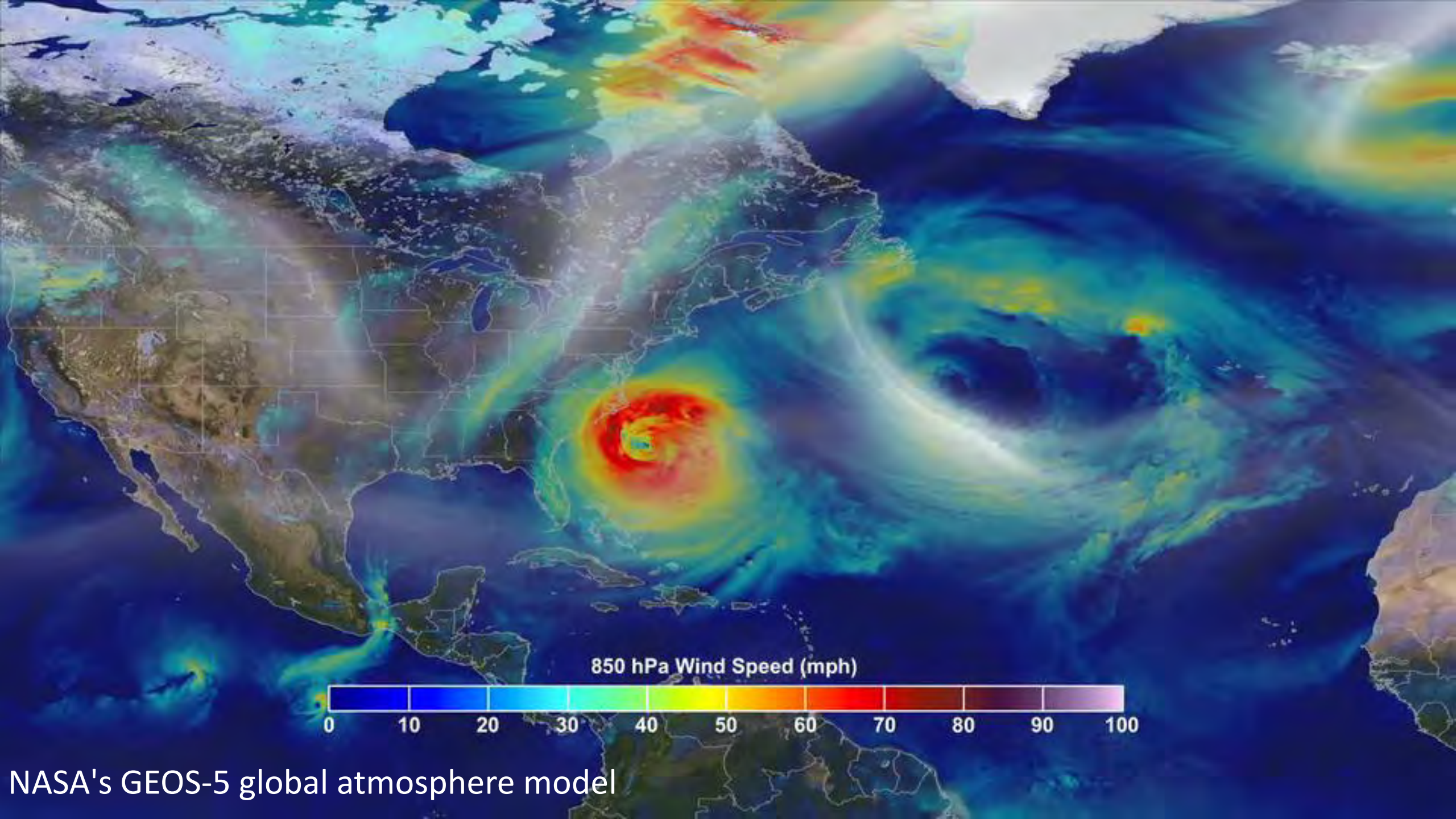


MC-FRM Overview



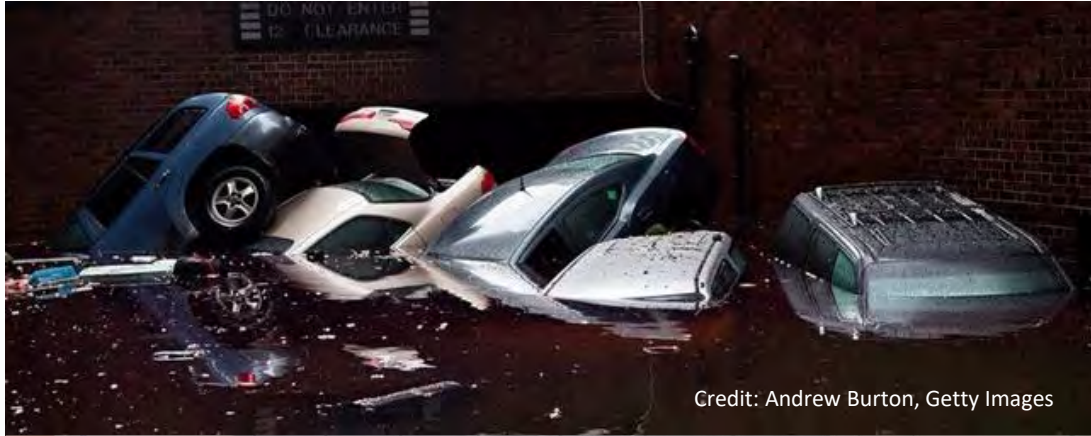


850 hPa Wind Speed (mph)



NASA's GEOS-5 global atmosphere model

FHWA /MassDOT Pilot Project – The Boston Harbor Flood Risk Model

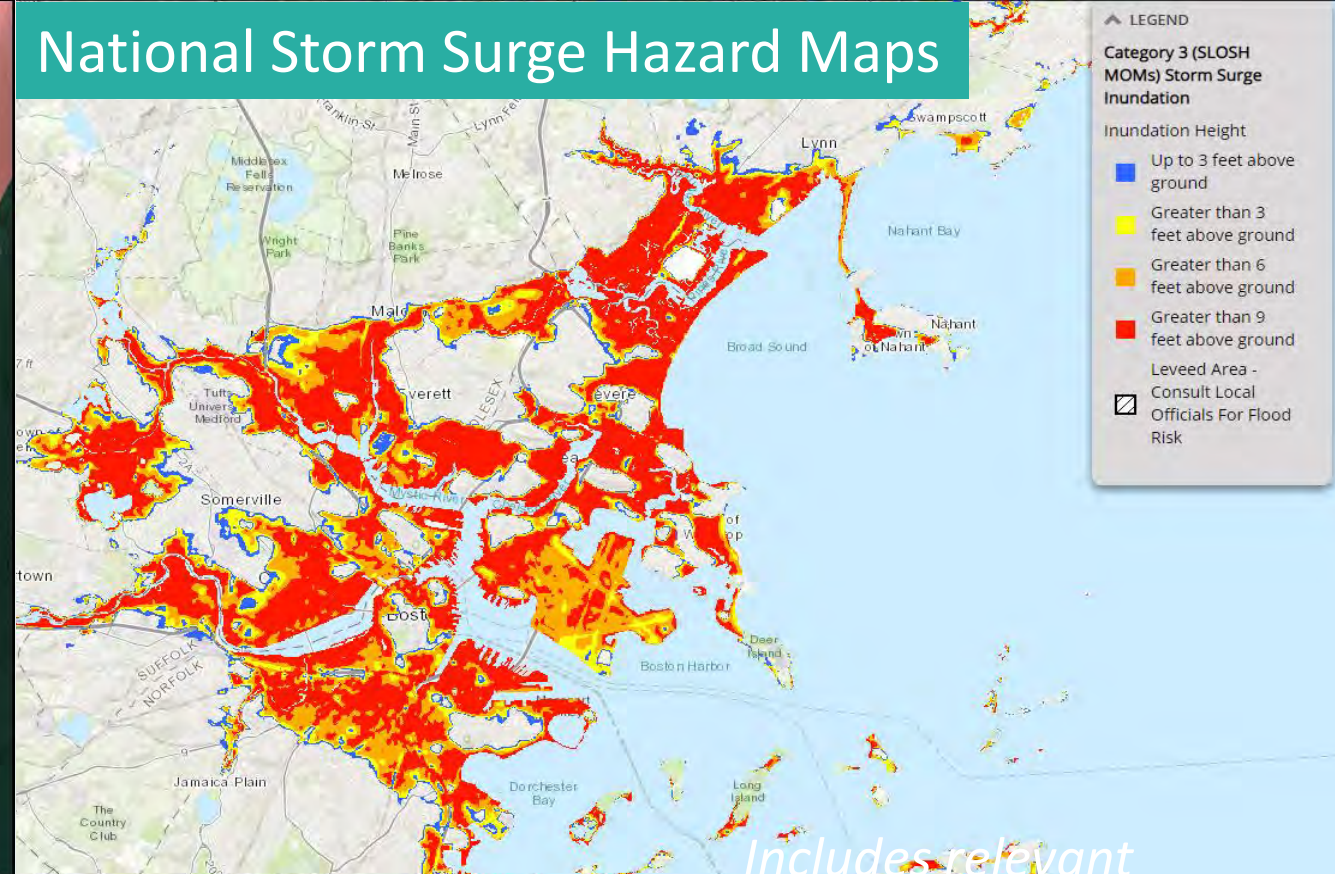
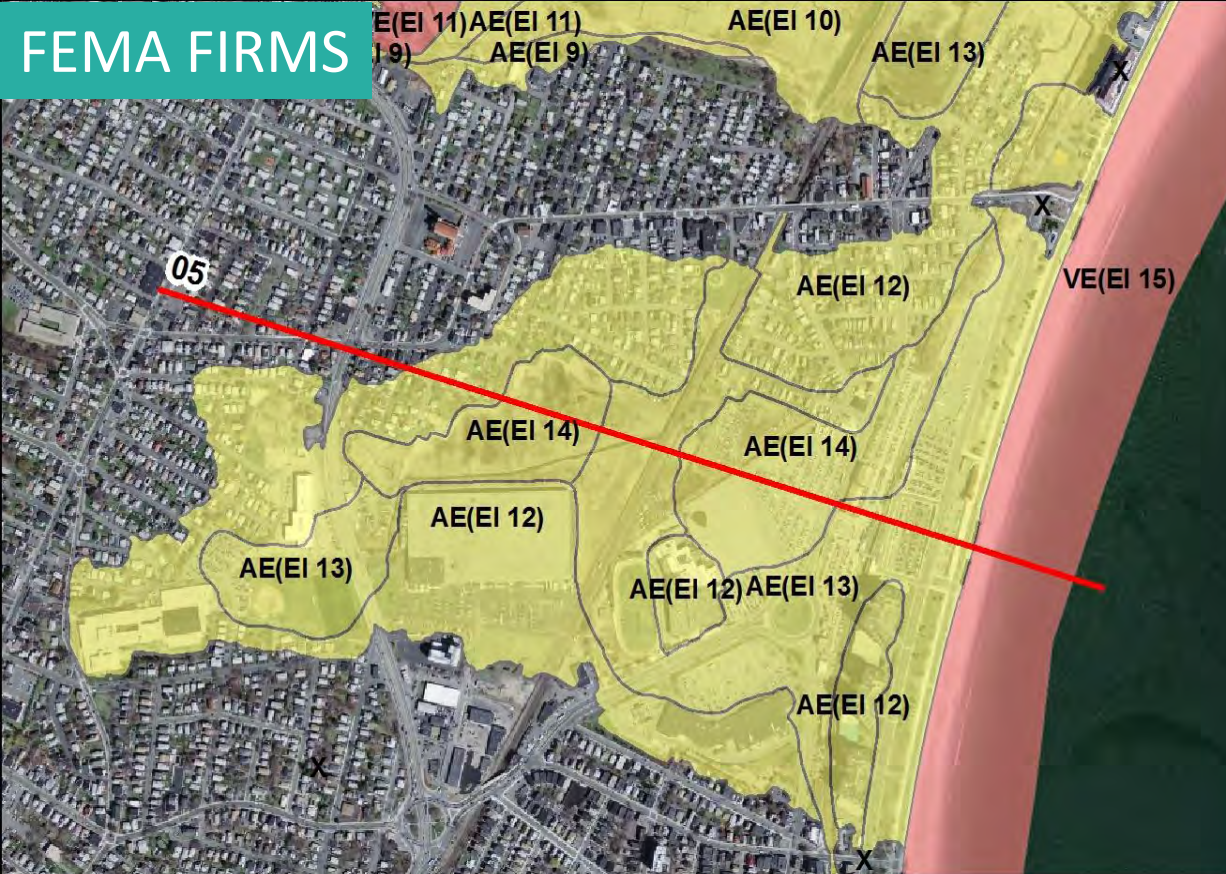


Credit: Andrew Burton, Getty Images

The Central Artery Tunnel System

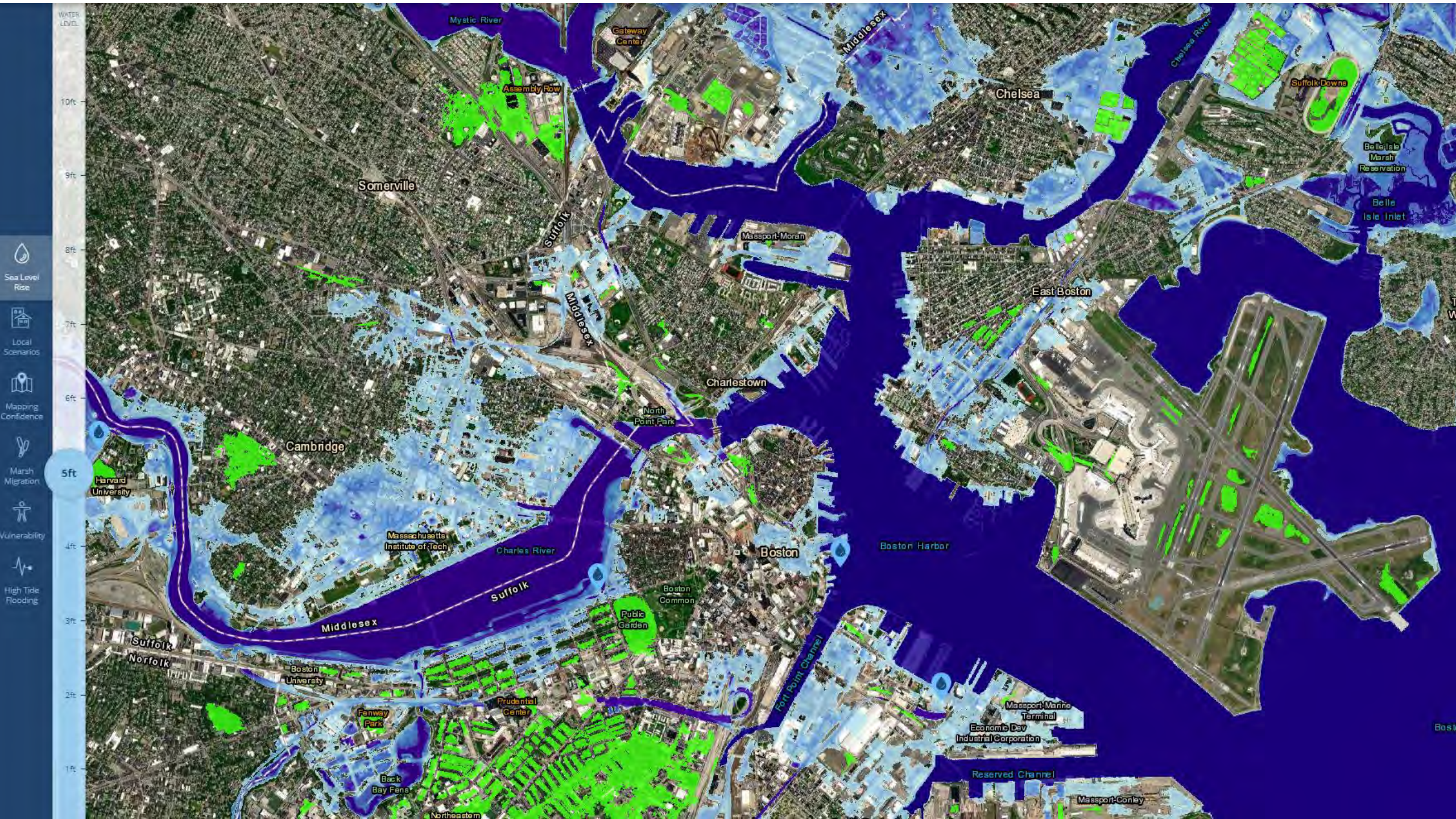
1. What is the probability of flooding?
2. What is vulnerable and what is the priority?
3. What interventions are available and what is the plan?

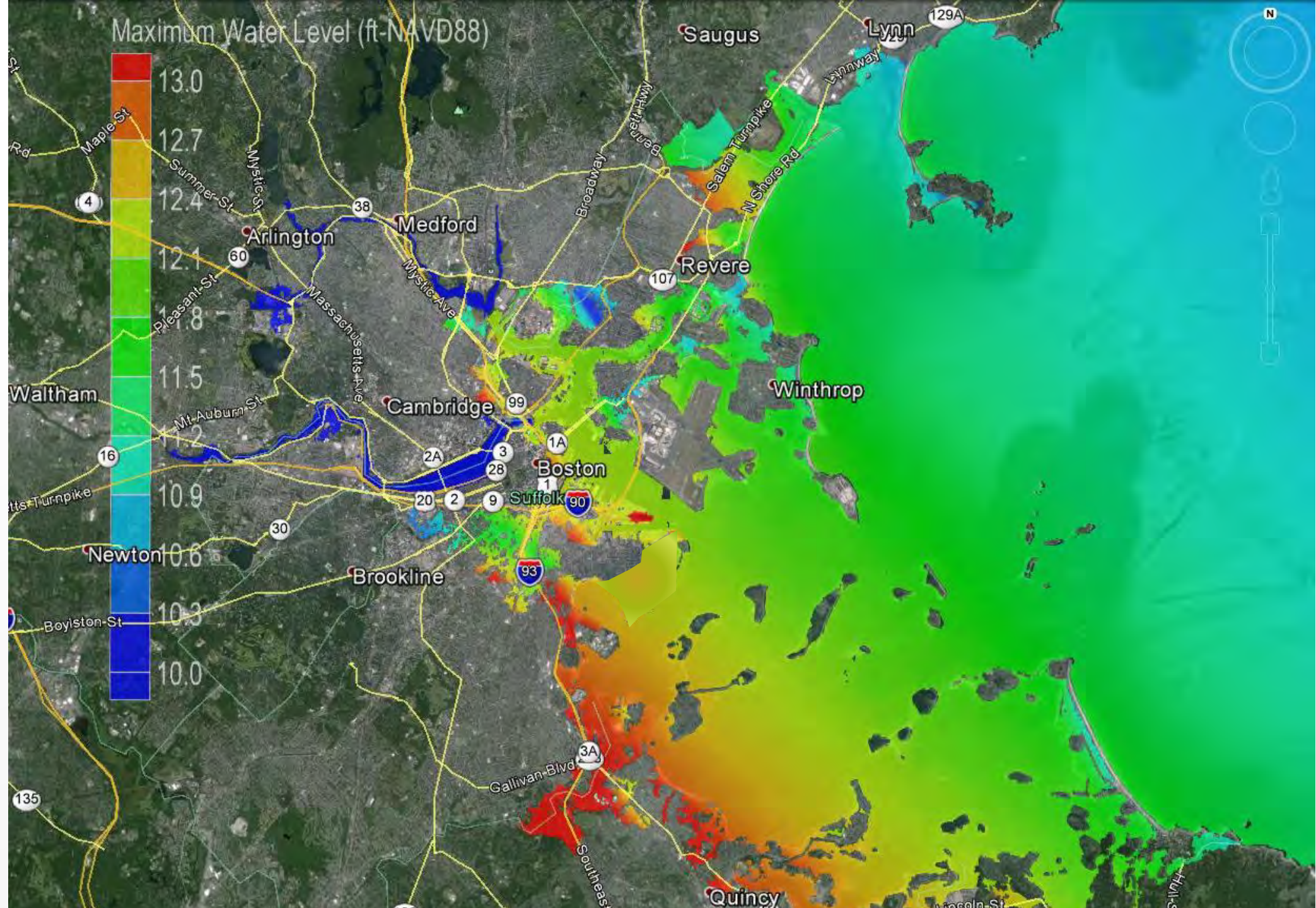




- FEMA is only backward looking
- Only considers “100-year” storm
- Region I does not use dynamic modeling
- Transect based analysis
- PRESENT CONDITIONS ONLY

- Worst possible scenarios for emergency planning
- Coarse modeling domain
- Does not include impacts of waves
- Errors are relatively large (+/- 20%)
- Just hurricanes
- PRESENT CONDITIONS ONLY





High Resolution, Probabilistic Modeling

INPUTS



SEA LEVEL
RISE



TROPICAL / EXTRA-
TROPICAL STORMS



LANDSCAPE



ELEVATION



CHANGING
CLIMATE

PROBABILISTIC /
HYDRODYNAMIC
MODEL



Includes relevant physical processes:
sea level rise, tides, storm surge, wind, wave setup
/ run-up / overtopping, future climate scenarios

Future version to incorporate coastal erosion



FLOOD
PROBABILITY



FLOOD
DEPTH



FLOOD
DURATION



FLOOD
VOLUMES



FLOOD
PATHWAYS



WINDS



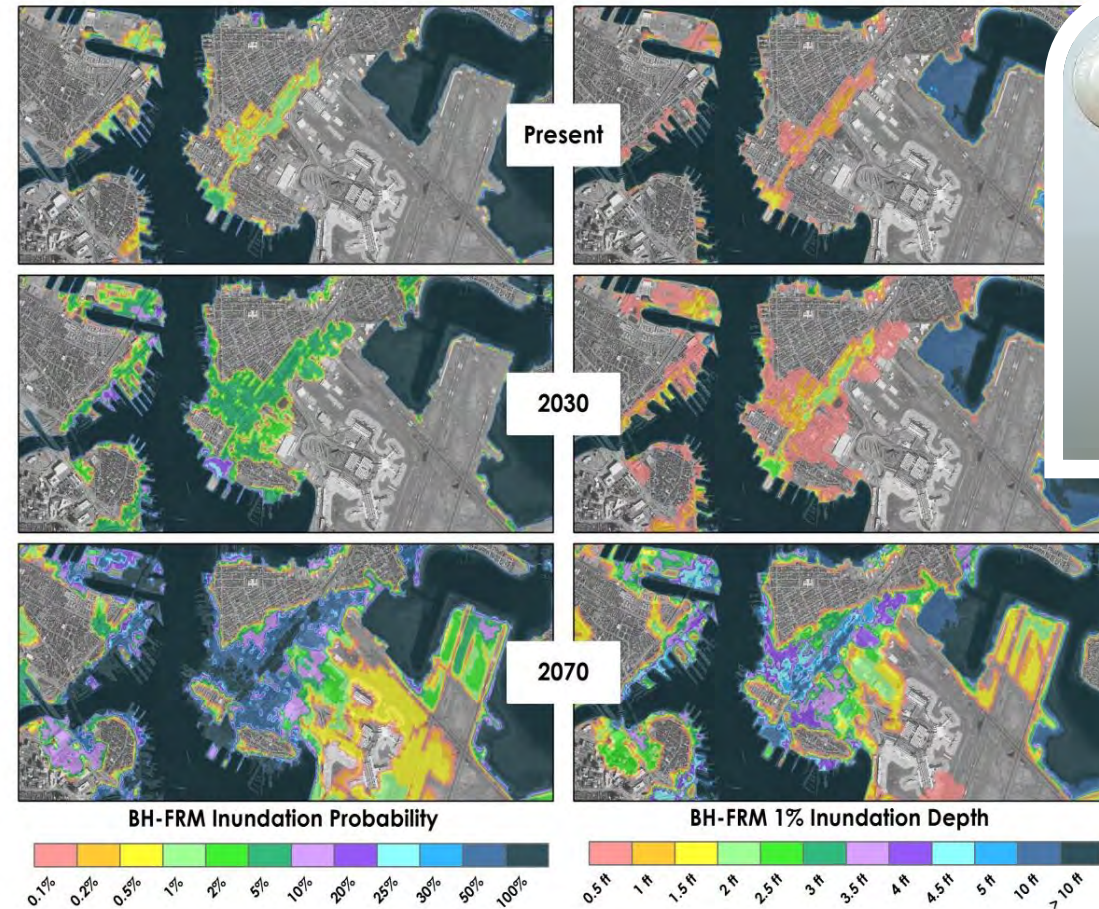
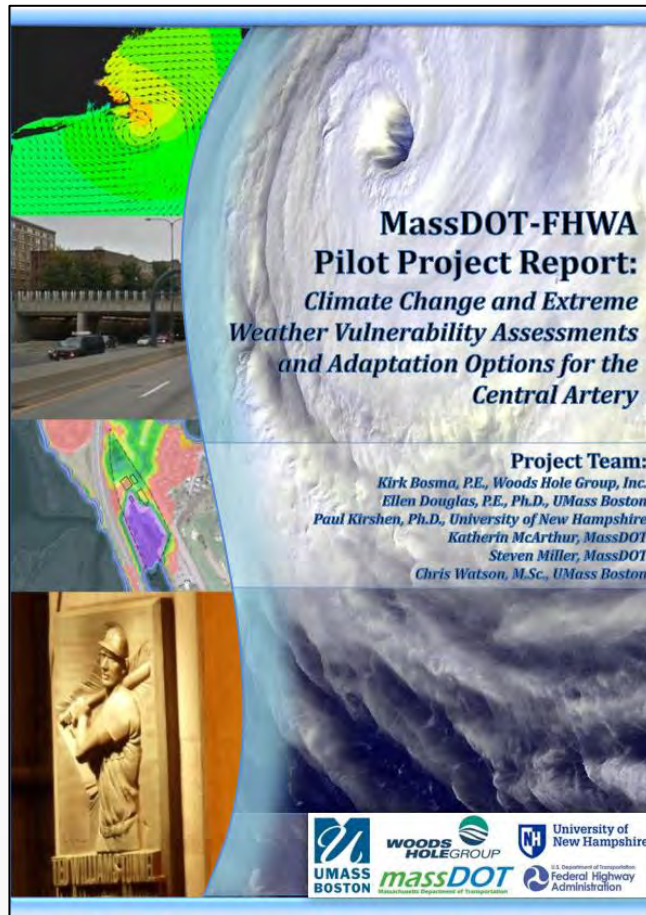
WAVES



CURRENTS

OUTPUTS

Pilot BH-FRM



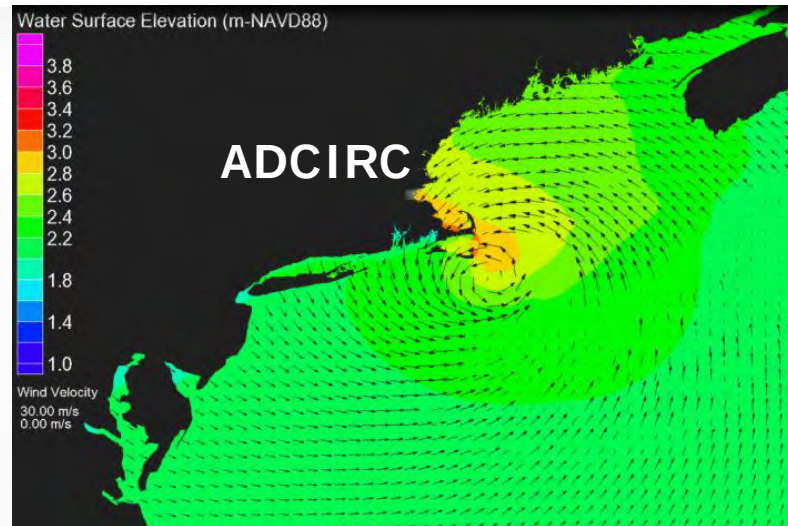
This peer-reviewed method “serves as a blueprint for national and international agencies seeking to incorporate resiliency into infrastructure design.”

BH-FRM → MC-FRM

- 1) Updated sea level rise projections, specifically developed for the State of MA
- 2) Expanded storm data sets for both tropical and extra-tropical cyclones
- 3) Inclusion of dynamic wave overtopping
- 4) Updated landscape and topography in parts of Boston and Cambridge
- 5) Creation of Level 2 output (not available as part of BH-FRM)

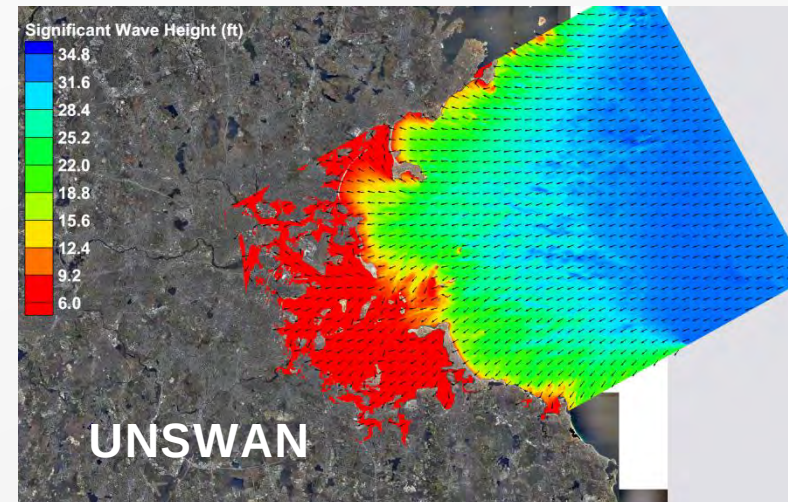
Foundational Models of Flood Risk Approach

Charles River Dam



- Currents
- Storm Surge
- Tides
- Water Levels
- Winds
- SLR
- Discharge
- Infrastructure

Tightly Coupled



- Waves
- Wave Setup



Amelia Earhart Dam

Model Input

Data Input	Source
Lidar and topography	MassGIS, MassDOT, USGS, NOAA CSC, site specific surveys
Bathymetry	NOAA/NGDC, USGS, site specific surveys
Land cover	MassGIS, USGS
River flow and hydrographs	BWSC, USGS, Douglas (2018)
High water marks	USGS (2020), Gadoury (1979)
Tides	NOAA Tides and Currents
Sea level rise scenarios	Parris et al. (2012)
Flood control structures	Massachusetts DCR, USACE, MCZM
Tropical storm climatology	Emanuel et al. (2006), Global climate models
Extra-tropical storm climatology	Vickery et al. (2013), ECMWF (2014), ERA5 ECMWF (2020), Myers and Malkin (1961)

PRIMARY DATA SOURCE: 2011 U.S. Geological Survey Topographic LiDAR: LiDAR for the North East <- Topobathy data set

BATHYMETRY DATA SOURCES

National Ocean Service (NOS) soundings

NOAA Electronic Navigational Charts (ENCs) bathymetry

Bathymetry archived by Bedford Institute of Oceanography (BIO)

National Geospatial-Intelligence Agency (NGA) Digital Nautical Charts (DNCs)

ETOPO2v2 archived by the NOAA National Geophysical Data Center (NGDC).

Bathymetric data encompassed in existing ADCIRC meshes (e.g., ec95d mesh)

Bathymetric data for the Charles River (MWH Global, 2014)

Bathymetric data for the Mystic River (VHB, 2014)

Site-specific survey data for Fort Point Channel (Woods Hole Group, 2012)

NOAA survey data within Boston Harbor

Various bathymetric surveys in Massachusetts estuaries conducted by Woods Hole Group

TOPOGRAPHIC DATA SOURCES

2011 U.S. Geological Survey Topographic LiDAR: LiDAR for the Northeast

2010 Federal Emergency Management Agency (FEMA) Topographic Lidar: Coastal Massachusetts and Rhode Island

2009 National Renewable Energy Laboratory/Boston Redevelopment Authority Topographic LiDAR: Boston, Massachusetts

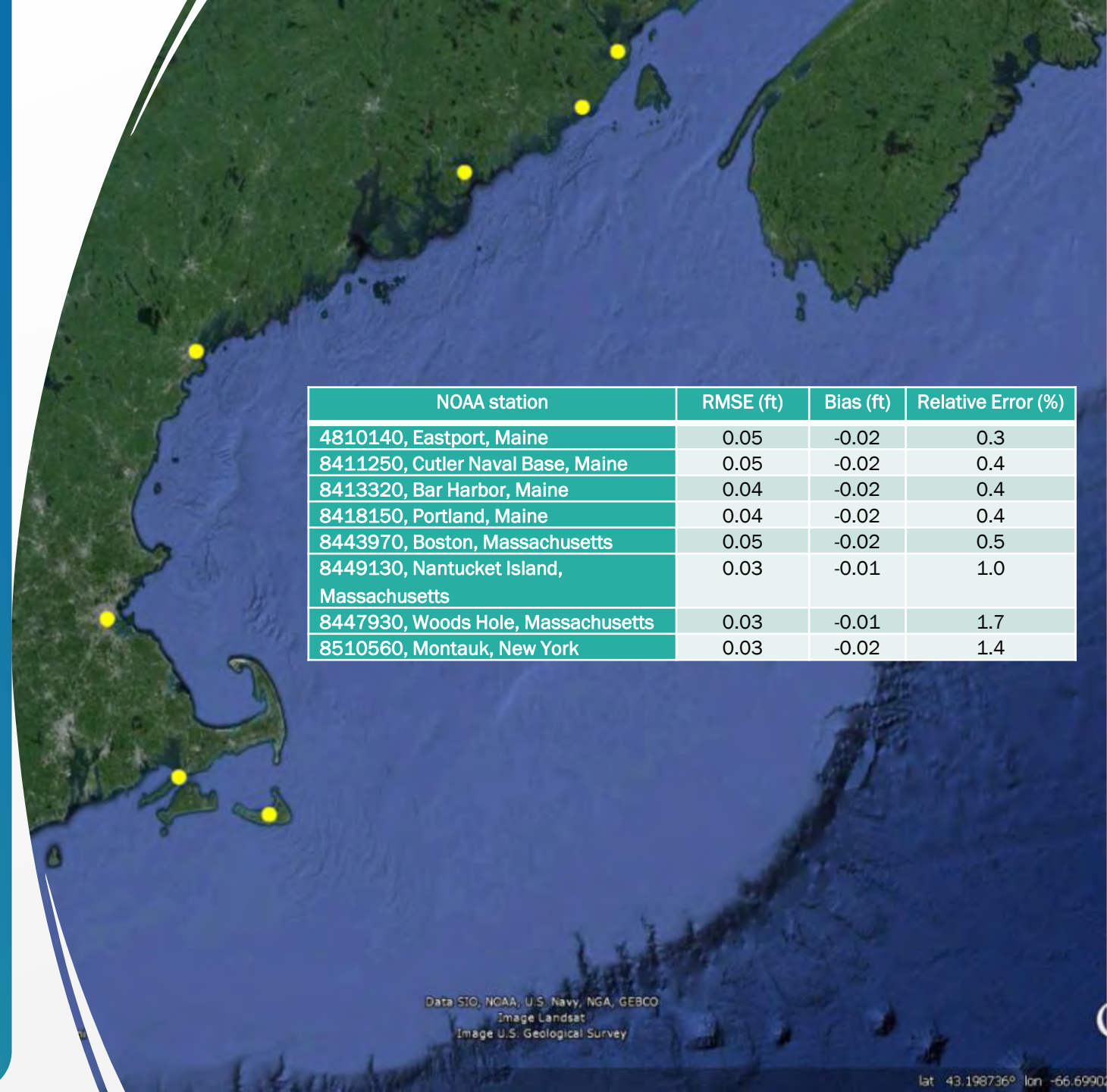
2013-2014 U.S. Geological Survey CMGP LiDAR: Post Sandy (MA, NH, RI)

2014 City of Cambridge Lidar data

Maine and Massachusetts 2015 QL1 and QI2 Lidar (2016)

Model Calibration and Validation

- Tides and tidal constituents across the entire Atlantic Ocean
- Calibration to storm tides for major historical events using high water mark data (USGS) and tide records
- Validation against 2018 ETC events
- Waves in Massachusetts areas



NOAA station	RMSE (ft)	Bias (ft)	Relative Error (%)
4810140, Eastport, Maine	0.05	-0.02	0.3
8411250, Cutler Naval Base, Maine	0.05	-0.02	0.4
8413320, Bar Harbor, Maine	0.04	-0.02	0.4
8418150, Portland, Maine	0.04	-0.02	0.4
8443970, Boston, Massachusetts	0.05	-0.02	0.5
8449130, Nantucket Island, Massachusetts	0.03	-0.01	1.0
8447930, Woods Hole, Massachusetts	0.03	-0.01	1.7
8510560, Montauk, New York	0.03	-0.02	1.4

Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat
Image U.S. Geological Survey

lat 43.198736° lon -66.69900°

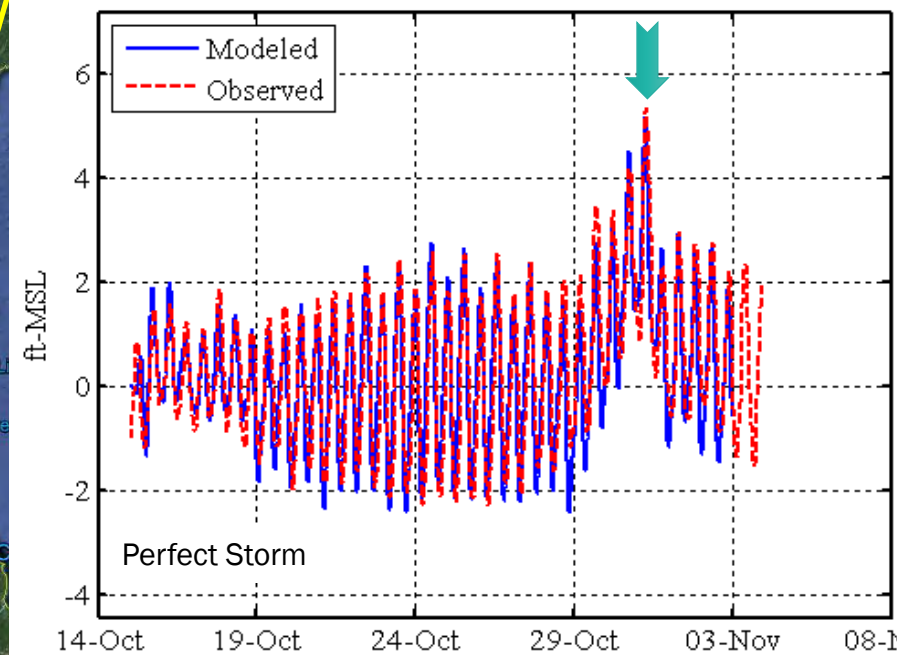
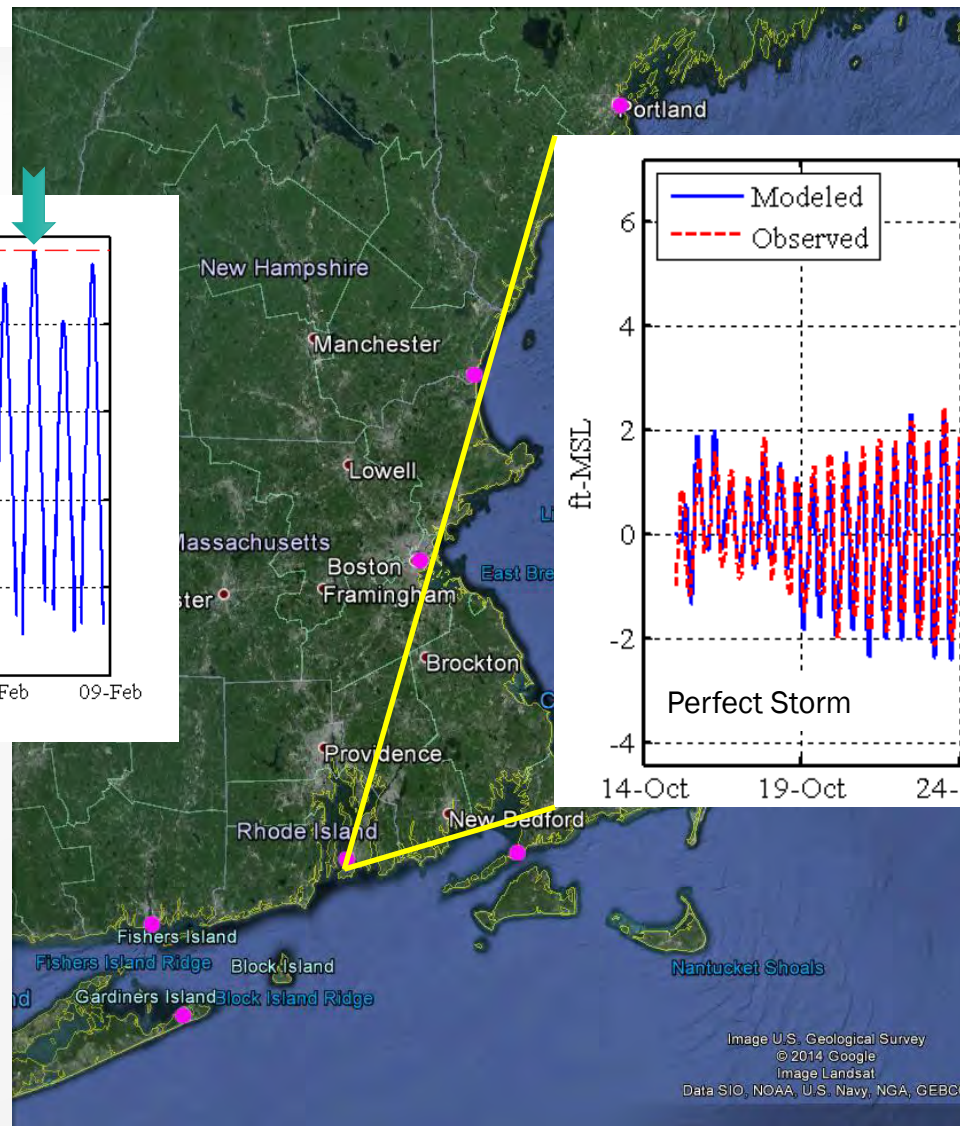
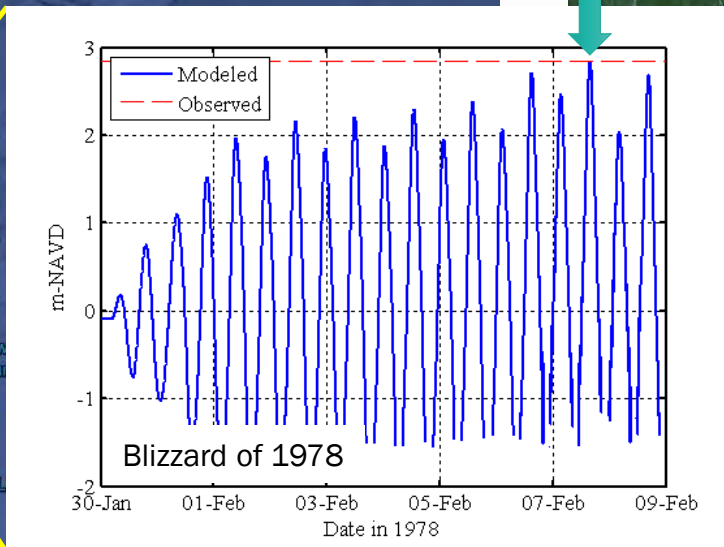
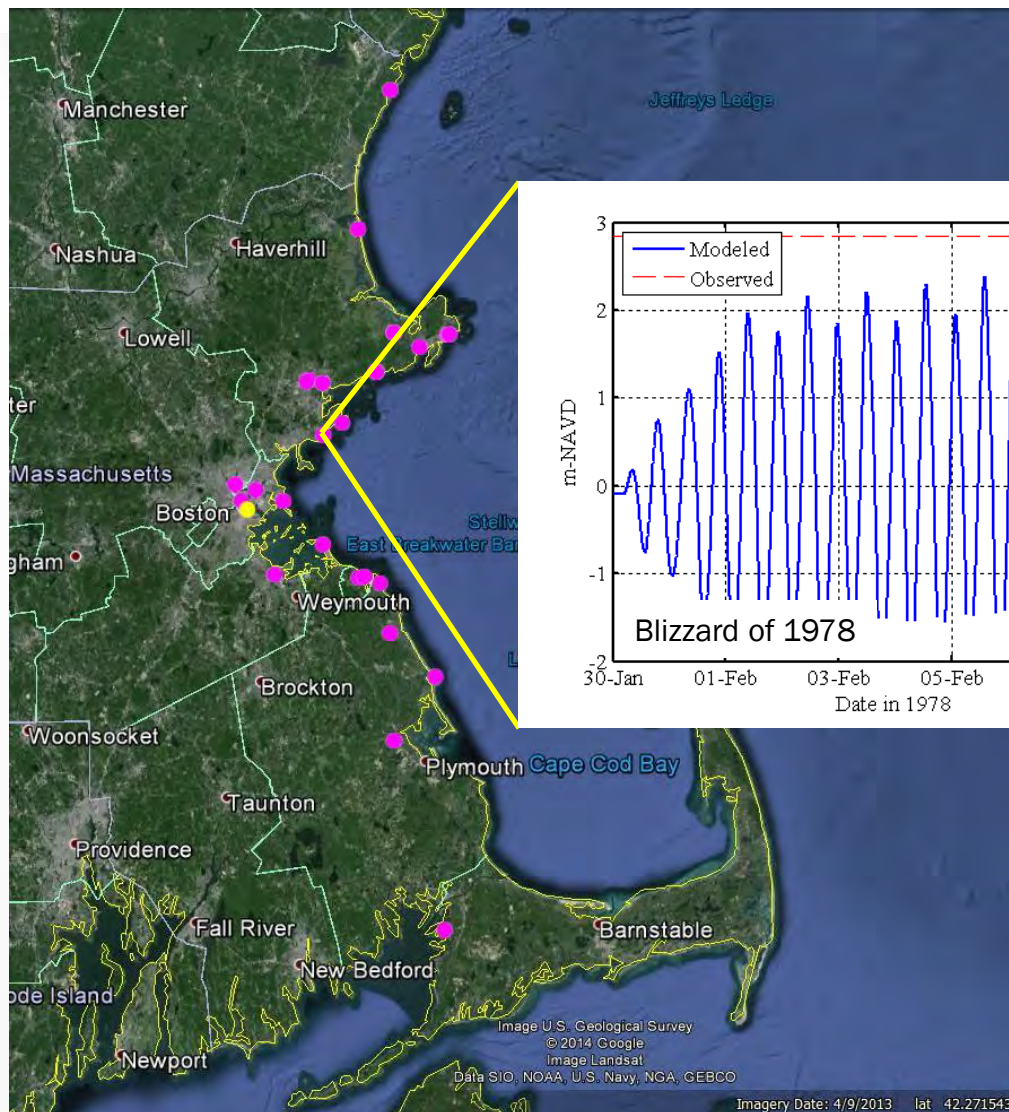
USGS High Water Marks – Blizzard of '78



- 8.44 Lat 42°15'42", long 71°02'51", Quincy, Mass., Gulliger Creek, good to fair debris line in tree 15 ft below West Squantum Street culvert at the corner of Christopher Drive. Tidal surge.
- 10.97 Lat 42°29'32", long 70°50'47", Marblehead Neck, Mass., Marblehead Harbor, fair drift mark 0.65 ft above base of U.S. Postal Service mail box at corner of Causeway Street and Harbor Avenue. Waves driven over seawall and road.
- 6.62 Lat 42°49'52", long 70°51'52", Salisbury, Mass., good ice ring, nail, flag on western support of billboard, west side of U.S. Route 1A (Bridge Road), 0.6 mi south of junction of U.S. Route 1A and State Route 110. Cause of flooding uncertain.



Storm Calibration



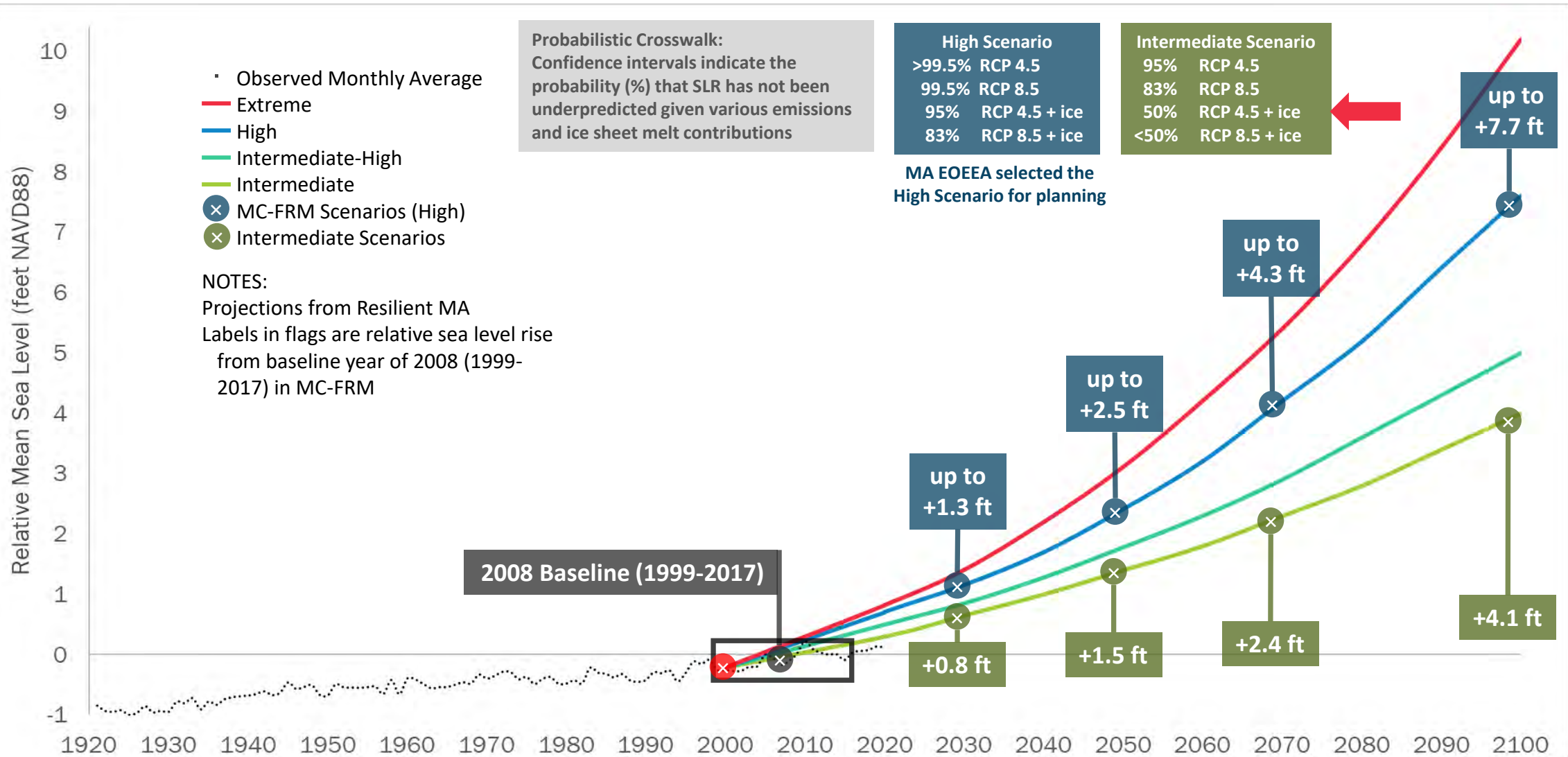
Sea Level Rise

- Regional Concentration Pathways
- Start Date
- Crosswalking

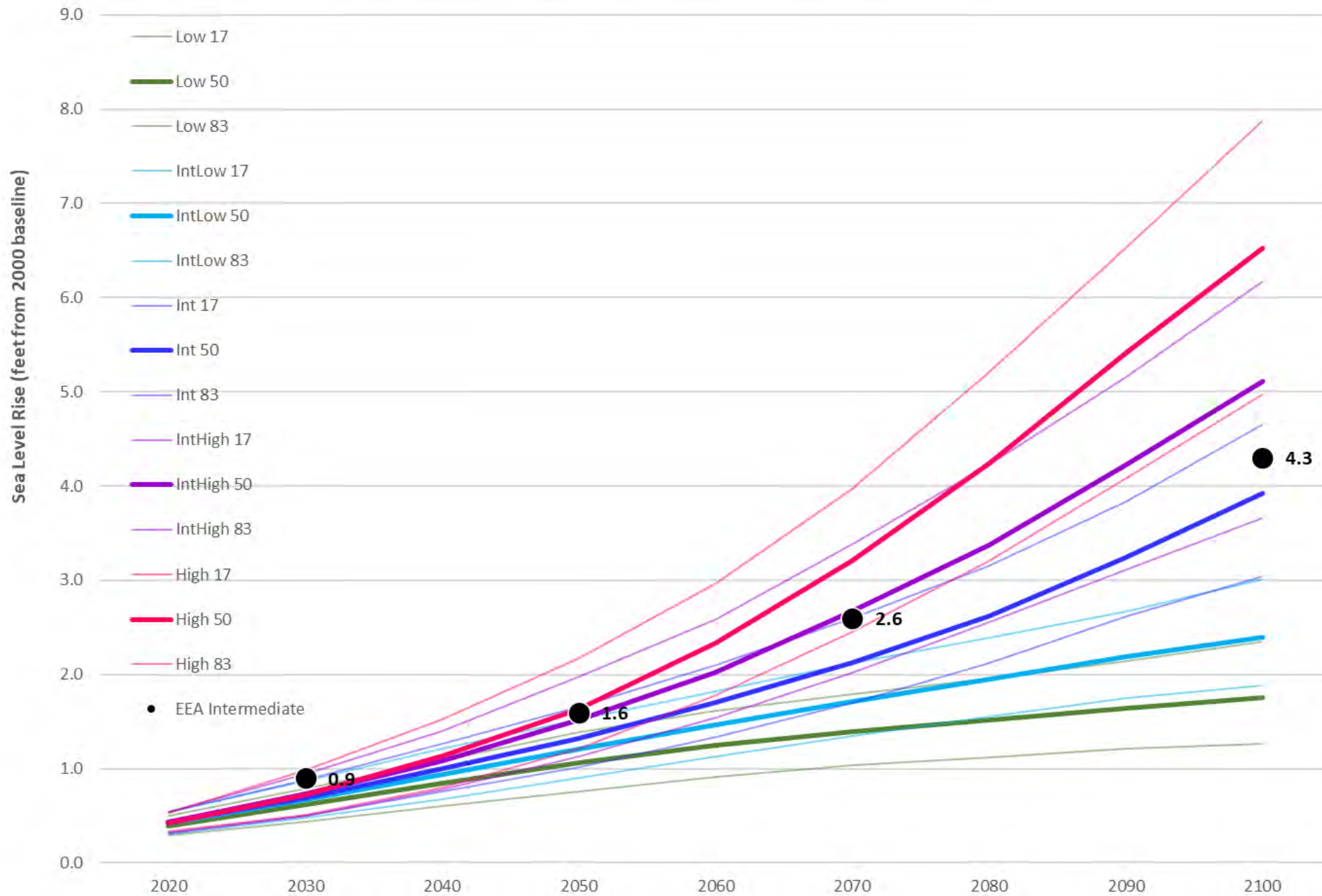


MA EOEEA Probabilistic Sea Level Rise Projections

MC-FRM NORTH (DeConto & Kopp, 2017)



NOAA (2022) vs. MA EOEEA (DeConto SLR Projections)



MC-FRM Advantages and Limitations



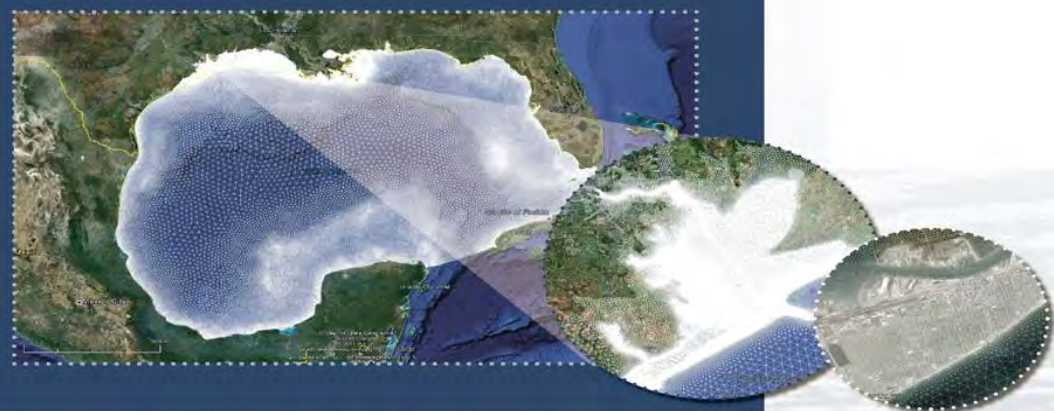
Advantages
Limitations



1) High Resolution

- Unstructured grid allows for varying resolution
- Overland resolution of 3-7 meters

2) Hydrodynamic, Physics-based



- Simulates the physical flow of water, waves, wind, surge, currents, and tides.
- Includes dynamic runup and overtopping
- Non-linear effects

3) High Priority Tidal Structure Flow

- Major Coastal Structures
- Dams with operations (sluicing, pumps)
- Culverts and Bridges (NH and ME)

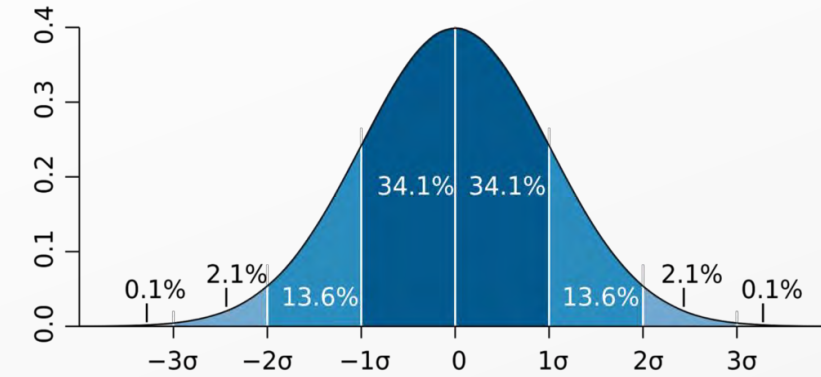
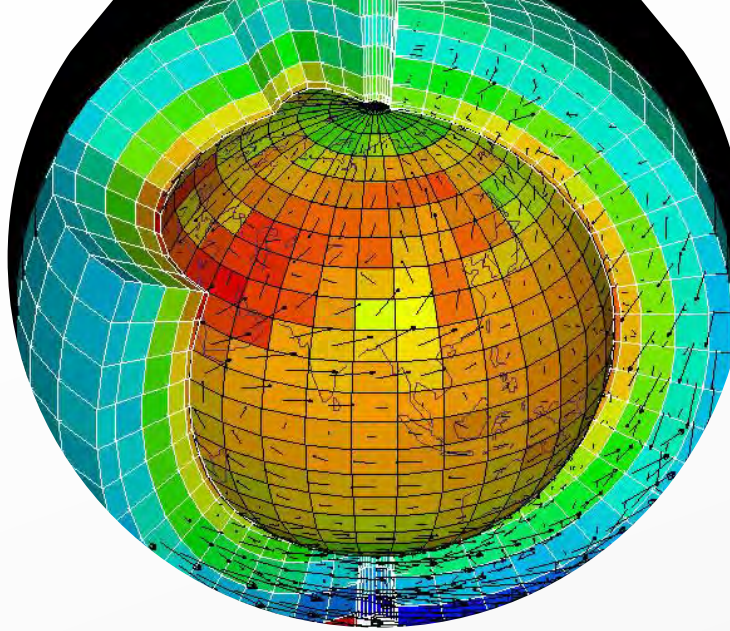


4) Changing Climate

- Utilizes 4 Global Climate Models
- Increasing intensity and frequency of tropical cyclones

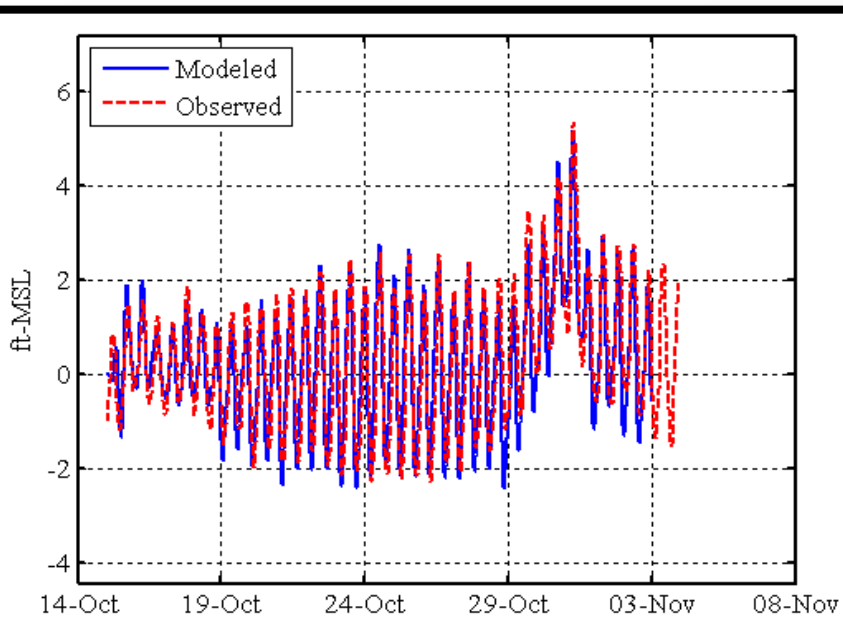
5) Calibrated and Validated

- Calibrated to historic storms
- Validated against most recent storms
- Peer reviewed (WHOI, USGS, NOAA, USACE, FHWA, and EPA)



6) Probabilistic

- Simulates thousands of storm events
- Monte Carlo approach
- No need to determine joint probabilities

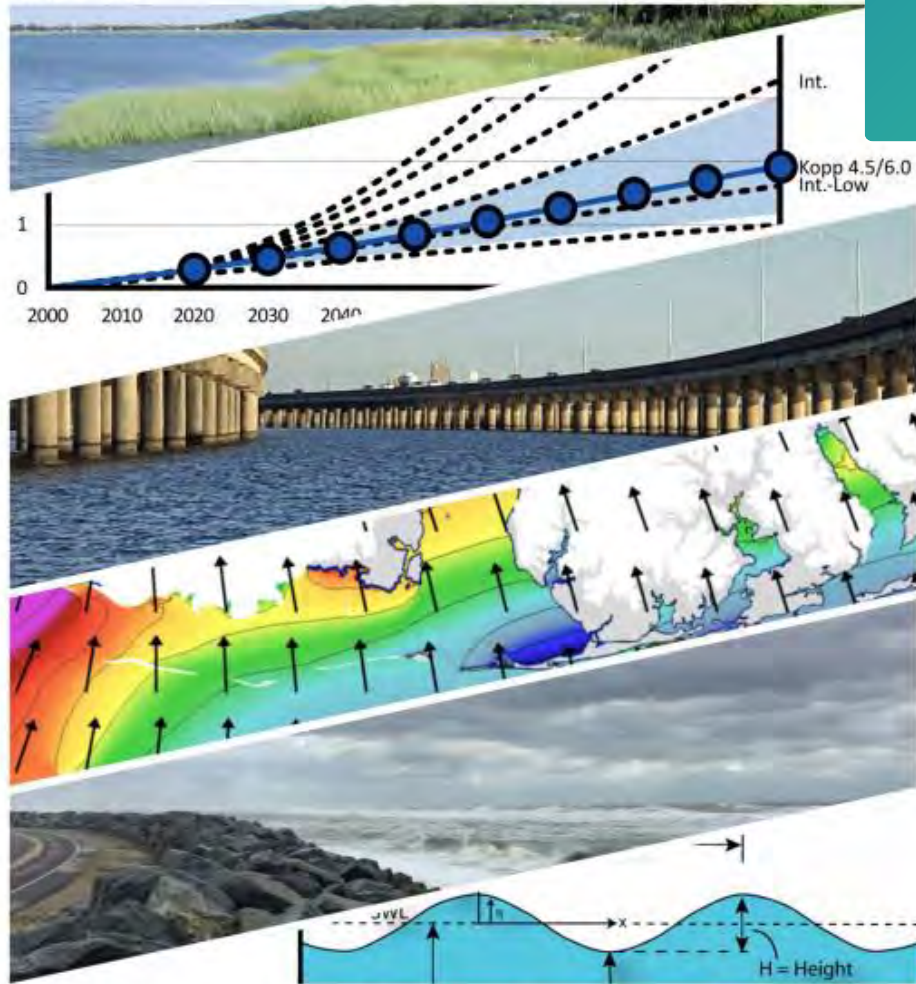




U.S. Department
of Transportation
**Federal Highway
Administration**

Publication No. FHWA-HIF-
January

Hydraulic Engineering Circular



Highways in the Coastal Environment

Third Edition

FHWA – LEVEL 3 Approach

- “...a comprehensive Level 3 approach”
- “...an excellent example of coastal transportation vulnerability assessment.”

MC-FRM Limitations



Sea level rise is not probabilistic



Digital elevation model is fixed in time and does not include geomorphic change



Culverts and crossings



High resolution, but not micro resolution

MC-FRM Limitations

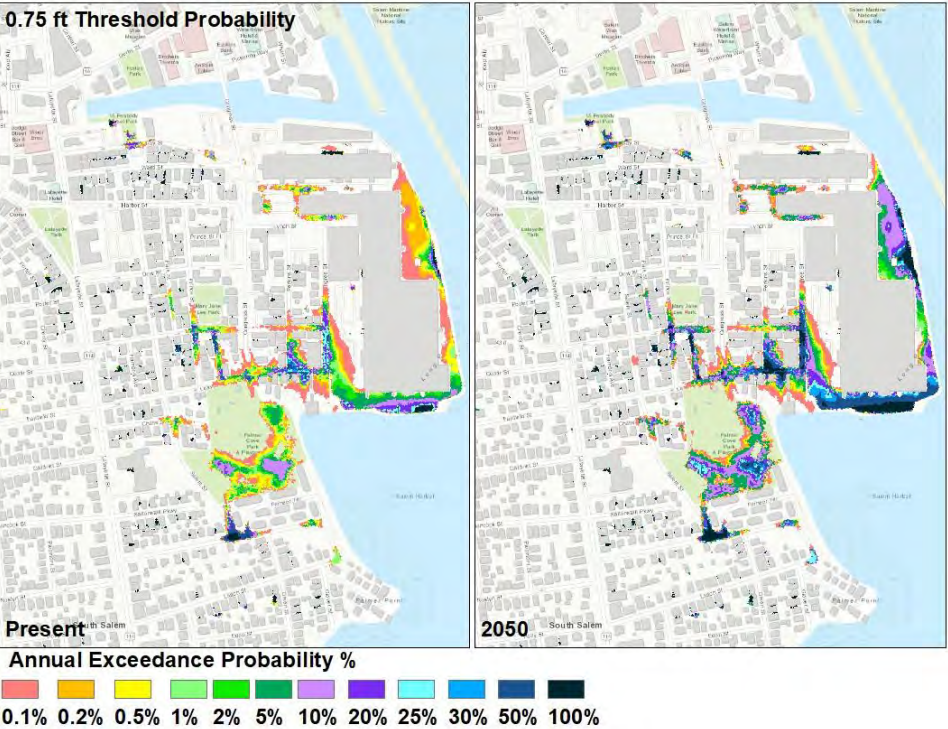
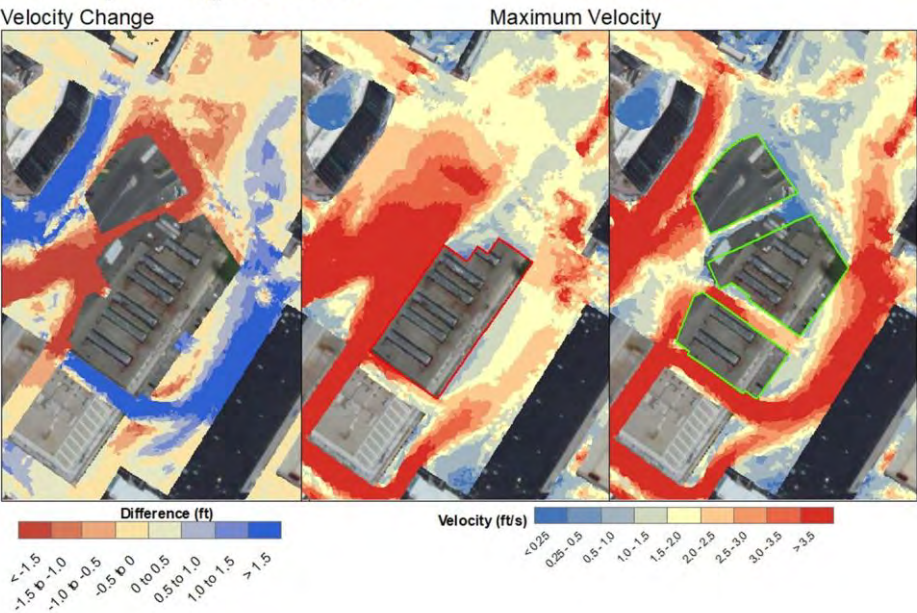


Buildings are not included explicitly



No Precipitation-based flooding

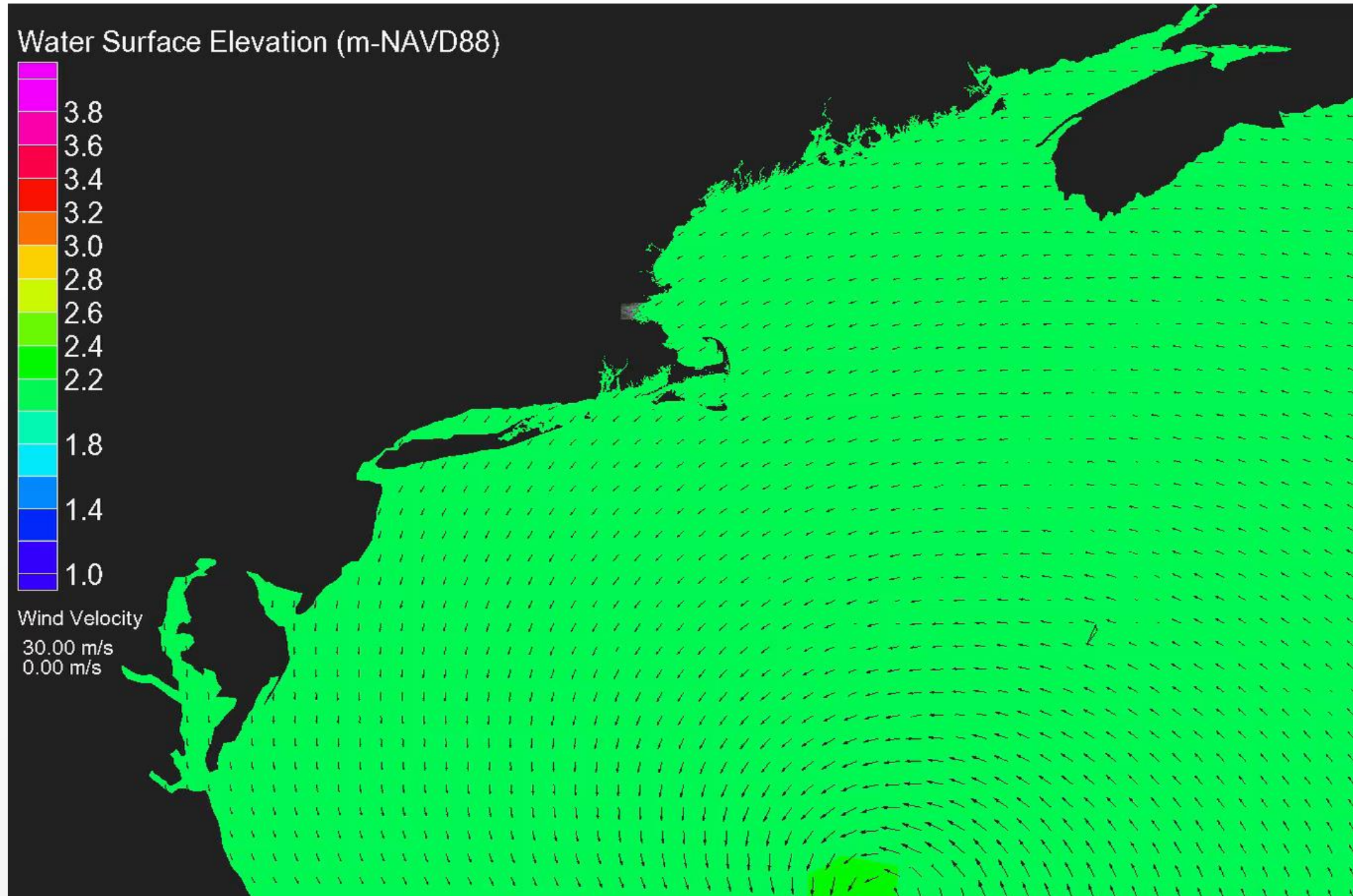
Velocity Change Storm 3



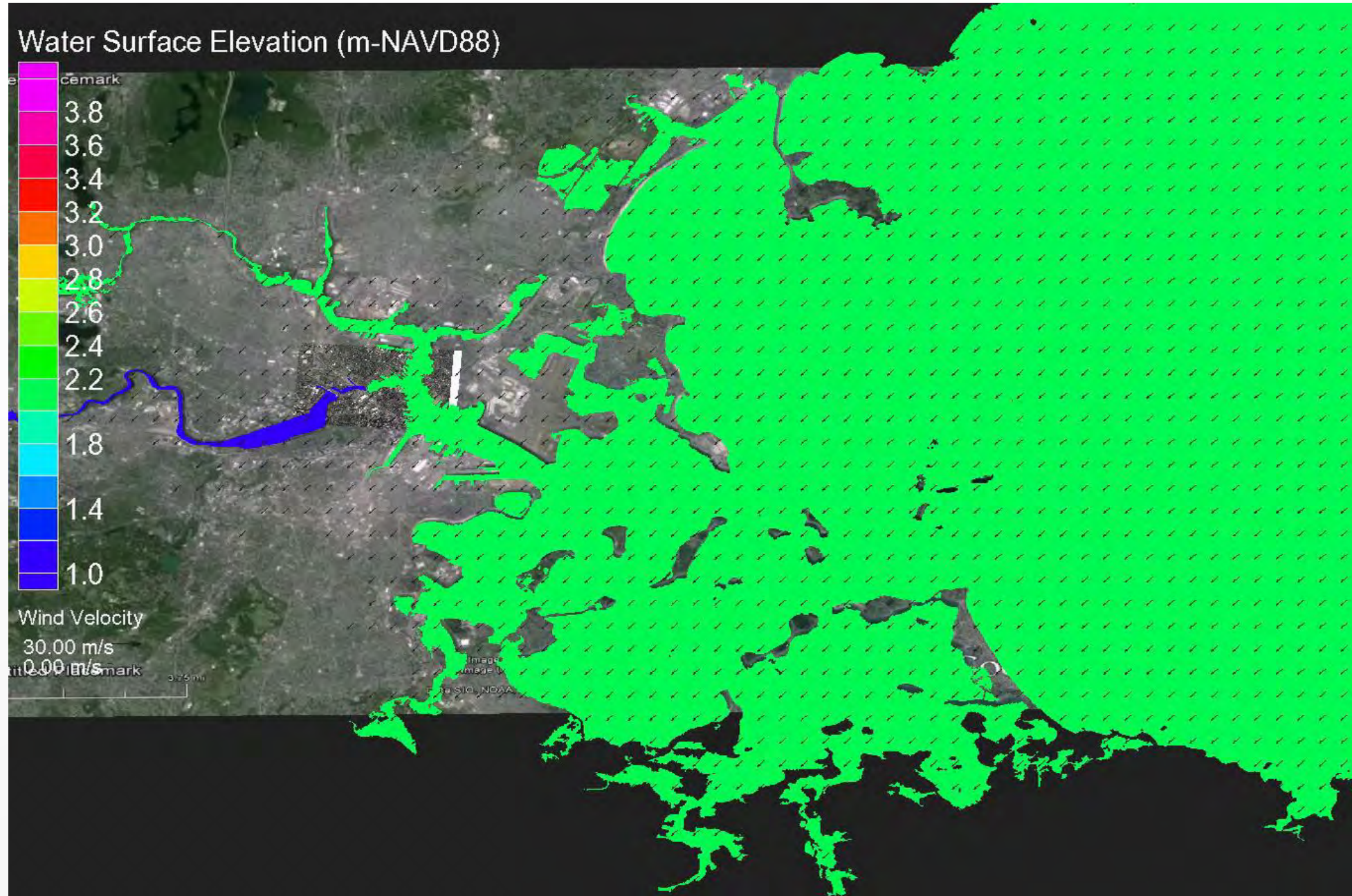
Level 1 Data Outputs



Example – Tropical Cyclone

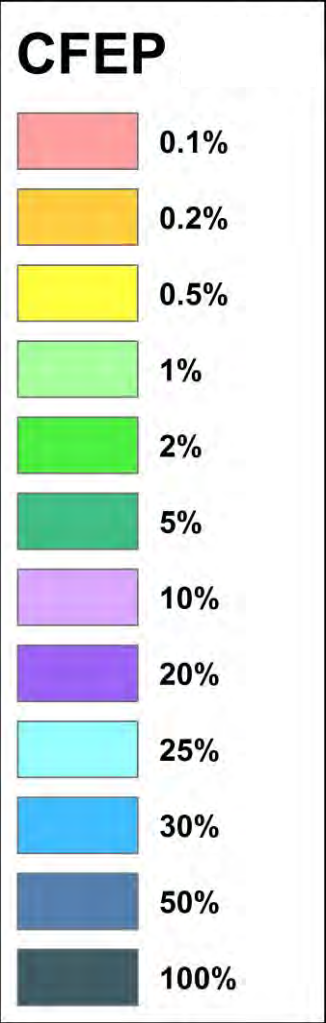
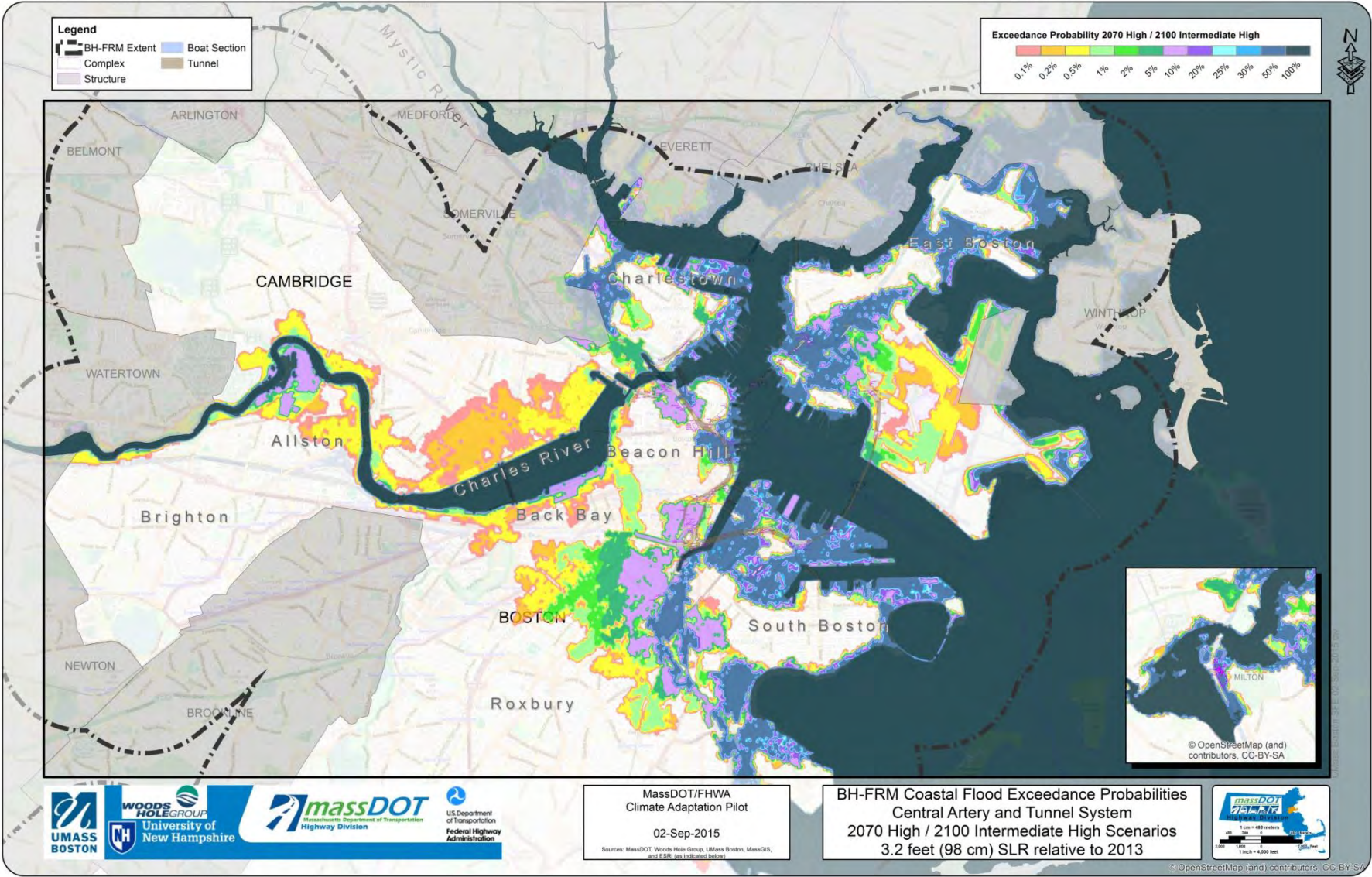


Example – Tropical Cyclone

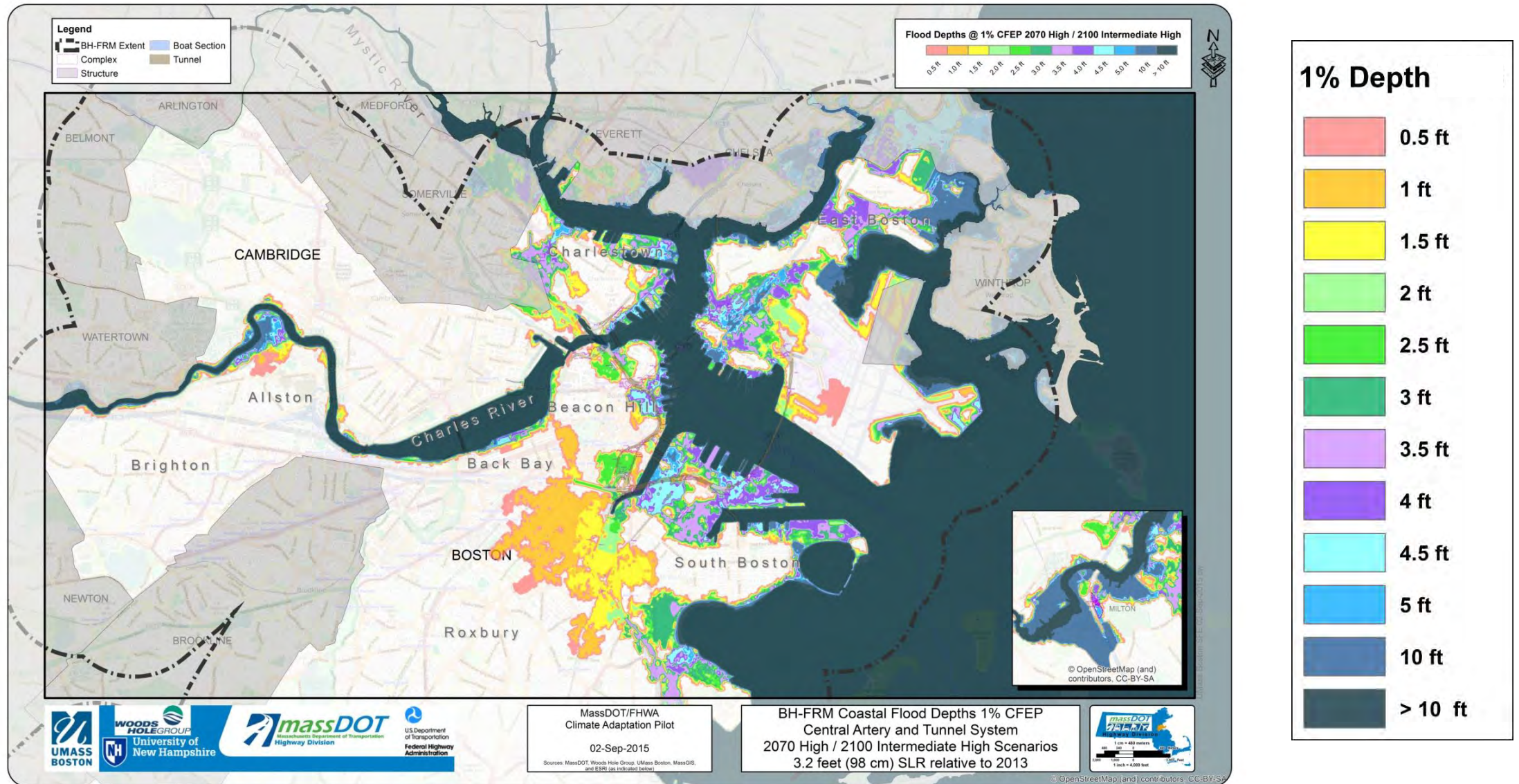


Exceedance Probability Maps

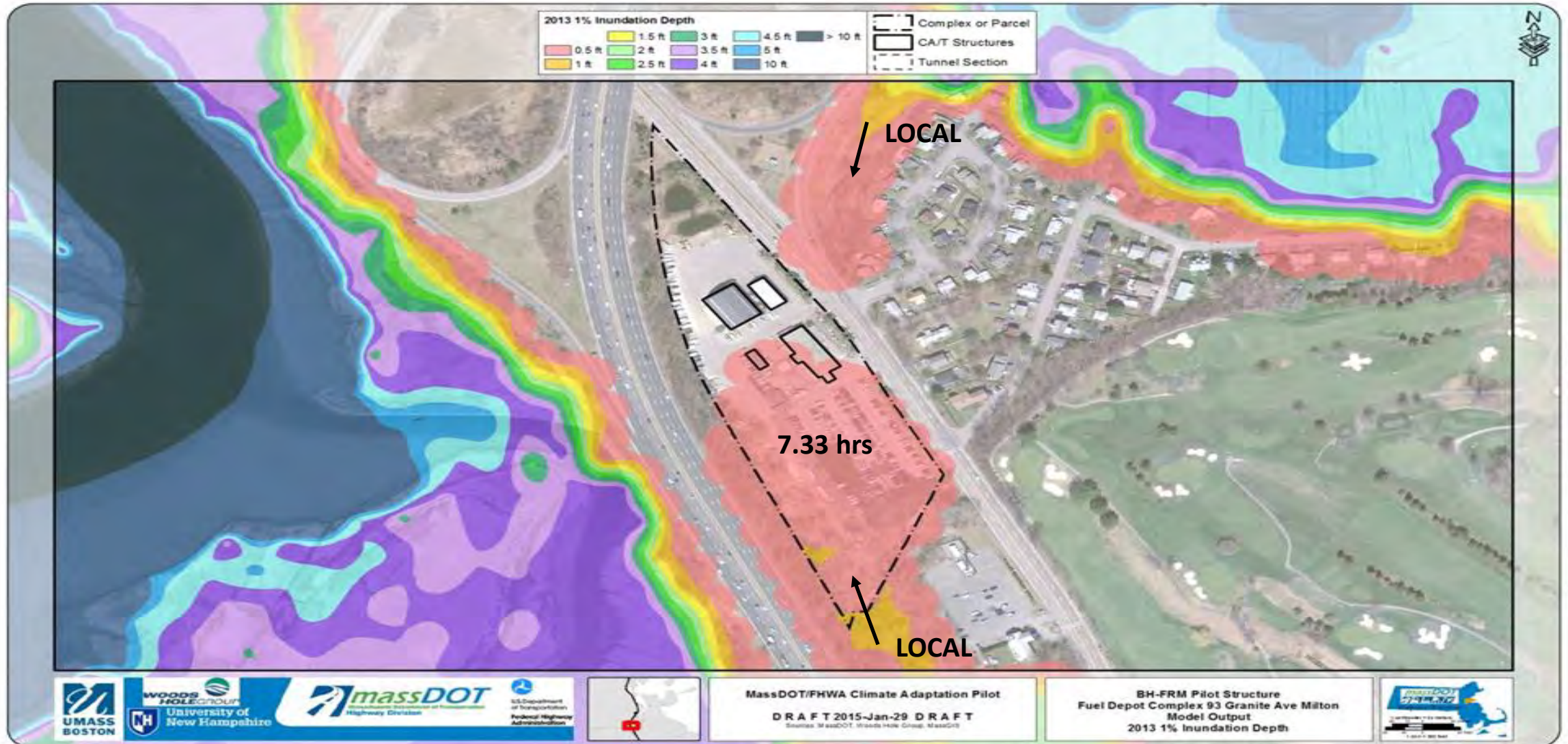
Coastal Flood Exceedance Probability



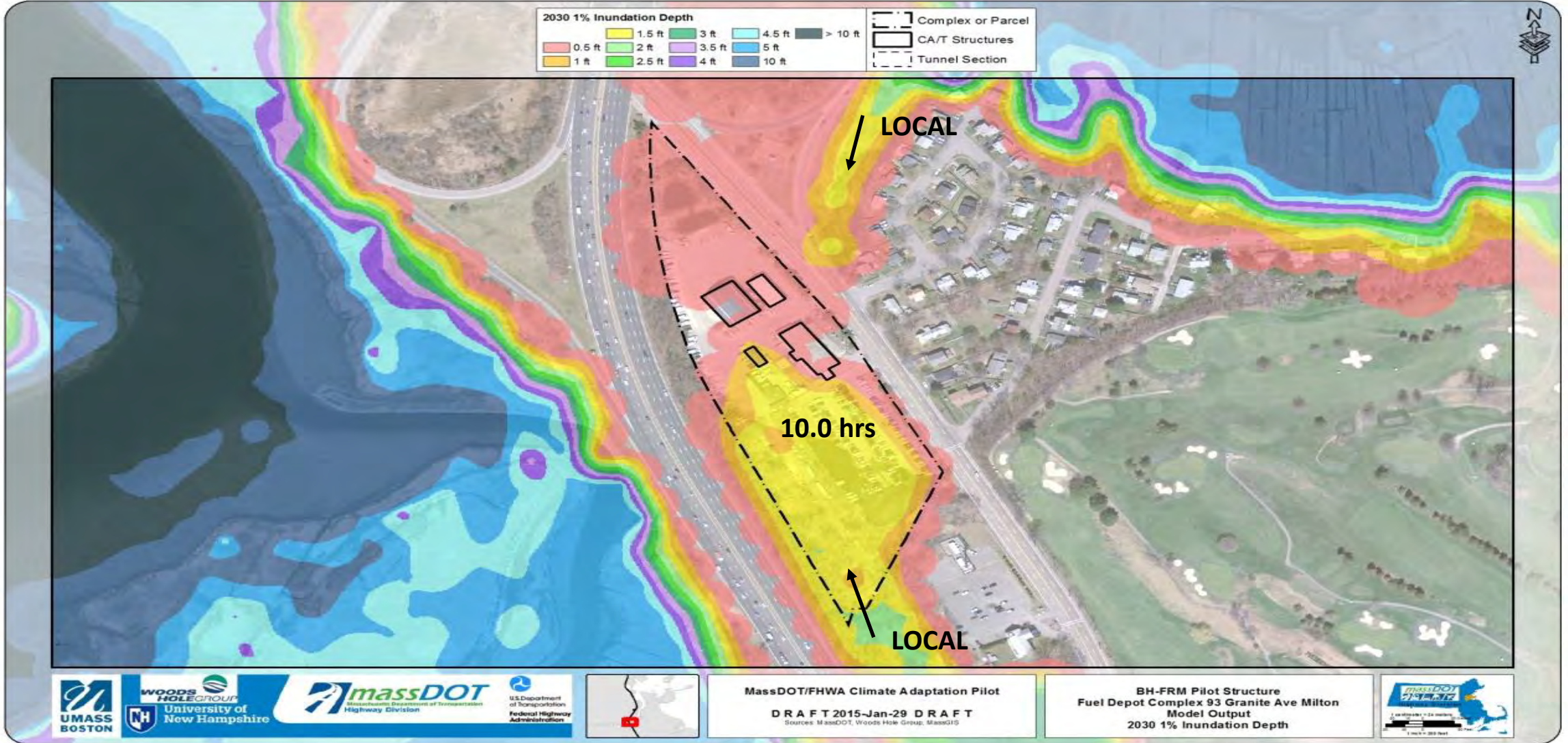
Depth of Inundation Maps



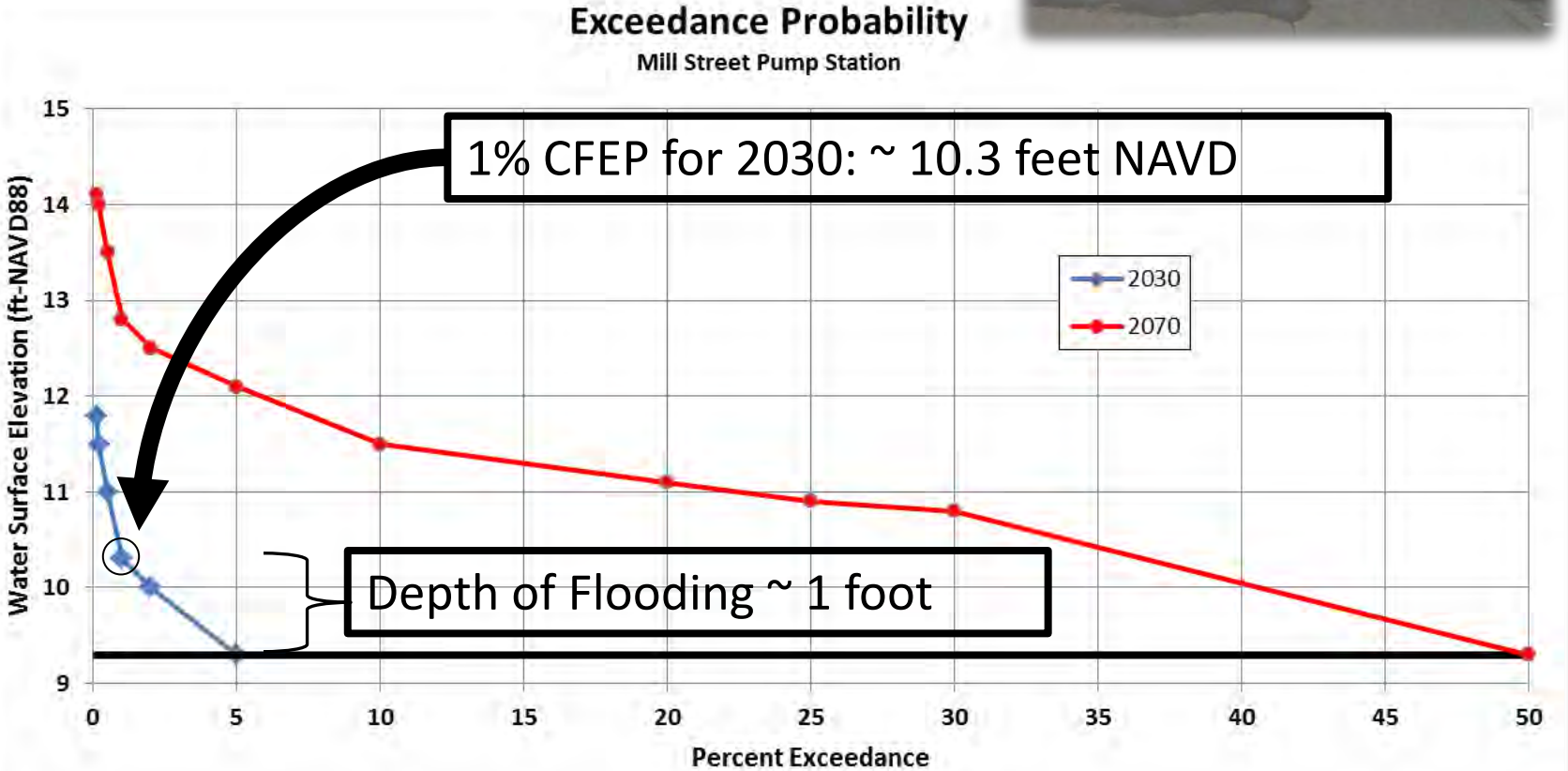
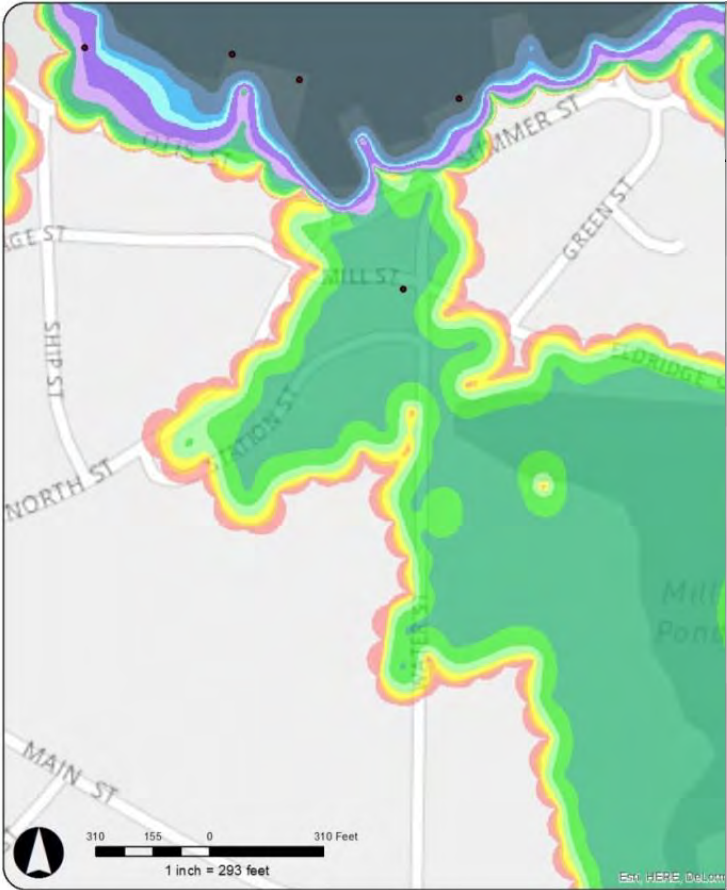
BH-FRM Assessment



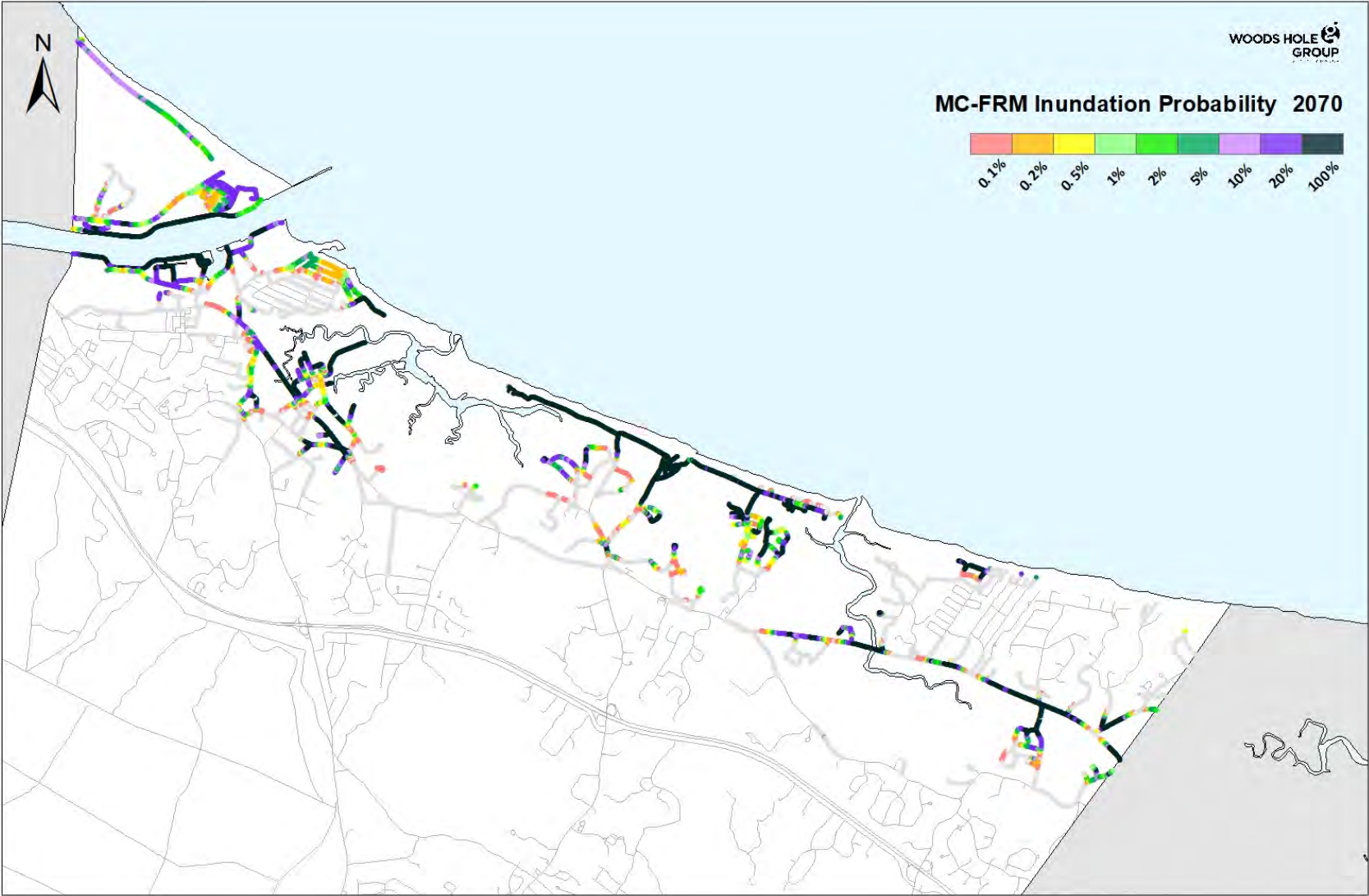
BH-FRM Assessment



Site Specific Information

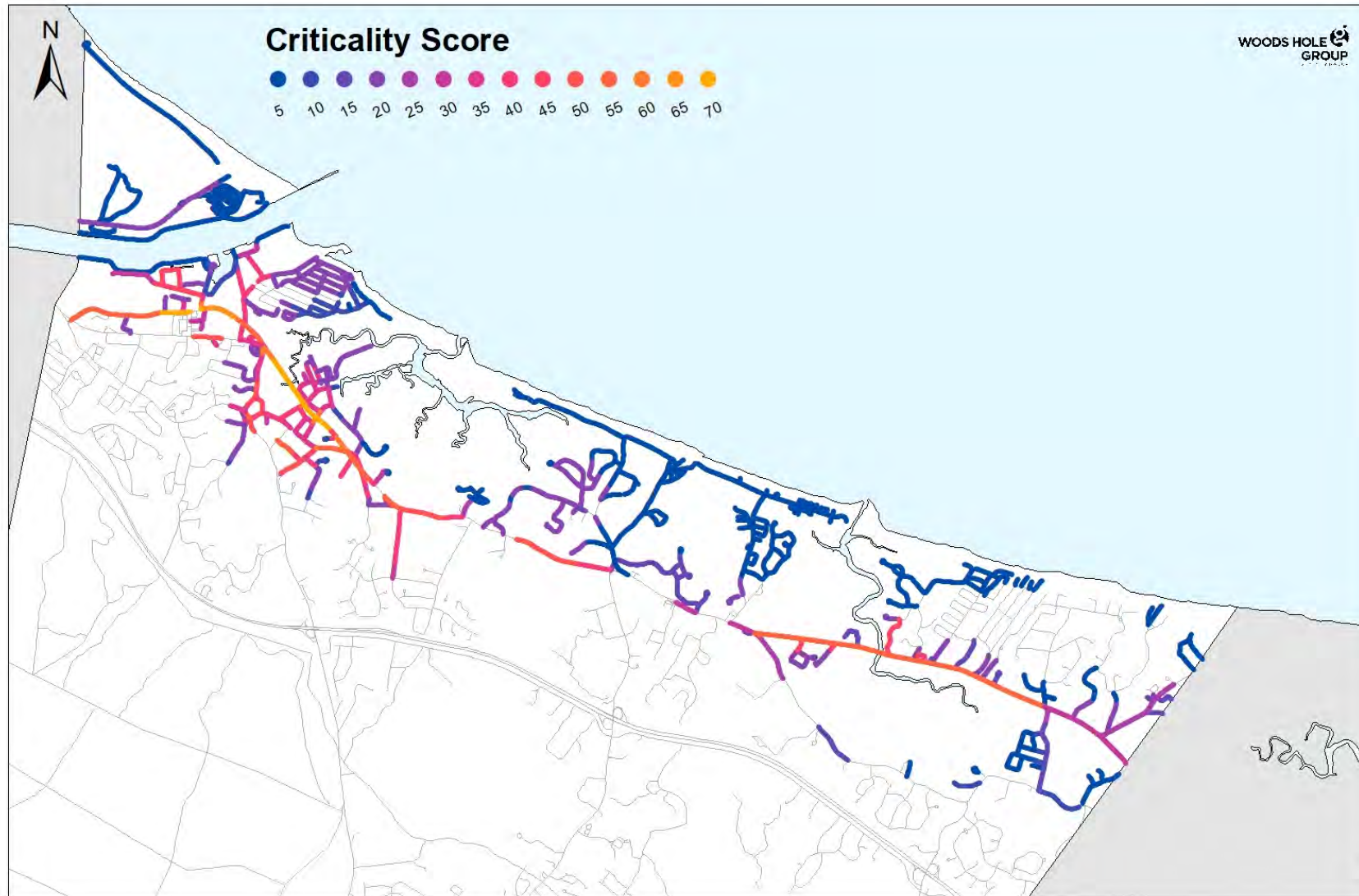


Low Lying Roads 2030 Inundation Probability (Sandwich)

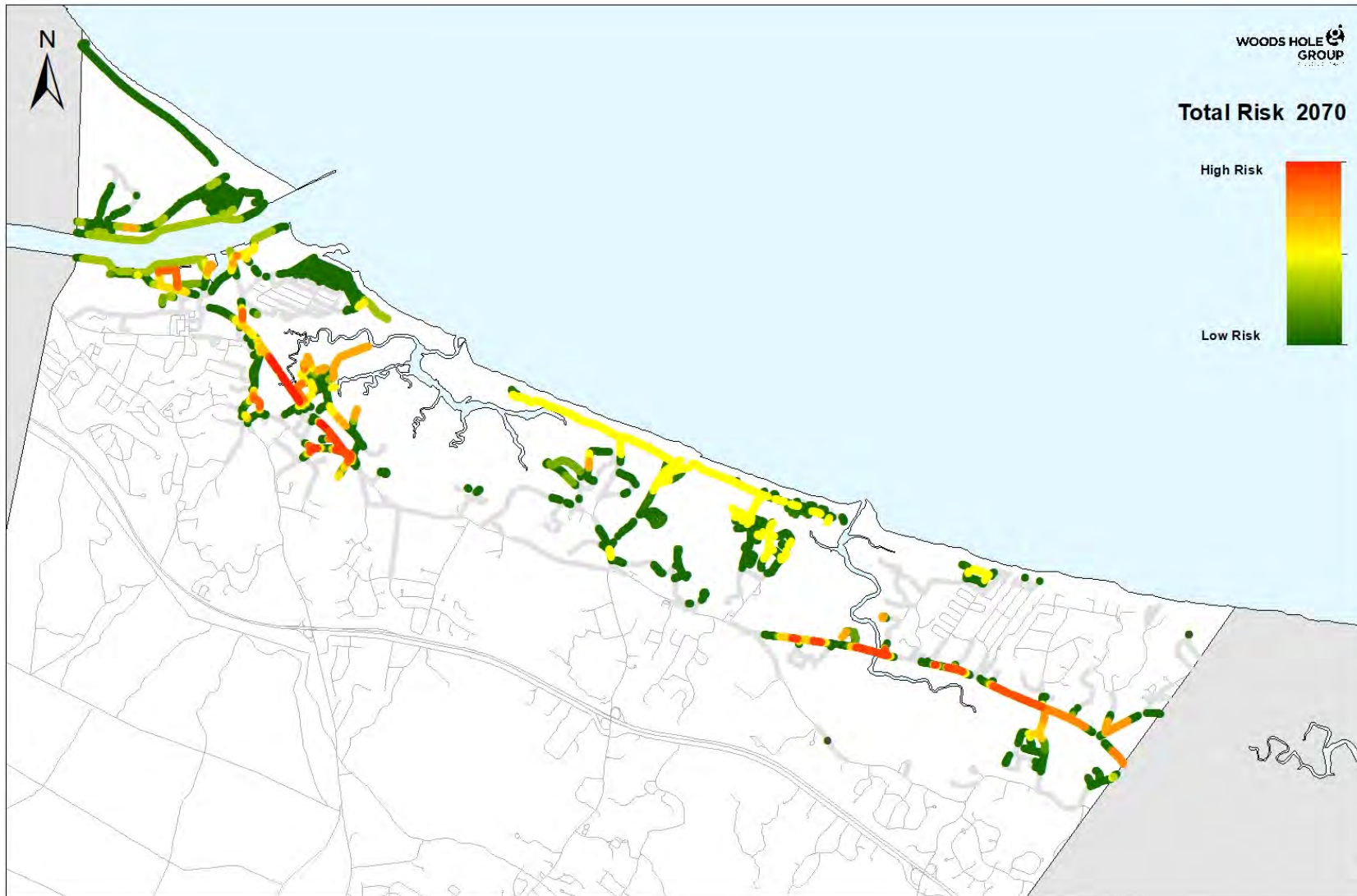


	%	Road miles
	0.1	31.3
	0.2	28.5
	0.5	26.3
	1	24.7
	2	23.1
	5	20.8
	10	18.5
	20	16.1
	100	11.3

Low Lying Roads Criticality Scoring (Sandwich)



Low Lying Roads 2070 Risk Results (Sandwich)



High Risk Road Segments

Route 6A (Joslin Ln)*

River St

Route 6A (Howland Ln)*

Jones Ln (Scorton Creek & Route 6A)

Boardwalk Rd

Dewey Ave

Route 6A (Old Main St intersection)*

Route 6A (Scorton Creek Bridge)*

Route 6A (Mill Creek Bridge)*

Willow St and Jarves St

Sandy Neck Rd and Cranberry Trail

Beale Ave and Main St

Town Neck Rd

Scusset Beach Rd

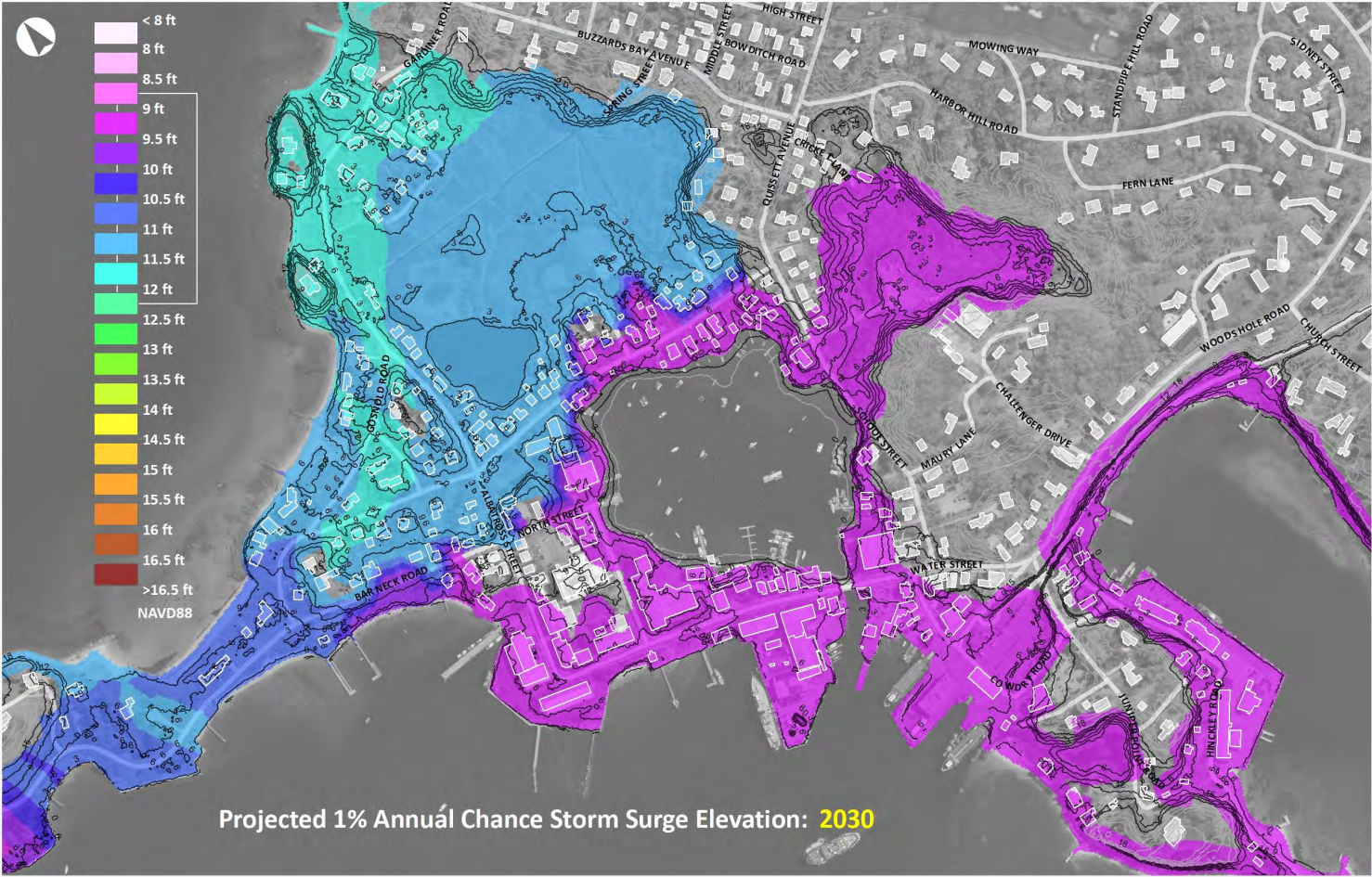
Ploughed Neck Rd

Spring Hill Rd

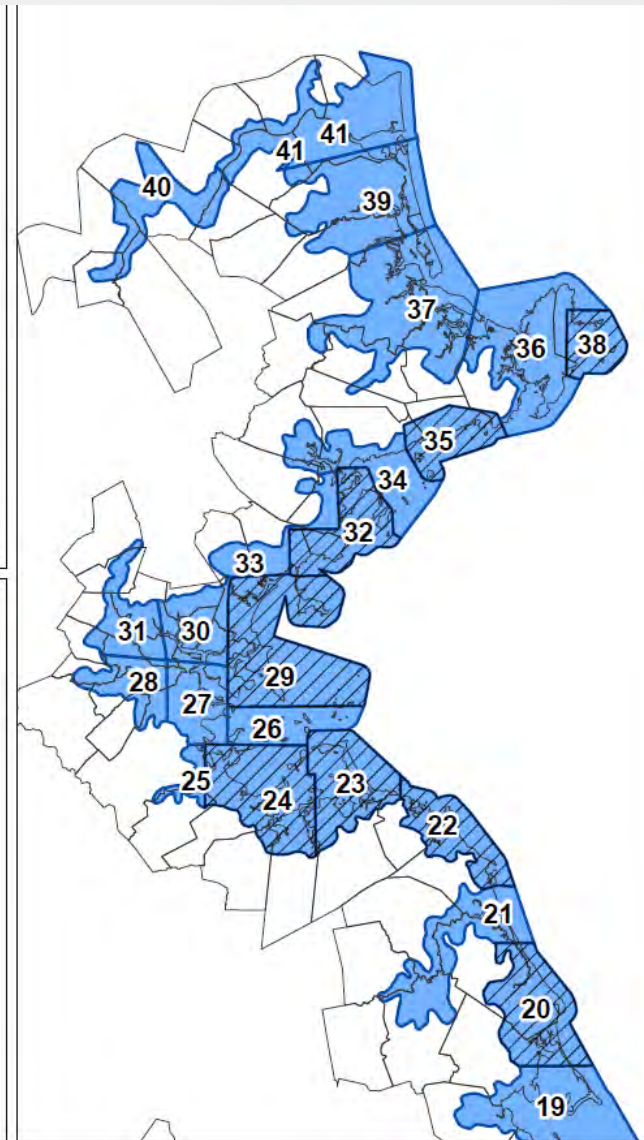
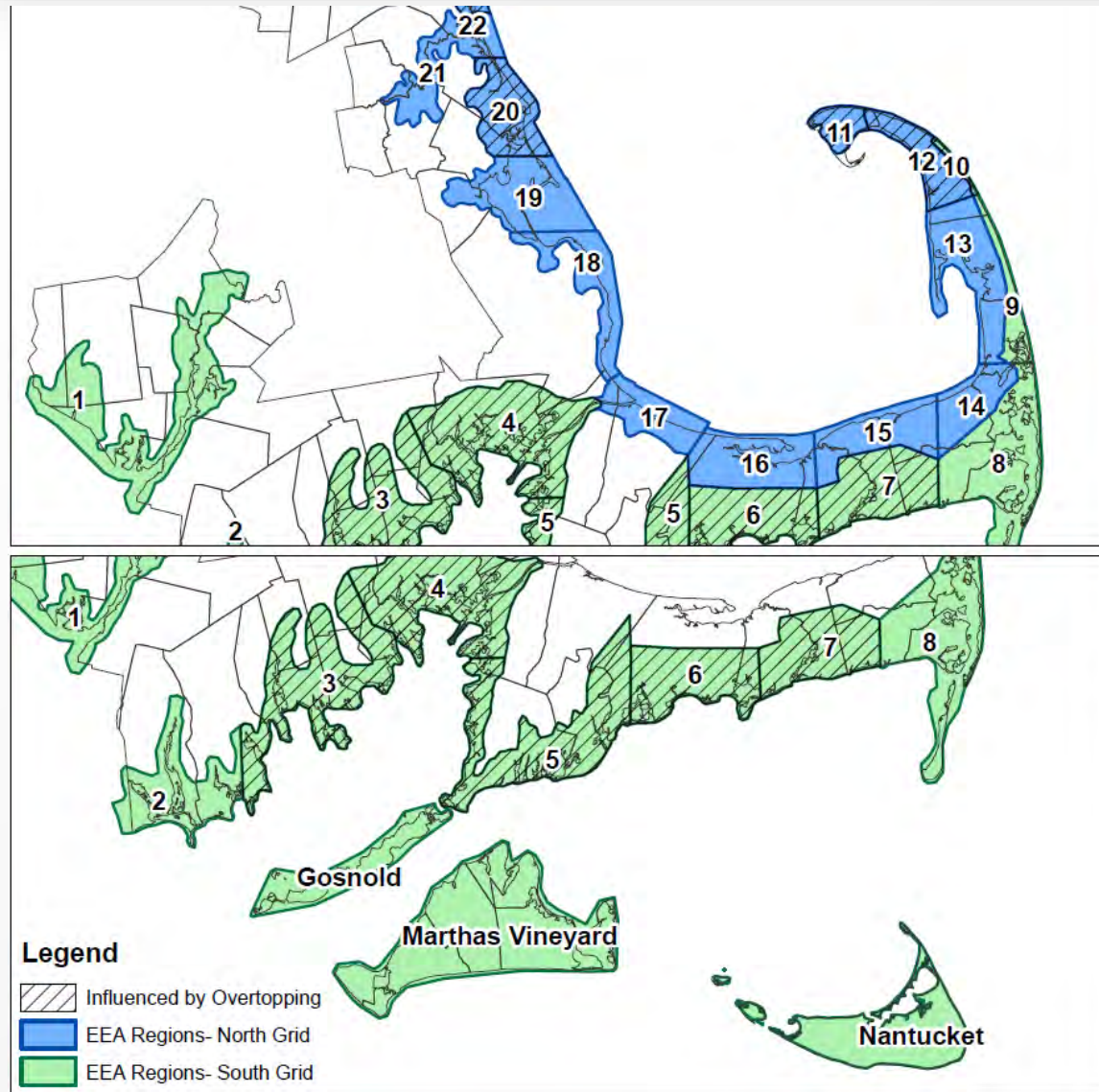
Foster Rd (Old Harbor Creek)

Wood Ave

Level 2 Data Outputs



Level 2 MC-FRM Regions



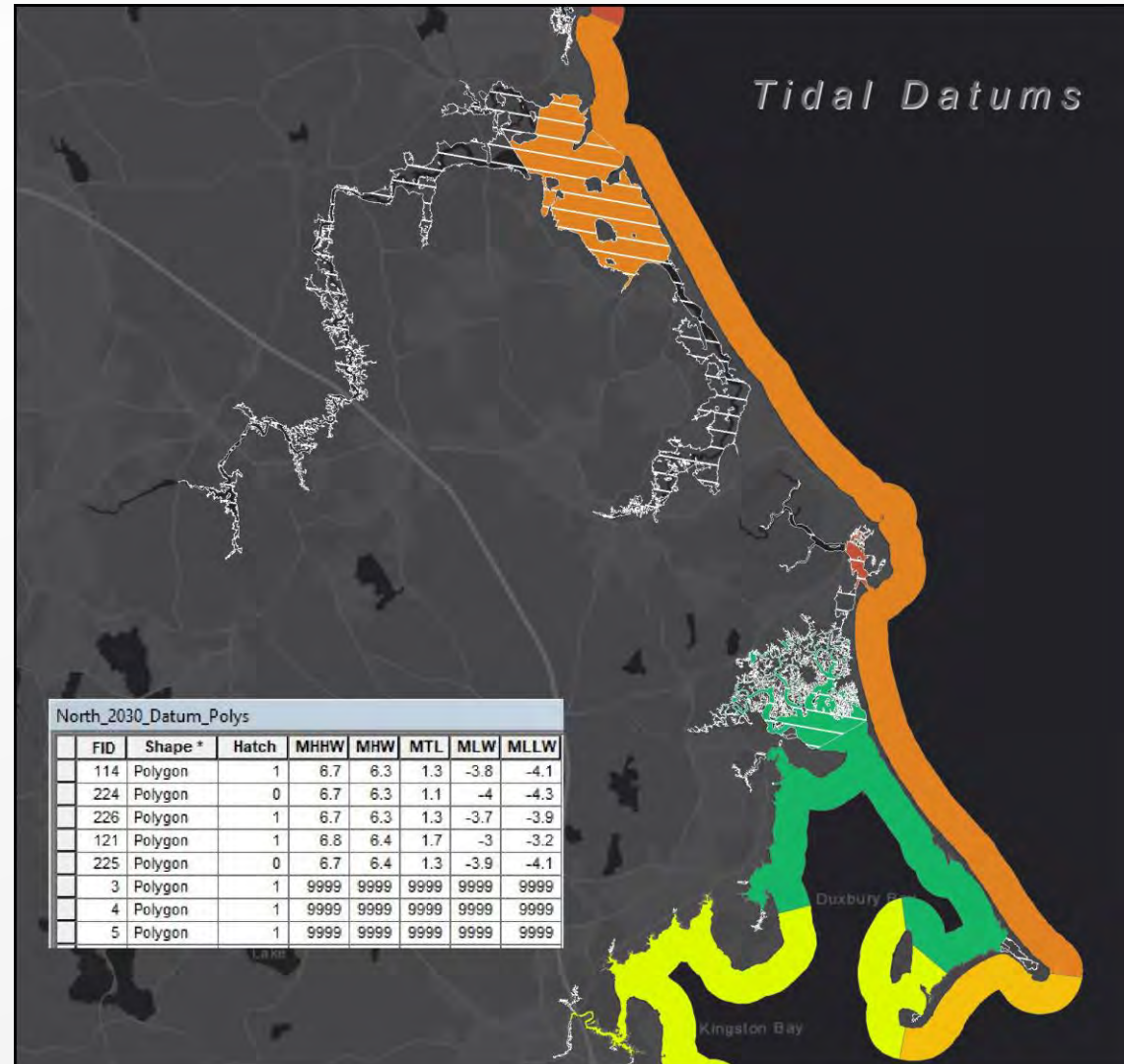
44 total regions

2,322 raster files

Tidal Datums

5 tidal datums (MHHW, MHW, MTL, MLW, MLLW) in 2030, 2050, and 2070

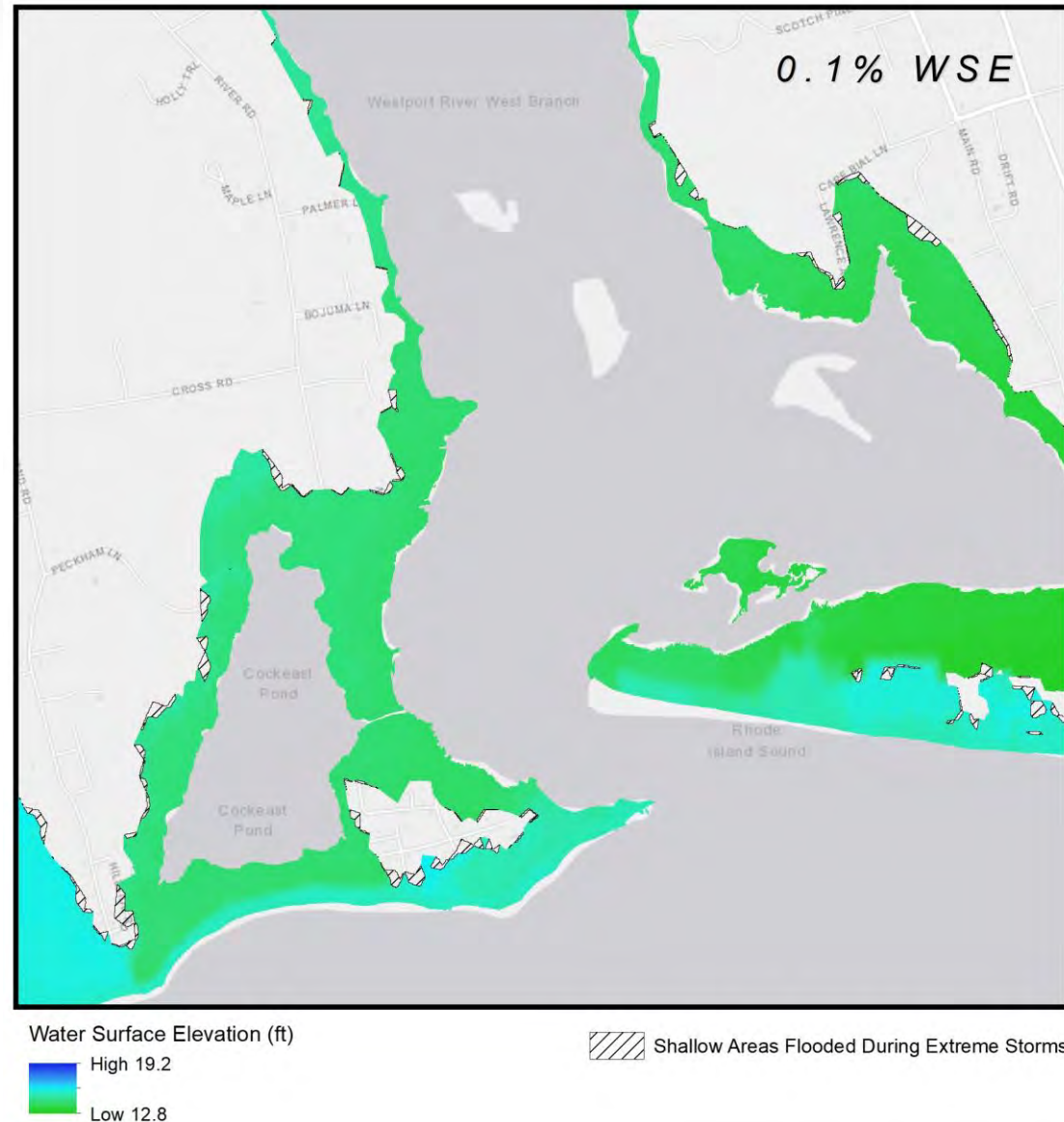
- Shapefiles as shore-parallel extents
- Rounded to the nearest 0.1 foot in NAVD88 vertical datum
- Special hatched areas indicate areas of uncertainty (can be with or without values), care needs to be taken in these areas when applying tidal datum values
- Does not map the extent of tidal flooding



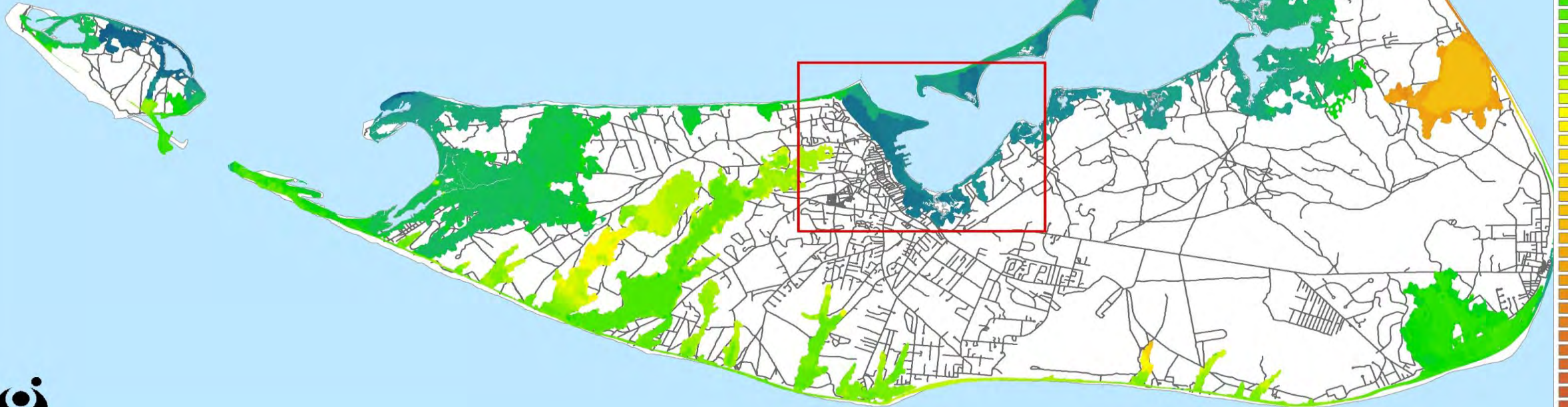
Water Surface Elevations (Stillwater Levels)

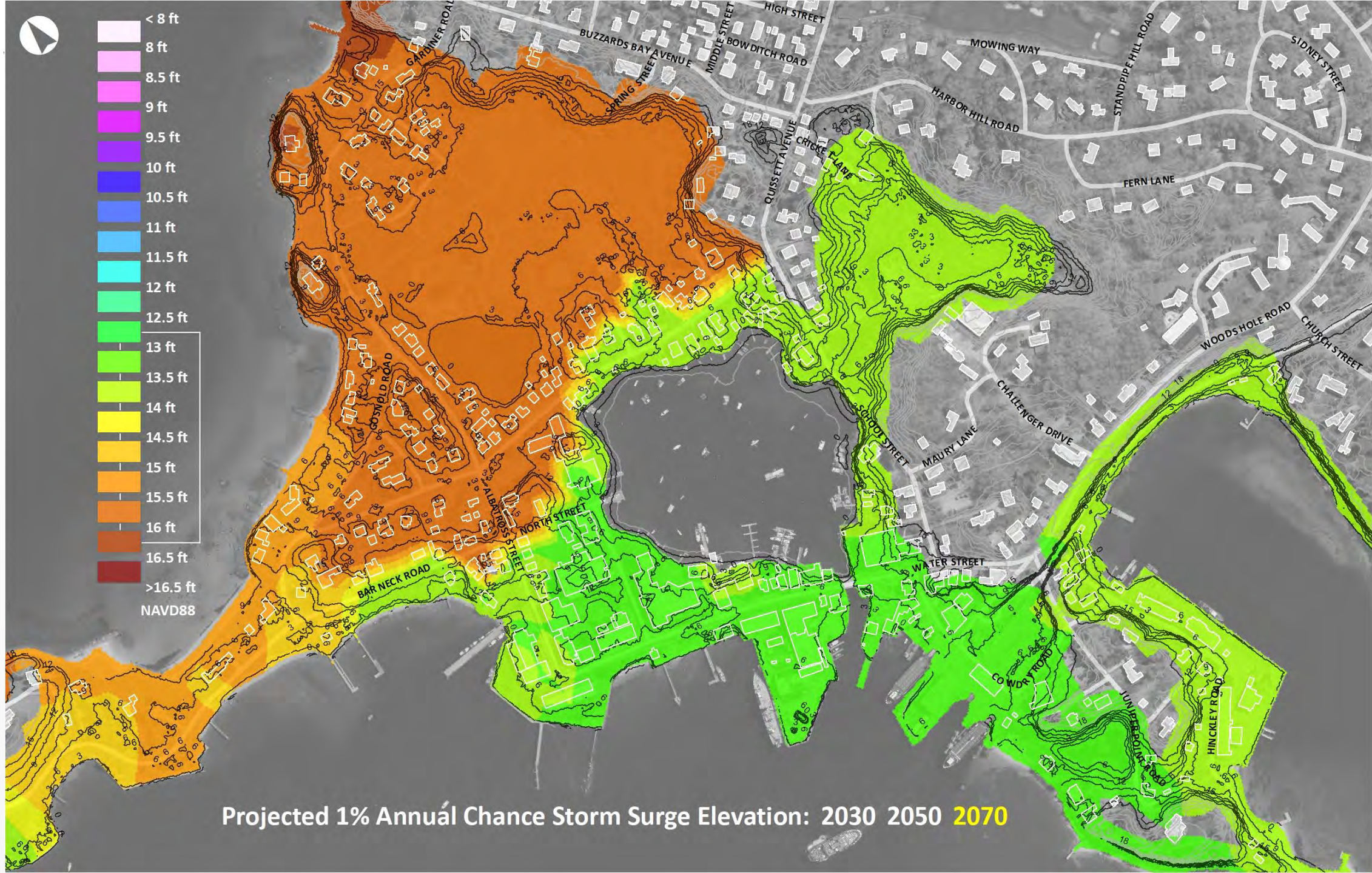
Available for six (6) AEP levels (0.1%, 0.2%, 0.5%, 1%, 2%, 5%) for 2030, 2050, and 2070. <- 18 data sets!

- geoTIFF raster files
- Rounded to the nearest 0.1 foot in NAVD88 datum
- Matches Level 1 extent exactly
- Data only provided in overland areas (above MHW)
- Special hatched areas



Water Surface Elevation 2070 Raster 1%



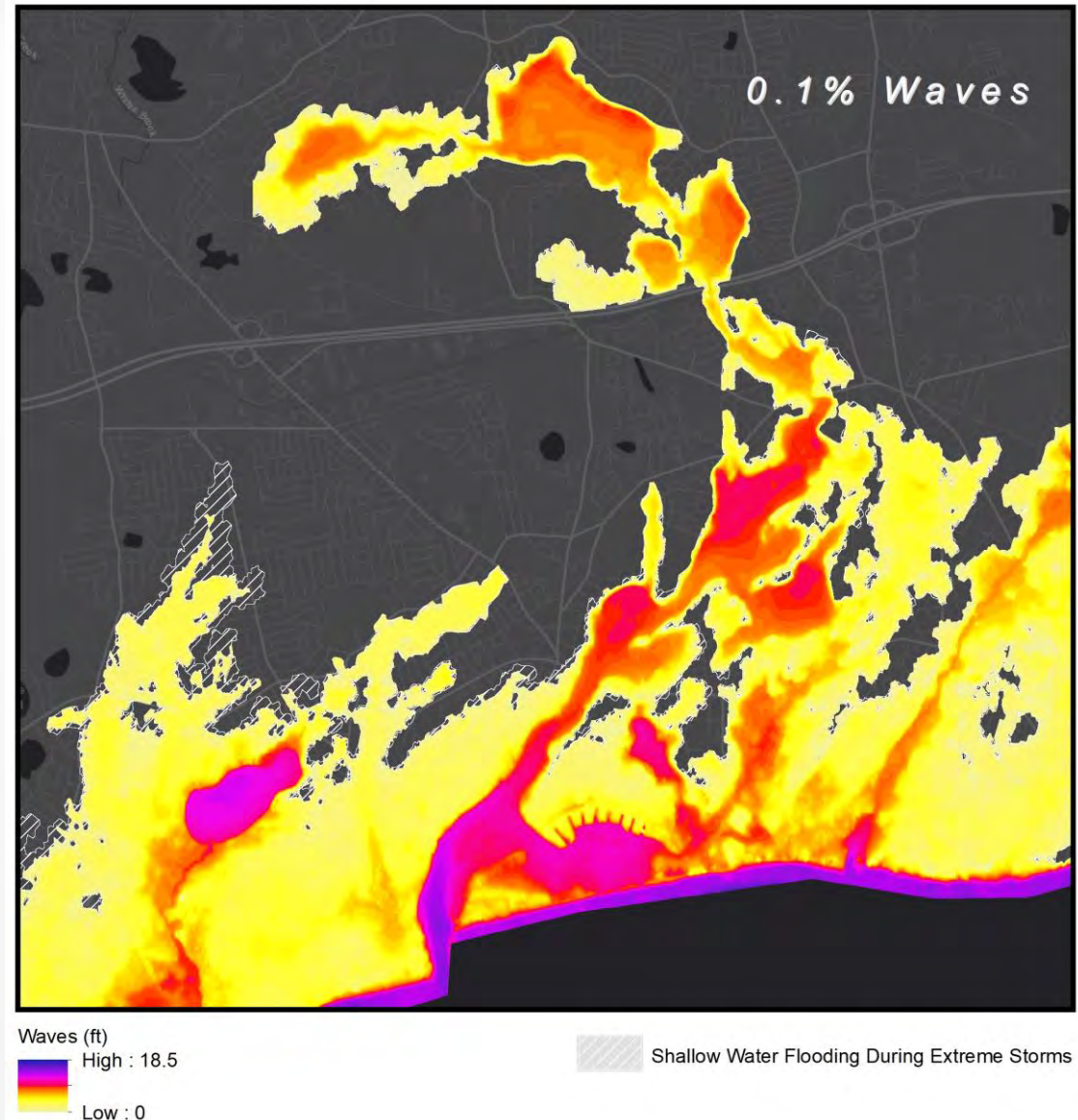


Projected 1% Annual Chance Storm Surge Elevation: 2030 2050 **2070**

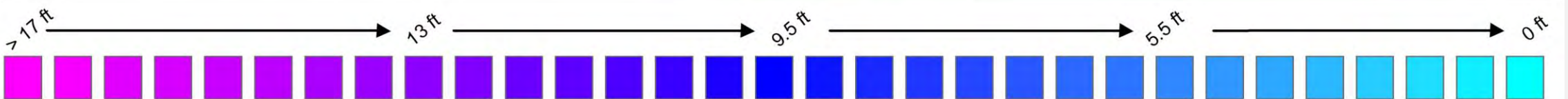
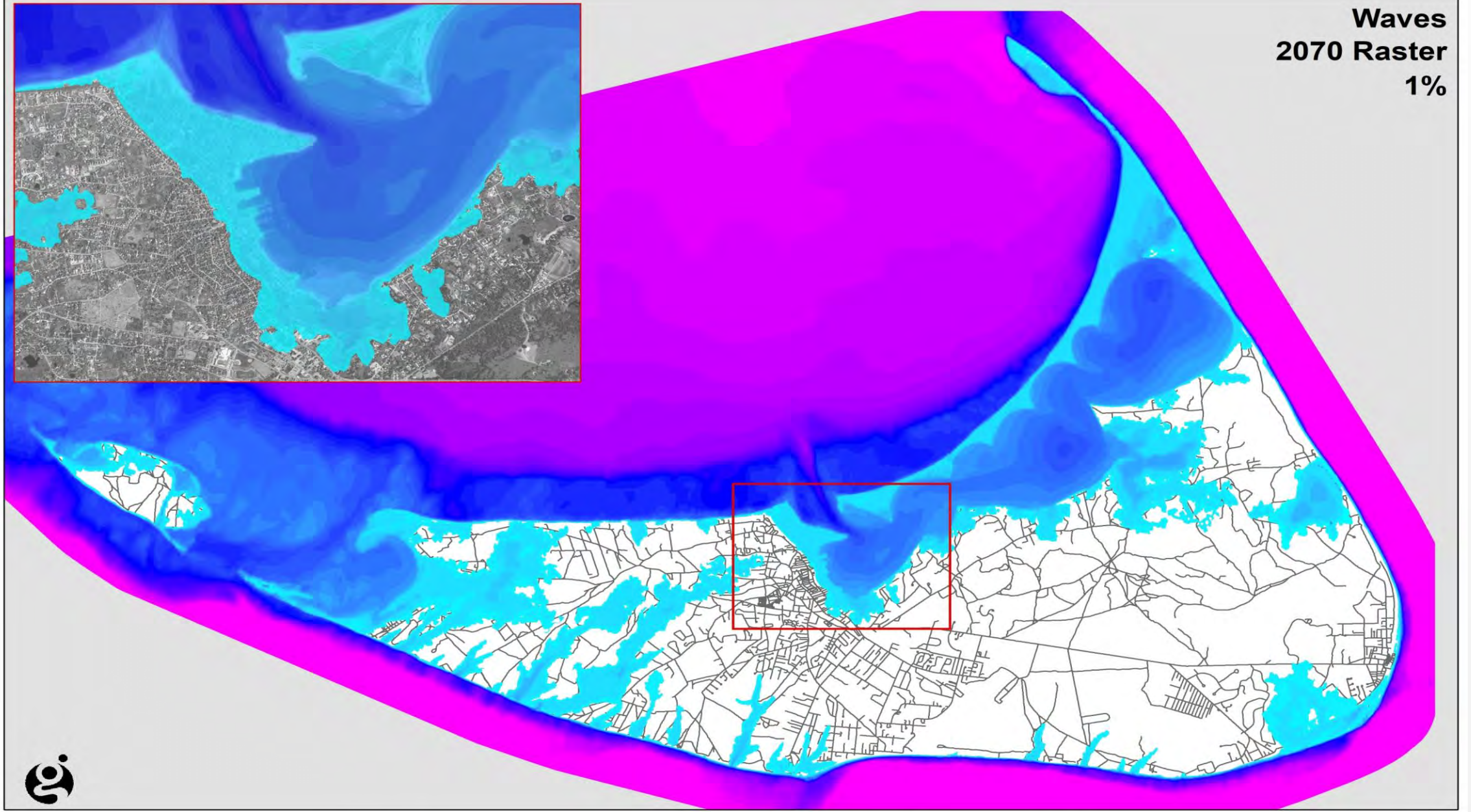
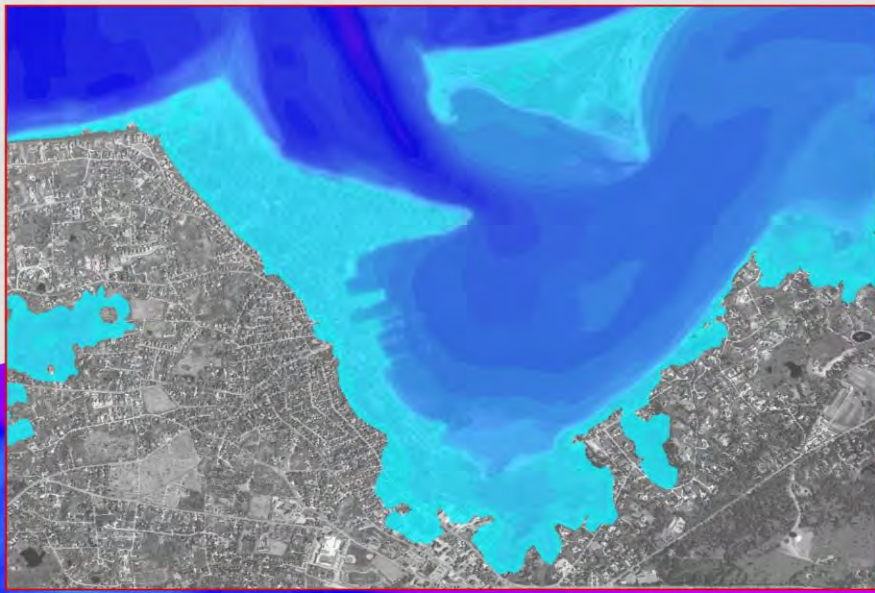
Maximum Wave Heights

Available for six (6) AEP levels (0.1%, 0.2%, 0.5%, 1%, 2%, 5%) for 2030, 2050, and 2070. <- 18 data sets!

- geoTIFF raster files
- MC-FRM provides significant wave height, but converted to maximum wave height per FHWA, HEC-25 guidance
- Recurrence probabilities of maximum wave heights were calculated independently from water levels
- Special hatched areas
- Does include water bodies



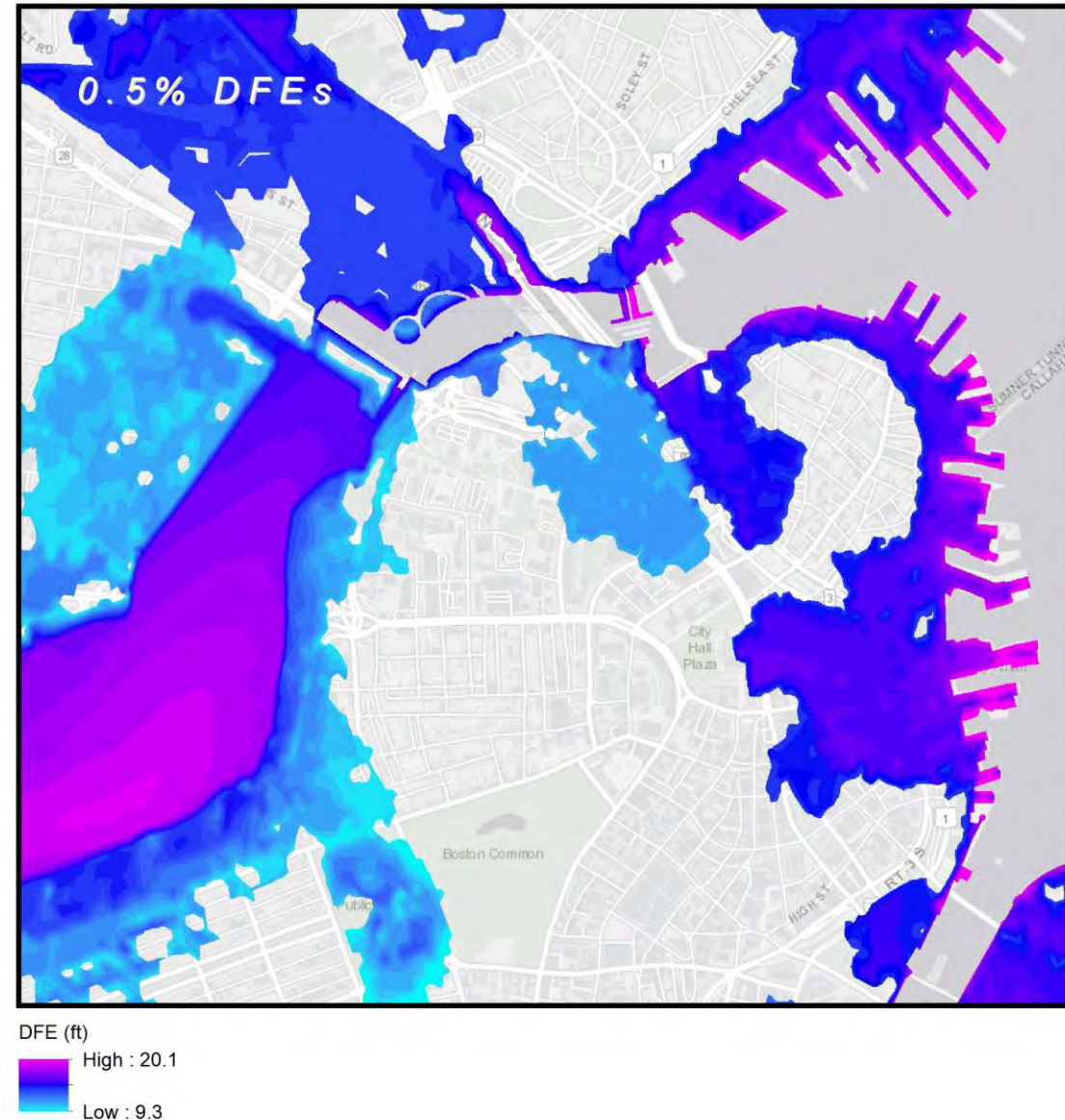
Waves
2070 Raster
1%



Design Flood Elevations or Wave Action Water Elevation

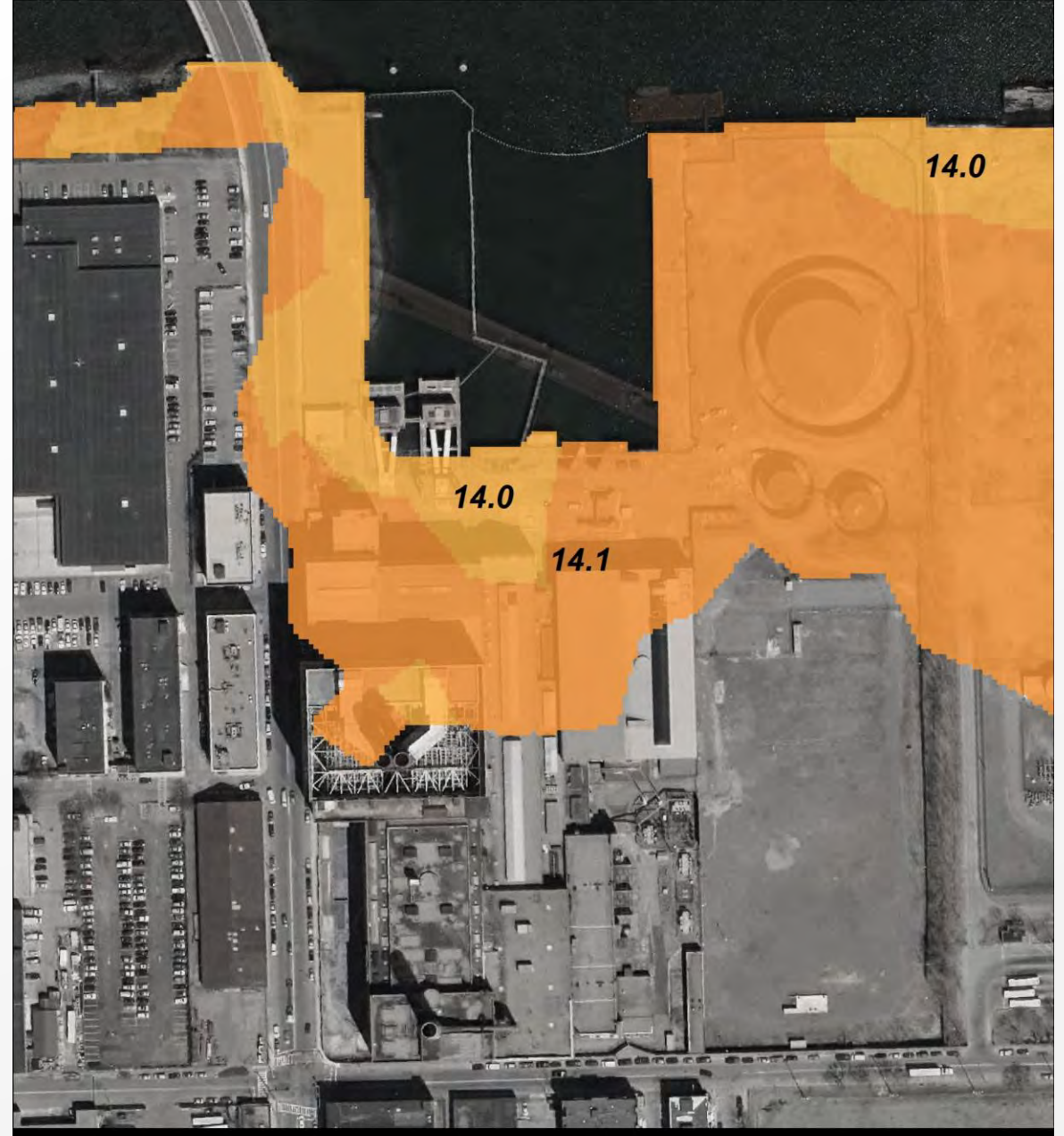
Available for six (6) AEP levels (0.1%, 0.2%, 0.5%, 1%, 2%, 5%) for 2030, 2050, and 2070. <- 18 data sets!

- geoTIFF raster files
- No freeboard included
- Special hatched areas
- Data only provided in overland areas (above MHW)
- Water Surface Elevation + Wave Crest Elevation ($0.75 * H_{max}$) per HEC-25





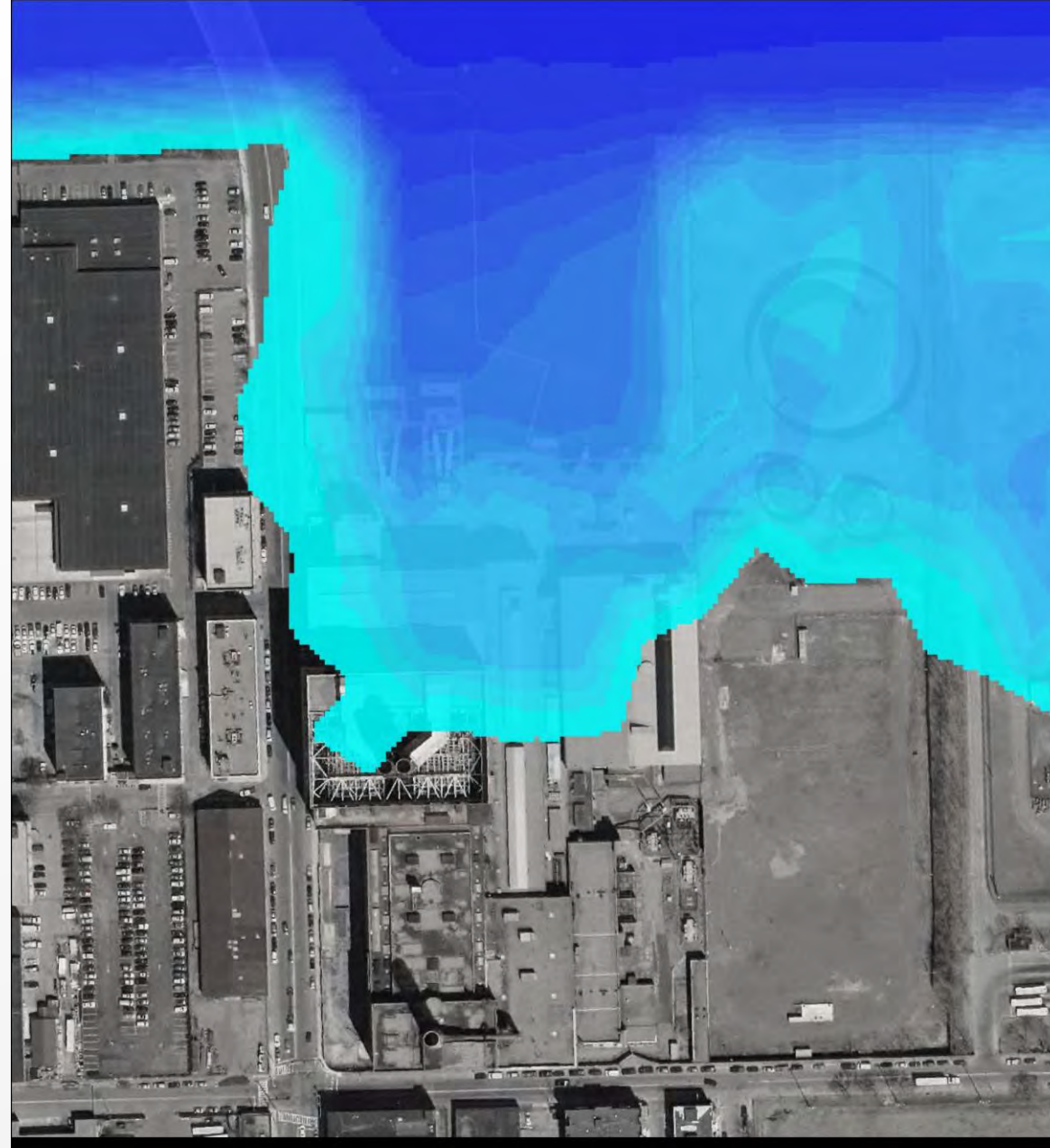
Property Assessment



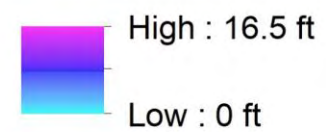
**Water Surface Elevation
2070
1%**



Property Assessment

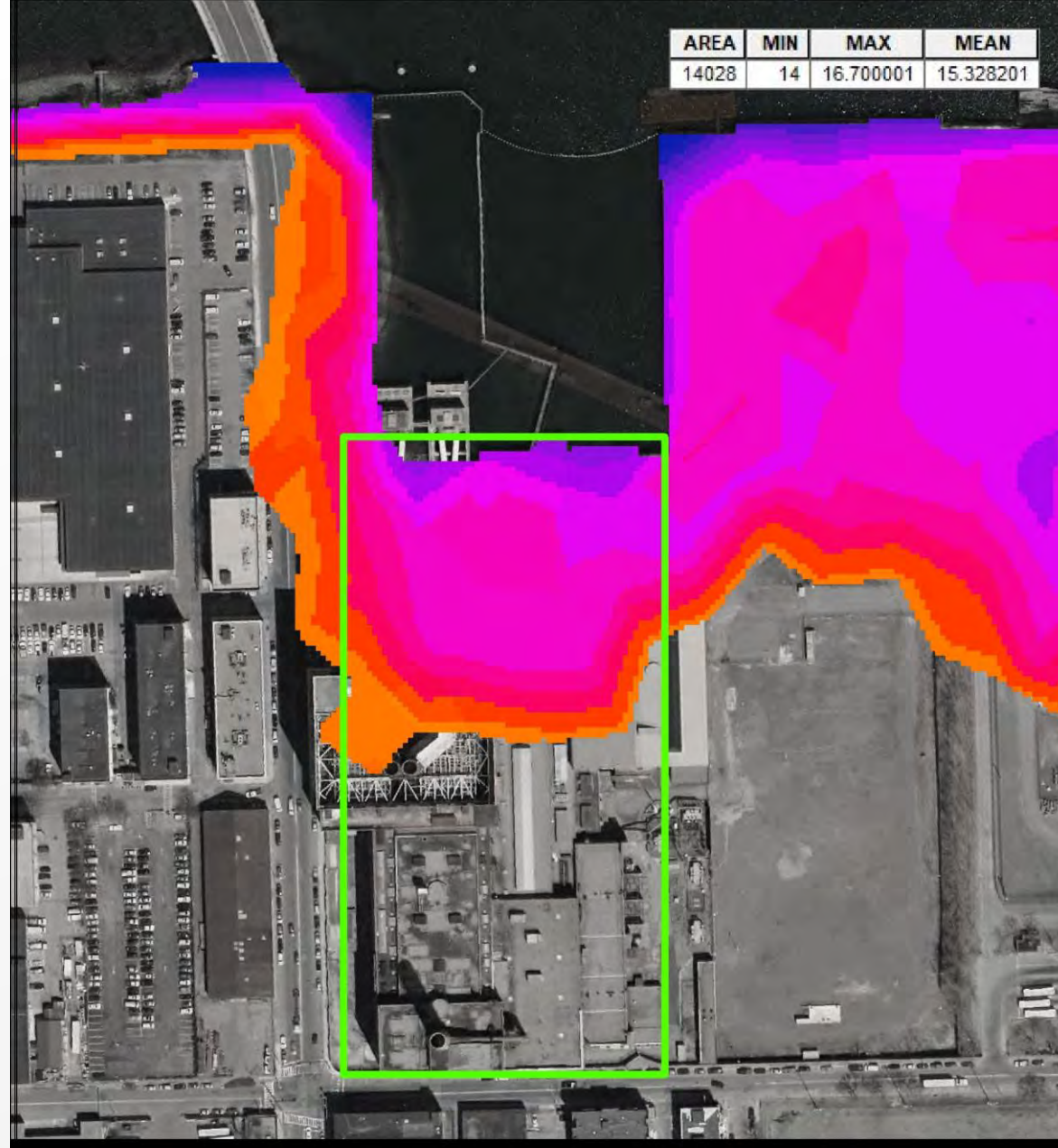


**Waves
2070
1%**

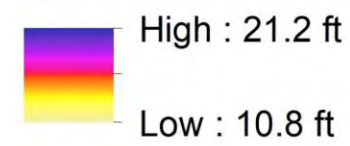




Property Assessment



**Design Flood Elevations
2070
1%**



MC-FRM Level 1 Layers Viewing

CZM's Sea Level Rise and Coastal Flooding Viewer



Sea Level Rise and Coastal Flooding Viewer

DRAFT

Sea Level Rise

MA Coast Flood Risk Model

Hurricane Surge

FEMA Coastal Flood Zones

About

2030 Flooding

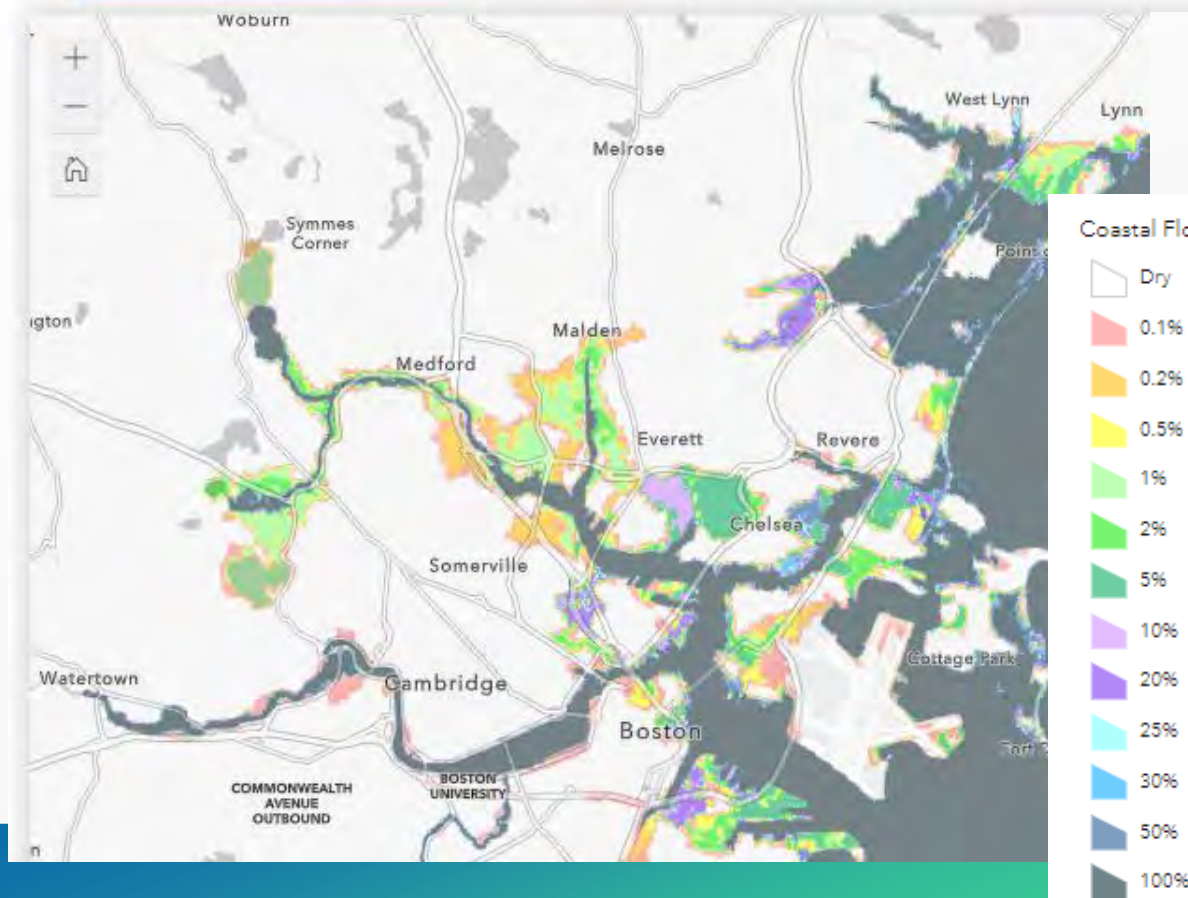
2030 Flood Depths - 1%

2050 Flooding

2050 Flood Depths - 1%

2070 Flooding

2070 Flood Depths - 1%



Example for 2030 Coastal Flood Exceedance Probability layer

- ❖ MC-FRM Level 1 layers as of April 2021
- ❖ Viewing only
- ❖ Coastal Flood Exceedance Probabilities for 2030, 2050, 2070
- ❖ Flood Depths by time horizon for the 1% probability scenario

Climate Resilience Design Standards (CRDS) Tool

CASE STUDY

Draw Seven Park
Somerville, MA



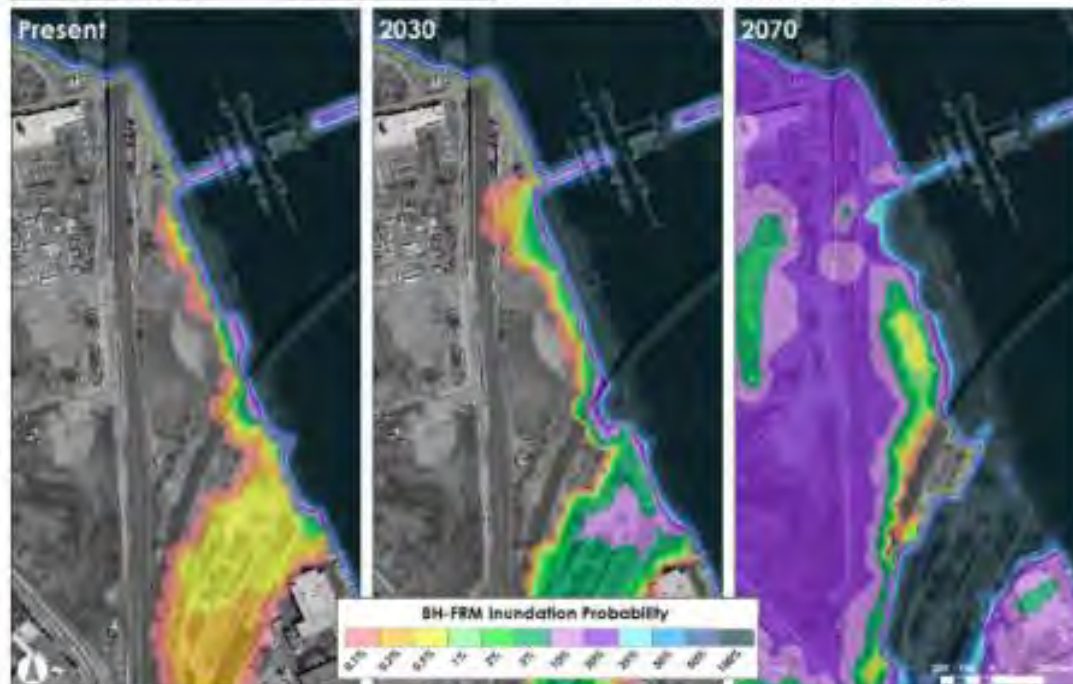
CLIMATE RESILIENCE DESIGN GUIDELINES

FLEXIBLE ADAPTATION PATHWAYS GUIDELINES (AP)

Guidelines recommend approaches to incorporate flexible climate standards into project design. Designs should be able to function under current climate conditions as well as future planning horizons. Where possible, the approach should embrace strategies that adapt over time and respond to changing conditions.

Figure 2. (top) Draft rendering of multi-layered design to incorporate co-benefits and flexible flood protection systems.

Figure 3. (bottom) BH-FRM Coastal Flood Probability Maps. Expanding flood risk over time, where the floodplain expands from the park towards Somerville and Cambridge.



	Guideline	Proposed Design Strategy
AP-1	Embed future capacity and design for uncertainty.	The open space is designed so that the living shoreline can migrate into the site as sea level rises. The park will likely undergo reinvestment in 2050 (parks have a useful life of roughly 30 years) where investment in the barrier and other site features can be re-evaluated. 2070+ Strategy: The grading along the waterfront is designed to allow the living shoreline to migrate into the park as sea level rises. The flood height of the barrier was increased to the 500-year return period for 2070 (standards recommended 200-year return period for 2070) to be consistent with design improvements planned for AED as part of regional analyses.
AP-2	Design for incremental change.	The project will meet 2070 climate conditions as recommended in the Climate Standards, but the park will function differently through its useful life. 2030 Strategy: The site is able to function as a flood barrier for future flood conditions through grading. For expected 2030 coastal flooding, site grading will allow most of the site to stay dry. On-site bioretention will mitigate stormwater flooding and increased tree canopies will mitigate heat effects. The project proposes a freshwater wetland on the freshwater side of the Annis Earhart Dam (AED) and a living shoreline on the coastal side. 2070 Strategy: For expected 2070 coastal flooding, site grading will allow critical access to the AED and some park pathways to remain dry and keep the flood pathway through the site.
AP-3	Encourage climate mitigation and other co-benefits.	In addition to the wetlands and living shoreline, proposed park improvements include increased tree canopy, increased public access to the waterfront with a future connection to the Encore Resort in Everett and potential MBTA access through the park, and a reduction in parking on-site. Co-Benefits: Equity & Social Resilience, Public Health, Natural Resources, Ecosystem Services
AP-4	Prioritize nature-based solutions.	The project features a living shoreline, freshwater wetland, bioretention basin, new passive open space park, and increased tree canopy.
AP-5	Prepare for current and future operational and maintenance needs.	Operations at the AED are critical for regional flood protection. Site design prioritizes access to the AED, including during the 2070 design storm event.

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MC-FRM DATA

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Town of Nantucket Coastal Resilience Advisory Committee Survey . Created: March 5, 2024

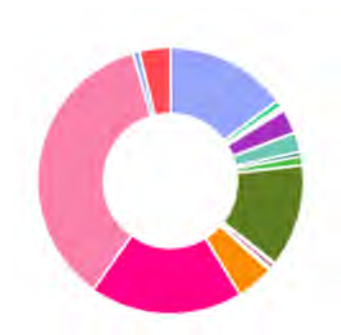
Town of Nantucket Coastal Resilience Advisory Committee Survey

November 13, 2023 to January 31, 2024

371 Participants *

Your Property

Which area association is your property located in?



Brant Point	(14.82%)
Cisco	(0.81%)
Fishers Landing	(0.27%)
Harbor South	(0%)
Hinckley Lane	(0%)
Hummock of Nantucket	(0.27%)
Hummock Pond	(2.96%)
Hussey Farm	(0%)
Madaket Residents	(2.43%)
Miacomet	(0.54%)
Monomoy	(1.08%)
Nantucket Town	(12.4%)
Naushop	(0%)
Pine Valley	(0%)
Pocomo	(0.27%)
Polpis	(0.54%)
Quidnet Squam	(0.27%)
Shimmo	(4.58%)
Siasconset	(18.6%)
Surfside	(35.58%)
Tom Nevers	(0.81%)
Wauwinet	(0%)
West Miacomet	(0%)
Other	(3.77%)

Results ⓘ

ANSWER OPTION	COST	COUNT	PERCENTAGE
Brant Point		55	14.82%
Cisco		3	0.81%
Fishers Landing		1	0.27%
Harbor South		0	0%
Hinckley Lane		0	0%
Hummock of Nantucket		1	0.27%
Hummock Pond		11	2.96%
Hussey Farm		0	0%
Madaket Residents		9	2.43%
Miacomet		2	0.54%
Total		371	

Your Property

Type of resident:



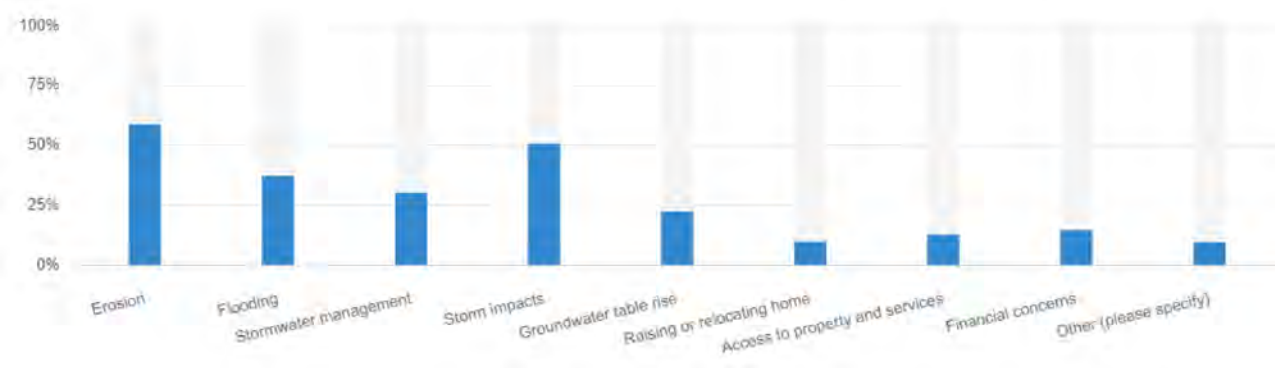
Results ⓘ

ANSWER OPTION	COST	COUNT	PERCENTAGE
Seasonal		254	69.4%
Total		366	

ANSWER OPTION	COST	COUNT	PERCENTAGE
Year-round		112	30.6%
Total		366	

Coastal Hazards

What are your biggest concerns today regarding coastal hazards related to sea level rise on your property or within your neighborhood?

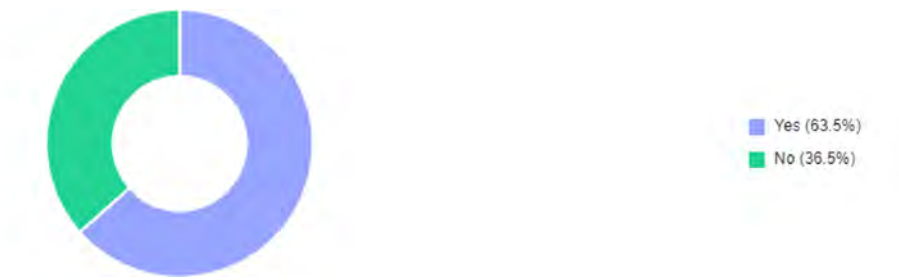


Results

ANSWER OPTION	COST	COUNT	PERCENTAGE
Erosion		201	58.77%
Flooding		127	37.13%
Stormwater management		104	30.41%
Storm impacts		173	50.58%
Groundwater table rise		77	22.51%
Raising or relocating home		34	9.94%
Access to property and services		44	12.87%
Financial concerns		50	14.62%
Other (please specify)		33	9.65%
Total		843	

Your Concerns

Do you have concerns about your property or your neighborhood for the future? If so, what are they?

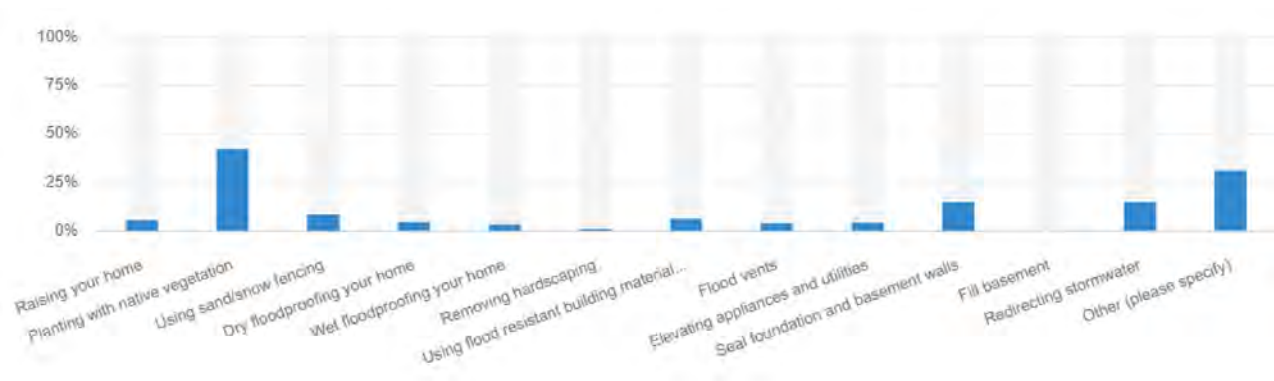


Results ⓘ

ANSWER OPTION	COST	COUNT	PERCENTAGE
Yes		214	63.5%
No		123	36.5%
Total		337	

Your Plans

Are you currently planning/implementing coastal resiliency measures?



Results ⓘ

ANSWER OPTION	COST	COUNT	PERCENTAGE
Raising your home		18	5.9%
Planting with native vegetation		129	42.3%
Total		439	

ANSWER OPTION	COST	COUNT	PERCENTAGE
Using sand/snow fencing		27	8.85%
Dry floodproofing your home		15	4.92%
Wet floodproofing your home		11	3.61%
Removing hardscaping		4	1.31%
Using flood resistant building materials in interiors (i.e., ceramic tile or lime plaster)		20	6.56%
Flood vents		13	4.26%
Elevating appliances and utilities		14	4.59%
Seal foundation and basement walls		46	15.08%
Total		439	

Your Ideas

From your perspective, how can the Coastal Resilience Advisory Committee and the Town’s Coastal Resilience Plan help your neighborhood within our capacity?



Results ⓘ

ANSWER OPTION	COST	COUNT	PERCENTAGE
Informational presentation		154	51.68%
Resilience protocol		111	37.25%
Total		675	

ANSWER OPTION	COST	COUNT	PERCENTAGE
Best practices brochure for your home		140	46.98%
Best practices brochure for your yard		132	44.3%
Interactive online tool		79	26.51%
Other (please specify)		59	19.8%
Total		675	

* Note: Results contained in this report represent a subset of submissions. Duplicate submissions have been excluded.

Answers to the

ANSWERS to others: Are you currently planning/implementing coastal resiliency measures?

Option- other

- Houses is raisedWorry that Town will not help neighborhood
- No plans at the moment
- Not planning anything at this time
- we raised our hot water tank, and would be open to other ideas. we currently just shovel any sand out of the basement each summer
- None
- Learn more about risks and remedies
- None of the above
- We are not planning anything
- None
- No
- none
- We have done none of the above.
- no
- No. Iâ€™m safe
- None
- Not doing anything
- na
- No measures (there should have been this option to check).
- Not doing anything
- None look
- Our home does relatively well currently in terms of flooding and erosion, storms, and is already on a slightly higher foundation. We do not plan to resist the effect of climate change in our home, though. We will use the house for as long as we can and then accept that our time in our home is done and it's time for us to move on.
- None of the above
- We have taken all the measures we can. Our street, Willard, has no storm sewers which is problem every time it rains. The pump at Children's beach is finally working, but was broken for years. It needs to be a priority to help with flooding.
- Nothing at this point
- no, we arenâ€™t doing anything.
- Maintains bulkhead and dock
- Maintaining bulkhead and dock
- Not doing any of the above

- No
- House was raised but not enough. (4 feet)
- In the past the Historical commission did not prioritize FEMA guidelines or building guidelines for flood protection
- Iâ€™ve already done many of these - home is raised, appliances elevated
- Behind 8 willard there is standing water after a rain storm.
- nothing
- Flood barriers
- No strategic measures being taken as I live far enough from the beach
- Our home is built on pilings 3 feet above ground with no basement. We now try to keep sentimental objects another foot above the floor.
- No
- Coast areas like the Madaket parking lot need to be removed and dunes restored w/ beach grass replanted.
- None
- No
- I am not
- We are not doing any of these things. There really isn't anything for us to do.
- SEE MY EARLIER COMMENTS
- Relocating the structure
- Not planning anything but chose other because the NEXT button would not send me to the next question!
- watching what happens to Baxter Road and those geotubes and the mess they are causing
- None
- Coir tube terraces at bluff toe
- No
- Geotubes
- none
- No
- None
- None at moment
- none, we live on the Sconset embankment
- bluff erosion & protection
- Road closing
- nothing at this point
- None
- None as above flood zone
- None

- not at this time
- Nothing
- None
- Rebuilding groins
- erosion measures to prevent land loss
- None of these.
- NA
- None
- worrying
- Sell
- None at this time.
- None
- None
- Nothing as we are well above sea level
- I have already raised the house, put in flood vents, use sand fencing, elevated utilities on outside of house and am planting more native vegetation. All was done with concerns of rising water.
- providing alternate access for neighbors
- Nothing
- reducing impermeable materials
- Have put in a retaining wall at waters edge as water level have risen over the last 20 years
- our home is not in an area where flooding will affect it directly and none of these actions are relevant to our property
- Nothing
Not planning coastal resiliency measures
- advocating to mitigate the impact of excessive commercial traffic on Prospect St. + reduction of overdevelopment and building
- Nothing
- None currently
- Not required
- Unfortunately the Building Department is not regulating stormwater as part of their permitting process. I have two neighbors that have redeveloped and raised their grade significantly. The increased stormwater runoff is impacting myself as an abutter and the neighborhood road. It is not tied into Town wastewater, and apparently the Town has no plans to implement stormwater regulations in these cases. It seems like REALLY poor planning.
- Nothing because we are 1,000 feet from high tide on a bluff on Western Avenue

- None. I'm 0.5 mi from ocean with 40ft elev
- We are trying to preserve what little beach we have left
- None of these.
- No plans
- no need to do anything yet..we are about a mile away from the ocean
- replace siding on the house to protect from wind and rain
- Dune protection
- none of the above
- Drainage issues in the roads
- rebuilding home
- not worried as of yet to my house...I am too far back from the ocean
- none
- Need to research what dry and wet floodproofing consist of.

ANSWERS to other: From your perspective, how can the Coastal Resilience Advisory Committee and the Town's Coastal Resilience Plan help your neighborhood within our capacity?

- Polpis Road access
- Raise Funds from Federal Government and start action
- Help to stop the building on Surfside. Soon there will be no natural habitat. People should be planting - planting native plants. Instead, we have green lawns and more houses built one on top of each other
- Replenish the beach. We do it on the jersey shore
- No more covering land with homes
- I see resources better spent in other neighborhoods
- Nothing
- Focus on building a resilient (1) wastewater treatment center, including breakwaters and artificial reef, (2) Build proper drainage for the roads, including ditches, culverts, etc. and (3) install permanent pond dams for better circulation and flooding control.
- Have geocaching like events, or walks that folks can sign up for that have booths with info from various places like the library, land trust, and other philanthropic groups. Interactive, fun, and interactive events for different abilities to enjoy.
- Not much you can do.
- Dune restoration; beach driving
- Educate our neighbors who continue to insist on perfectly manicured lawns and building on every inch of land they can get their hands on.
- We don't need brochures. We need action. This problem is not going away and puts all of Brant Point and town in jeopardy.

- Need a concrete plan for the area's future
- Lot coverage should be smaller for home square footage to allow for more grass to absorb water. Maxing out lot coverage is a joke- visually and environmentally bad. Brant point is being ruined
- Raise children's beach pump station
- Understand the facts and don't overreact.
- Develop a realistic strategy for projected sea level rise that includes allowing home owners to raise the grade on their property starting with raising bulkheads.
- Having a resilience coach who could come meet you at your house to help advise you on things you could do, similar to the energy coaching programs the state offers. Tax credits and rebates could be offered for people who make the appropriate improvements, similar to what they do for energy efficiency updates..
- Recommend zoning and permitting changes to further preserve natural landscape and limit development
- While our immediate neighborhood is likely going to be safe, there are other parts of Sconset that are going to need significant help.
- SEE EARLIER COMMENTS
- be certain people in the most vulnerable neighborhoods are fully educated and kept informed about the situations island wide, but especially what they can do for themselves
- Coming up with a rational and reasonable strategy for slowing the erosion in Sconset and elsewhere
- Advocate extension of extremely successful geotube erosion protection ensuring long-term preservation of Baxter Road community
- Get town to approve geotubes
- Aside from erosion, homes on the island are not in danger. It's the island itself!
- Disband
- Push back against the efforts to ban measures to protect the Sconset Bluff. Letting the Bluff just erode away over time is idiotic and unnecessary.
- Assuring the appointment of Administrators and ConCom member whose decisions are fact based and informed by engineering best practices. and consistent with 2024 erosion mitigation best practices
- Permanently repair/replace the pump at Children's beach
- 1. Support the geotube project. 2. Support reasonable measures to protect homes -- rather than a do nothing approach that is somehow called conservation; support applications for federal funding .
- Follow CRP recommendations re erosion control
- Create municipal resilience measures to control flooding and stormwater
- Not overreact

- I think it would be good for our neighborhood to understand the impacts to the shared beach and what might happen to access as erosion continues to shrink this valuable common space.
- Not clear.
- We need to limit additional hard scaling, as many communities do, because storm water is not absorbed, but causes large amounts of water in the streets during rainstorms. Witness the water at liberty and winter street!
- seawall
- None
- Look at raising Wauwinet Road in the future where it abuts the harbor
- Form a collaborative insurance agency - insurance has gone through the roof and the private market is not working
- I would like to see focus on issues of concern to everyone. Although a good part of downtown is affected by storm/tide issues, much of it is elevated above personal property issues.
- Hotline help
- Advocacy
- By planning for erosion control measures island wide.
- Advocate to the Select Board and Planning Board for necessary bylaws and investment. Planning staff won't do anything on their own. Survey other communities for best practices and invite speakers to come and speak to Nantucket about relevant issues.
- Dredging and redirecting sand to Southwest shore and Smith Point Oceanside beaches to the extend beach and mitigate erosion, drop objects like old train cars offshore of Smith Point and Madaket Beach to build a reef to help mitigate erosion, prevent driving cars on southwest shore and driving beaches to mitigate erosion, beach plantings to build up dunes
- Add sand, reinforce bridge, make artificial reef
- all of your initiatives to adapt Town + Harborfront to the impact of sea level rise are appreciated as they effect our inland neighborhood as well
- Projection of beach erosion in the near future (10-20+ year time frame)
- While my home is not at risk I would like to be armed with info and tools that I can share with others who are and may be unaware of (or ostriches with their heads in the sand about) what they can do
- I'm horrified by the pushback from the development and construction industry toward the ConCom's initiative to updaet our 10 year old Wetlands Regulations. I would like to see the CRAC and the Town be far more aggressive toward projects like the three pools in a flood zone in Mariner Way.
- Resources to help with costs of implementing the plans

- An online interactive tool that serves as one stop shopping for Resilience protocol/best practices for home and yard/ would be great. If there is a point person who can answer specific questions sparked by the online tool - even better.
- I will take care of my home. I am concerned about the town taking care of theirs. Sewage treatment, beaches, ferry. Airport
- Our home is on Nobadeer beach. If the bluff erodes, we will lose everything. Beach driving kills the vegetation that holds the dunes together. My top suggestions is DON'T allow driving on the beach! The dunes will recover, the vegetation will grow, the birds will reproduce. The year the beach was roped off for nesting plovers, the vegetation grew back immediately. We need more dune protection, from cars, from people, from dogs.
- Address the water levels at Miacomet Pond to avoid basement flooding when the pond level gets too high
- Make a plan to move the water treatment plant to somewhere it doesn't get washed away
- More fences on the beach.
- protect south coast beaches
- Please teach people that mother nature will win. Stop trying to fight it.

ANSWERS: Is there anything else you would like to share with us?

- Storm water pump at Children's Beach needs relocation and/or replacement.
- Time is important - act sooner
- I would hope that zoning might change so less of the land is covered by building and hardscaping in the future
- It would help to know where the town stands now on its plans for dealing with inevitable sea level rise.
- we have our empty lot in front of us (30 Willard St). Would the town consider buying a conservation easement to keep it open for nature/ stormwater collection ?
- It's great the Town has Millions on the sewer treatment plant in Surfside without any thought to the future.i walk this beach most days and its been evident for awhile that this plant has a short term life expectancy. I see the town had hired another outside team to monitor this. I see their stakes
- No
- No
- none
- What are plans for the wastewater treatment plant
- The building is out of control

- I am concerned about this winter's unusual amount of storms from the south which is impacting Nobadeer, Stones, Fisherman's Beaches more than I have ever seen before. (We have been at our location since 1978)
- Keep up the good work
- Stop the over building
- Stop new housing from removing all trees and shrubs etc when building new houses. It should be illegal. Need to enforce native plantings only
- NA
- I would say that in addition to the practicalities of mitigating storm damage and flooding, the island as an entity should heighten its introspection about how to lessen its contributions to the causes of climate change. What does Nantucket need to do, as a community?
- No
- The loss of beach in front of the Surfside wastewater treatment center is so significant that either breakwaters or artificial reefs are installed or it needs to be moved.
- Thank you for addressing climate change concerns.
- Thank you for your effort
- I am concerned that new builds in our area are occupying large footprints of their land, putting in grass lawns and gardens which are not native plantings, and then hard scraping any remaining land with no provision for run off or drainage. and
- no
- I'd love for there to be a size restriction for cars and houses so people stop living in such excess.
- Glad this is being addressed. Better late than never. Please let the community know how we can help and keep the sewer pumps going. Thank you!
- Keep the communication up with all residents
- Allow neighborhood (Brant Point)seasonal residents a proportional vote or say on all coastal resiliency issues impacting the Brant Point area.
- Allow neighborhood (Brant Point seasonal residents) a proportional vote or say on all coastal issues impacting the Brant Point area.
- No
- Our neighborhood is varied. Our property is fortunate to be on the beach but far back. The most flooding we get is from the street. I think our issues are not too common for the neighborhood
- Time to get the storm water pump put in place. It was fully funded for Children's beach. Never installed looking for a perfect location. Now depending on temp pump put in place for storms. Perfect is the enemy of good.
- No
- No

- I work with NLWC. Thanks for your tireless work to protect our island's natural resources!
- beach erosion is bad
- Educating property owners is important and they should continue to do that. Also, in terms of impervious surfaces on Brant Point, zoning updates should be considered. Currently very large homes and garages/guest houses are being built, often including basements and pools such that almost no exposed grass is left on the property to absorb water. Continued engagement of our Brant Point community would be good as plans are made for coastal resilience .
- Maintain and restore our dunes and dune grass.
- Thank you!
- No
- Thanks for pursuing this effort.
- NO
- Good to get us to start thinking about these issues.
- Living in Codfish Park
- No, thanks
- No
- A \$50MM plan to reroute Baxter Road is a total waste of Money. Find a public private partnership
- Preservation of historic Baxter Road community will save TON 10's of \$millions
- Protecting the Sconset bluff will require the continuation and expansion of the geotube project
- Try a new approach-the island needs a plan for the future and there is none. The island can't even apply for a grant from the government because there's no plan. Homeowners will not make alternative plans unless forced -an example. We drink ground water and agreed as a community not to use poison on our precious lawns but it continues to be sold so it continues to be used and our natural resources won't be there forever.
- I believe we need an island-wide plan for dealing with erosion. While it may only be impacting several hot spots today (Madaket, Sconset) it looks like it's only a matter of time before the broader island is impacted. Geotubes may be a reasonable interim solution, but if we really want to solve the problem some type of hard solution will need to be used. The Town of Montauk successfully deployed stones at the base of the bluff below their lighthouse and it's been working well. What would it take for ACK to change the regulations so it could do the same? Thanks for all your work on this important issue
- My home is not near the bluff or subject to issues for many, many years but I support extension of the geotube project on Baxter Road as a form of resilience and adaption. We can't stop it but we can slow it.
- No

- walls and bulkheads should be allowed. and other hard scaping
- This survey could not be more "Push Poll" if you tried.
- Home is actually in Codfish, so a bit different than Sconset in general. Obviously Codfish is always a worry given the history and low lying nature of the neighborhood.
- keep up the good work
- In my view, those who advocate just letting erosion take away the Sconset Bluff should logically also be calling for the removal of the jetties protecting the channel into Nantucket harbor. They also interfere with nature. We'd all just have to live with no ferries coming when the channel silts up, and consequently without much food or fuel. Obviously I'm kidding. The point is, if one opens one's mind and looks at seaside towns and cities around the world, there are 2,000+ years of history of mankind successfully creating infrastructure on the coast that protects the interests of people living there without causing significant adverse consequences. The channel jetties are an example of that.
- yes Beware of advocates whose positions are based on 1980s dogma not current realities and science
- I don't want to lose my home, even if I am just a seasonal resident. I don't want to see the beautiful area washed away when something can be done to preserve it. Please help. I cannot afford another place. And this one means so much to me. There is no time to spare.
- would like to see the re-establishment of the Sconset bluff revetment project.
- I would like better information on where flooding might occur in the future. I have found the information hard to find.
- Rarely does Mother Nature lose when challenged by man.
- I think the town should consider a small tax to help raise funds to offset costs related to the protection of the island . Maybe a fund raiser during the summer to try and raise needed dollars for this .
- No. Thank you for doing this survey
- We have serious flooding issues in Codfish park
- Intensifying building in Codfish Park- basements and increasing size and height of homes- seems ill advised
- Adopt how the Dutch and other coastal countries have managed flooding and erosion.
- In real estate, the saying "Location, location, location" is a no brainer. If you choose to buy property where erosion is evident, you have chosen that problem!
-
- I would like to see Illustrations of what-ifs in vulnerable parts of town. The exhibit at the AAN Large Gallery was great, but lots of people will never set foot in a gallery. In Paris, there are poles along the river showing high water lines back to 1920 or so. What if we had "scenario marks" on poles and building corners in vulnerable parts of town? All real estate surveys should be required to include flood information, and sales contracts

should require purchasers to acknowledge receiving these. FINALLY: why should the Town be involved in Sconset Bluff erosion if they are not involved in Madaket and Cisco erosion? Selective involvement is unfair. There are more year round voters who do not live on Baxter Road than there are who do.

- Let's keep the comprehensive plan top of mind for our community. We should be talking about this regularly.
- Not clear how this applies to Monomoy.
- Thank you
- No
- I guess this is a neighborhood focused survey, but I am more concerned with things that affect everyone such as the ferries and the sewer plant.
- My house is on a hill so I don't worry about it. However, I am very concerned about downtown Nantucket, and out Washington Street.
- Information as it becomes available about what the town will be doing to help with all the flooding.
- This is the most important issue facing Nantucket, not short term rentals, not topless beaches.
- The entire island - both seasonal and year round residents - need to get behind controlling erosion.
- I object to any armoring or other attempts to slow erosion. Let nature take its course.
- No
- Keep up the great work!
- My gratitude! Thank you:-)
- Smith Point should be added to list Town Roads, Town Property, Town Building, Town Pier
- Possibly moving the house at future date
- Smith's Point should have a fire hydrant. There is a hydrant on the "other" side of Millie's Bridge. It should be straightforward operation to put an auxiliary hydrant on our side of the bridge. The Town does precious little out there. This would benefit all homeowners, especially on insurance costs.
- the retaining wall is to protect the house from Hummock Pond, not the a direct threat from the ocean
- It would be great if we could slow down beach erosion
- would like to see action plan for Madaket public beach
- I would like to emphasize the importance of maintaining the opening of Hummock Pond to the ocean as the winter rains often flood over the bank into our yard and often into our basement close to damaging our utilities. We are aware of elevating these systems when financially feasible.

- Nantucket Planning staff has stated they've signed a contract with a consultant for updating long range plan for Nantucket. Make sure this process is community and neighborhood focused and best for Nantucket.
- No thank you.
- No
- Smith's Point is not mentioned or protected enough. The real estate does not turn over like other parts of the island because people keep the homes for generations. The historic value and natural beauty are unparalleled and can easily be protected. Talk has gone on and on, it is time to do something.
- Keep up the good work!
- Would love to learn about meetings happening
- What is going to be done about protecting the historic downtown waterfront. I have seen many plans/ideas but isn't it time that we approve a step by step plan for the next 80+years?
- I am horrified by the push back from the development and construction lobby against the ConCom's initiative to update our 10 year old Wetlands Regulations. I would like to see CRAC and the Town be more aggressive toward projects like three pools in a flood zone on Mariner Way.
- What about allocating some of the land bank funds to resiliency and land sustainability. It doesn't help to buy open land if you can not protect it.
- Oga's concern
- First and foremost - I would like to know how my neighbors and I along the beach stretching from Surfside to Nobadeer (I am at 31 Nonantum) can do as much as possible to both protect existing dunes and rebuild parts of them that may have been eroded. Given the increasing intensity of storms and storm surge - this is an urgent issue. I think we should have expedited ways of using natural means to prevent and repair dune erosion. Regarding the online tool from the previous section, I think a very clean website that gathers the substantial work that Nantucket and ReMain have already done on the key issues would be extremely valuable. As I was filling out this questionnaire, I found myself doing multiple separate Google searches to be sure I understood the options fully.
- The town should focus less on helping individual homeowners and more on addressing the town. Move sewage treatment away from water (to Surfside crossing). Raise Ferry. Raise town. Sea walls in town. Surf beakwater off certain coastal areas. Waves do damage.
- Would like best practices for sustainability to help combat climate change as well as adapt/mitigate it
- The dunes in Nantucket need a lot more protection. Other states have been doing this for years. We should be much stricter about allowing cars on the beach, which not only destroys dunes, but invites all night parties on the beach, drinking, bonfires, and really

no one monitors the beach at night, which is what we were promised when the town took the access to our beaches.

- Concerns about impact of rising sea levels on well water and septic.
- I think we all realize we must do everything to preserve this Island
- This year the beach erosion on the South Shore
- Nothing right now, thank you
- The town needs to LISTEN to its citizens!
- Thank you for caring.
- No
- The south beaches got pounded this year -- we need to restore them.
- forget affordable housing. finance and resources directed at coastal protection.
- What you are doing is so important!
- I support doing what ever the towns needs to protect the island
- Maybe people with homes that are going to wash away could do a swap with the landbank in the middle of the island. The coast should be left alone. Building so close to the water is a problem that will only pollute the ocean even more. Accept the fact that storm surges happen.
- N/A

Survey Insights

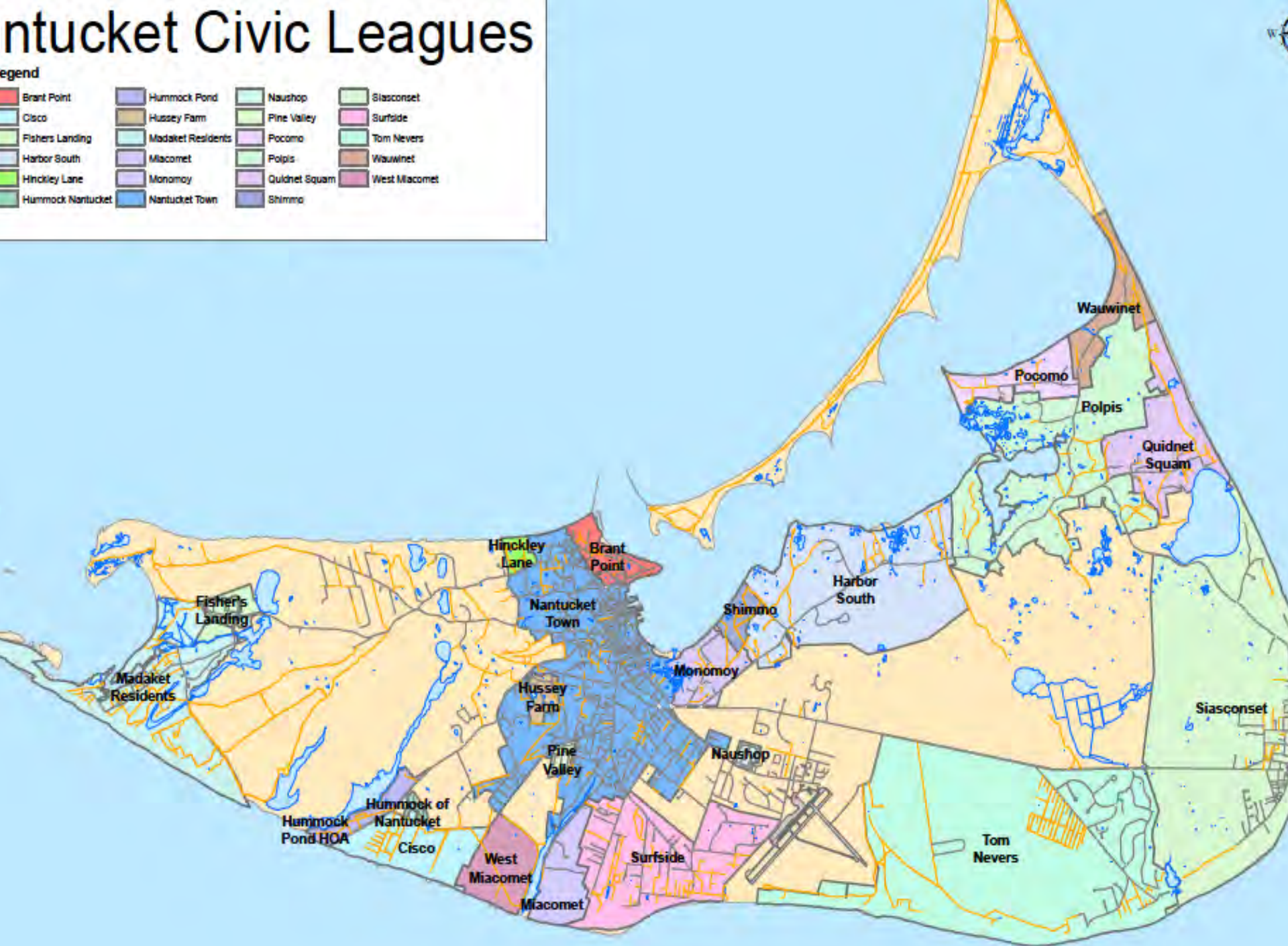
Peter A. Morrison

CRAC Meeting, April 8, 2024

Nantucket Civic Leagues

Legend

Brant Point	Hummock Pond	Naushop	Siasconset
Cisco	Hussey Farm	Pine Valley	Surfside
Fishers Landing	Madaket Residents	Pocomo	Tom Nevers
Harbor South	Miacomet	Polpis	Wauwinet
Hinckley Lane	Monomoy	Quidnet Squam	West Miacomet
Hummock Nantucket	Nantucket Town	Shimmo	



Key Points

- Survey portrays current state of public understanding and concern
- Validates proposed formation of Coastal Resilience Districts & Sub-Districts
- Shows how residents' concern varies across neighborhoods
- Points to *where* an initial pilot efforts might succeed