

# NJ Coastal Study Meeting

Community Kick-off #1



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Photo credit NOAA/NASA

# Today's Goals

1

Coastal Study  
Overview



2

Review Coastal  
Reanalysis Milestones



3

Discuss Opportunities  
for Collaboration



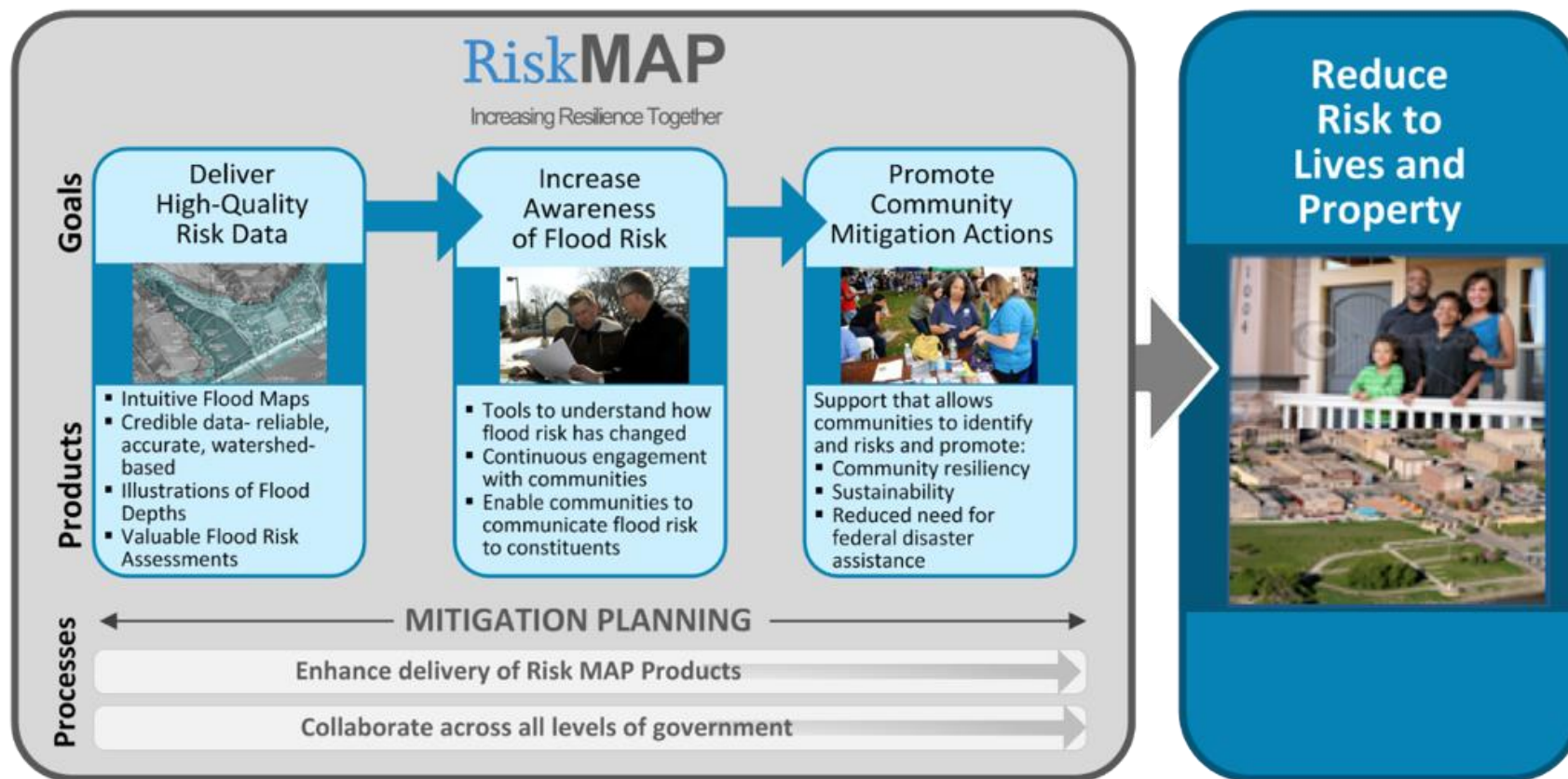
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# FEMA Mitigation Division

## Risk MAP - Mapping Assessment and Planning:

Provide updated flood hazard data to 100% of populated U.S. coasts to create stronger and safer communities



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# Flood Maps Impact Important Decisions



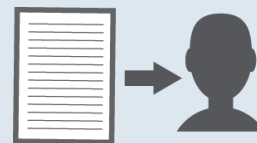
To Identify  
Hazards  
and Assess  
the  
Flood Risk



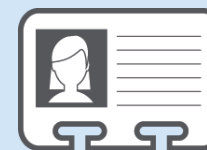
To Establish  
Rates for  
Flood  
Insurance



To Inform  
Local Land  
Use  
Planning



To Inform  
Engineers  
and  
Developers



To Equip  
Emergency  
Managers



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# National Flood Insurance Program (NFIP)

- Voluntary program based on a mutual agreement between the Federal government and the local community.
- In exchange for adopting and enforcing a Floodplain Management ordinance, Federally-backed flood insurance is made available.

## Federal

- Risk Identification and Mapping
- Building/Development Standards
- Flood Insurance

## State

- Building Codes
- Technical Assistance
- Set Enhanced Building/Development Standards

## Local

- Adoption and Enforcement of Development and Building Standards



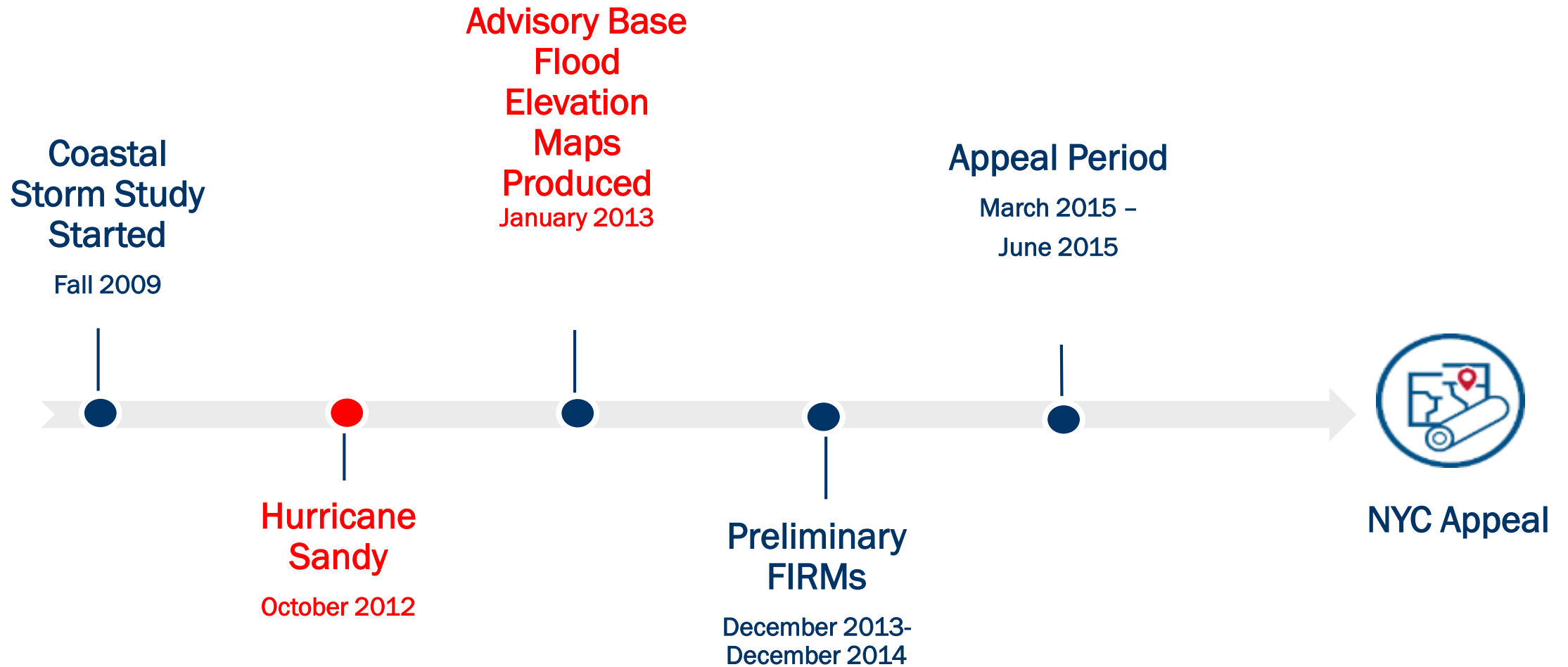
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# Coastal Study Overview



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# Coastal Study Analysis: 2009 - 2015



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# Coastal Study Analysis: 2015 - 2017

New York City challenged two aspects of FEMA's storm surge analysis (validation of extratropical storms and representation of tidal effects)

The FEMA team agreed with NYC's findings and developed an approach to address them

**FEMA initiated a series of analyses and "pressure tests" to determine next steps**

Sensitivity analyses conducted and finalized Summer 2017, results are informing reanalysis

Region II storm surge, started late 2017, and **reanalysis data** will include storms occurring post-2010 – Irene, Sandy, 2016 Nor'easter, etc.



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# Summary of Post-Appeal Sensitivity Analysis (2016-2017)

- Results from the Region II Coastal Surge Sensitivity Study and a review of the post-2009 storm history will assist in evaluation of which storms should be added to the historical tropical and extra-tropical storm databases.
- There were three specific shortcomings within the FEMA study that will be addressed in surge model restudy:



## Issue 1: Extratropical Storm Validation

- Model Error Analysis and Bias Assessment
- Assessment of the 1950 Storm Event
- Reanalysis of Historical Wind Fields

## Issue 2: Representation of Tidal Effects

- Improve analysis of non-linear tide/surge interaction,

## Issue 3: Inclusion of Post-2009 Storm Events

- Expand validation effort to include historic hurricanes to improve overall effort.

**Restudy:** Each of these technical activities further explore and expand on the IRB recommendations with the goal of clearly identifying lessons learned and developing technical recommendations that can be carried forward to the revised Region II coastal flood risk study. Revised flood maps will also be produced for the entire New Jersey coastal study area.



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# Previous Appeals

## NJ/NY Coastal Study: History of Appeal Submissions

County	Total number of appeals	Number of appeals not accepted due to insufficient Information	Number of appeals resolved
Atlantic, NJ	7	1	6
Bergen, NJ	10	8	2
Cape May, NJ	8	3	5
Essex, NJ	6	1	5
Hudson, NJ	5	0	5
Middlesex, NJ	58	56	2
Monmouth, NJ	20	10	10
New York City	27	23	4
Ocean, NJ	19	3	16
Union, NJ	7	0	7



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# Community Engagement



- **External outreach/engagement began Oct. 17, 2016**
  - Formal meeting w/City of New York to begin appeal resolution discussions
  - New Jersey and New York State government and congressional delegation



- **New Jersey Community Briefings were held between November 2016 – March 2017 in 10 counties reaching over 221 communities**



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# Map Adoption

Several communities opted to adopt their current maps

County	Communities	LFD Date	Effective Date
Cape May	Avalon, Cape May, Cape May Point, Dennis, Middle, North Wildwood, Ocean City, Sea Isle City, Stone Harbor, Upper ,West Cape May, West Wildwood, Wildwood, Wildwood Crest, and Woodbine	4/5/2017	10/5/2017
Ocean	Point Pleasant Beach	12/20/2017	6/20/2018
Monmouth	Borough of Highlands, Little Silver, Matawan, and Monmouth Beach	12/20/2017	6/20/2018
Atlantic	Absecon, Brigantine, Egg Harbor Township, City of Egg Harbor (construction only) Hamilton, Linwood, Longport, Margate, and Mullica	2/28/18	8/28/18



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# Big Picture Next Steps



Federal Sandy recovery projects will continue to be informed by preliminary FIS/FIRMs in NYC, Rockland & Westchester Counties, and coastal NJ Counties.



Flood Insurance Rate purchase requirements will continue to be based on current effective FIRMs



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# Review Coastal Reanalysis Milestones

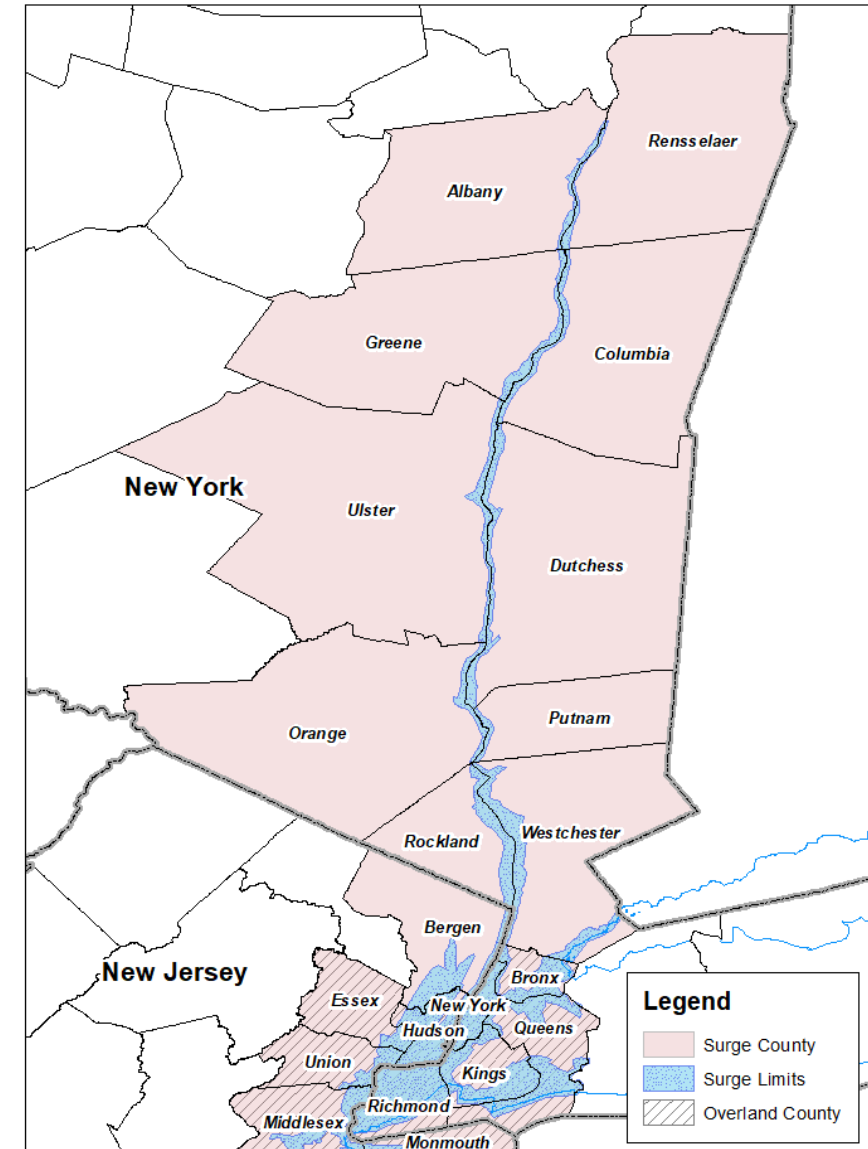
2017 - Present



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# Overview of Study Area – Surge Study

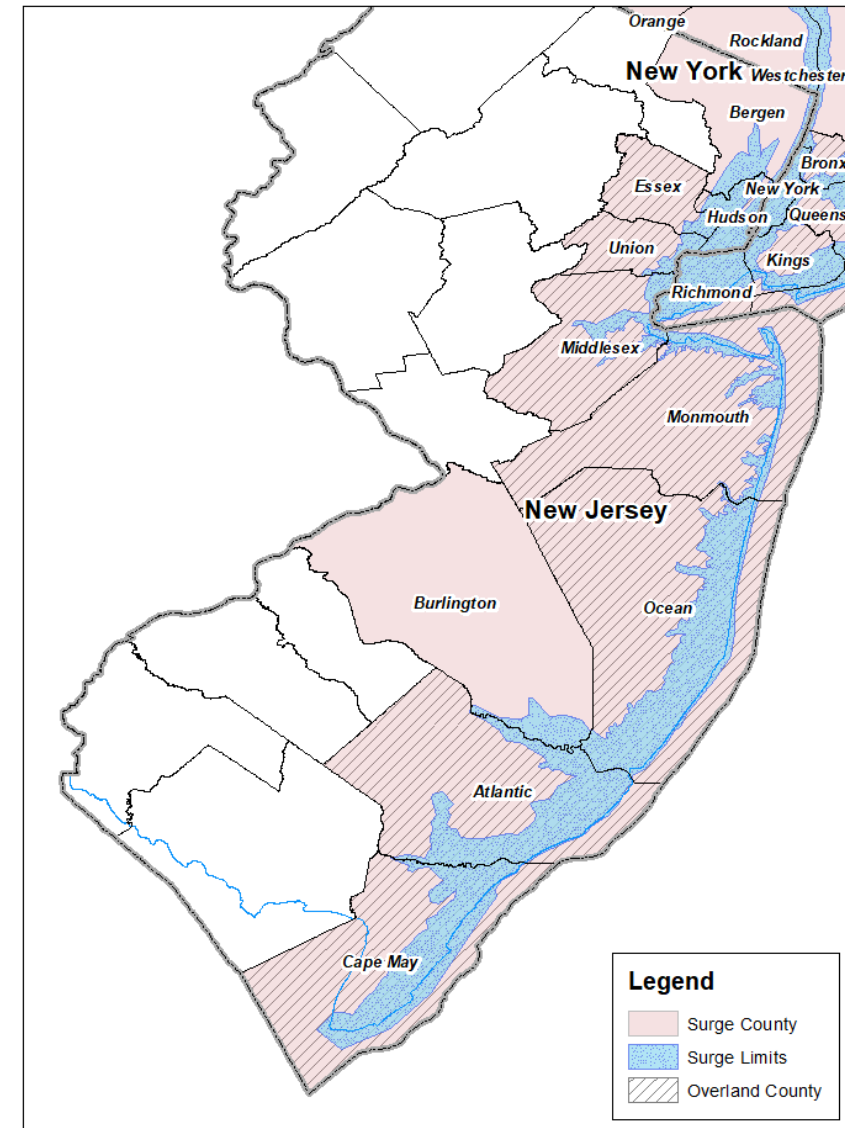
- Surge Study
  - Tidal Hudson River
  - Western Long Island Sound
  - NY & Raritan Bay
  - Atlantic Ocean
  - Does NOT include Delaware Bay



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# Overview of Study Area – Flood Hazard Mapping

- Flood Hazard Mapping Communities:
  - NYC (5 Boroughs); Atlantic, Cape May, Essex, Hudson, Middlesex, Monmouth, Ocean, and Union Counties in NJ



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# Key Milestones

- All work to be performed with tight quality control
- Revised FIRMs will be produced for NYC and NJ coastal study areas
- Engaging NYC and NYS & NJ agencies as part of Stakeholder Committee

Summer  
2017

Sensitivity  
Analysis

2017-  
2019

Full Storm  
Surge  
Reanalysis

2019-  
2020

Wave  
Hazard  
Analyses  
and  
Floodplain  
Mapping



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# Quality Assurance

- **Independent Coastal Steering Committee (CSC)**
  - Internal group of experts in storm surge modeling and FEMA coastal study process
  - Independent from study production
- **Will establish a Stakeholder Committee for external oversight**
  - State of New Jersey, State of New York, NYC, FEMA, and CSC



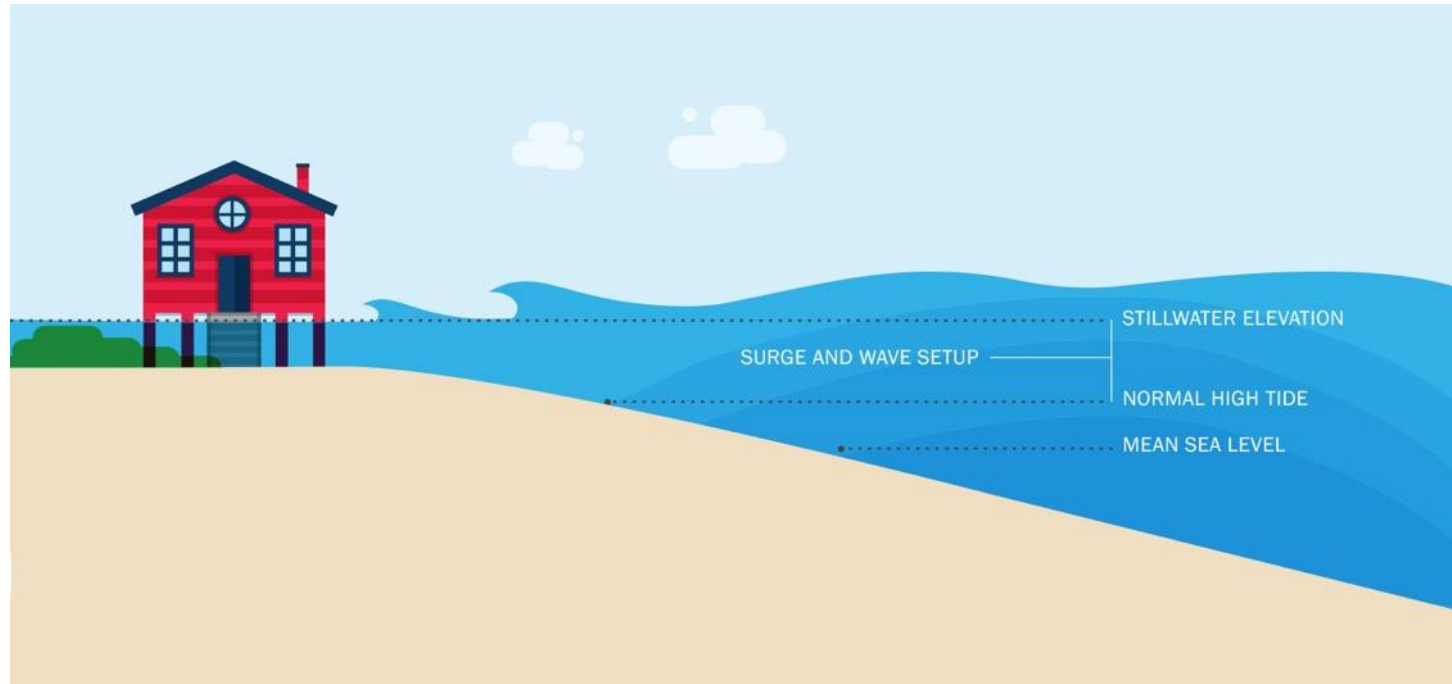
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# Coastal Study Phase 1: Storm Surge Study



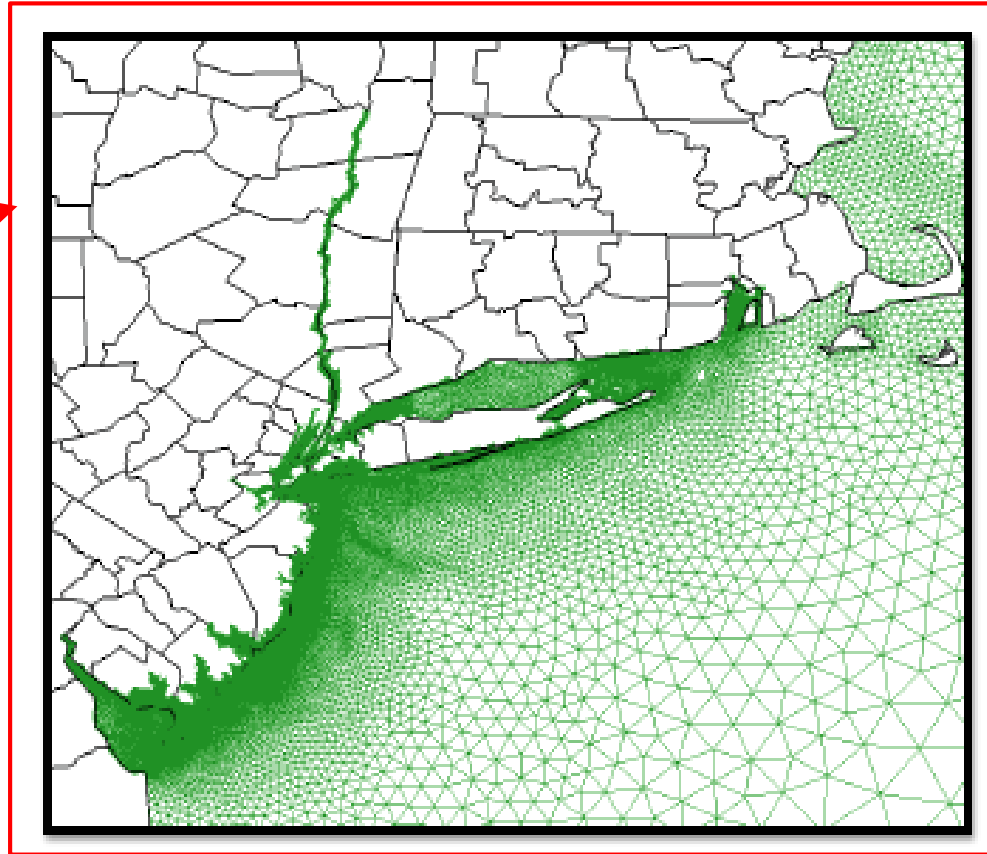
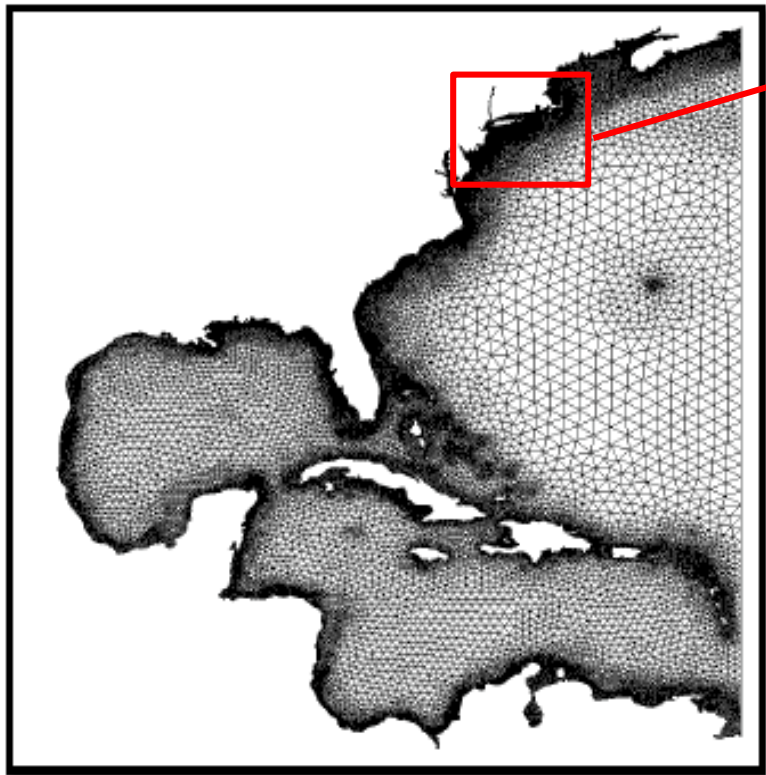
## EVALUATE WATER LEVELS AND STORM SURGE

In order to identify coastal flood hazards, FEMA analyzes sea level, tides, wave setup, and storm surge. Storm surge is the water that is pushed toward the shore by strong winds during a storm. Wave setup is the increase in water level caused by the onshore movement of water due to waves breaking.



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# NYNJ Study SWAN+ADCIRC Mesh

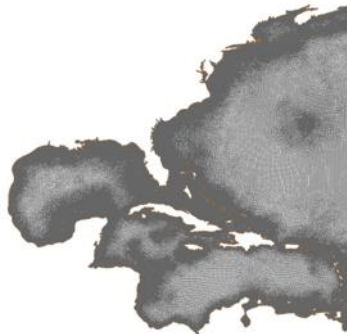
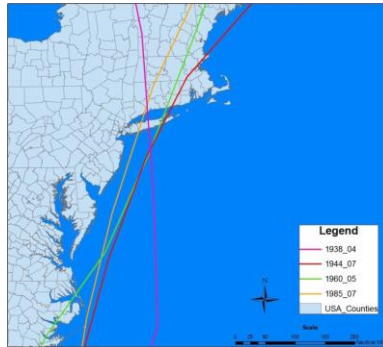


[http://www.nhc.noaa.gov/data/tcr/AL142016\\_Matthew.pdf](http://www.nhc.noaa.gov/data/tcr/AL142016_Matthew.pdf)



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# Approach - Storm Surge Stillwater Elevation (SWEL)



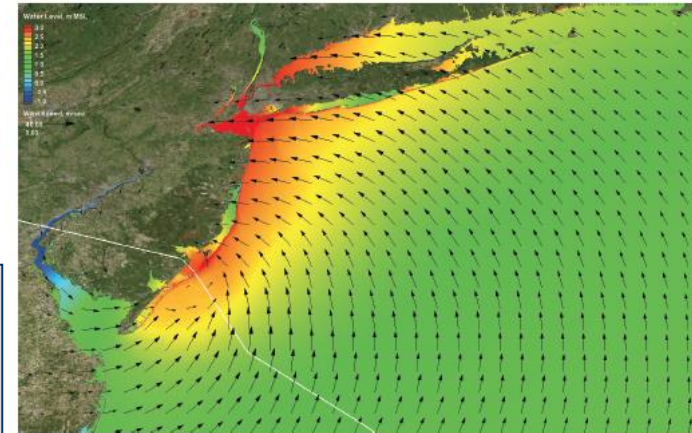
**Storm Forcing**  
Hurricane Tracks

**Storm Surge Modeling**

**Winds**

**Waves**

**Water Levels**

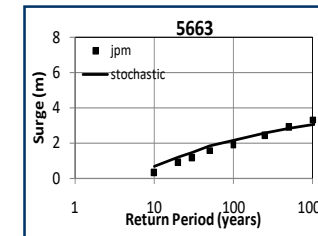


**High-Resolution  
Bathymetry / Topography  
Mesh**

**Return Period Analysis**

JPM-OS for Tropical Storms (low freq.)  
EST Analysis for Extra-Tropical Storms (high freq.)  
Analysis to Develop Combined Probability

**SWEL**

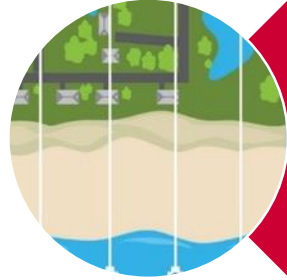


*JPM-OS: Joint Probability Method - Optimum Sampling*  
*EST: Empirical Simulation Technique*



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# Coastal Study Phase 2: Wave Hazard Analysis



Define cross-shore  
transects



Evaluate storm-induced  
erosion and shore  
protection structures

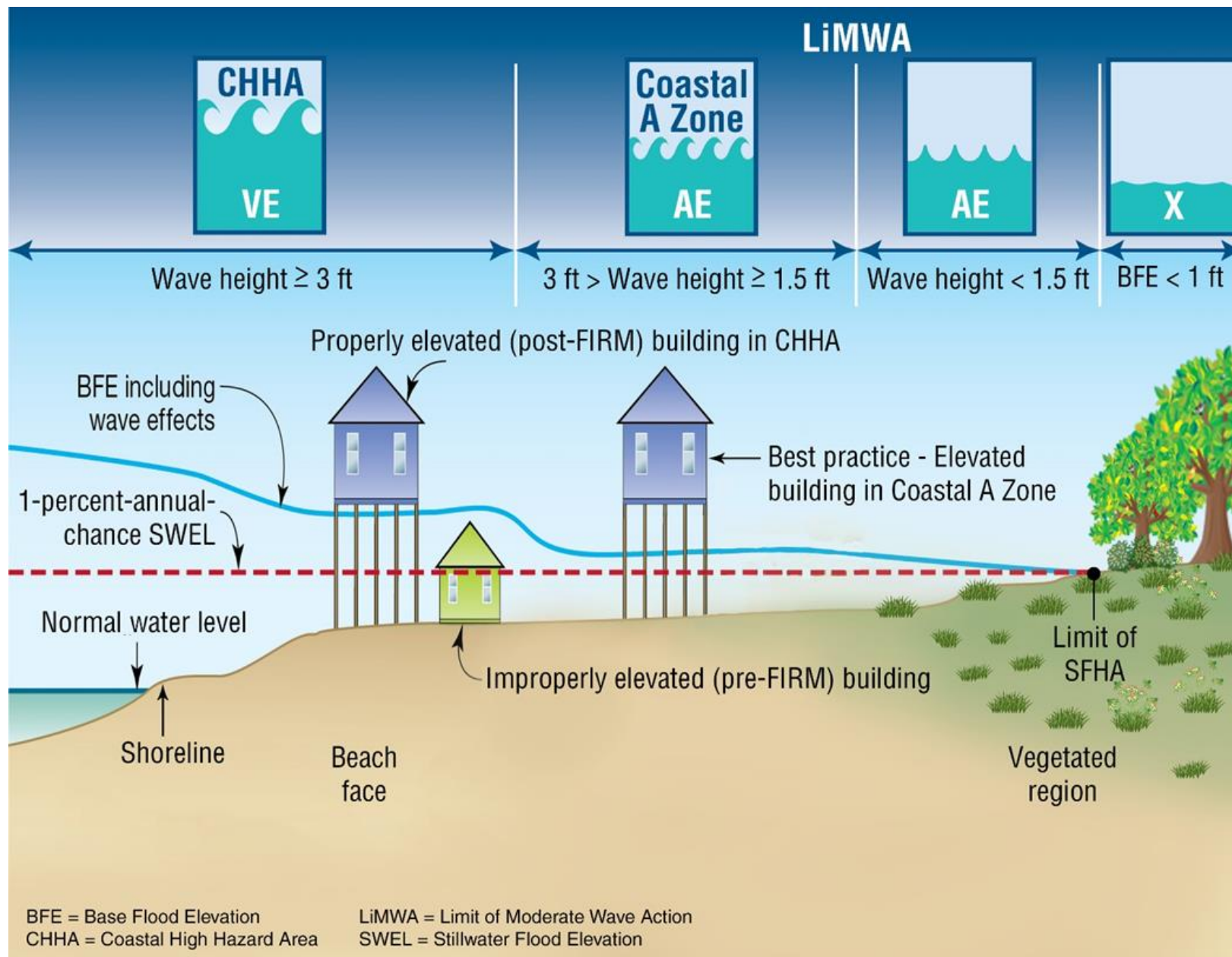


Wave hazard modeling:  
overland wave propagation  
& wave run-up/overtopping



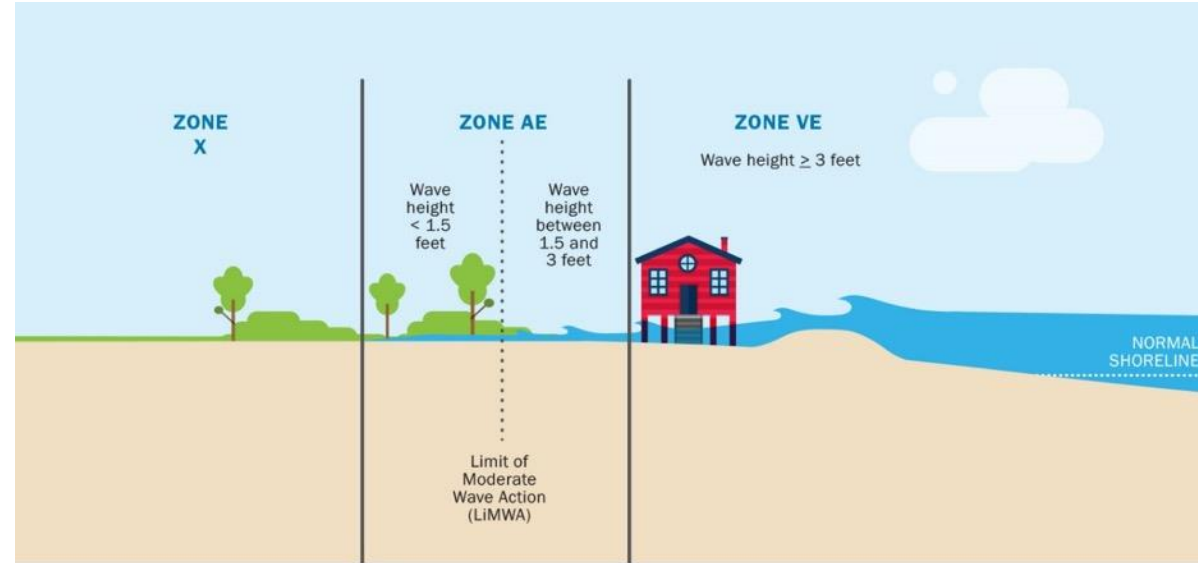
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# Coastal Study: Floodplain Mapping



## COASTAL FLOOD HAZARD MAPPING

Results of the coastal flood hazard assessment are used to create flood maps. The maps include flood zone designations that indicate areas at high-risk for flooding, e.g., Zone VE and Zone AE. Zone VE indicates a coastal high hazard area where wave action and/or high-velocity water can cause structural damage during severe storms. Zone VE is also assigned to areas identified as the Primary Frontal Dune. Zone AE is mapped for inundated areas with less hazardous wave action. Each zone has a base flood elevation (BFE), which is the elevation to which floodwater is anticipated to rise during the 1-percent-annual-chance flood. The Limit of Moderate Wave Action (LiMWA) may also be mapped to indicate the inland limit of waves 1.5 feet or greater for floodplain management purposes.



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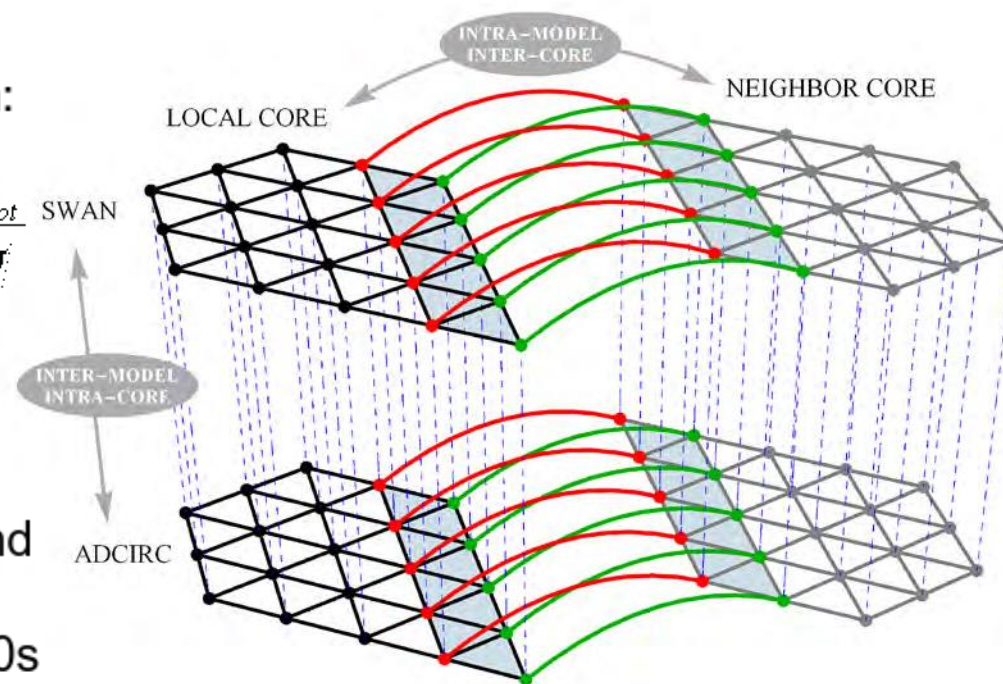
# Detailed Study Process

## 'Tight' Coupling of SWAN + ADCIRC

Solves the action balance equation:

$$\frac{\partial N}{\partial t} + \nabla_{\vec{x}} \cdot \left[ \left( \vec{c}_g + \vec{U} \right) N \right] + \frac{\partial c_\theta N}{\partial \theta} + \frac{\partial c_\sigma N}{\partial \sigma} = \frac{S_{tot}}{\sigma} \quad \text{SWAN}$$

- Models use same unstructured mesh; Information passed dynamically
- SWAN is as accurate as WAM and STWAVE
- Coupled model is efficient to 1000s of computational cores



Communication is optimized for high-performance computing:



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# Discuss Opportunities for Collaboration



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# MONMOUTH COUNTY, NJ

APRIL 2018

## KNOW YOUR RISK

FEMA's Risk Mapping, Assessment, and Planning (Risk MAP) program helps strengthen communities to take actions to reduce their hazard risk, enhances local planning, improves outreach through risk communication, and increases local resilience to natural hazards. Included below are key community highlights.



630,380

POPULATION BASED  
ON 2010 CENSUS



\$883,024,668

TOTAL CLAIMS PAID SINCE 1978



138.4

COASTAL MILES STUDIED \*



NFIP PARTICIPANT



20

NUMBER OF APPEALS RESOLVED  
OR NOT ACCEPTED DUE TO  
INSUFFICIENT INFORMATION



19,523

NUMBER OF INSURANCE  
CLAIMS RECORDED

17,900

NUMBER OF FLOOD INSURANCE  
POLICIES IN FORCE

HAZARD MITIGATION  
PLAN EXPIRATION DATE

4/24/2020



5,906,182,500

FLOOD INSURANCE COVERAGE



### Proposed Mitigation Actions:

1. Develop a countywide gauging and warning system for flash and riverine flooding.
2. Develop specific mitigation solutions for flood prone roadways and intersections in conjunction with State Department of Transportation. Develop a work plan for when sites will be surveyed and what role the local government can play in selection and implementation of mitigation activities (e.g., any monetary or contextual support through the local capital improvement plan).

## KEEPING MONMOUTH SAFE: Your Risk MAP Timeline

YOU ARE HERE



Reanalysis  
Kick-off Meeting  
April 2018

Study Update Meetings  
2018-2019

Flood Risk Review  
Meeting  
2020

Preliminary Maps  
2021

Consultation Coordination Officer  
Meeting,  
Open House, Appeal Period  
2021

Letter of Final  
Determination and  
Effective FIRMs  
2022

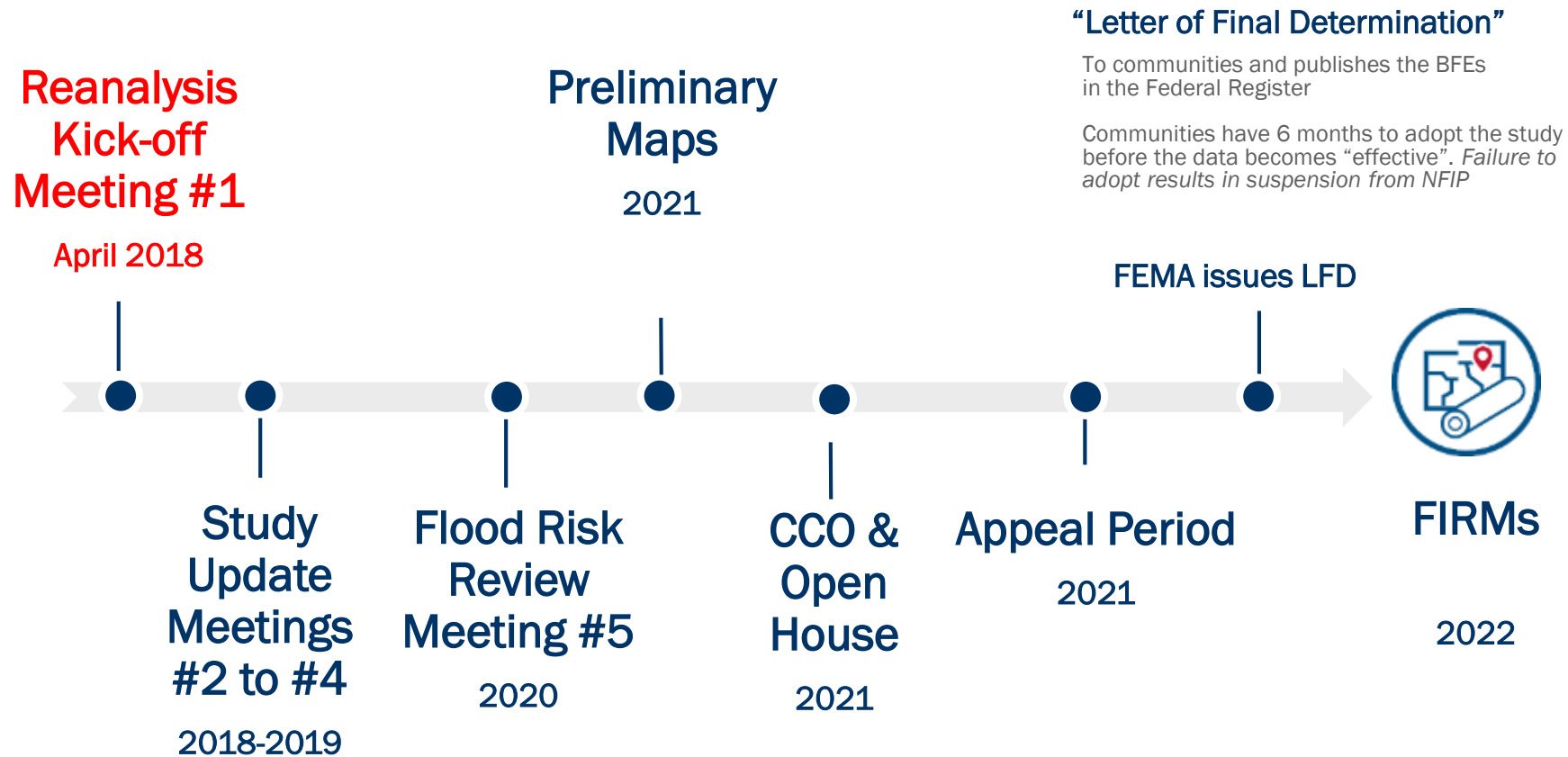
\*Numbers and dates are subject to change



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# Reanalysis Outreach Timeline: 2018 - 2022



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# Local Knowledge & Data Availability

## Coastal Data Currently Being Reviewed

- FEMA Pre and Post-Appeal Data
- FEMA Hazard Mitigation Grant Program Projects
- USACE NACCS
- USACE Beach Nourishment
- USACE Enterprise Coastal Inventory Database
- USACE Coastal Systems Portfolio Initiative (CSPI)
- ASPBA/WCU Beach Nourishment Database
- NJDEP Shoreline Features
- NJDEP Coastal Engineering Projects
- NYC Coastal Protection Project
- NYC Waterfront Facilities Maintenance Management System



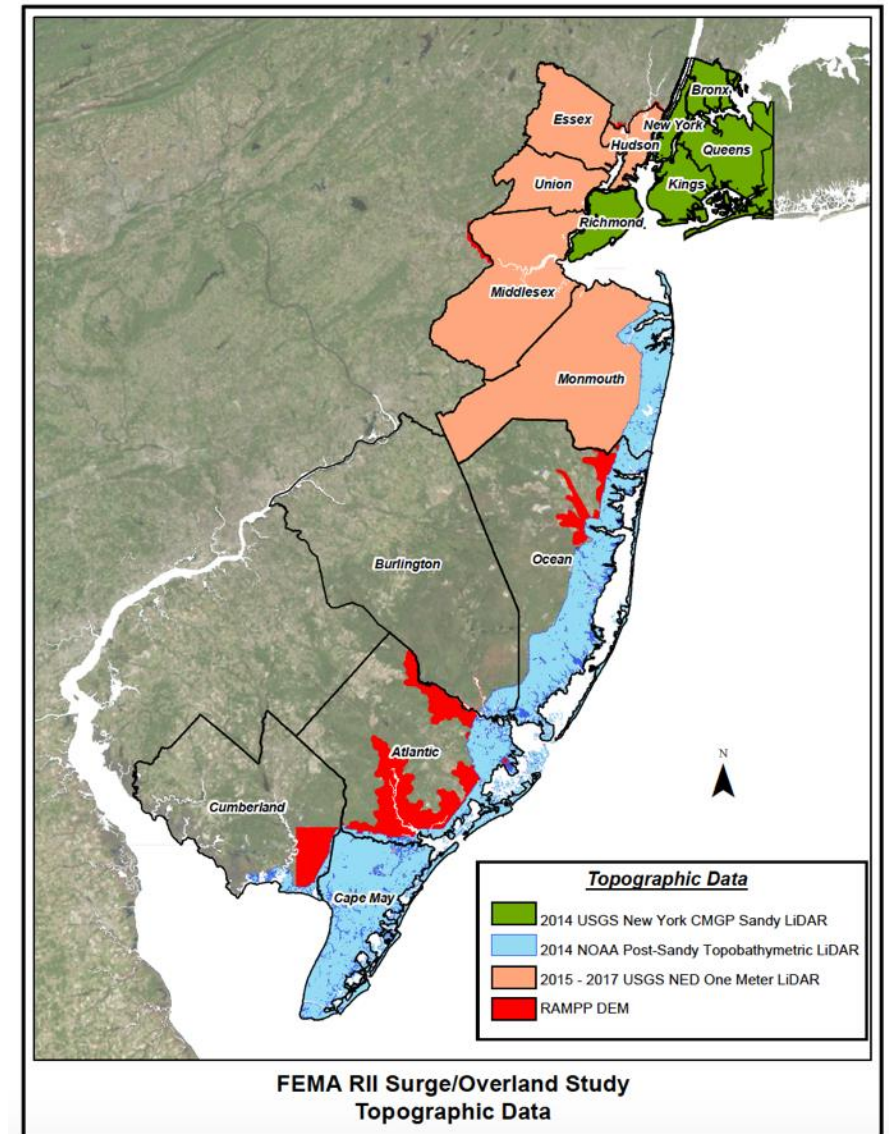
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# Local Knowledge & Data Availability

## Topo/Bathy Data Currently Being Reviewed

- 2014 USGS New York CMGP Sandy LiDAR\*
- 2014 NOAA Post-Sandy Topobathymetric LiDAR\*
- 2015-2017 USGS NED One Meter LiDAR\*
- Stockton University Beach Profiles
- NOS Surveys
- USACE Hydrographic Surveys
- ENC (Electronic Nautical Chart Data)

*\*Topographic data currently expected to be utilized for the storm surge modeling*



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# Local Knowledge & Data Availability

## Coastal Structures

- Seawalls, revetments, beach nourishment, protection structures
- Specifications or as-built drawings
- Historical flood performance
- Repairs, maintenance, or reconstruction



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# Local Knowledge & Data Availability

## Current Flood Studies

- Surge field visit May 2018 and wave height field visit summer/fall 2018

## Historic Flood Hazard Information

- Erosion hazard data
- Areas subject to wave hazard and overtopping
- Information on existing or anticipated development or mitigation
- Specifications or as-built drawings
- Historical flood performance
- Repairs, maintenance, or reconstruction

## Stakeholder Ideas



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# Development and Mitigation Group Discussion



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# Next Steps for the Community

- Recommend other community staff
- Suggest additional stakeholders
- Notify FEMA of any contact information changes



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# Contacts

	Title	Employee	Phone Number
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Project Mgt.	Project Manager, Floodplain Analysis and Mapping - Compass	Jeff Smith, P.E., PMP, CFM <a href="mailto:jeff.r.smith@aeacom.com">jeff.r.smith@aeacom.com</a>	(215) 789-2166
		Elena Drei-Horgan, PhD, CFM <a href="mailto:elena.drei-horgan@aeacom.com">elena.drei-horgan@aeacom.com</a>	(703) 682-1634
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# Questions & Discussion

*Challenges, Innovation, The way forward*