



Earthquakes ★ Floods ★ Hurricanes ★ Landslides ★ Tsunamis ★ Volcanoes ★ Wildfires

USGS Hurricane-Hardening and the Storm Surge Sensor Network: *Preparing for the next round*

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USGS, Office of Surface Water

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



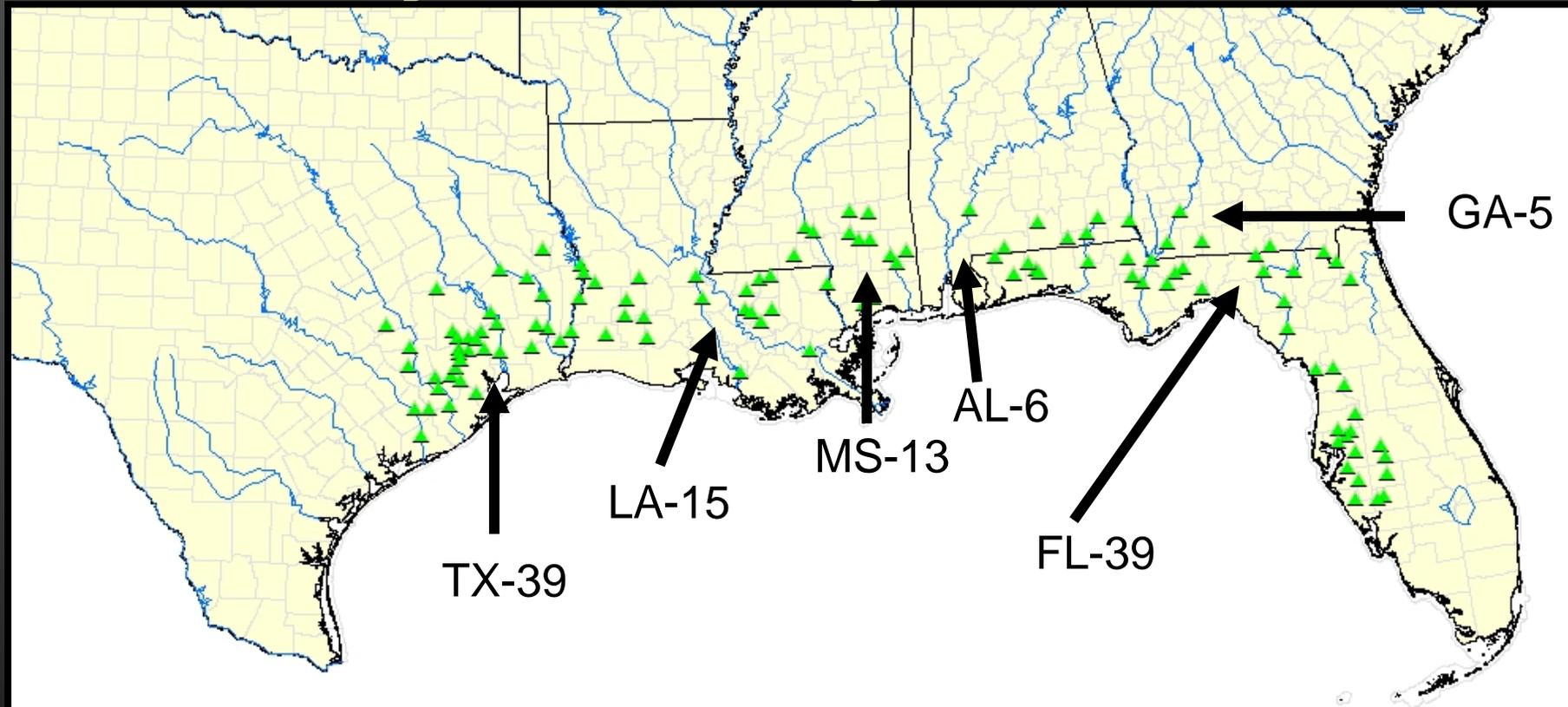
Agenda

- **Hurricane-Hardening Effort**
 - Hurricane-Hardening National Streamflow Information Program (NSIP) that are also NWS Flood Forecast Points
 - Within 100 miles of the Gulf of Mexico coast
 - Wind speed/direction
 - Tipping-bucket precipitation sensor
 - Florida, Georgia, Alabama, Mississippi, Louisiana, and Texas
- **Storm Surge Sensor Network**
 - Rita and Wilma deployments as pilots
 - Q&D estimates of
 - Timing
 - Duration
 - Surge Peak
 - Gulf of Mexico and Eastern Seaboard States

Hurricane-Hardening Effort

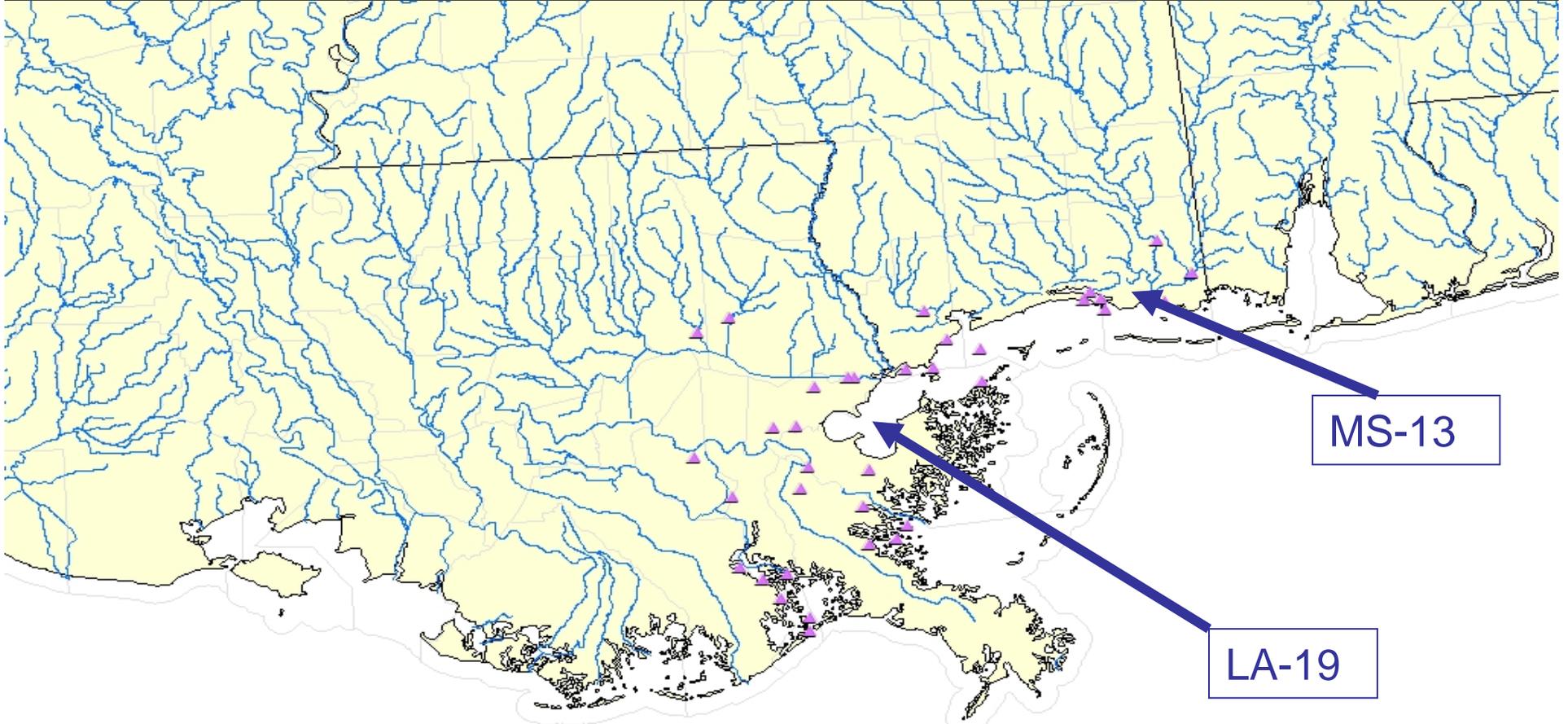
- Analysis of Gage Network
- Development of a Web Applet
- Populating the Web Applet Database
- Designing a flood-hardened structure
- Relocation/Installation

1. Analysis of Gage Network



Within 100 miles of the Gulf of Mexico

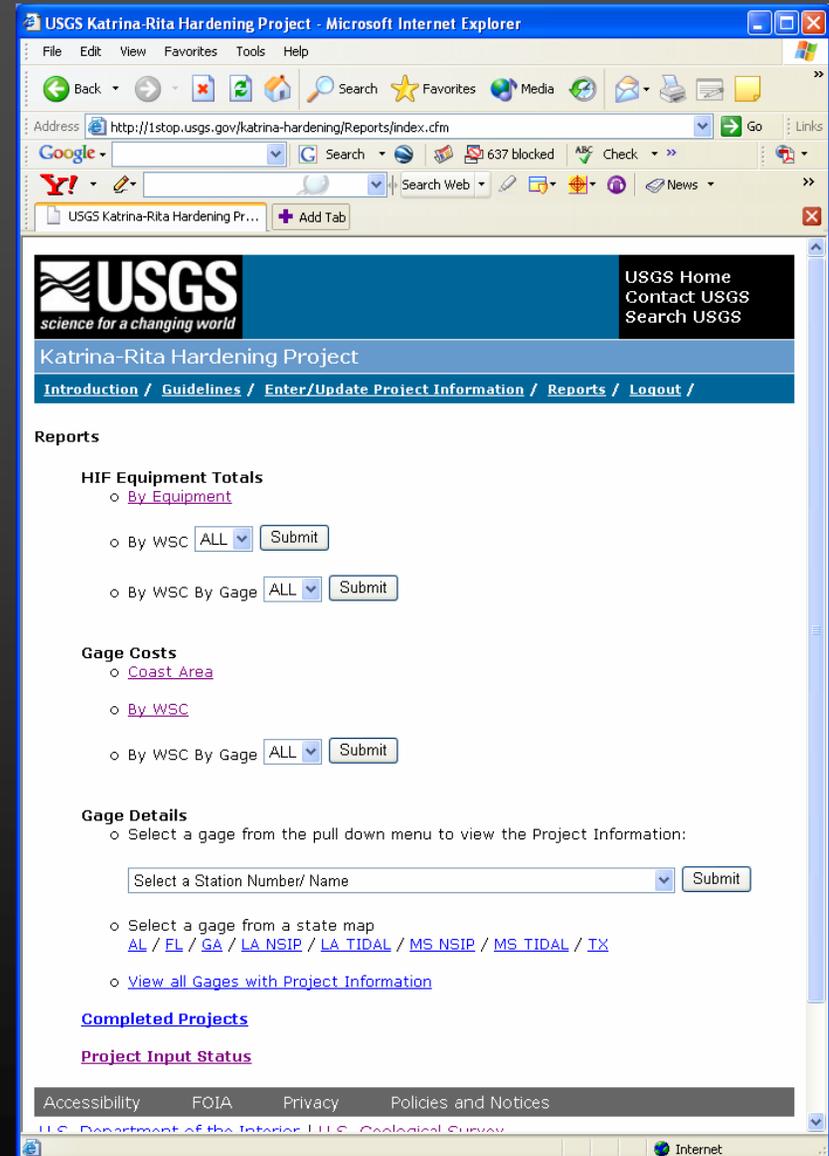
1. Analysis of Gage Network



Tidal stations near the Gulf of Mexico completely destroyed or damaged by Katrina

2. Development of a Web Applet

- Accounting for costs
- Audit
- Centralized depot



3. Populating the the Web Applet Database

- **Equipment**
 - **2 types of High Data Radio (HDR)**
 - **Antenna/cable**
 - **Solar Panel**
 - **6 types of stage sensors**
 - **1 precipitation sensor**
 - **1 Doppler wind speed/direction**

3. Populating the the Web Applet Database

- Definition of the 200-year flood
- Construction of new platform
- Relocation/Hardening costs
- Decommissioning old gage

4. Designing a flood-hardened structure



4. Designing a flood-hardened structure



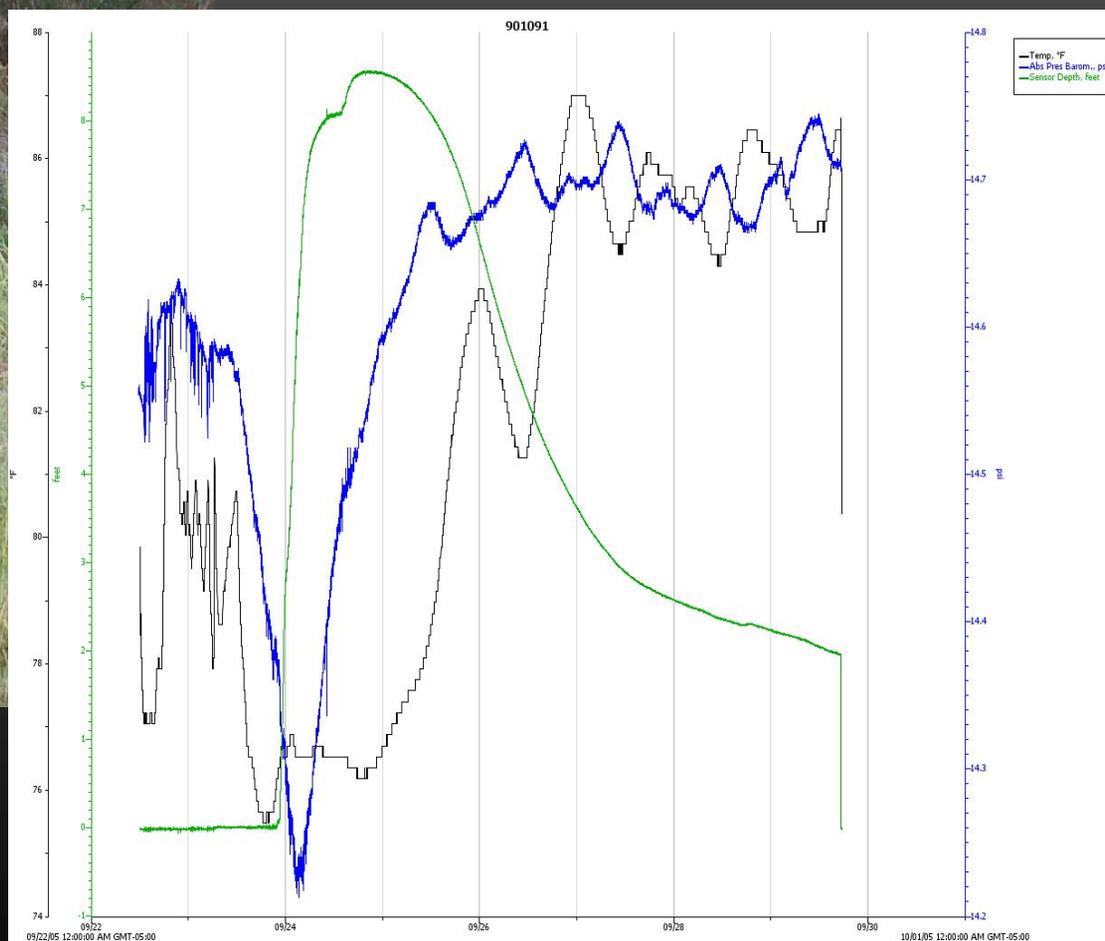
5. Relocation / Installation

- **Researching more stable structures in the area**
- **Computation of the 200-year flood level**
- **Decommissioning old gage**

Agenda

- **Hurricane-Hardening Effort (\$4.8 M)**
 - Hurricane-Hardening National Streamflow Information Program (NSIP) that are also NWS Flood Forecast Points
 - Within 100 miles of the Gulf of Mexico coast
 - Wind speed/direction
 - Doppler precipitation sensor
 - Florida, Georgia, Alabama, Mississippi, Louisiana, and Texas
- **Storm Surge Sensor Network**
 - Rita and Wilma deployments as pilots
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 - Gulf of Mexico and Eastern Seaboard States in 2006

Deployed 41 experimental storm-surge gages to monitor Rita landfall



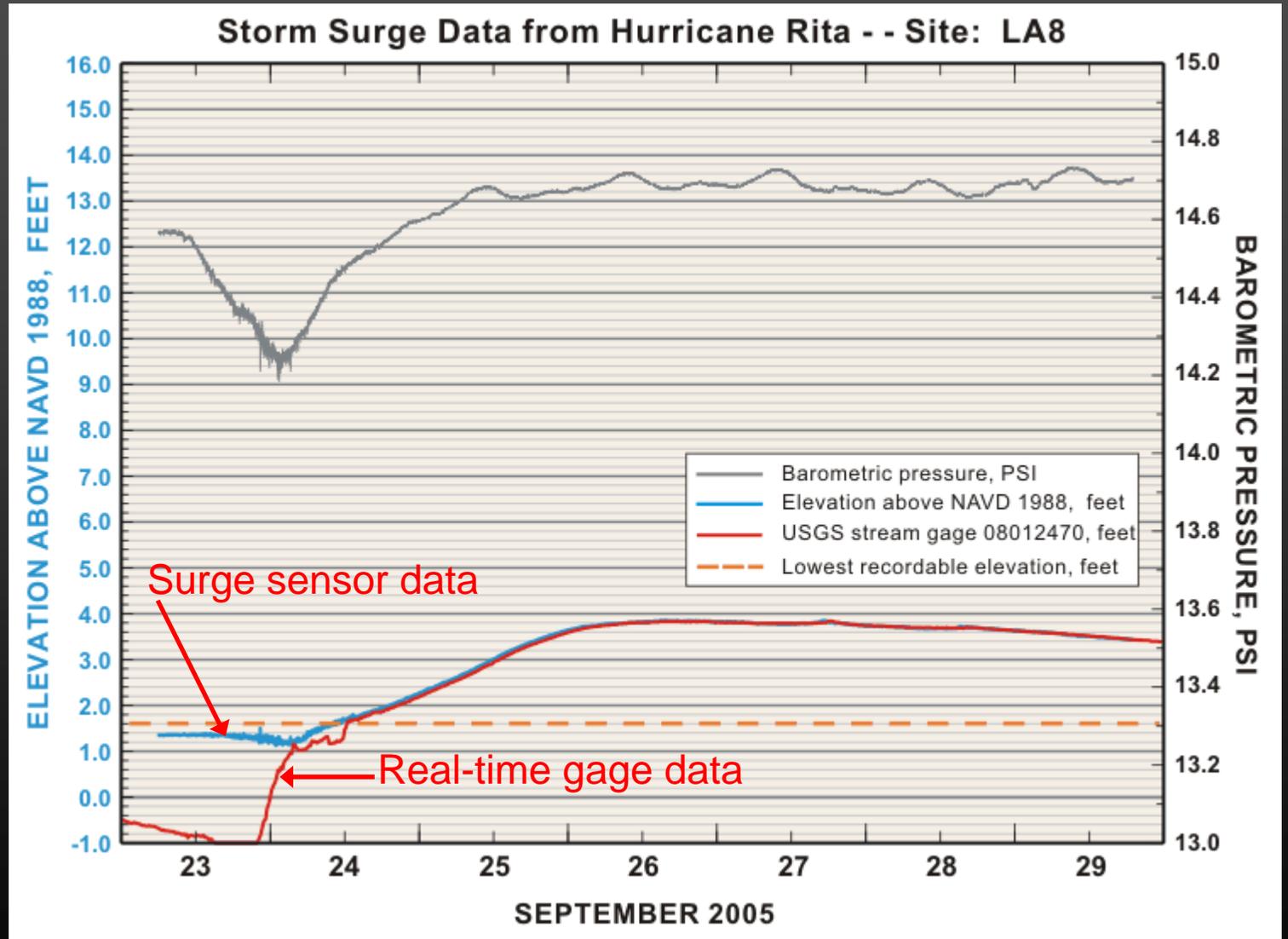
Small, recording pressure transducers for rapid deployment.

Rita Storm Surge Sensor Site Map



Bayou Lacassine (LA8) QA Graph

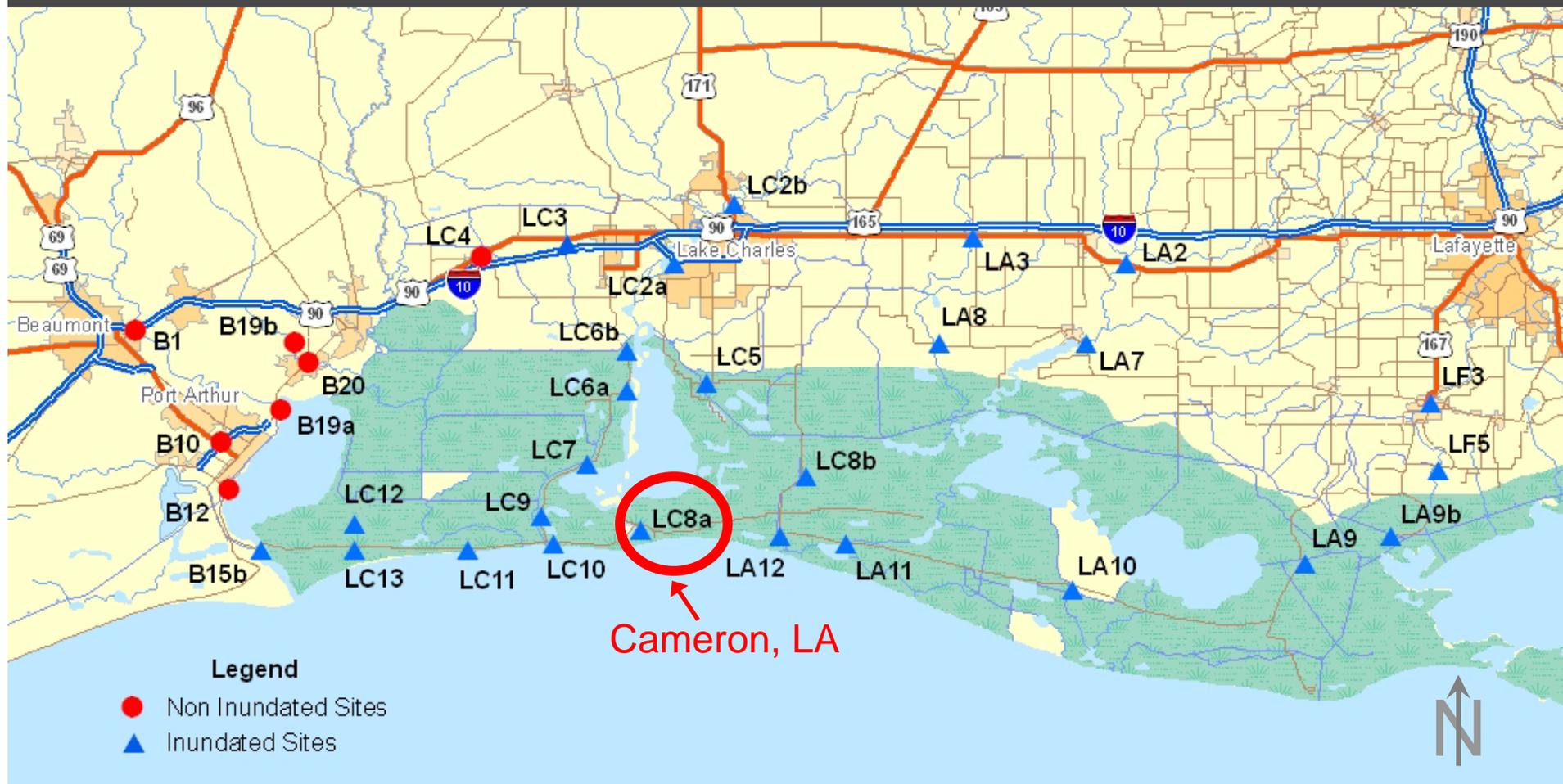
- Barometric sensor at LA7 (east) used to process data.
- Surge sensor data processed as freshwater.



Bayou Lacassine (LA8) QA – cont.

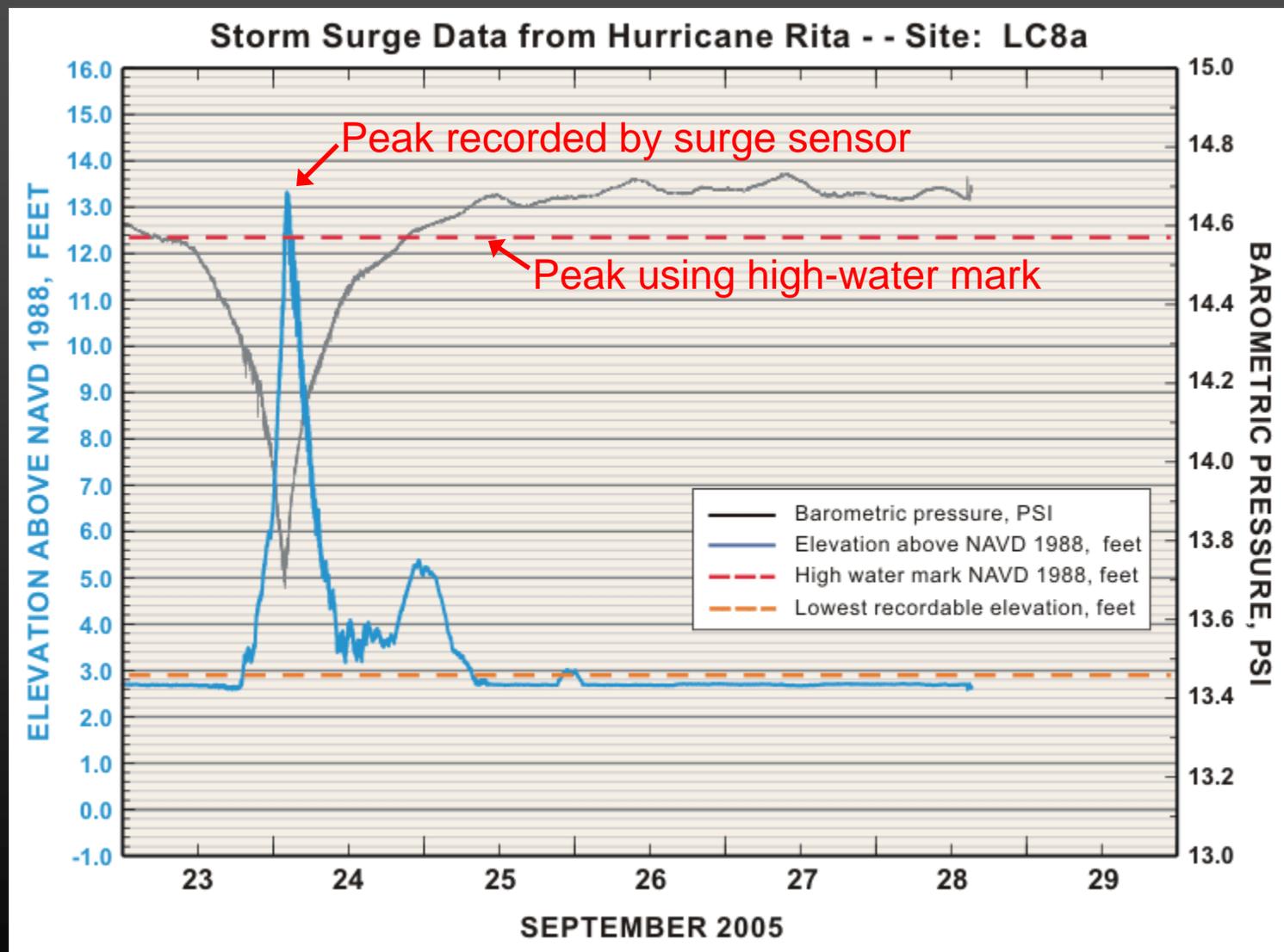
- **Levels run to relate the surge sensor datum to the real-time gage datum. The difference between datums was negligible (approx. 0.03 feet)- sensor survey methods are valid.**
- **Data from surge sensor tracks the real-time gage data well- surge sensors are accurate and responsive.**

Rita Storm Surge Sensor Site Map



Cameron (LC8a) HWM Graph

- Barometric sensor not recovered. Sensor at LC7 (NW) used to process data.
- Surge sensor data processed as saltwater.
- High-water mark rated as good.





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EROS Data Center

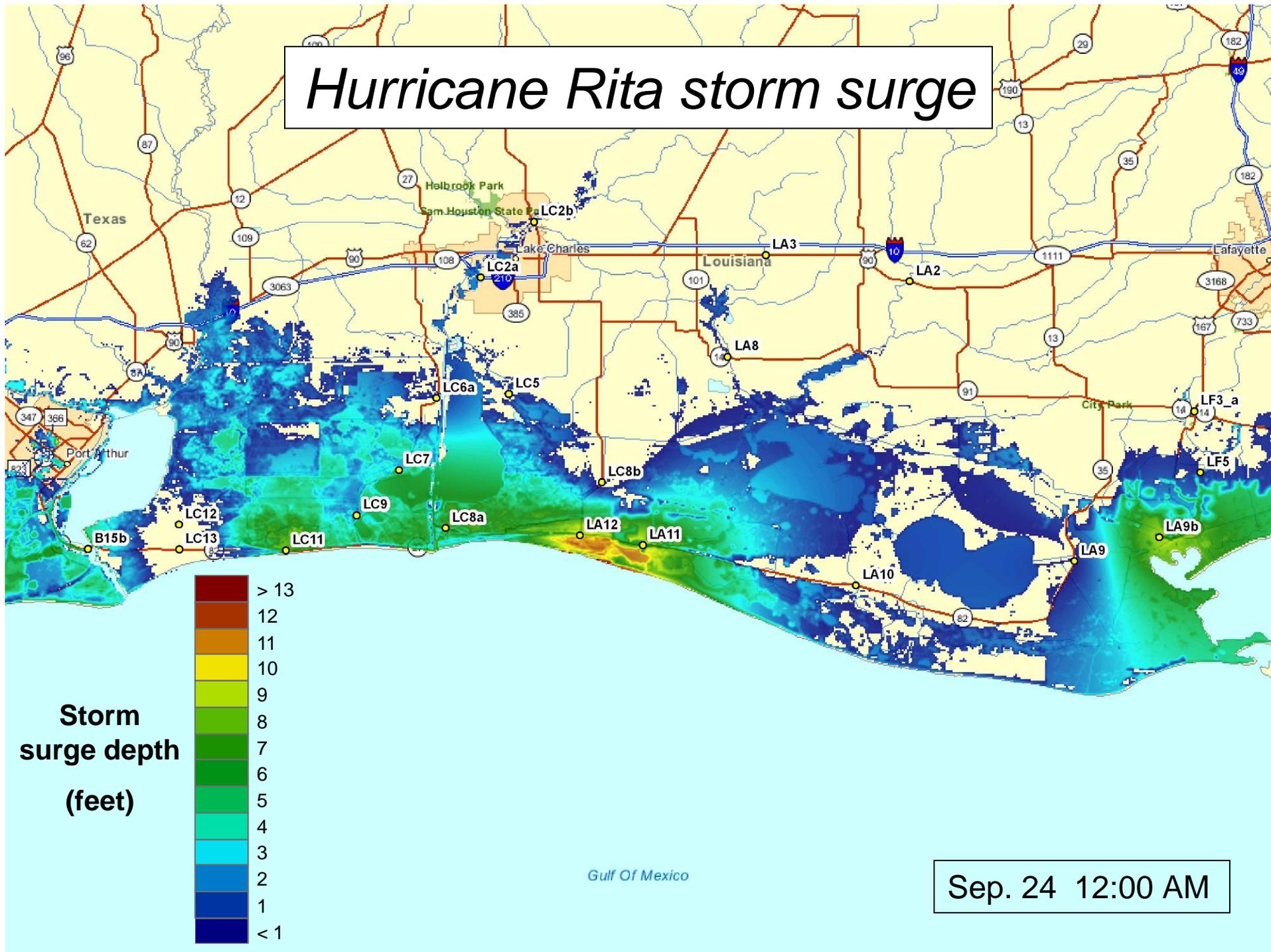
Processed LiDAR DEM (3 m) and built a virtual simulation of the Hurricane Rita Storm Surge based on these 41 partial duration hydrographs

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

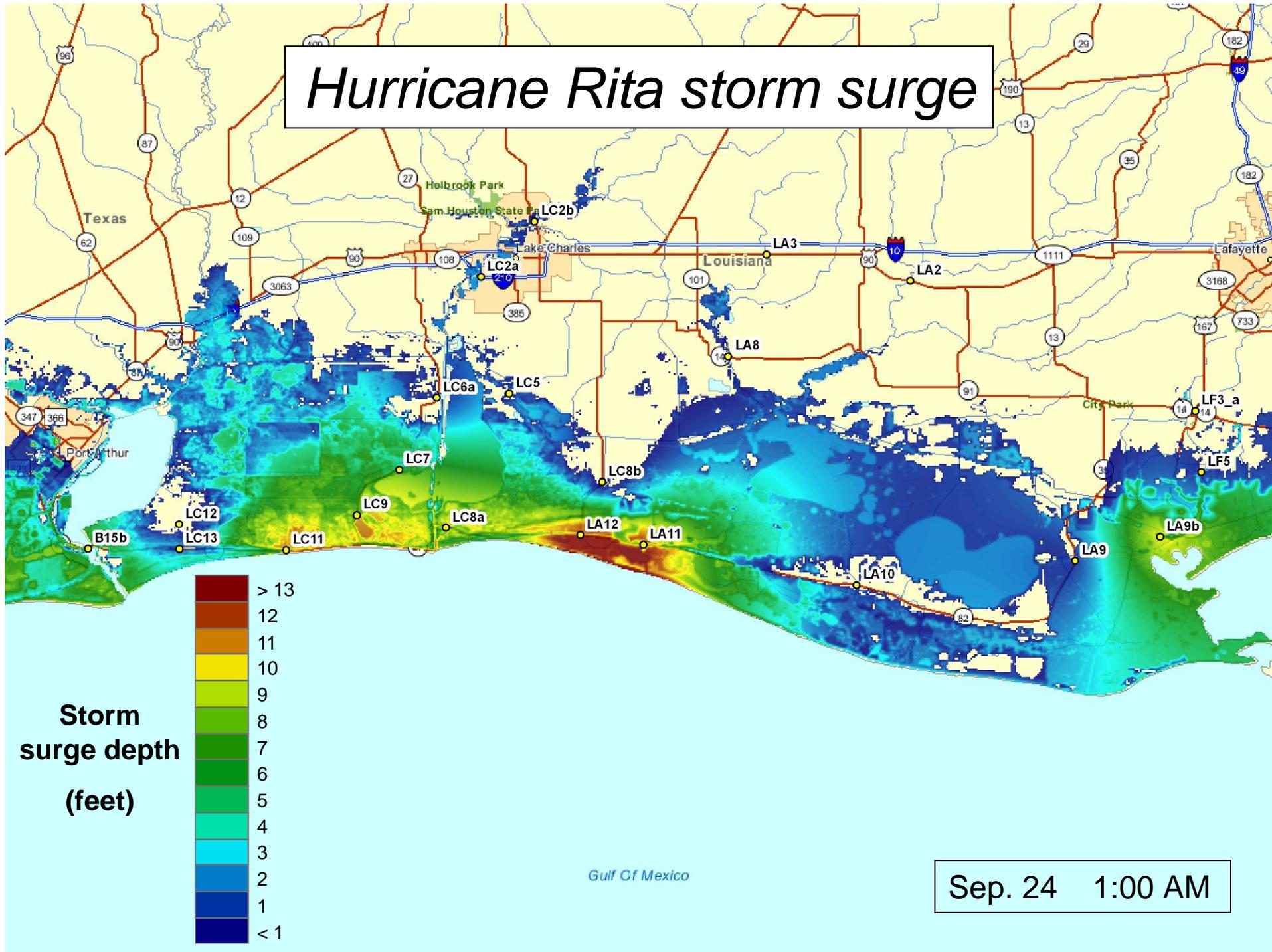
Hurricane Rita storm surge



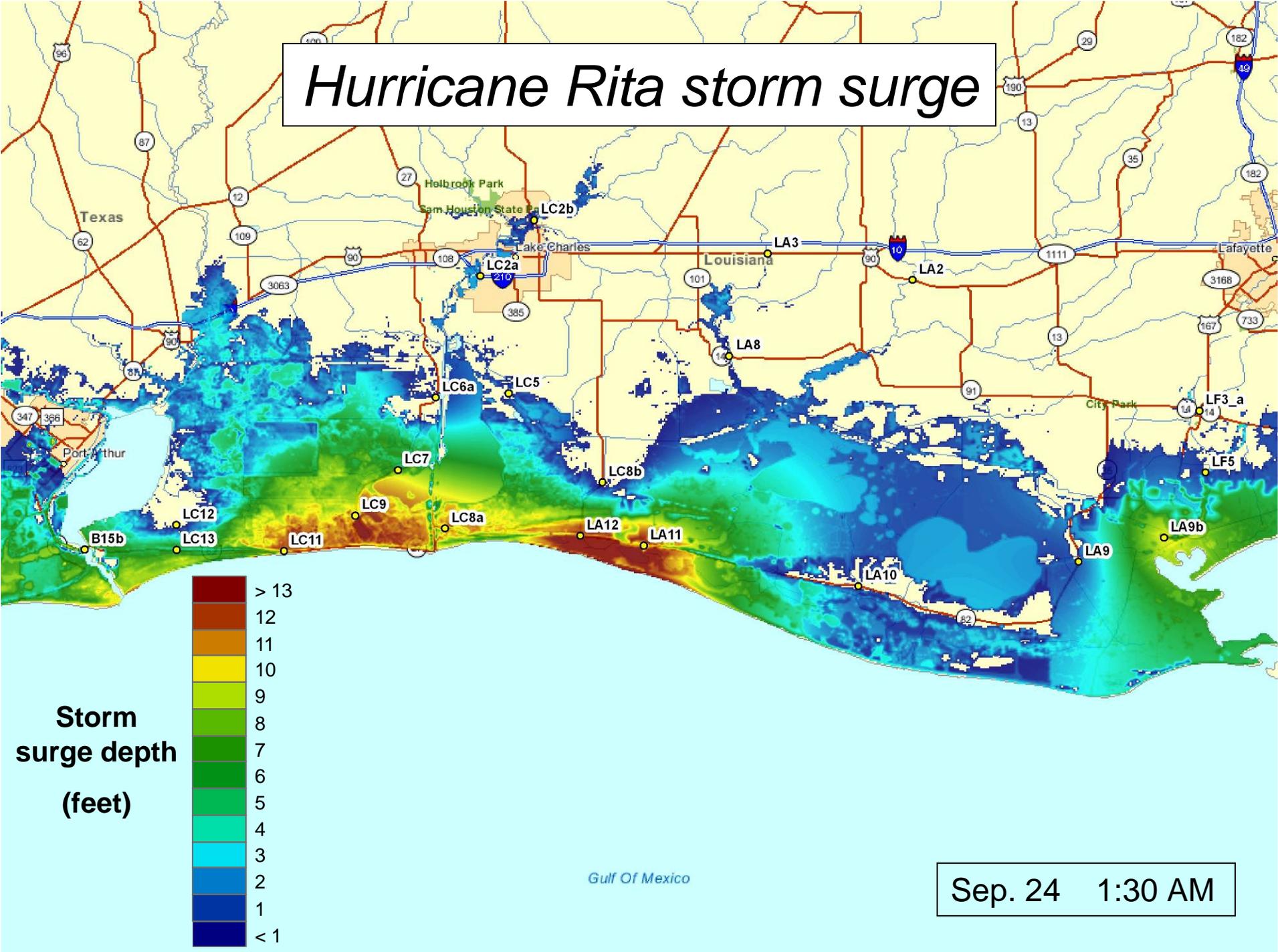
Hurricane Rita storm surge



Hurricane Rita storm surge

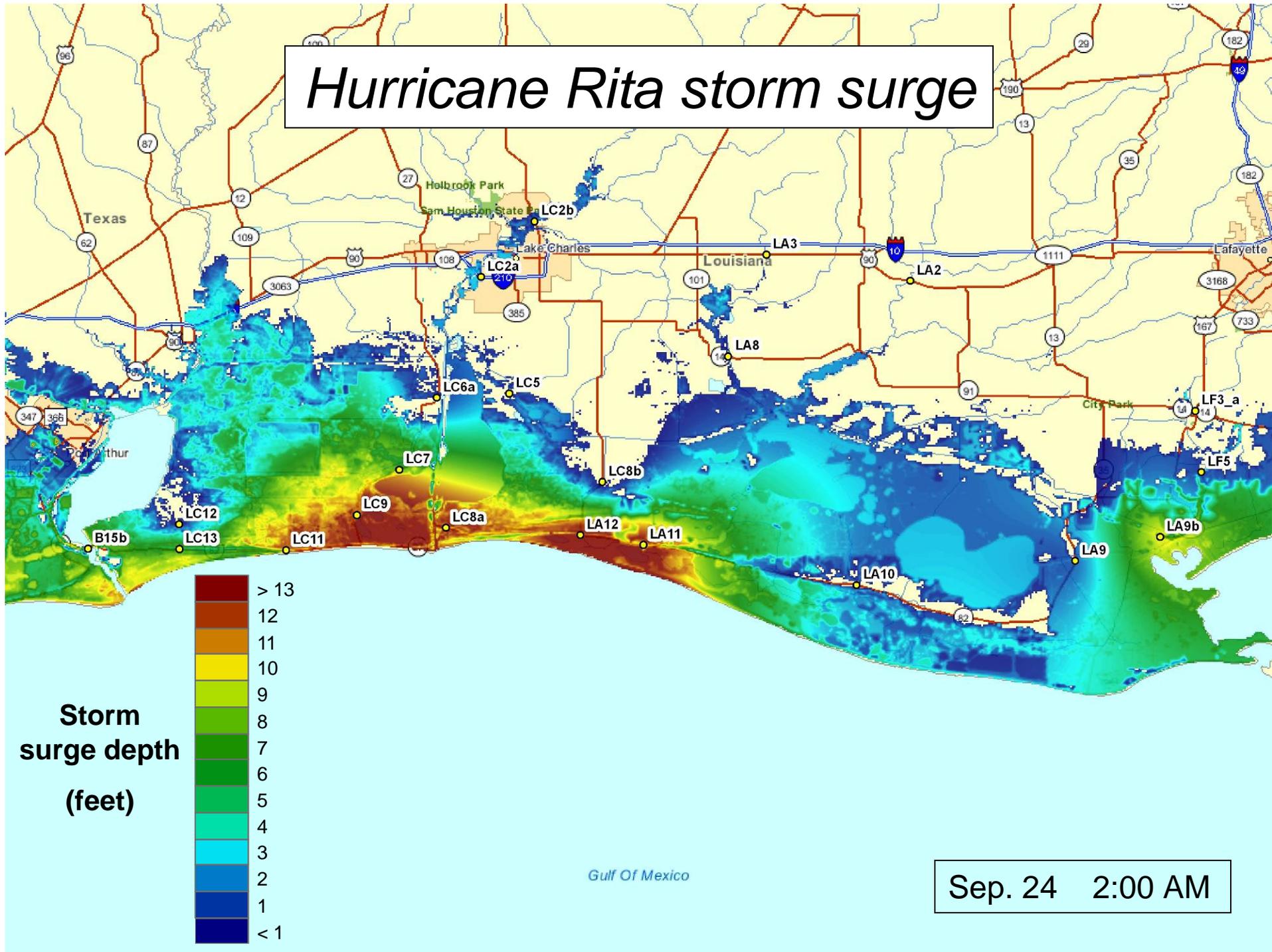


Hurricane Rita storm surge

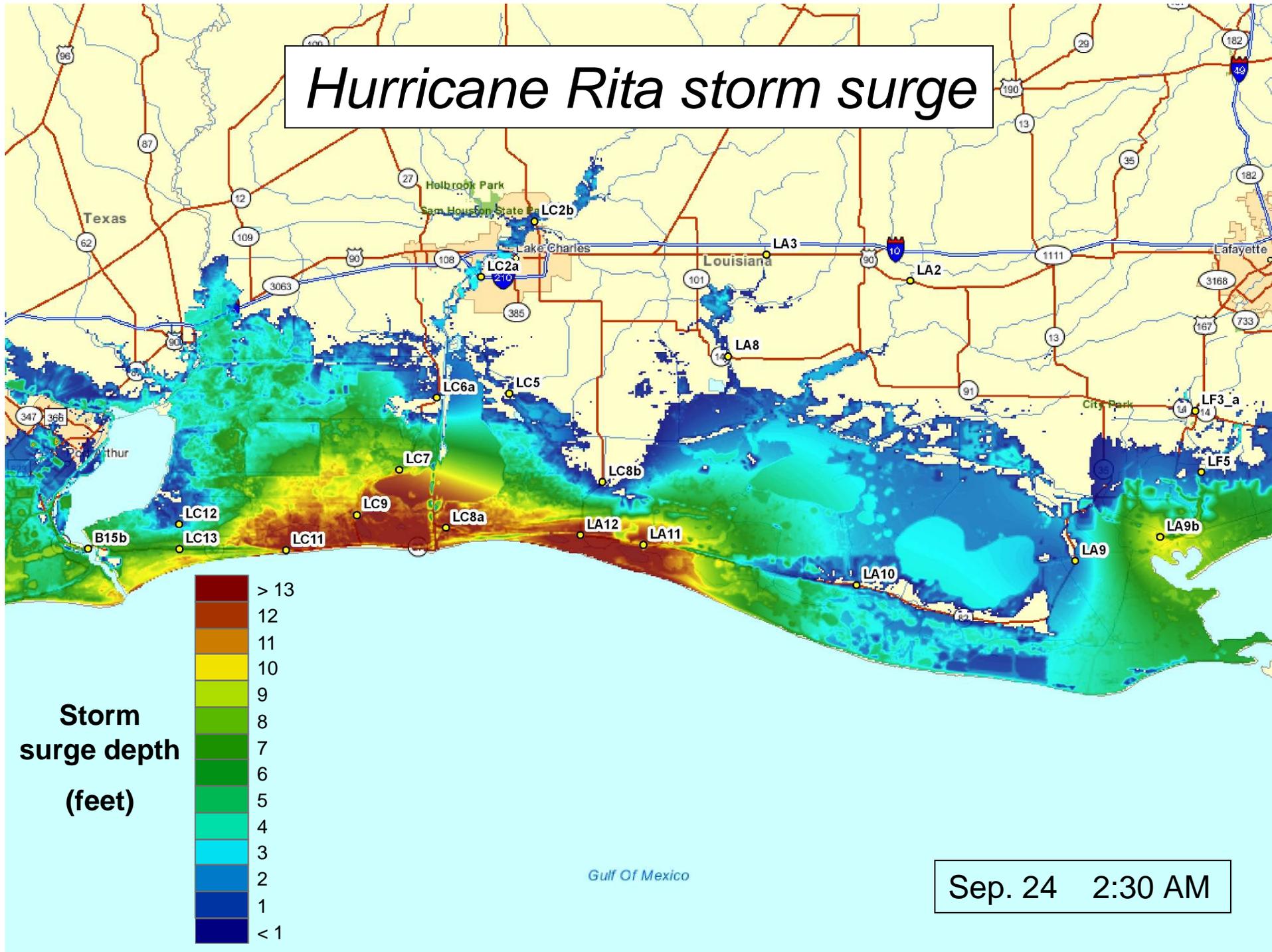


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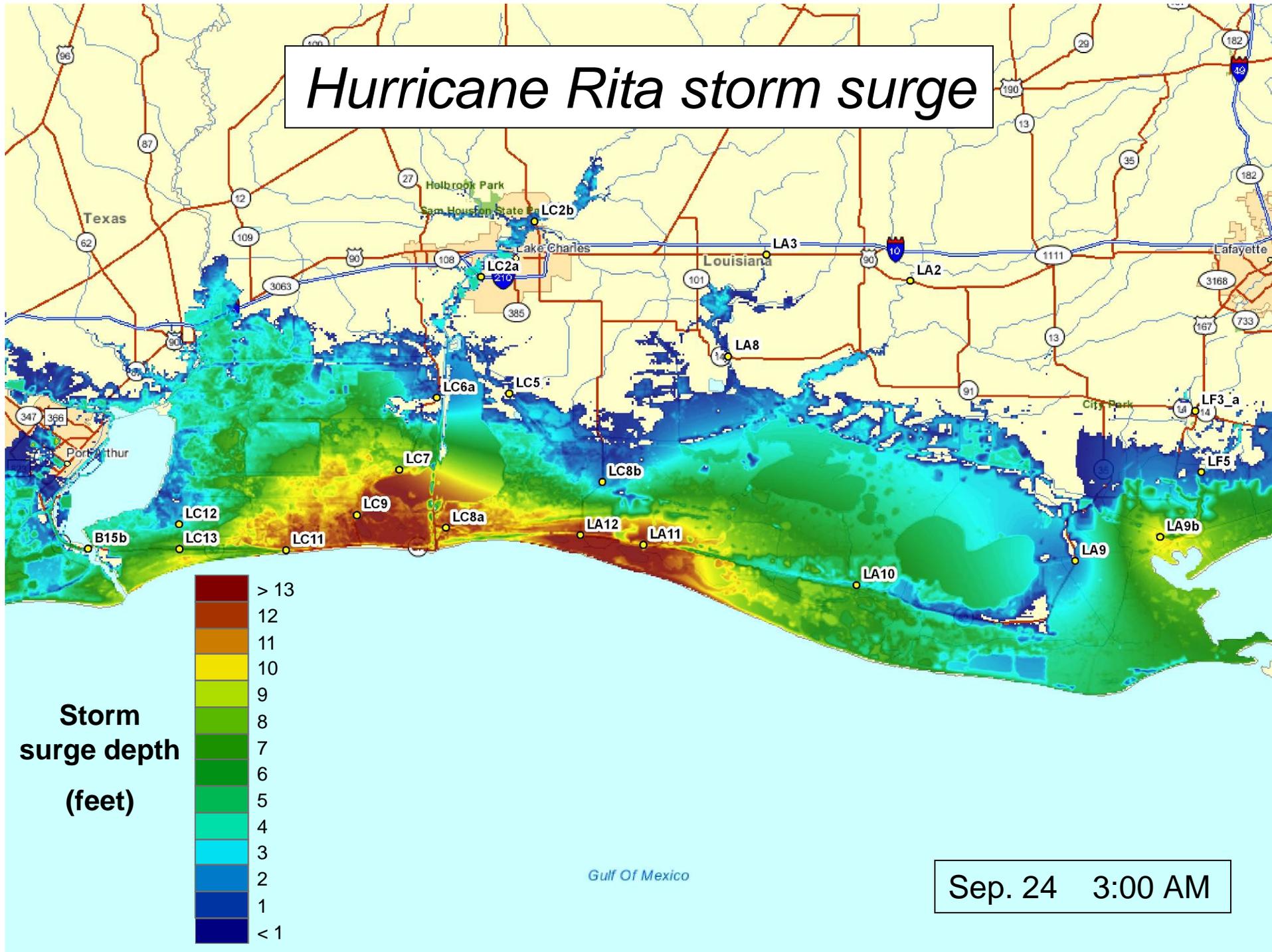
Hurricane Rita storm surge



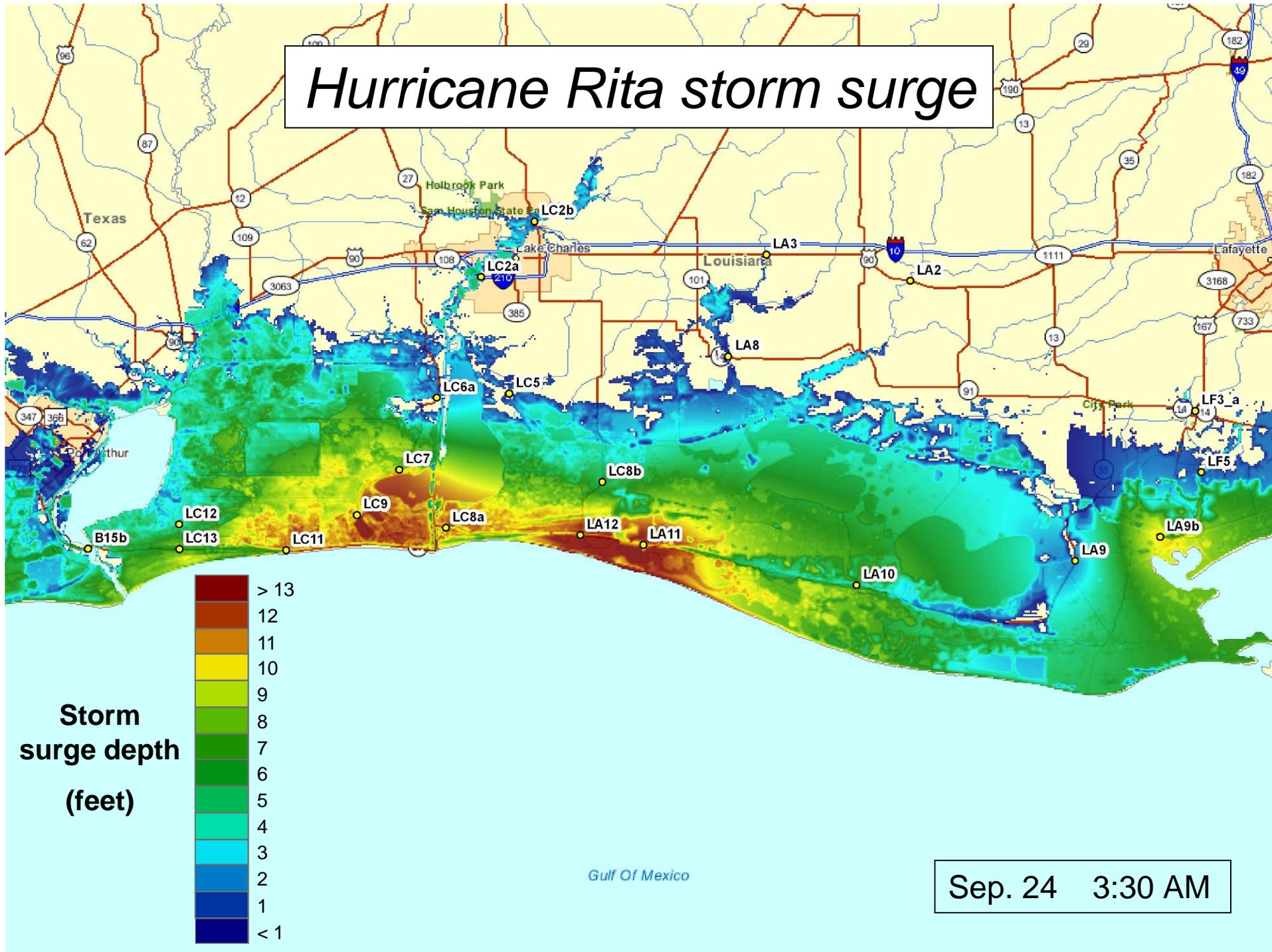
Hurricane Rita storm surge



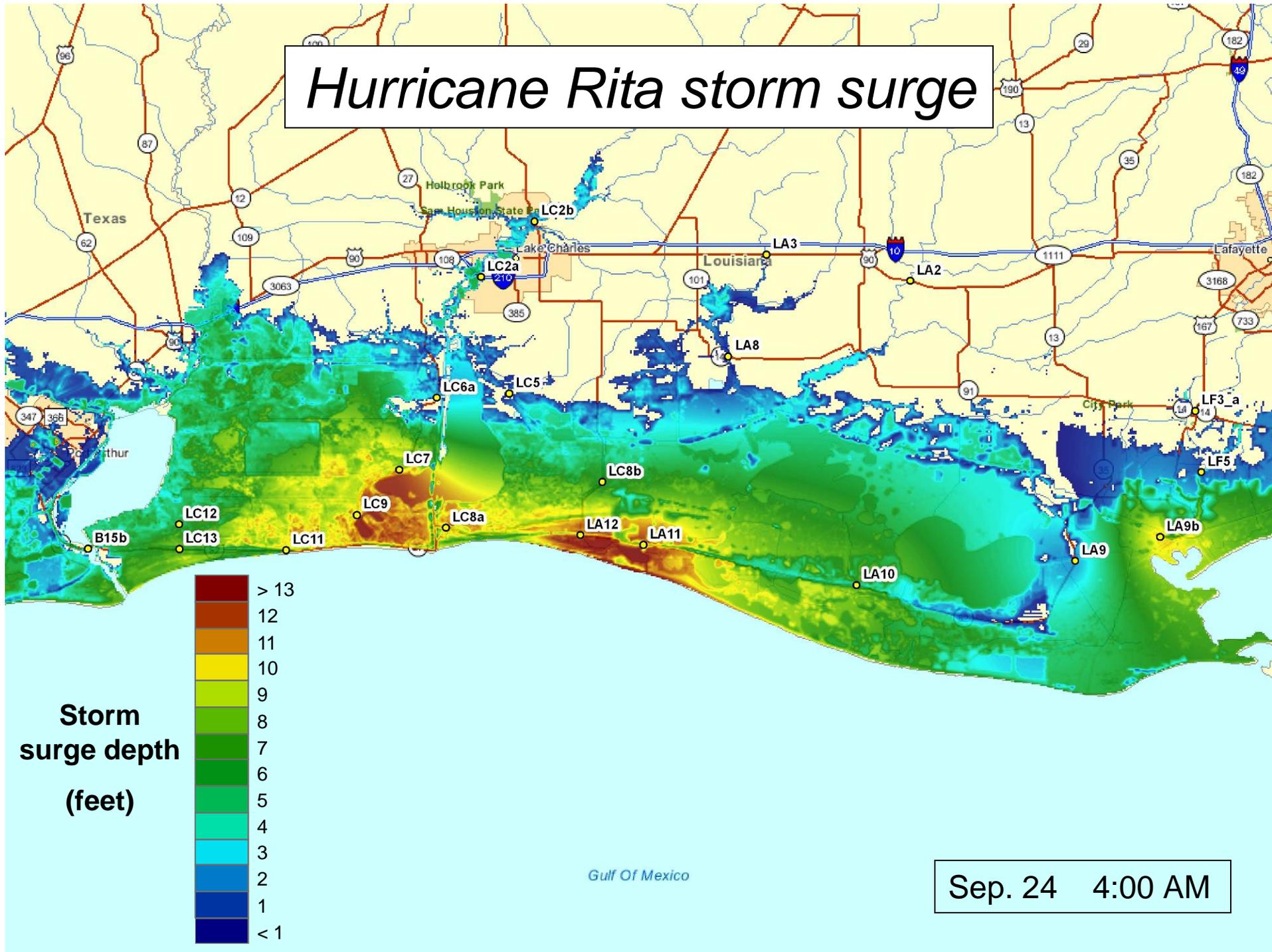
Hurricane Rita storm surge



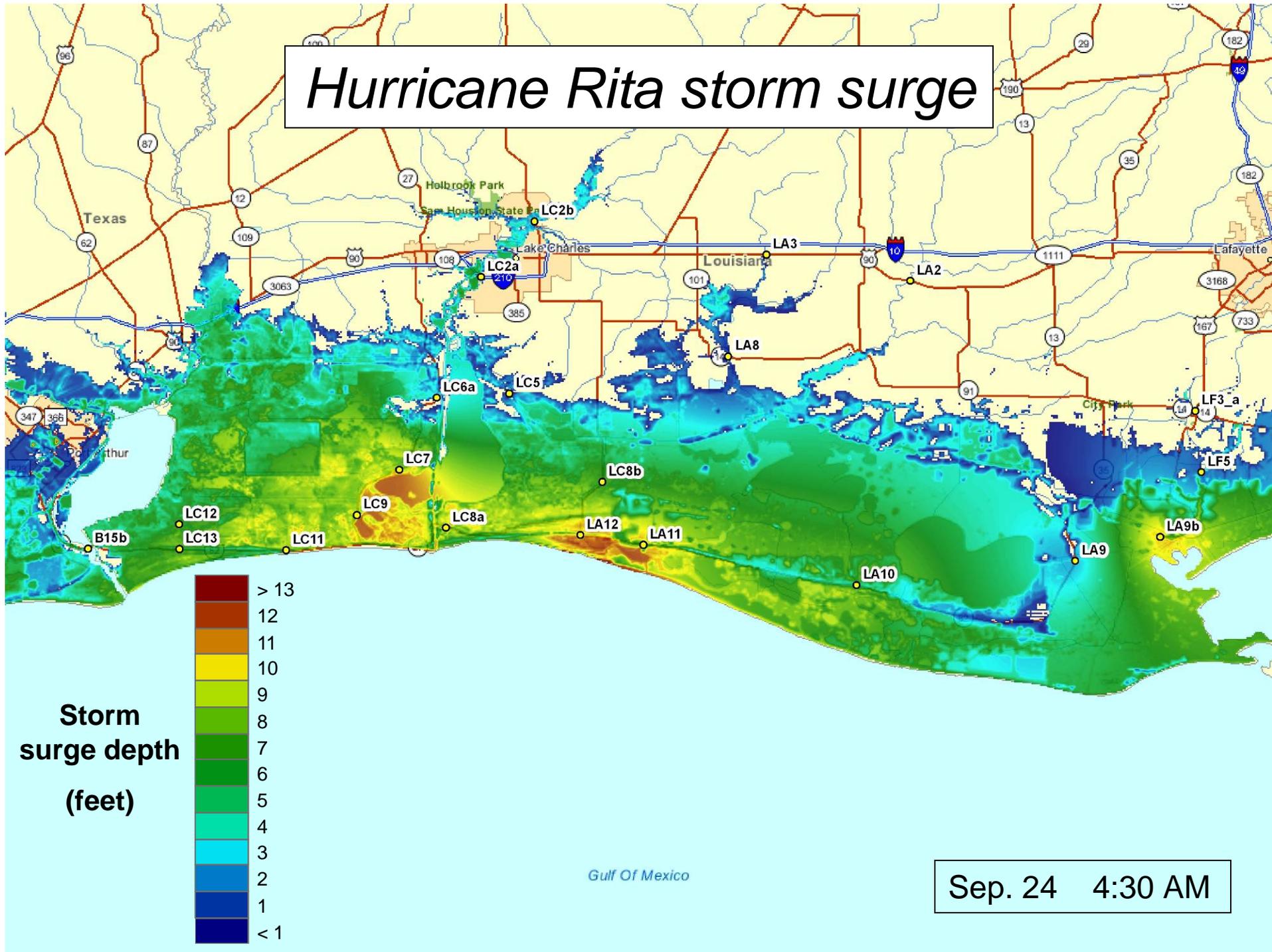
Hurricane Rita storm surge



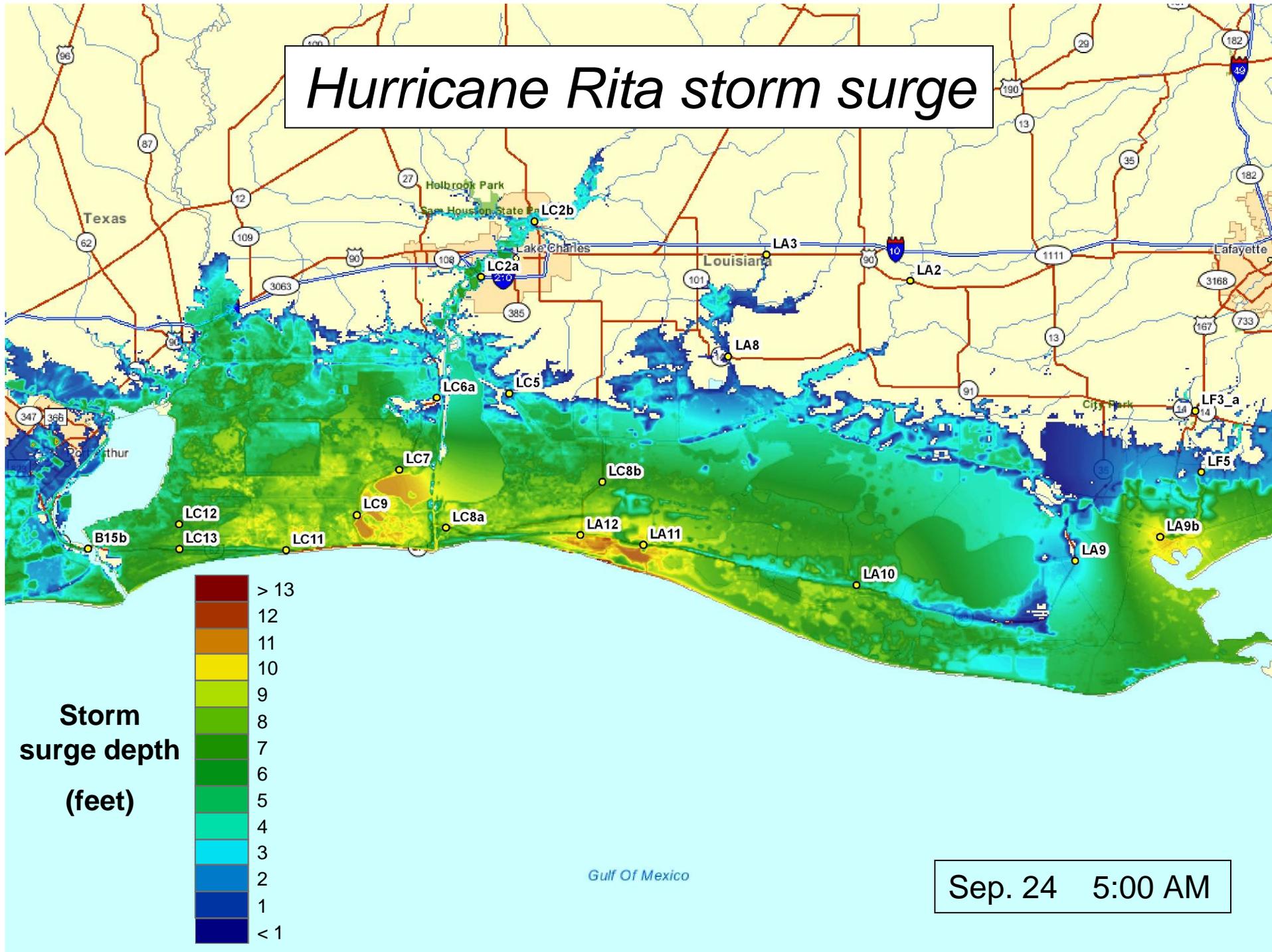
Hurricane Rita storm surge



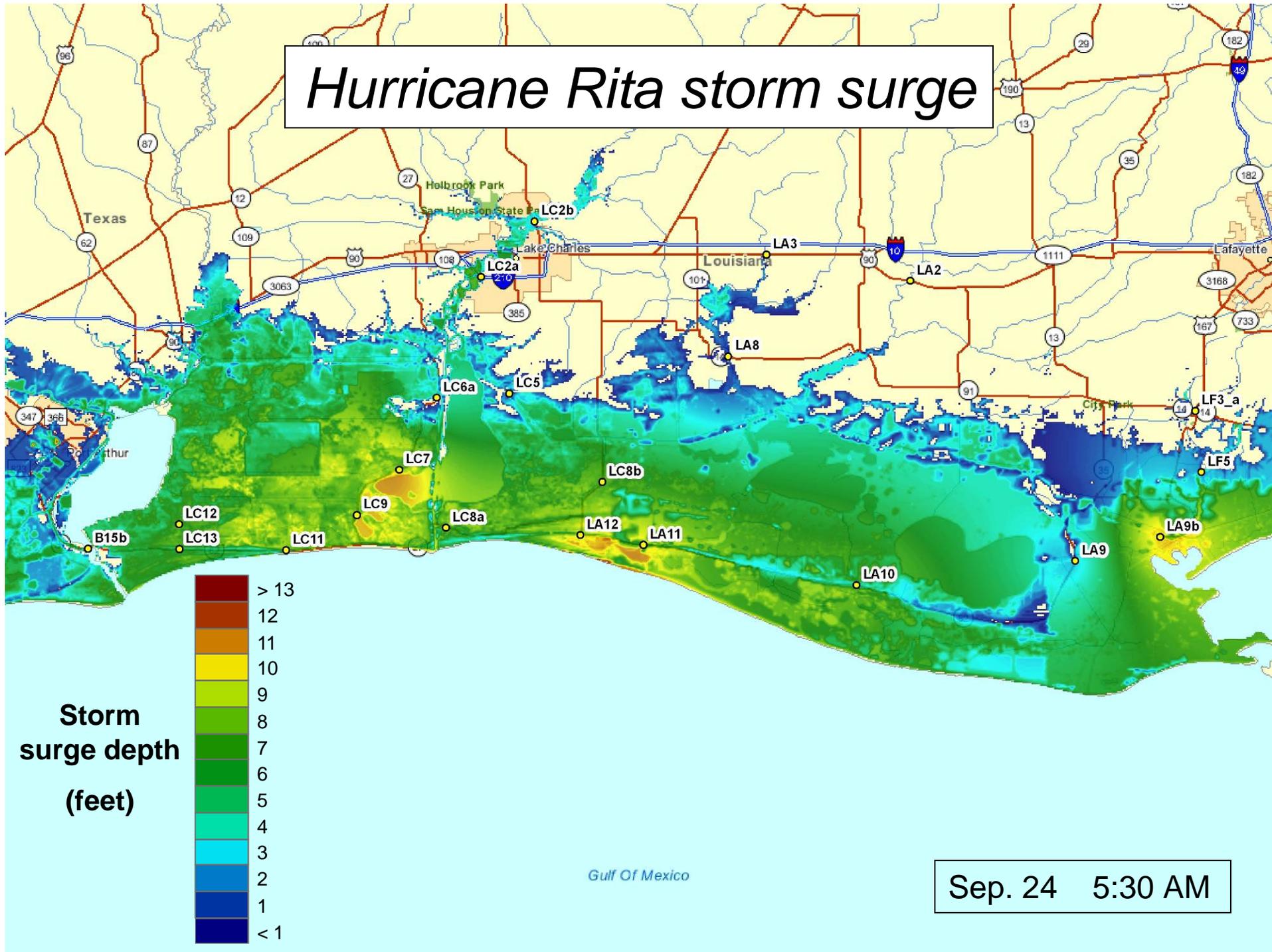
Hurricane Rita storm surge



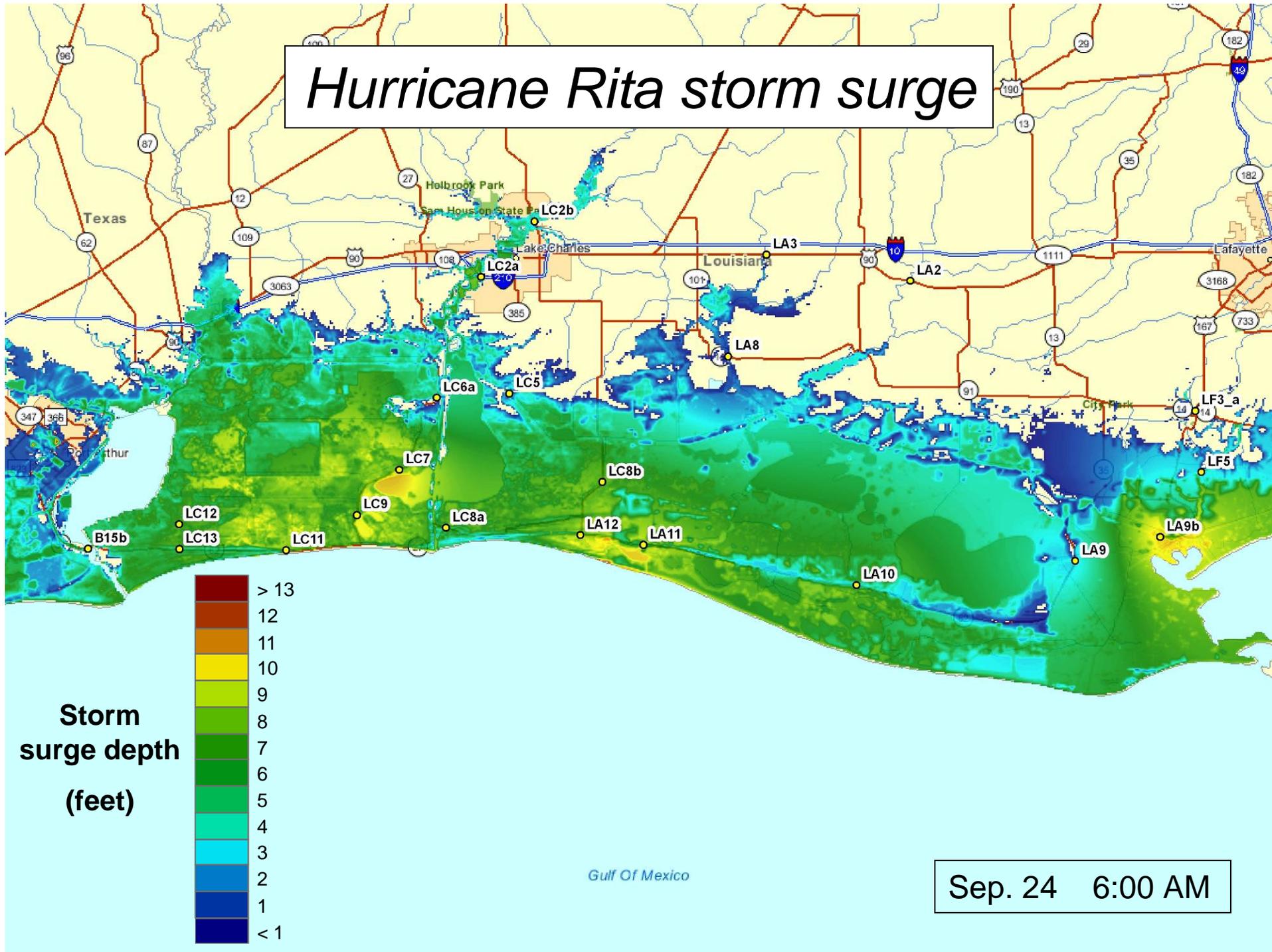
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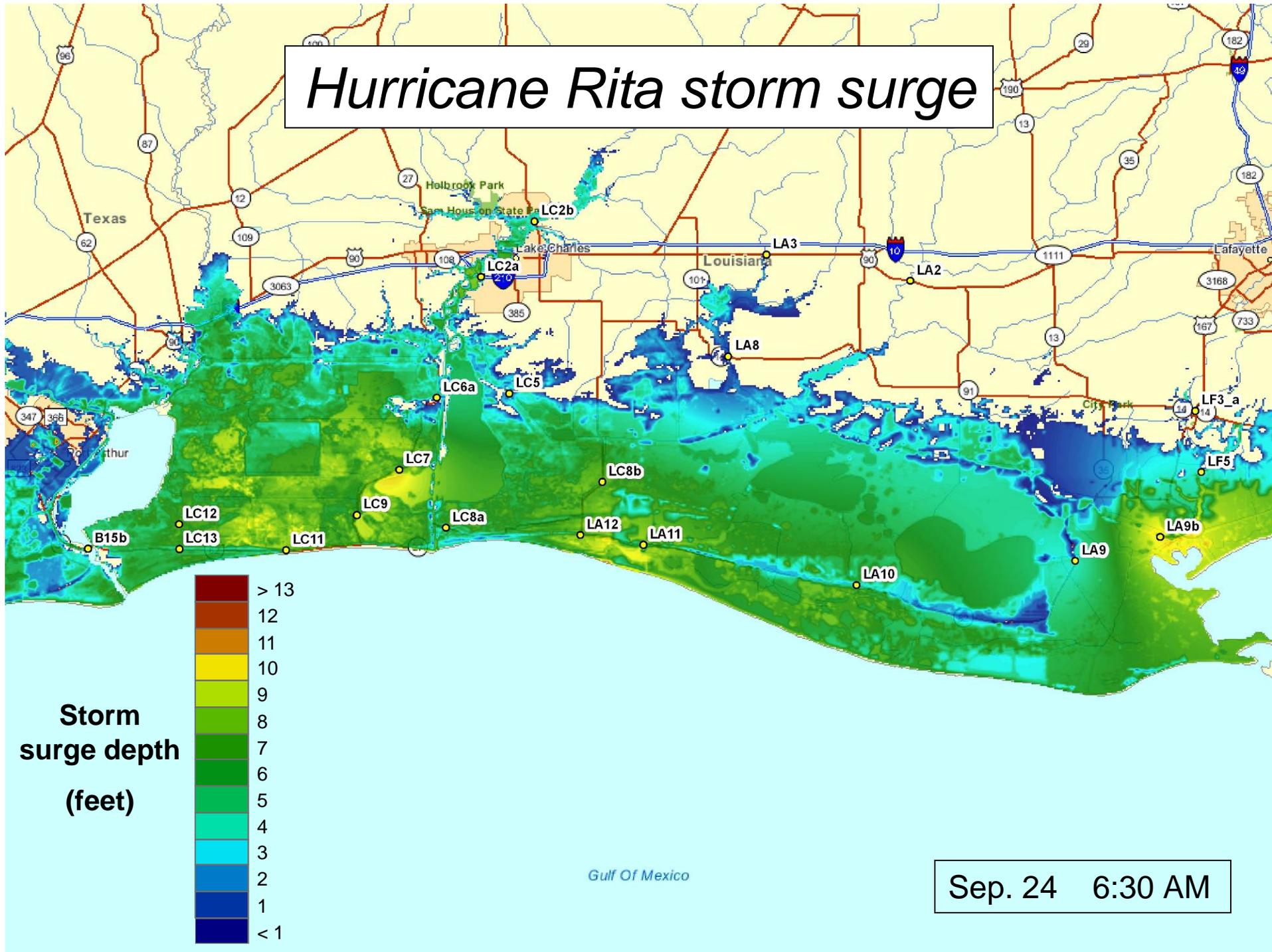
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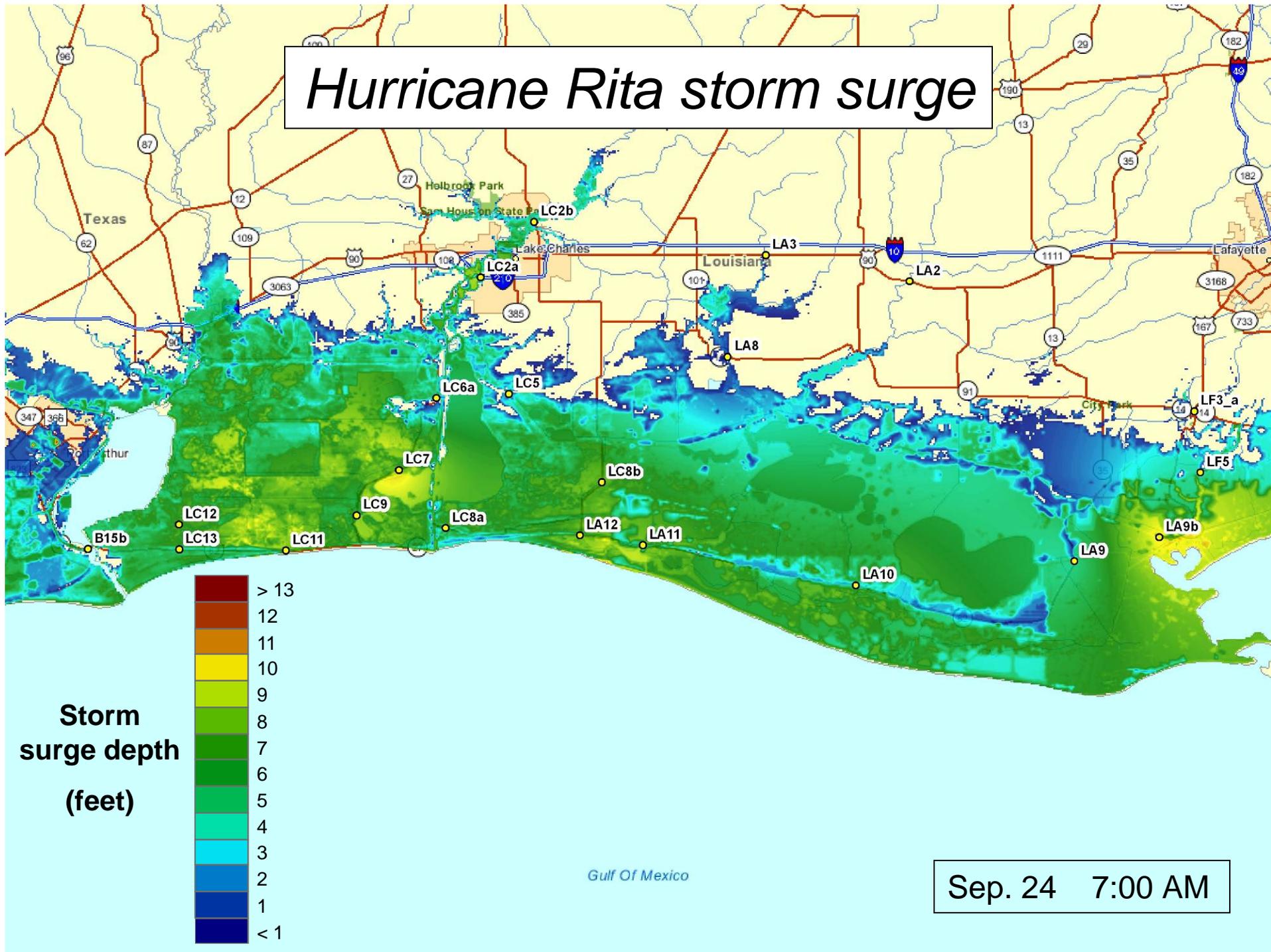
Hurricane Rita storm surge



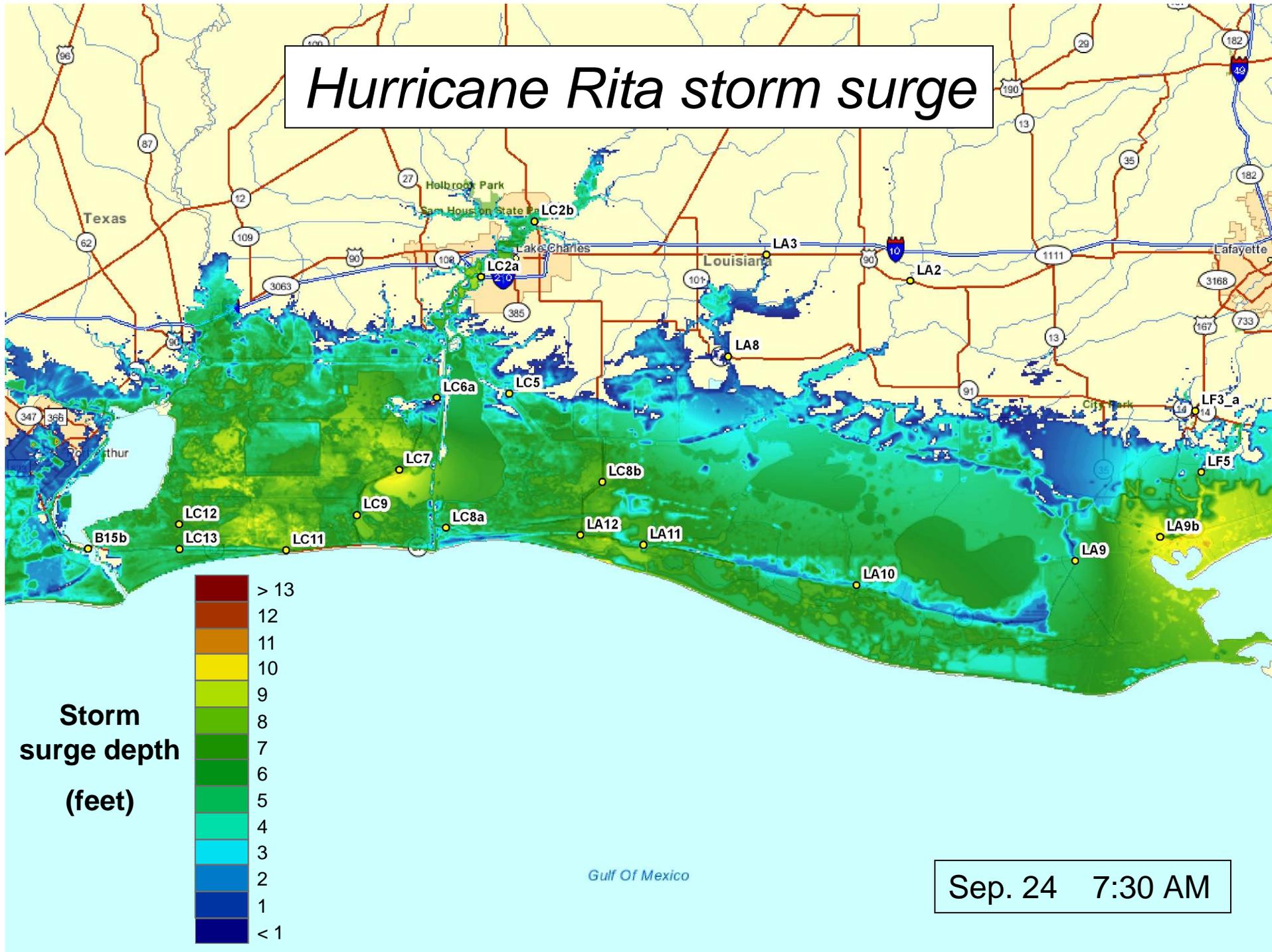
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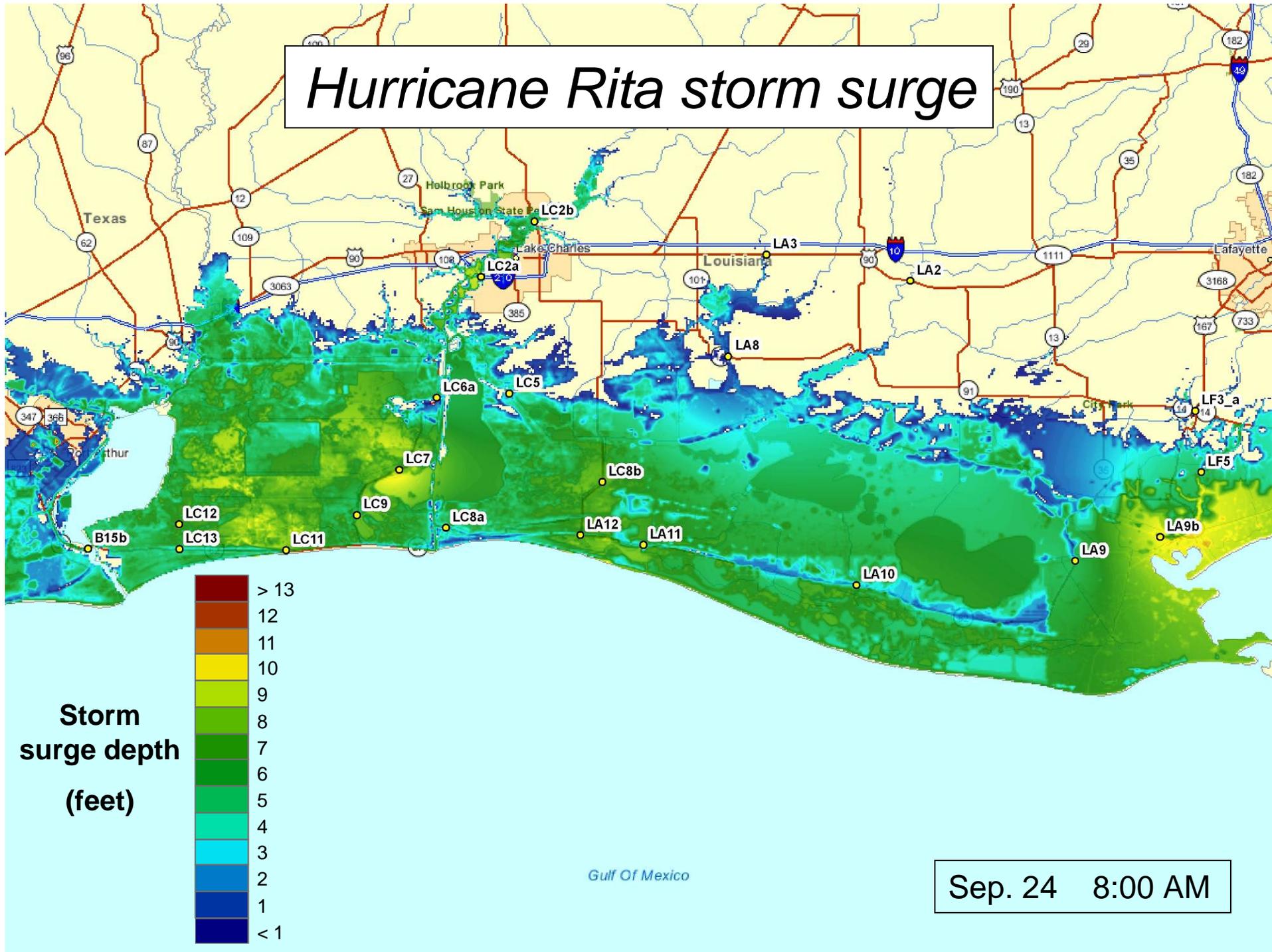
Hurricane Rita storm surge



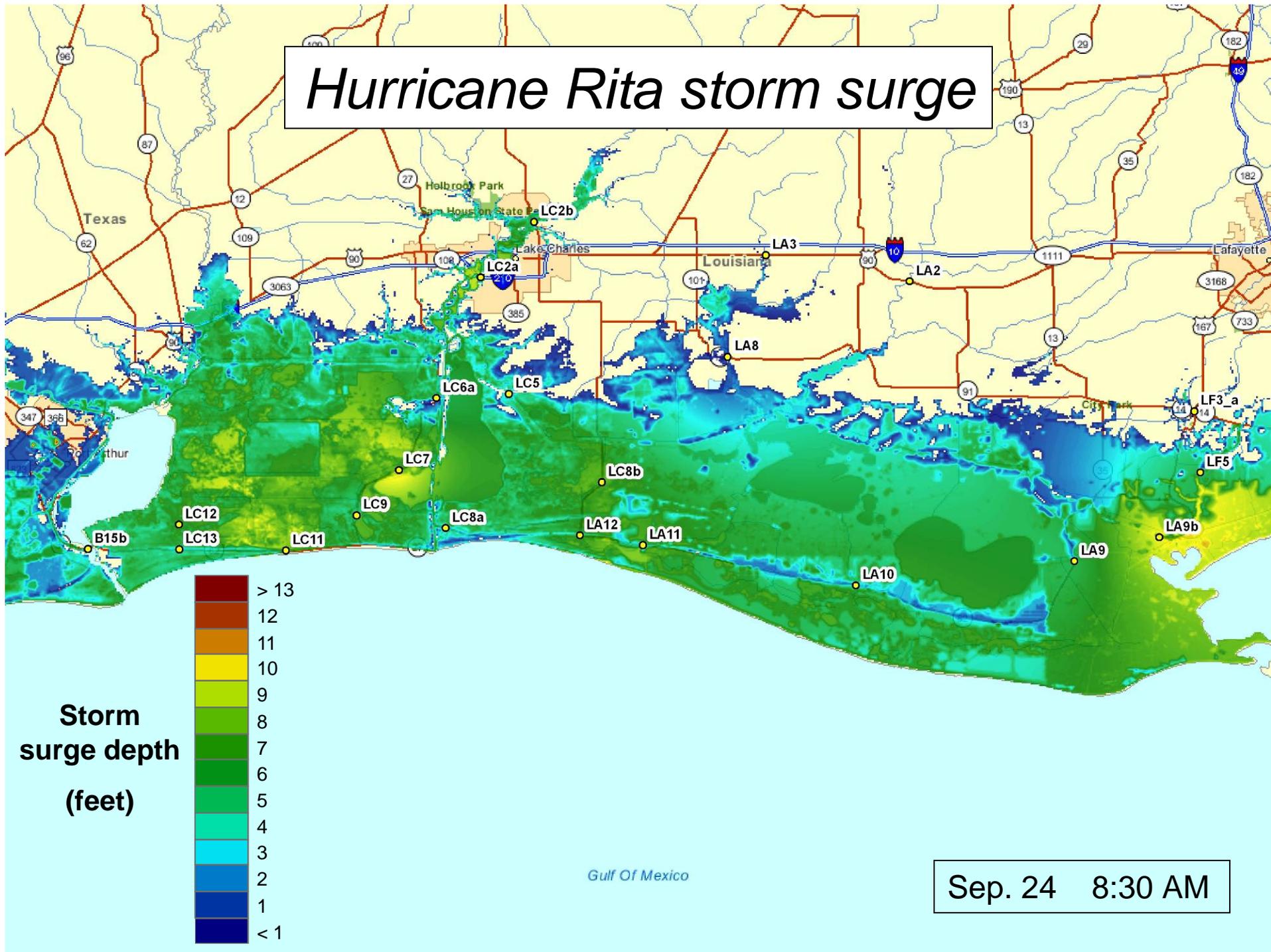
Hurricane Rita storm surge



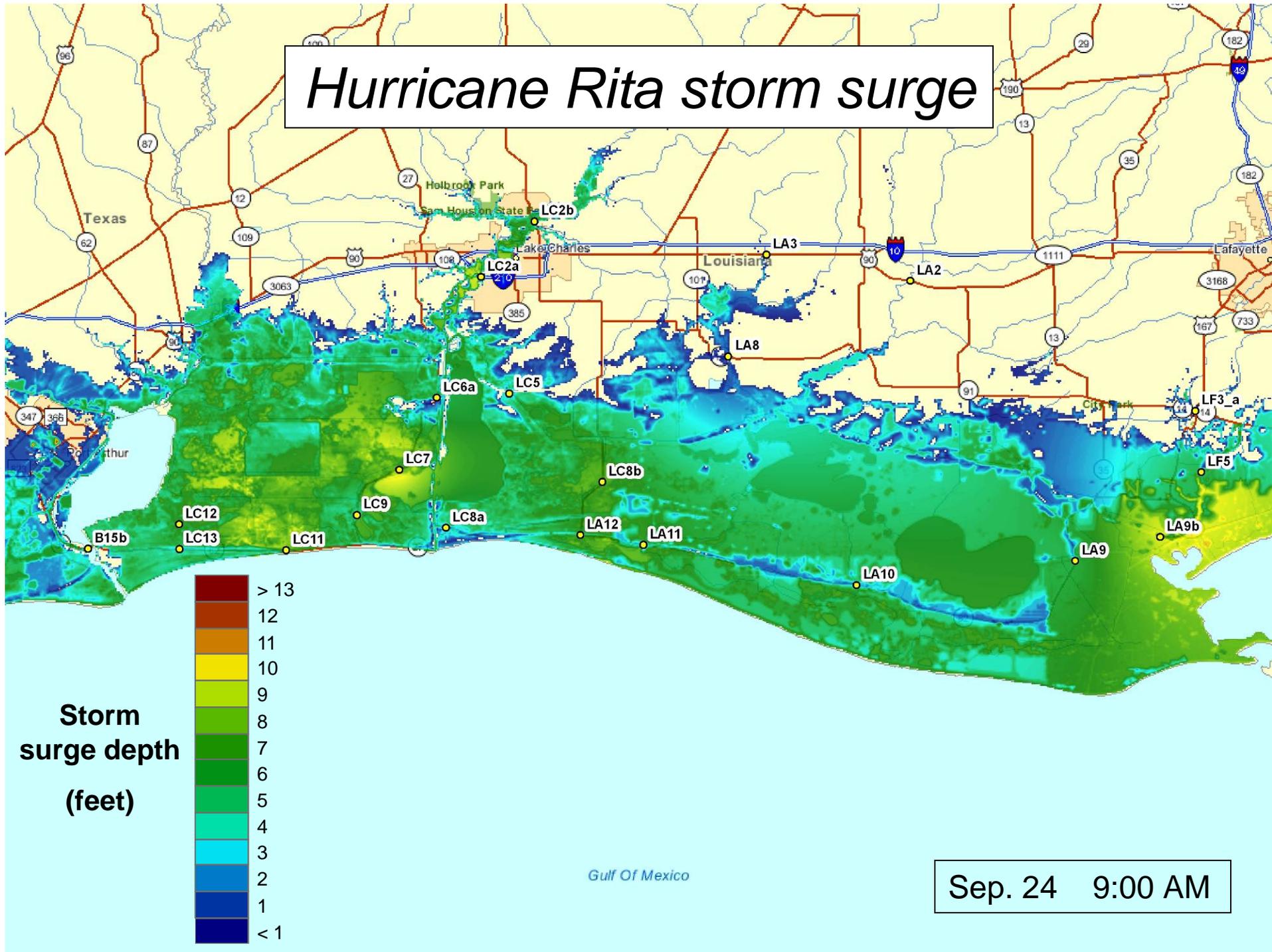
Hurricane Rita storm surge



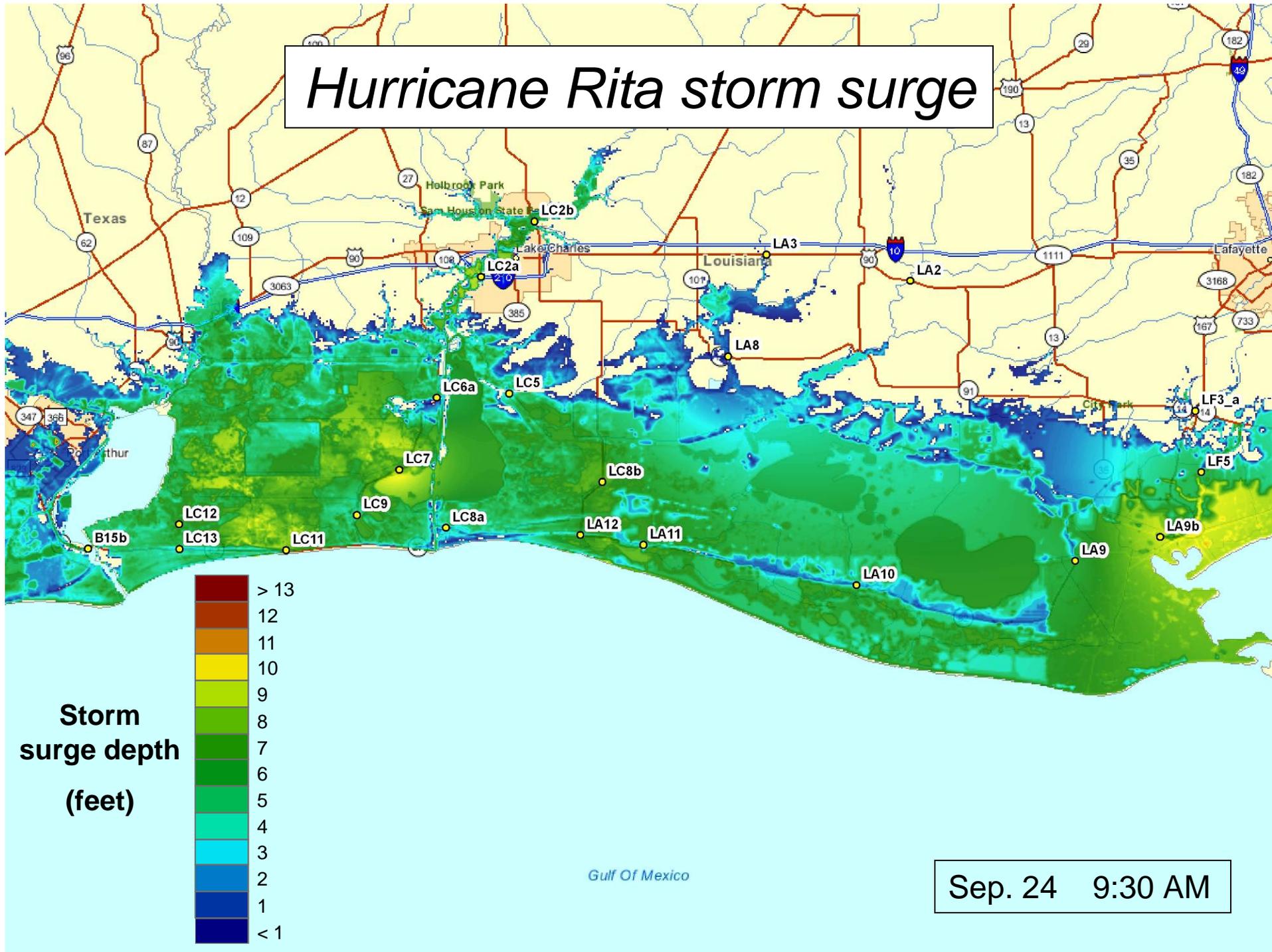
Hurricane Rita storm surge



Hurricane Rita storm surge

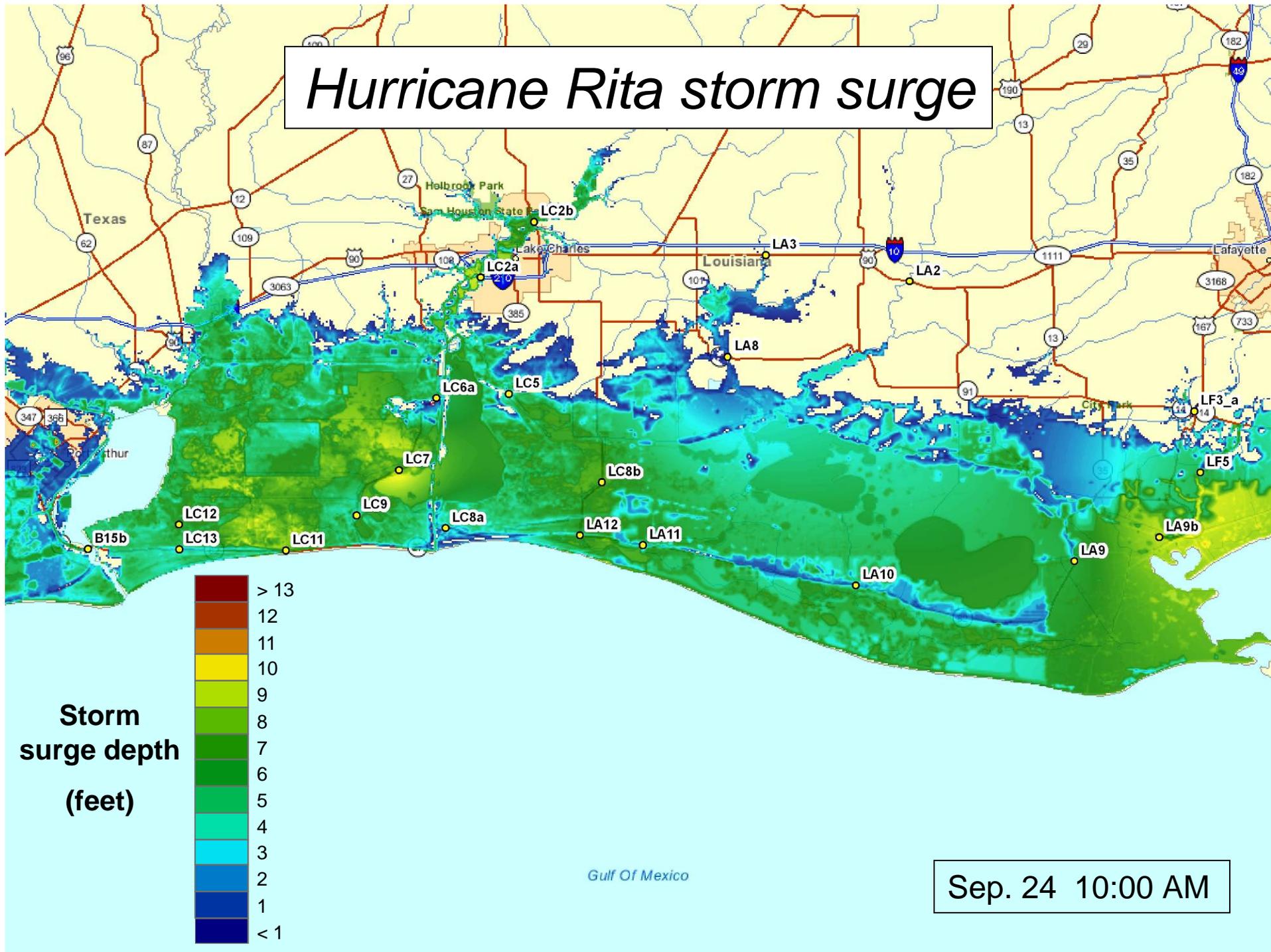


Hurricane Rita storm surge



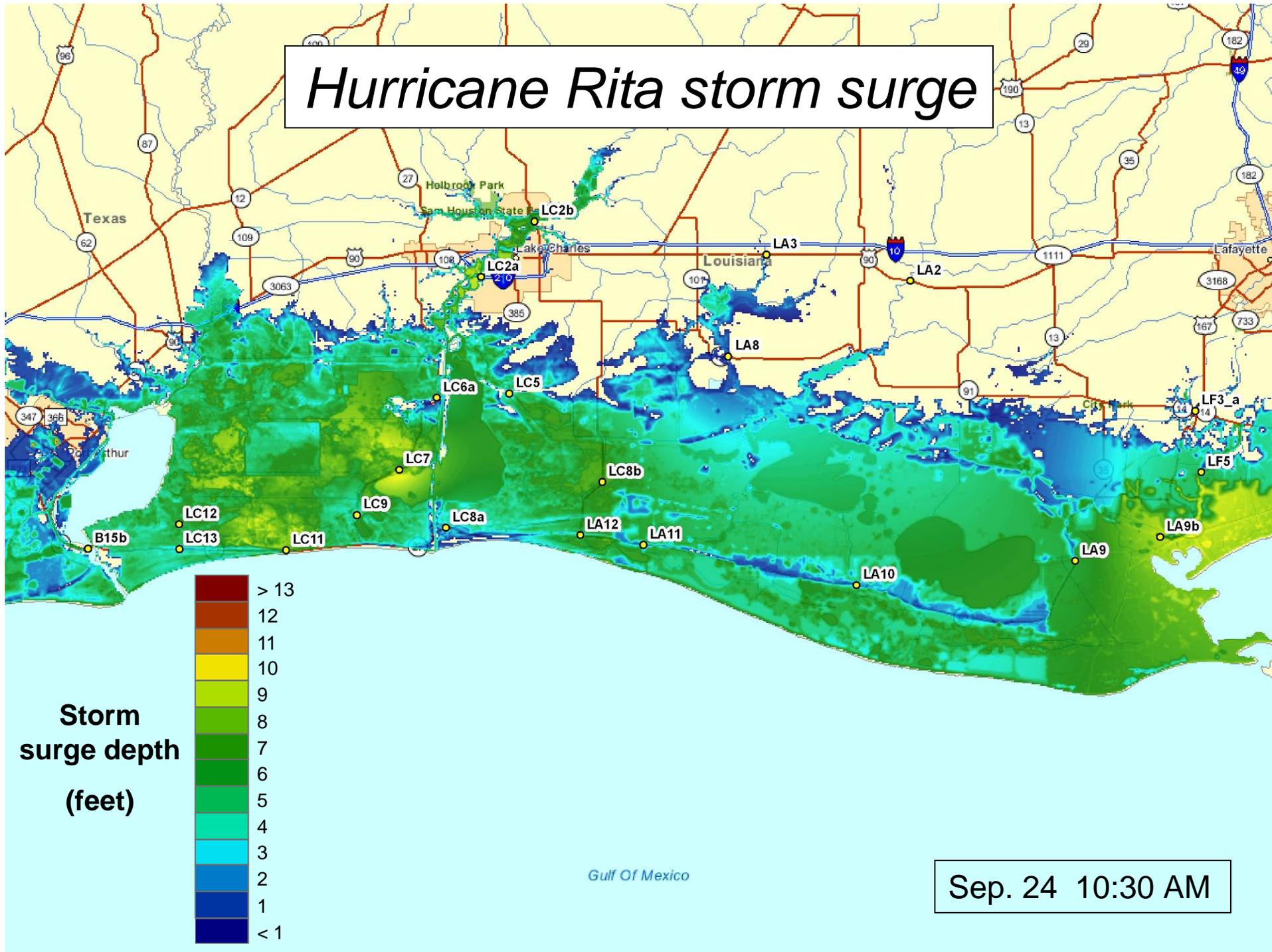
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Hurricane Rita storm surge

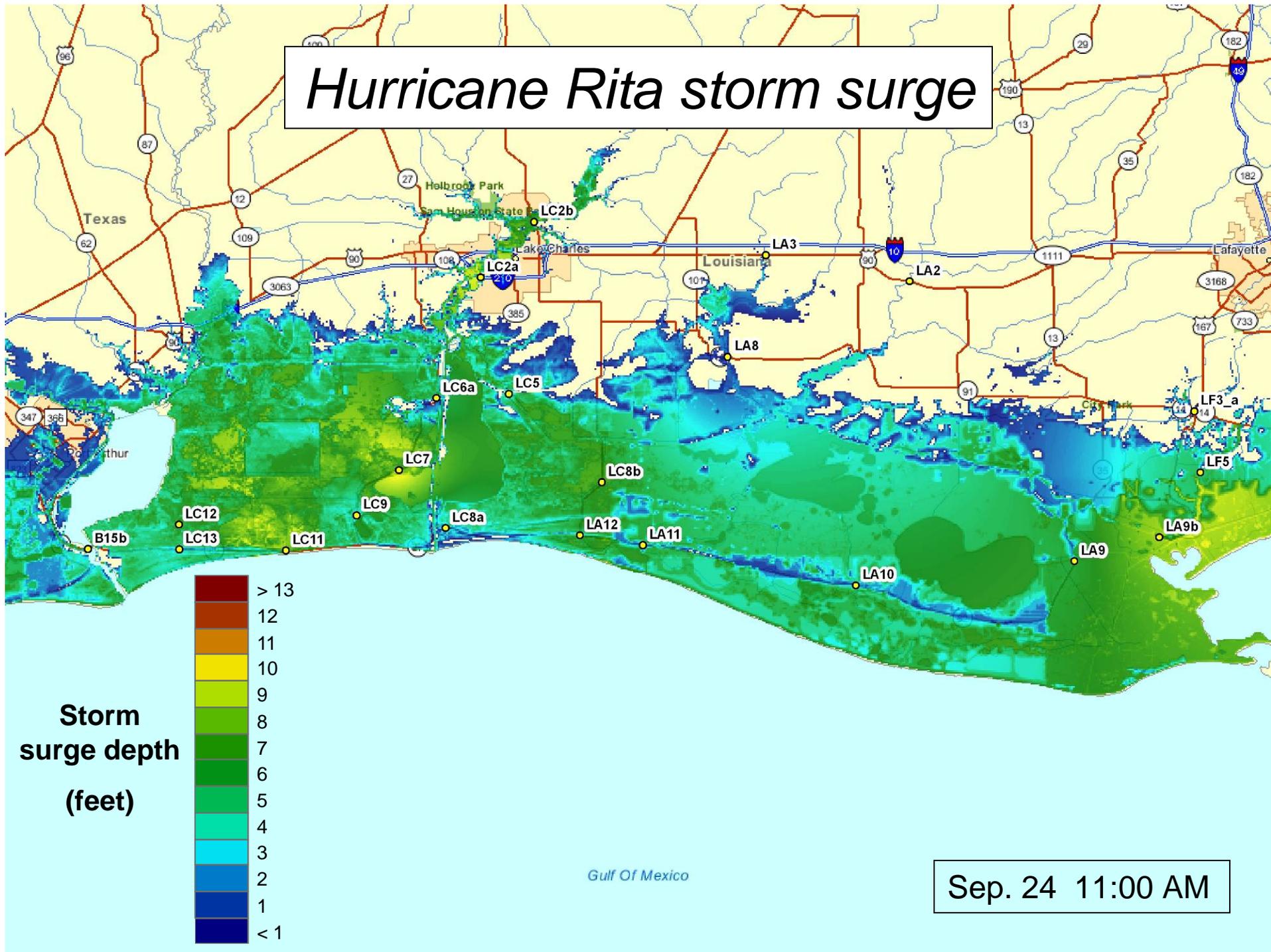


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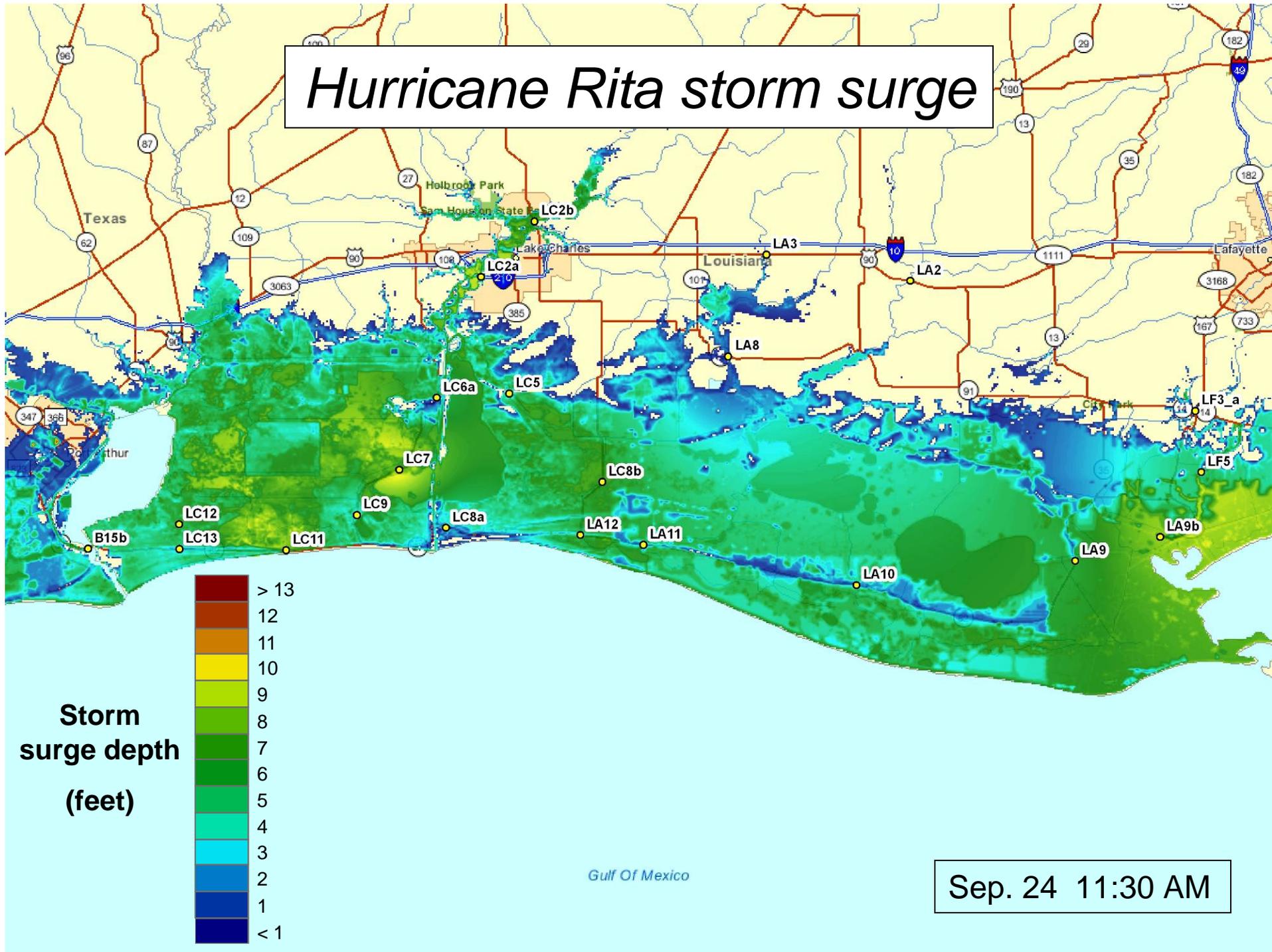
Hurricane Rita storm surge



Hurricane Rita storm surge

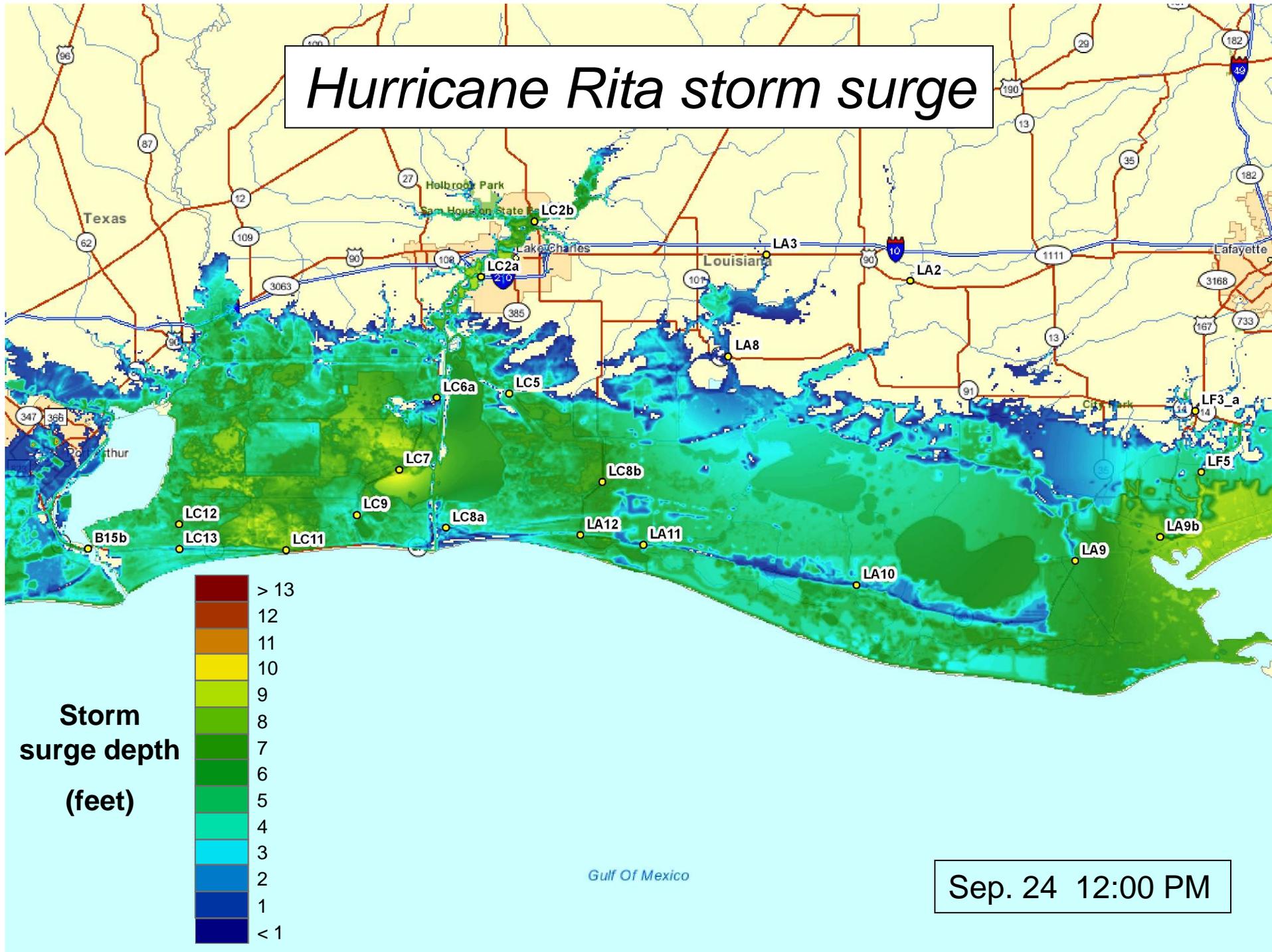


Hurricane Rita storm surge



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Hurricane Rita storm surge



EROS Data Center

- ✓ Web application of the Katrina region that will allow for users to obtain peak Katrina storm surge depths (07/2006)
- ✓ Analysis of pre- and post-Katrina LiDAR to measure barrier island planform change and use as a tool to determine debris volume (07/2006)