.966011	-91.991645	Vermilio-30
RLAC-14-21	Iberia	Coastal - Surge Only	9.2	29.953788	-91.984170	Iberia-3
RLAC-14-22	Orleans	Levee break	3.0	29.966649	-90.009025	Orleans-3
RLAC-14-23	Orleans	Levee break	5.6	29.964350	-90.025619	Orleans-4
RLAC-14-24	St. Bernard	Coastal - Surge Only	4.4	29.968677	-89.992586	St. Bern-1
RLAC-14-25	St. Bernard	Coastal - Surge Only	5.5	29.964807	-90.000478	St. Bern-2
RLAC-14-26	St. Bernard	Coastal - Surge Only	2.0	29.968496	-89.988662	St. Bern-3
RLAC-15-02	Jefferson	Coastal - Surge Only	4.6	29.662125	-90.109081	Jefferso-9
RLAC-15-03	Jefferson	Coastal - Surge Only	3.6	29.731384	-90.123041	Jefferso-10
RLAC-15-04	Jefferson	Coastal - Surge Only	2.8	29.760826	-90.102972	Jefferso-11
RLAC-15-05	Jefferson	Coastal - Surge Only	3.6	29.767612	-90.083568	Jefferso-12
RLAC-15-14	Lafourche	Coastal - Wave Height	6.3	29.238479	-90.209128	Lafourn-3
RLAC-15-15	Lafourche	Coastal - Wave Height	5.8	29.257622	-90.214718	Lafourn-4
RLAC-15-16	Lafourche	Coastal - Wave Height	6.4	29.306549	-90.235187	Lafourn-5
RLAC-15-17	Lafourche	Coastal - Wave Run-up	5.9	29.342626	-90.247451	Lafourn-6
RLAC-15-18	Orleans	Levee break	-1.9	30.032910	-90.000898	Orleans-5
RLAC-16-01	Terrebonne	Levee issue	5.3	29.336005	-90.842419	Terrebon-11
RLAC-16-02	Terrebonne	Levee issue	5.5	29.376462	-90.805707	Terrebon-12
RLAC-16-03	Terrebonne	Levee issue	6.3	29.405502	-90.787658	Terrebon-13
RLAC-16-04	Terrebonne	Levee issue	8.0	29.438710	-90.751560	Terrebon-14
RLAC-16-05	Terrebonne	Levee issue	6.2	29.457892	-90.749956	Terrebon-15
RLAC-16-06	Terrebonne	Coastal - Wave Height	6.7	29.302506	-90.669808	Terrebon-1
RLAC-16-07	Terrebonne	Coastal - Surge Only	7.2	29.375847	-90.712811	Terrebon-2

HWM ID	County	Flooding Type	HWM Flood Elevation - NAVD 88	Survey Latitude	Survey Longitude	HWM Report Sheet No.
RLAC-16-08	Terrebonne	Coastal - Surge Only	6.8	29.407842	-90.700515	Terrebon-3
RLAC-16-09	Terrebonne	Coastal - Surge Only	7.4	29.452947	-90.702649	Terrebon-4
RLAC-16-10	Terrebonne	Coastal - Surge Only	4.0	29.498044	-90.679589	Terrebon-5
RLAC-16-11	Iberia	Coastal - Surge Only	9.6	29.960420	-91.943439	Iberia-4
RLAC-16-12	Iberia	Coastal - Surge Only	8.7	29.974172	-91.898810	Iberia-5
RLAC-16-13	Iberia	Coastal - Surge Only	9.3	29.914694	-91.904482	Iberia-6
RLAC-16-14	Iberia	Coastal - Surge Only	9.1	29.947611	-91.875430	Iberia-7
RLAC-16-15	St. Mary	Coastal - Surge Only	12.1	29.713780	-91.876723	St. Mary-7
RLAC-16-16	St. Mary	Coastal - Surge Only	12.0	29.753394	-91.802621	St. Mary-8
RLAC-16-17	Iberia	Coastal - Surge Only	8.2	29.906463	-91.783830	Iberia-8
RLAC-17-01	Tangipahoa	Coastal - Surge Only	5.9	30.404079	-90.324012	Tangipah-3
RLAC-17-03	St. Tammany	Coastal - Wave Run-up	6.6	30.388895	-90.207204	St. Tamm-15
RLAC-17-04	St. Tammany	Coastal - Surge Only	6.3	30.396997	-90.157590	St. Tamm-16
RLAC-17-06	St. Tammany	Coastal - Surge Only	8.7	30.359850	-90.082069	St. Tamm-17
RLAC-17-07	St. Tammany	Coastal - Surge Only	6.8	30.366881	-90.101256	St. Tamm-18
RLAC-17-08	St. Tammany	Coastal - Surge Only	6.3	30.339046	-90.040818	St. Tamm-19
RLAC-17-09	Plaquemines	Coastal - Surge Only	0.7	29.273584	-89.354106	Plaquemi-3
RLAC-17-10	Plaquemines	Coastal - Surge Only	-1.2	29.290896	-89.368476	Plaquemi-4
RLAC-17-11	Plaquemines	Coastal - Surge Only	0.4	29.318055	-89.388678	Plaquemi-5
RLAC-17-12	Plaquemines	Coastal - Surge Only	2.6	29.336085	-89.406724	Plaquemi-6
RLAC-17-13	Plaquemines	Coastal - Surge Only	1.1	29.352654	-89.440705	Plaquemi-7
RLAC-17-14	Plaquemines	Coastal - Surge Only	1.2	29.341395	-89.470965	Plaquemi-8
RLAC-17-15	Plaquemines	Coastal - Surge Only	-1.2	29.341027	-89.470897	Plaquemi-9
RLAC-17-16	Plaquemines	Coastal - Surge Only	-1.3	29.337127	-89.498079	Plaquemi-10
RLAC-17-17	Plaquemines	Coastal - Surge Only	1.2	29.353417	-89.533231	Plaquemi-11
RLAC-17-18	Plaquemines	Coastal - Surge Only	0.6	29.367829	-89.569263	Plaquemi-12
RLAC-17-19	Plaquemines	Coastal - Surge Only	6.3	29.440721	-89.621595	Plaquemi-13
RLAC-17-20	Plaquemines	Coastal - Wave Height	7.3	29.464696	-89.677407	Plaquemi-14
RLAC-18-01	Terrebonne	Coastal - Surge Only	8.3	29.367308	-90.600972	Terrebon-6
RLAC-18-02	Terrebonne	Coastal - Wave Run-up	7.6	29.387511	-90.586947	Terrebon-7
RLAC-18-03	Terrebonne	Levee issue	4.3	29.446880	-90.565351	Terrebon-16
RLAC-18-04	Terrebonne	Coastal - Wave Height	9.2	29.245935	-90.662049	Terrebon-8
RLAC-18-05	Terrebonne	Coastal - Surge Only	7.3	29.367480	-90.625131	Terrebon-9
RLAC-18-06	Terrebonne	Levee issue	3.9	29.426602	-90.600292	Terrebon-17
RLAC-18-07	St. Mary	Coastal - Surge Only	11.2	29.716287	-91.875978	St. Mary-9

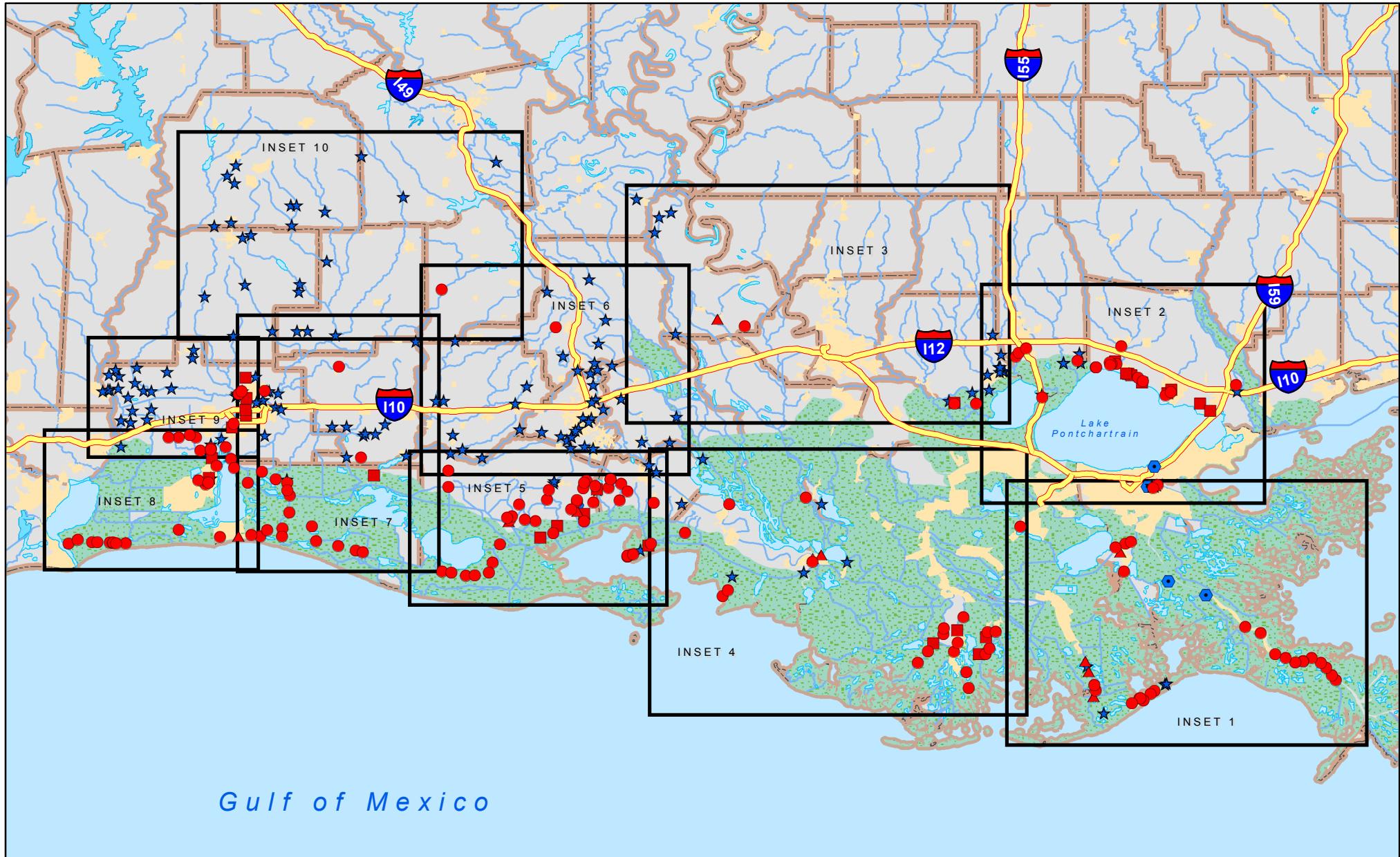
HWM ID	County	Flooding Type	HWM Flood Elevation - NAVD 88	Survey Latitude	Survey Longitude	HWM Report Sheet No.
RLAC-18-08	St. Mary	Coastal - Surge Only	12.2	29.722899	-91.856110	St. Mary-10
RLAC-18-09	St. Mary	Coastal - Surge Only	11.9	29.761133	-91.791923	St. Mary-11
RLAC-18-10	St. Mary	Coastal - Wave Height	6.6	29.573491	-91.537235	St. Mary-12
RLAC-18-11	St. Mary	Coastal - Wave Height	7.9	29.594306	-91.518419	St. Mary-13
RLAR-02-03	Jeff. Davis	Riverine - Hurricane	22.7	30.390525	-92.903358	Jeff. Da-1
RLAR-02-05	Calcasieu	Riverine - Hurricane	5.8	30.295206	-93.121450	Calcasie-36
RLAR-02-06	Calcasieu	Riverine - Hurricane	4.0	30.265716	-93.197675	Calcasie-37
RLAR-02-07	Calcasieu	Riverine - Hurricane	5.6	30.286072	-93.270520	Calcasie-38
RLAR-02-08	Calcasieu	Riverine - Hurricane	6.8	30.291998	-93.267428	Calcasie-39
RLAR-02-10	Rapides	Riverine - Hurricane	169.3	31.141564	-92.824598	Rapides-1
RLAR-02-12	Calcasieu	Riverine - Hurricane	42.6	30.423275	-93.424744	Calcasie-40
RLAR-04-01	Avoyelles	Riverine - Hurricane	40.0	30.988450	-91.844291	Avoyelle-1
RLAR-04-03	Calcasieu	Riverine - Hurricane	6.8	30.287193	-93.257807	Calcasie-41
RLAR-04-06	Rapides	Riverine - Hurricane	59.9	31.119978	-92.343842	Rapides-2
RLAR-07-01	Calcasieu	Riverine - Hurricane	4.4	30.200434	-93.679369	Calcasie-42
RLAR-07-02	Calcasieu	Riverine - Hurricane	25.1	30.380346	-93.698407	Calcasie-43
RLAR-07-05	Jeff. Davis	Riverine - Hurricane	3.5	30.066710	-92.824815	Jeff. Da-2
RLAR-07-06	Lafayette	Riverine - Hurricane	11.8	30.103449	-92.078797	Lafayett-1
RLAR-07-07	Lafayette	Riverine - Hurricane	11.7	30.141280	-92.076837	Lafayett-2
RLAR-07-08	Lafayette	Riverine - Hurricane	10.3	30.170055	-92.050732	Lafayett-3
RLAR-07-09	Lafayette	Riverine - Hurricane	9.0	30.207565	-92.004862	Lafayett-4
RLAR-07-12	Lafayette	Riverine - Hurricane	16.5	30.209189	-92.034576	Lafayett-5
RLAR-07-13	Lafayette	Riverine - Hurricane	12.6	30.274809	-91.989308	Lafayett-6
RLAR-07-14	Lafayette	Riverine - Hurricane	16.1	30.265108	-92.002985	Lafayett-7
RLAR-07-15	Lafayette	Riverine - Hurricane	14.7	30.143942	-92.114569	Lafayett-8
RLAR-07-16	Lafayette	Riverine - Hurricane	11.7	30.127924	-92.091800	Lafayett-9
RLAR-07-17	Lafayette	Riverine - Hurricane	18.0	30.107203	-92.029298	Lafayett-10
RLAR-07-18	Lafayette	Riverine - Hurricane	21.0	30.099940	-91.998795	Lafayett-11
RLAR-07-19	Acadia	Riverine - Hurricane	18.5	30.167492	-92.260702	Acadia-1
RLAR-07-20	Lafayette	Riverine - Hurricane	19.9	30.159262	-92.181040	Lafayett-12
RLAR-07-21	St. Martin	Riverine - Hurricane	10.1	30.123217	-91.826194	St. Mart-1
RLAR-07-22	St. Martin	Riverine - Hurricane	3.7	30.211647	-91.702678	St. Mart-2
RLAR-07-26	St. Martin	Riverine - Hurricane	11.5	30.276523	-91.900012	St. Mart-3
RLAR-07-27	St. Martin	Riverine - Hurricane	8.4	30.239350	-91.962603	St. Mart-4
RLAR-07-28	Calcasieu	Riverine - Hurricane	52.2	30.451379	-93.421972	Calcasie-44

HWM ID	County	Flooding Type	HWM Flood Elevation - NAVD 88	Survey Latitude	Survey Longitude	HWM Report Sheet No.
RLAR-07-31	Beauregard	Riverine - Hurricane	42.6	30.517436	-93.140948	Beaurega-1
RLAR-07-32	Allen	Riverine - Hurricane	21.8	30.502520	-92.915193	Allen-1
RLAR-07-35	Jeff. Davis	Riverine - Hurricane	23.4	30.480733	-92.631528	Jeff. Da-3
RLAR-07-36	St. Landry	Riverine - Hurricane	32.3	30.482968	-92.490471	St. Land-1
RLAR-07-38	St. Landry	Riverine - Hurricane	57.9	30.531969	-92.130765	St. Land-2
RLAR-07-42	Jeff. Davis	Riverine - Hurricane	6.2	30.187152	-92.739284	Jeff. Da-4
RLAR-07-43	Jeff. Davis	Riverine - Hurricane	3.6	30.151543	-92.774651	Jeff. Da-5
RLAR-07-45	Jeff. Davis	Riverine - Hurricane	3.4	30.146834	-92.817359	Jeff. Da-6
RLAR-07-46	Jeff. Davis	Riverine - Hurricane	17.5	30.153342	-92.809600	Jeff. Da-7
RLAR-07-47	Jeff. Davis	Riverine - Hurricane	3.6	30.069789	-92.876570	Jeff. Da-8
RLAR-07-49	Jeff. Davis	Riverine - Hurricane	4.3	30.177244	-92.876040	Jeff. Da-9
RLAR-07-50	Jeff. Davis	Riverine - Hurricane	3.7	30.176870	-92.928622	Jeff. Da-10
RLAR-07-51	Pointe Coupee	Riverine - Hurricane	12.0	30.534936	-91.458506	Pointe C-1
RLAR-07-53	Pointe Coupee	Riverine - Hurricane	12.1	30.559260	-91.556227	Pointe C-2
RLAR-07-55	Pointe Coupee	Riverine - Hurricane	14.2	30.507845	-91.706363	Pointe C-3
RLAR-07-57	Vermilion	Riverine - Hurricane	9.4	30.103916	-92.080211	Vermilio-31
RLAR-07-58	Lafayette	Riverine - Hurricane	11.9	30.142247	-92.076161	Lafayett-13
RLAR-07-59	Lafayette	Riverine - Hurricane	11.7	30.163187	-92.061471	Lafayett-14
RLAR-07-60	Lafayette	Riverine - Hurricane	9.6	30.195044	-92.016868	Lafayett-15
RLAR-07-61	Lafayette	Riverine - Hurricane	9.6	30.195088	-92.015347	Lafayett-16
RLAR-07-62	Lafayette	Riverine - Hurricane	13.7	30.325692	-91.999659	Lafayett-17
RLAR-08-02	Vernon	Riverine - Hurricane	199.0	30.964361	-93.074528	Vernon-1
RLAR-08-03	Vernon	Riverine - Hurricane	175.5	30.965000	-93.054861	Vernon-2
RLAR-08-04	Beauregard	Riverine - Hurricane	140.0	30.860972	-93.216139	Beaurega-2
RLAR-08-05	Vernon	Riverine - Hurricane	142.7	30.894278	-93.072028	Vernon-3
RLAR-08-06	Allen	Riverine - Hurricane	79.9	30.766806	-92.947417	Allen-2
RLAR-08-07	Beauregard	Riverine - Hurricane	70.4	30.657417	-93.046083	Beaurega-3
RLAR-08-08	Allen	Riverine - Hurricane	38.2	30.518750	-93.015194	Allen-3
RLAR-08-09	Vernon	Riverine - Hurricane	142.4	30.943056	-92.953333	Vernon-4
RLAR-08-10	Rapides	Riverine - Hurricane	119.5	30.996861	-92.674648	Rapides-3
RLAR-08-11	St. Landry	Riverine - Hurricane	29.1	30.701678	-92.013608	St. Land-3
RLAR-08-12	St. Landry	Riverine - Hurricane	47.4	30.658588	-92.163108	St. Land-4
RLAR-08-13	Evangeline	Riverine - Hurricane	48.7	30.666054	-92.538284	Evangeli-1
RLAR-09-19	Calcasieu	Riverine - Hurricane	12.3	30.145999	-93.167261	Calcasie-45
RLAR-09-30	Vernon	Riverine - Hurricane	203.0	31.107583	-93.270500	Vernon-5

HWM ID	County	Flooding Type	HWM Flood Elevation - NAVD 88	Survey Latitude	Survey Longitude	HWM Report Sheet No.
RLAR-09-32	Calcasieu	Riverine - Hurricane	15.6	30.234477	-93.639204	Calcasie-46
RLAR-09-33	Calcasieu	Riverine - Hurricane	7.6	30.193269	-93.645582	Calcasie-47
RLAR-09-34	Calcasieu	Riverine - Hurricane	16.8	30.239587	-93.571398	Calcasie-48
RLAR-09-35	Calcasieu	Riverine - Hurricane	8.7	30.203438	-93.587374	Calcasie-49
RLAR-09-36	Calcasieu	Riverine - Hurricane	17.2	30.303599	-93.744066	Calcasie-50
RLAR-09-37	Calcasieu	Riverine - Hurricane	20.1	30.304040	-93.571578	Calcasie-51
RLAR-09-46	St. Landry	Riverine - Hurricane	41.5	30.429422	-92.106713	St. Land-5
RLAR-09-47	St. Landry	Riverine - Hurricane	27.4	30.379127	-92.053524	St. Land-6
RLAR-10-37	Vernon	Riverine - Hurricane	196.1	31.043639	-93.275778	Vernon-6
RLAR-10-38	Vernon	Riverine - Hurricane	174.1	30.904639	-93.288250	Vernon-7
RLAR-10-39	Vernon	Riverine - Hurricane	152.8	30.891694	-93.346861	Vernon-8
RLAR-10-40	Vernon	Riverine - Hurricane	181.2	31.072139	-93.302000	Vernon-9
RLAR-10-41	Beauregard	Riverine - Hurricane	45.0	30.501417	-93.279917	Beaurega-4
RLAR-10-42	Beauregard	Riverine - Hurricane	98.3	30.642528	-93.382361	Beaurega-5
RLAR-10-43	Beauregard	Riverine - Hurricane	111.4	30.683194	-93.238111	Beaurega-6
RLAR-10-44	Beauregard	Riverine - Hurricane	150.1	30.851139	-93.245972	Beaurega-7
RLAR-10-45	Beauregard	Riverine - Hurricane	68.1	30.685444	-93.043111	Beaurega-8
RLAR-10-46	Allen	Riverine - Hurricane	33.2	30.519583	-93.053222	Allen-4
RLAR-11-01	St. Tammany	Riverine - Hurricane	6.7	30.463382	-90.118141	St. Tamm-21
RLAR-12-01	Calcasieu	Riverine - Hurricane	12.0	30.308183	-93.718638	Calcasie-52
RLAR-12-02	Jeff. Davis	Riverine - Hurricane	4.0	30.074822	-92.663378	Jeff. Da-11
RLAR-12-03	Acadia	Riverine - Hurricane	5.2	30.081767	-92.506096	Acadia-2
RLAR-12-04	Vermilion	Riverine - Hurricane	8.7	30.021661	-92.513823	Vermilio-32
RLAR-12-05	Acadia	Riverine - Hurricane	6.8	30.148379	-92.498327	Acadia-3
RLAR-12-06	Vermilion	Riverine - Hurricane	3.5	29.962562	-92.514317	Vermilio-33
RLAR-12-07	Vermilion	Riverine - Hurricane	8.0	29.950999	-92.156578	Vermilio-34
RLAR-12-08	Vermilion	Riverine - Hurricane	9.6	29.975136	-92.139499	Vermilio-35
RLAR-12-09	Vermilion	Riverine - Hurricane	9.8	29.983437	-92.137118	Vermilio-36
RLAR-12-10	Iberia	Riverine - Hurricane	8.6	29.988893	-91.936193	Iberia-9
RLAR-12-11	Iberia	Riverine - Hurricane	8.6	29.988949	-91.936180	Iberia-10
RLAR-12-12	Iberia	Riverine - Hurricane	6.4	30.016148	-91.773994	Iberia-11
RLAR-12-13	Iberia	Riverine - Hurricane	9.9	30.041000	-91.800786	Iberia-12
RLAR-12-14	Iberia	Riverine - Hurricane	7.5	29.902539	-91.683980	Iberia-13
RLAR-12-16	St. Martin	Riverine - Hurricane	9.5	30.104262	-91.882586	St. Mart-5
RLAR-12-17	Iberia	Riverine - Hurricane	5.7	30.122108	-91.726521	Iberia-14

HWM ID	County	Flooding Type	HWM Flood Elevation - NAVD 88	Survey Latitude	Survey Longitude	HWM Report Sheet No.
RLAR-12-18	Iberia	Riverine - Hurricane	3.6	30.061649	-91.608653	Iberia-15
RLAR-12-19	St. Landry	Riverine - Hurricane	20.3	30.559022	-91.955258	St. Land-7
RLAR-12-20	St. Landry	Riverine - Hurricane	18.0	30.473629	-91.980184	St. Land-8
RLAR-12-21	St. Landry	Riverine - Hurricane	16.6	30.396814	-91.931694	St. Land-9
RLAR-12-22	St. Landry	Riverine - Hurricane	17.0	30.405301	-91.994228	St. Land-10
RLAR-12-23	St. Martin	Riverine - Hurricane	16.5	30.380065	-91.982603	St. Mart-6
RLAR-12-24	St. Landry	Riverine - Hurricane	17.8	30.367788	-92.008889	St. Land-11
RLAR-12-25	Acadia	Riverine - Hurricane	20.3	30.260398	-92.277024	Acadia-4
RLAR-12-26	Acadia	Riverine - Hurricane	28.6	30.321629	-92.235413	Acadia-5
RLAR-12-27	Acadia	Riverine - Hurricane	7.3	30.066532	-92.394560	Acadia-6
RLAR-12-28	Acadia	Riverine - Hurricane	7.8	30.097335	-92.463604	Acadia-7
RLAR-12-29	Acadia	Riverine - Hurricane	8.1	30.270475	-92.531019	Acadia-8
RLAR-12-30	Acadia	Riverine - Hurricane	5.8	30.269082	-92.557852	Acadia-9
RLAR-12-31	Calcasieu	Riverine - Hurricane	14.5	30.313742	-93.501163	Calcasie-53
RLAR-12-32	Calcasieu	Riverine - Hurricane	6.9	30.193193	-93.645513	Calcasie-54
RLAR-12-33	Calcasieu	Riverine - Hurricane	10.3	30.312406	-93.689848	Calcasie-55
RLAR-12-34	Calcasieu	Riverine - Hurricane	13.0	30.307374	-93.724905	Calcasie-56
RLAR-12-35	Calcasieu	Riverine - Hurricane	16.6	30.362666	-93.722066	Calcasie-57
RLAR-12-36	Calcasieu	Riverine - Hurricane	28.0	30.333001	-93.630206	Calcasie-58
RLAR-12-38	Calcasieu	Riverine - Hurricane	5.5	30.304648	-93.151687	Calcasie-59
RLAR-12-39	Calcasieu	Riverine - Hurricane	5.8	30.248371	-93.129542	Calcasie-60
RLAR-12-40	Calcasieu	Riverine - Hurricane	7.9	30.239742	-93.110251	Calcasie-61
RLAR-12-42	Pointe Coupee	Riverine - Hurricane	38.1	30.940444	-91.721600	Pointe C-4
RLAR-12-43	Pointe Coupee	Riverine - Hurricane	41.1	30.923881	-91.764403	Pointe C-5
RLAR-12-44	Pointe Coupee	Riverine - Hurricane	28.9	30.869653	-91.780492	Pointe C-6
RLAR-13-02	St. Tammany	Coastal - Surge Only	5.6	30.299155	-89.941758	St. Tamm-20
RLAR-14-01	Livingston	Riverine - Hurricane	4.0	30.269242	-90.732822	Livingst-5
RLAR-14-02	Livingston	Riverine - Hurricane	4.2	30.374933	-90.540525	Livingst-6
RLAR-14-03	Livingston	Riverine - Hurricane	4.0	30.389706	-90.553633	Livingst-7
RLAR-15-01	Jefferson	Coastal - Surge Only	3.6	29.746711	-90.138928	Jefferso-13
RLAR-15-02	Livingston	Riverine - Hurricane	4.1	30.433657	-90.546000	Livingst-8
RLAR-15-03	Livingston	Riverine - Hurricane	3.1	30.504614	-90.576886	Livingst-9
RLAR-15-04	Livingston	Riverine - Hurricane	4.2	30.258559	-90.712475	Livingst-10
RLAR-15-06	St. Mary	Coastal - Wave Run-up	5.7	29.695191	-91.216895	St. Mary-14
RLAR-15-07	St. Mary	Coastal - Wave Run-up	6.1	29.707681	-91.217522	St. Mary-15

HWM ID	County	Flooding Type	HWM Flood Elevation - NAVD 88	Survey Latitude	Survey Longitude	HWM Report Sheet No.
RLAR-15-08	St. Mary	Riverine - Hurricane	3.5	29.721692	-91.187977	St. Mary-16
RLAR-15-09	Assumption	Riverine - Hurricane	2.9	29.901226	-91.185605	Assumpti-1
RLAR-15-10	St. Martin	Riverine - Hurricane	3.9	29.924212	-91.240803	St. Mart-7
RLAR-15-11	Assumption	Riverine - Hurricane	2.7	29.697117	-91.094232	Assumpti-2
RLAR-15-12	St. Charles	Riverine - Hurricane	2.8	29.821591	-90.476381	St. Char-1
RLAR-15-13	Lafourche	Coastal - Surge Only	6.6	29.216708	-90.216384	Lafourch-7
RLAR-16-01	Tangipahoa	Riverine - Hurricane	5.0	30.425380	-90.493295	Tangipah-7
RLAR-16-02	Tangipahoa	Riverine - Hurricane	5.8	30.439765	-90.482758	Tangipah-8
RLAR-16-03	Tangipahoa	Riverine - Hurricane	9.0	30.456412	-90.456648	Tangipah-9
RLAR-17-02	Tangipahoa	Coastal - Surge Only	6.1	30.405773	-90.262556	Tangipah-4
RLAR-20-01	Livingston	Riverine - Hurricane	5.0	30.372872	-90.550517	Livingst-11
RLAR-20-02	Livingston	Riverine - Hurricane	5.0	30.362225	-90.595989	Livingst-12
RLAR-20-03	Livingston	Riverine - Hurricane	4.3	30.299975	-90.648706	Livingst-13
RLAR-20-10	Tangipahoa	Coastal - Surge Only	5.7	30.404185	-90.323669	Tangipah-5
RLAR-20-11	St. Tammany	Riverine - Hurricane	6.9	30.325457	-89.710032	St. Tamm-22
RLAR-20-13	St. Tammany	Riverine - Hurricane	5.2	30.303100	-89.706707	St. Tamm-23
RLAR-20-14	Tangipahoa	Coastal - Surge Only	5.4	30.438668	-90.267666	Tangipah-6
RLR1-15-06	Livingston	Riverine - Hurricane	5.2	30.390386	-90.549345	Livingst-14

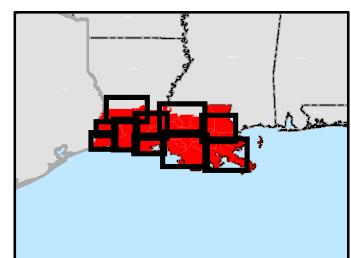


**Overview & Inset Index Map
Hurricane Rita, Louisiana
Surveyed Locations of High Water Mark Elevations**

RLAR-15-13 HWM ID
6.2 Surveyed Elevation,
NGVD88, Feet

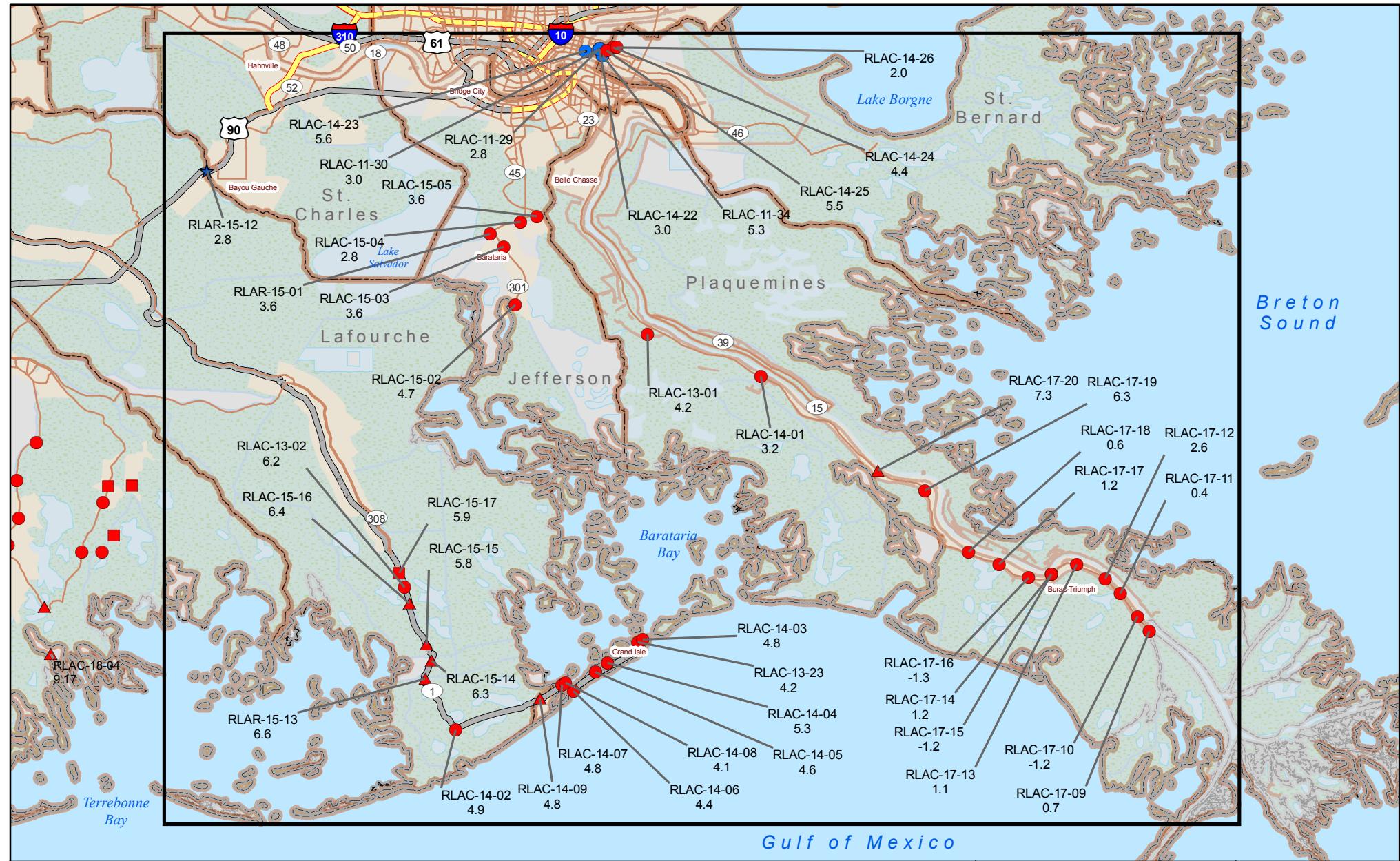
- Coastal-Surge Only
- ▲ Coastal-Wave Height
- Coastal-Wave Runup

- ★ Riverine
- Levee Break



FEMA

0 3.5 7 14 21 28
Miles
0 4.5 9 18 27 36
Kilometers



**Figure B-1: Inset Map 1 Hurricane Rita, Louisiana
Plaquemines, Jefferson, St. Charles & Lafourche Parishes
Surveyed Locations of High Water Mark (HWM) Elevations**

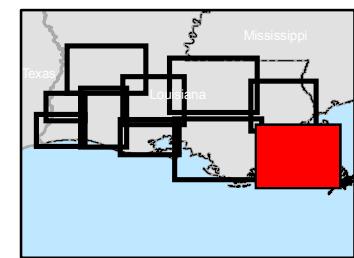
RLAR-15-13 HWM ID
6.2 Surveyed Elevation,
NGVD88, Feet

- Coastal-Surge Only
- ▲ Coastal-Wave Height
- Coastal-Wave Runup

★ Riverine-Hurricane

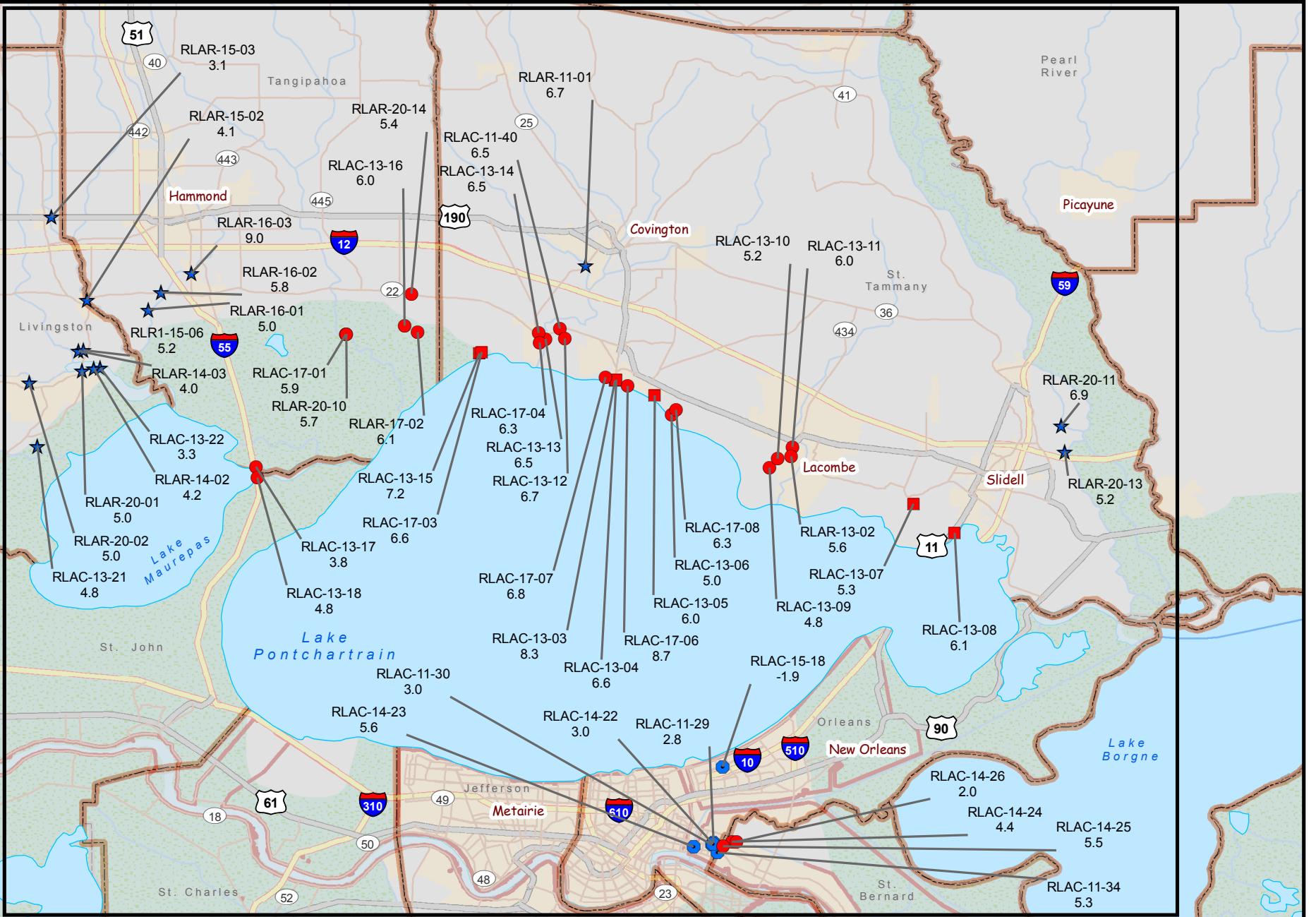


- | Road Classification | |
|---------------------|-------------------|
| Limited Access | Levees |
| Highway | Water Body |
| Major Road | Hydrology |
| Swamp or Marsh | County Boundaries |



U.S. DEPARTMENT OF
HOMELAND SECURITY
FEMA

0 1 2 4 6 8
Miles
0 2 4 8 12 16
Kilometers



**Figure B-2: Inset Map 2 Hurricane Rita, Louisiana
St Tammany, Orleans, Tangipahoa, St. Bernard, & St. John Parishes
Surveyed Locations of High Water Mark (HWM) Elevations**



FEMA

RLAR-15-13

HWM ID
Surveyed Elevation,
NGVD88, Feet

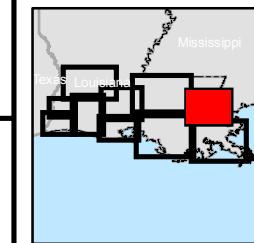
- Coastal-Surge Only
- ▲ Coastal-Wave Height
- Coastal-Wave Runup

- ★ Riverine-Hurricane
- ◆ Levee Break

Inset
Municipalities
County Boundaries

Levees
Water Body
Hydrology
Swamp or Marsh

Road Classification
Limited Access
Highway
Major Road



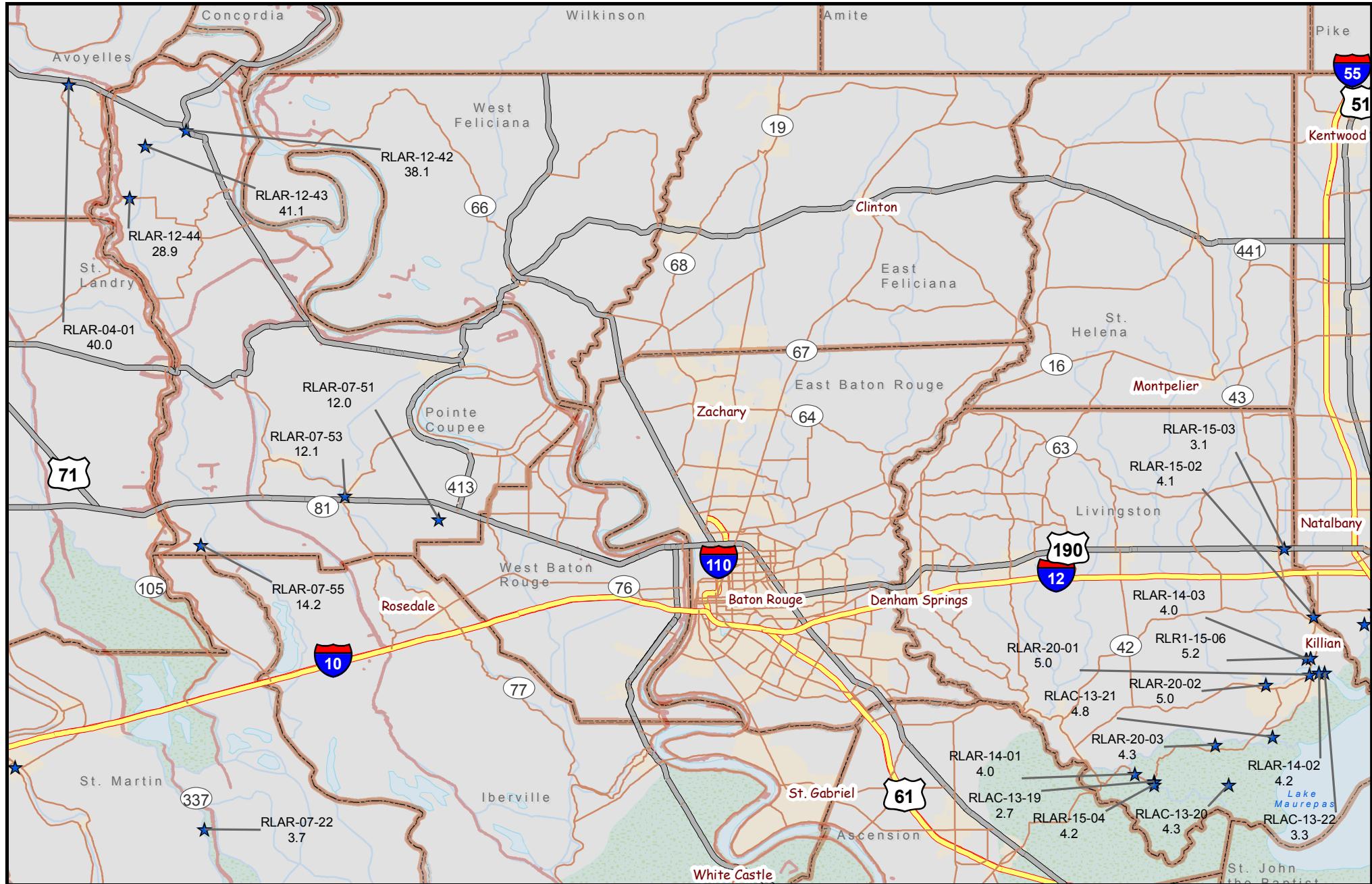
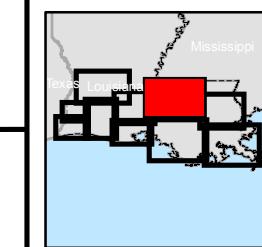
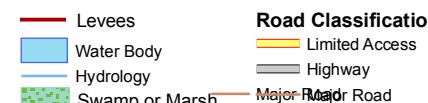
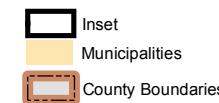


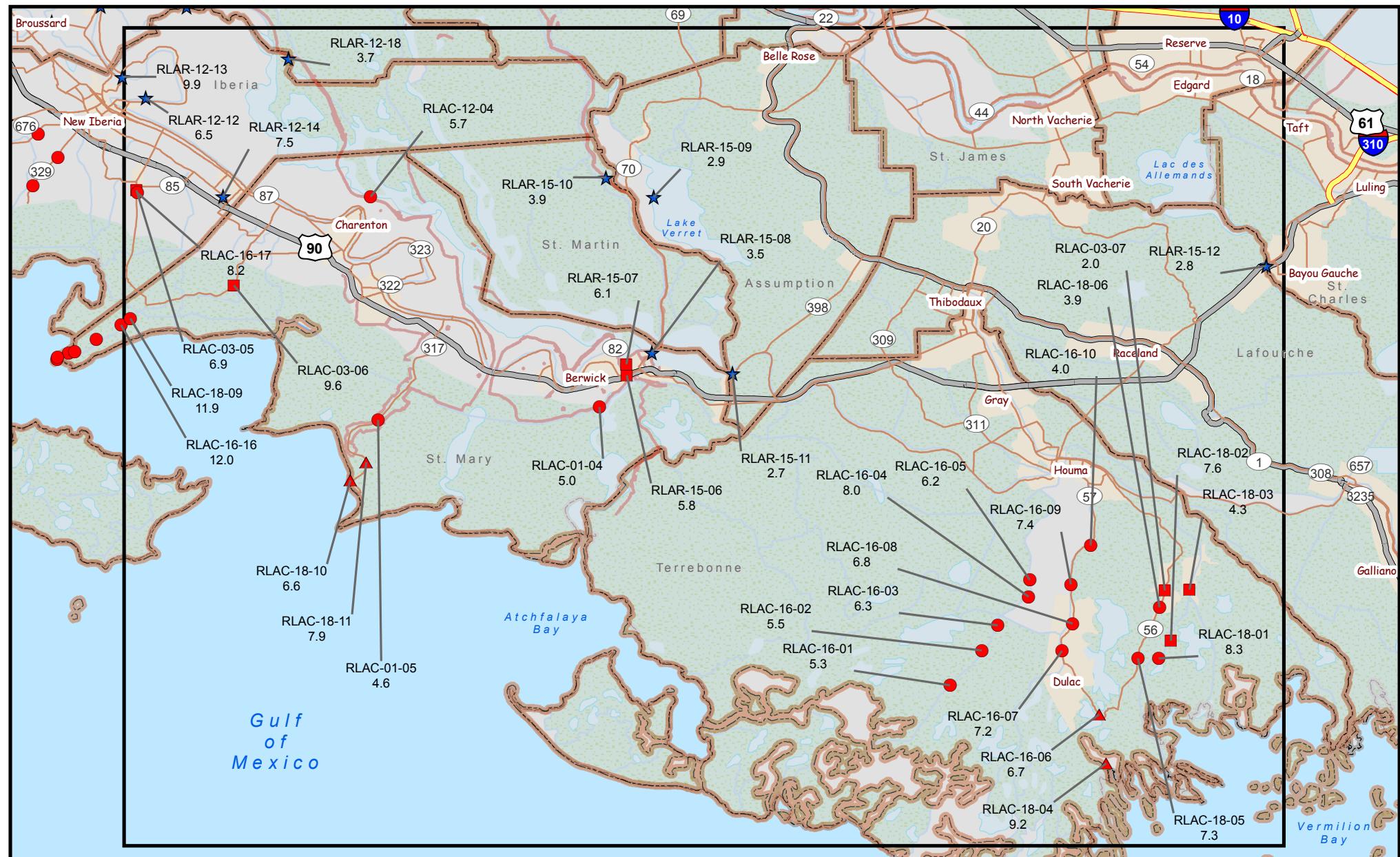
Figure B-3 : Inset Map 3 Hurricane Rita, Louisiana Livingston, Pointe Coupee, & Avoyelles Parishes Surveyed Locations of High Water Mark (HWM) Elevations

RLAR-15-13 HWM ID
6.2 Surveyed Elevation,
NGVD88, Feet

- Coastal- Surge Only
- ▲ Coastal- Wave Height
- Coastal- Wave Runup
- ★ Riverine- Hurricane
- Levee Break



0 2.5 5 Miles
0 3.75 7.5 Kilometers

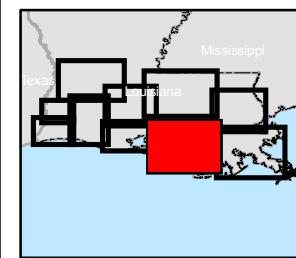
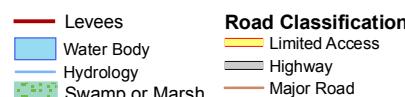


**Figure B-4 : Inset Map 4 Hurricane Rita, Louisiana
Terrebonne, St. Mary, Southern St. Martin,
Eastern Iberia & Assumption Parishes**

Surveyed Locations of High Water Mark (HWM) Elevations

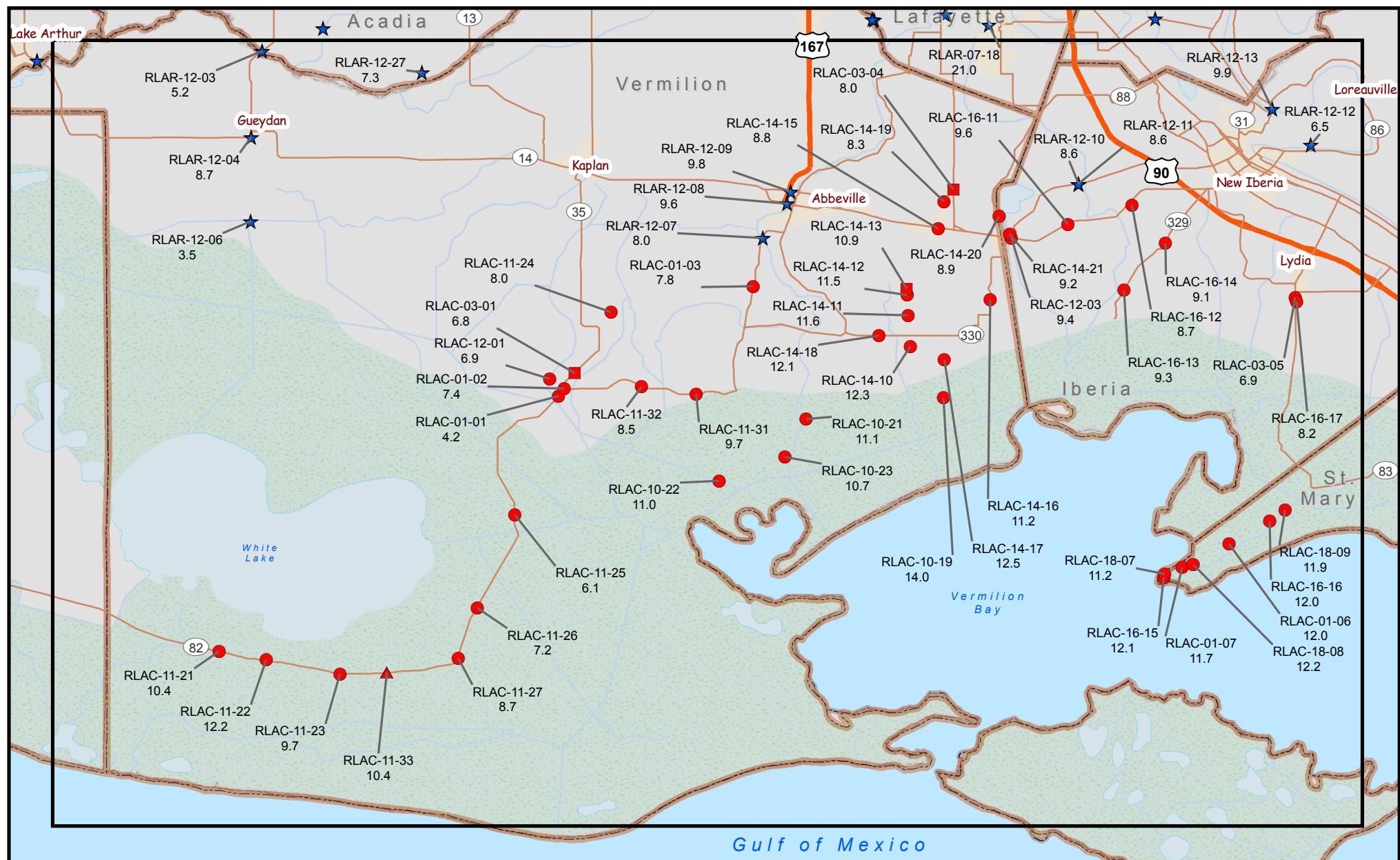
RLAR-15-13 HWM ID
6.2 Surveyed Elevation,
NGVD88, Feet

- Coastal- Surge Only
- ▲ Coastal- Wave Height
- Coastal- Wave Runup
- ★ Riverine- Hurricane
- Levee Break



0 1.5 3 6 9 12
Miles

0 2.5 5 10 15 20
Kilometers



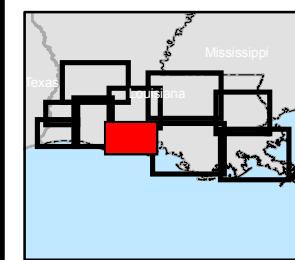
**Figure B-5 : Inset Map 5 Hurricane Rita, Louisiana
Vermillion & Western Iberia Parishes
Surveyed Locations of High Water Mark (HWM) Elevations**

RLAR-15-13 HWM ID
6.2 Surveyed Elevation,
NGVD88, Feet

- Coastal-Surge Only
- ▲ Coastal-Wave Height
- ★ Riverine-Hurricane
- Coastal-Wave Runup
- Levee Break



- | Road Classification | |
|---------------------|----------------|
| Yellow Line | Limited Access |
| Blue Line | Hydrology |
| Grey Line | Highway |
| Brown Line | Major Road |



0 2 4 8
Miles
0 3 6 12
Kilometers

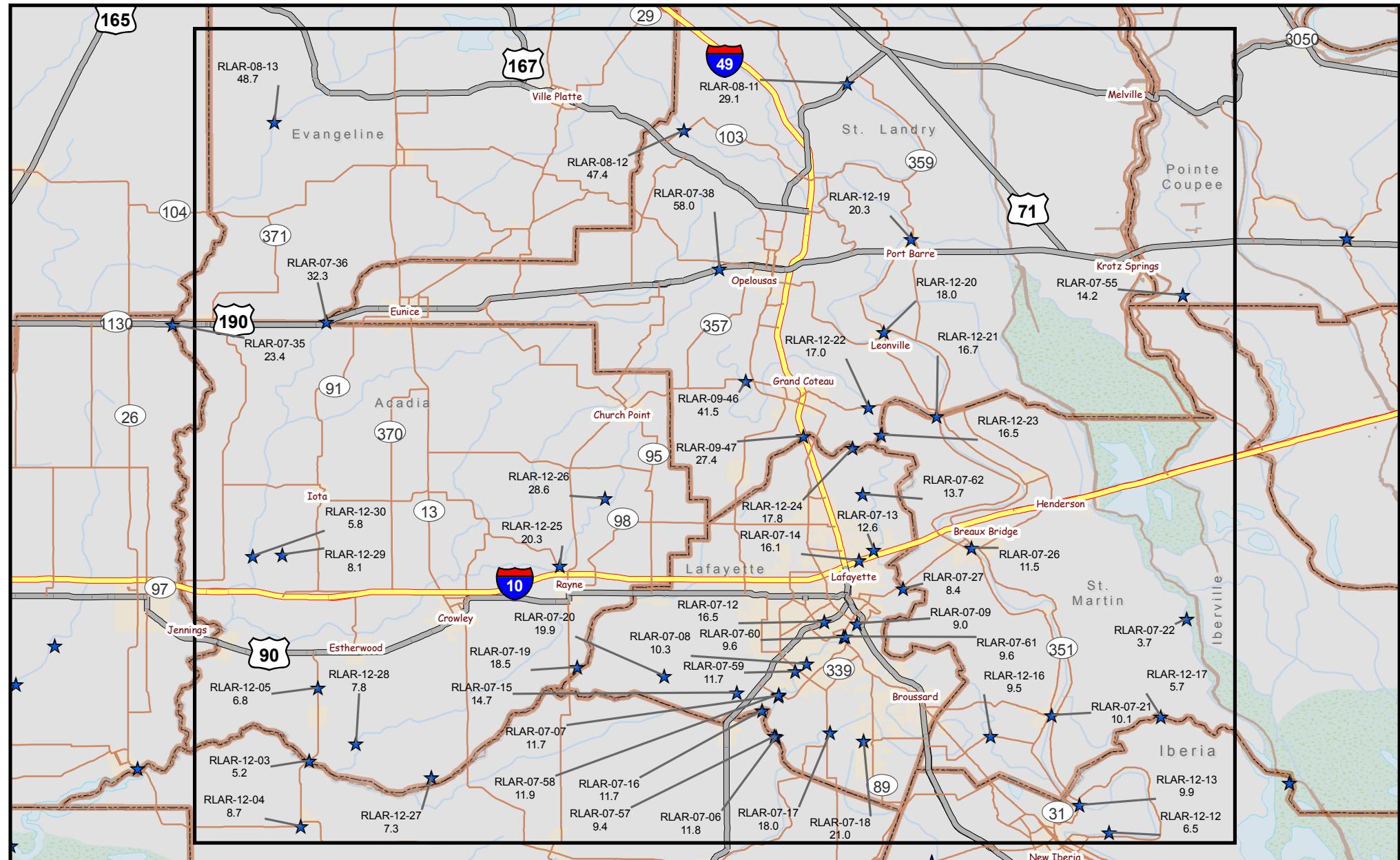


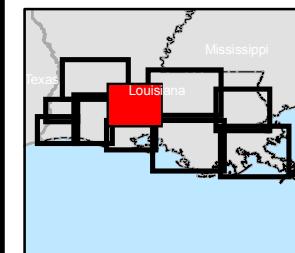
Figure B-6 : Inset Map 6 Hurricane Rita, Louisiana
Acadia, Lafayette, Northern St. Martin, Evangeline & St. Landry Parishes
Surveyed Locations of High Water Mark (HWM) Elevations

RLAR-15-13 HWM ID
6.2 Surveyed Elevation,
 NGVD88, Feet

- Coastal- Surge Only
- ▲ Coastal- Wave Height
- ★ Riverine-Hurricane
- Coastal- Wave Runup
- ◆ Levee Break



- Levees
Water Body
Hydrology
Swamp or Marsh
- Road Classification
Limited Access
Highway
Major Road



0 2.5 5 10
Miles
0 4 8 16
Kilometers

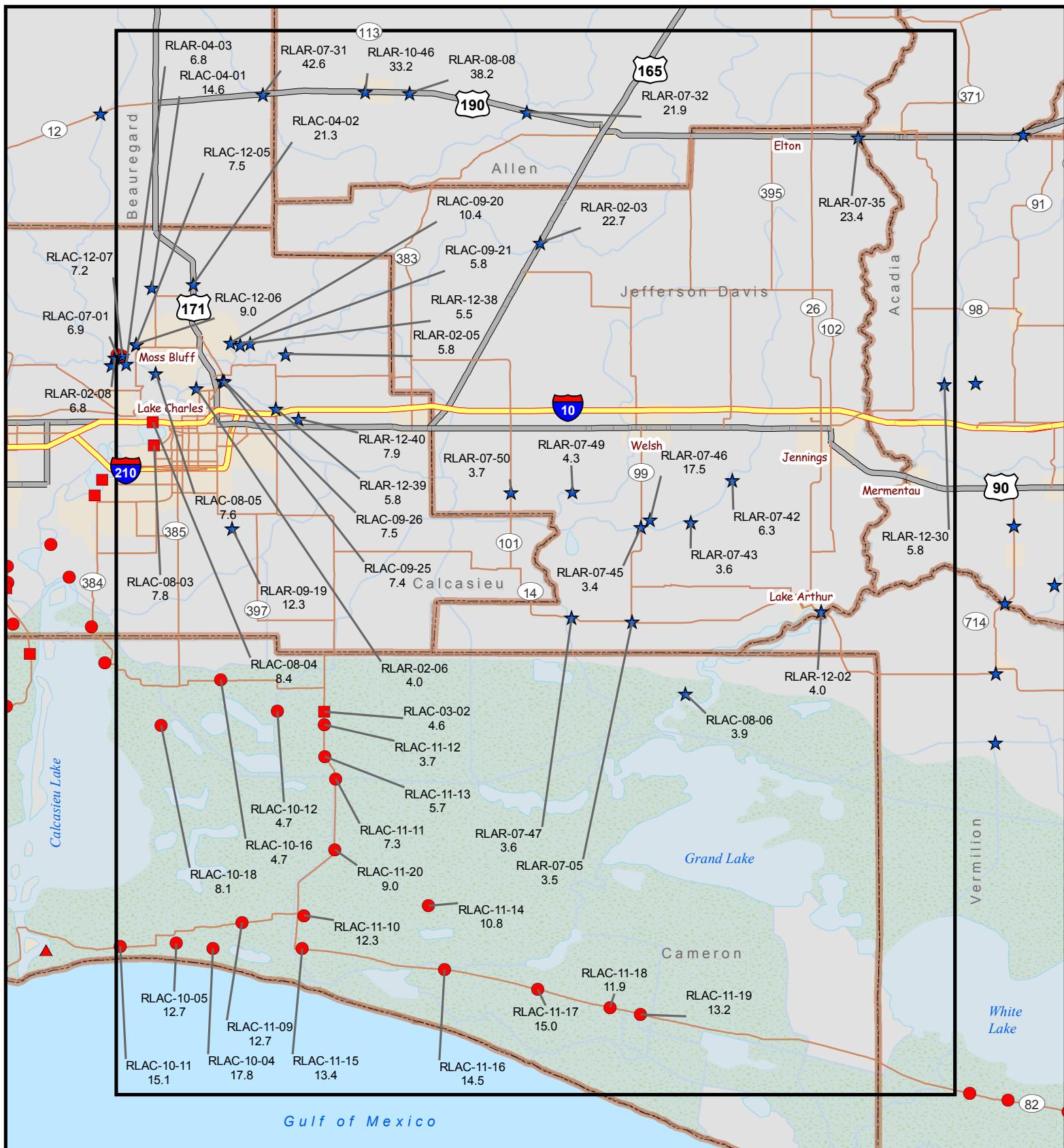
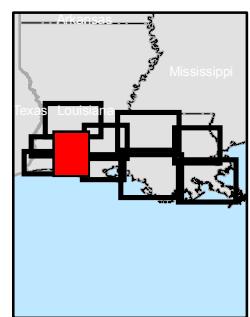


Figure B-7 : Inset Map 7 Hurricane Rita, Louisiana Jefferson Davis, Eastern Cameron, & Eastern Calcasieu Parishes Surveyed Locations of High Water Mark (HWM) Elevations

- Coastal- Surge Only
- ▲ Coastal- Wave Height
- Coastal- Wave Runup
- ★ Riverine- Hurricane
- Levee Break

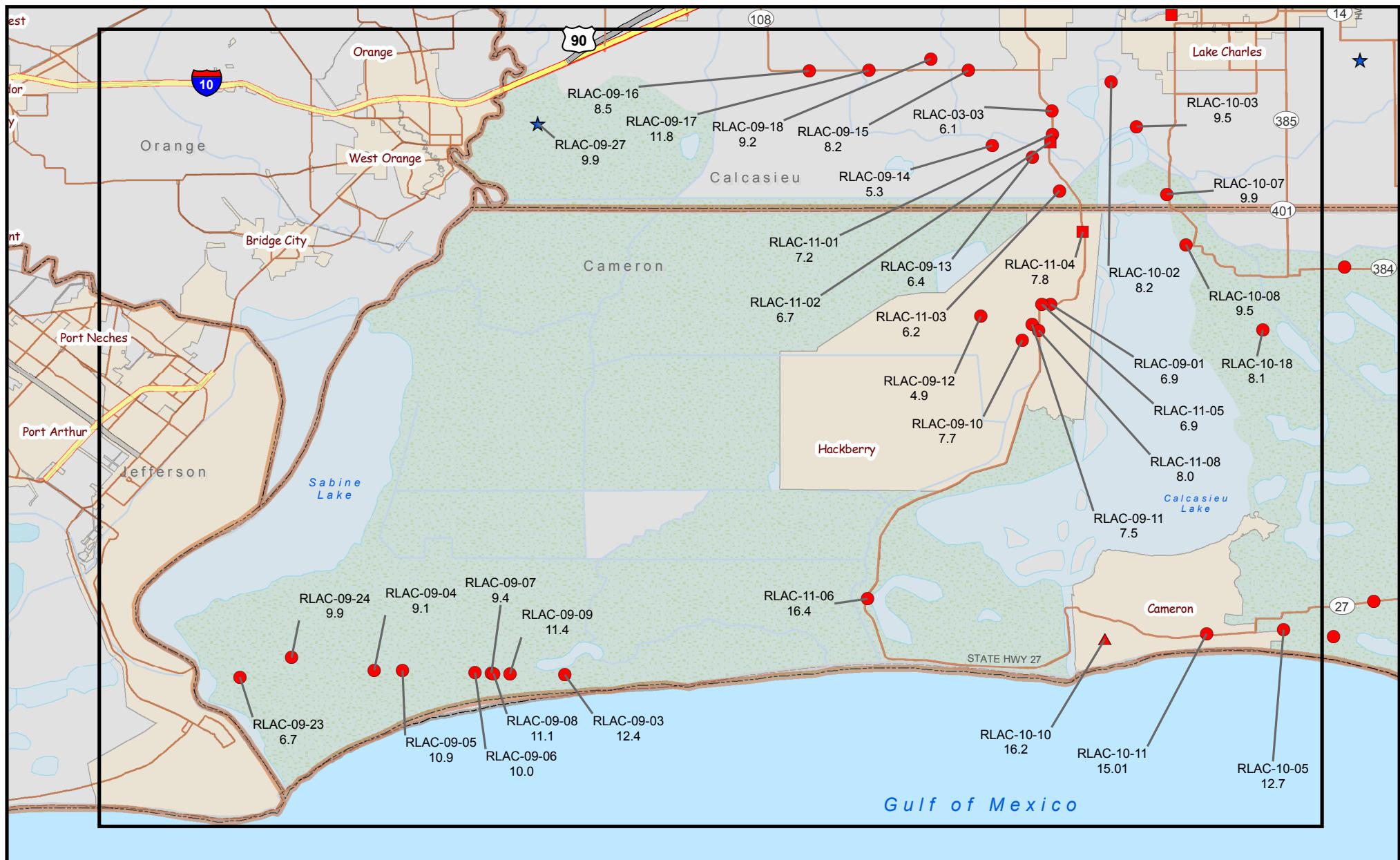
- | | |
|-------------------|---|
| RLAR-15-13
6.2 | HWM ID
Surveyed Elevation,
NGVD88, Feet |
| Inset | Levees |
| Municipalities | Water Body |
| County Boundaries | Hydrology |
| | Road Classification |

- | | |
|----------------|----------------|
| Water Body | Limited Access |
| Hydrology | Highway |
| Swamp or Marsh | Major Road |



FEMA

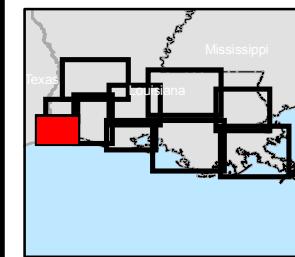
0 1.5 3 6 Miles
0 2.5 5 10 Kilometers



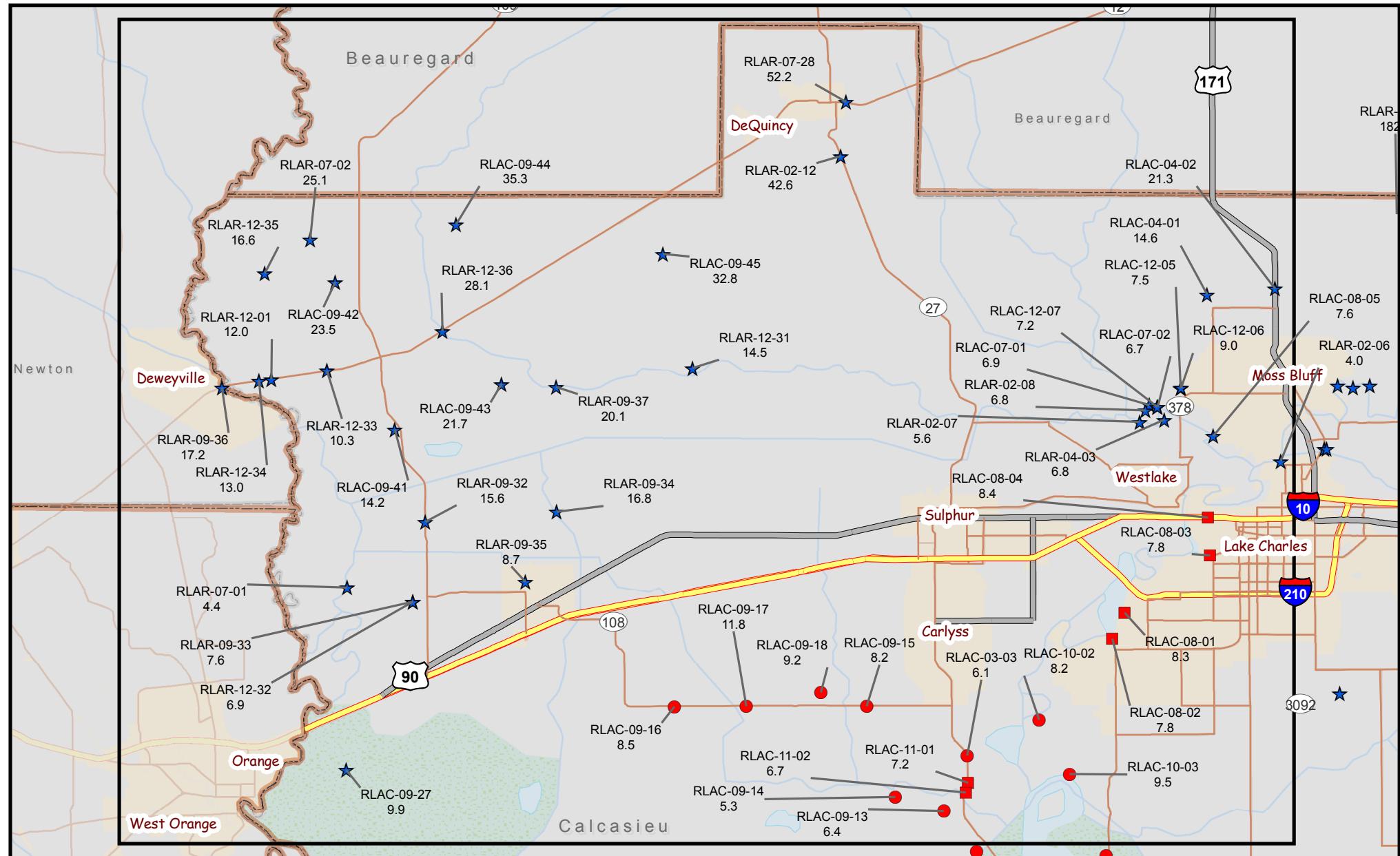
**Figure B-8 : Inset Map 8 Hurricane Rita, Louisiana
Western Cameron Parish
Surveyed Locations of High Water Mark (HWM) Elevations**

RLAR-15-13 HWM ID
6.2 Surveyed Elevation,
NGVD88, Feet

- Coastal-Surge Only
- ▲ Coastal-Wave Height
- ★ Riverine-Hurricane
- Coastal-Wave Runup
- Levee Break



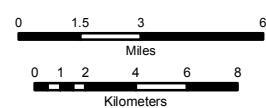
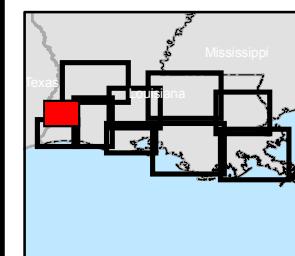
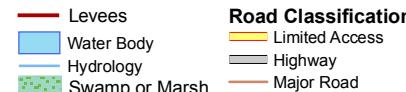
0 1 2 4 6 8
Miles
0 1.5 3 6 9 12
Kilometers

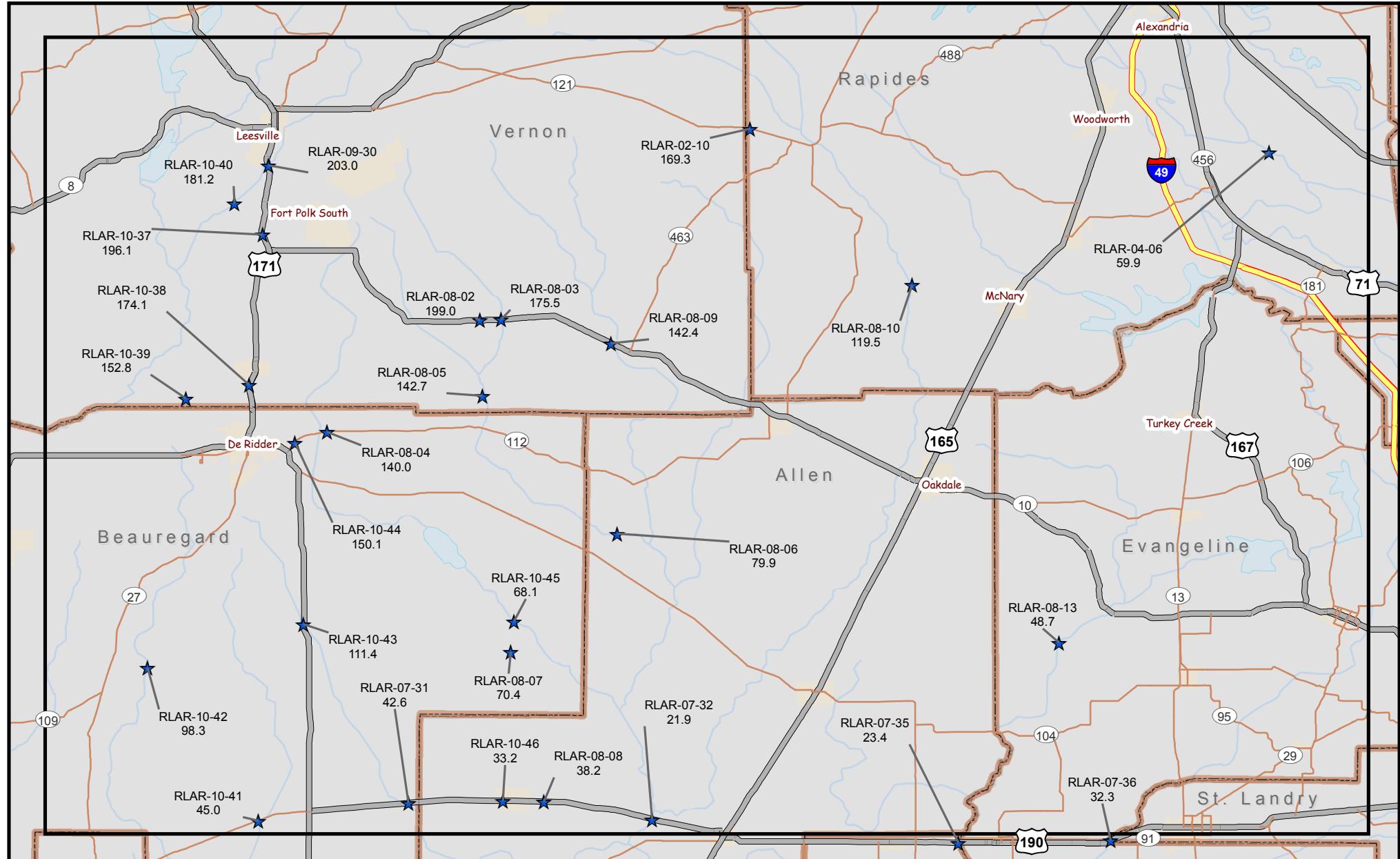


**Figure B-9 : Inset Map 9 Hurricane Rita, Louisiana
Surveyed Locations of High Water Mark (HWM) Elevations**

RLAR-15-13 HWM ID
6.2 Surveyed Elevation,
NGVD88, Feet

- Coastal- Surge Only
- ▲ Coastal- Wave Height
- ★ Riverine- Hurricane
- Coastal- Wave Runup
- Levee Break



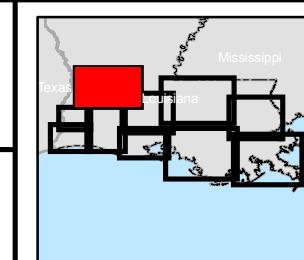


RLAR-15-13 HWM ID
6.2 Surveyed Elevation,
NGVD88, Feet

- Coastal-Surge Only
- ▲ Coastal-Wave Height
- Coastal-Wave Runup
- ★ Riverine-Hurricane
- Levee Break



- Levees
- Water Body
- Hydrology
- Swamp or Marsh
- Municipalities
- County Boundaries



0 2 4 8
Miles
0 4 8 16
Kilometers

Appendices C-AE not included due to privacy issues.