

Prepared under a mission assignment with the Federal Emergency Management Agency

Monitoring Storm Tide and Flooding from Hurricane Isaac along the Gulf Coast of the United States, August 2012



Open-File Report 2012–1263

U.S. Department of the Interior
U.S. Geological Survey

Cover photographs.

Top left: Boat damaged by Hurricane Isaac (Christopher J. Henry, USGS)

Top right: USGS deploying a storm-tide water-level sensor (Aub N. Ward, USGS)

Lower left: USGS storm-tide barometric pressure sensor in Harrison County, Mississippi (Christopher J. Henry, USGS)

Lower right: House damage by Hurricane Isaac (Benton D. McGee and Aub N. Ward, USGS)

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KEN SALAZAR, Secretary

U.S. Geological Survey
Marcia K. McNutt, Director

U.S. Geological Survey, Reston, Virginia: 2012

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Introduction

The U.S. Geological Survey (USGS) deployed a temporary monitoring network of water-level and barometric pressure sensors at 127 locations along the gulf coast from Alabama to Louisiana to record the timing, areal extent, and magnitude of hurricane storm tide and coastal flooding generated by Hurricane Isaac (fig. 1). This deployment was undertaken as part of a coordinated federal emergency response as outlined by the Stafford Act under a directed mission assignment by the Federal Emergency Management Agency. Storm tide, as defined by National Oceanic and Atmospheric Administration (NOAA; National Oceanic and Atmospheric Administration, 2008), is the water-level rise generated by a combination of storm surge and astronomical tide during a coastal storm.

Hurricane Isaac initially made landfall on the coast of Louisiana in Plaquemines Parish on August 28, 2012, as a Category 1 hurricane on the Saffir–Simpson Hurricane Wind Scale (National Weather Service, 1974) and then stalled over southern Louisiana for several days, causing prolonged storm-tide impacts. A total of 188 water-level and wave-height sensors were deployed at 127 locations during August 27–28 prior to landfall. More than 90 percent of the sensors and all high-water marks (HWMs) were recovered and surveyed to North American Vertical Datum of 1988 (NAVD 88) within 7 days of the Isaac landfall. Only a handful of sensors in the Plaquemines Parish area of Louisiana could not be retrieved until weeks later due to prolonged flooding in the area. Data collected from this event can be used to evaluate the performance of storm-tide models for maximum and incremental water level and flood extent and the site-specific effects of storm tide on natural and anthropogenic features of the environment.

Hurricane Isaac Storm-Tide Monitoring

The locations of these water-level sensors were selected to augment existing tide-gage networks and to ensure adequate monitoring in areas forecasted to have significant storm tide. After Hurricane Isaac made landfall in Louisiana, the sustained winds from the stalled hurricane exacerbated storm-tide flooding along the Louisiana and Mississippi coasts, and caused significant backwater to occur far inland along the Mississippi and Atchafalaya Rivers, which were very low because of previous prolonged drought conditions upstream. Of the 127 locations monitored, 2 water-level sensors (1 storm-tide and 1 wave-height) were lost or malfunctioned during the storm, and 2 sensors (1 storm-tide and 1 wave-height) did not record storm tide either due to a lack of water-level rise or because the sensor was installed too high above the water. A typical sensor installation is shown in figure 2.

Of the 127 monitored locations, 109 had sensors that were programmed to record water pressure at 30-second intervals, expressed as water level in feet above NAVD 88 following surveys completed during sensor recovery, and 55 locations had additional sensors to record barometric pressure at 30-second intervals, expressed in pounds per square inch (table 1). Water-level elevation and barometric pressure were recorded over time by the sensors during the storm, as shown in the example in figure 3, and a nearby HWM elevation was used to compare with the sensor data.

Of the 127 monitored locations, 18 were instrumented with real-time water level sensors that recorded water-level elevations every 15 minutes during the hurricane and updated hourly to USGS Web pages (table 1; fig. 4). Wave-height sensors that were co-located at six of the monitored locations along the gulf coast from Bay St. Louis, Mississippi to Dauphin Island, Alabama measured every 2 seconds from midnight to noon on August 29 (Wednesday).

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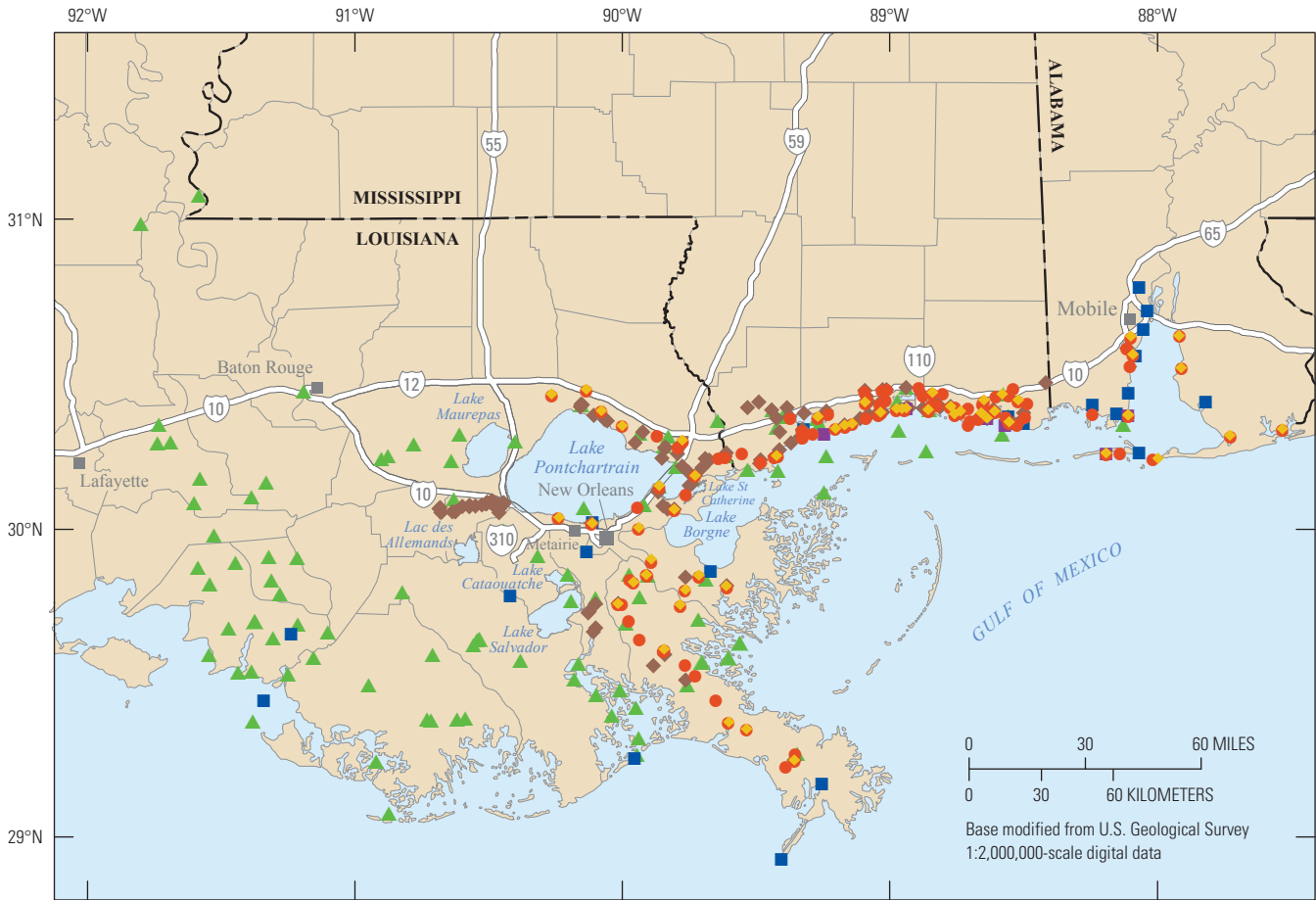


Figure 1. Gulf coast locations equipped with storm-tide sensors for monitoring time, areal extent, and magnitude of storm tide and coastal flooding generated by Hurricane Isaac, August 2012.

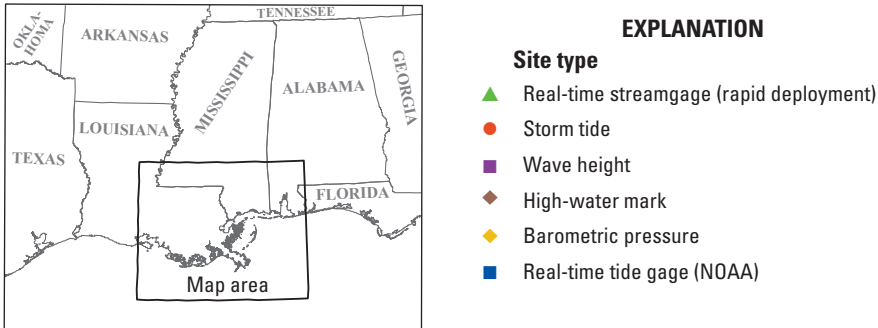


Table 1. Number of sites equipped to monitor Hurricane Isaac storm tide, by State.

State	Type and number of sensors deployed			
	Storm tide	Wave height	Real-time rapid deployment gages	Barometric pressure
Alabama	13	2	1	10
Mississippi	56	4	7	22
Louisiana	40	0	10	23
Total	109	6	18	55

Figure 2. A USGS scientist obtaining water-surface elevation data relative to a known reference elevation and deploying a storm-tide sensor at SSS-MS-JAC-039WV on the west side of Pascagoula Bay in Mississippi, August 28, 2012. Photo by Robert Brendlinger III, USGS.

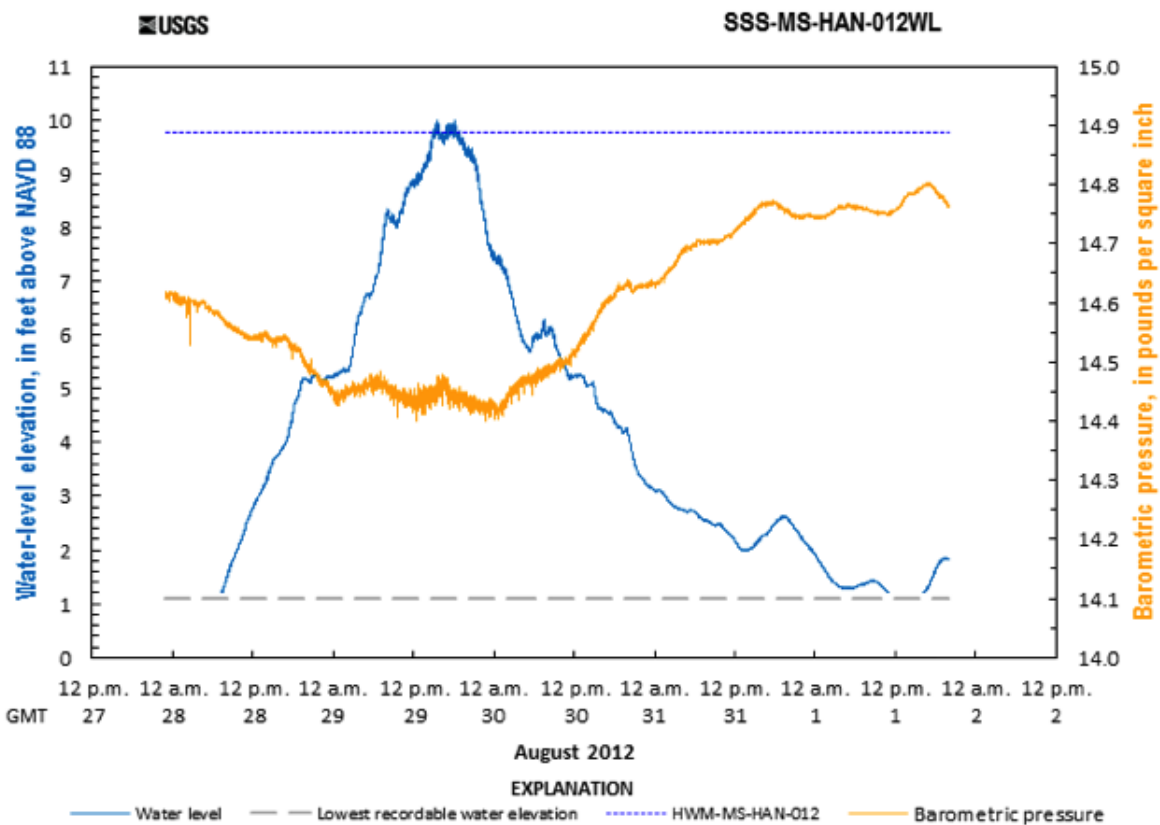


Figure 3. Example of a hydrograph displaying storm-tide elevation and barometric pressure data recorded during Hurricane Isaac, including nearby high-water mark elevation (HWM-MS-HAN-012).

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Data were collected and processed following protocols established by McGee and others (2006) and expanded upon by McCallum and others (2012), which included correcting water pressure for changes in barometric pressure and salinity. Quality-control checks were made by (1) deploying redundant sensors at a subset of sites, (2) comparing water levels computed from recorded pressure data to water levels recorded at nearby USGS streamgaging and NOAA tidal stations, and (3) to co-located high-water marks where possible. In the aftermath of the storm, 50 HWM locations were surveyed relative to NAVD 88 in Mississippi, 53 locations in Louisiana, and 1 in Alabama, where the impacts of the storm were the most pronounced.



Figure 4. A USGS rapid-deployment gage collecting real-time water-level and meteorological data at Lake Pontchartrain, Louisiana. Photo by Christopher A. Smith, USGS.

Elevation Surveys

Reference points were established on permanent objects near the water-level sensors in order to relate the recorded water-surface elevation to NAVD 88. Graduated steel tapes were used to relate the elevation of the reference points to the water-level sensors. Survey-grade Global Navigation Satellite Systems (GNSS) equipment (fig. 5) was used to determine the elevation above NAVD 88 of the reference points and HWMs, per USGS technical guidance in Rydland and Densmore (2012). GNSS equipment relies on GEOID models to determine elevations above NAVD 88. A new model, the GEOID12, was released in July 2012; however, errors in the model were soon discovered for the gulf coast region in checking the surveying accuracy at benchmarks (http://www.ngs.noaa.gov/web/news/GEOID12_Error_Notice.shtml). Following analysis of the control data and a number of corrections, the GEOID12A model was released on

September 11, 2012 (National Geodetic Survey, 2012).

However, because this model was in beta testing during the initial recovery effort of this study, the GEOID09 model was used for consistency within the deployment area, and all elevations in this report were derived using the GEOID09 model.

National Geodetic Survey (NGS) benchmarks throughout the study area were surveyed for vertical control. Table 2 (back of report) lists the GNSS-derived elevations using both the GEOID09 and GEOID12A models for all NGS benchmarks surveyed during this study. Table 2 also lists the difference in the GNSS elevations for both models, and the published NGS elevations from the datasheets, which can be accessed at <http://www.ngs.noaa.gov/cgi-bin/datasheet.prl>.



Figure 5. A global positioning system used to survey storm-tide elevation after Hurricane Isaac. Photo by William C. Vervaeke, USGS.

Data Presentation

The data from the Hurricane Isaac storm-tide network constitute an extensive collection of continuous water-level records documenting a single, landfall hurricane. The data can be used to evaluate the performance of storm-tide models for maximum and incremental water level and flood extent and for site-specific effects of storm tide on natural and anthropogenic features of the environment. The data are available on a provisional basis in tab-delineated, ASCII format by site for each sensor by using a USGS interactive storm-tide mapper at <http://wim.usgs.gov/isaacstormtidemapper/stormtidemapper.html>.

Digital photographs for selected locations are available on the interactive mapper. Data for each sensor include location, date, time, water level, and barometric pressure and the data-processing date are provided in the file header. Data for HWMs include location, description and quality of the mark, and elevation.

A list of the 133 water-level and wave-height sensor locations and the peak elevation recorded at each are listed in table 3 (back of report). These temporary sensors were deployed to augment long-term monitoring networks operated by the USGS (table 4, back of report) and NOAA (table 5, back of report). All HWM data, both those co-located at a sensor and those independent of a sensor location, that were collected by the USGS immediately after Hurricane Isaac are listed in table 6 (back of report). The reference points and HWMs were surveyed to a vertical accuracy of 0.25 foot at the 95-percent confidence level and within 10 feet horizontally. All NOAA data are displayed to mean sea level.

Acknowledgments

This report was prepared in cooperation with the Federal Emergency Management Agency. The data in this report are the result of the long hours and effort by numerous staff in the USGS Water Science Centers in Alabama, Mississippi, Louisiana, and Georgia. The USGS would like to recognize the assistance and access to the real-time network (RTN) along the gulf coast provided by the Center for Geoinformatics at no charge because of the public safety nature of this event. The authors particularly highlight the leadership and dedication of USGS employees in the Wisconsin Water Science Center who assisted with the Storm-Tide Mapper updates to deliver these valuable data to numerous stakeholders in a very timely and accurate manner.

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Tables 2–6

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Table 2. Differences between Global Navigation Satellite System (GNSS) surveyed elevations and National Geodetic Survey (NGS) elevations used to check vertical accuracies in Louisiana, Mississippi, and Alabama, following Hurricane Isaac, August 2012.

[NGS PID, National Geodetic Survey Point Identifier; elevations referenced to the North American Vertical Datum of 1988; GEOID09 and GEOID12A are models]

NGS PID	State	County or Parish	GNSS elevation (GEOID09)	GNSS elevation (GEOID12A)	Difference in models	NGS datasheet elevation	Difference from NGS datasheet (GEOID09)	Difference from NGS datasheet (GEOID12A)
BH0847	Mississippi	Harrison	26.01	25.61	0.40	25.57	0.44	0.04
BH0847	Mississippi	Harrison	25.96	25.56	0.40	25.57	0.39	-0.01
BH1197	Mississippi	Hancock	17.30	17.04	0.26	17.03	0.27	0.01
BH1197	Mississippi	Hancock	17.36	17.11	0.26	17.03	0.33	0.07
BH1197	Mississippi	Hancock	17.29	17.03	0.26	17.03	0.26	0.00
DL8830	Mississippi	Jackson	20.35	19.98	0.38	19.98	0.37	-0.00
DL8830	Mississippi	Jackson	20.40	20.03	0.38	19.98	0.42	0.04
DL8830	Mississippi	Jackson	20.34	19.96	0.38	19.98	0.36	-0.02
DL8830	Mississippi	Jackson	20.33	19.96	0.38	19.98	0.35	-0.02
DL8830	Mississippi	Jackson	20.42	20.05	0.38	19.98	0.44	0.07
DL8830	Mississippi	Jackson	20.29	19.91	0.38	19.98	0.31	-0.07
DL8830	Mississippi	Jackson	20.22	19.85	0.38	19.98	0.24	-0.14
DL8843	Mississippi	Harrison	40.99	40.61	0.39	40.57	0.42	0.04
DL8843	Mississippi	Harrison	40.97	40.59	0.39	40.57	0.40	0.02
DL8843	Mississippi	Harrison	41.03	40.64	0.39	40.57	0.46	0.07
BH3280	Mississippi	Hancock	18.83	18.42	0.40	18.46	0.37	-0.04
BH3280	Mississippi	Hancock	18.84	18.43	0.40	18.46	0.38	-0.03
BH3280	Mississippi	Hancock	18.81	18.41	0.40	18.46	0.35	-0.05
BH0370	Mississippi	Jackson	21.60	21.23	0.38	21.24	0.36	-0.01
BH0919	Mississippi	Harrison	8.53	8.13	0.40	8.13	0.40	-0.00
BH1605	Alabama	Mobile	26.60	26.39	0.21	26.25	0.35	0.14
BH1737	Alabama	Mobile	16.36	16.10	0.26	16.00	0.36	0.10
DL8841	Mississippi	Harrison	10.12	9.73	0.39	9.73	0.39	-0.01
DN3570	Alabama	Mobile	13.92	13.67	0.25	13.67	0.25	0.00
BH0432	Mississippi	Jackson	10.28	9.96	0.32	10.06	0.22	-0.10
DL9654	Mississippi	Jackson	14.11	13.79	0.32	13.74	0.37	0.05
DL9655	Mississippi	Jackson	12.55	12.23	0.32	12.18	0.37	0.05
DL8995	Mississippi	Pearl River	173.44	172.98	0.46	173.02	0.42	-0.04
BH3273	Mississippi	Hancock	46.56	46.14	0.42	46.05	0.51	0.09
BH3310	Mississippi	Harrison	48.88	48.49	0.39	48.63	0.25	-0.14
BH3315	Mississippi	Harrison	115.45	115.03	0.42	115.18	0.27	-0.15
DL8884	Mississippi	Pearl River	164.87	164.46	0.41	164.49	0.38	-0.03
DL8892	Mississippi	Pearl River	332.00	331.56	0.44	331.71	0.29	-0.15

Table 2. Differences between Global Navigation Satellite System (GNSS) surveyed elevations and National Geodetic Survey (NGS) elevations used to check vertical accuracies in Louisiana, Mississippi, and Alabama, following Hurricane Isaac, August 2012.—Continued

[NGS PID, National Geodetic Survey Point Identifier; elevations referenced to the North American Vertical Datum of 1988; GEOID09 and GEOID12A are models]

NGS PID	State	County or Parish	GNSS elevation (GEOID09)	GNSS elevation (GEOID12A)	Difference in models	NGS datasheet elevation	Difference from NGS datasheet (GEOID09)	Difference from NGS datasheet (GEOID12A)
DL8880	Mississippi	Pearl River	233.24	232.84	0.40	232.95	0.29	−0.11
DL8873	Mississippi	Pearl River	59.06	58.66	0.40	58.73	0.33	−0.07
BH3268	Mississippi	Hancock	71.68	71.24	0.44	71.17	0.51	0.07
DL8899	Mississippi	Pearl River	244.48	244.06	0.42	244.26	0.22	−0.20
DJ9378	Louisiana	Plaquemines	3.48	3.23	0.25	3.48	0.00	−0.25
AU2303	Louisiana	Jefferson	1.14	0.99	0.15	1.35	−0.20	−0.36
AT0332	Louisiana	St. Bernard	6.52	6.42	0.11	6.79	−0.27	−0.38
BJ1342	Louisiana	Orleans	5.96	6.10	−0.14	6.04	−0.08	0.07
AT1390	Louisiana	Plaquemines	2.09	2.70	−0.61	2.59	−0.50	0.11
BH1811	Louisiana	Orleans	−1.69	−1.59	−0.10	−1.20	−0.49	−0.39
BJ1342	Louisiana	Orleans	5.85	6.00	−0.14	6.04	−0.18	−0.04
BJ3816	Louisiana	Livingston	56.64	56.64	0.00	56.69	−0.05	−0.06
AT1390	Louisiana	Plaquemines	1.97	2.59	−0.61	2.59	−0.62	−0.01
BJ1342	Louisiana	Orleans	5.78	5.93	−0.14	6.04	−0.26	−0.11

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Table 3. Hurricane Isaac peak storm-tide data for 133 U.S. Geological Survey temporarily-deployed sites, by State.

[NAVD 88, North American Vertical Datum of 1988; GMT, Greenwich meridian time; RDG, rapid-deployment gage]

Site identification	State	County or Parish	Latitude	Longitude	Site type	Type of data recorded	Peak storm-tide elevation, feet above NAVD 88	Peak storm-tide date and time (GMT)
			Decimal degrees					
302019088074181	Alabama	Mobile	30.33862	−88.12828	real-time RDG	storm tide	none	peak not recorded
SSS-AL-BAL-001WL	Alabama	Baldwin	30.32640	−87.53355	water level	storm tide	3.52	8/29/2012 16:35:51
SSS-AL-BAL-002WL	Alabama	Baldwin	30.30453	−87.72813	water level	storm tide	3.18	8/29/2012 15:14:00
SSS-AL-BAL-003WL	Alabama	Baldwin	30.23196	−88.01794	water level	storm tide	4.72	8/28/2012 16:55:00
SSS-AL-BAL-004WL	Alabama	Baldwin	30.52506	−87.91155	water level	storm tide	4.94	8/29/2012 17:29:00
SSS-AL-BAL-005WL	Alabama	Baldwin	30.63002	−87.91876	water level	storm tide	4.97	8/29/2012 16:31:30
SSS-AL-MOB-001WL	Alabama	Mobile	30.25270	−88.14082	water level	storm tide	4.93	8/29/2012 14:36:30
SSS-AL-MOB-002WV	Alabama	Mobile	30.24848	−88.19156	wave height	wave height	7.43	8/29/2012 11:04:14
SSS-AL-MOB-003WL	Alabama	Mobile	30.24848	−88.19156	water level	storm tide	7.31	8/28/2012 20:54:30
SSS-AL-MOB-004WL	Alabama	Mobile	30.37822	−88.24212	water level	storm tide	5.28	8/29/2012 14:39:30
SSS-AL-MOB-005WL	Alabama	Mobile	30.37160	−88.10972	water level	storm tide	5.96	8/29/2012 16:06:00
SSS-AL-MOB-006WV	Alabama	Mobile	30.37160	−88.10972	wave height	wave height	5.86	8/29/2012 11:10:28
SSS-AL-MOB-007WL	Alabama	Mobile	30.53263	−88.10500	water level	storm tide	5.31	8/29/2012 16:35:30
SSS-AL-MOB-008WL	Alabama	Mobile	30.56630	−88.09299	water level	storm tide	5.45	8/29/2012 19:07:30
SSS-AL-MOB-009WL	Alabama	Mobile	30.58637	−88.11424	water level	storm tide	5.40	8/29/2012 19:44:30
SSS-AL-MOB-010WL	Alabama	Mobile	30.62526	−88.09924	water level	storm tide	5.48	8/29/2012 19:38:30
00004264	Louisiana	Jefferson	29.77833	−90.10028	real-time RDG	storm tide	4.28	8/30/2012 19:00:00
295020089411600	Louisiana	St Bernard	29.83889	−89.68778	real-time RDG	storm tide	7.96	8/29/2012 11:15:00
300413090084304	Louisiana	Jefferson	30.07042	−90.14529	real-time RDG	storm tide	7.41	8/29/2012 13:15:00
3004510895507	Louisiana	Orleans	30.08111	−89.91861	real-time RDG	storm tide	0.27	8/30/2012 23:00:00
300830089515000	Louisiana	Orleans	30.14167	−89.86389	real-time RDG	storm tide	6.13	8/30/2012 8:15:00
301213894806	Louisiana	St Tammany	30.20374	−89.80163	real-time RDG	storm tide	7.49	8/30/2012 2:30:00
301609089504016	Louisiana	St Tammany	30.26921	−89.84449	real-time RDG	storm tide	6.20	8/30/2012 5:45:00

Table 3. Hurricane Isaac peak storm-tide data for 133 U.S. Geological Survey temporarily-deployed sites, by State.—Continued

[NAVD 88, North American Vertical Datum of 1988; GMT, Greenwich meridian time; RDG, rapid-deployment gage]

Site identification	State	County or Parish	Latitude	Longitude	Site type	Type of data recorded	Peak storm-tide elevation, feet above NAVD 88	Peak storm-tide date and time (GMT)
			Decimal degrees					
301704090240655	Louisiana	Tangipahoa	30.28462	−90.40182	real-time RDG	storm tide	6.99	8/30/2012 10:45:00
301847089560989	Louisiana	St Tammany	30.31317	−89.93608	real-time RDG	storm tide	7.95	8/30/2012 5:45:00
302415090091465	Louisiana	St Tammany	30.40433	−90.15407	real-time RDG	storm tide	8.45	8/30/2012 3:45:00
SSS-LA-ORL-013WL	Louisiana	Orleans	30.00633	−89.93955	water level	storm tide	4.05	8/30/2012 14:45:00
SSS-LA-ORL-014WL	Louisiana	Orleans	30.07691	−89.94309	water level	storm tide	6.41	8/30/2012 8:59:00
SSS-LA-ORL-017WL	Louisiana	Orleans	30.06712	−89.80600	water level	storm tide	7.79	8/29/2012 8:10:30
SSS-LA-ORL-050WL	Louisiana	Orleans	30.14197	−89.86349	water level	storm tide	6.30	8/30/2012 4:01:00
SSS-LA-ORL-051WL	Louisiana	Orleans	30.04104	−90.23839	water level	storm tide	6.72	8/29/2012 16:18:00
SSS-LA-ORL-052WL	Louisiana	Orleans	30.11626	−89.76152	water level	storm tide	10.13	8/29/2012 15:48:00
SSS-LA-ORL-054WL	Louisiana	Orleans	30.02226	−90.11422	water level	storm tide	5.82	8/30/2012 9:24:00
SSS-LA-PLA-001WL	Louisiana	Plaquemines	29.61310	−89.84530	water level	storm tide	11.62	8/29/2012 4:48:30
SSS-LA-PLA-002WL	Louisiana	Plaquemines	29.61179	−89.84579	water level	storm tide	−0.26	8/29/2012 13:59:00
SSS-LA-PLA-003WL	Louisiana	Plaquemines	29.52933	−89.72734	water level	storm tide	11.97	8/29/2012 2:52:00
SSS-LA-PLA-004WL	Louisiana	Plaquemines	29.56657	−89.76587	water level	storm tide	14.41	8/29/2012 2:56:30
SSS-LA-PLA-005WL	Louisiana	Plaquemines	29.64860	−89.93526	water level	storm tide	13.29	8/29/2012 8:18:00
SSS-LA-PLA-006WL	Louisiana	Plaquemines	29.71100	−89.97722	water level	storm tide	13.49	8/29/2012 9:27:30
SSS-LA-PLA-007WL	Louisiana	Plaquemines	29.35278	−89.53640	water level	storm tide	7.12	8/29/2012 14:08:30
SSS-LA-PLA-008WL	Louisiana	Plaquemines	29.44990	−89.64972	water level	storm tide	8.10	8/29/2012 16:01:00
SSS-LA-PLA-009WL	Louisiana	Plaquemines	29.27228	−89.35315	water level	storm tide	−0.43	8/28/2012 19:39:00
SSS-LA-PLA-010WL	Louisiana	Plaquemines	29.25242	−89.35828	water level	storm tide	6.37	8/29/2012 6:44:00
SSS-LA-PLA-011WL	Louisiana	Plaquemines	29.23234	−89.38946	water level	storm tide	4.58	8/29/2012 14:30:00
SSS-LA-PLA-012WL	Louisiana	Plaquemines	29.37509	−89.60143	water level	storm tide	7.27	8/29/2012 13:57:00
SSS-LA-PLA-017WL	Louisiana	Plaquemines	29.76189	−90.00966	water level	none	none	lost

12 Monitoring Storm Tide and Flooding from Hurricane Isaac along the Gulf Coast of the United States, August 2012

Table 3. Hurricane Isaac peak storm-tide data for 133 U.S. Geological Survey temporarily-deployed sites, by State.—Continued

[NAVD 88, North American Vertical Datum of 1988; GMT, Greenwich meridian time; RDG, rapid-deployment gage]

Site identification	State	County or Parish	Latitude	Longitude	Site type	Type of data recorded	Peak storm-tide elevation, feet above NAVD 88	Peak storm-tide date and time (GMT)
			Decimal degrees					
SSS-LA-PLA-018WL	Louisiana	Plaquemines	29.76168	−90.01019	water level	storm tide	14.07	8/29/2012 12:36:30
SSS-LA-PLA-019WL	Louisiana	Plaquemines	29.83164	−89.95924	water level	storm tide	13.89	8/29/2012 14:25:30
SSS-LA-PLA-020WL	Louisiana	Plaquemines	29.84030	−89.97102	water level	storm tide	14.00	8/29/2012 12:32:30
SSS-LA-PLA-021WL	Louisiana	Plaquemines	29.85545	−89.90964	water level	storm tide	13.53	8/29/2012 12:39:30
SSS-LA-PLA-022WL	Louisiana	Plaquemines	29.85561	−89.91063	water level	storm tide	13.71	8/29/2012 12:20:00
SSS-LA-STB-003WL	Louisiana	St Bernard	29.90092	−89.89368	water level	storm tide	2.00	8/29/2012 21:29:30
SSS-LA-STB-024WL	Louisiana	St Bernard	29.80691	−89.76452	water level	storm tide	11.57	8/29/2012 15:03:00
SSS-LA-STB-025WL	Louisiana	St Bernard	29.81886	−89.61126	water level	storm tide	10.18	8/29/2012 6:06:00
SSS-LA-STB-026WL	Louisiana	St Bernard	29.75786	−89.78380	water level	storm tide	11.45	8/29/2012 10:17:00
SSS-LA-STB-027WL	Louisiana	St Bernard	29.85327	−89.71373	water level	storm tide	10.77	8/29/2012 16:17:30
SSS-LA-STT-007WL	Louisiana	St Tammany	30.29038	−89.77743	water level	storm tide	8.50	8/30/2012 4:28:00
SSS-LA-STT-008WL	Louisiana	St Tammany	30.27134	−89.79356	water level	storm tide	8.28	8/30/2012 7:30:00
SSS-LA-STT-009WL	Louisiana	St Tammany	30.30617	−89.87098	water level	none	none	no surge recorded
SSS-LA-STT-010WL	Louisiana	St Tammany	30.33739	−90.00198	water level	storm tide	7.91	8/30/2012 5:08:00
SSS-LA-STT-011WL	Louisiana	St Tammany	30.38488	−90.07906	water level	storm tide	10.04	8/30/2012 8:43:00
SSS-LA-STT-012WL	Louisiana	St Tammany	30.45449	−90.13426	water level	storm tide	9.35	8/30/2012 9:27:30
SSS-LA-STT-100WL	Louisiana	St Tammany	30.23835	−89.61631	water level	storm tide	9.32	8/29/2012 19:23:00
SSS-LA-STT-101WL	Louisiana	St Tammany	30.17615	−89.72835	water level	storm tide	7.50	8/29/2012 20:55:00
SSS-LA-STT-102WL	Louisiana	St Tammany	30.23518	−89.63959	water level	storm tide	9.70	8/29/2012 19:13:30
SSS-LA-TAN-004WL	Louisiana	Tangipahoa	30.43865	−90.26640	water level	storm tide	9.27	8/30/2012 8:55:30
02480605	Mississippi	Harrison	30.45948	−88.93892	real-time RDG	storm tide	none	peak not recorded
02481299	Mississippi	Jackson	30.41910	−88.82804	real-time RDG	storm tide	6.96	8/29/2012 18:15:00
02481325	Mississippi	Harrison	30.34242	−89.26449	real-time RDG	storm tide	8.66	8/29/2012 19:30:00

Table 3. Hurricane Isaac peak storm-tide data for 133 U.S. Geological Survey temporarily-deployed sites, by State.—Continued

[NAVD 88, North American Vertical Datum of 1988; GMT, Greenwich meridian time; RDG, rapid-deployment gage]

Site identification	State	County or Parish	Latitude	Longitude	Site type	Type of data recorded	Peak storm-tide elevation, feet above NAVD 88	Peak storm-tide date and time (GMT)
			Decimal degrees					
0248152650	Mississippi	Harrison	30.35800	−89.27336	real-time RDG	storm tide	9.39	8/29/2012 17:00:00
02481667	Mississippi	Hancock	30.36517	−89.40161	real-time RDG	storm tide	9.69	8/29/2012 16:30:00
02481671	Mississippi	Hancock	30.33020	−89.42477	real-time RDG	storm tide	10.12	8/29/2012 17:45:00
02492670	Mississippi	Hancock	30.23908	−89.61478	real-time RDG	storm tide	7.78	8/29/2012 12:00:00
SSS-MS-HAN-004WL	Mississippi	Hancock	30.31007	−89.32571	water level	storm tide	10.73	8/29/2012 19:00:00
SSS-MS-HAN-012WL	Mississippi	Hancock	30.36557	−89.37379	water level	storm tide	10.00	8/29/2012 18:12:00
SSS-MS-HAN-013WL	Mississippi	Hancock	30.32420	−89.32778	water level	storm tide	8.78	8/29/2012 17:38:00
SSS-MS-HAN-014WL	Mississippi	Hancock	30.30244	−89.32799	water level	storm tide	10.90	8/29/2012 17:39:30
SSS-MS-HAN-015WL	Mississippi	Hancock	30.23954	−89.42480	water level	storm tide	11.60	8/29/2012 13:16:30
SSS-MS-HAN-016WL	Mississippi	Hancock	30.23953	−89.43230	water level	storm tide	10.09	8/29/2012 17:06:30
SSS-MS-HAN-017WL	Mississippi	Hancock	30.24995	−89.55179	water level	storm tide	9.52	8/29/2012 20:01:00
SSS-MS-HAN-018WL	Mississippi	Hancock	30.22103	−89.48212	water level	storm tide	9.99	8/29/2012 14:33:30
SSS-MS-HAR-001WL	Mississippi	Harrison	30.45346	−89.02775	water level	storm tide	9.24	8/30/2012 2:34:00
SSS-MS-HAR-002WL	Mississippi	Harrison	30.45353	−89.01321	water level	storm tide	8.13	8/29/2012 18:07:30
SSS-MS-HAR-003WL	Mississippi	Harrison	30.44943	−89.09260	water level	riverine	18.50	8/30/2012 1:31:30
SSS-MS-HAR-004WL	Mississippi	Harrison	30.41288	−89.09313	water level	riverine	12.43	8/30/2012 7:29:00
SSS-MS-HAR-005WL	Mississippi	Harrison	30.36419	−89.09032	water level	storm tide	8.79	8/29/2012 17:49:00
SSS-MS-HAR-006WL	Mississippi	Harrison	30.37691	−89.04433	water level	storm tide	9.19	8/29/2012 17:57:00
SSS-MS-HAR-007WL	Mississippi	Harrison	30.40946	−89.03756	water level	storm tide	8.26	8/29/2012 20:18:30
SSS-MS-HAR-008WL	Mississippi	Harrison	30.42071	−89.01804	water level	storm tide	8.15	8/29/2012 19:55:00
SSS-MS-HAR-009WL	Mississippi	Harrison	30.43154	−89.08820	water level	storm tide	8.78	8/29/2012 20:14:00
SSS-MS-HAR-010WL	Mississippi	Harrison	30.37702	−89.23209	water level	storm tide	9.51	8/29/2012 18:20:00
SSS-MS-HAR-011WL	Mississippi	Harrison	30.36672	−89.26917	water level	storm tide	9.41	8/29/2012 17:55:00

14 Monitoring Storm Tide and Flooding from Hurricane Isaac along the Gulf Coast of the United States, August 2012

Table 3. Hurricane Isaac peak storm-tide data for 133 U.S. Geological Survey temporarily-deployed sites, by State.—Continued

[NAVD 88, North American Vertical Datum of 1988; GMT, Greenwich meridian time; RDG, rapid-deployment gage]

Site identification	State	County or Parish	Latitude	Longitude	Site type	Type of data recorded	Peak storm-tide elevation, feet above NAVD 88	Peak storm-tide date and time (GMT)
			Decimal degrees					
SSS-MS-HAR-014WL	Mississippi	Harrison	30.31244	−89.29070	water level	storm tide	9.37	8/29/2012 17:45:30
SSS-MS-HAR-019WL	Mississippi	Harrison	30.38999	−88.85783	water level	storm tide	7.46	8/29/2012 18:57:30
SSS-MS-HAR-020WL	Mississippi	Harrison	30.39084	−88.95499	water level	storm tide	9.19	8/29/2012 18:07:00
SSS-MS-HAR-021WL	Mississippi	Harrison	30.39089	−88.97488	water level	storm tide	9.41	8/29/2012 18:04:30
SSS-MS-HAR-022WL	Mississippi	Harrison	30.38008	−89.03524	water level	storm tide	9.32	8/29/2012 17:55:00
SSS-MS-HAR-023WL	Mississippi	Harrison	30.34418	−89.14133	water level	storm tide	10.15	8/29/2012 17:34:00
SSS-MS-HAR-024WL	Mississippi	Harrison	30.33752	−89.17010	water level	storm tide	9.87	8/29/2012 18:21:00
SSS-MS-HAR-025WL	Mississippi	Harrison	30.32801	−89.20386	water level	none	none	no surge recorded
SSS-MS-HAR-026WV	Mississippi	Harrison	30.31130	−89.24516	wave height	wave height	9.48	8/29/2012 12:01:14
SSS-MS-HAR-101WV	Mississippi	Harrison	30.39307	−88.93840	wave height	none	none	lost
SSS-MS-JAC-012WL	Mississippi	Jackson	30.40644	−88.82242	water level	storm tide	6.85	8/29/2012 18:53:00
SSS-MS-JAC-013WL	Mississippi	Jackson	30.39889	−88.77331	water level	storm tide	6.60	8/29/2012 19:12:30
SSS-MS-JAC-014WL	Mississippi	Jackson	30.40036	−88.75736	water level	storm tide	6.55	8/29/2012 16:56:00
SSS-MS-JAC-015WL	Mississippi	Jackson	30.37429	−88.76000	water level	storm tide	6.52	8/29/2012 16:43:30
SSS-MS-JAC-016WL	Mississippi	Jackson	30.38059	−88.73830	water level	storm tide	6.49	8/29/2012 17:19:00
SSS-MS-JAC-017WL	Mississippi	Jackson	30.34301	−88.70840	water level	storm tide	7.76	8/29/2012 15:45:00
SSS-MS-JAC-018WL	Mississippi	Jackson	30.36284	−88.70138	water level	storm tide	6.74	8/29/2012 17:15:30
SSS-MS-JAC-019WL	Mississippi	Jackson	30.39582	−88.70824	water level	storm tide	7.05	8/30/2012 4:18:00
SSS-MS-JAC-020WL	Mississippi	Jackson	30.37901	−88.65967	water level	storm tide	6.13	8/29/2012 16:42:00
SSS-MS-JAC-021WL	Mississippi	Jackson	30.36332	−88.66297	water level	storm tide	7.65	8/29/2012 16:11:30
SSS-MS-JAC-022WL	Mississippi	Jackson	30.38803	−88.61578	water level	storm tide	6.13	8/29/2012 16:31:00
SSS-MS-JAC-023WL	Mississippi	Jackson	30.41112	−88.65489	water level	storm tide	6.71	8/29/2012 17:18:30
SSS-MS-JAC-024WL	Mississippi	Jackson	30.41980	−88.64940	water level	storm tide	6.29	8/29/2012 17:18:30

Table 3. Hurricane Isaac peak storm-tide data for 133 U.S. Geological Survey temporarily-deployed sites, by State.—Continued

[NAVD 88, North American Vertical Datum of 1988; GMT, Greenwich meridian time; RDG, rapid-deployment gage]

Site identification	State	County or Parish	Latitude	Longitude	Site type	Type of data recorded	Peak storm-tide elevation, feet above NAVD 88	Peak storm-tide date and time (GMT)
			Decimal degrees					
SSS-MS-JAC-030WL	Mississippi	Jackson	30.41344	−88.48890	water level	storm tide	5.62	8/29/2012 19:00:30
SSS-MS-JAC-031WL	Mississippi	Jackson	30.41989	−88.51984	water level	storm tide	5.68	8/29/2012 17:53:30
SSS-MS-JAC-032WL	Mississippi	Jackson	30.36814	−88.49949	water level	storm tide	7.07	8/29/2012 17:42:00
SSS-MS-JAC-033WL	Mississippi	Jackson	30.34300	−88.52312	water level	storm tide	5.75	8/29/2012 16:18:30
SSS-MS-JAC-034WL	Mississippi	Jackson	30.34821	−88.55405	water level	storm tide	5.81	8/29/2012 16:18:00
SSS-MS-JAC-035WL	Mississippi	Jackson	30.44055	−88.80580	water level	none	none	no surge recorded
SSS-MS-JAC-036WL	Mississippi	Jackson	30.44324	−88.84183	water level	storm tide	7.19	8/29/2012 19:04:00
SSS-MS-JAC-037WL	Mississippi	Jackson	30.43813	−88.88013	water level	storm tide	7.46	8/29/2012 19:06:30
SSS-MS-JAC-038WL	Mississippi	Jackson	30.46218	−88.89183	water level	storm tide	7.11	8/29/2012 21:18:00
SSS-MS-JAC-039WV	Mississippi	Jackson	30.36134	−88.63615	wave height	wave height	6.70	8/29/2012 11:34:36
SSS-MS-JAC-040WV	Mississippi	Jackson	30.33962	−88.57019	wave height	none	none	no surge recorded
SSS-MS-JAC-050WL	Mississippi	Jackson	30.43780	−88.60480	water level	storm tide	5.00	8/29/2012 16:12:15
SSS-MS-JAC-051WL	Mississippi	Jackson	30.43825	−88.55779	water level	storm tide	5.42	8/29/2012 16:30:28
SSS-MS-JAC-052WL	Mississippi	Jackson	30.45860	−88.54140	water level	storm tide	6.15	8/29/2012 18:42:37
SSS-MS-JAC-053WL	Mississippi	Jackson	30.40942	−88.84371	water level	storm tide	7.55	8/29/2012 17:47:25
SSS-MS-JAC-054WL	Mississippi	Jackson	30.36778	−88.56310	water level	storm tide	6.06	8/29/2012 15:35:50
SSS-MS-JAC-055WL	Mississippi	Jackson	30.38270	−88.60844	water level	storm tide	6.32	8/29/2012 15:18:56
SSS-MS-JAC-056WL	Mississippi	Harrison	30.38830	−88.85720	water level	storm tide	7.49	8/29/2012 17:34:00

Table 4. Hurricane Isaac peak storm-tide data recorded at U.S. Geological Survey long-term monitoring sites, by State.

[NAVD 88, North American Vertical Datum of 1988; NGVD 29, National Geodetic Vertical Datum of 1929; GMT, Greenwich meridian time]

Site identification	State	County or Parish	Latitude	Longitude	Site type	Type of data recorded	Peak storm-tide elevation, feet above gage datum	Gage altitude datum	Peak storm-tide date and time (GMT)
			Decimal degrees						
07374000	Louisiana	West Baton Rouge	30.44567	−91.19156	real-time streamgage	storm tide	12.59	NAVD 88	8/29/2012 9:45
07374525	Louisiana	Plaquemines	29.85715	−89.97785	real-time streamgage	storm tide	11.61	NAVD 88	8/29/2012 4:00
073745253	Louisiana	Plaquemines	29.78417	−89.93750	real-time streamgage	storm tide	1.56	NAVD 88	8/28/2012 23:00
07374526	Louisiana	Plaquemines	29.63354	−89.56367	real-time tidegage	storm tide	6.75	NAVD 88	8/28/2012 18:00
07374527	Louisiana	Plaquemines	29.58596	−89.60603	real-time streamgage	storm tide	13.21	NAVD 88	8/29/2012 2:30
07374581	Louisiana	St Tammany	30.30131	−89.83062	real-time streamgage	storm tide	8.13	NAVD 88	8/30/2012 6:45
07380200	Louisiana	Livingston	30.27547	−90.77926	real-time streamgage	storm tide	6.87	NGVD 29	8/31/2012 3:30
07380215	Louisiana	Livingston	30.30936	−90.61037	real-time streamgage	storm tide	6.58	NAVD 88	8/30/2012 15:00
073802245	Louisiana	Ascension	30.24047	−90.87732	real-time streamgage	storm tide	6.08	NAVD 88	8/30/2012 13:30
073802273	Louisiana	Ascension	30.22742	−90.89954	real-time streamgage	storm tide	5.49	NAVD 88	8/31/2012 3:30
073802375	Louisiana	St Charles	29.77139	−90.19333	real-time streamgage	storm tide	4.71	NAVD 88	8/30/2012 16:00
07380238	Louisiana	Plaquemines	29.69911	−89.98886	real-time streamgage	storm tide	3.44	NAVD 88	8/30/2012 0:30
07380251	Louisiana	Plaquemines	29.42272	−89.95063	real-time tidegage	storm tide	6.63	NAVD 88	8/29/2012 11:00
073802512	Louisiana	Lafourche	29.39856	−90.04118	real-time tidegage	storm tide	6.18	NAVD 88	8/29/2012 9:00
073802516	Louisiana	Jefferson	29.27283	−89.94681	real-time tidegage	storm tide	4.09	NAVD 88	8/30/2012 8:00
07380335	Louisiana	Lafourche	29.51772	−90.18147	real-time tidegage	storm tide	5.70	NGVD 29	8/29/2012 19:00
07381000	Louisiana	Lafourche	29.79799	−90.82259	real-time streamgage	storm tide	6.68	NAVD 88	8/30/2012 1:15
07381150	Louisiana	Lafourche	29.64706	−90.53678	real-time streamgage	storm tide	3.13	NAVD 88	8/31/2012 11:00
07381235	Louisiana	Lafourche	29.57722	−90.38083	real-time streamgage	storm tide	3.90	NAVD 88	8/31/2012 0:00
07381324	Louisiana	Terrebonne	29.38300	−90.71537	real-time streamgage	storm tide	2.58	NAVD 88	8/30/2012 16:45
07381328	Louisiana	Terrebonne	29.38522	−90.72981	real-time streamgage	storm tide	2.95	NAVD 88	8/30/2012 16:45
07381331	Louisiana	Terrebonne	29.59806	−90.71000	real-time streamgage	storm tide	2.57	NAVD 88	8/30/2012 22:00
073813375	Louisiana	Terrebonne	29.38889	−90.58778	real-time streamgage	storm tide	3.03	NAVD 88	8/29/2012 8:15

Table 4. Hurricane Isaac peak storm-tide data recorded at U.S. Geological Survey long-term monitoring sites, by State.—Continued

[NAVD 88, North American Vertical Datum of 1988; NGVD 29, National Geodetic Vertical Datum of 1929; GMT, Greenwich meridian time]

Site identification	State	County or Parish	Latitude	Longitude	Site type	Type of data recorded	Peak storm-tide elevation, feet above gage datum	Gage altitude datum	Peak storm-tide date and time (GMT)
			Decimal degrees						
07381343	Louisiana	Terrebonne	29.38697	−90.61803	real-time streamgage	storm tide	2.51	NAVD 88	8/29/2012 8:30
07381349	Louisiana	Terrebonne	29.24917	−90.92111	real-time tidegage	storm tide	4.54	NAVD 88	8/30/2012 16:12
07381350	Louisiana	Lafourche	29.64521	−90.54481	real-time streamgage	storm tide	3.07	NAVD 88	8/31/2012 10:15
07381355	Louisiana	Lafourche	29.62733	−90.55767	real-time streamgage	storm tide	3.06	NAVD 88	8/31/2012 12:00
07381454	Louisiana	St Martin	29.90911	−91.21583	real-time streamgage	storm tide	2.01	NAVD 88	8/31/2012 22:15
073814675	Louisiana	St Mary	29.66833	−91.09972	real-time streamgage	storm tide	2.97	NAVD 88	8/30/2012 21:45
07381490	Louisiana	Pointe Coupee	30.98250	−91.79833	real-time streamgage	storm surge	5.27	NGVD 29	8/30/2012 14:00
07381515	Louisiana	St Martin	30.28159	−91.68678	real-time streamgage	storm tide	4.41	NGVD 29	8/31/2012 0:15
073815450	Louisiana	St Mary	29.89270	−91.44567	real-time streamgage	storm tide	3.70	NGVD 29	8/30/2012 22:00
07381600	Louisiana	St Mary	29.69282	−91.21194	real-time streamgage	storm tide	3.90	NAVD 88	8/30/2012 21:30
073816503	Louisiana	Terrebonne	29.58556	−91.15528	real-time streamgage	storm tide	3.67	NAVD 88	8/30/2012 21:30
07381670	Louisiana	St Mary	29.68083	−91.47056	real-time streamgage	storm tide	3.87	NAVD 88	8/30/2012 21:30
07385765	Louisiana	St Mary	29.87937	−91.58622	real-time streamgage	storm tide	1.49	NAVD 88	8/30/2012 15:15
07385790	Louisiana	St Mary	29.82306	−91.54167	real-time streamgage	storm tide	1.84	NAVD 88	8/30/2012 15:00
291929089562600	Louisiana	Jefferson	29.32472	−89.94050	real-time tidegage	storm tide	5.99	NAVD 88	8/29/2012 16:00
292800090060000	Louisiana	Lafourche	29.46667	−90.10000	real-time streamgage	storm tide	5.54	NAVD 88	8/29/2012 17:00
292859090004000	Louisiana	Jefferson	29.48306	−90.01111	real-time tidegage	storm tide	9.47	NAVD 88	8/30/2012 9:00
292952089453800	Louisiana	Plaquemines	29.49778	−89.76056	real-time streamgage	storm tide	8.84	NAVD 88	8/29/2012 16:00
292952090565300	Louisiana	Terrebonne	29.49778	−90.94806	real-time streamgage	storm tide	2.43	NAVD 88	8/31/2012 7:00
293229091230800	Louisiana	St Mary	29.54139	−91.38556	real-time streamgage	storm tide	3.55	NAVD 88	8/30/2012 20:00
2951190901217	Louisiana	St Charles	29.85528	−90.20472	real-time streamgage	storm tide	5.12	NAVD 88	8/30/2012 4:00
295124089542100	Louisiana	Plaquemines	29.85356	−89.90769	real-time streamgage	storm tide	3.00	NAVD 88	8/29/2012 5:45
295501090190400	Louisiana	St Charles	29.91694	−90.31778	real-time streamgage	storm tide	4.63	NAVD 88	8/30/2012 18:15

Table 4. Hurricane Isaac peak storm-tide data recorded at U.S. Geological Survey long-term monitoring sites, by State.—Continued

[NAVD 88, North American Vertical Datum of 1988; NGVD 29, National Geodetic Vertical Datum of 1929; GMT, Greenwich meridian time]

Site identification	State	County or Parish	Latitude	Longitude	Site type	Type of data recorded	Peak storm-tide elevation, feet above gage datum	Gage altitude datum	Peak storm-tide date and time (GMT)
			Decimal degrees						
300602090375100	Louisiana	St John the Baptist	30.10056	−90.63083	real-time streamgage	storm tide	5.83	NAVD 88	8/31/2012 21:00
301001089442600	Louisiana	Orleans	30.16694	−89.74056	real-time tidegage	storm tide	7.88	NAVD 88	8/30/2012 3:00
301141089320300	Louisiana	St Tammany	30.19472	−89.53417	real-time streamgage	storm tide	9.01	NAVD 88	8/29/2012 16:30
301324090382400	Louisiana	Ascension	30.22333	−90.64000	real-time streamgage	storm tide	6.24	NAVD 88	8/31/2012 1:00
301655091440800	Louisiana	St Martin	30.28194	−91.73556	real-time streamgage	storm tide	8.88	NAVD 88	8/29/2012 23:30
302020091435700	Louisiana	St Martin	30.33889	−91.73250	real-time streamgage	storm tide	8.96	NAVD 88	9/4/2012 2:00
02480212	Mississippi	Jackson	30.36778	−88.56306	real-time streamgage	storm tide	5.90	NAVD 88	8/29/2012 15:30
02480273	Mississippi	Jackson	30.43806	−88.58083	real-time streamgage	storm tide	5.11	NAVD 88	8/29/2012 16:30
02480285	Mississippi	Jackson	30.38269	−88.60844	real-time streamgage	storm tide	5.96	NAVD 88	8/29/2012 15:30
02481270	Mississippi	Harrison	30.41575	−88.97587	real-time tidegage	storm tide	7.66	NAVD 88	8/29/2012 18:45
02481660	Mississippi	Hancock	30.38722	−89.44139	real-time streamgage	storm tide	10.28	NAVD 88	8/29/2012 17:00
0248166590	Mississippi	Hancock	30.38436	−89.38111	real-time streamgage	storm tide	10.26	NAVD 88	8/29/2012 16:45
07290880	Mississippi	Adams	31.56044	−91.41873	real-time streamgage	storm surge	¹ 28.39	NGVD 29	8/31/2012 18:00
302318088512600	Mississippi	Harrison	30.38833	−88.85722	real-time tidegage	storm tide	8.07	NAVD 88	8/29/2012 18:15

¹Includes gage datum; storm surge probably caused by localized wind effect.

Table 5. Hurricane Isaac peak storm-tide data recorded at National Oceanic and Atmospheric Administration long-term monitoring sites, by State (NOAA, 2012).

[NAVD 88, North American Vertical Datum of 1988; GMT, Greenwich meridian time]

Site identification	State	County or Parish	Latitude	Longitude	Site type	Type of data recorded	Peak storm-tide elevation, feet above NAVD 88	Peak storm-tide date and time (GMT)
			Decimal degrees					
8732828	Alabama	Baldwin	30.41670	−87.82500	real-time- tide gage	storm tide	3.67	8/29/2012 16:12
8735180	Alabama	Mobile	30.25000	−88.07500	real-time- tide gage	storm tide	3.77	8/29/2012 15:18
8735391	Alabama	Mobile	30.56517	−88.08800	real-time- tide gage	storm tide	4.54	8/29/2012 17:36
8735523	Alabama	Mobile	30.44369	−88.11392	real-time- tide gage	storm tide	4.53	8/29/2012 15:36
8736897	Alabama	Mobile	30.64830	−88.05830	real-time- tide gage	storm tide	4.99	8/29/2012 17:00
8737048	Alabama	Mobile	30.70830	−88.04330	real-time- tide gage	storm tide	4.51	8/29/2012 18:54
8737138	Alabama	Mobile	30.78189	−88.07361	real-time- tide gage	storm tide	4.36	8/29/2012 19:18
8738043	Alabama	Mobile	30.37664	−88.15856	real-time- tide gage	storm tide	4.33	8/29/2012 14:24
8739803	Alabama	Mobile	30.40567	−88.24769	real-time- tide gage	storm tide	4.89	8/29/2012 13:12
8741041	Mississippi	Jackson	30.34770	−88.50540	real-time- tide gage	storm tide	5.13	8/29/2012 15:12
8741533	Mississippi	Jackson	30.36790	−88.56300	real-time- tide gage	storm tide	4.63	8/29/2012 10:00
8747437	Mississippi	Hancock	30.32639	−89.32578	real-time- tide gage	storm tide	8.95	8/29/2012 16:42
8760721	Louisiana	Plaquemines	29.17830	−89.25830	real-time- tide gage	storm tide	5.88	8/29/2012 3:24
8760922	Louisiana	Plaquemines	28.93220	−89.40750	real-time- tide gage	storm tide	3.94	8/29/2012 7:36
8761305	Louisiana	St Bernard	29.86811	−89.67325	real-time- tide gage	storm tide	10.30	8/29/2012 5:36
8761724	Louisiana	Jefferson	29.26333	−89.95667	real-time- tide gage	storm tide	5.10	8/29/2012 14:06
8761927	Louisiana	Orleans	30.02717	−90.11342	real-time- tide gage	storm tide	6.28	8/30/2012 8:24
8761955	Louisiana	Jefferson	29.93289	−90.13547	real-time- tide gage	storm tide	3.36	8/29/2012 4:48
8762482	Louisiana	Lafourche	29.78856	−90.42019	real-time- tide gage	storm tide	1.50	8/29/2012 12:12
8764044	Louisiana	St Mary	29.66750	−91.23761	real-time- tide gage	storm tide	0.83	8/30/2012 21:36
8764227	Louisiana	St Mary	29.44958	−91.33811	real-time- tide gage	storm tide	2.66	8/30/2012 19:12
8766072	Louisiana	Vermilion	29.55500	−92.30500	real-time- tide gage	storm tide	0.95	8/30/2012 9:48

Table 6. Hurricane Isaac storm-tide high-water-mark data recorded by U.S. Geological Survey, by State.

[NAVD 88, North American Vertical Datum of 1988; GMT, Greenwich meridian time]

Site identification	State	County or Parish	Latitude	Longitude	Type of high-water mark	Peak storm- tide elevation, feet above NAVD 88	Peak storm-tide estimated date (GMT)
			Decimal degrees				
HWM-AL-MOB-002	Alabama	Mobile	30.58637	−88.11424	Co-located	5.6	8/29/2012
HWM-LA-JEF-001	Louisiana	Jefferson	29.68025	−90.10141	Independent	5.1	8/29/2012
HWM-LA-JEF-002	Louisiana	Jefferson	29.66820	−90.10934	Independent	4.9	8/29/2012
HWM-LA-JEF-003	Louisiana	Jefferson	29.73444	−90.12459	Independent	3.5	8/29/2012
HWM-LA-JEF-004	Louisiana	Jefferson	29.73223	−90.12875	Independent	3.9	8/29/2012
HWM-LA-JEF-005	Louisiana	Jefferson	29.75909	−90.10209	Independent	4.4	8/29/2012
HWM-LA-ORL-001	Louisiana	Orleans	30.07725	−89.84861	Independent	6.9	8/29/2012
HWM-LA-ORL-002	Louisiana	Orleans	30.06708	−89.83292	Independent	8.6	8/29/2012
HWM-LA-ORL-003	Louisiana	Orleans	30.14968	−89.74074	Independent	9.8	8/29/2012
HWM-LA-ORL-004	Louisiana	Orleans	30.12564	−89.86719	Independent	5.2	8/29/2012
HWM-LA-ORL-017	Louisiana	Orleans	30.06643	−89.80586	Co-located	9.7	8/29/2012
HWM-LA-ORL-028	Louisiana	Orleans	30.14508	−89.74825	Independent	6.1	8/29/2012
HWM-LA-ORL-029	Louisiana	Orleans	30.12434	−89.86669	Independent	5.9	8/29/2012
HWM-LA-ORL-202	Louisiana	Plaquemines	30.02181	−90.11422	Co-located	5.6	8/29/2012
HWM-LA-PLA-010	Louisiana	Plaquemines	29.25280	−89.35805	Co-located	6.3	8/29/2012
HWM-LA-PLA-201	Louisiana	Plaquemines	29.76060	−90.01770	Co-located	14.3	8/29/2012
HWM-LA-PLA-202	Louisiana	Plaquemines	29.51200	−89.76480	Independent	8.0	8/29/2012
HWM-LA-PLA-204	Louisiana	Plaquemines	29.55910	−89.88480	Independent	7.1	8/29/2012
HWM-LA-PLA-205	Louisiana	Plaquemines	29.59507	−89.84190	Independent	7.8	8/29/2012
HWM-LA-SJA-001	Louisiana	St James	30.05567	−90.67761	Independent	10.1	8/29/2012
HWM-LA-SJA-002	Louisiana	St James	30.07197	−90.68247	Independent	5.6	8/29/2012
HWM-LA-SJA-003	Louisiana	St James	30.06850	−90.68689	Independent	7.0	8/29/2012
HWM-LA-STB-001	Louisiana	St Bernard	29.84669	−89.76403	Independent	11.3	8/29/2012
HWM-LA-STB-004	Louisiana	St Bernard	29.81886	−89.61126	Co-located	9.4	8/29/2012
HWM-LA-STJ-001	Louisiana	St John the Baptist	30.08883	−90.50602	Independent	5.5	8/30/2012
HWM-LA-STJ-002	Louisiana	St John the Baptist	30.08830	−90.50597	Independent	5.1	8/30/2012
HWM-LA-STJ-003	Louisiana	St John the Baptist	30.08327	−90.51130	Independent	5.5	8/30/2012
HWM-LA-STJ-004	Louisiana	St John the Baptist	30.07714	−90.54957	Independent	5.6	8/30/2012
HWM-LA-STJ-005	Louisiana	St John the Baptist	30.08213	−90.46706	Independent	7.4	8/30/2012
HWM-LA-STJ-006	Louisiana	St John the Baptist	30.08688	−90.44575	Independent	7.2	8/30/2012

Table 6. Hurricane Isaac storm-tide high-water-mark data recorded by U.S. Geological Survey, by State.—Continued

[NAVD 88, North American Vertical Datum of 1988; GMT, Greenwich meridian time]

Site identification	State	County or Parish	Latitude	Longitude	Type of high-water mark	Peak storm- tide elevation, feet above NAVD 88	Peak storm-tide estimated date (GMT)
			Decimal degrees				
HWM-LA-STJ-007	Louisiana	St John the Baptist	30.08590	−90.44424	Independent	5.8	8/30/2012
HWM-LA-STJ-200	Louisiana	St John the Baptist	30.07794	−90.57258	Independent	3.6	8/30/2012
HWM-LA-STJ-201	Louisiana	St John the Baptist	30.07639	−90.57231	Independent	4.9	8/30/2012
HWM-LA-STJ-202	Louisiana	St John the Baptist	30.07594	−90.59753	Independent	5.4	8/30/2012
HWM-LA-STJ-203	Louisiana	St John the Baptist	30.05756	−90.62594	Independent	6.5	8/30/2012
HWM-LA-STJ-204	Louisiana	St John the Baptist	30.05778	−90.63572	Independent	6.5	8/30/2012
HWM-LA-STJ-205	Louisiana	St John the Baptist	30.08775	−90.48217	Independent	6.0	8/30/2012
HWM-LA-STJ-206	Louisiana	St John the Baptist	30.08469	−90.48700	Independent	7.0	8/30/2012
HWM-LA-STJ-207	Louisiana	St John the Baptist	30.09450	−90.48853	Independent	6.4	8/30/2012
HWM-LA-STJ-208	Louisiana	St John the Baptist	30.09536	−90.49397	Independent	6.2	8/30/2012
HWM-LA-STJ-209	Louisiana	St John the Baptist	30.08131	−90.52483	Independent	5.6	8/30/2012
HWM-LA-STJ-210	Louisiana	St John the Baptist	30.06922	−90.45872	Independent	7.7	8/30/2012
HWM-LA-STJ-211	Louisiana	St John the Baptist	30.05664	−90.46103	Independent	8.4	8/30/2012
HWM-LA-STT-001	Louisiana	St Tammany	30.26725	−89.79142	Co-located	6.8	8/29/2012
HWM-LA-STT-002	Louisiana	St Tammany	30.26725	−89.79142	Co-located	6.7	8/29/2012
HWM-LA-STT-003	Louisiana	St Tammany	30.26504	−89.83965	Independent	6.9	8/30/2012
HWM-LA-STT-004	Louisiana	St Tammany	30.40633	−90.15576	Independent	8.9	8/30/2012
HWM-LA-STT-005	Louisiana	St Tammany	30.22644	−89.67750	Independent	8.9	8/29/2012
HWM-LA-STT-025	Louisiana	St Tammany	30.22908	−89.69031	Independent	8.3	8/29/2012
HWM-LA-STT-026	Louisiana	St Tammany	30.20098	−89.70341	Independent	7.0	8/29/2012
HWM-LA-STT-030	Louisiana	St Tammany	30.39932	−90.15698	Independent	8.7	8/30/2012
HWM-LA-STT-031	Louisiana	St Tammany	30.36994	−90.10686	Independent	6.4	8/30/2012
HWM-LA-STT-032	Louisiana	St Tammany	30.31566	−89.92443	Independent	5.8	8/30/2012
HWM-LA-STT-101	Louisiana	St Tammany	30.17595	−89.72842	Co-located	5.0	8/29/2012
HWM-LA-STT-200	Louisiana	St Tammany	30.40464	−90.15136	Independent	8.8	8/30/2012
HWM-LA-STT-201	Louisiana	St Tammany	30.35500	−90.06453	Independent	8.0	8/30/2012
HWM-LA-STT-202	Louisiana	St Tammany	30.35239	−90.05767	Independent	7.8	8/30/2012

Table 6. Hurricane Isaac storm-tide high-water-mark data recorded by U.S. Geological Survey, by State.—Continued

[NAVD 88, North American Vertical Datum of 1988; GMT, Greenwich meridian time]

Site identification	State	County or Parish	Latitude	Longitude	Type of high-water mark	Peak storm- tide elevation, feet above NAVD 88	Peak storm-tide estimated date (GMT)
			Decimal degrees				
HWM-LA-STT-204	Louisiana	St Tammany	30.26517	−89.84336	Independent	6.7	8/30/2012
HWM-LA-STT-205	Louisiana	St Tammany	30.24436	−89.79425	Independent	6.4	8/29/2012
HWM-LA-STT-206	Louisiana	St Tammany	30.23873	−89.61653	Co-located	9.3	8/29/2012
HWM-LA-STT-300	Louisiana	St Tammany	30.18591	−89.75190	Independent	5.7	8/29/2012
HWM-LA-STT-301	Louisiana	St Tammany	30.20462	−89.77684	Independent	6.5	8/29/2012
HWM-LA-STT-302	Louisiana	St Tammany	30.23203	−89.85334	Independent	6.2	8/29/2012
HWM-LA-STT-801	Louisiana	St Tammany	30.28110	−89.95375	Independent	7.2	8/30/2012
HWM-MS-HAN-012	Mississippi	Hancock	30.36651	−89.37555	Co-located	9.8	8/29/2012
HWM-MS-HAN-013	Mississippi	Hancock	30.36120	−89.42433	Independent	9.7	8/29/2012
HWM-MS-HAN-014	Mississippi	Hancock	30.38771	−89.44152	Independent	10.6	8/29/2012
HWM-MS-HAN-015	Mississippi	Hancock	30.31574	−89.41150	Independent	9.8	8/29/2012
HWM-MS-HAN-016	Mississippi	Hancock	30.32311	−89.32813	Co-located	9.5	8/29/2012
HWM-MS-HAN-017	Mississippi	Hancock	30.25842	−89.41450	Independent	9.7	8/29/2012
HWM-MS-HAN-018	Mississippi	Hancock	30.23825	−89.42927	Co-located	10.6	8/29/2012
HWM-MS-HAN-019	Mississippi	Hancock	30.22539	−89.48349	Independent	9.9	8/29/2012
HWM-MS-HAN-020	Mississippi	Hancock	30.21624	−89.48819	Co-located	10.2	8/29/2012
HWM-MS-HAN-021	Mississippi	Hancock	30.28221	−89.36990	Independent	10.2	8/29/2012
HWM-MS-HAN-022	Mississippi	Hancock	30.39312	−89.38655	Independent	6.4	8/29/2012
HWM-MS-HAN-024	Mississippi	Hancock	30.24890	−89.61298	Independent	9.7	8/29/2012
HWM-MS-HAN-101	Mississippi	Hancock	30.31768	−89.32319	Independent	9.7	8/29/2012
HWM-MS-HAN-201	Mississippi	Hancock	30.29995	−89.33509	Independent	12.0	8/29/2012
HWM-MS-HAR-001	Mississippi	Harrison	30.39080	−88.85766	Co-located	7.5	8/29/2012
HWM-MS-HAR-002	Mississippi	Harrison	30.45897	−88.93891	Co-located	8.6	8/31/2012
HWM-MS-HAR-003	Mississippi	Harrison	30.45331	−89.01315	Co-located	8.6	8/31/2012
HWM-MS-HAR-004	Mississippi	Harrison	30.45319	−89.02776	Co-located	8.1	8/29/2012
HWM-MS-HAR-005	Mississippi	Harrison	30.44971	−89.09315	Co-located	19.7	8/29/2012
HWM-MS-HAR-006	Mississippi	Harrison	30.41307	−89.08046	Co-located	12.1	8/30/2012
HWM-MS-HAR-007	Mississippi	Harrison	30.36969	−89.08046	Co-located	10.9	8/29/2012
HWM-MS-HAR-008	Mississippi	Harrison	30.36396	−89.09014	Co-located	8.8	8/29/2012
HWM-MS-HAR-009	Mississippi	Harrison	30.37781	−89.04596	Co-located	10.0	8/29/2012
HWM-MS-HAR-010	Mississippi	Harrison	30.41926	−89.08721	Independent	11.0	8/30/2012
HWM-MS-HAR-011	Mississippi	Harrison	30.43205	−89.08773	Co-located	8.7	8/29/2012
HWM-MS-HAR-012	Mississippi	Harrison	30.38272	−89.23764	Co-located	9.2	8/29/2012

Table 6. Hurricane Isaac storm-tide high-water-mark data recorded by U.S. Geological Survey, by State.—Continued

[NAVD 88, North American Vertical Datum of 1988; GMT, Greenwich meridian time]

Site identification	State	County or Parish	Latitude	Longitude	Type of high-water mark	Peak storm- tide elevation, feet above NAVD 88	Peak storm-tide estimated date (GMT)
			Decimal degrees				
HWM-MS-HAR-023	Mississippi	Harrison	30.37722	−89.32154	Independent	9.8	8/29/2012
HWM-MS-HAR-101	Mississippi	Harrison	30.39369	−88.87803	Independent	7.9	8/29/2012
HWM-MS-HAR-102	Mississippi	Harrison	30.39354	−88.93093	Independent	9.0	8/29/2012
HWM-MS-HAR-103	Mississippi	Harrison	30.38246	−89.02811	Independent	9.7	8/29/2012
HWM-MS-HAR-104	Mississippi	Harrison	30.35884	−89.11190	Independent	9.6	8/29/2012
HWM-MS-HAR-105	Mississippi	Harrison	30.33819	−89.17061	Co-located	9.2	8/29/2012
HWM-MS-HAR-201	Mississippi	Harrison	30.39359	−88.93825	Co-located	8.7	8/29/2012
HWM-MS-HAR-202	Mississippi	Harrison	30.39324	−88.93848	Co-located	8.3	8/29/2012
HWM-MS-HAR-203	Mississippi	Harrison	30.39323	−88.93849	Co-located	8.6	8/29/2012
HWM-MS-HAR-204	Mississippi	Harrison	30.40944	−89.03772	Co-located	8.4	8/29/2012
HWM-MS-JAC-001	Mississippi	Jackson	30.37899	−88.50063	Independent	13.0	8/29/2012
HWM-MS-JAC-002	Mississippi	Jackson	30.34387	−88.53730	Independent	6.6	8/29/2012
HWM-MS-JAC-039	Mississippi	Jackson	30.36134	−88.63680	Co-located	6.2	8/29/2012
HWM-MS-JAC-101	Mississippi	Jackson	30.38803	−88.61578	Co-located	5.8	8/29/2012
HWM-MS-JAC-103	Mississippi	Jackson	30.39886	−88.77229	Co-located	6.3	8/29/2012
HWM-MS-JAC-104	Mississippi	Jackson	30.40650	−88.82232	Co-located	6.9	8/29/2012
HWM-MS-JAC-105	Mississippi	Jackson	30.39671	−88.81310	Independent	7.8	8/29/2012
HWM-MS-JAC-400	Mississippi	Jackson	30.41348	−89.48950	Independent	6.7	8/29/2012
HWM-MS-JAC-402	Mississippi	Jackson	30.47506	−88.41932	Independent	13.6	8/29/2012
HWM-MS-JAC-403	Mississippi	Jackson	30.34371	−88.52033	Independent	5.7	8/29/2012
HWM-MS-JAC-404	Mississippi	Jackson	30.36387	−88.63972	Independent	5.2	8/29/2012
HWM-MS-JAC-405	Mississippi	Jackson	30.36603	−88.66454	Independent	6.1	8/29/2012
HWM-MS-JAC-406	Mississippi	Jackson	30.43744	−88.87985	Co-located	7.7	8/29/2012

Glossary

EDT Eastern daylight time.

EST Eastern standard time.

GMT Greenwich meridian time.

GNSS Global Navigation Satellite Systems.

HWM High-water mark.

NAVD 88 North American Vertical Datum of 1988.

NGS National Geodetic Survey.

NGVD 29 National Geodetic Vertical Datum of 1929.

NOAA National Oceanic and Atmospheric Administration.

RDG Rapid deployment gage.

RTN Real-Time Network.

storm surge Water level rise caused by a storm over and above the predicted astronomical tide.

storm-tide Water level rise due to the combination of storm surge and the astronomical tide.

streamgage Instrumentation used to measure water level and corresponding streamflow.

tide gage Instrumentation used to measure coastal water level.

USGS United States Geological Survey.

Conversion Factors and Datums

Multiply	By	To obtain
	Length	
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
mile, nautical (nmi)	1.852	kilometer (km)

Vertical coordinate information is referenced to the North American Vertical Datum of 1988 (NAVD 88) unless otherwise noted.

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83) unless otherwise noted.

Elevation, as used in this report, refers to distance above the vertical datum.

Gage Altitude Datum, as used in this report, refers to the vertical datum that a streamgage is surveyed to.

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