



Belle Isle Marsh

MVP Assessment – Year 2

June 14, 2023



Regional Coordination to Protect Communities & Preserve Marsh

Year 1 - Climate Vulnerability Assessment

- › Flood Risk
- › Future Conditions
- › Strategy Identification
- › Stakeholder & Community Engagement

Year 2 – Alternatives & Feasibility Assessment

- › Alternatives Analysis
- › Cumulative Impact Analysis
- › Stakeholder & Community Engagement



Agenda

Belle Isle Marsh

- What is Belle Isle Marsh?
- Why Belle Isle Marsh?

Habitat and Community Vulnerability

- Sea Level Rise
- Marsh Migration
- Coastal Flooding
- Priority Sites

Nature-Based Solutions

- Strategy Toolbox
- **Conceptual** Alternative Development

Performance Modeling

- Flood Extent Reduction
- Flood Depth Reduction

Next Steps





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Belle Isle Marsh

What is Belle Isle Marsh?



- Largest remaining salt marsh in Boston Harbor



- The land of Belle Isle Marsh is the traditional unceded territory of the Massachusetts people

- 300+ acres

- Spans East Boston, Revere, and Winthrop

- Over 250 bird species

- 7 threatened / endangered



Why is Belle Isle Marsh important?



- It's Beautiful!
- Storm Protection
- Clean Water
- Cooling from the Summer Heat
- Coastal Wildlife Habitat
- Carbon Storage
- *Area of Critical Environmental Concern* Designation



"It is one of the most biologically significant habitats in Boston"

- US Fish & Wildlife Service



Existing Conditions

Low Marsh



High Marsh Habitat

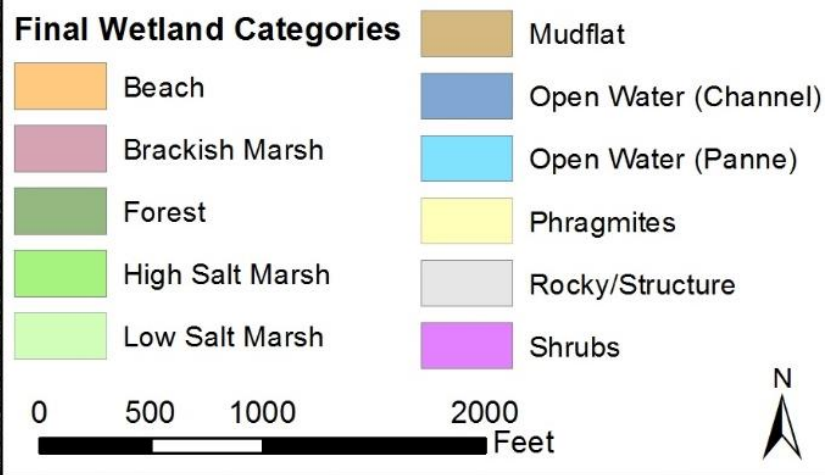
› Saltmarsh Sparrow



Phragmites



Upland Meadow



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- • Habitat and Community Vulnerability



Environmental Challenges

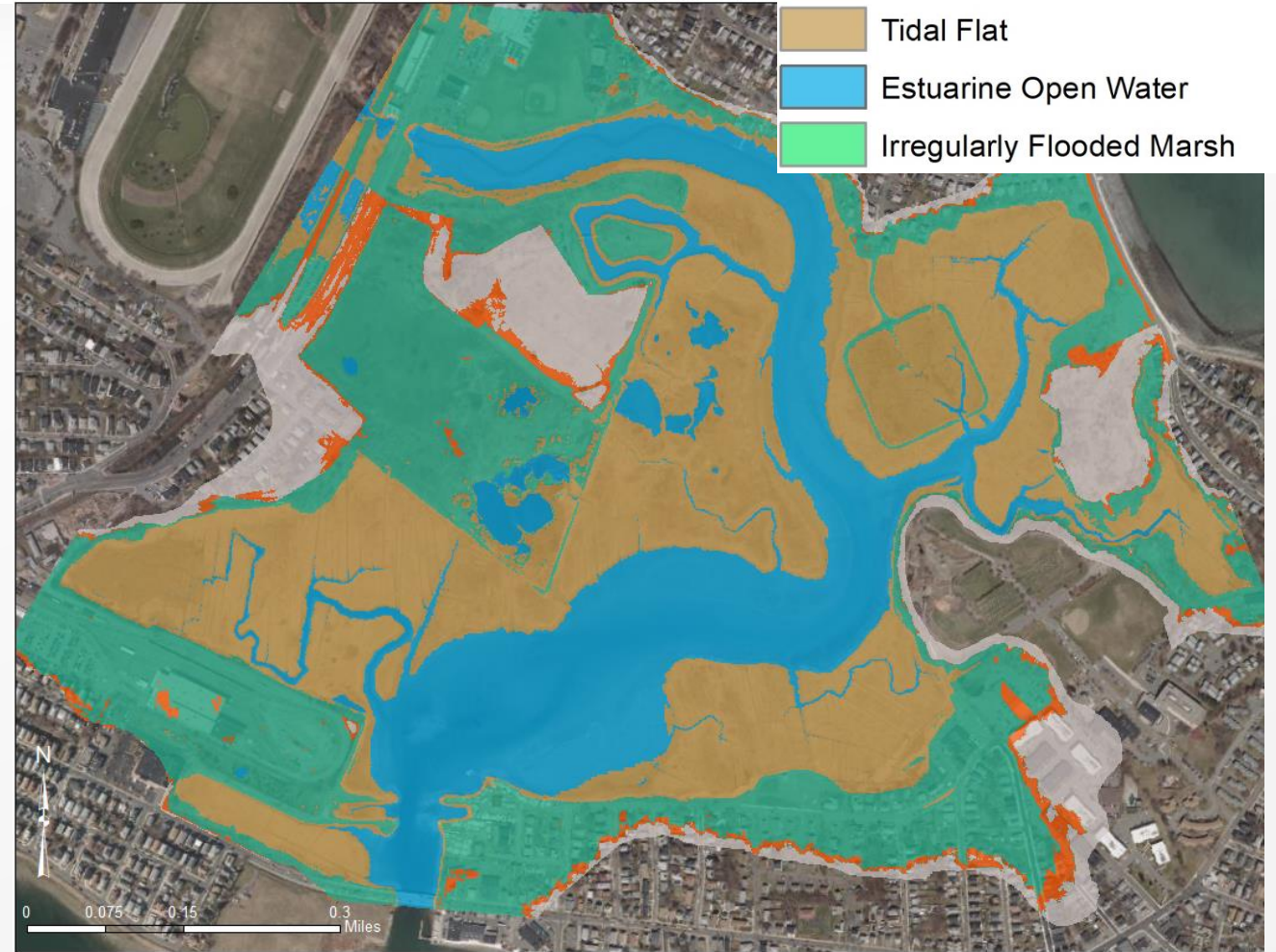
- Sea Level Rise
- Storm Flooding
- Coastal Squeeze
- Mosquito Ditching
- Invasive Species
- Historic Fill & Berms

Marsh Migration with Sea Level Rise

- Upland
- Transitional Marsh/Scrub-Shrub
- Regularly Flooded Marsh
- Tidal Flat
- Estuarine Open Water
- Irregularly Flooded Marsh



Present Day



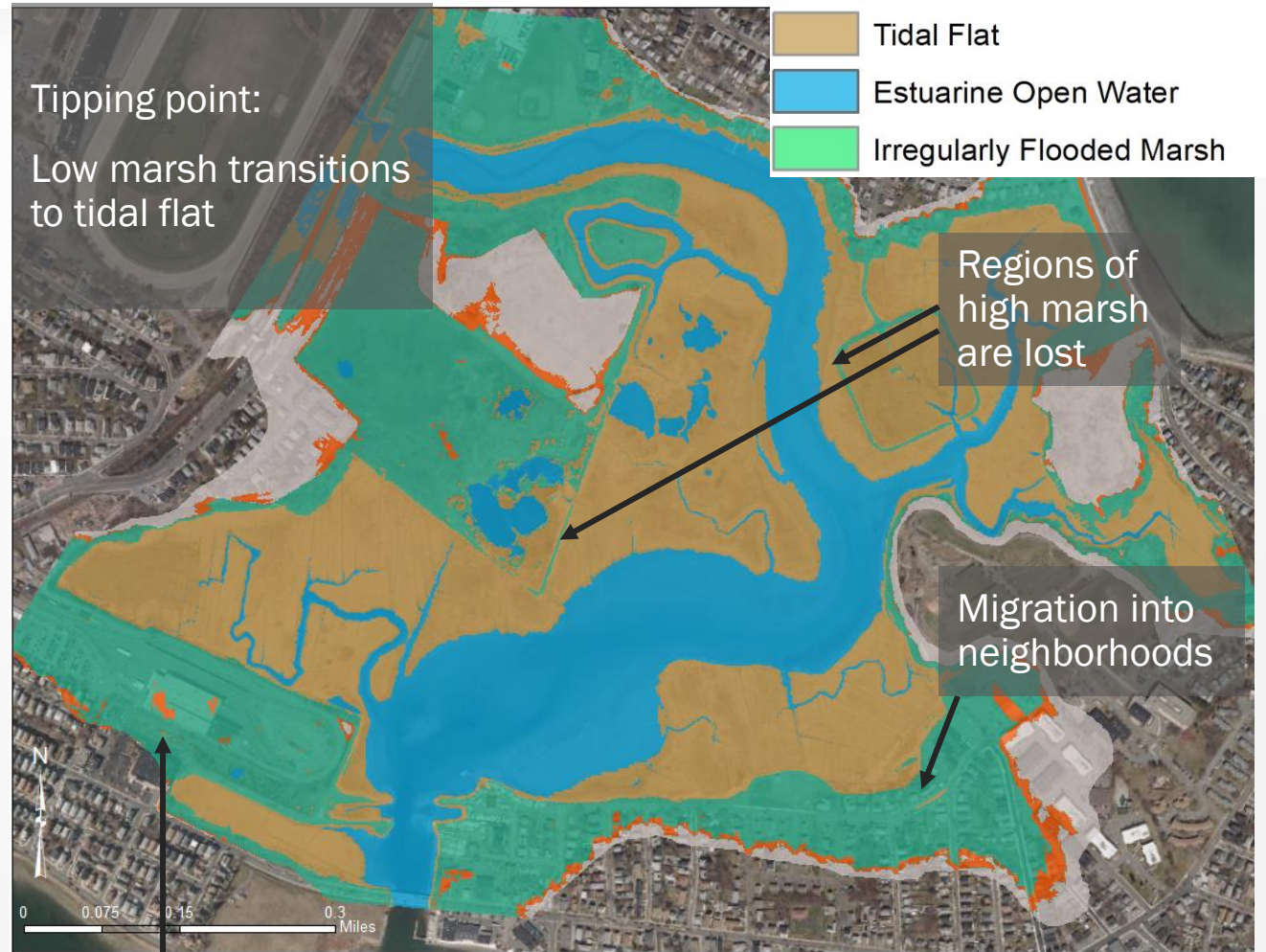
2100, 7.7 ft SLR

Marsh Migration with Sea Level Rise

- Upland
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Present Day



Migration into critical infrastructure

2100, 7.7 ft SLR

Flood Risk & Site Selection



Beachmont



Morton St



Bennington St



Fredericks Park

Flood Risk & Site Selection

Relative Flood Exposure

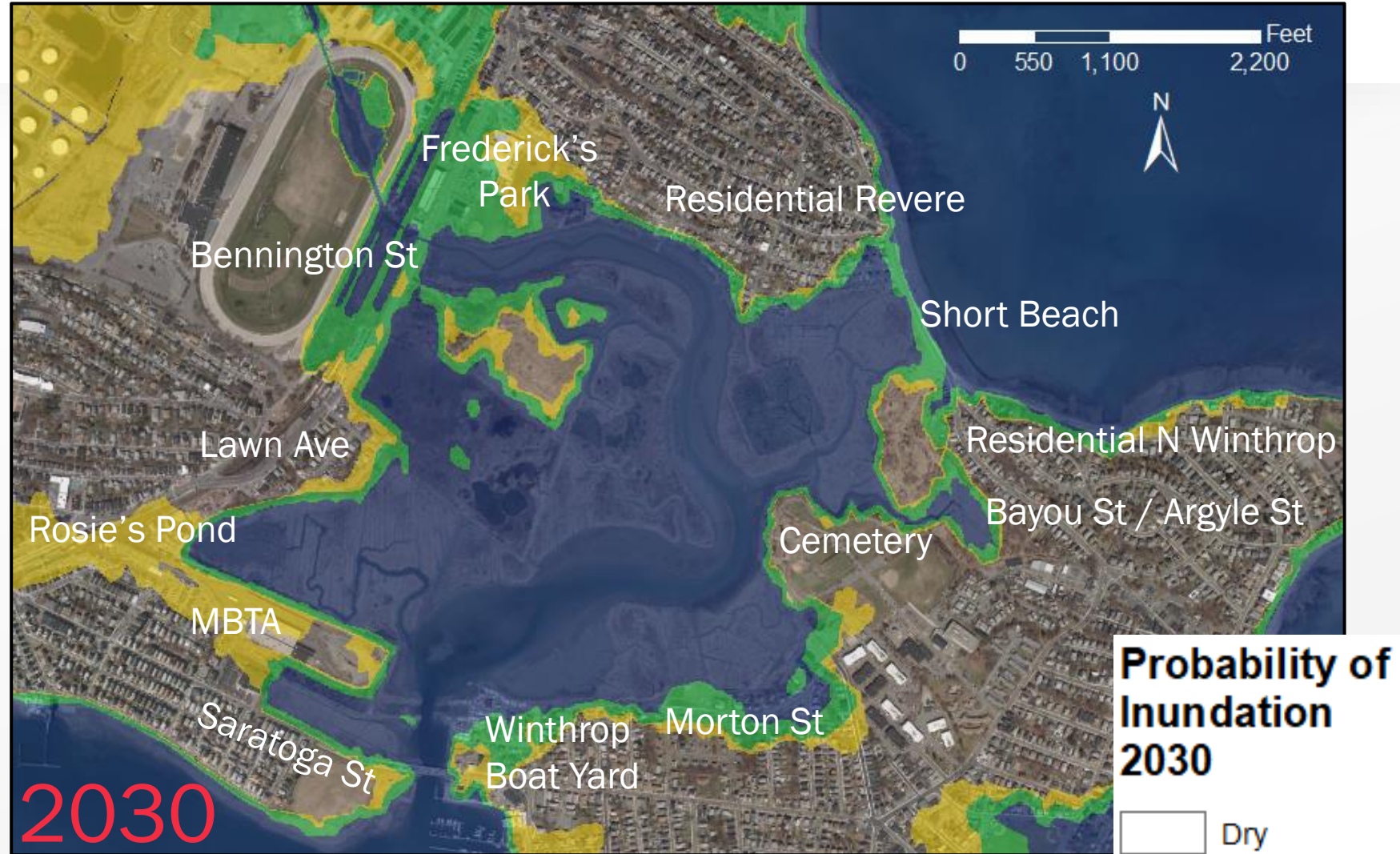
Asset Criticality

Permitting Feasibility

Construction Feasibility

Community Benefit

Habitat Restoration Value



Flood Risk & Site Selection

Relative Flood Exposure

Asset Criticality

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Construction Feasibility

Community Benefit

Habitat Restoration Value



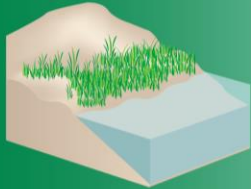
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 - • Nature-Based Solutions

Nature-Based Solutions

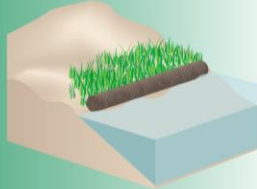
GREEN - SOFTER TECHNIQUES

GRAY - HARDER TECHNIQUES

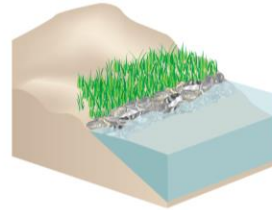
Living Shorelines



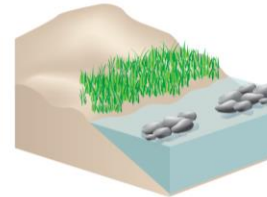
VEGETATION ONLY -
Provides a buffer to upland areas and breaks small waves. Suitable for low wave energy environments.



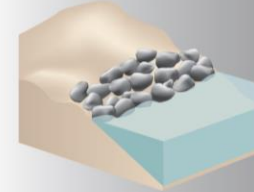
EDGING -
Added structure holds the toe of existing or vegetated slope in place. Suitable for most areas except high wave energy environments.



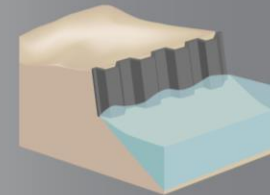
SILLS -
Parallel to vegetated shoreline, reduces wave energy, and prevents erosion. Suitable for most areas except high wave energy environments.



BREAKWATER -
(vegetation optional) - Offshore structures intended to break waves, reducing the force of wave action, and encourage sediment accretion. Suitable for most areas.

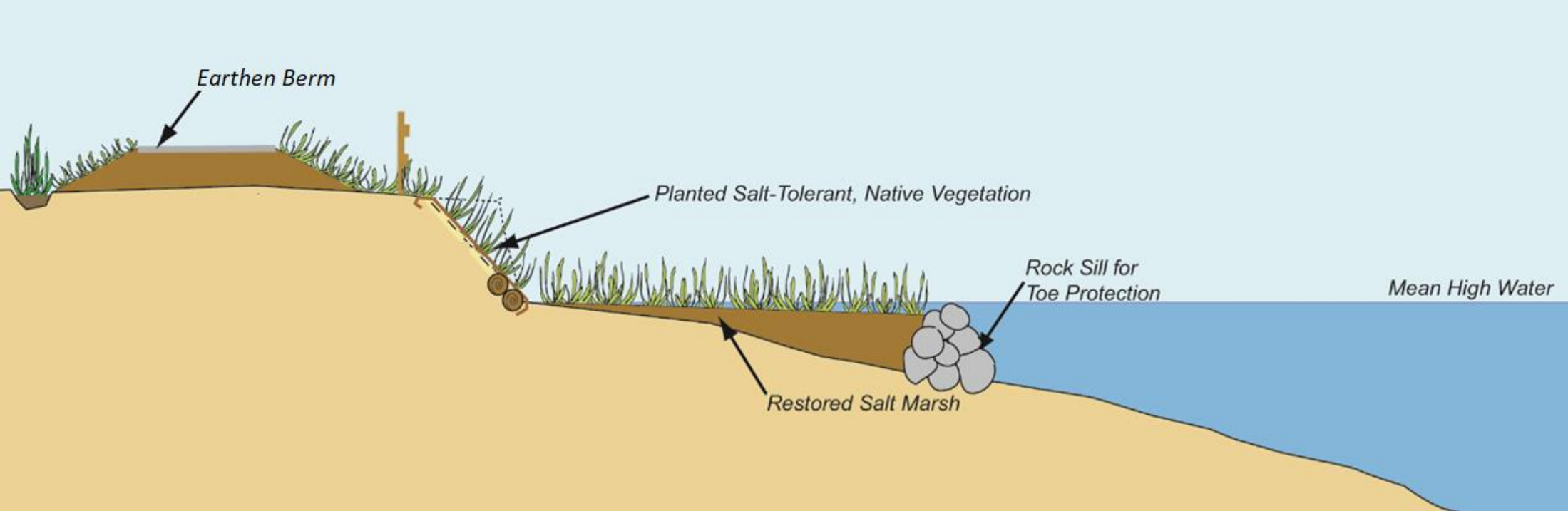


REVETMENT -
Lays over the slope of the shoreline and protects it from erosion and waves. Suitable for sites with existing hardened shoreline structures.



BULKHEAD -
Vertical wall parallel to the shoreline intended to hold soil in place. Suitable for high energy settings and sites with existing hard shoreline structures.

Living Levee



Living Levee – Watson Park, Braintree, MA

BEFORE



AFTER



CZM Funded, Constructed Spring 2022

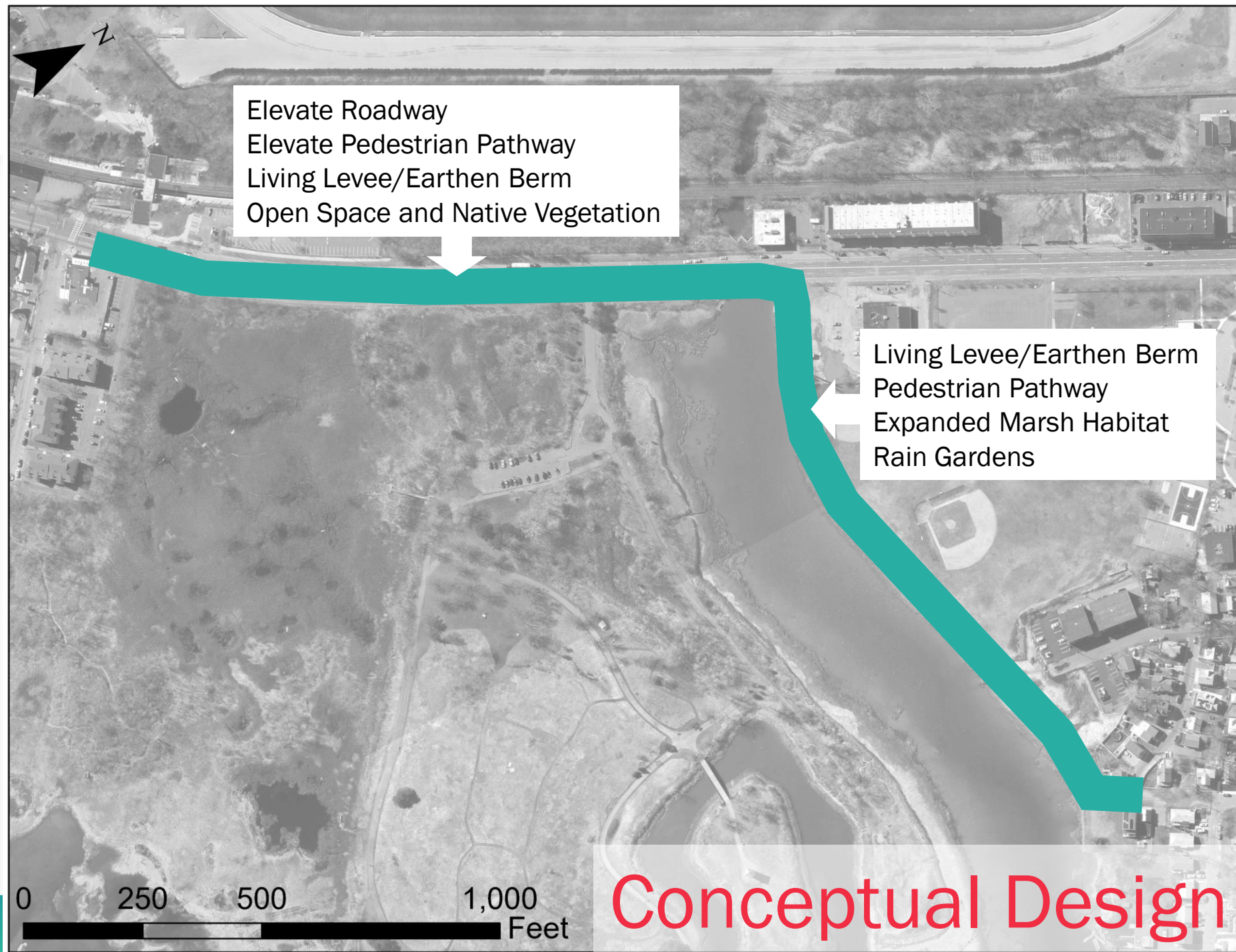
Bennington St and Fredericks Park

Adaptation Goals

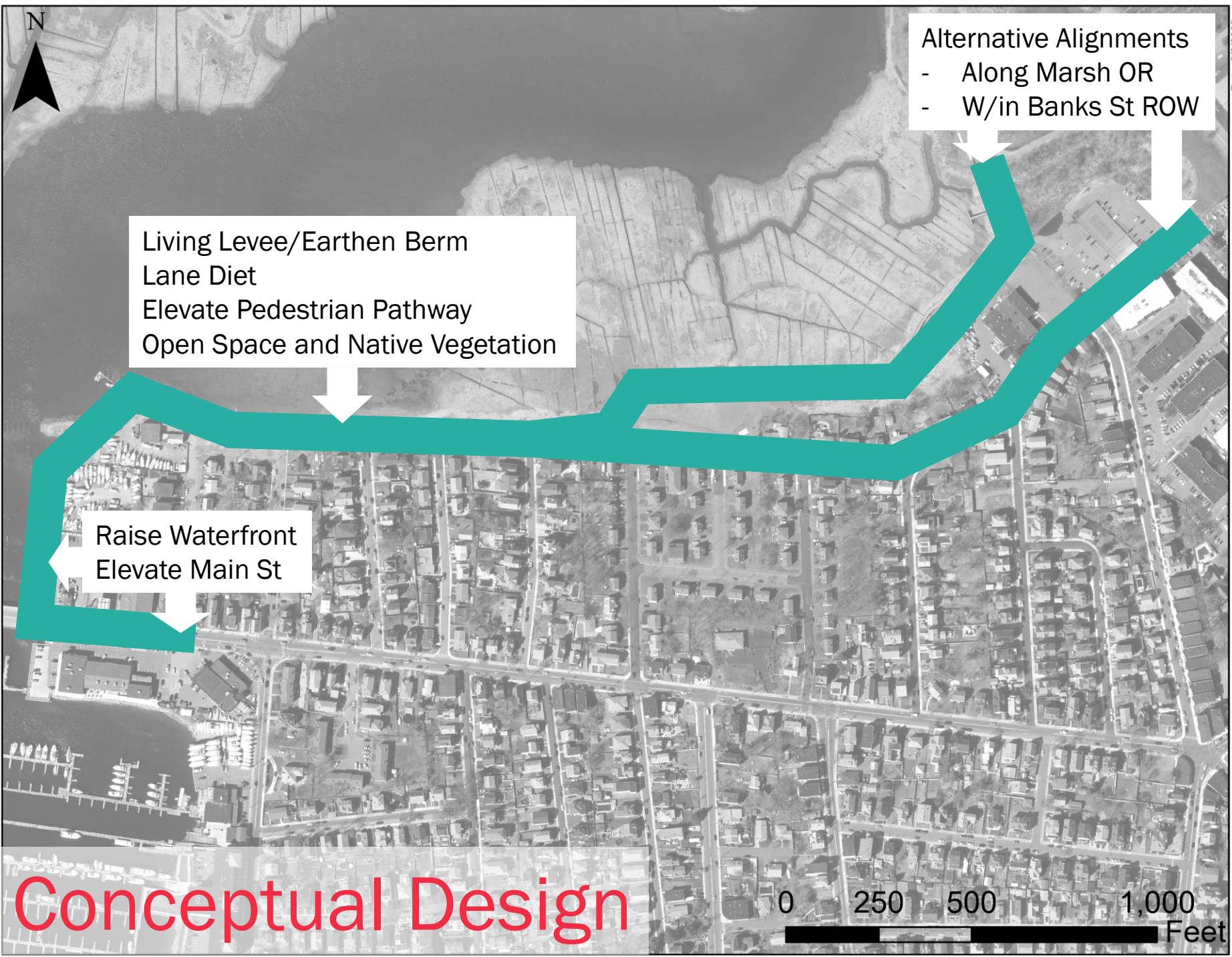
Flood Protection

Habitat Enhancement

Public Access



Morton St



Alternative Alignments
- Along Marsh OR
- W/in Banks St ROW

Living Levee/Earthen Berm
Lane Diet
Elevate Pedestrian Pathway
Open Space and Native Vegetation

Raise Waterfront
Elevate Main St

Conceptual Design

0 250 500 1,000 Feet

Adaptation Goals
Flood Protection
Habitat Enhancement
Public Access

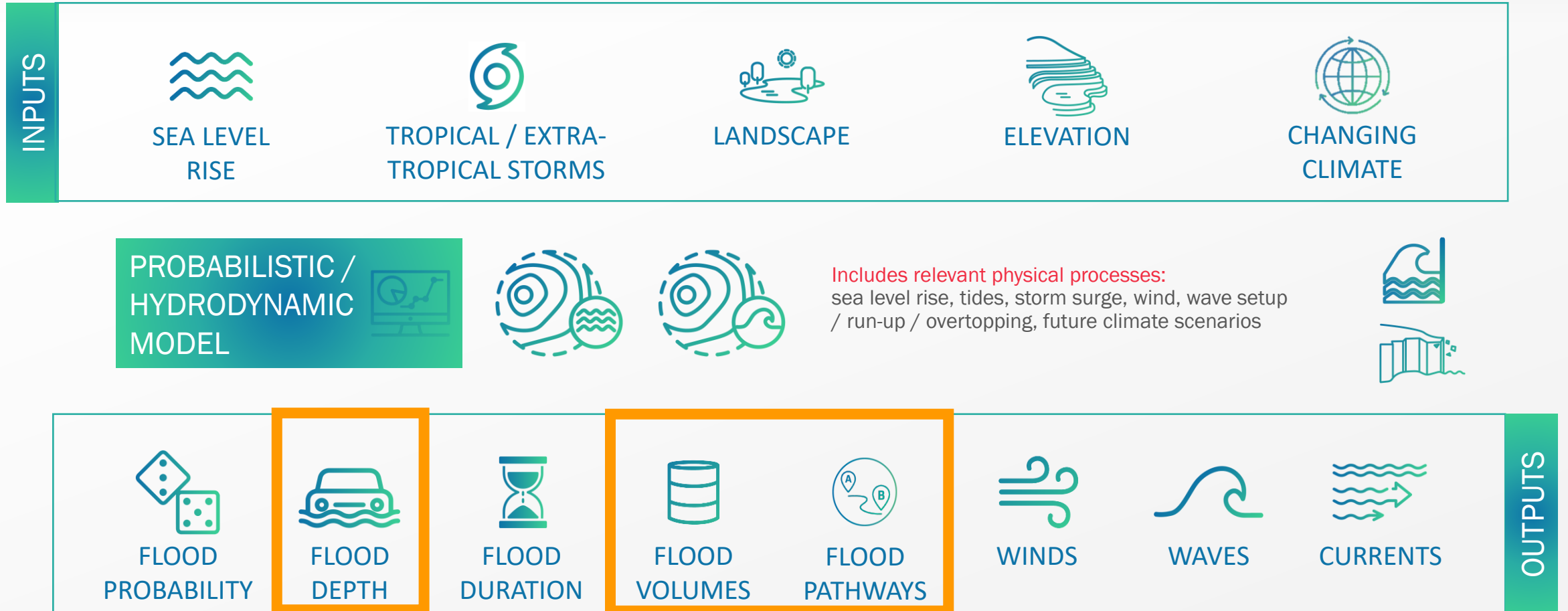
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Performance Modeling

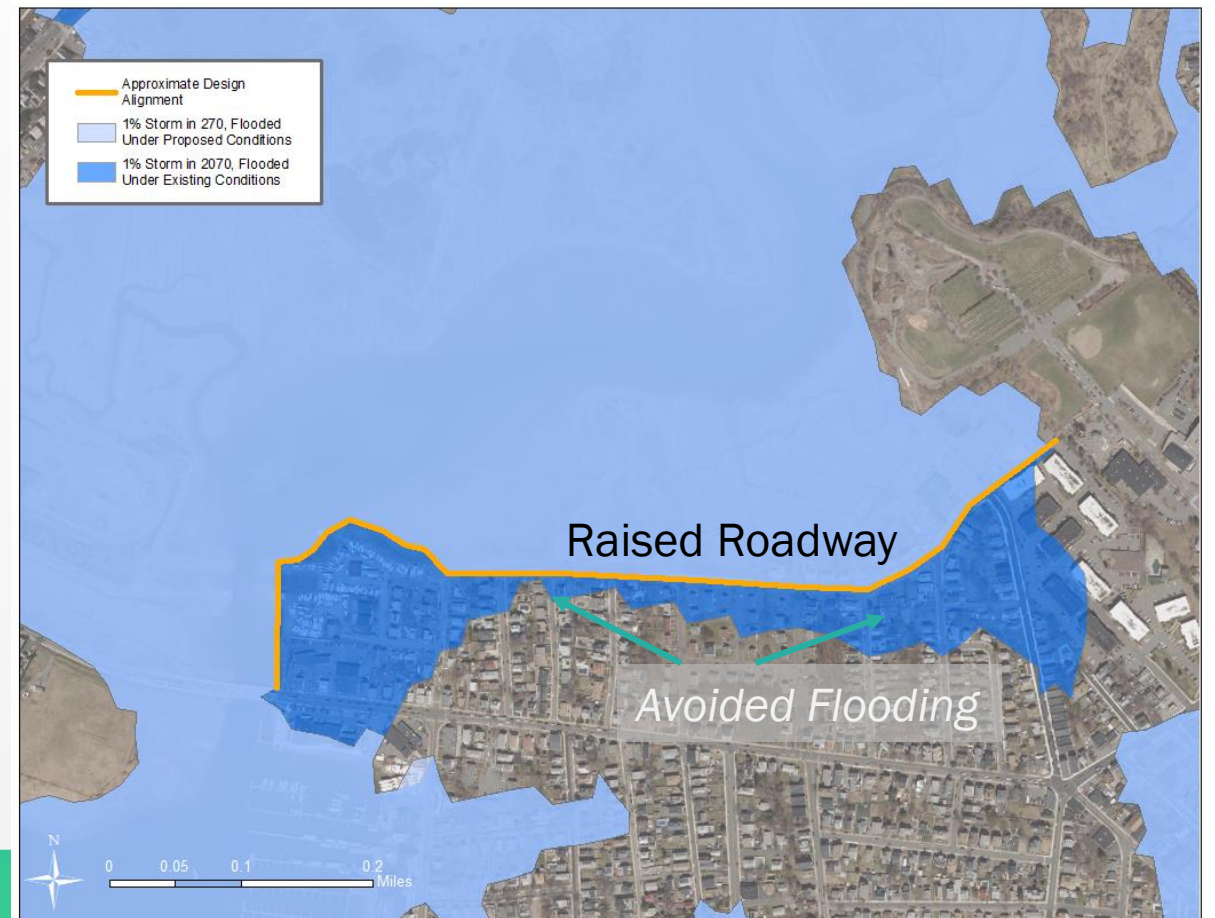
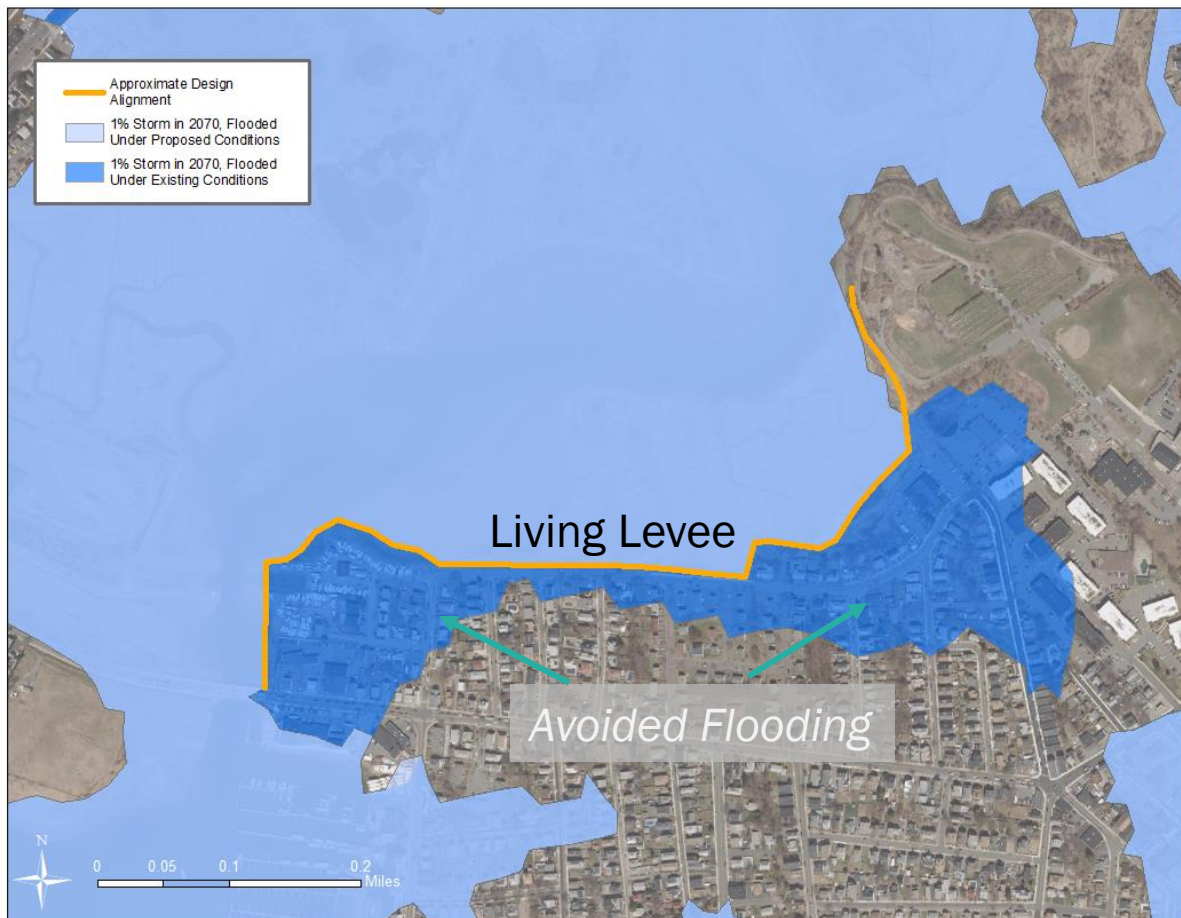
Modeling of Alternatives (MC-FRM)



Morton St, Winthrop

2070 1% Storm Flood Extent

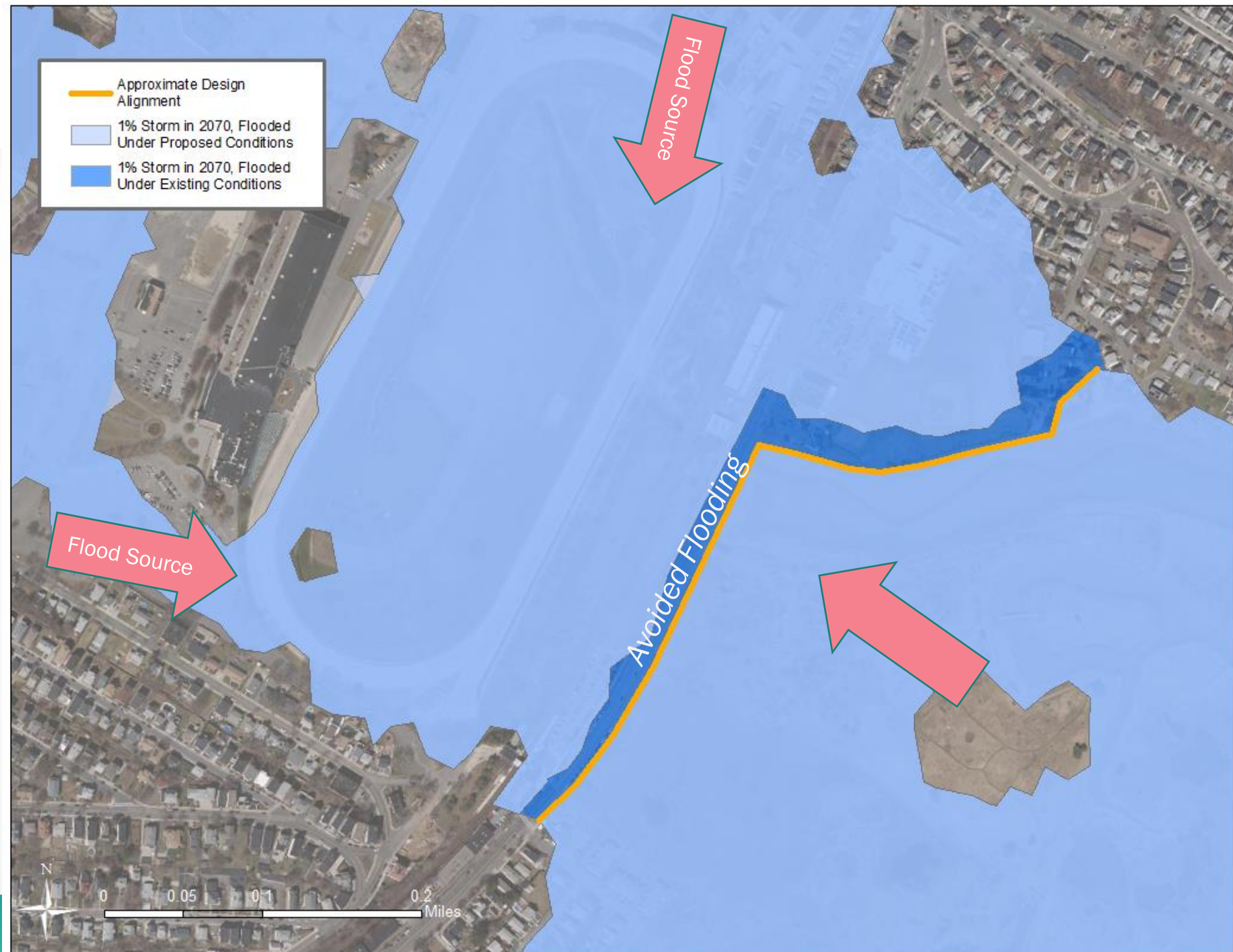
- Project serves as a barrier to all flood water from Belle Isle Marsh
- Aligning the design crest within the marsh protects an additional 1 commercial and 8 residential buildings
- Protection/raising Saratoga St is necessary for preventing back flooding



Bennington St & Frederick's Park

2070 1% Storm Flood Extent

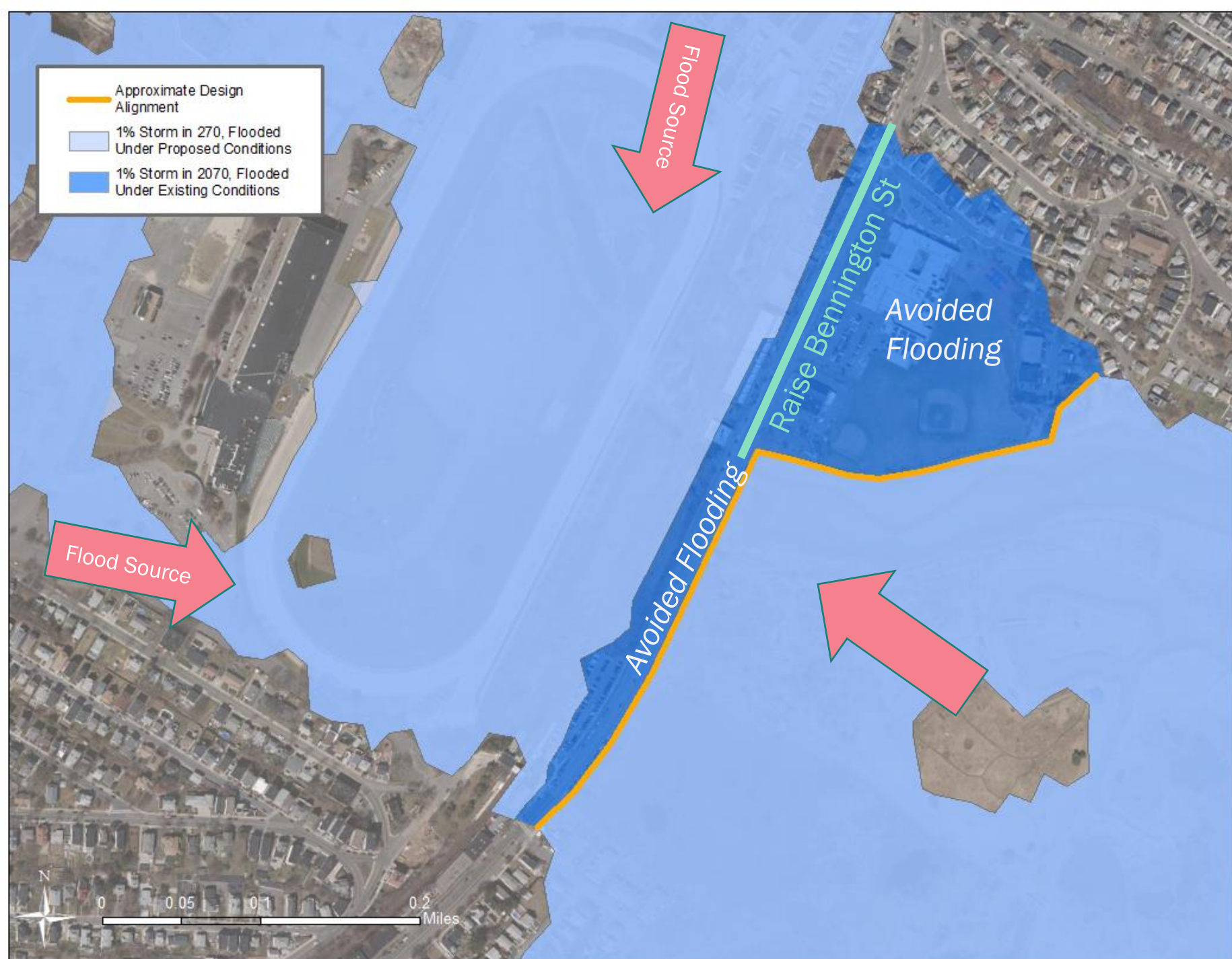
- Project serves as a barrier to all flood water from Belle Isle Marsh
- Back flooding from Chelsea Creek and Revere Beach / Roughan's Point reach the project area



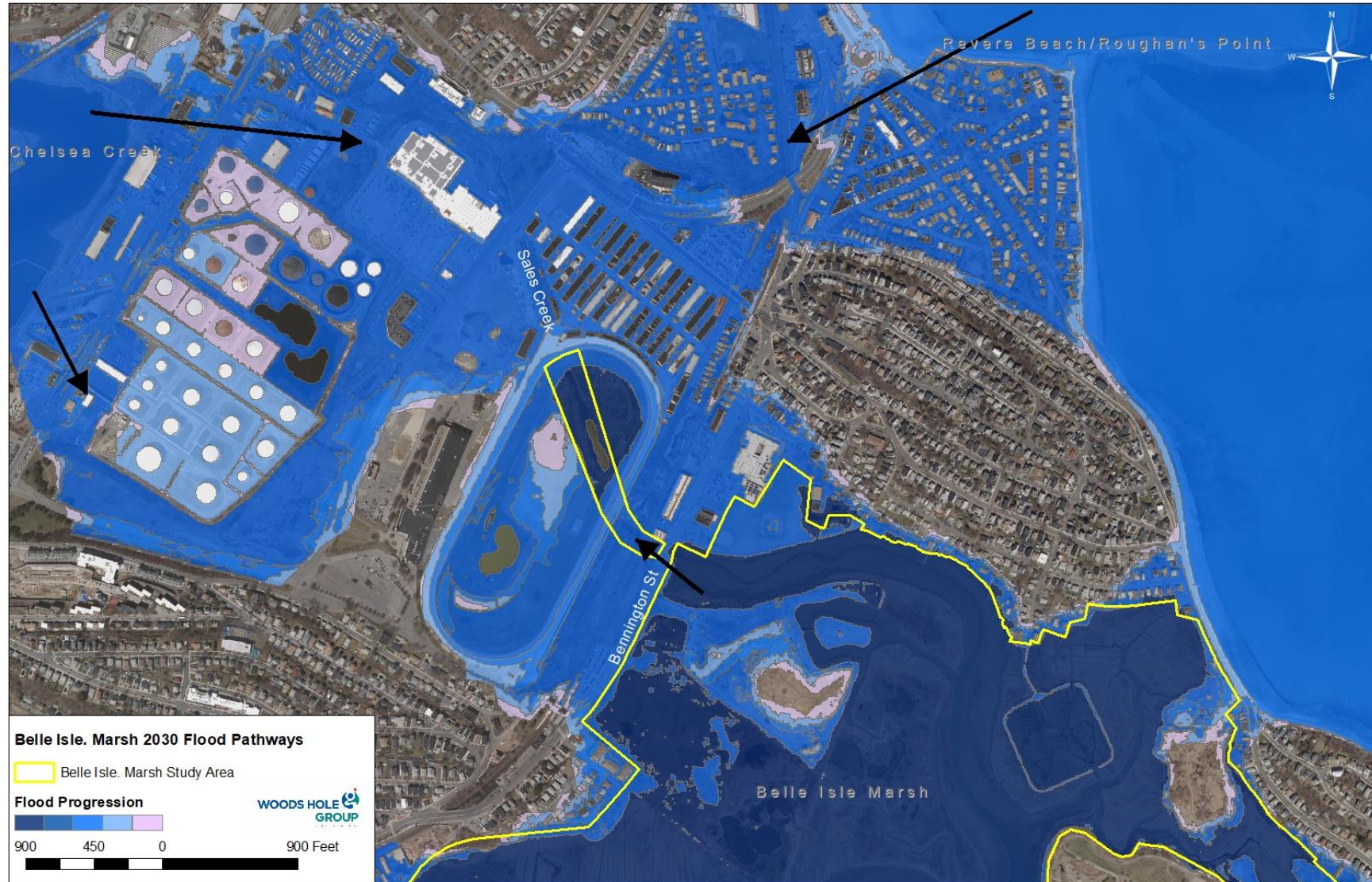
Bennington St & Frederick's Park

2070 1% Storm Flood Extent

- Project serves as a barrier to all flood water from Belle Isle Marsh
- Back flooding from Chelsea Creek and Revere Beach / Roughan's Point reach the project area
- Raising Bennington St to 14.1 ft NAVD88 keeps it dry



Risks of Back Flooding



Bennington St & Frederick's Park

2030 25% Storm Flood Extent

Independent benefits
are still gained

Flood extent is reduced

Inland flood depths
decrease even if
backflooding occurs



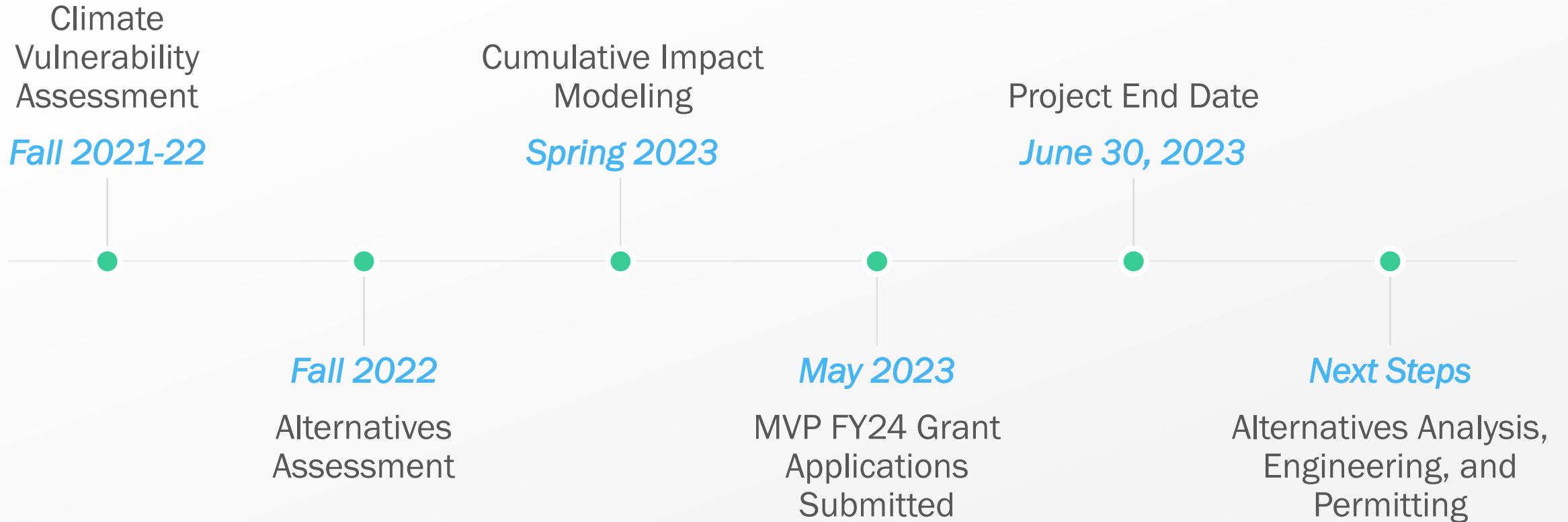
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Next Steps

Next Steps



Thank You

BELLE ISLE
MARSH
RESERVATION

dcr  MASSACHUSETTS DEPARTMENT OF
CONSERVATION AND RECREATION

cofsthun@woodsholegroup.com

Science in the Marsh

Vegetation



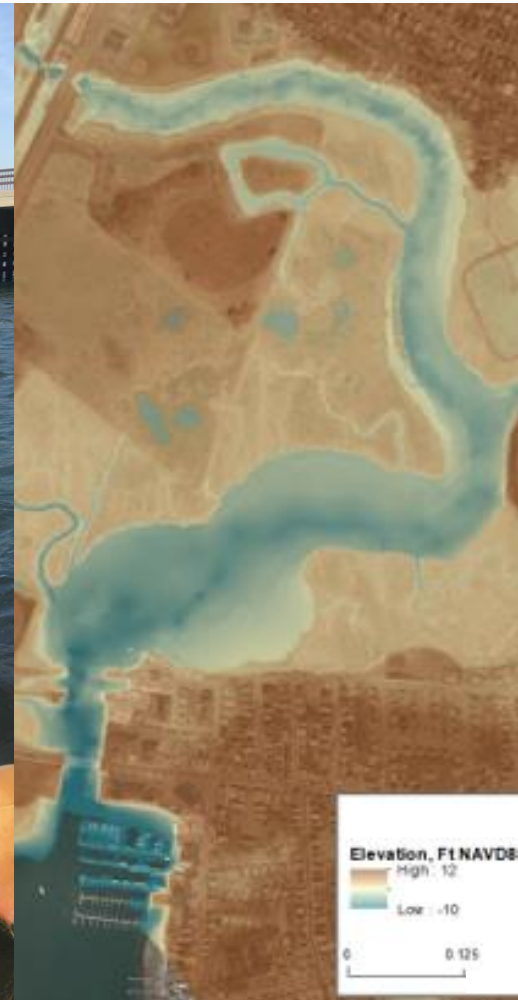
Sediment



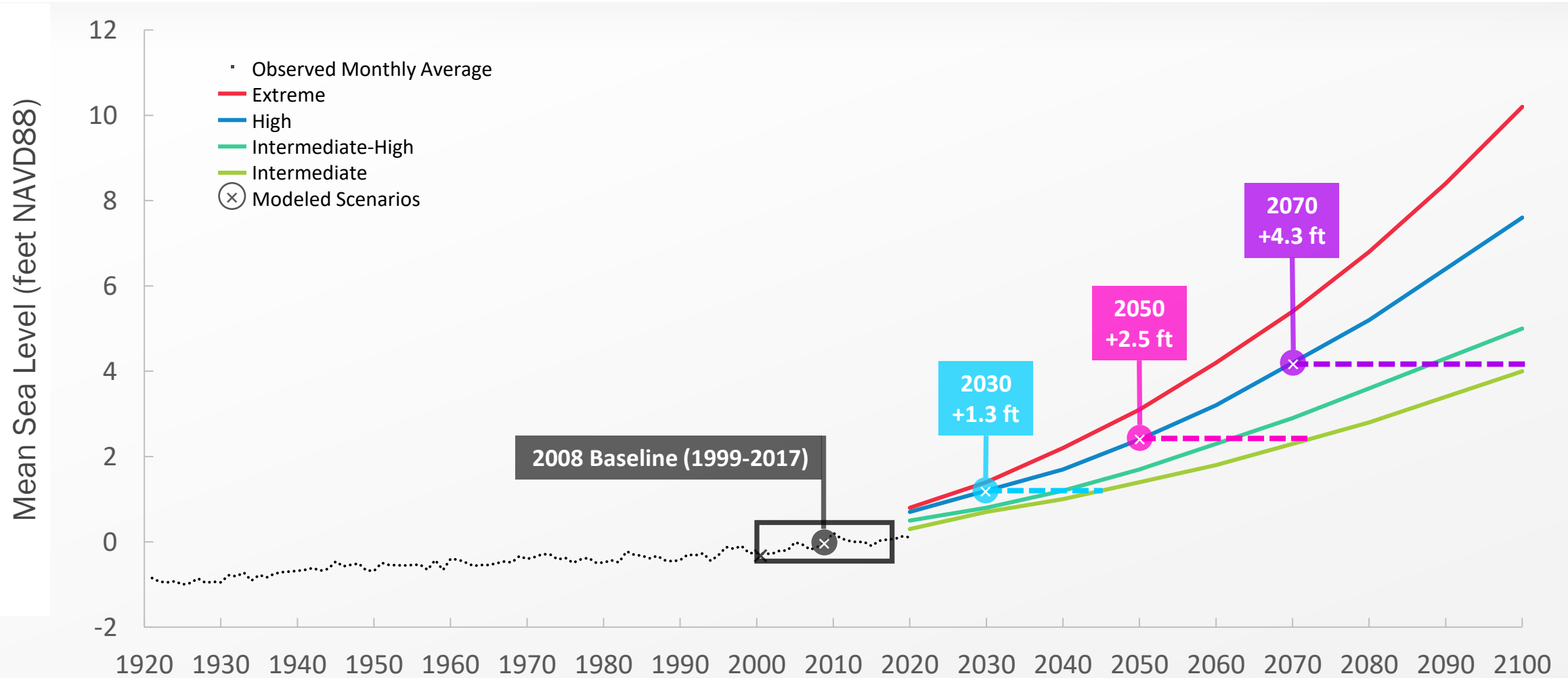
Depth/Elevation



Modeling



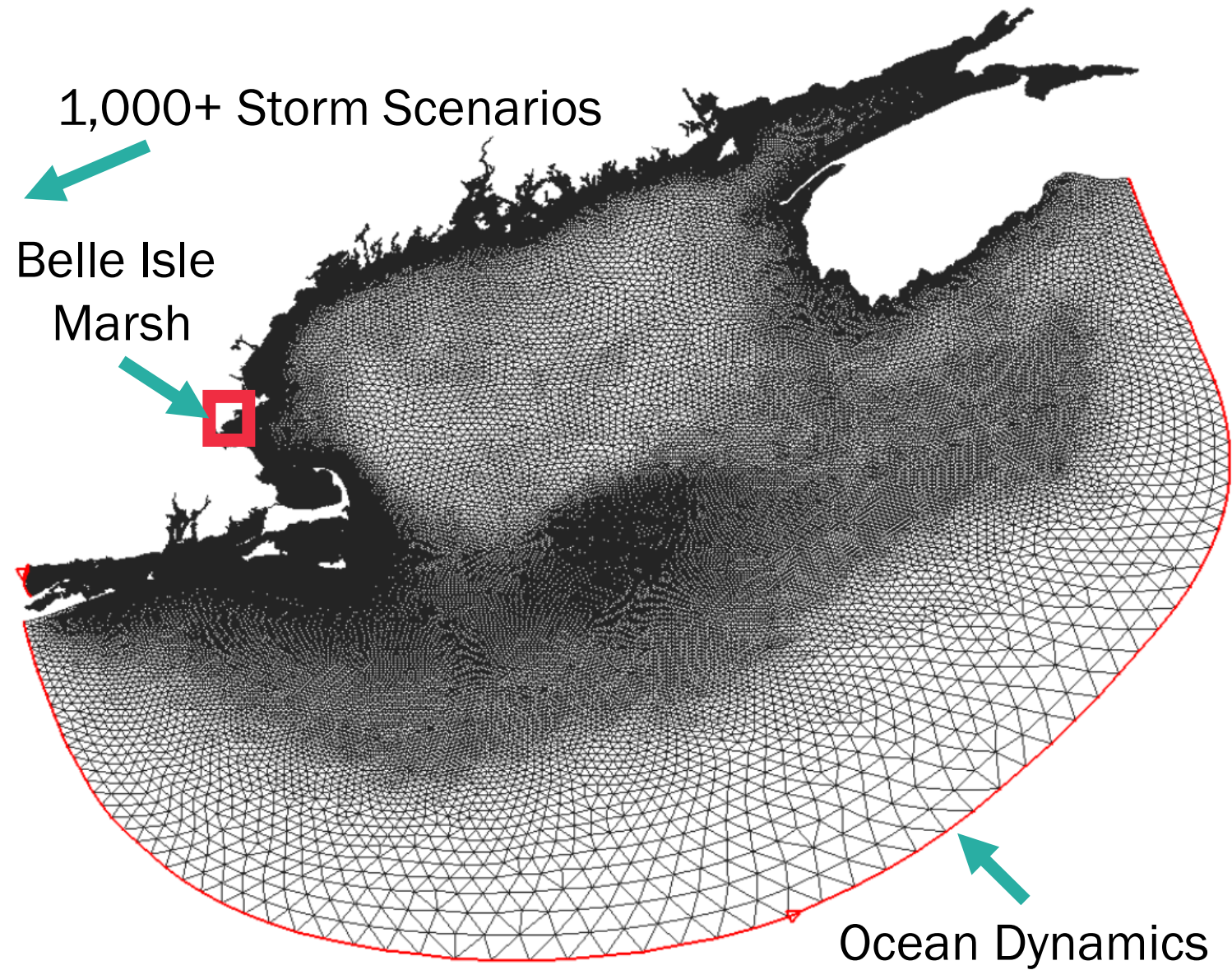
Boston Harbor Sea Level Rise Projections



- › Projections from Resilient MA (DeConto and Kopp, 2017)
- › Labels in flags are relative sea level rise from baseline year of 2008 (1999-2017) in MC-FRM
- › SLR Projections are regionally representative of Provincetown to Salisbury MA

Flood Probability Modeling – MC-FRM

Massachusetts Coastal Flood Risk Model

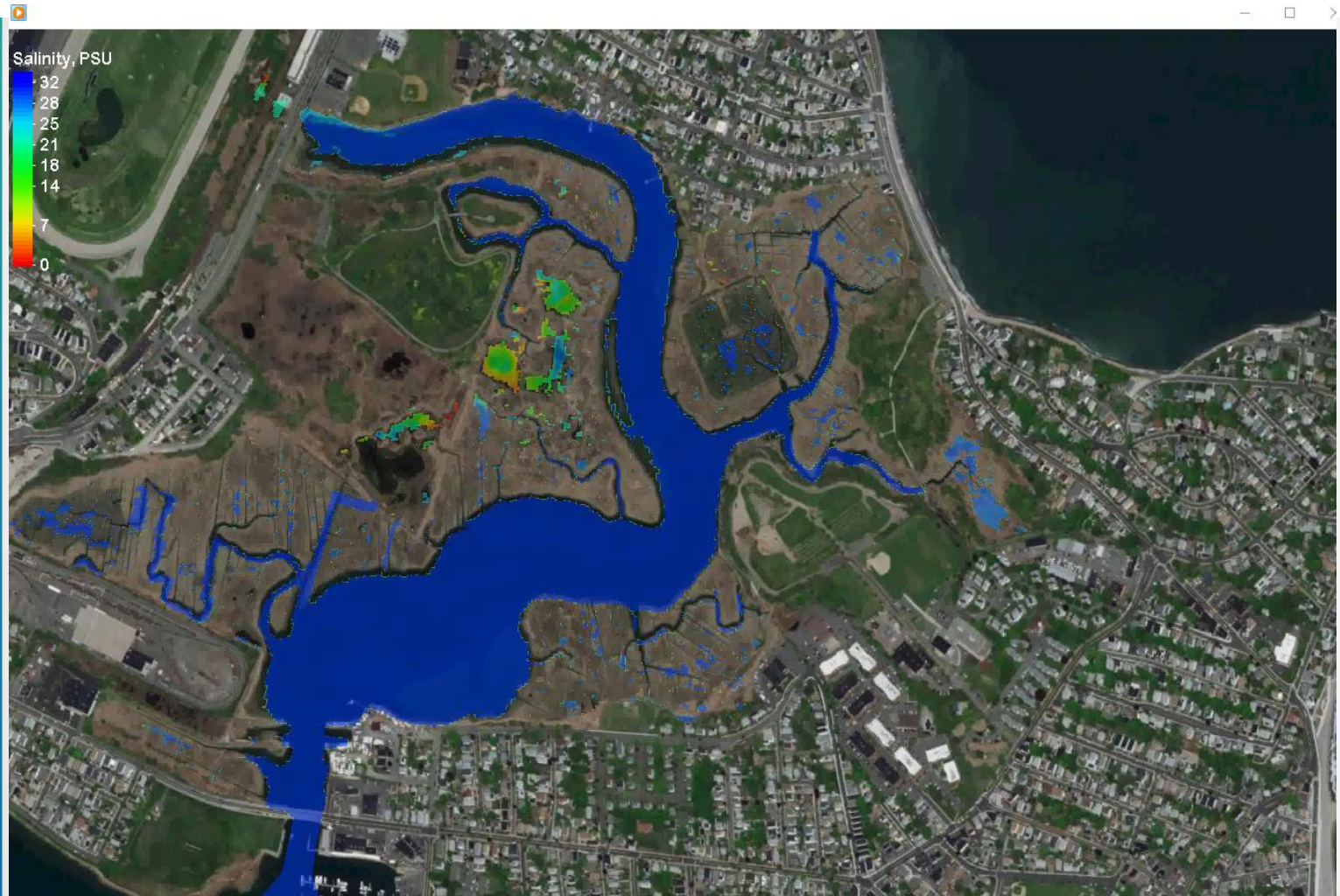


MC-FRM Modeled Storm Scenarios

AEP	Storm Level	Time Horizon	Sea Level Rise Scenario	Maximum Water Level (ft NAVD88)
5%	20-year Storm	2050	2.5 ft	11.1
2%	50-year Storm	2030	1.3 ft	10.0
1%	100-year Storm	2070	4.3 ft	13.6
0.2%	500-year Storm	2050	2.5 ft	13.0

Movement of the Tides in Belle Isle Marsh

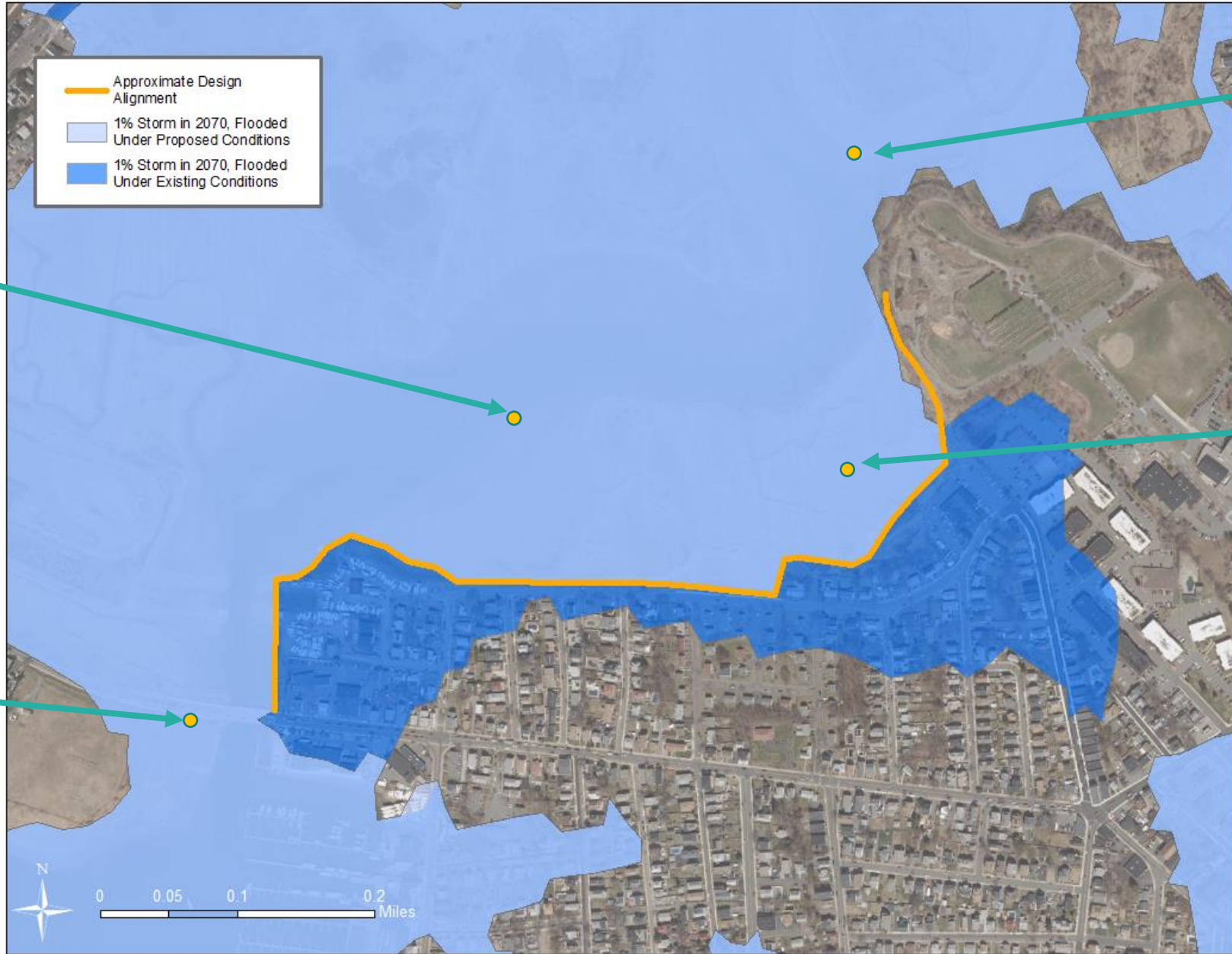
Modeled salinity during a small storm





Morton St

Water Surface Elevations



Existing: 13.6 ft
With Design: 13.6 ft

Existing: 13.6 ft
With Design: 13.6 ft

Existing: 13.6 ft
With Design: 13.6 ft

No measurable unintended impacts

Existing: 13.6 ft
With Design: 13.6 ft



Bennington Street

Belle Isle Marsh

Suffolk Downs
Station

Bennington St & Frederick's Park



Water Surface Elevations

No measurable unintended impacts



Flood Depth Reduction

Independent benefits are still gained

Flood extent is reduced

Flood depths decrease by up to 1 ft in areas still wet

