Alabama’s Coastal Flood Maps: What a Journey!

Presented by:
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October 9, 2019
Brief History

• Effective studies were out of date
  – Baldwin County Flood Insurance Study
    • Surge Elevations revised in 1983
    • Wave Elevations revised in 2002
  – Mobile County Flood Insurance Study
    • Surge and Wave Elevations revised in 1983
• Major storms since 1983
  – Georges (1998)

• **Bottom Line = New Coastal Studies Needed**
• First FEMA grants were issued in FY08
  – Followed by grants in FY09, FY10, FY11, FY12, FY13 and FY15
Baldwin County Study Overview

- Detailed Studies – Zone AE
  - Zone AE – 214 miles of studies
  - **Zone VE – 111 miles of studies**
- Approximate Studies – Zone A
  - 494 miles of studies
- 15 Communities

Baldwin County
Riverine and Coastal Study Areas

- New Detailed Study (Zone AE) Streams
- Existing Zone AE Stream
- Existing Approximate Study (Zone A) Streams
- New Coastal Study Area
- Baldwin County Political Boundaries
Mobile County Study Overview

- **Detailed Studies**
  - Zone AE – 34 miles of studies
  - Mobile LOMRs – 88 miles of studies
  - **Zone VE – 100 miles of studies**

- **Approximate Studies – Zone A**
  - 278 miles of studies
  - Mobile LOMRs – 15 miles of studies

### Mobile County Riverine and Coastal Study Areas

- New Detailed Study (Zone AE) Streams
- Existing Zone AE
- New Approximate Study (Zone A) Streams
- Existing Approximate Study (Zone A) Streams
- New Coastal Study Area
- Mobile County Political Boundaries
Coastal Modeling – Two Phased Approach

• Phase 1 – ADCIRC/Wave set up modeling to determine the 1% and 0.2% annual chance stillwater elevations.
  – ADCIRC is an Advanced 3D Circulation Model used to compute storm surge heights from either historic or synthetic storm events.

• Phase 2 – Overland wave or transect modeling and DFIRM mapping.
  – Wave Height Analysis for Flood Insurance Studies (WHAFIS)
    – used to predict wave heights associated with hurricane storm surge.
  – Runup methods (Runup 2.0, TAW, & SPM) – used to model the effects of wave runup and overtopping of coastal dunes.
Coastal Modeling – Two Phased Approach

Still Water Elevation + Wave Height = Coastal BFE

- Phase I (NWFWMD)
  - ADCIRC/Wave Setup
  - Storm Surge Modeling

- Phase II (AL OWR)
  - Overland Wave or Transect Modeling

A presentation by Wood.
Coastal Modeling 101

- What is coastal storm surge?
  - Still Water Elevation (SWEL) above Normal Tide Levels
  - Created from several hundred synthetic storm tracks, then validated with historical storm information
Coastal Hazard Analysis

- Coastal BFE on FIRMs include:
  - Storm surge stillwater elevation (SWEL)
  - Wave setup
  - Wave height above SWEL
  - Wave runup above SWEL (if applicable)
Coastal Flood Mapping

- Wave height ≥ 3 ft
- Wave height < 3 ft
- BFE including wave effects
- 100-year stillwater elevation
- Datum (NAVD 88)
- Properly elevated building
- Unelevated building constructed before community entered the NFIP

- Shoreline
- Sand Beach
- Buildings
- Overland wind fetch
- Vegetated region
- Limit of 100-year flooding and waves

A presentation by Wood.
Hurricane Katrina vs. Old Effective FIS
Hurricane Ivan vs. Old Effective FIS

Hurricane Ivan Inundation Mapping
Effective Special Flood Hazard Area
Hurricane Ivan High Water Mark

BFE Exceeded by 2.9 Feet!
BFE Exceeded by 2.3 Feet!
BFE Exceeded by 3.7 feet!
BFE Exceeded by 3.5 feet!
# Historical vs. New Baldwin County FIS

<table>
<thead>
<tr>
<th>Transect</th>
<th>USGS Reference</th>
<th>Location</th>
<th>HWM (ft.)</th>
<th>New BFE (ft.)</th>
<th>Effective BFE (ft.)</th>
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<tbody>
<tr>
<td>157.2</td>
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<td>Pine Beach</td>
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<td>161</td>
<td>USGS 14</td>
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<td>173</td>
<td>USGS 10</td>
<td>Orange Beach</td>
<td>12.24</td>
<td>13 VE</td>
<td>12 VE</td>
</tr>
</tbody>
</table>

## Hurricane Ivan High Water Marks – Baldwin County, AL

<table>
<thead>
<tr>
<th>Location</th>
<th>Flood Source</th>
<th>HWM**</th>
<th>New BFE (ft.)</th>
<th>Effective BFE (ft.)</th>
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<tbody>
<tr>
<td>Fairhope</td>
<td>Mobile Bay</td>
<td>6.07</td>
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<td>Weeks Bay</td>
<td>Mobile Bay</td>
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<td>Gulf Shores</td>
<td>Gulf of Mexico</td>
<td>10.55</td>
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<td>10 AE</td>
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<tr>
<td>Gulf Shores</td>
<td>Gulf of Mexico</td>
<td>10.66</td>
<td>14 VE</td>
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</tr>
<tr>
<td>Orange Beach</td>
<td>Gulf of Mexico</td>
<td>12.24</td>
<td>13 VE</td>
<td>12 VE</td>
</tr>
<tr>
<td>Ono Island</td>
<td>Gulf of Mexico</td>
<td>6.91</td>
<td>10 AE</td>
<td>9 AE</td>
</tr>
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</table>

**measured HWMs values may include some wave effects**

A presentation by Wood.
Historical vs. New Mobile County FIS

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<tr>
<th>Location</th>
<th>Flood Source</th>
<th>HWM (ft)**</th>
<th>New BFE (ft.)</th>
<th>Effective BFE (ft.)</th>
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</thead>
<tbody>
<tr>
<td>Chickasaw</td>
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<td>Mobile</td>
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<td>11.6</td>
<td>8.7</td>
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<tr>
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<td>Mobile Bay</td>
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<td>8.1</td>
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<td>Coden</td>
<td>Portersville Bay</td>
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<td>11.2</td>
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<td>Dauphin Island</td>
<td>Gulf of Mexico</td>
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<td>Dauphin Island</td>
<td>Gulf of Mexico</td>
<td>6.7</td>
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<tr>
<td>Dauphin Island</td>
<td>Gulf of Mexico</td>
<td>6.3</td>
<td>8.6</td>
<td>5.1</td>
</tr>
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Coastal Special Flood Hazard Area Changes

Old vs. New
Spanish Fort – Mobile Bay
Baldwin County – Weeks Bay
Fort Morgan
Gulf Shores
City of Mobile – Mobile Bay
Dog River Confluence
Bayou La Batre

[Map of Bayou La Batre area with various color codes indicating different flood risk categories, such as Political Area Boundary, Floodway Decrease, 1% Annual Chance Floodplain Increase, 1% Annual Chance Floodplain Decrease, 0.2% Annual Chance Floodplain Increase, High-Risk SFHA Increase, High-Risk SFHA Decrease, and No SFHA Change.]
Dauphin Island

Legend:
- Political Area Boundary
- 1% Annual Chance Floodplain Increase
- 1% Annual Chance Floodplain Decrease
- 0.2% Annual Chance Floodplain Increase
- 0.2% Annual Chance Floodplain Decrease
- High-Risk SFHA Increase
- High-Risk SFHA Decrease
- No SFHA Change
AL OWR Website

http://www.alabamaflood.com/
Validation Storm 1: Hurricane Ivan - 2004

- 14 foot storm surge recorded between Gulf Shores and Orange Beach.
- 100-yr flood elevations exceeded throughout Alabama.
- Landfall: Gulf Shores, AL
Validation Storm 2: Hurricane Opal - 1995

- Category 4 – October 4, 1995
- Landfall near Pensacola, FL
- 19.4” of rain in Brewton, AL.
- 145 mph winds at Hurlburt Field

http://www.csc.noaa.gov/hurricanes
Validation Storm 3: Hurricane Georges - 1998

- Category 2 – September 28, 1998
- Landfall at Biloxi, MS
- Made 7 total landfalls
- Storm Surge of 11.9 feet at Fort Morgan
- 25 foot waves
- 30” of rain in Bay Minette

Historical Hurricane Tracks
National Oceanic and Atmospheric Administration

http://www.csc.noaa.gov/hurricanes
Validation Storm 4: Hurricane Dennis - 2005

- Category 3 – July 10, 2005
- Landfall at Santa Rosa Island, FL
- Storm surges up to 9 feet on Florida Coast
- One of most powerful “early season” tornadoes

http://www.csc.noaa.gov/hurricanes
Validation Storm 5: Hurricane Katrina - 2005

- 100-yr flood elevations exceeded throughout Alabama.
- Dauphin Island overwashed.
- Landfall in Louisiana

http://www.csc.noaa.gov/hurricanes