Broward County Discovery Meeting
Southeast Florida Coastal Study

June 25, 2014
Welcome and Introductions

- **FEMA Region IV**
  - Mark Vieira – Project Manager
  - Christina Lindemer – Technical Lead
  - Henrietta Williams – Outreach Lead

- **Production and Technical Services (PTS) Contractor**
  - Michael DelCharco – Project Manager
  - Chris Mack – Technical Lead
  - Dick Wild – Outreach Lead
  - Michael Taylor – Discovery Lead
Introductions

- Emergency Management
- Water Management Districts
- Other Federal Agencies
- FEMA
- State of Florida
- Local Stakeholders
Agenda

- Risk MAP Overview
- Coastal Project Overview
- Coastal Project Deliverables
- First Order Approximation
- Discovery Process
- Stakeholder Input and Feedback
Risk MAP Overview
National Flood Insurance Program

- U.S. Congress established the National Flood Insurance Program with the passage of the National Flood Insurance Act of 1968
- Community adopts and enforces a floodplain management ordinance to reduce flood risk to new and existing development in mapped floodplains
- Federal government makes flood insurance available to property owners in participating communities
Risk MAP Program Overview

- Risk MAP Objective (Coastal)
  - To provide updated flood hazard data for 100% of the populated U.S. coast
Risk MAP Program Overview

**Risk MAP**
- Mapping
- Assessment
- Planning

**Vision**
- Deliver quality data
- Increase public awareness
- Encourage local and regional action
Program Overview

- Study flooding at a watershed level
- Strengthen local and state partnerships
- Improve Local Mitigation Strategies and Floodplain Ordinances
- Make informed decisions about flood mitigation projects
- Citizens understand flood risk
Historical FEMA Project Timeline

- Scoping
- Coastal Modeling
- Outreach
- FIRM Production
- Preliminary Issuance
- CCO Meeting
Risk MAP Project Timeline

Coastal Modeling

Discovery

Flood Risk Review Meeting

Outreach

Flood Risk Products

Resilience Meeting

CCO/Open House Meeting

FIRM Production

Preliminary Issuance
Southeast Florida Coastal Study – Overview
Southeast Florida Coastal Study – What It’s Not……

The new FEMA Coastal Study is NOT a Hurricane Evacuation Study and is not meant to replace your current Hurricane Evacuation Study.
Southeast FL Coastal Study – Project Goals

Determine revised Base Flood Elevations (BFEs) and flood inundation boundaries for 1% annual-chance (base) flood total water levels.

Update the coastal Flood Insurance Study (FIS) and Flood Insurance Rate Map (FIRM) Panels.

Assist communities with incorporating this information into risk assessment and hazard mitigation planning.
Basic Elements of a Coastal Flood Risk Study

Base Flood Elevation (BFE) on FIRM includes 4 components:

1. Storm surge stillwater elevation (SWEL)
2. Amount of wave setup
3. Wave height above storm surge (SWEL) elevation
4. Wave runup above storm surge elevation (where present)

Determined from storm surge model
Basic Elements of a Coastal Flood Risk Study

- Normal water level
- Storm surge level
- Wave setup
- Wave action
Basic Elements of a Coastal Flood Risk Study

Dune erosion (540 ft²)
Basic Elements of a Coastal Flood Risk Study

Dune erosion (removal)
Limit of Moderate Wave Action (LiMWA)

- FEMA Procedure Memorandum No. 50, 2008
- At present not a regulatory requirement
- No Federal Insurance requirements tied to LiMWA
- CRS benefit for communities requiring VE Zone construction standards in areas defined by LiMWA or areas subject to waves greater than 1.5 ft.
Primary Frontal Dune (PFD)

“a continuous or nearly continuous mound or ridge of sand with relatively steep seaward and landward slopes immediately landward and adjacent to the beach and subject to erosion and overtopping from high tides and waves during major coastal storms” – NFIP regulations
Southeast FL Coastal Study – Process

- Discovery
- Data Acquisition
- Coastal Engineering Analyses
- Floodplain Mapping
- Produce Preliminary Flood Insurance Rate Maps
- Post-Preliminary Processing
Southeast FL Coastal Study – Project Schedule

- **2014**: PHASES (Planned)
  - Kickoff/Discovery Meetings

- **2015**: Data Acquisition & Analysis
  - Community Touchpoint: Storm Surge Analysis Update

- **2016**: Floodplain Mapping
  - Community Touchpoint: Risk Review/Resilience/Map Changes

- **2017**: Preliminary FIRMs

- **2018**: Post-Preliminary Processing
  - Community Touchpoint: CCO Meeting/Regulatory FIRM Open House

- **2019**: Effective Maps
Southeast FL Coastal Study – Palm Beach County Scope of Work

<table>
<thead>
<tr>
<th>Shoreline Miles</th>
<th>46</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated WHAFIS Transects</td>
<td>184</td>
</tr>
<tr>
<td>Transects Per Mile</td>
<td>4</td>
</tr>
<tr>
<td>Estimated Panels</td>
<td>41</td>
</tr>
<tr>
<td>Communities</td>
<td>24</td>
</tr>
</tbody>
</table>

Effective transects shown
Southeast FL Coastal Study – Broward County Scope of Work

<table>
<thead>
<tr>
<th>Shoreline Miles</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated WHAFIS Transects</td>
<td>100</td>
</tr>
<tr>
<td>Transects Per Mile</td>
<td>4</td>
</tr>
<tr>
<td>Estimated Panels</td>
<td>33</td>
</tr>
<tr>
<td>Communities</td>
<td>20</td>
</tr>
</tbody>
</table>

Effective transects shown
Southeast FL Coastal Study – Miami-Dade County Scope of Work

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoreline Miles</td>
<td>116</td>
</tr>
<tr>
<td>Estimated WHAFIS</td>
<td>406</td>
</tr>
<tr>
<td>Transects Per Mile</td>
<td>3.5</td>
</tr>
<tr>
<td>Estimated Panels</td>
<td>132</td>
</tr>
<tr>
<td>Communities</td>
<td>28</td>
</tr>
</tbody>
</table>

Effective transects shown
Southeast FL Coastal Study – Monroe of Work

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoreline Miles</td>
<td>120</td>
</tr>
<tr>
<td>Estimated WHAFIS Transects</td>
<td>360</td>
</tr>
<tr>
<td>Transects Per Mile</td>
<td>3</td>
</tr>
<tr>
<td>Estimated Panels</td>
<td>160</td>
</tr>
<tr>
<td>Communities</td>
<td>6</td>
</tr>
</tbody>
</table>

Effective transects shown
South Florida Topographic Datasets
Palm Beach County and Broward County Topographic Data
SFL Bathymetric Data: Datasets by Agency
SFL Data Bathymetric: Datasets by Collection Date
Broward County Missing Data

Legend

NoData Areas

1.0 mi  3.0 mi  5.0 mi

NoData Areas

0.5 mi  1.5 mi  2.5 mi  3.5 mi  4.5 mi

Risk MAP
Increasing Resilience Together
Southeast Florida Coastal Study – Surge and Wave Modeling

- **ADCIRC and SWAN Coupled Model**
  - Identical, unstructured mesh with shared parallel computing infrastructure
  - Run sequentially in time
  - Wave induced water level changes

- **Mesh Development**
  - Good elevation data critical for terrain and bathymetry
  - Identification of significant coastal features
Grid resolution drives costs
- What resolution is good enough? Too much or too little?
- Canal/riverine features, levees/berms, hydraulic constrictions

Extensive sensitivity analyses
- Grid sizes, channel features/conveyance
- Conclusion
Southeast Florida Coastal Study – Wind and Pressure Field Modeling

- Developed with JPM-OS procedure as objective – preliminary estimate of 850 storms
- Wind/pressure fields for the validation storms are based on observed data supplemented with theoretical values
- Team member Ocean Weather, Inc. (OWI)
- Example Oceanweather wind and pressure field (maximum)
Southeast Florida Coastal Study – Model Forcing and Validation

- **Tides**
  - ADCIRC response to tides
  - Simulate multiple tides and examine results

- **Historic Events**
  - Explore existing data
  - Create wind field for historic events
  - Simulate event and examine results
Southeast Florida Coastal Study – Statistical Approach

Joint Probability-Optimal Solution (JPM-OS) method,

- Develop an array of synthetic storms
- Five primary parameters
  - Central pressure deficit
  - Radius to maximum wind speeds
  - Storm track heading
  - Forward velocity
  - Shoreline crossing point
- Run enough storms to give valid statistical sample set
Southeast Florida Coastal Study – Overland Wave Modeling

- Wave Height Analysis for Flood Insurance Studies – WHAFIS
  - 1-D model – using GIS allows huge amount of transects
  - Capable of variable obstructions including vegetation types (rigid and flexible) and buildings (area of obstruction)
Southeast Florida Coastal Study – From Preliminary to Effective FIRMs

Preliminary Maps

Community Review

Preliminary FIRM Meeting

Post-Preliminary Processing

90-Day Appeal Period Administration

Final Map Preparation and Issuance of Letter of Final Determination

Compliance Period (FIRM panels adopted by ordinance)

Revised FIRMs become effective

30-45 Days

90 Days

6 Months
Southeast Florida Coastal Study – Project Deliverables
Updated Regulatory Products
A Suite of Coastal Non-Regulatory Products

- Coastal Flood Risk Map
- Changes Since Last FIRM
- Coastal Depth Grids
- Increased Inundation Areas
- Wave Height
- Primary Frontal Dune Erosion Areas
- Dune Peak
- HAZUS Analysis
Coastal Flood Risk Map
Coastal Changes Since Last FIRM

- Makes it easy for communities and homeowners to identify impacts of new FIRM
- Assists in prioritizing mitigation actions
- Helps identify reasons for changes

<table>
<thead>
<tr>
<th>Changes Since Last FIRM</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFHA Decrease</td>
</tr>
<tr>
<td>Floodway Decrease</td>
</tr>
<tr>
<td>SFHA Increase</td>
</tr>
<tr>
<td>Floodway Increase</td>
</tr>
<tr>
<td>No Zone Change</td>
</tr>
<tr>
<td>Non-SFHA Decrease</td>
</tr>
<tr>
<td>Non-SFHA Increase</td>
</tr>
</tbody>
</table>
Coastal Depth Grid
Coastal Increased Inundation Areas
Coastal Wave Height Grid
Primary Frontal Dune Erosion Areas
Dune Peak
First Order Approximation
First Order Approximation – Broward Co Base Data

Effective Resources

- Surge Modeling Topo/Bathy
  - Original – completed 1988
  - USGS 1:24,000, 5 ft. contour
  - NOS Hydrographic Surveys
- Land Use Map and Aerials
  - 1984-1986 County sources
- WHAFIS Topo and Beach Profile
  - USGS 1:24,000, 5 ft. contour
  - 1981 FL DNR CCL study
- PFD Mapping Topo
  - PFD added 8/18/1992
  - USGS 1:24,000, 5 ft. contour

FY13 – SFL Risk MAP

- Surge Modeling Topo/Bathy
  - 2007 FDEM LiDAR
  - Jalbtcx/USACE/Surveys/NOS ranging from 1928-2012
- Land Use Map and Aerials
  - On going investigation (FDEP, County GIS, etc.)
- WHAFIS Topo and Beach Profile
  - 2007 FDEM LiDAR/Newer beach profiles will be evaluated for applicability
- PFD Mapping Topo
  - Same as for WHAFIS tasks
### Effective Surge Modeling Status

- **Storm Surge Models**
  - FEMA Coastal Storm Surge model (1988)
  - NWS 15, 23, 38 for climatology
- **Grid Domain and Size**
  - 5X5 nm coarse grid
  - 0.5 X 1 nm sub-grid scheme
- **Validation Storms**
  - (Unknown)
- **Statistical Methods**
  - Joint Probability Method (JPM)

### FY13 – SFL Risk MAP

- **Storm Surge Models**
  - ADCIRC/UnSWAN
- **Grid Domain and Size**
  - 30-50m for main channels
  - 50m for overland areas and near-shore
  - 100+m to Km going offshore
- **Validation Storms**
  - Ongoing Investigation
- **Statistical Methods**
  - JPM - OS
Effective Wave Analysis and Mapping

- Wave Setup Method and Date Applied
  - Method – SPM (2.2 feet)
  - 1992 and 1995 wave analyses
- Wave Height Analyses Method and Date Applied
  - Method – WHAFIS 3.0
  - Completed in 1989
- Storm-induced Erosion Assessment Method and Date Applied
  - Method – 540-SF
  - August 18, 1992 (completed in 1989)
  - Revised October 2, 1997

FY13 – SFL Risk MAP

- Wave Setup Method
  - 2D wave model (UnSWAN)
- Wave Height Analyses
  - WHAFIS 4.0
- Storm-induced Erosion Assessment Method
  - 540-SF
Effective Wave Analysis and Mapping (cont.)

- Wave Runup Analyses Method and Date Applied
  - Mean wave runup
  - Method – RUNUP 2.0
  - Date Applied – August 18, 1992
- Primary Frontal Dunes VE Zone Mapping Date Applied
  - Mapped August 18, 1992 FIRM

FY13 – SFL Risk MAP

- Wave Runup Analyses
  - 2% wave runup
  - Method based upon slope
  - Runup 2.0 (open coast beaches)
  - TAW (beach/structures slope 1:1-1:8)
  - SPM (vertical wall)
- Primary Frontal Dunes VE Zone Date Applied
  - Delineation Method FEMA 2007 G&S
First Order Approximation – Broward Co FIS and FIRM Status

Effective FIRMs

• Original FIS Date
  • August 18, 1992
  • Surge modeling and coastal analyses completed December 1988

• Date of Initial Countywide DFIRM Conversion
  • August 18, 1992
  • Revised October 2, 1997

• Date Coastal Barrier Resources System Mapped
  • August 18, 1992

FY13 – SFL Risk MAP

• Risk MAP FIRMs
• Risk MAP Database
• Risk MAP Non-Regulatory Products
Discovery Process
Southeast Florida Coastal Study – Discovery Overview

- Review current flood hazards and risks and collect data
- Understand local mitigation activities and capabilities and hazard risk assessments
- Develop outreach strategy for the life of the project
Discovery Data Collected to Date

- Effective Flood Data and Historical Flood Information
- Community Assessment Surveys
- Local Mitigation Strategies and Mitigation Projects
- Key Project Stakeholders
Local Knowledge – Data Availability

Base map data / terrain data
- Terrain data – TOPO or BATHY
- Orthophotos
- Updated roads, political boundaries, and public works projects
- Land use data

Coastal structures
- Seawalls, revetments, beach nourishment, protection structures
  - Specifications or as-built drawings
  - Historical flood performance
  - Repairs, maintenance, or reconstruction
Local Knowledge – Data Availability

**Historic flood hazard information**
- Erosion hazard areas
- Areas subject to wave damage and overtopping

**Current flood studies**
- For existing or anticipated development or mitigation
- Flood studies or flood map revisions in progress (CLOMR LOMR)

Stakeholder Ideas?
Local Knowledge – Identify Key Stakeholders

1. Recommend other community staff
2. Suggest additional stakeholders
3. Let us know if your contact information changes
Thank you for taking the time to complete this questionnaire. The information that you provide will help FEMA understand the flood risk in your community. It will also help FEMA work with you to implement the Risk MAP program. The goal of the program is to increase public awareness and understanding of the flood hazard in your community and to inspire action to reduce risks to life and property from this hazard.

Some of the questions below will ask if your community has specific data sets applicable to this project. If so, please let us know if FEMA can use this data for the project in the Additional Comments box for each question.

BakerAECOM, LLC is FEMA’s Production and Technical Services Contractor and is administering this questionnaire. Please return your questionnaire to Michael Taylor, BakerAECOM, by e-mail at Michael.Taylor@aecom.com or by fax at 404.965.9605. You can also mail your completed questionnaire to:

Michael Taylor
AECOM
1360 Peachtree Street NE, Suite 500
Atlanta, GA 30309
Mitigation Planning

- **Local Mitigation Strategies:**
  - Help guide your decisions on mitigation activities for all hazards you face
  - Are an important resource responsible for responding to disasters
  - Can help you apply for assistance to take action
## Local Mitigation Strategies

<table>
<thead>
<tr>
<th>County LMS</th>
<th>Expiration Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palm Beach</td>
<td>January 2015</td>
</tr>
<tr>
<td>Broward</td>
<td>March 2018</td>
</tr>
<tr>
<td>Miami-Dade</td>
<td>May 2015</td>
</tr>
<tr>
<td>Monroe</td>
<td>December 2015</td>
</tr>
</tbody>
</table>
Local Mitigation Strategy Updates

Risk MAP Products can help enhance the flood risk portion of your Hazard Mitigation Plan

Risk MAP Products can help you identify and prioritize future flood mitigation activities
Southeast Florida Coastal Study – Outreach Efforts

Community Engagement Tools
• e-Bulletins
• Webinar updates
• Project Charter

Website
www.southeastcoastalmaps.com
• Meeting materials
• Periodic updates

Meetings
• Discovery and Kick-off Meeting
• Storm Surge Analysis Update Meeting
• Flood Risk Review Meeting
• Resilience Meeting
• CCO Meeting/Open House

Contacts
• FEMA Study Manager
• Project Manager
• Discovery Lead
• Outreach Lead
## Southeast Florida Coastal Study – Community Meetings

<table>
<thead>
<tr>
<th>Community Meetings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discovery Kick-Off Meeting</td>
</tr>
<tr>
<td>Discovery Meeting</td>
</tr>
<tr>
<td>Technical Update Meeting</td>
</tr>
<tr>
<td>Storm Surge Analysis Update Meeting</td>
</tr>
<tr>
<td>Flood Risk Review Meeting</td>
</tr>
<tr>
<td>Resilience Meeting</td>
</tr>
<tr>
<td>Preliminary DFIRM Community Coordination Meeting</td>
</tr>
<tr>
<td>Public Open Houses</td>
</tr>
</tbody>
</table>

![Image of people working at a table with laptops]
Next Steps

Based on today’s discussion, will provide you with:

- An Updated Discovery Map
- A Discovery Report

Today we will seek your input on flooding issues, development patterns, best available data, and mitigation projects.

Today we will work with you to review your community survey.

Today we will ask that you sign the Project Charter.
Southeast FL Coastal Study –
Points of Contact

Mark Vieira, PE
770.220.5450
mark.vieira@fema.dhs.gov

Christina Lindemem
770.220.5424
christina.lindemer@fema.dhs.gov

Michael DelCharco, PE
904.472.0082
Mdelcharco@tayloengineering.com

Michael Taylor, PE
404.946.9488
Michael.Taylor@aecom.com