Long Island Regional Planning Council

Wednesday, November 16th, 2022

10am – 12 pm

"Protecting Long Island from Future Sandy Flood Events"
South Shore Sea Gate Study

Stony Brook University

Malcolm Bowman, Ph. D., P.E.
Professor Of Oceanography and Distinguished Service Professor
School of Marine and Atmospheric Sciences
Stony Brook University

ACKNOWLEDGEMENTS

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- Hamish Bowman, University of Otago, New Zealand.
- Dr. Keith J. Roberts, Stonybrook University School of Marine and Atmospheric Science, Visiting Scholar.

SOUTH SHORE SEA GATE STUDY

- School of Marine and Atmospheric Sciences (SoMAS) is conducting a study funded by the NYS DEC
- Assess the feasibility of "sea gates" (operable storm surge barriers) built across the inlets of the South Shore of Long Island.

LOCATION MAP

- Great South Bay stretches from Atlantic Beach in the west to Mastic Beach in the east.
- 45 miles in length.
- Average depth 4 to 20 feet.
- Local winds set up significant surges within the Bay, especially in the very shallow western reaches.

Map Credit: Climate Change

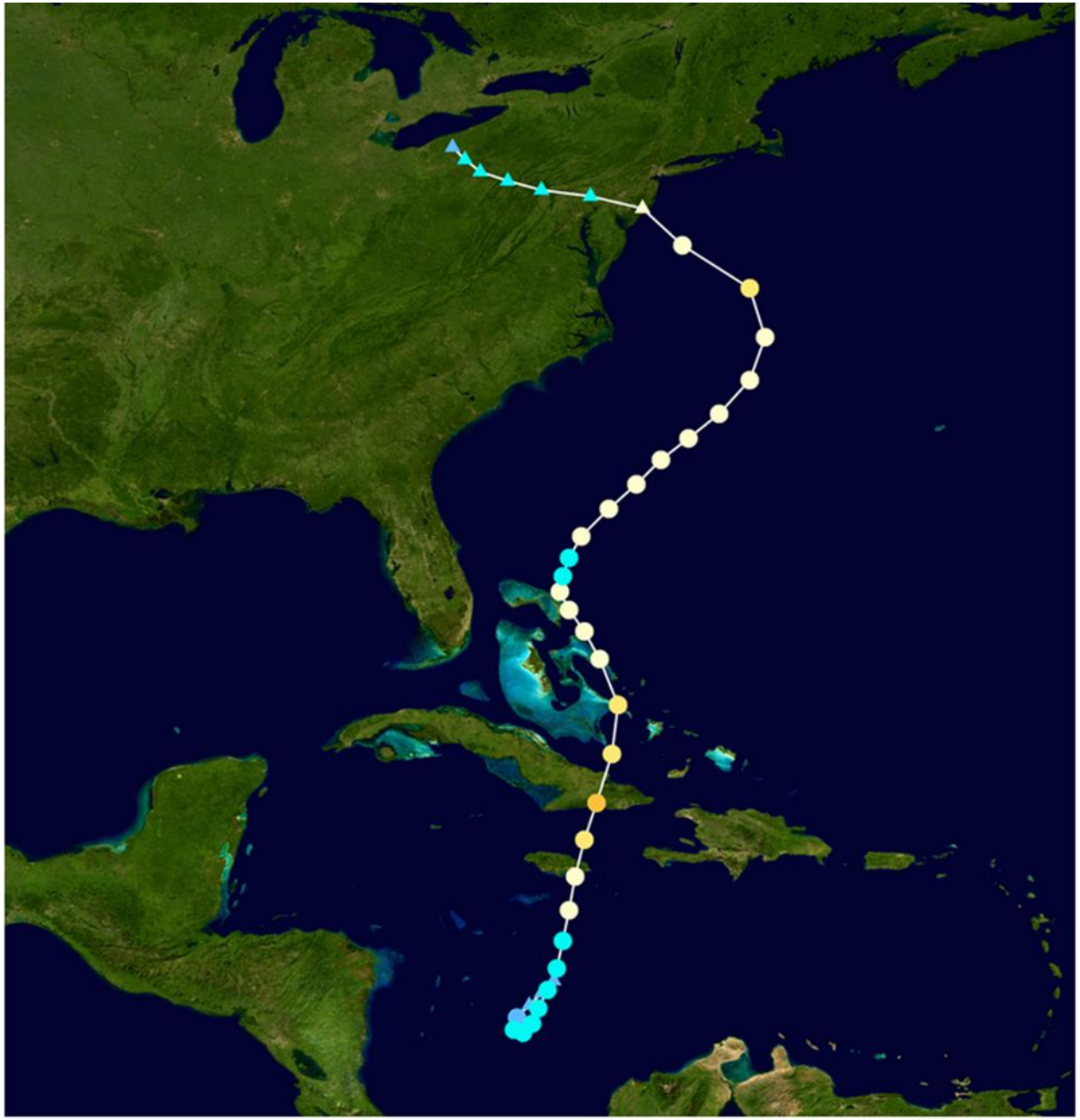
MAJOR LONG ISLAND STORM EVENTS

- 1991 – Nor'easter ("The Perfect Storm," a.k.a., "The No-Name Storm)
- 1992 – Nor'easter (Winter-Record Tides and Snowfall)
- 1993 – "Storm of the Century"
- 2011 – Hurricane Irene
- 2012 – Superstorm Sandy

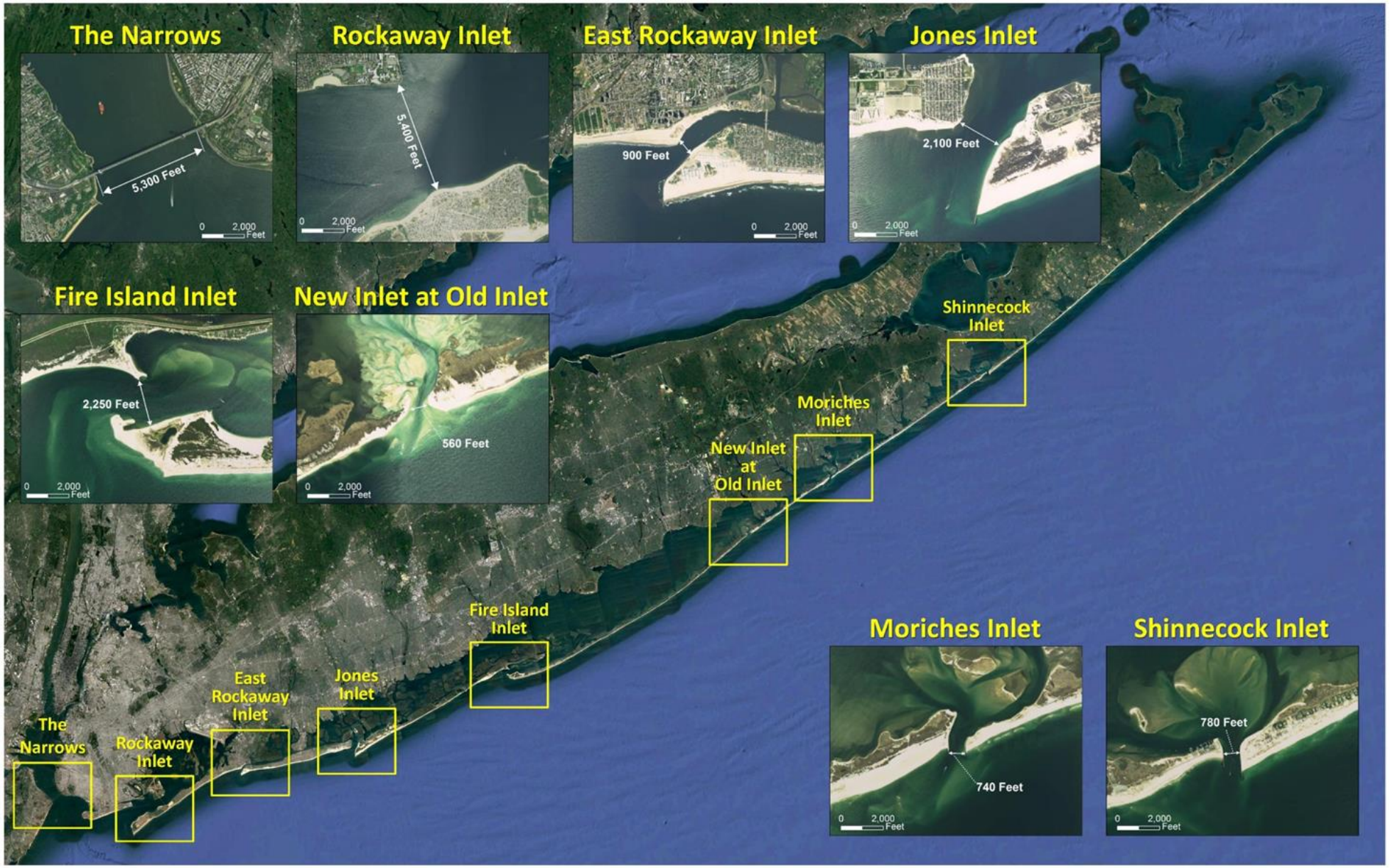
SUPERSTORM SANDY IMPACT ON LONG ISLAND

- Multi-Billion Dollar Direct and Indirect Impact on Island's Economy
- Thousands of Homeowners and Businesses Displaced
- Delayed and Insufficient Funding Resulted in a Slow Recovery and Piecemeal Approach to Resiliency/Protection Planning
- Damage Caused by Flooding Due to "Storm Surge"
- Sandy Not a "Worst Case Scenario" Non-Rain Event, Non-Hurricane Strength Winds, Initial Landfall in New Jersey, not Long Island!

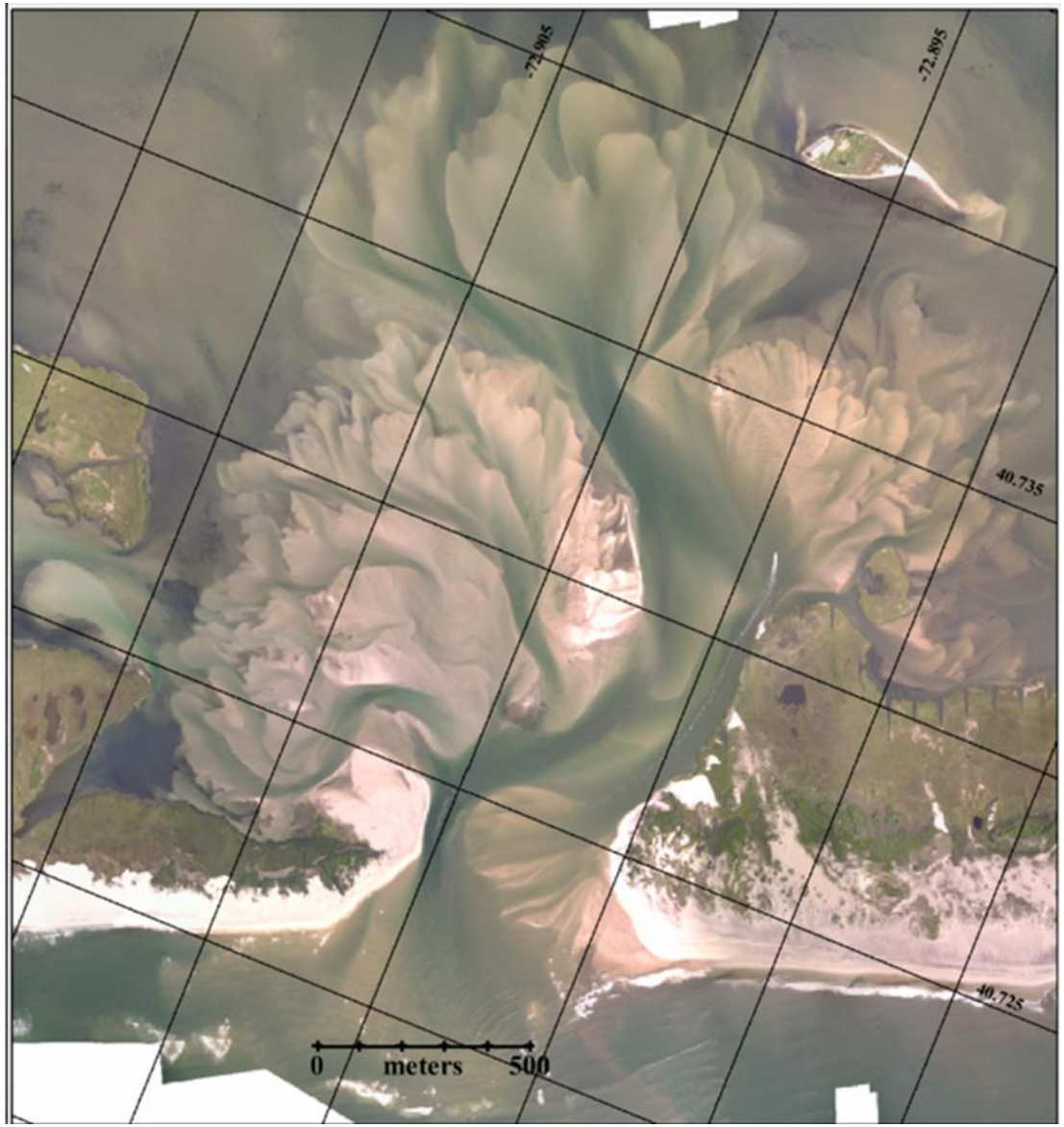
Path of Superstorm Sandy, Oct. 22-30, 2012



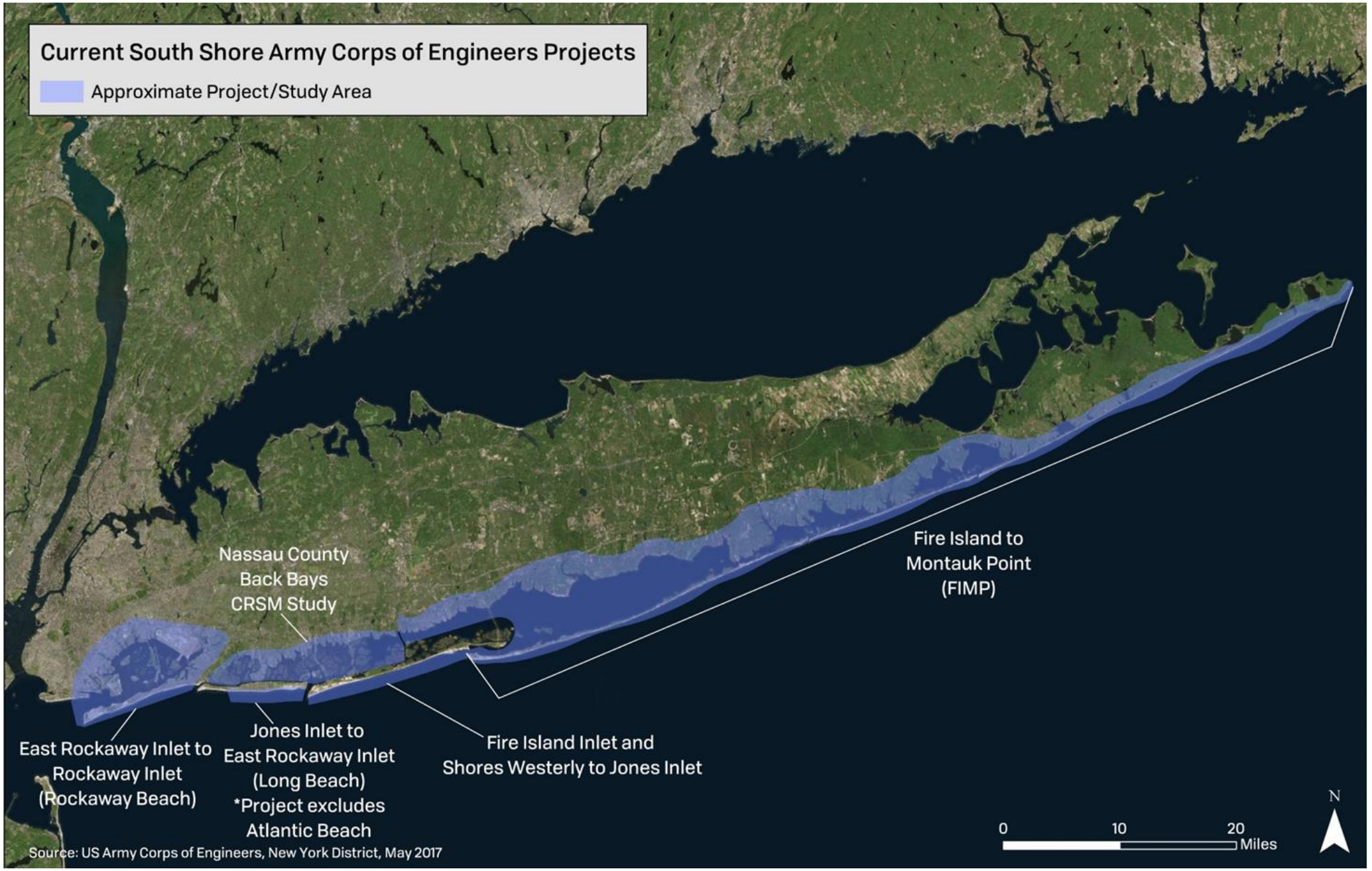
SOUTH SHORE INLETS



NEW OLD INLET



- "New Old Inlet" that broke through during Superstorm Sandy as photographed by Charles Flagg, SoMAS.
- After 10 years of dramatic changes in form and function, the inlet is slowly closing itself off.


Current South Shore Army Corps of Engineers Projects
Approximate Project/Study Area
Nassau County
Back Bays
CRSM Study
Fire Island to
Montauk Point
(FIMP)
East Rockaway Inlet to
Rockaway Inlet
(Rockaway Beach)
Jones Inlet to
East Rockaway Inlet
(Long Beach)
*Project excludes
Atlantic Beach
Fire Island Inlet and
Shores Westerly to Jones Inlet
Source: US Army Corps of Engineers, New York District, May 2017
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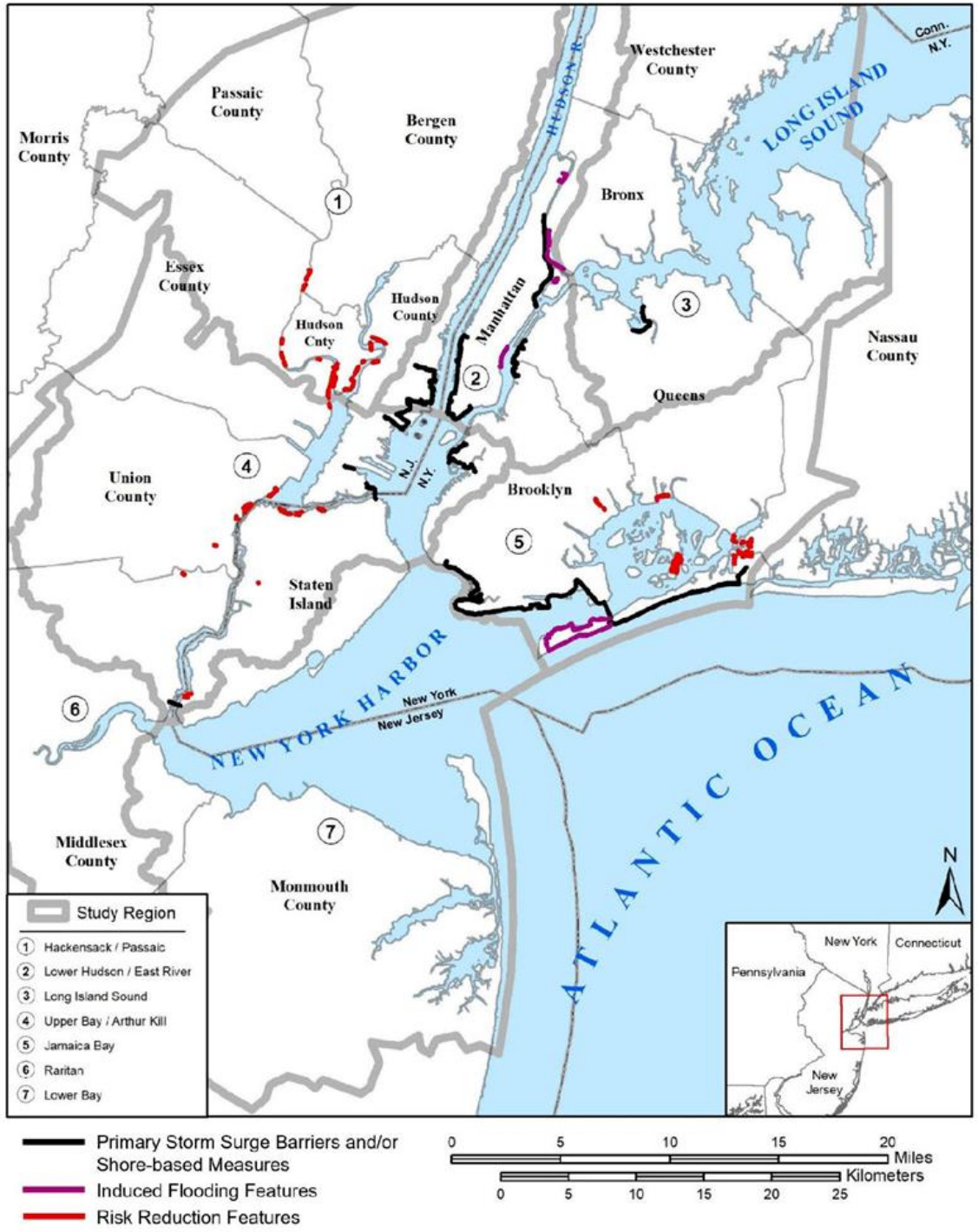
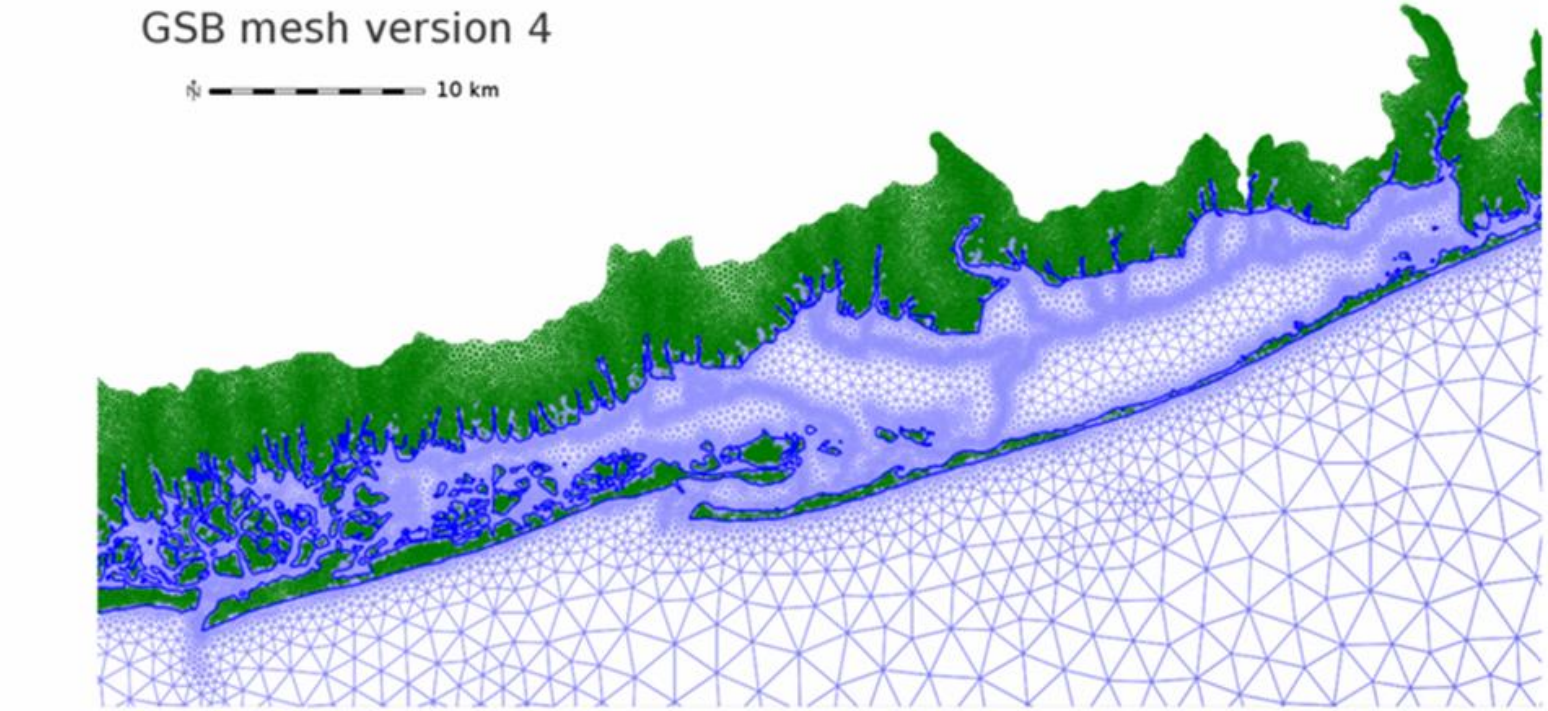


Army Corps of Engineers New York – New Jersey Harbor Tributaries Study

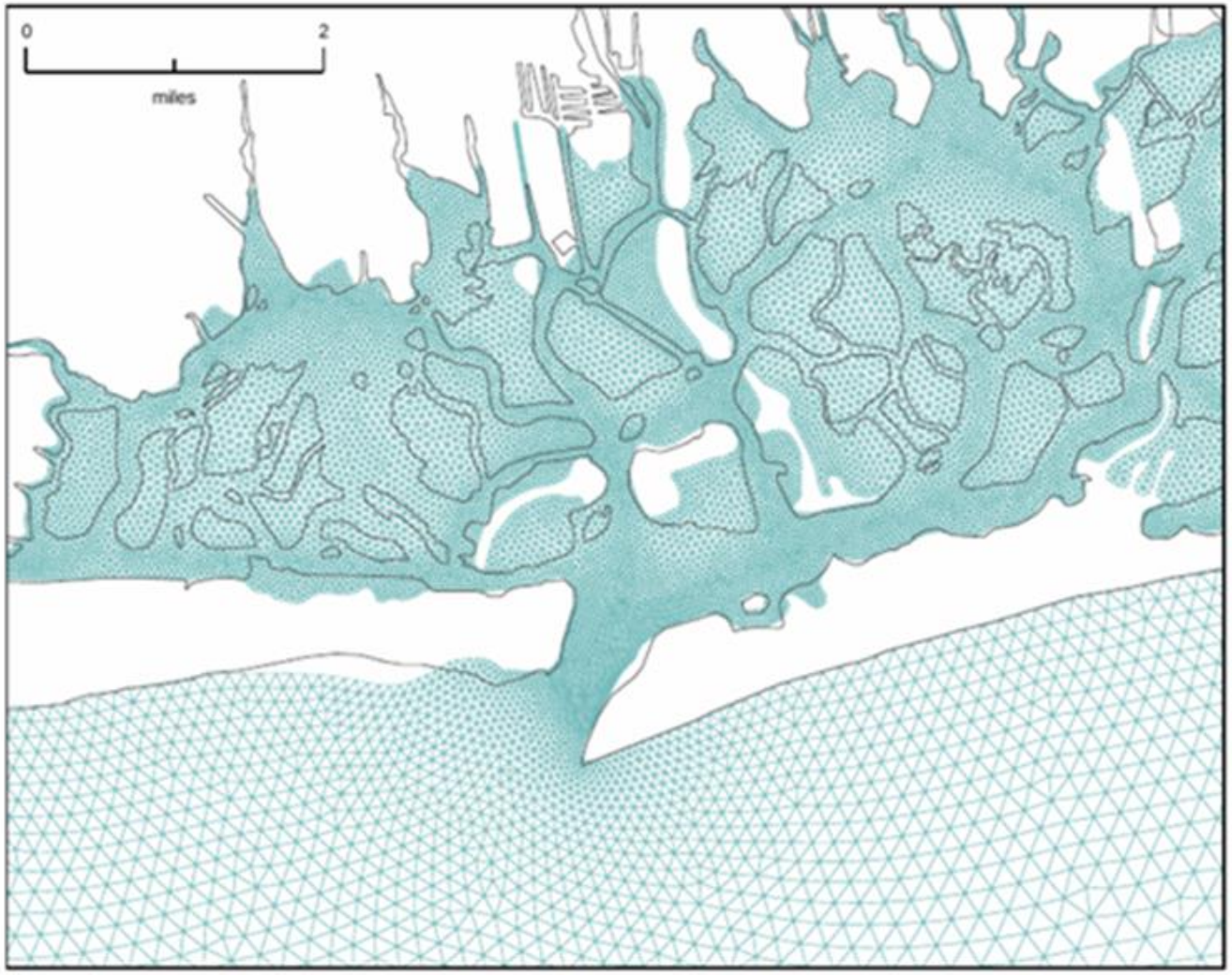
STORM SURGE MODEL

- Prediction of Storm Surge and Flooding
- Modeling Tides and Wind Driven Circulation

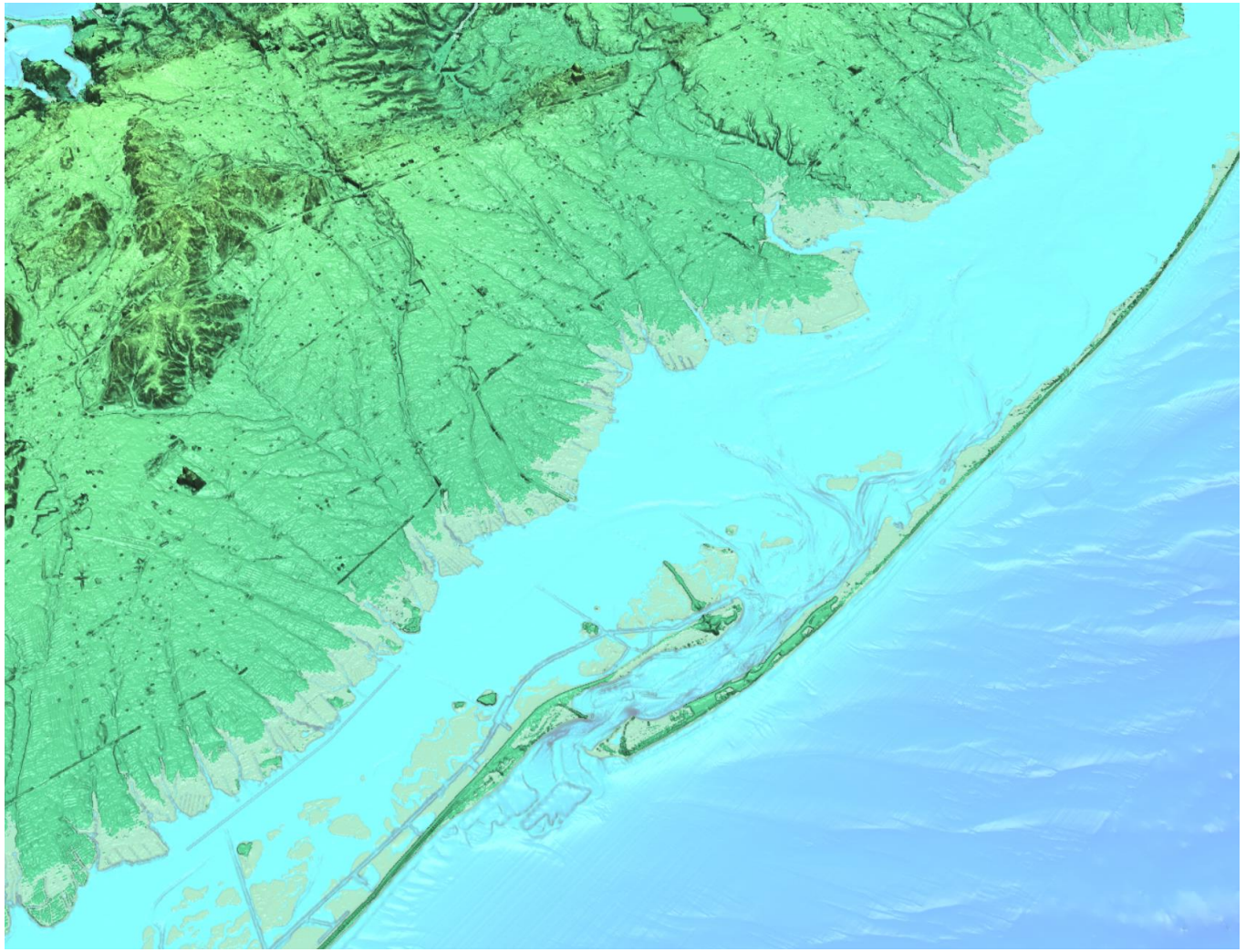


- An example of the ADCIRC unstructured grid (triangles of variable sizes and shapes) for the NY Bight coastal ocean region and Great South Bay. The rise and fall of the tides, wind driven surges and ocean currents are calculated for each connected triangle in the grid.

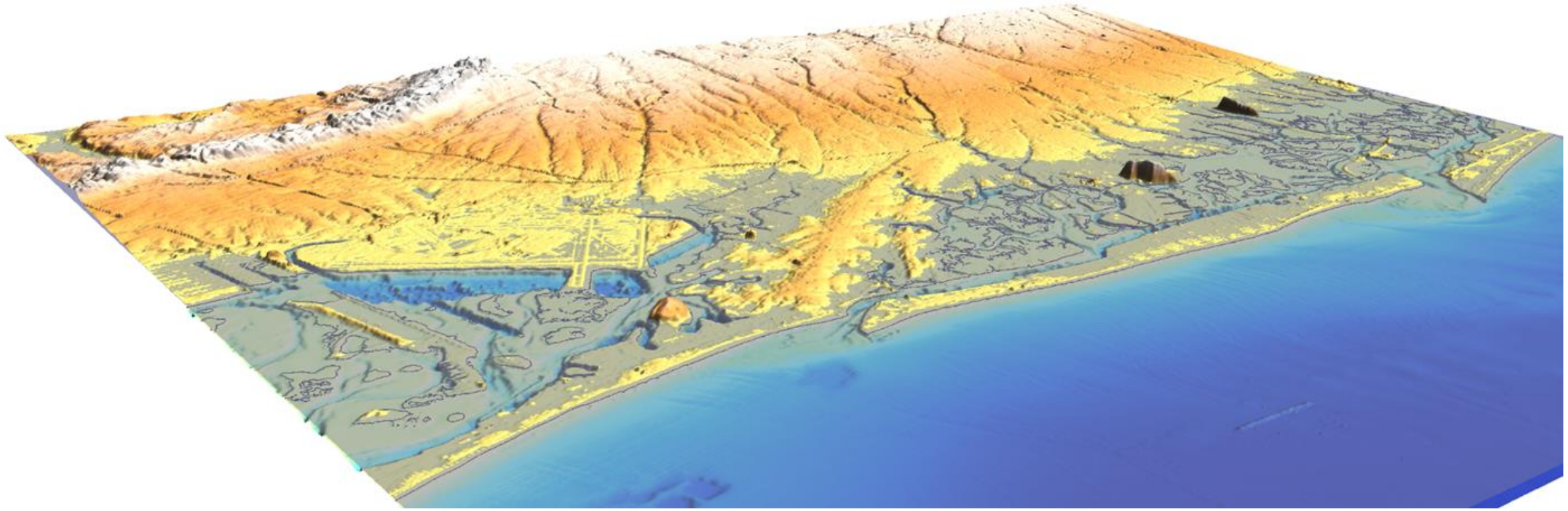
STORM SURGE MODEL: JONES INLET



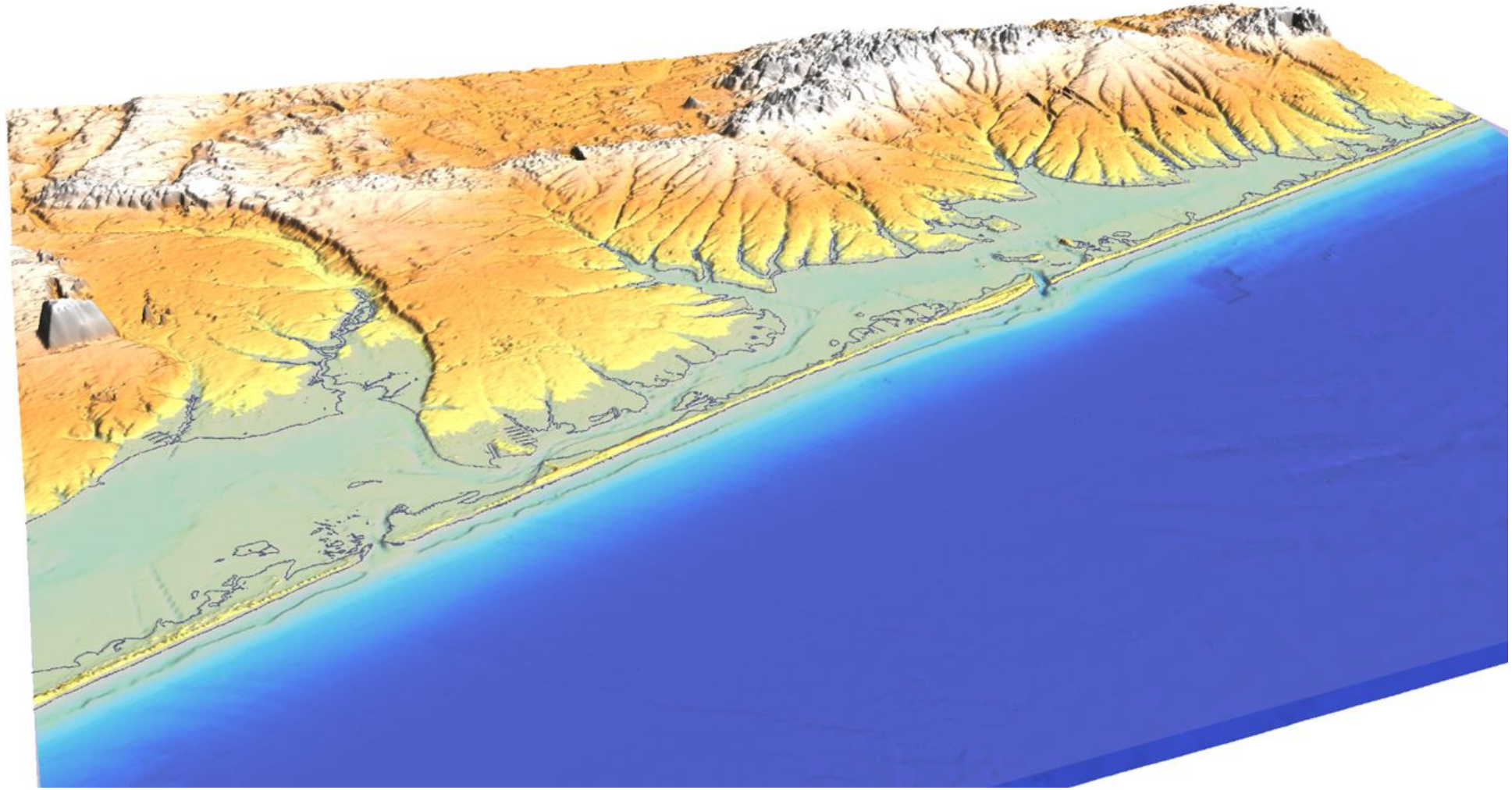
- A zoom of the unstructured ADCIRC grid for Jones Inlet and the archipelago of small islands and sand banks inside Western GSB.



- Maximum elevation of Sandy storm tide (astronomical tide +surge) at Fire Island Inlet.
- LIDAR topography, bathymetry (source), and water elevation from ADCIRC + SWAN.



- Maximum elevation of Sandy storm tide (astronomical tide +surge) between East Rockaway Inlet to Jones Inlet.
- LIDAR topography, bathymetry (source), and water elevation from ADCIRC + SWAN.

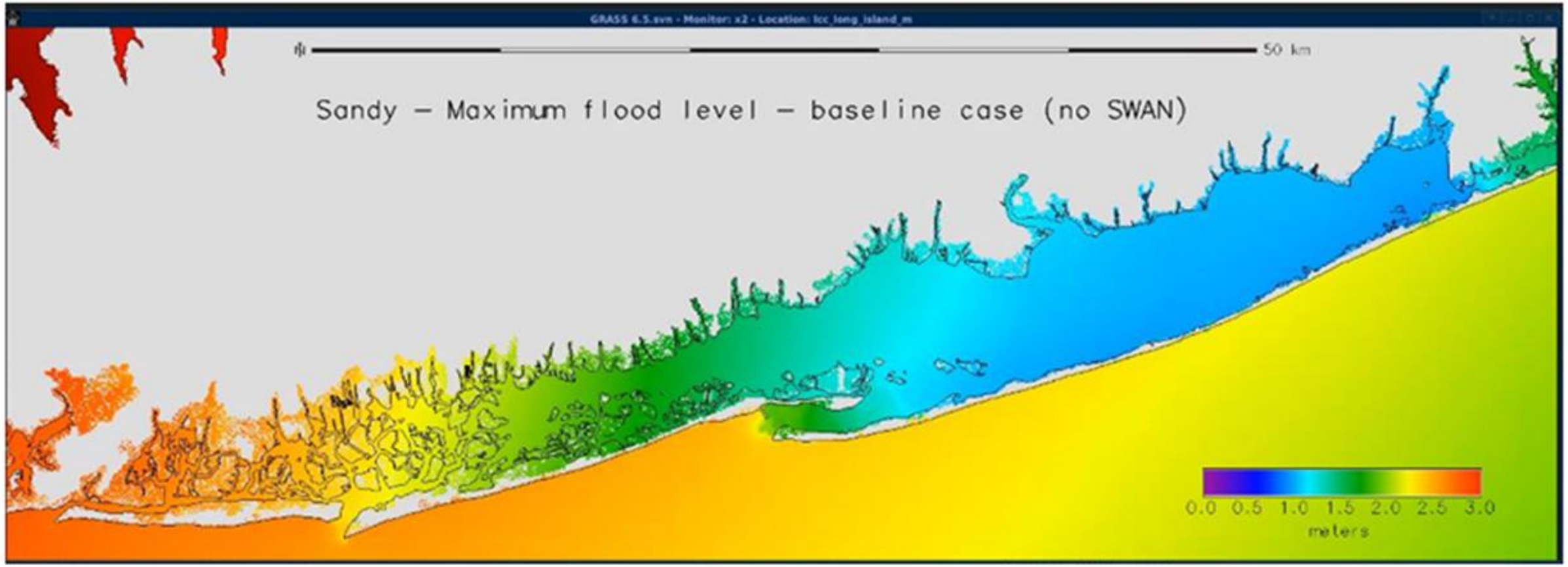


- Maximum elevation of Sandy storm tide (astronomical tide +surge) from Flagg (New Old) Inlet to Moriches Bay.
- LIDAR topography, bathymetry (source), and water elevation from ADCIRC + SWAN.

MODEL SCENARIOS

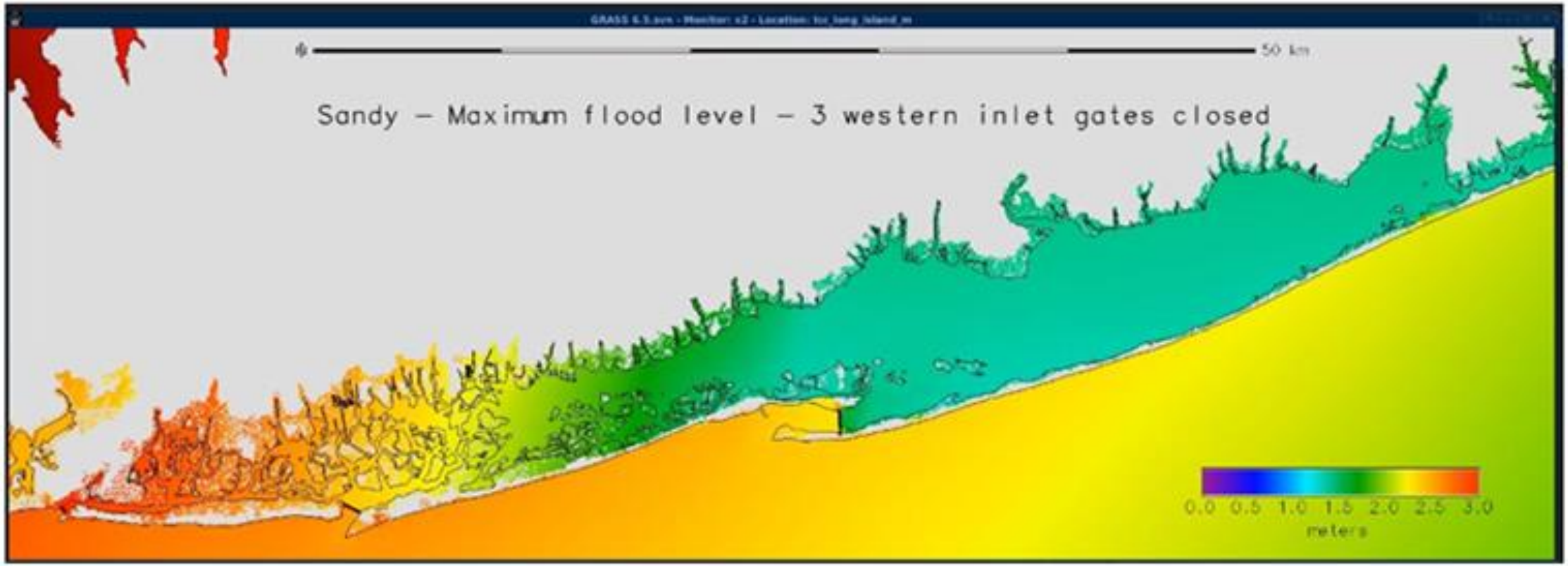
1. Superstorm Sandy	No Sea Gates or Baffles
2. Superstorm Sandy	Sea Gates: East Rockaway, Jones and Fire Island Inlets
3. Superstorm Sandy	Cross Bay Baffle at Meadowbrook Pkwy
4. Superstorm Sandy	Sea Gates: East Rockaway and Jones Inlet Cross Bay Baffle at Meadowbrook Pkwy
5. Superstorm Sandy	Sea Gate: East Rockaway - Closed Sea Gate: Jones Inlet – open Cross Bay Baffle at Meadowbrook Pkwy Loop Parkway Cross Bay Baffle
6. Superstorm Sandy	Sea gates: East Rockaway and Jones Inlets Cross Bay Baffle at Meadowbrook Pkwy Robert Moses Cross Bay Baffle
7. Superstorm Sandy	Sea Gates (6) • East Rockaway Inlet • Jones Inlet • Fire Island Inlet • New Inlet/Old Inlet • Moriches Inlet • Shinnecock Inlet Cross Bay Baffles (5) • Meadowbrook • Amityville • Robert Moses • Bayport • Smith Point

SCENARIO 1: SANDY SIMULATION: NO SEA GATES OR BAFFLES



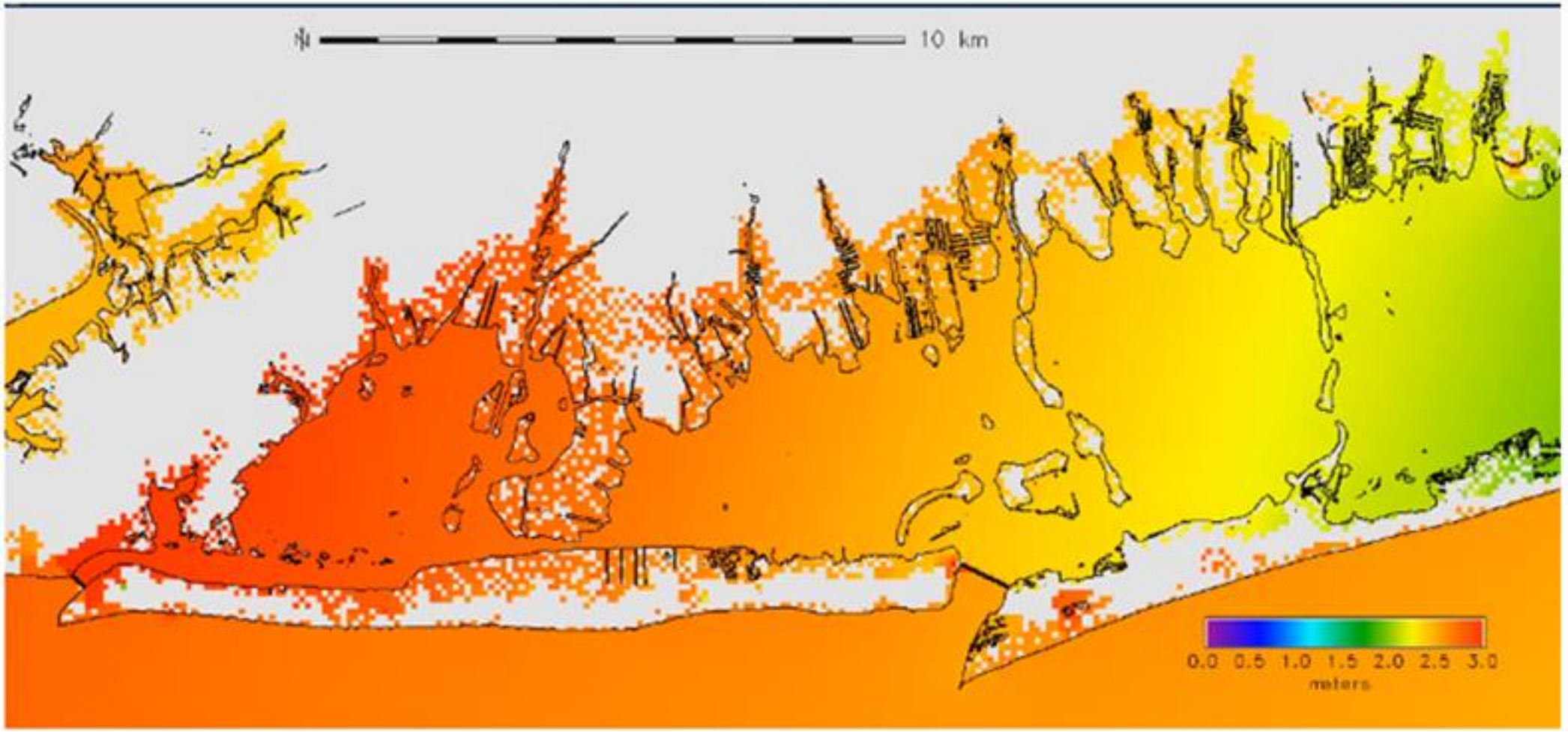
- Flooding due to an internal surge originating from the north-east inundating very low land elevations along both the bay side and barrier beach side of the western half of GSB.

SCENARIO 2:
SANDY SIMULATION: EAST ROCKAWAY, JONES AND FIRE ISLAND INLET SEA GATES



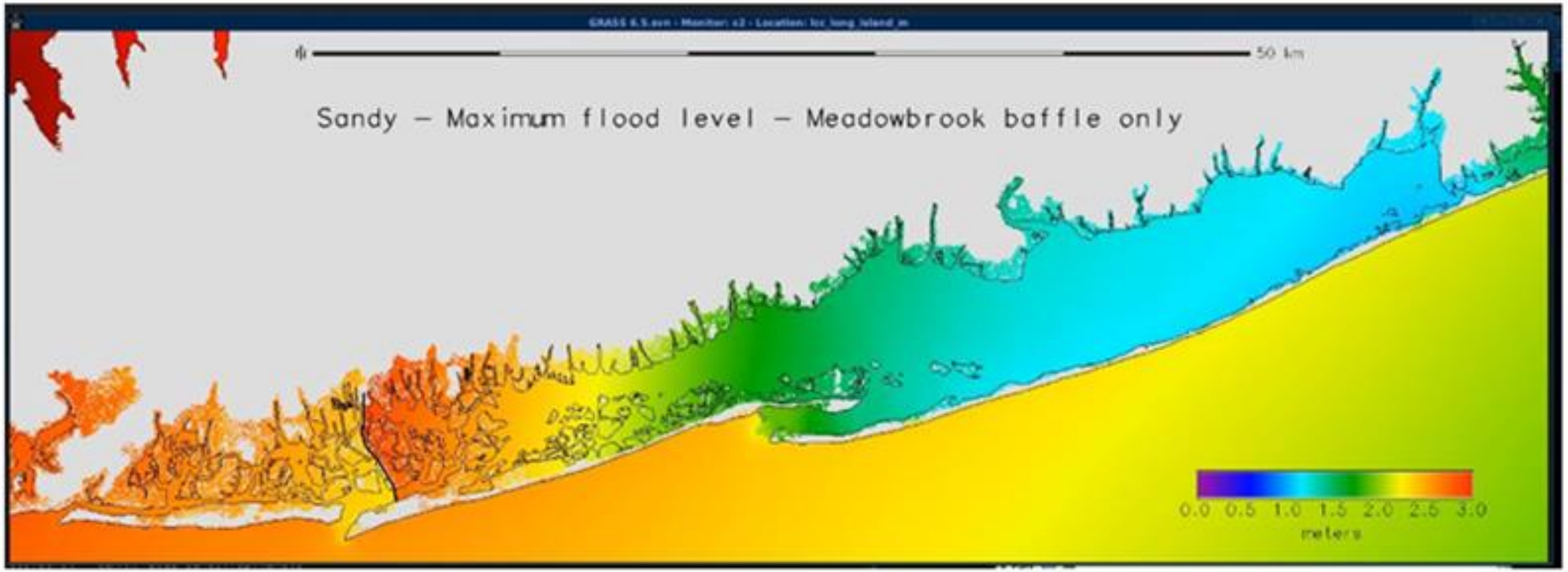
- Maximum Sandy flood levels with three western inlet gates (East Rockaway, Jones and Fire Island Inlets).
- All Sea Gates closed before the arrival of the storm surge.
- Shows little improvement to flood levels inside western GSB.

SCENARIO 2: ENLARGED



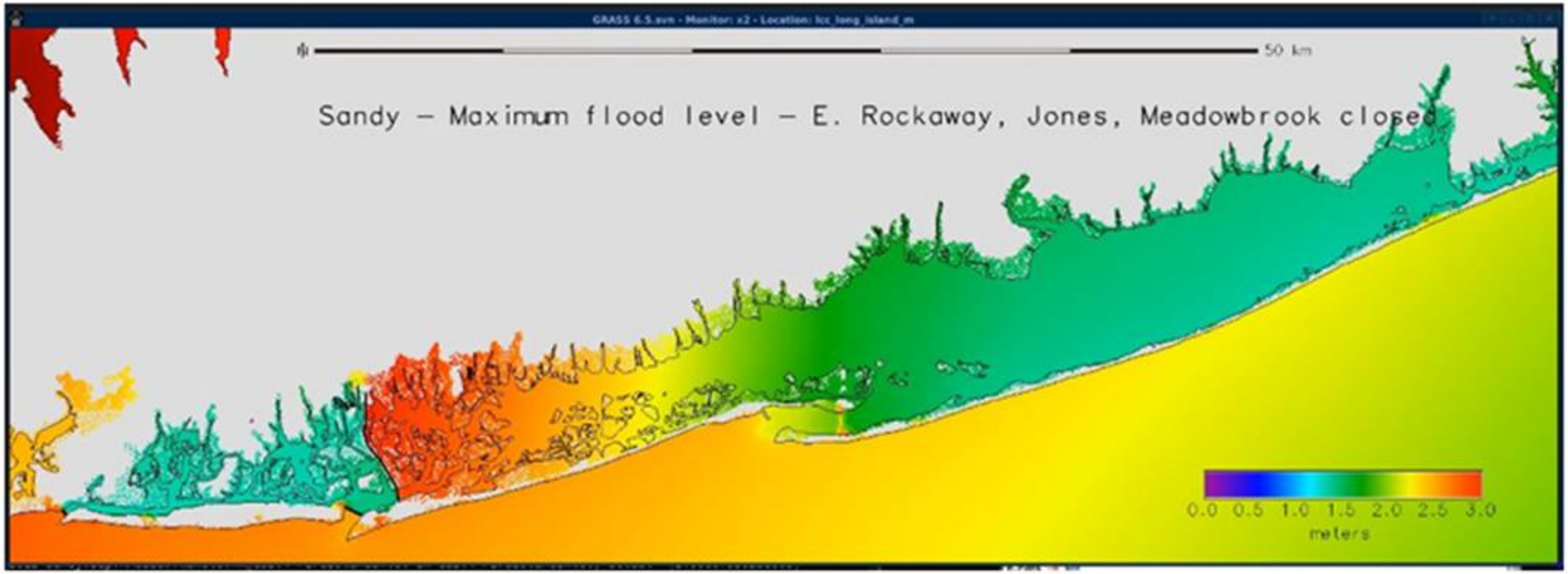
- Enlarged image of flooding of the western reaches of GSB.
- Flooding of the Bay Park Sewage Treatment Plant.
- Water level inside Reynolds Channel is 30 cm (12 inches) higher than outside East Rockaway Inlet.

SCENARIO 3: SANDY SIMULATION WITH ONE BAFFLE ALONG MEADOWBROOK PARKWAY



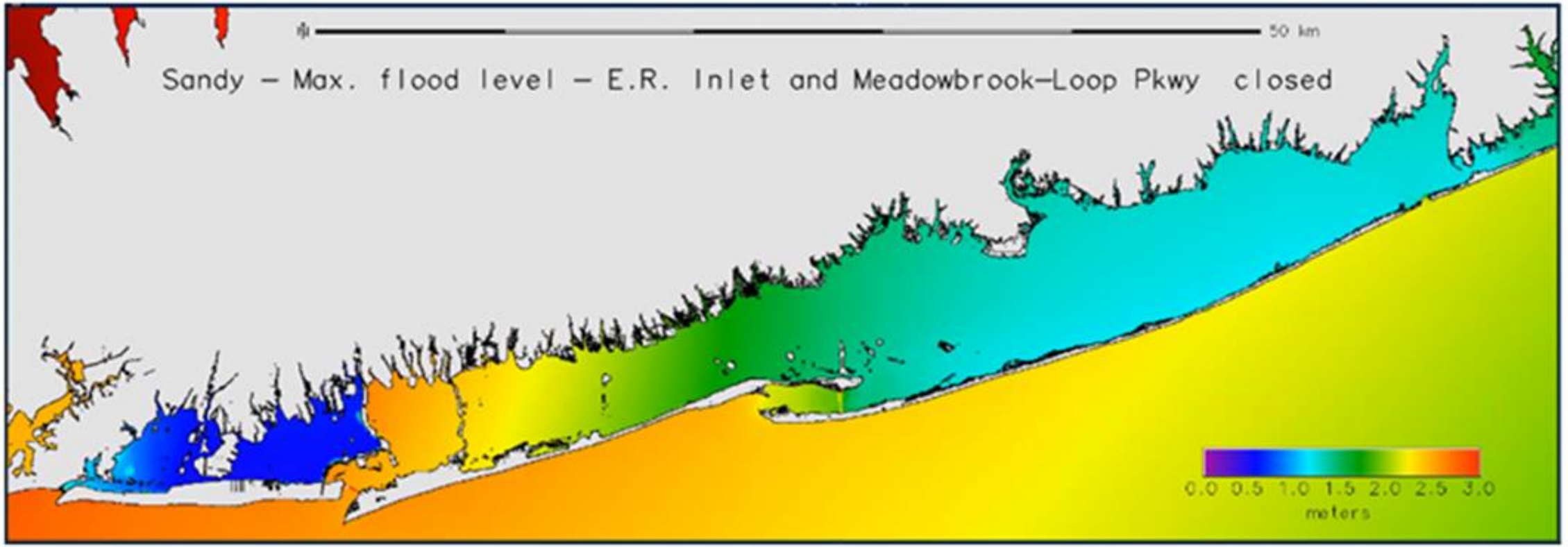
- Slight benefit for Long Beach but makes the situation worse east of the baffle.

SCENARIO 4: E. ROCKAWAY AND JONES INLET SEA GATES WITH MEADOWBROOK BAFFLE



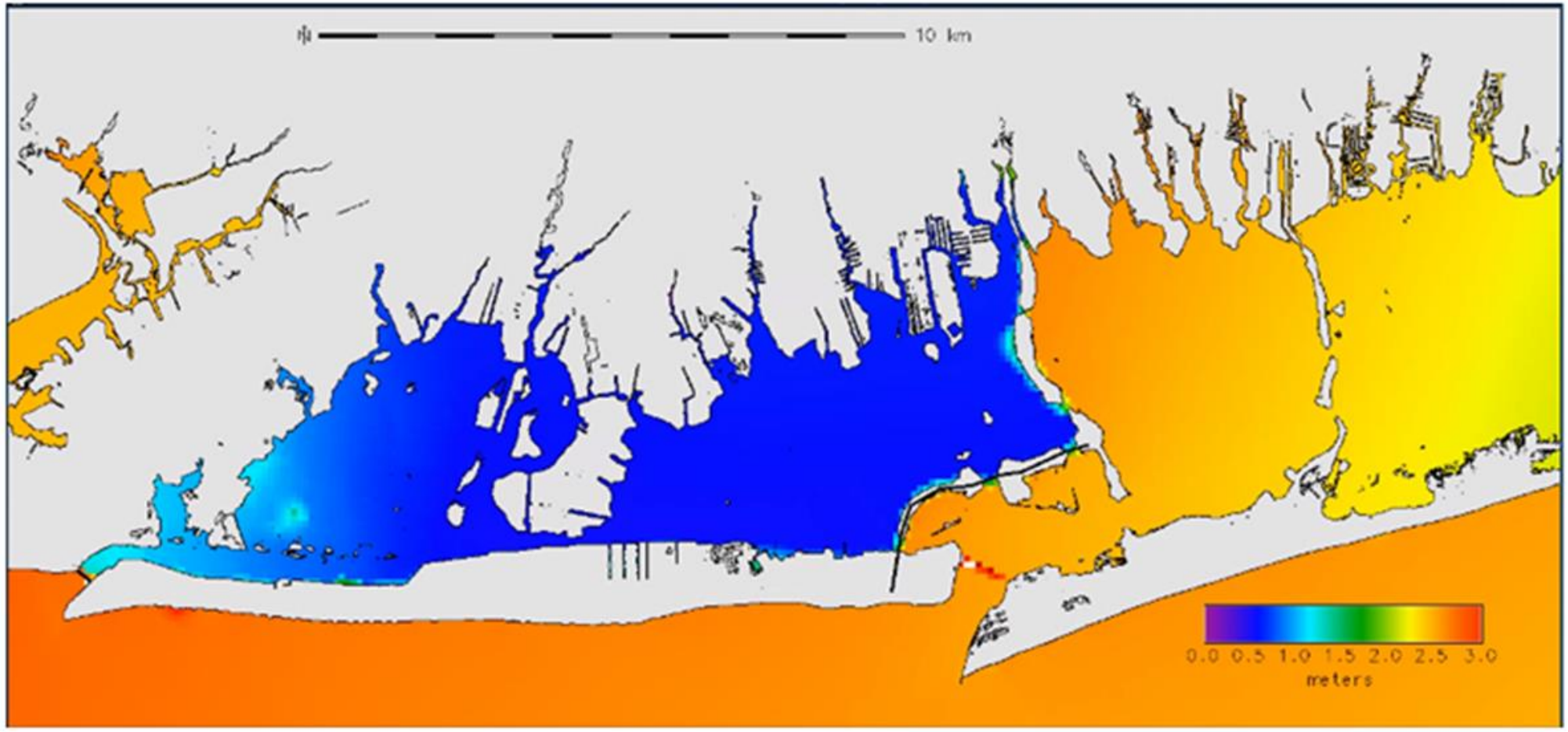
- Best scenario for the western reaches of GSB, including the City of Long Beach.
- The surge is worse east of the Meadowbrook baffle.
- Demonstrates GSB east of Meadowbrook water levels during Sandy were higher than offshore in the ocean (aka the offing)

SCENARIO 5: E. ROCKAWAY INLET CLOSED, JONES INLET OPEN, MEADOWBROOK NORTH BAFFLE CLOSED, LOOP PARKWAY BAFFLE CLOSED, ALL OTHER POINTS EAST OPEN



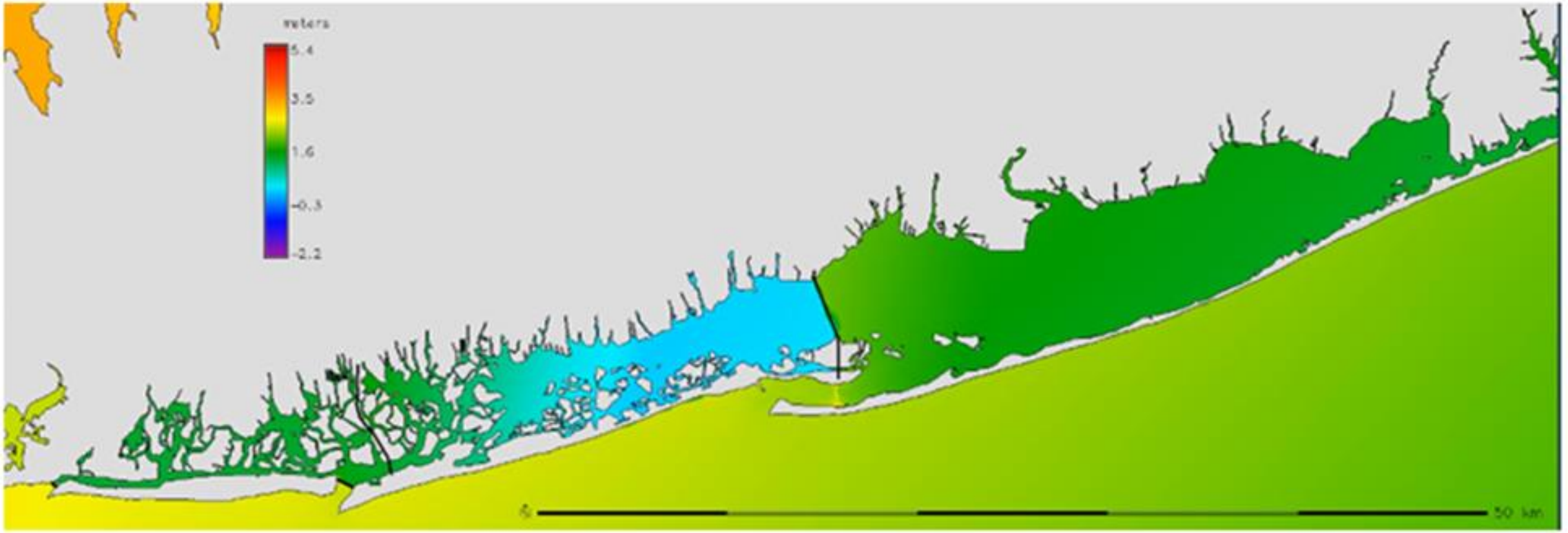
- Scenario allows GSB east of Meadowbrook/Loop Parkway to drain to the ocean.
- Water levels are higher inside GSB than the coastal ocean.
- Note: the jagged lines across Jones and Fire Island Inlets are an artifact of the gridding . Both inlets are open.

SCENARIO 5: ENLARGED



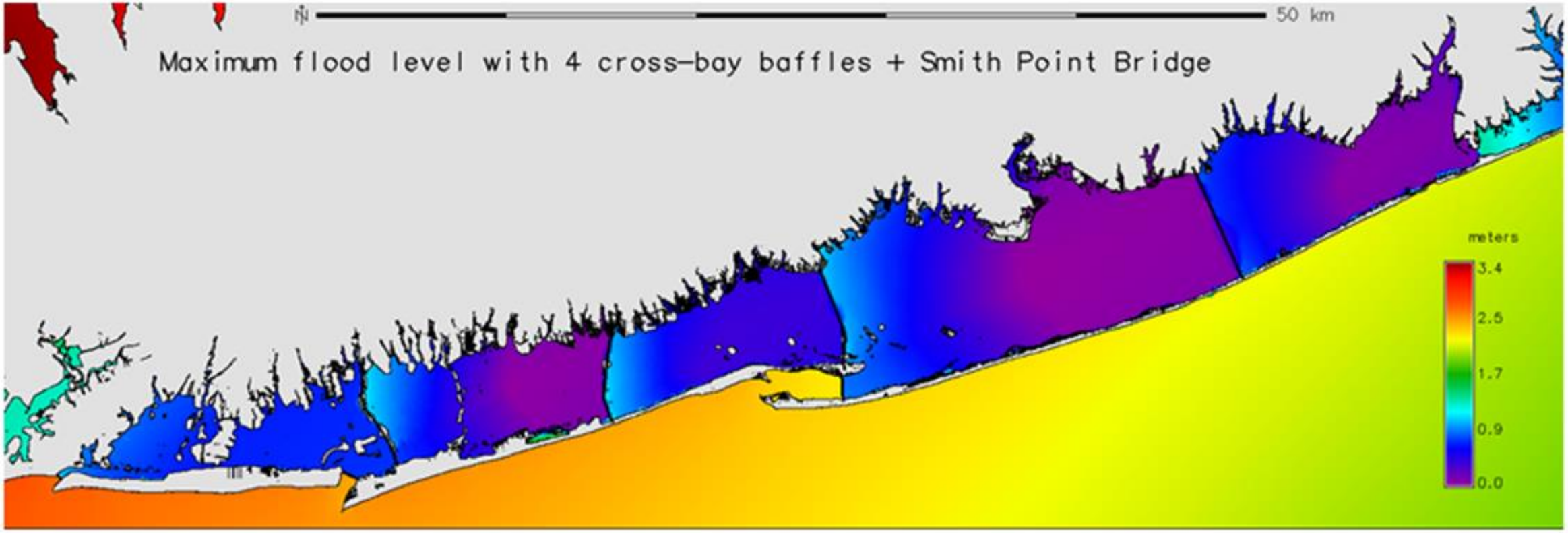
- Meadowbrook/Loop Parkway baffles closed provides protection to the west.
- The water levels east of the baffles are marginally worse than with zero protection.

SCENARIO 6: EAST ROCKAWAY AND JONES INLET GATES CLOSED. MEADOWBROOK AND ROBERT MOSES BAFFLES CLOSED



- General benefit in all areas, neutral east of Fire Island Inlet.
- The yellow streak at Fire Island Inlet is an artifact of the ADCIRC grid and is not real – the gate is open.
- This result is the best compromise in protecting all communities of concern in the study area.

SCENARIO 7:
GATES: E. ROCKAWAY, JONES, FIRE ISLAND, NEW/OLD INLETS, MORICHES AND SHINNECOCK
BAFFLES: MEADOWBROOK, AMITYVILLE, ROBERT MOSES, BAYPORT AND SMITH POINT



- All communities within the GSB study area are well protected.
- Provides the ultimate protection (at the highest cost).

Benefits of Storm Surge Barriers

- Provides Comprehensive Regional Protection of Major Assets from Flood Events
- Protection of Life, Property and Tax Base
- Allows Normal Navigation of Inlets, Rivers, Canals and Estuaries >99% of Time
- Activated Only Prior to Major Storm Events
- De-Activated after Passing of Storm Event and Recession of Tidal Surge
- Proven Technologies
- Typically Does Not Involve Private Property Takings
- Can Be Implemented Faster than All Other Major Alternatives

NEW BEDFORD, MA

- New Bedford sea gates consist of two vertical-axis Tainter gates and long stone walls stretching across the entrance of the Harbor.
- Built in 1966. (Note: The Charles W. Morgan returns to New Bedford Harbor for the first time in 73 years.)

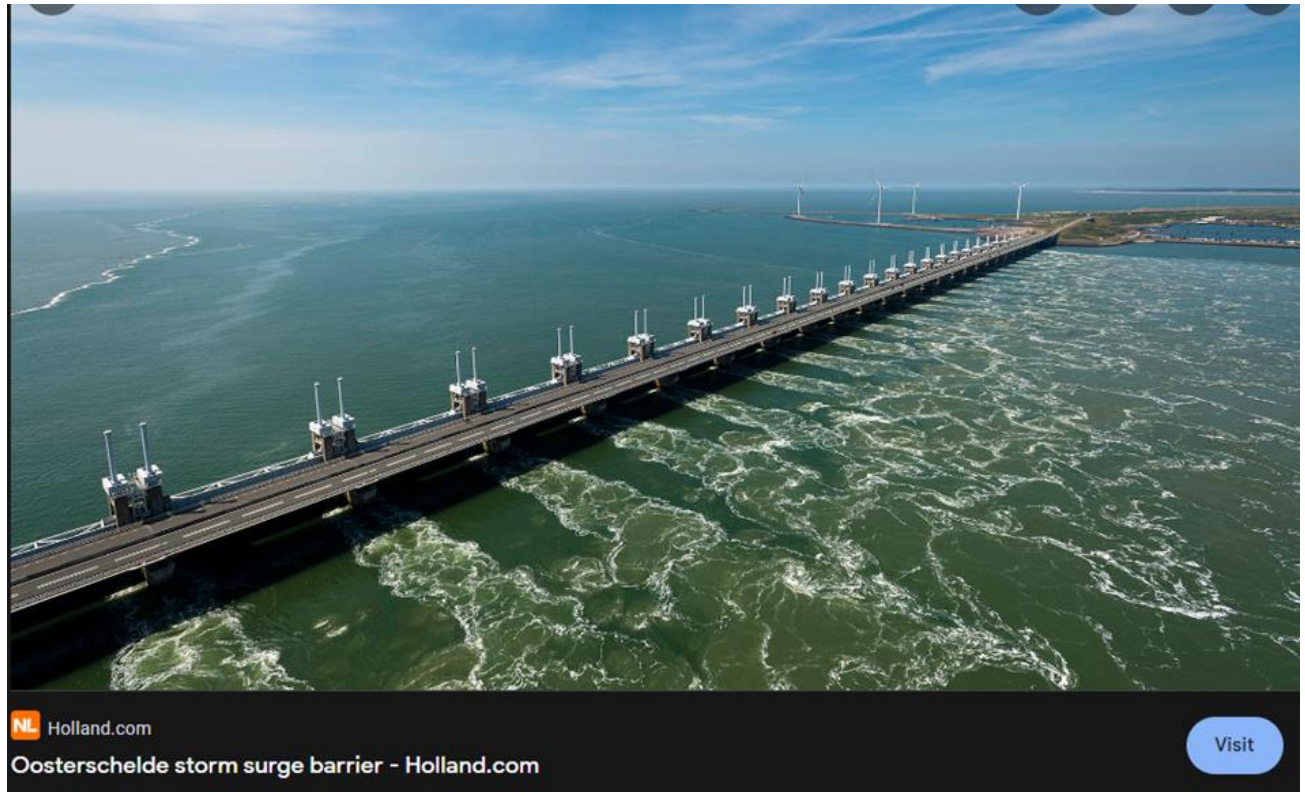
Providence, Rhode Island

- Three sea gates along Providence River
- Built in 1966

Thames River
London, England

St. Petersburg, Russia

Eastern Scheldt, Netherlands



Summary/Next Steps

1. The South Shore is vulnerable to storm surges and rising sea levels.
2. The barrier beaches are fragile and subject to overtopping, creation of new inlets during extreme weather events.
3. Flooding in western Great South Bay during Superstorm Sandy was due to oceanic storm surges on the coast and internal setup within the Bay.
4. More studies are needed on the feasibility of sea gates, cost, legality and effectiveness.
5. Water quality simulations needed to assess positive and negative consequences.
6. Surge protection is dependent on a continuous dune system constructed/maintained at proper elevations from East Rockaway Inlet to Montauk Point.
7. Comprehensive protection against sea level rise due to climate change and flooding attributable to storm surge events requires a layered defense system for effective long term protection.