FEMA

City of Poquoson, VA Coastal Hazard Analyses Risk MAP Coordination Meeting

March 29, 2011

RiskMAP
Increasing Resilience Together

US Army Engineer Research and Development Center

A JV of Dewberry, URS, and ESP
RAMPP
Risk Assessment, Mapping, and Planning Partners

Today's Agenda

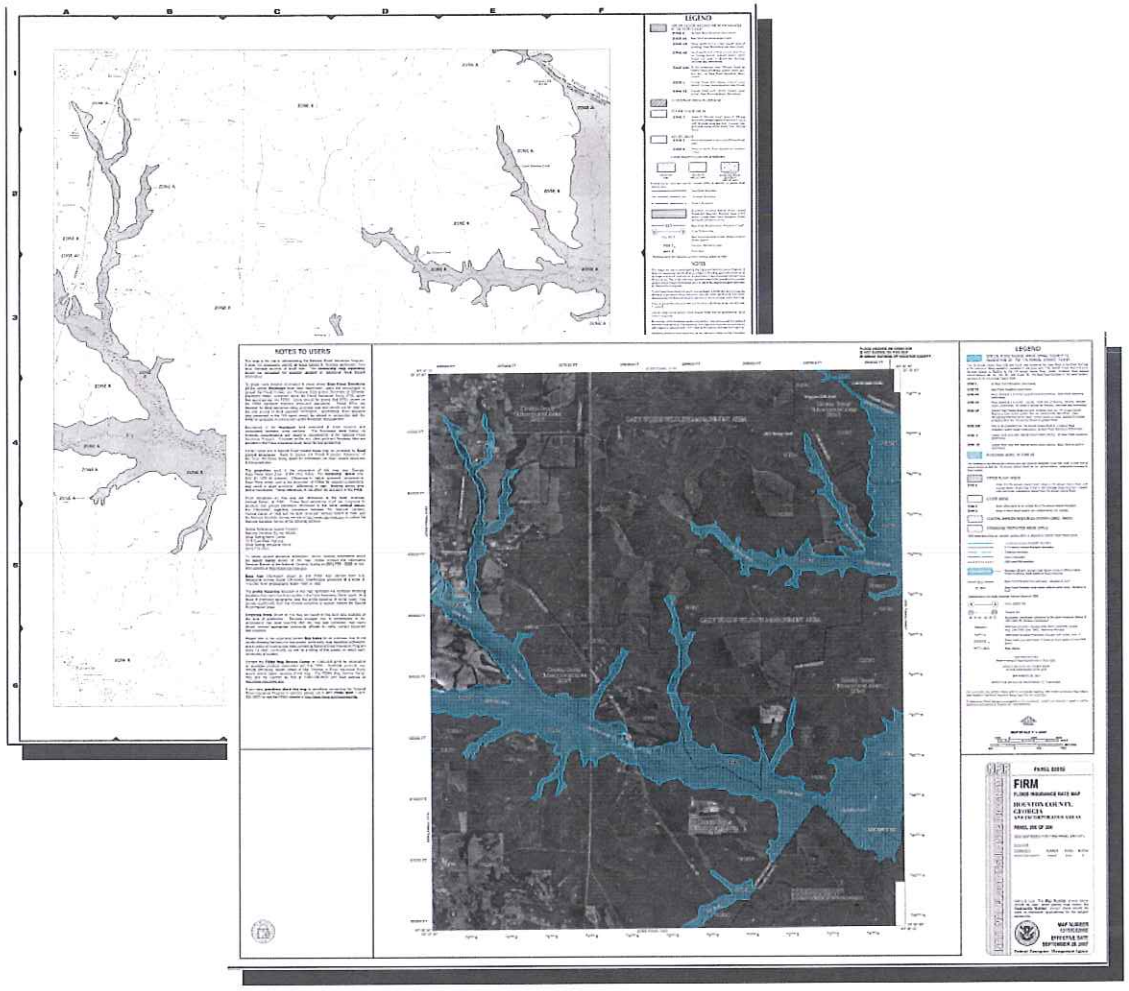
- Map Modernization to Risk MAP
- State of City of Poquoson effective floodplain maps and coastal study
- Why a coastal restudy is needed?
- Elements of a Coastal Flood Insurance Study
  - Storm surge modeling
  - Overland wave analysis
- Regulations
- Physical Map Revision (PMR) process
- Timeline for maps

Map Mod to Risk MAP

- Nationwide, 5-year, $1 billion program
- Updated FEMA's Flood Insurance Rate Maps (FIRMs): 70 percent were over 15 years old
- Produced seamless digital flood data on a countywide basis
- Reduced map production time
- Reduced cost/time for future updates

Map Mod to Risk MAP (continued)

- New digital FIRMs more accurately represent current flood risk
- Countywide DFIRMS – easier to use and update



Map Mod to Risk MAP (continued)

- Risk Mapping, Assessment and Planning, or Risk MAP: 2010-2014
- Builds on Map Mod successes
- Will deliver quality data that increases public awareness and leads to action that reduces risk to life and property.
- Watershed approach
- Coastal re-mapping
- Stronger communication support

Risk MAP - Risk

- Risk MAP goal: Ensure that a measurable increase of the public's awareness and understanding of risk results in a measurable reduction of current and future vulnerability.
  - More accurate data to identify, assess, and mitigate risk
  - Maps that provide a better display of risk information
  - More outreach to communicate risk

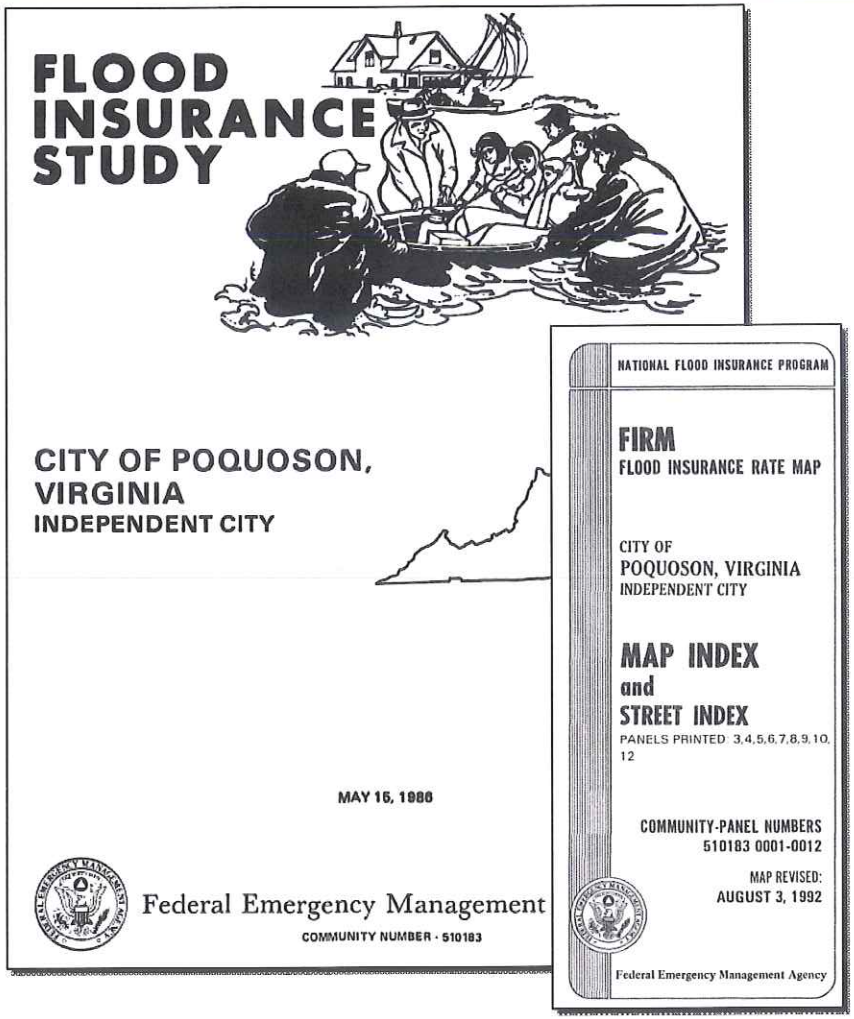
City of Poquoson and the NFIP

- City of Poquoson County joined the NFIP in 1973

  Latest FIS and FIRMs: Effective

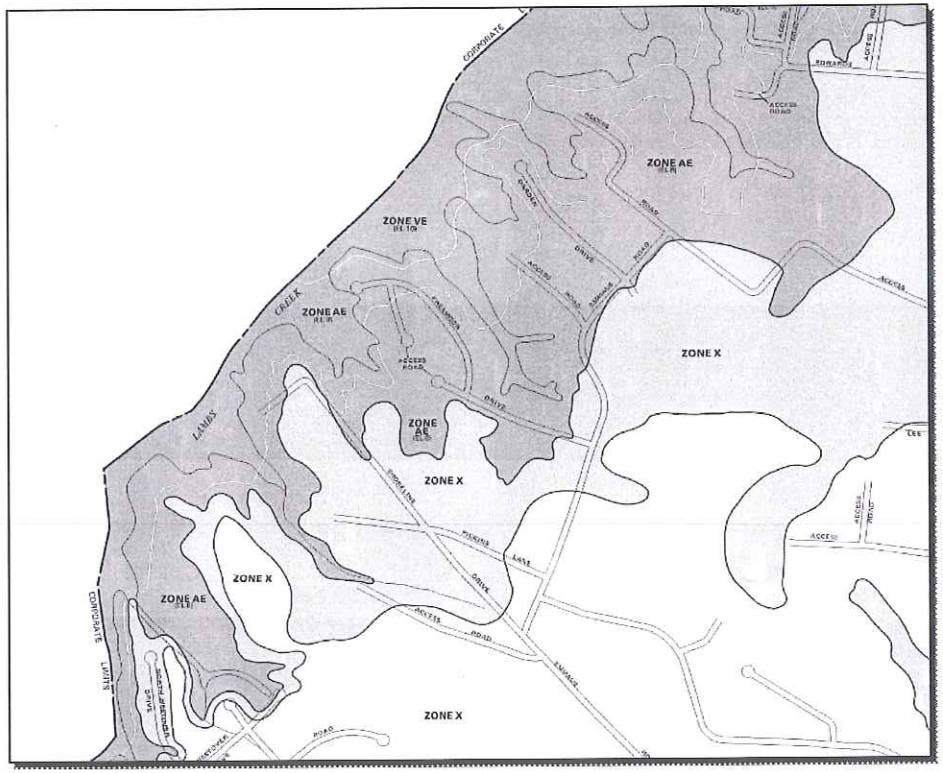
  FIS 5/15/1986; FIRMs 8/3/1992

- Map Mod Update: Preliminary 4/19/2010
  Projected Letter of Final Determination: 5/2/2011
  Projected Effective date: 11/2/2011
- This coastal update will be performed as a Physical Map Revision (PMR) to the current DFIRM panels.



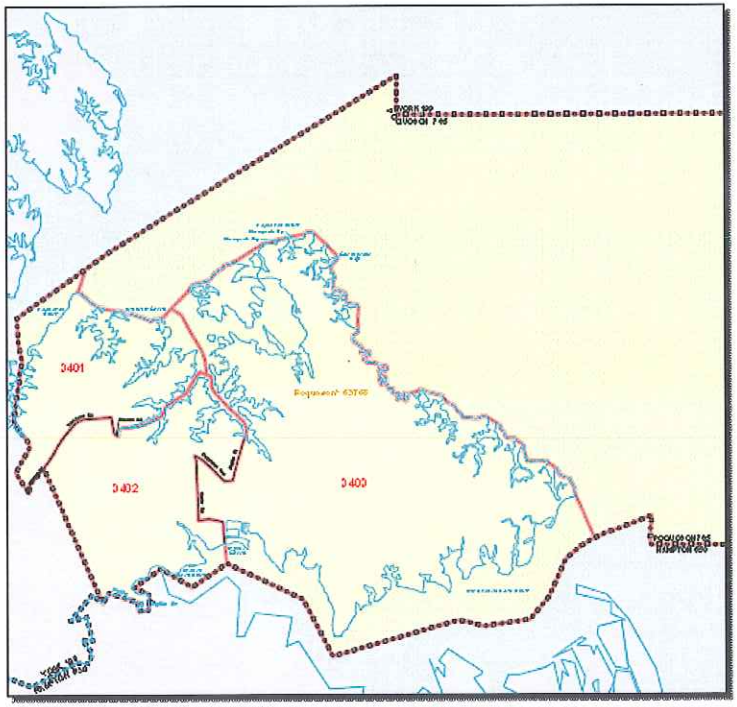
State of City of Poquoson Effective Coastal Study

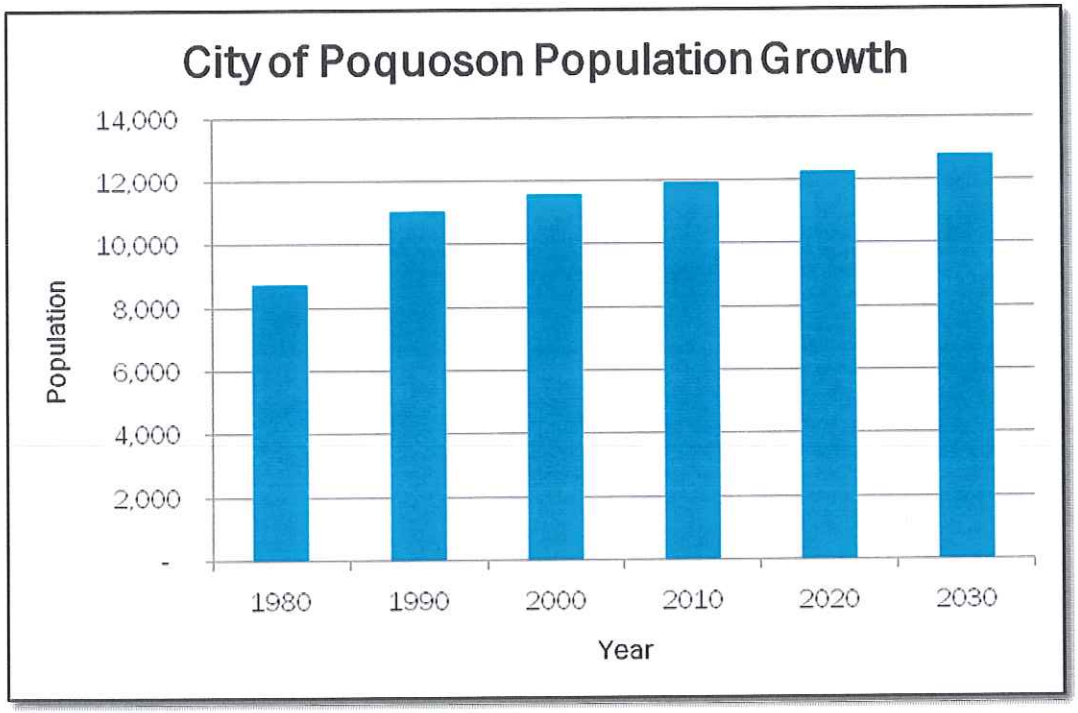
- Topographic data used for mapping (USGS 5-10 ft contours) date back to 1964-1979
- SWELs for the Chesapeake Bay were determined using a 1978 VIMS study.
- 10 transects modeled throughout the county
- Wave height determined with NAS method.
- Erosion analysis not performed
- Wave setup not accounted for
- WHAFIS or wave runup modeling not performed
- FIRMs vertical datum NGVD 29



Population Growth for City of Poquoson

Census tracts

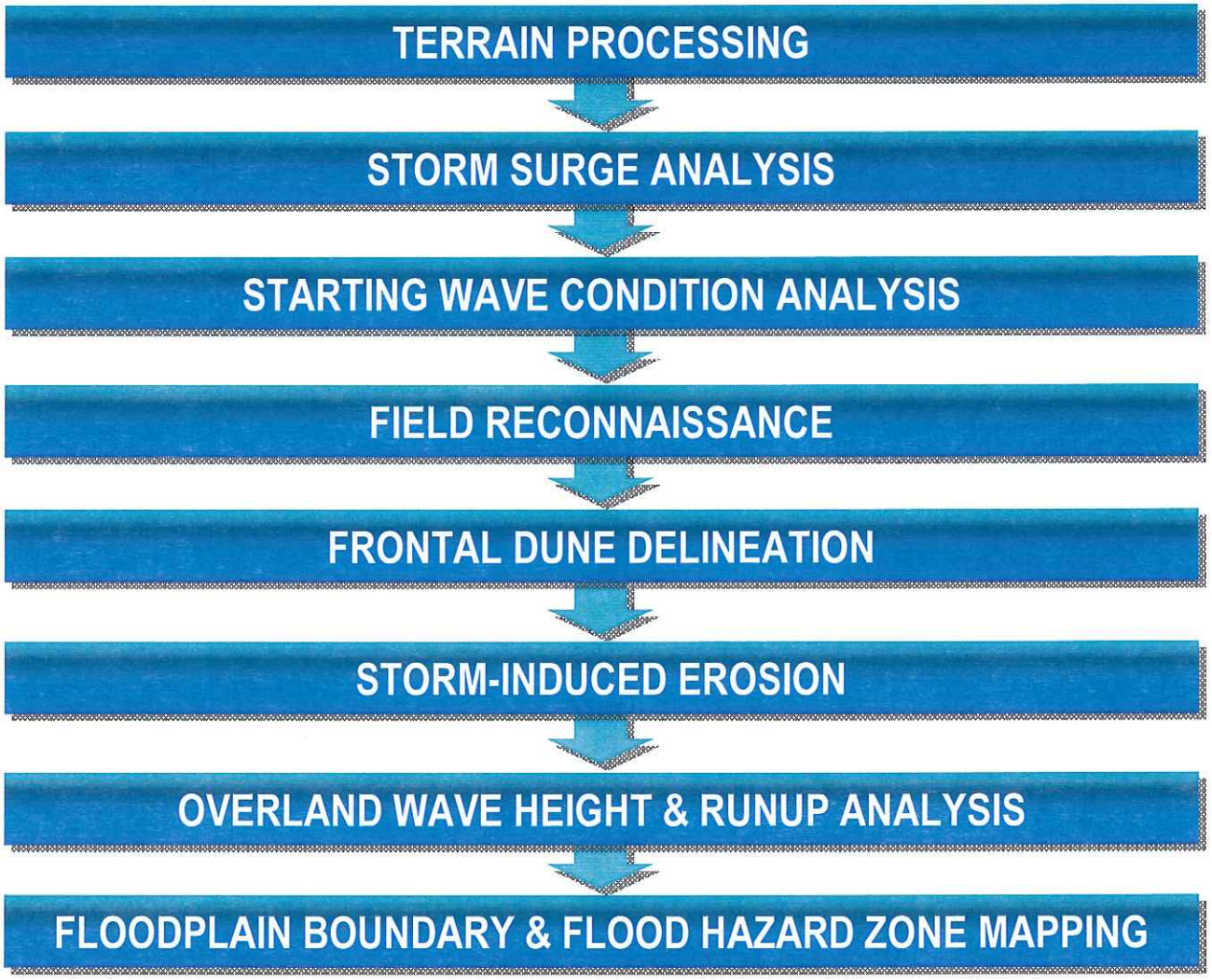




Why is a Coastal Restudy Needed?

- New Guidelines need to be implemented
  - *Atlantic Ocean and Gulf of Mexico Guidelines Update (2007)*
  - *Sheltered Water Report (2008)*
  - *PM 50 Limit of Moderate Wave Action (LiMWA) (2008)*
- To update base data such as topographic dataset and aerial imagery to high resolution products and seamless Digital Elevation Model (DEM)
- To utilize newer coastal hazard methodologies developed during the FEMA Mississippi Coastal Restudy
- To take advantage of higher performance numerical modeling
- To take advantage of improvement in GIS technologies to allow for more accurate FIRMs

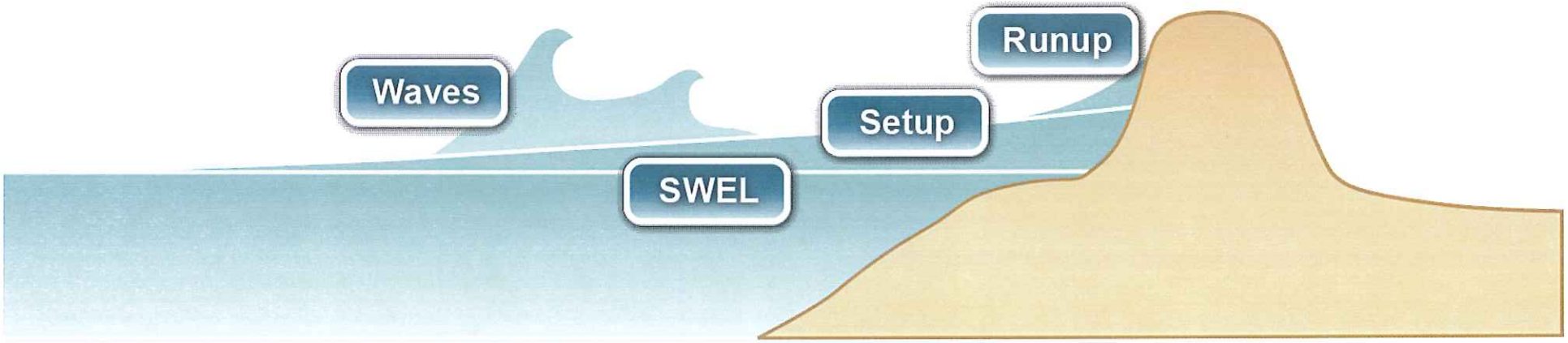
Coastal Study Process



Basic Elements of a Coastal Floodplain Study

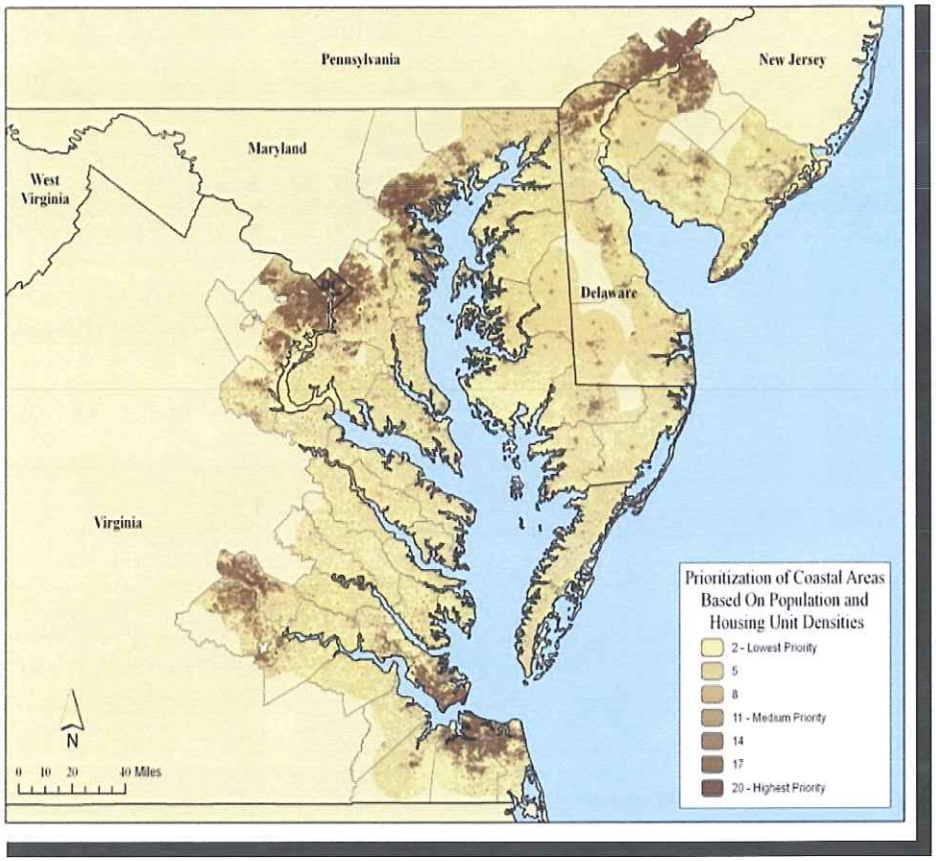
Base Flood Elevation on FIRM includes 4 components:

1. Storm surge stillwater elevation (SWEL) – (USACE)
2. Amount of wave setup – Determined from ADCIRC Model (USACE)
3. Wave height above storm surge (stillwater) elevation
4. Wave runup above storm surge elevation (where present)



Scope of Coastal Surge Analysis Study

- All of Region III coastal counties/cities (Atlantic Ocean Chesapeake Bay, Delaware Bay and their tributaries)



Ongoing FEMA Region III Storm Surge Modeling Effort

- Current stillwater elevations (SWELs) on FIRMs date back to 1973-1986 (few updates made in early-1990s) and were computed using a tidal gage analysis or the Virginia Institute of Marine Science (VIMS) model
- SWELs will be updated for 50 coastal counties covering approx. 2280 miles of shoreline
- State-of-the art modeling setup by using ADCIRC coupled with the 2D wave model SWAN
- Obtain updated 10%, 2%, 1% and 0.2% annual chance stillwater elevations, wave setup and wave conditions for nearshore open-coast and back-bay shorelines

Storm Surge Study Approach

Storm Forcing
- Extratropical Wind Fields
- Hurricane Tracks

High-Resolution Bathymetry/Topography Mesh

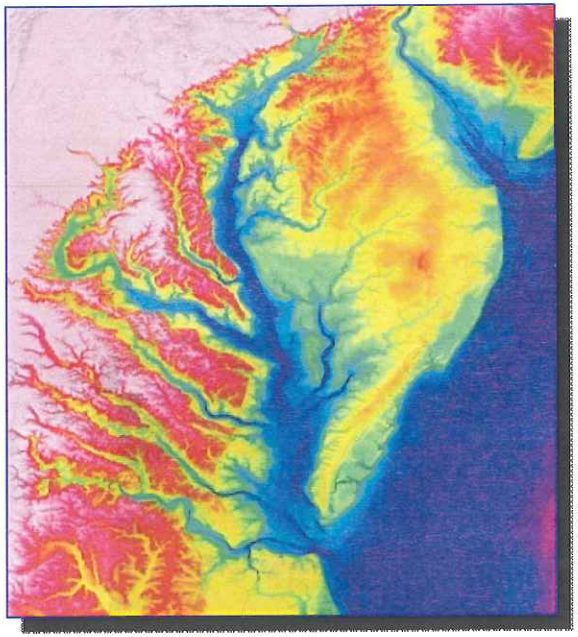
Storm Surge Modeling

Winds

Waves ⟺ Water Levels

Statistical Analysis completed in order to determine Return Period

Flood Levels
10, 50, 100 and 500 year



Components of the Storm Surge Study

- Digital Elevation Model: 10m DEM created with the most updated topo/bathy datasets
- Tropical and Extratropical winter storms modeling using PBL & HBL wind models coupled with ADCIRC
- Surge modeling performed using ADCIRC
- 2-D Wave Modeling performed using WaveWatch III and SWAN
- Tidal Calibration and Storm Hindcast
- Production Runs
- Statistical analysis of surge levels using JPM and EST techniques

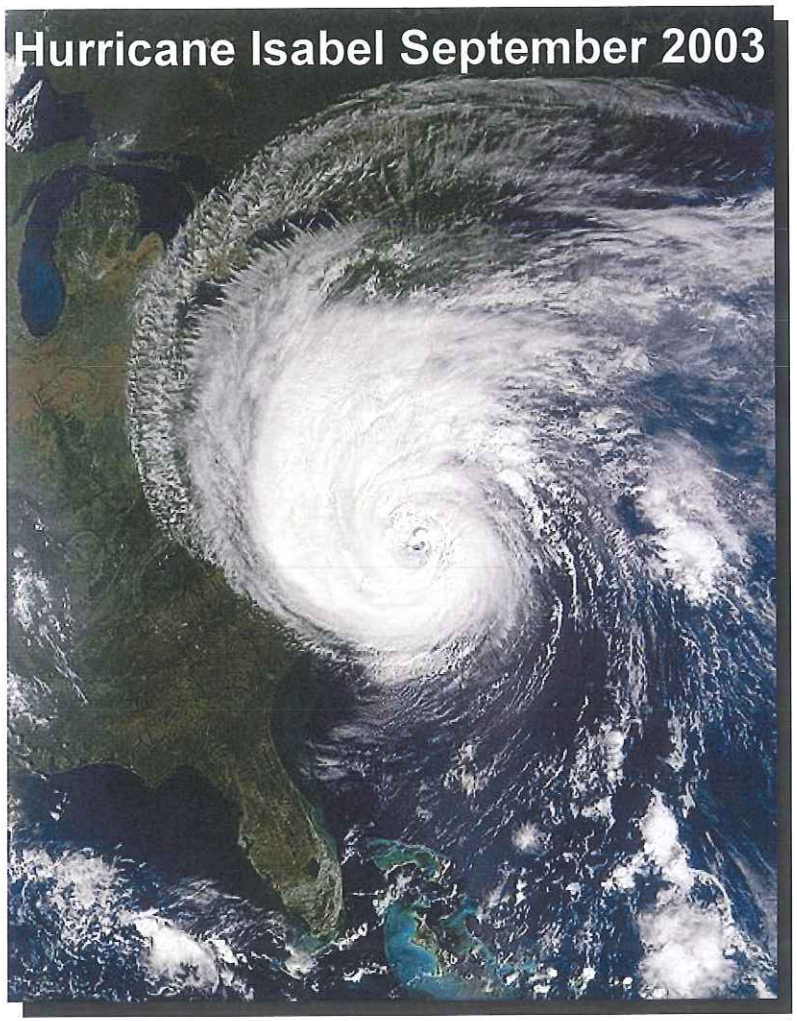
Modeling System Validation

Validation Storms

- Hurricane Isabel (SEP 03)
- Hurricane Ernesto (AUG 06)
- Extratropical Storm Ida (Nov 09)

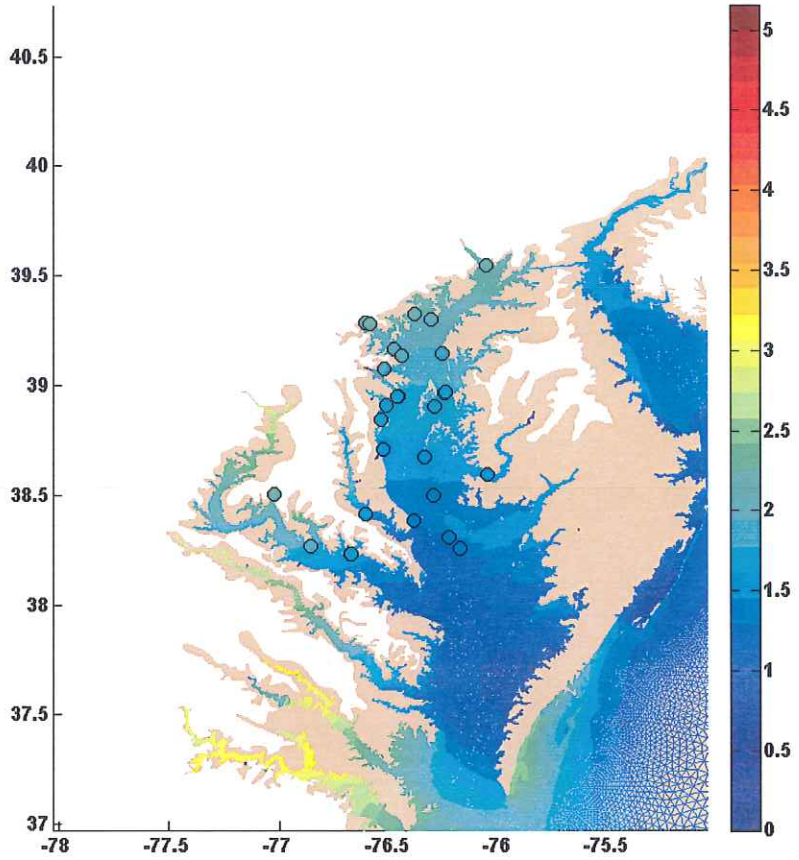
Validation Parameters

- Tides Hurricane Ernesto (AUG 06)
- Wind speed and direction
- Water levels
- High water marks

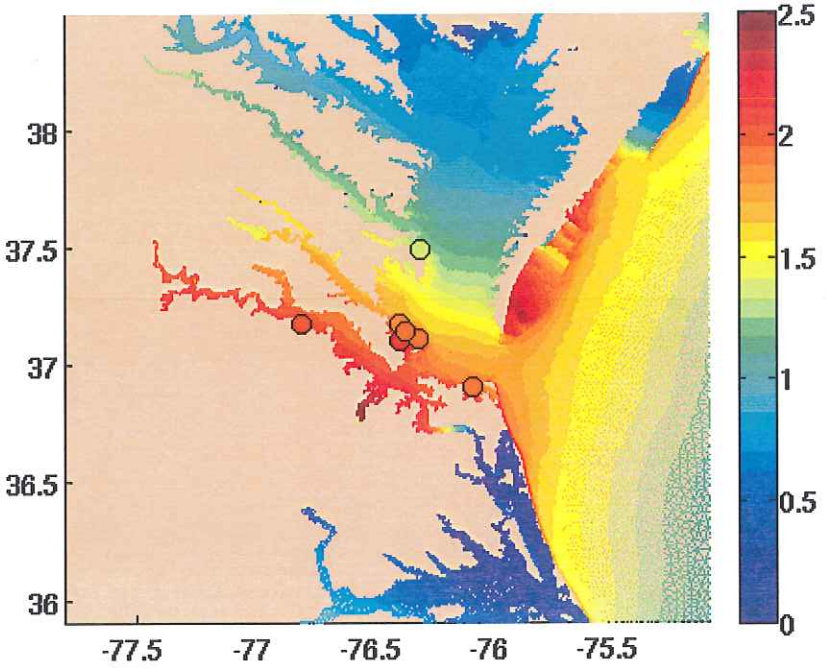


High Water Marks: Hurricanes Isabel and Ernesto

Hurricane Isabel September 2003

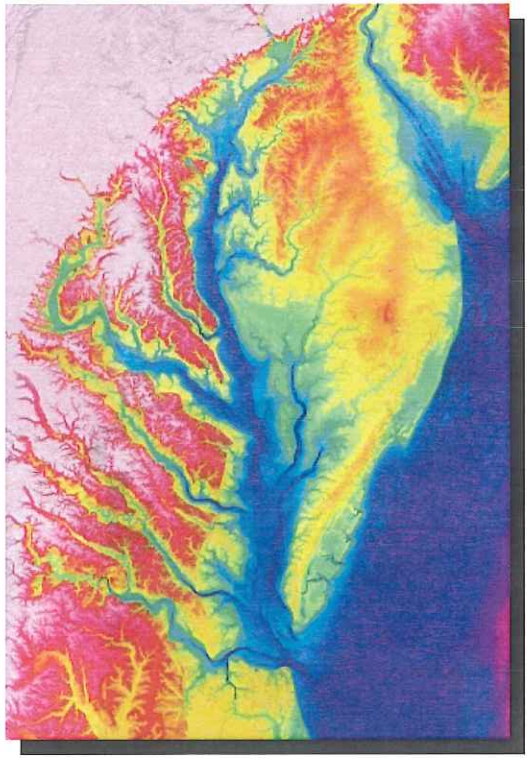


Extra-tropical Storm Ida
November 2009



Circles depict observed high water marks to same color scale as background surge predictions

Storm Surge Project



Project Status

- Submittal 1 quality control review completed
  - Study area description
  - DEM, Mesh
  - Modeling approach
  - Storm selection
- Submittal 2 - in progress
  - Modeling system validation
  - Hurricanes Ernesto and Isabel
  - Extratropical Storm Ida
- Production target April 2011– June/July 2011

Jeff Hanson
Region III Storm Surge
Project Manager
USACE-FRF

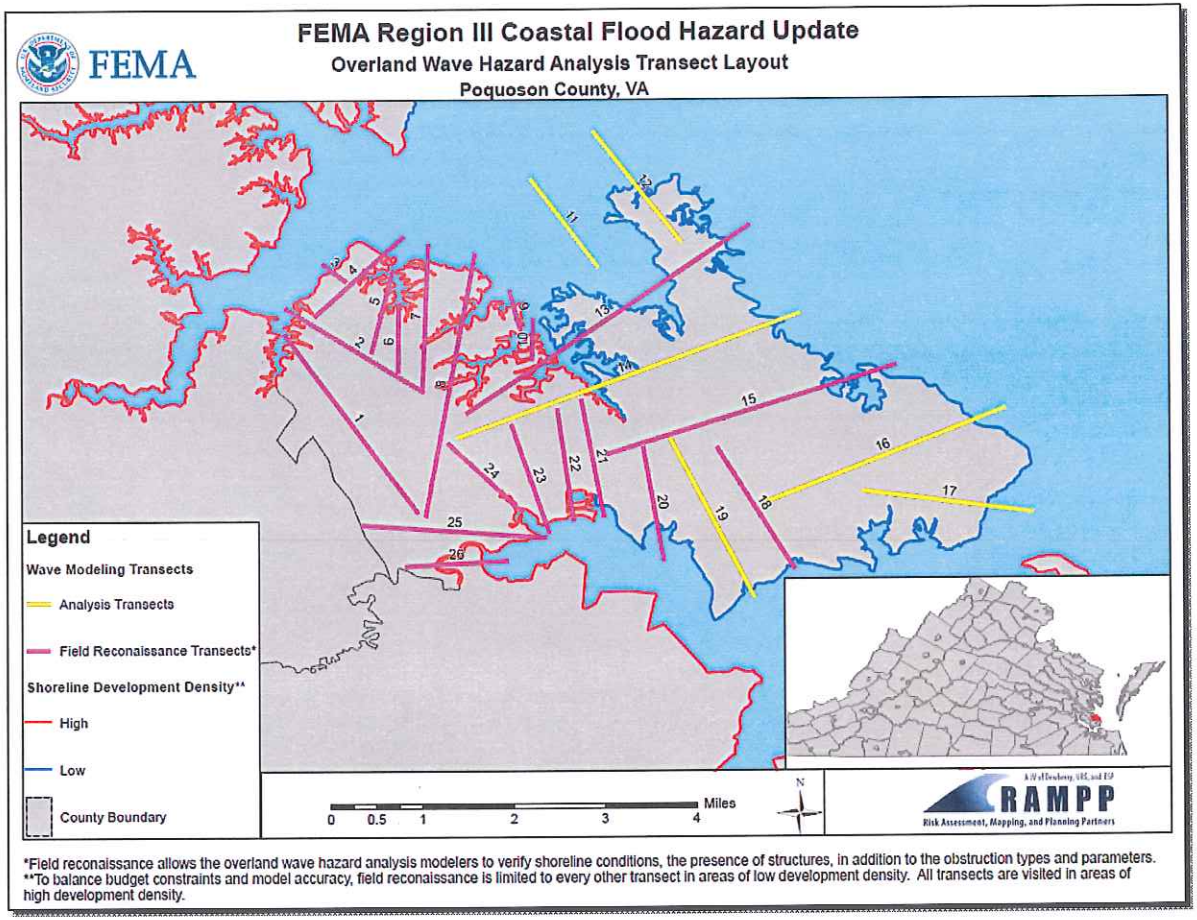
UNC Institute of Marine Sciences · Renci Renaissance Computing Institute · Elizabeth City State University ECSU · Applied Research Associates, Inc. · ARCADIS · oceanweather inc. Marine forecasts/hindcasts · Research at the air-sea interface

Coastal Hazard Analyses Components

- Transect layout
- Field Reconnaissance (land use, obstructions, shoreline conditions, structures)
- Starting wave conditions (wave height and period) from 2D wave modeling
- Wave setup from 2D wave modeling
- Bluffs: non standard erosion based on historic data
- WHAFIS modeling for overland wave height computation
- 2% Wave Runup
- All above analyses will be performed with the Coastal GeoRAMPP tool

Transect Placement

- Shoreline in the County: 24 miles
- Proposed Published Transects for Coastal Hazards Analyses and FIS: 26
- Proposed Transects surveyed during Field Reconnaissance: 20



Transect Layout
City of Poquoson

Field Reconnaissance

Virginia Beach County
Transect No. TR01, Review Location: RLT4, Team: Shultz & Tertell
2/7/2011, 12:57:17 PM

Location Description: End of Bay Point past Dolphin Run

Latitude, Longitude (decimal degrees): N36.9295, W76.1794;

Building Description: Residential area on Bay Point, Number of Rows: 6, Open Space

Vegetation Description: None

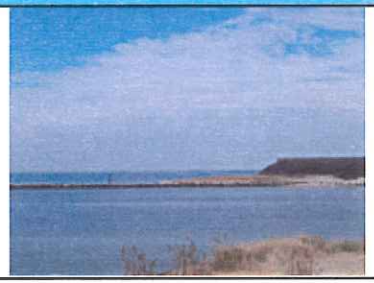
Marsh Description: None

Coast Description: sandy
Sandy shore approx. 30' wide; wide and low-lying PFD covered in grasses, which exten
Rubble-mound jetty: Rubble jetties and detached offshore breakwaters.
PFD: Approximate Height: 3ft; N36.9292, W76.1795; (see picture: 18, 20)

Fetch Description: Open Fetch

General Comments:

Photographs and Descriptions:



Description: End of
Latitude, Longitude
Direction: 123.3 de
#0016

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Description: Residential area on Bay Point
Latitude, Longitude: N36.92853, W-76.17952
Direction: 261.7 degrees
#0021

Description: End of Bay Point past Dolphin Run
Latitude, Longitude: N36.92958, W-76.17949
Direction: 12.8 degrees
#0017

Description: PFD
Latitude, Longitude: N36.92959, W-76.1795
Direction: 278.5 degrees
#0018

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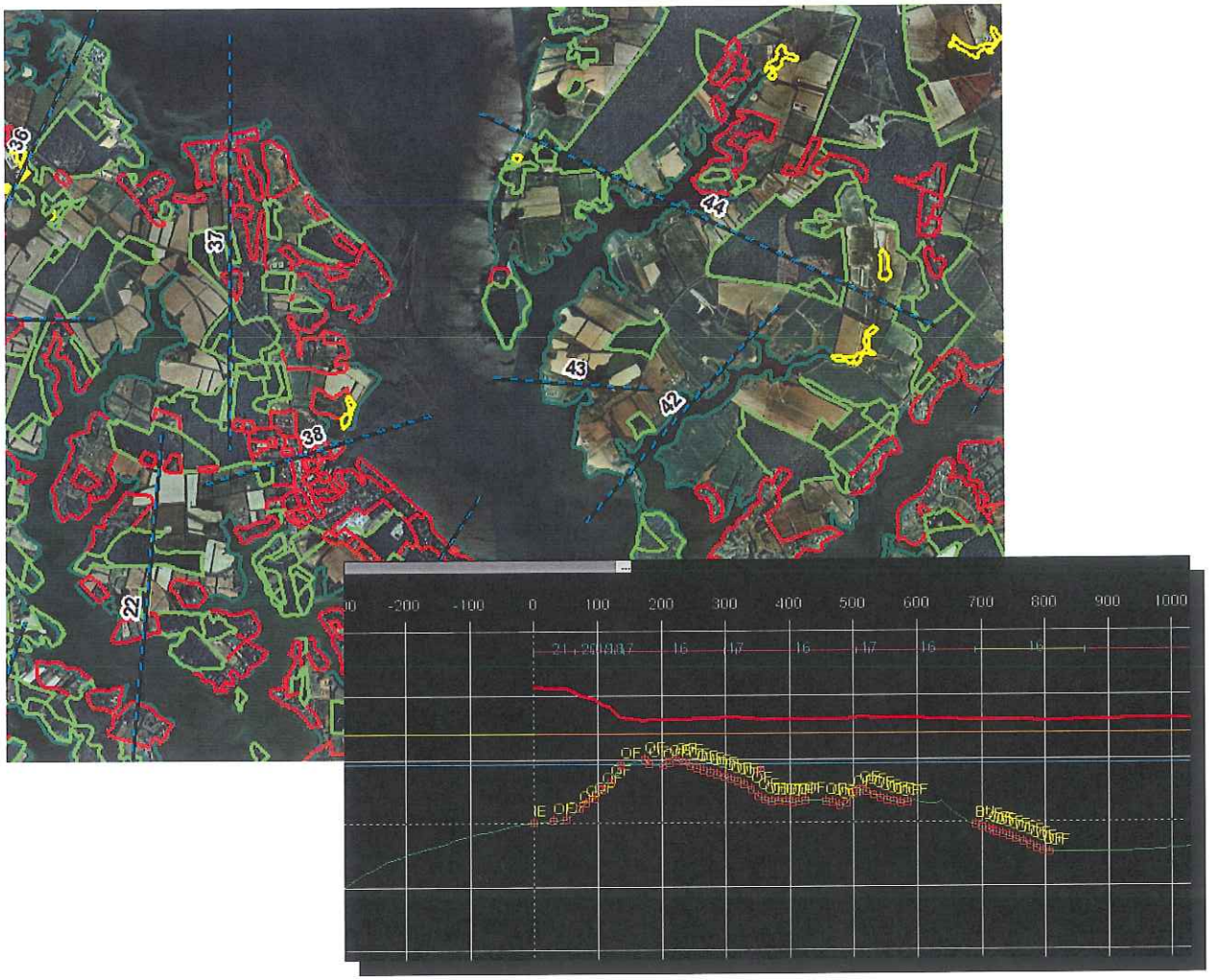
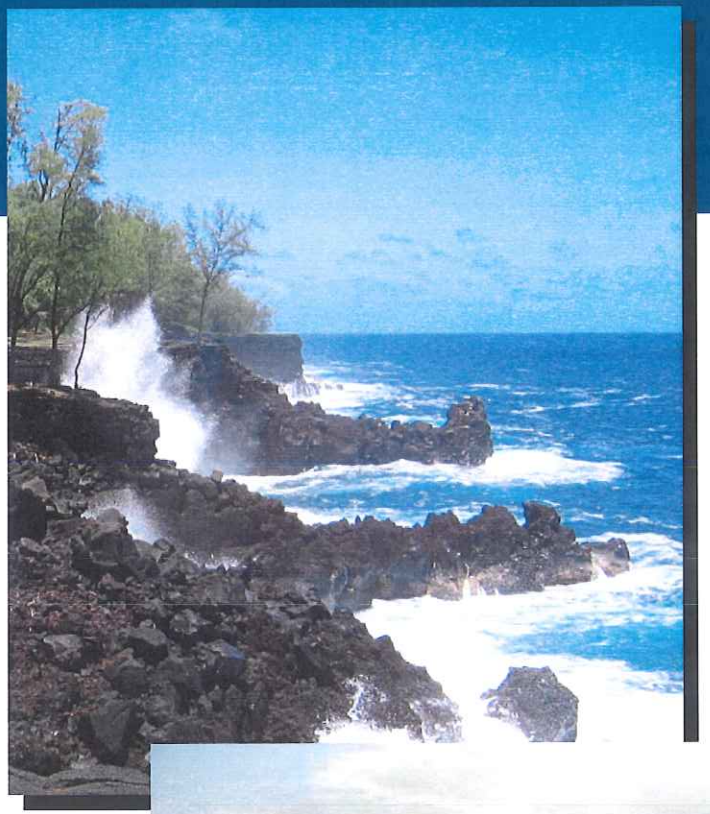
Overland Wave Hazard Modeling

- **WHAFIS 4.0**
  - Profile elevation
  - 1% SWELs
  - Starting wave conditions
  - Wave Setup
  - Obstruction cards (OF, IF, BU, VE, MG)



Wave Runup

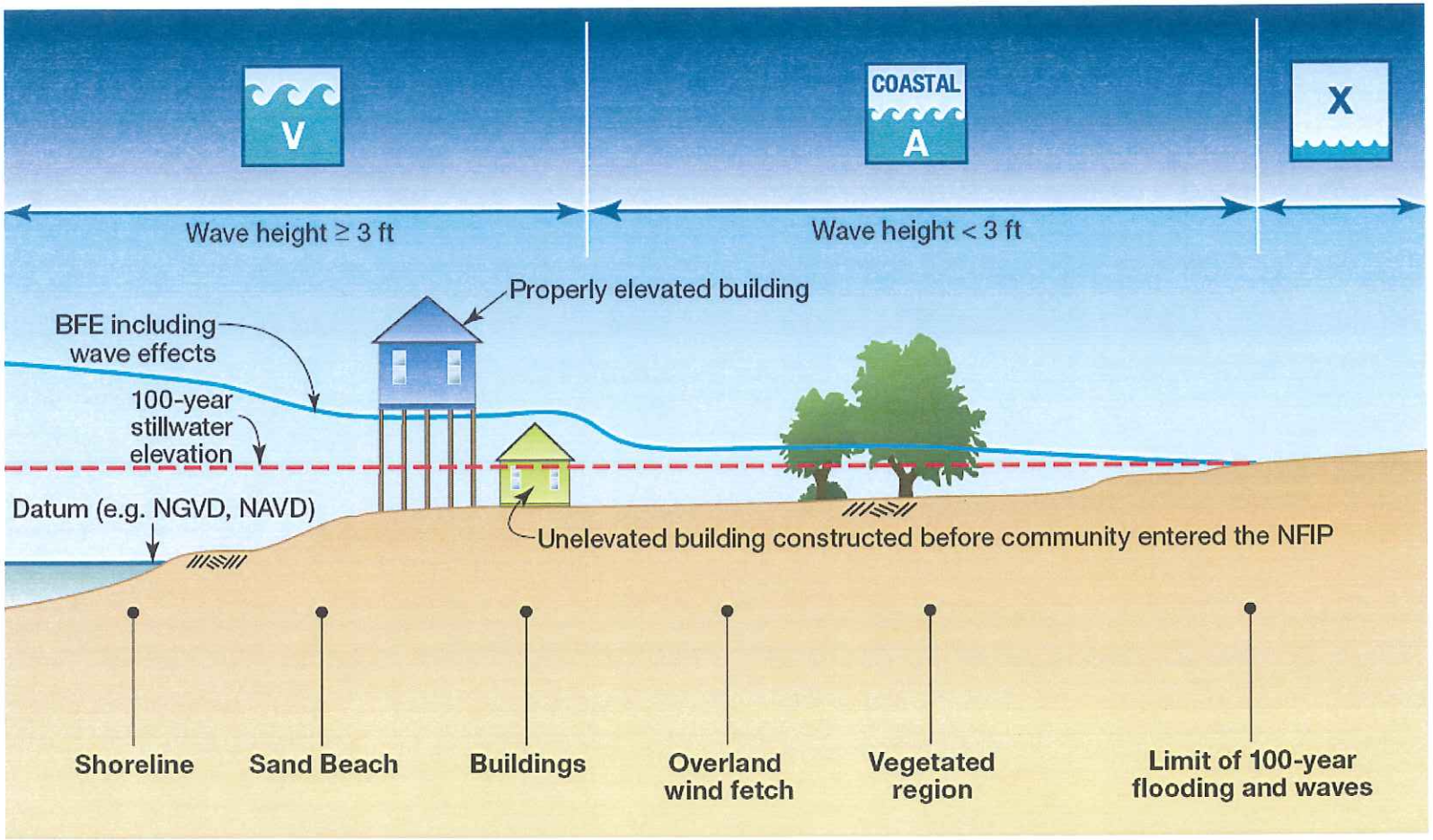
- FEMA G&S 2007 requires the use of the 2% runup vs. the mean runup computed prior to 2007
- Mild-sloping beaches, bluffs and cliffs
- Coastal Structures:
  - Will structure survive the 1% event?
  - Is structure certified?
  - Modeling of integral structure vs. fail structure to determine higher hazard
- Methods:
  - Runup 2.0, TAW, ACES, SPM



City of Poquoson Coastal Overland Wave Height Analysis Status

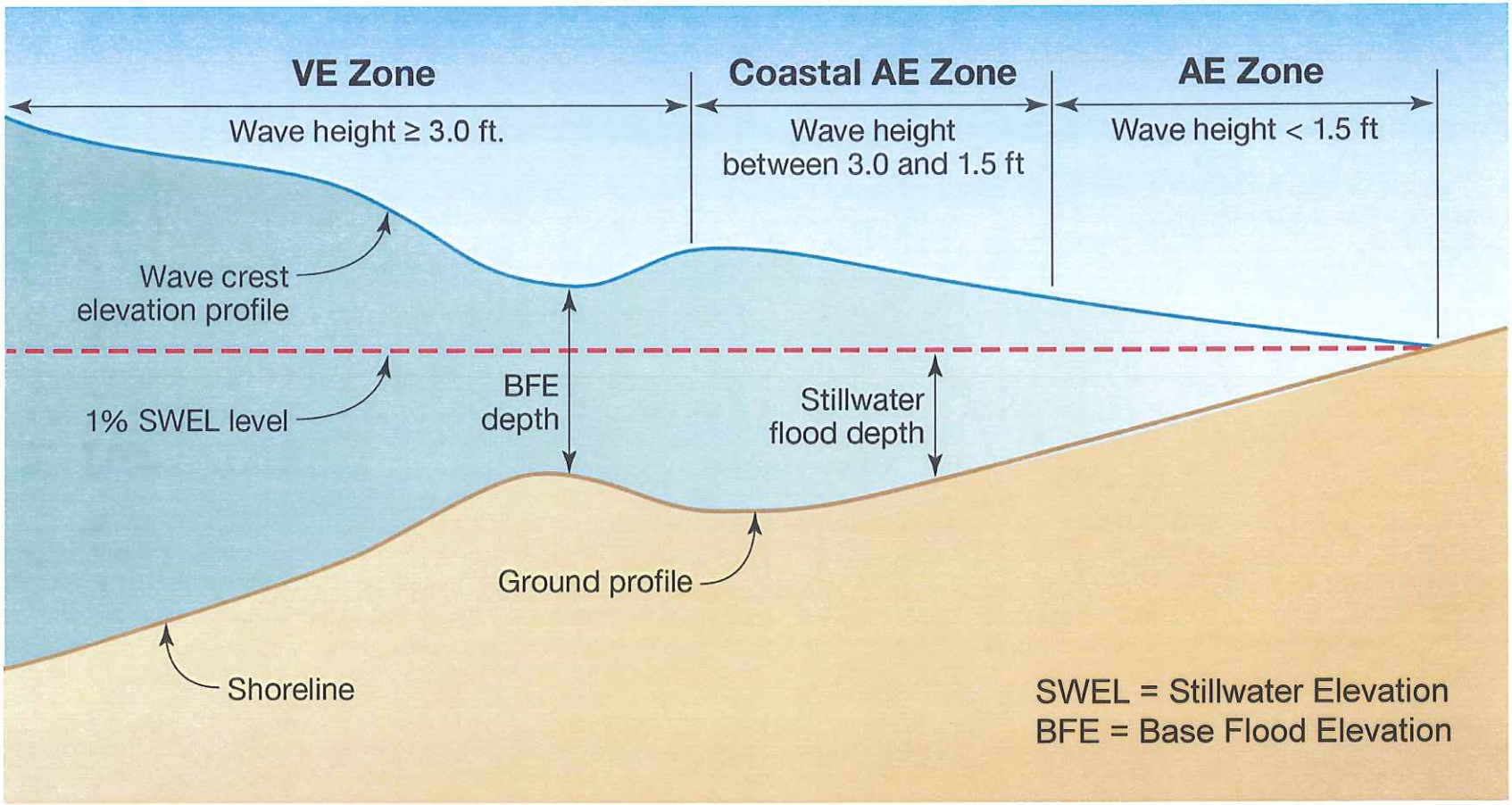
- **Modeling set-up**
  - Transect Layout completed
  - Field Reconnaissance completed
  - Obstruction carding completed
  - Topo/bathy /shoreline development completed
- **Wave height analysis (waiting on surge results)**
  - Starting wave conditions (wave height and period)
  - Wave setup – Determined from the ADCIRC model
  - Dune/Bluff erosion
  - WHAFIS modeling for overland wave height computation
  - 2% Wave Runup

Mapping


V
COASTAL
A
X
Wave height ≥ 3 ft
Wave height < 3 ft
Properly elevated building
BFE including wave effects
100-year stillwater elevation
Datum (e.g. NGVD, NAVD)
Unelevated building constructed before community entered the NFIP
Shoreline
Sand Beach
Buildings
Overland wind fetch
Vegetated region
Limit of 100-year flooding and waves

Limit of Moderate Wave Action (LiMWA)

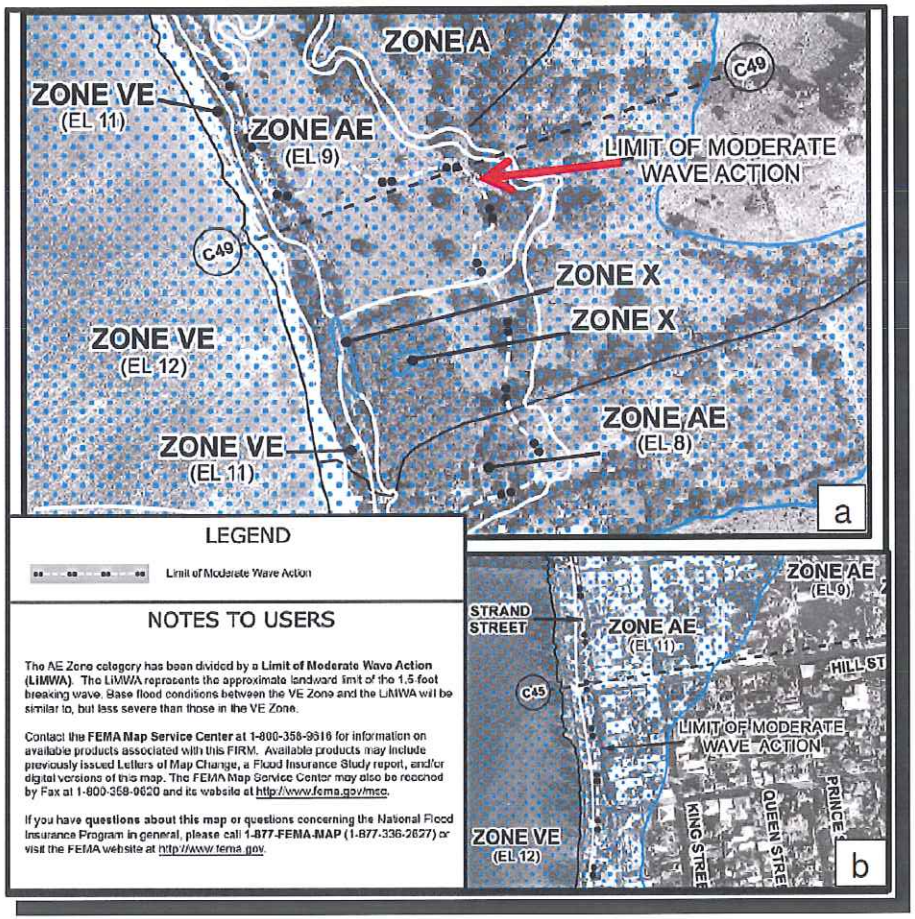
- Defined by the area subject to wave action with waves greater than 1.5 feet in height



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 then 1.5 ft.



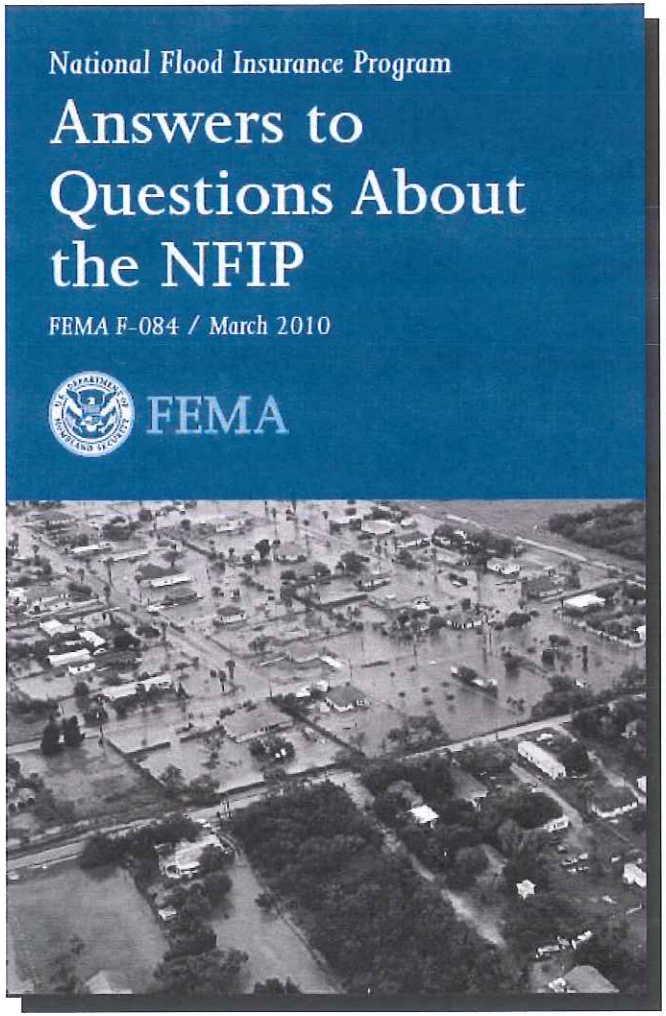
Potential Regulation Changes – Ordinance Revisions

- V Zones
- Limit of Moderate Wave Action (LiMWAs)

DFIRM Timeline City of Poquoson

- Physical Map Revision (PMR) for only those DFIRM panels affected by the coastal study
- Scheduled Preliminary Date– November 2012
- Final Community Meeting – December 2012/January 2013
- Receive and address community comments/protests (typically 30 days)
- 90 Day Appeals period for areas of revised BFEs–starts after CCO meeting
- Independent Technical Review
- Finalization of DFIRMs/FIS to address any appeals
- Letter of Final Determination (LFD) date – occurs after appeals are addressed
  - Initiates the 6-month ordinance adoption/compliance period
- Effective Date – 6 months after LFD date and typically at least 15 months after preliminary date (February 2014)

Flood Insurance



Coastal Study Outreach Efforts

- Coastal Outreach Strategy
- Website – www.r3coastal.com
- Outreach factsheets
- Outreach meetings
  - Initial outreach (scoping) meetings for each county
  - Regional technical storm surge study meetings
  - Flood study review meetings for some counties
  - Final community meetings for each county

Questions?