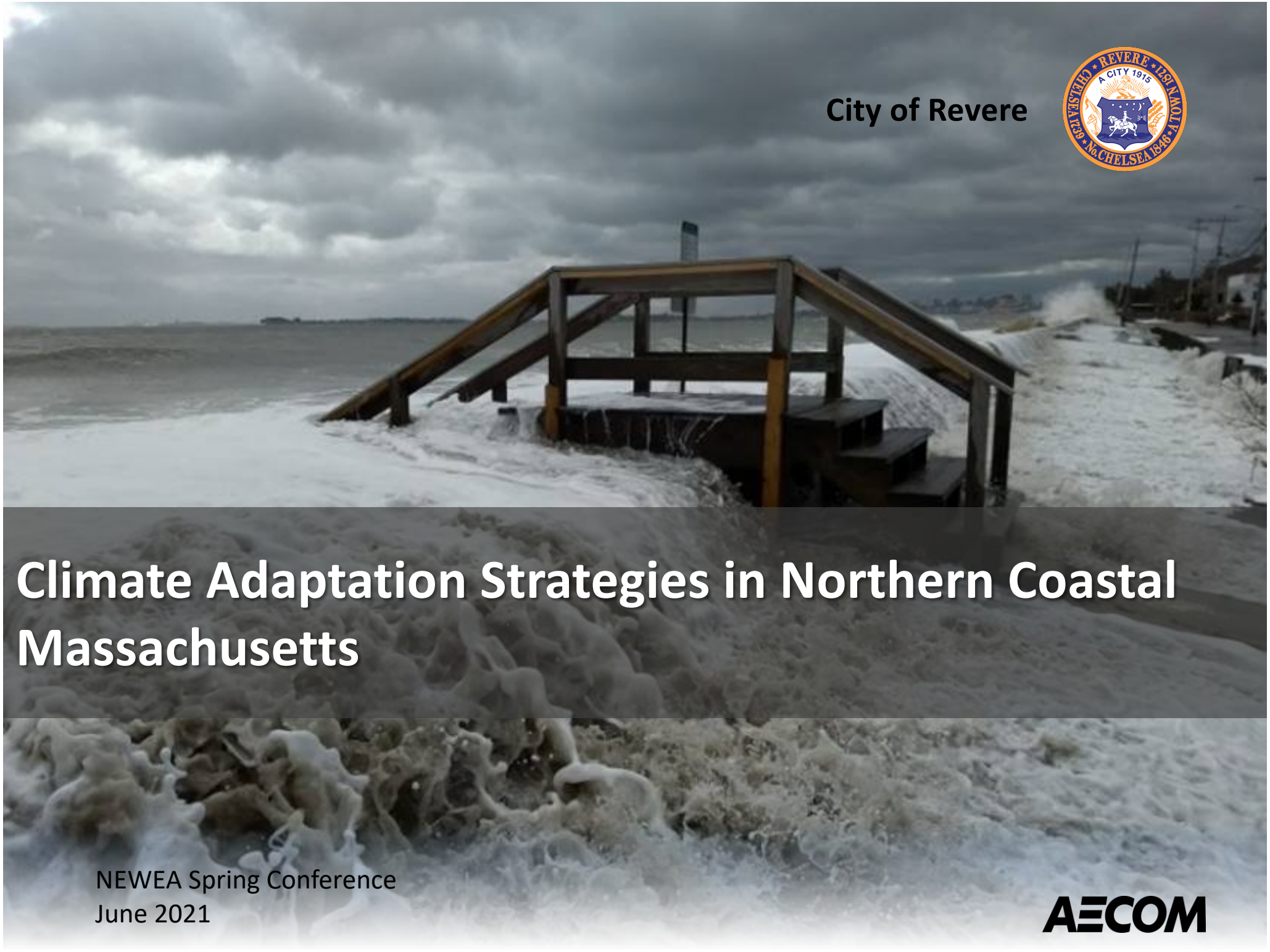


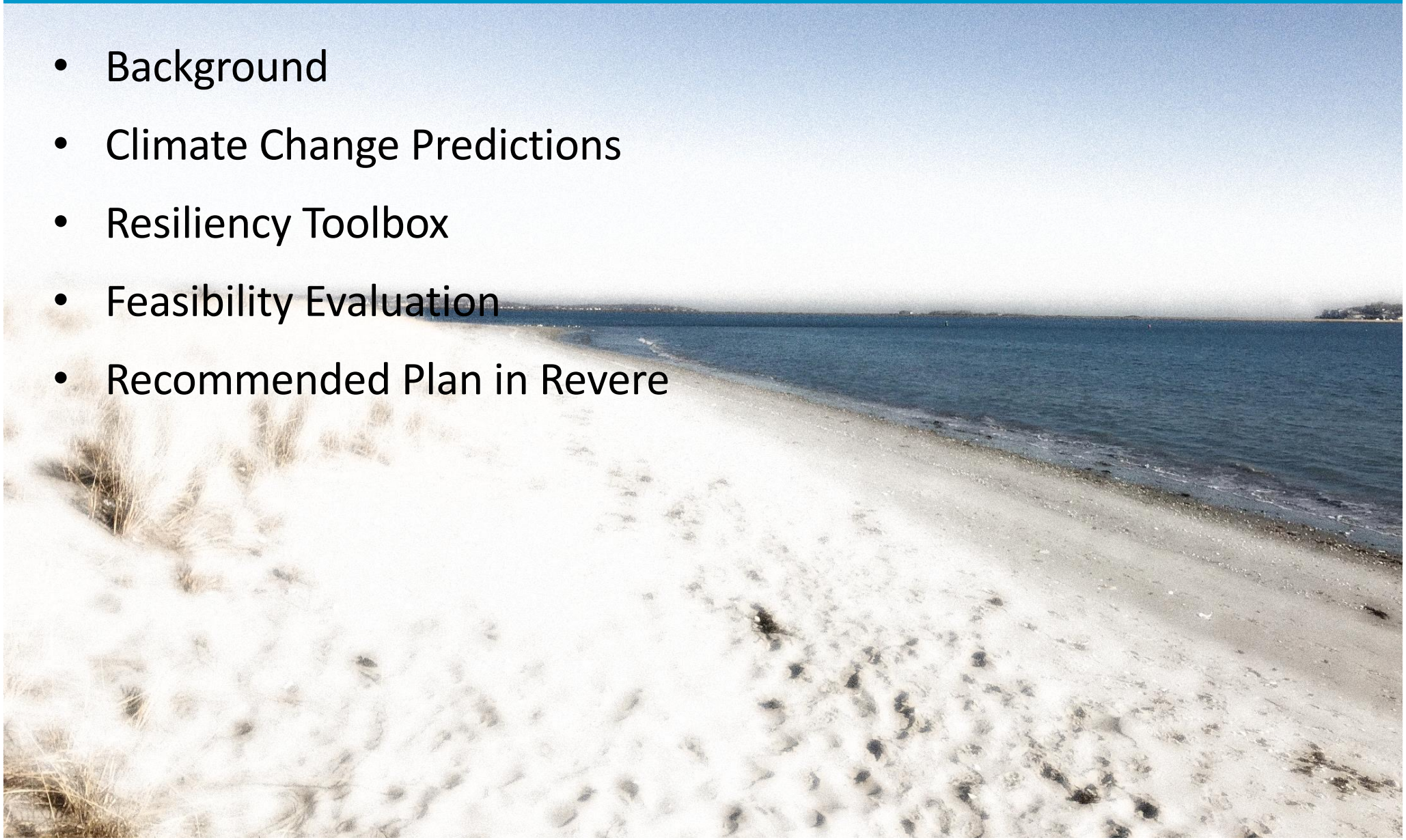
City of Revere

Climate Adaptation Strategies in Northern Coastal Massachusetts

NEWEA Spring Conference
June 2021

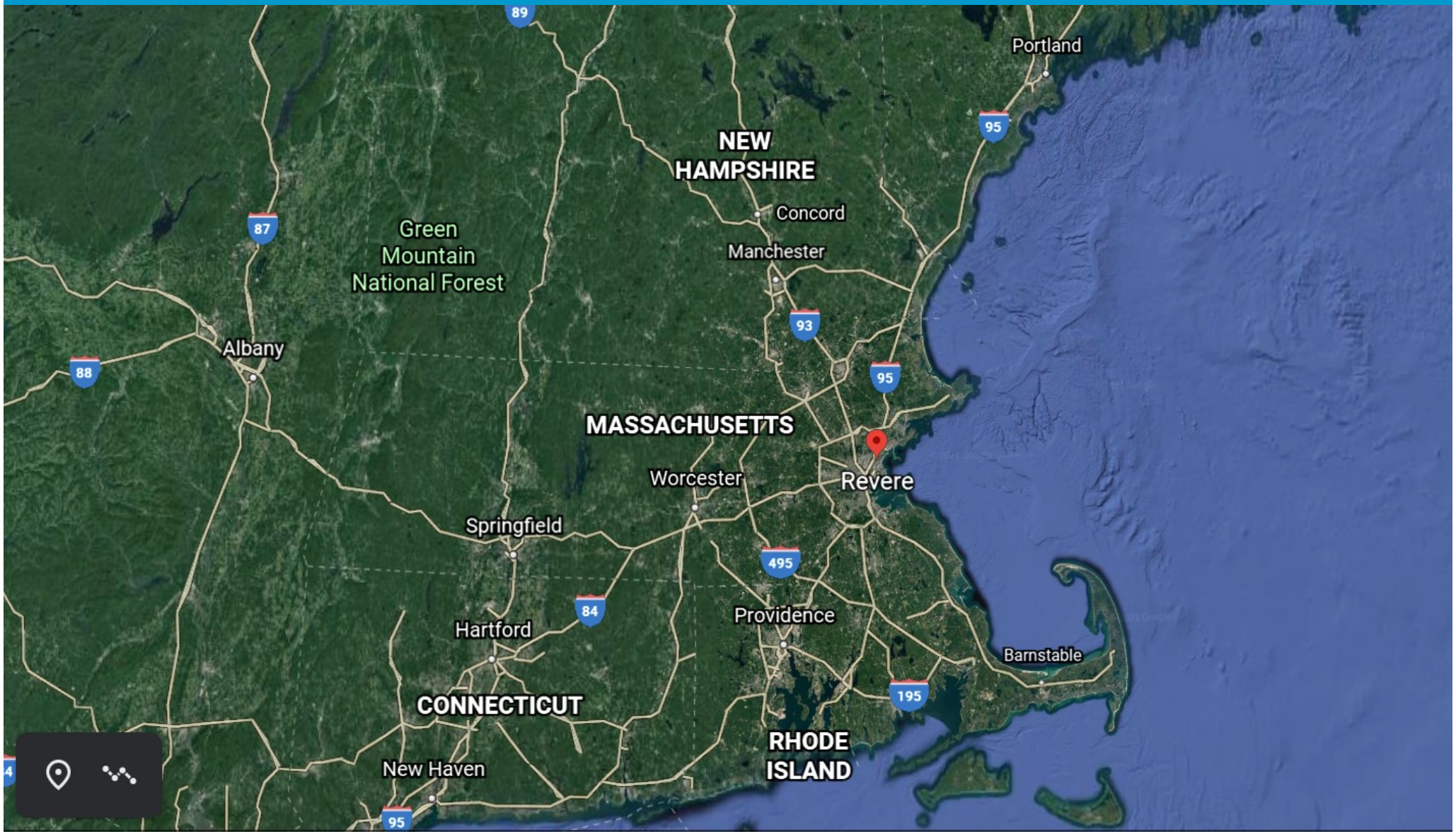
AECOM

Outline



- Background
- Climate Change Predictions
- Resiliency Toolbox
- Feasibility Evaluation
- Recommended Plan in Revere

Revere, MA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NEW
HAMPSHIRE
Concord
87
Green
Mountain
National Forest
Manchester
93
Albany
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MASSACHUSETTS
Worcester
Revere
Springfield
495
84
Providence
Hartford
Barnstable
195
CONNECTICUT
RHODE
ISLAND
New Haven
95

Point of Pines/Riverside

Point of Pines/Riverside

Municipal Vulnerability Preparedness Program

- City completed the MVP Planning Grant process in 2019, implementing a Community Resilience Building Workshop framework
- Core Project Team established
- State certified MVP provider, AECOM, engaged

Point of Pines / Riverside Area Existing Conditions

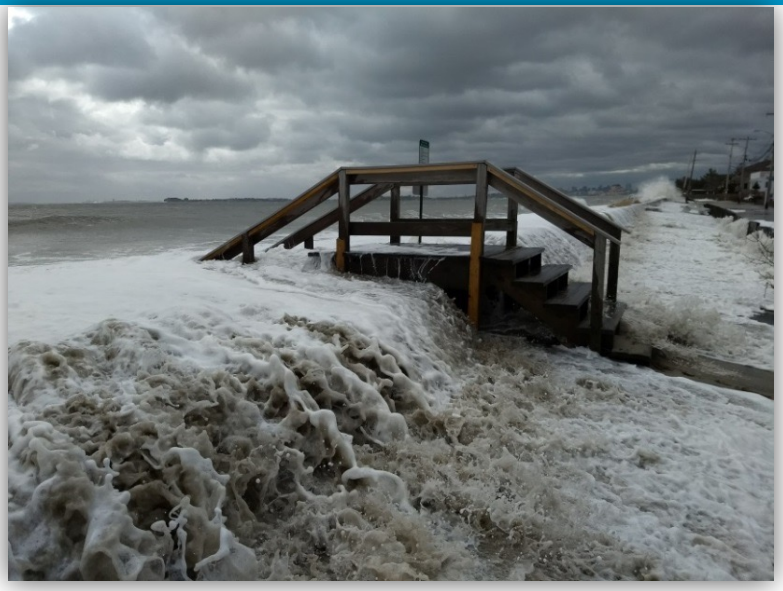


Photo Credit: John Polcari

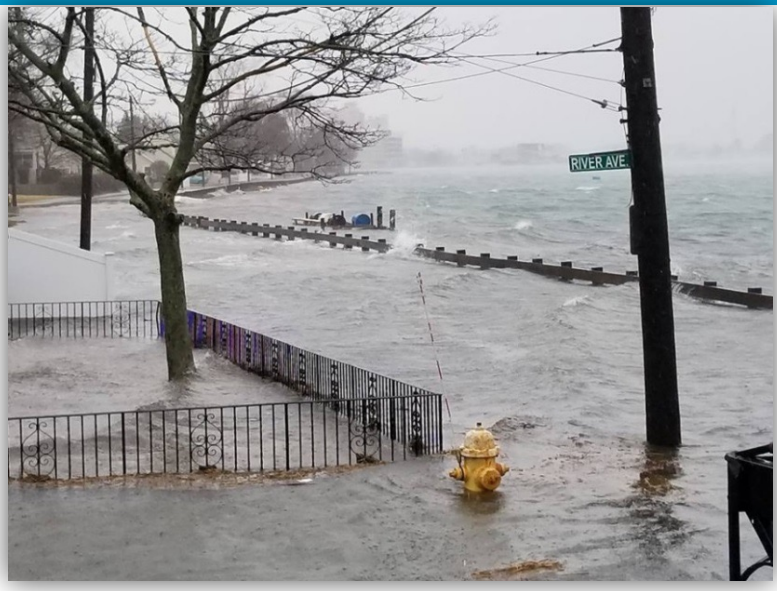
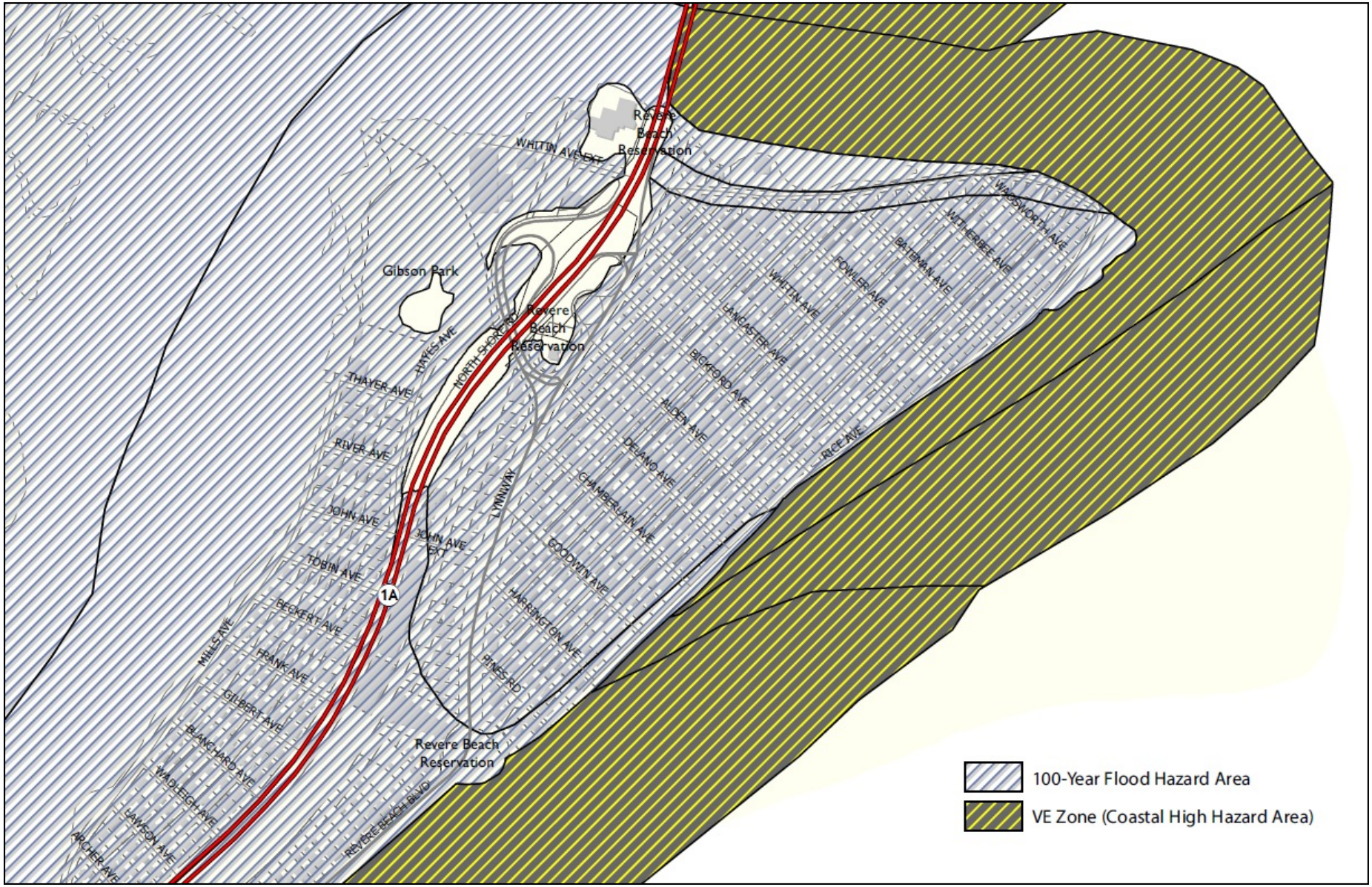


Photo Credit: Loretta LaCentra

Photo Credit: Elaine Hurley

Photo Credit: John Polcari

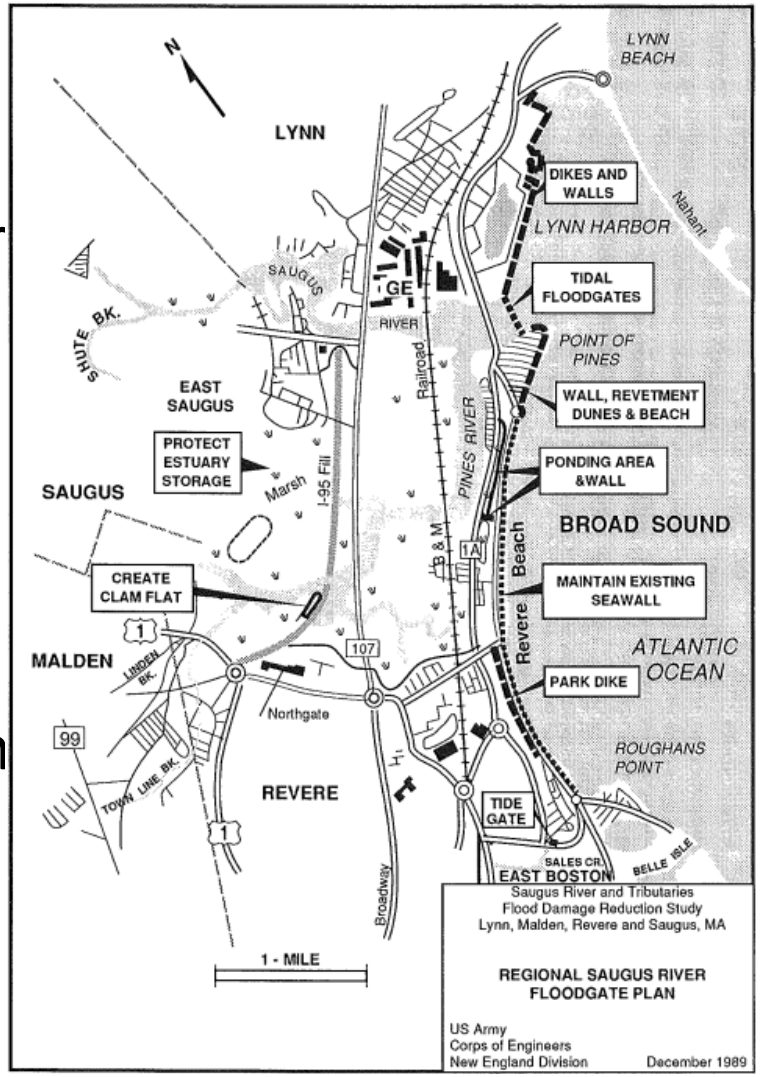
Current FEMA Flood Zone Mapping



Source: MassGIS, FEMA NFHL 1/29/2019

Past Studies

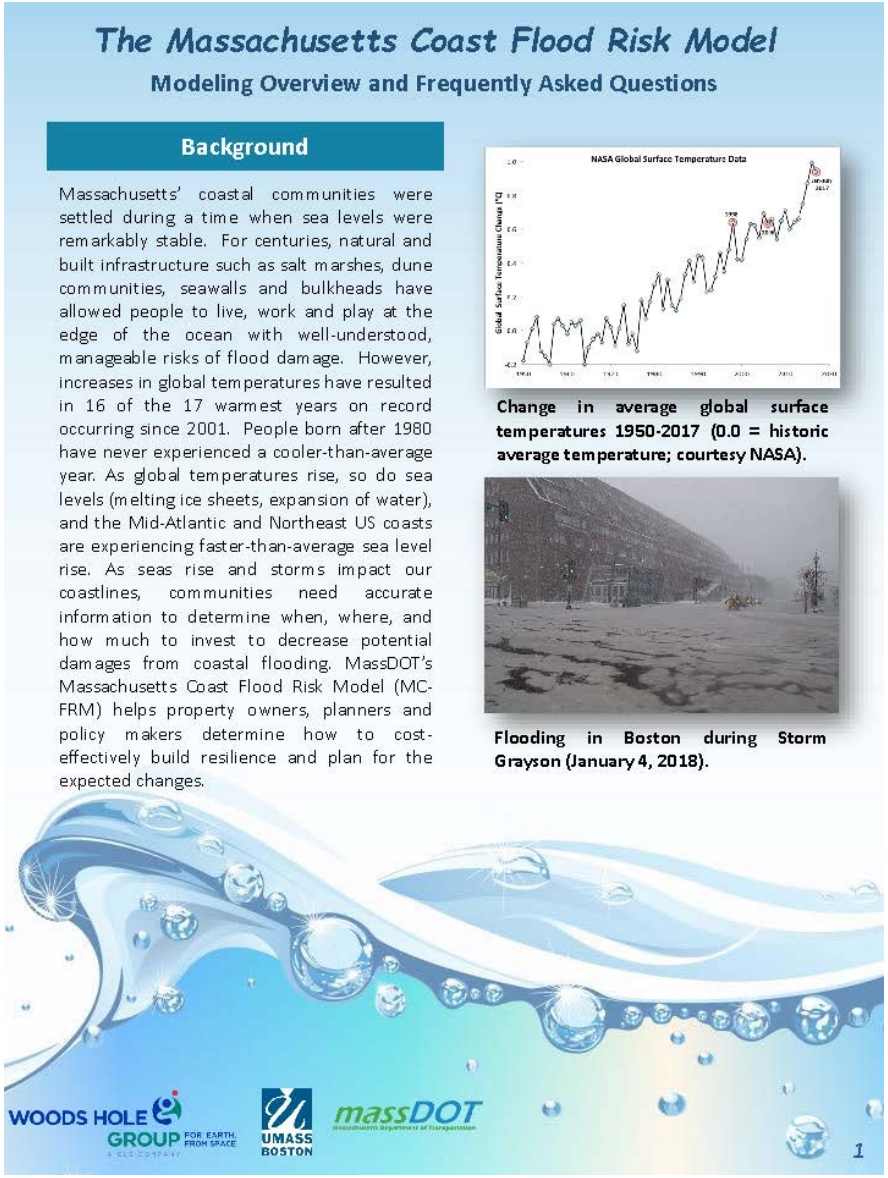
- Route 1A Corridor Vulnerability Assessment, 2020
- USACE Flood Damage Reduction Study for the Saugus River and Tributaries, 1990
- USACE EIS/EIR for Flood Damage Reduction, 1989
- USACE Coastal Flood Protection Report an Environmental Assessment, 1986



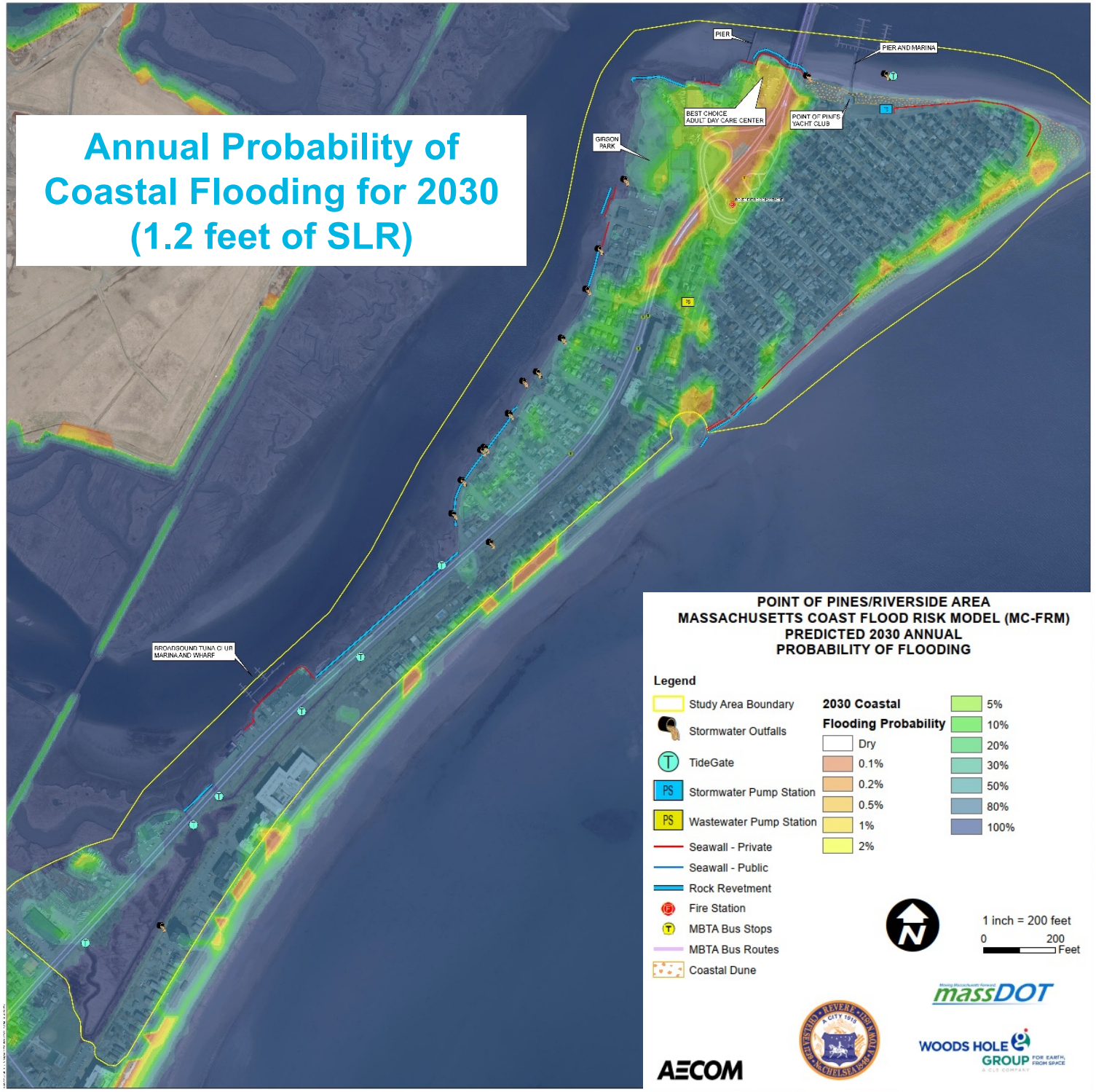
Existing and Future Sea Level

Projected Coastal Flooding

- Central Artery/Tunnel Vulnerability and Adaptation Assessment completed in 2015
  - Created the Boston Harbor Flood Risk Model (BH-FRM) to identify risk and depth of water resulting from storm surge induced coastal flooding
- Massachusetts Coast Flood Risk Model (MC-FRM)
  - Expanded to model entire coast and islands
  - Sea level rise and coastal storms (not extreme precipitation)
  - Used to support regional scale vulnerability analysis and conceptual adaptation strategies
  - Results for Present Day, 2030, 2050, and 2070

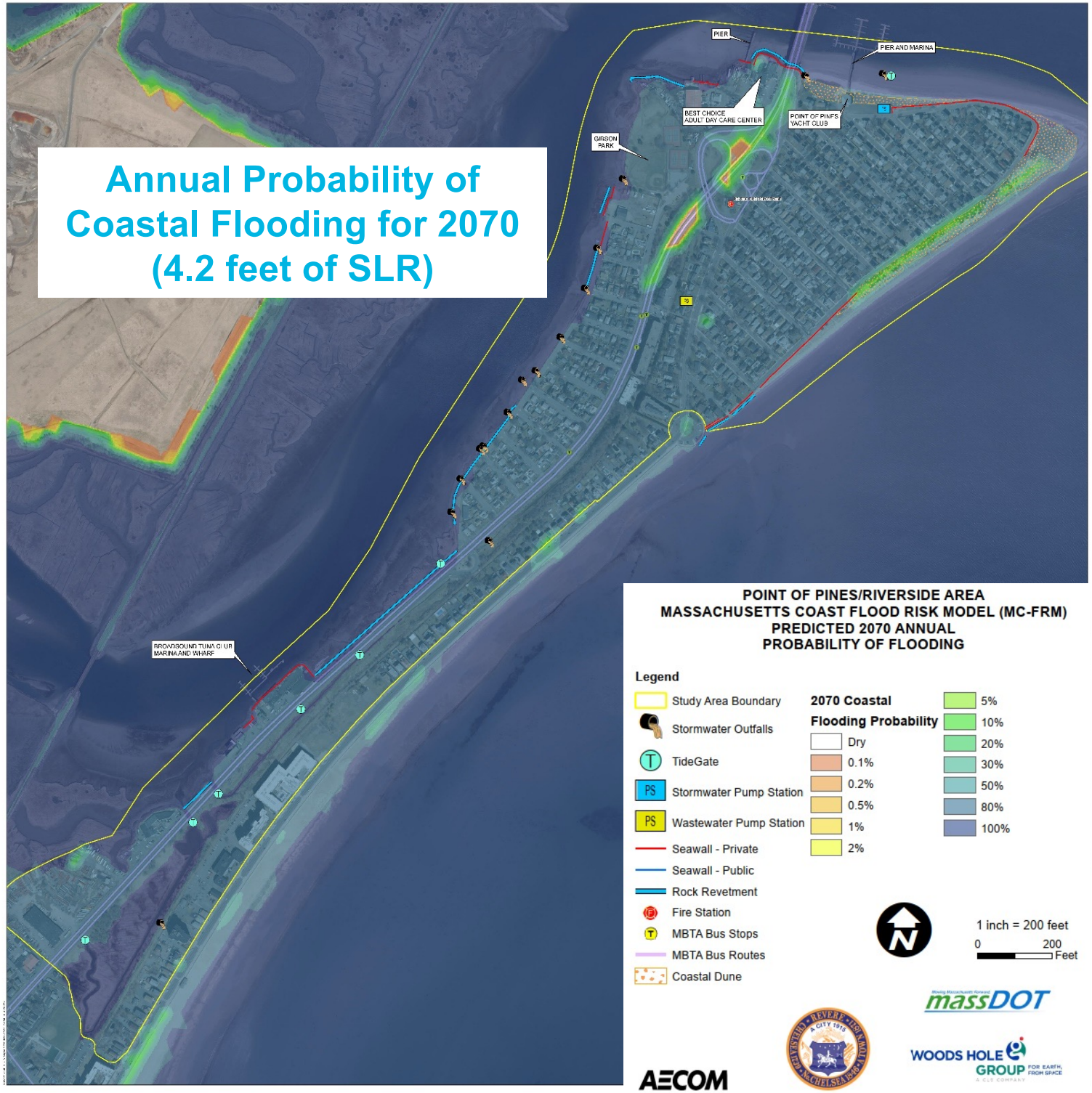


Annual Probability of Coastal Flooding for 2030 (1.2 feet of SLR)



AECOM

Annual Probability of Coastal Flooding for 2070 (4.2 feet of SLR)



INUNDATION DEPTH | 2030 100-YEAR STORM

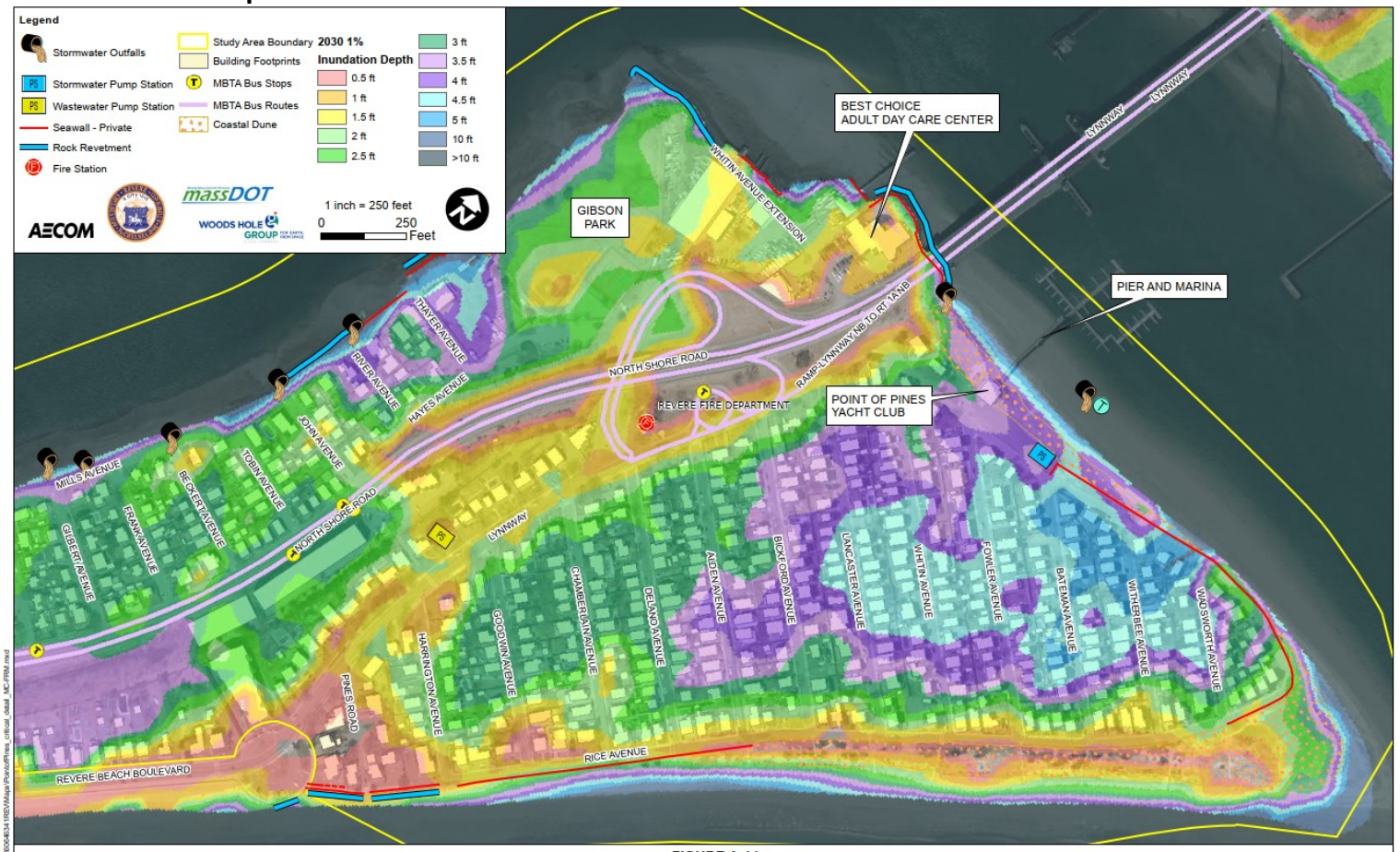


FIGURE A-14
POINT OF PINES/RIVERSIDE AREA
MASSACHUSETTS COAST FLOOD RISK MODEL (MC-FRM) PREDICTED 2030 WATER DEPTHS DUE TO 1 PERCENT ANNUAL CHANCE EXCEEDANCE (ACE) STORM - EAST

INUNDATION DEPTH | 2070 100-YEAR STORM

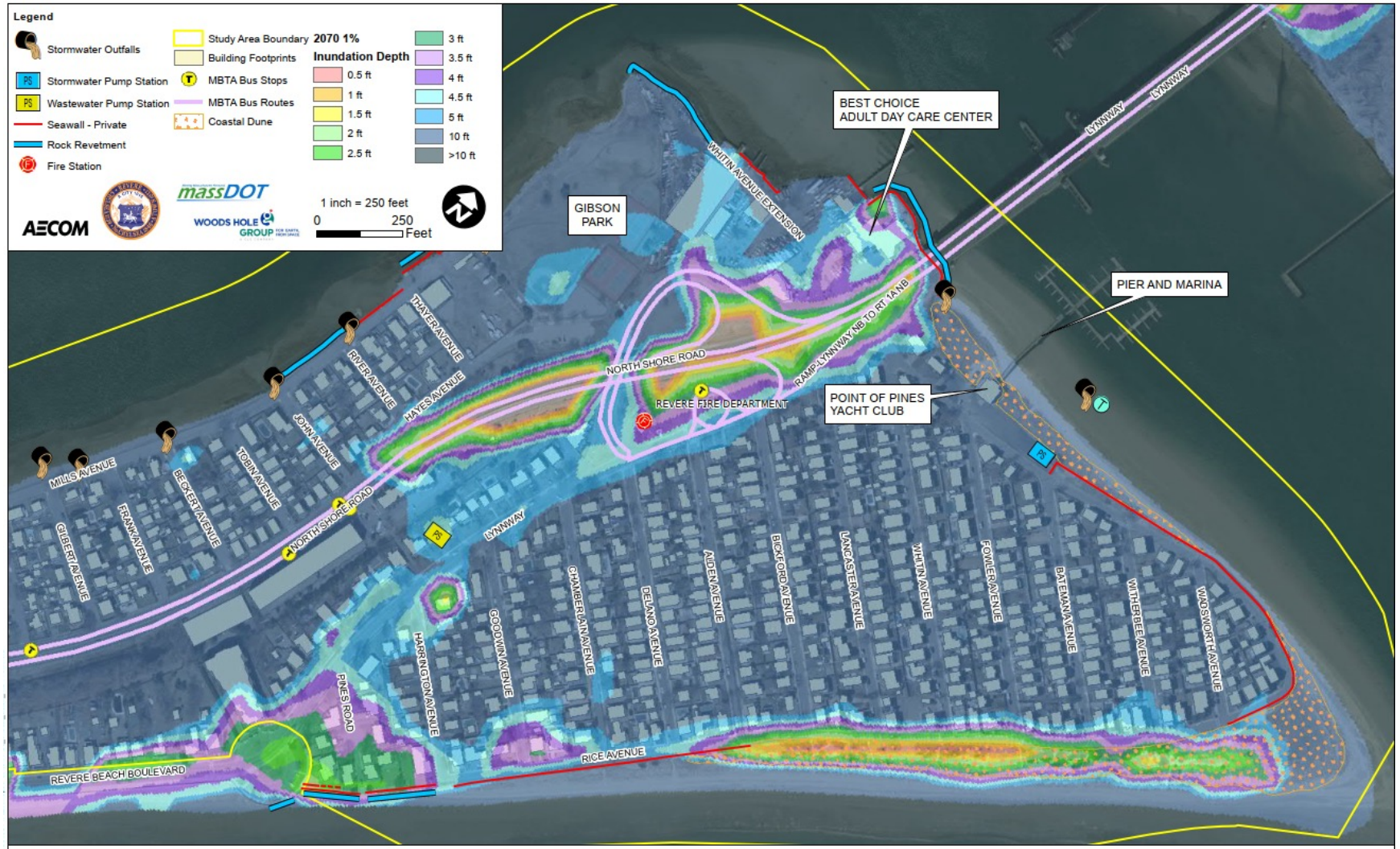
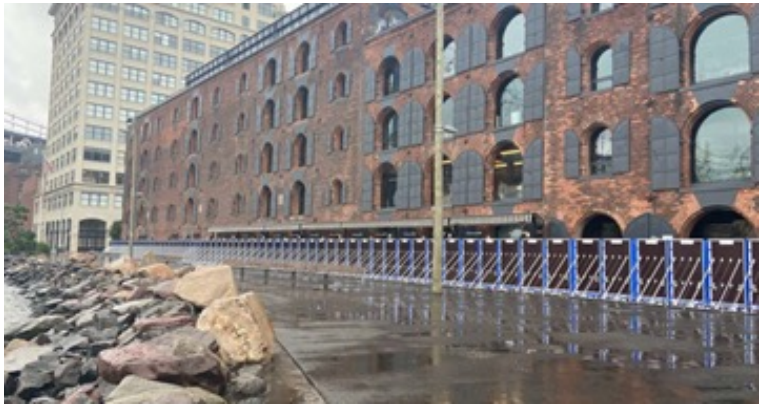


FIGURE A-16
POINT OF PINES/RIVERSIDE AREA
MASSACHUSETTS COAST FLOOD RISK MODEL (MC-FRM) PREDICTED 2070 WATER DEPTHS DUE TO 1 PERCENT ANNUAL CHANCE EXCEEDANCE (ACE) STORM - EAST

Short-Term Resilience Measures

Deployable Measures

- Require storage at a secondary location
- Require a deployment team/plan
- Less visual impact



Aquafence, Brooklyn, NY

Tiger Dams Lumberton, NC

Stop Logs, Aquarium Station, Boston, MA

Boxwall London, England

Short-Term Resilience Measures

On-Site Measures

- No deployment required
- Significant day to day visual impact

DefendCell, California

Hesco Barriers, Kane Berm, Hackensack, NJ

Sandbag Wall Cape Girardeau, MO

TrapBags, Sarasota, FL

Resilience Toolkit

NON-STRUCTURAL MEASURES

EVACUATION PROCEDURES

PUBLIC EDUCATION

LOCAL BUILDING CODE

LAND ACQUISITION

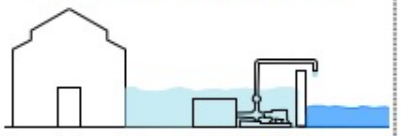
NATURE BASED ADAPTATION

BEACH/ DUNE PROTECTION AND EROSION CONTROL

WETLAND AND HABITAT PRESERVATION AND RESTORATION

LIVING SHORELINES

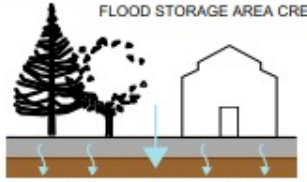
STORMWATER MANAGEMENT



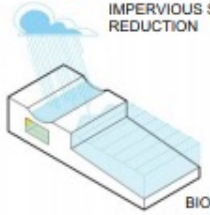
PUMP STATIONS

GREEN INFRASTRUCTURE FOR STORMWATER MANAGEMENT

FLOOD STORAGE AREA CREATION



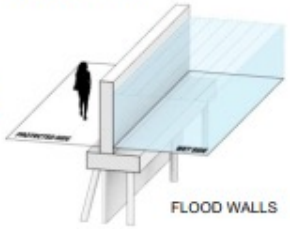
IMPERVIOUS SURFACE REMOVAL/ REDUCTION



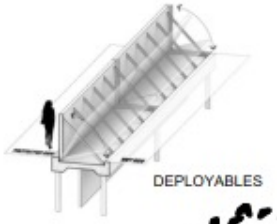
BIORETENTION BASIN

BACKFLOW PREVENTION

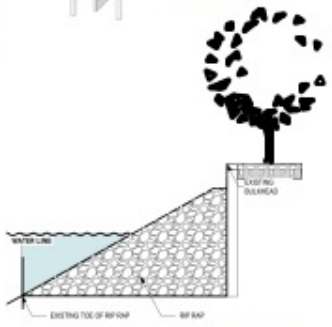
FLOOD RISK REDUCTION MEASURES



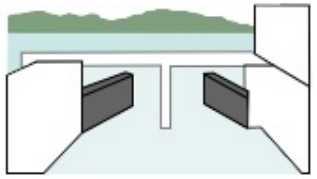
FLOOD WALLS



DEPLOYABLES



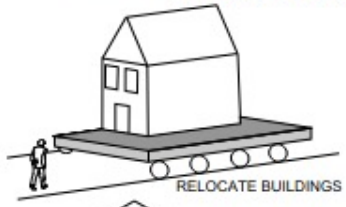
COASTAL STRUCTURES



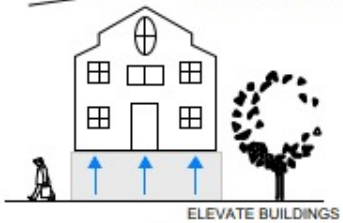
OFFSHORE STRUCTURES

CRITICAL INFRASTRUCTURE RISK REDUCTION MEASURES

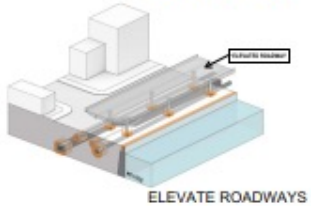
FLOODPROOF BUILDINGS



RELOCATE BUILDINGS



ELEVATE BUILDINGS



ELEVATE ROADWAYS

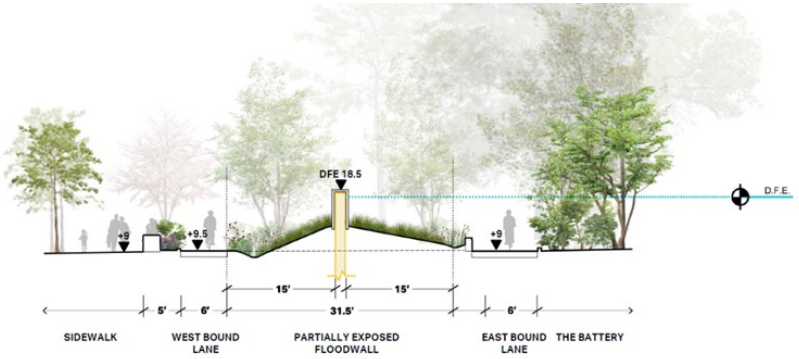
THE TOOLKIT

DEVELOPING A TOOLKIT:

There is no single solution, instead there are a multitude of ways to address the various needs and issues throughout the Point of Pines / Riverside project area. This toolkit will act as a resource for future climate resiliency projects not only for the City of Revere, but also for other coastal municipalities in the Commonwealth. Potential permanent nature-based adaptation, stormwater management, flood risk reduction, and critical infrastructure risk reduction measures for climate resilience are provided in the toolkit. Each of these measures has a particular way of performing, addressing a need, and relating to other components. For this reason, a range of solutions and combinations will likely be used to protect the project area. Additional information on the measures depicted in this toolkit can be found in the accompanying memorandum - Coastal Resilience Toolkit.

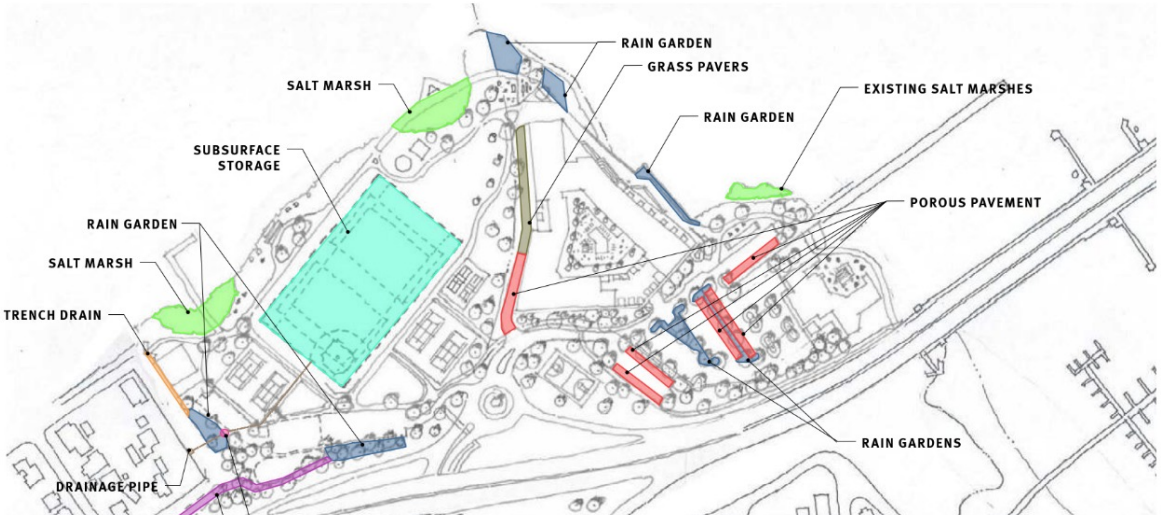
Coastal Resilience Toolkit

- Structural
  - Flood Walls
  - Flood storage area creation
  - Impervious surface removal/reduction
  - Offshore structures
  - Pump stations
  - Elevating roadways
  - Elevating buildings
  - Relocating buildings
  - Floodproofing buildings



Development of Coastal Resilience Toolkit

- Nature-Based
  - Beach/dune protection and erosion control
  - Wetland and habitat preservation and restoration
  - Living shorelines
  - Bioretention Basins
- Non-Structural
  - Land Acquisition
  - Public Education
  - Evacuation Procedures
  - Local Building Codes



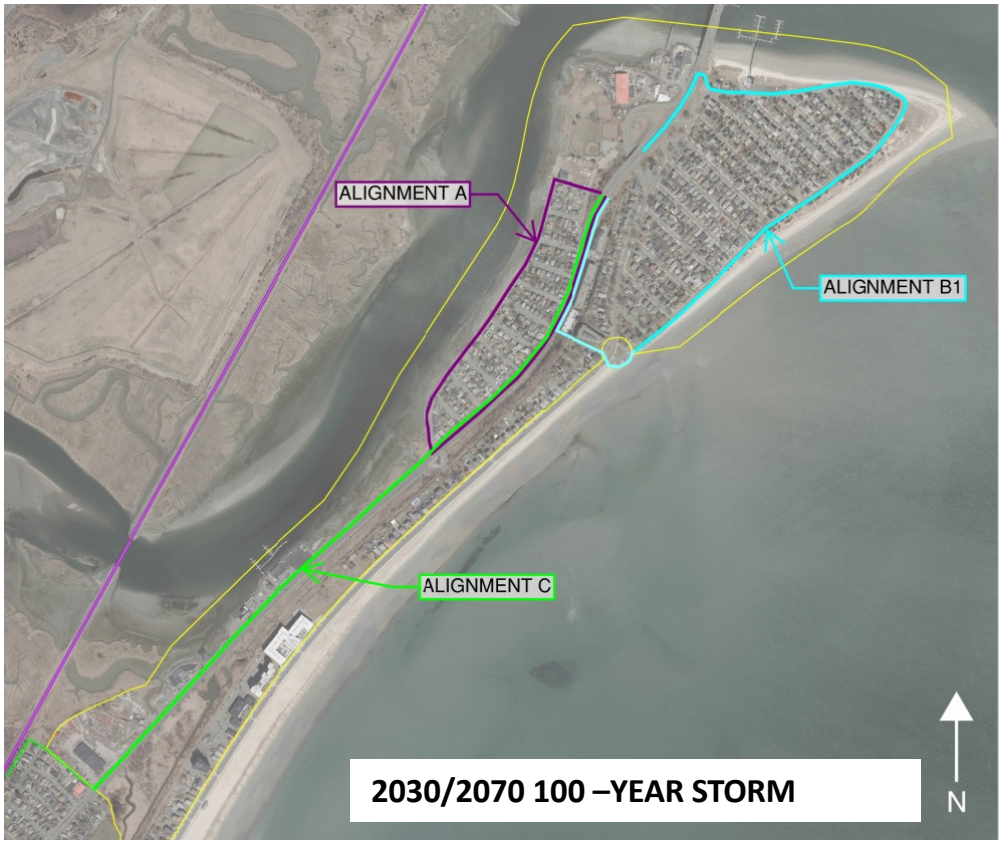
Feasibility Assessment Criteria

- Floodwater Control
- Funding Opportunities
- Ownership
- Community Acceptance
- Conservation Restriction Requirements
- Permitting Requirements
- Relative Cost

Feasibility Summary

- Flood Barriers/Deployables
- Stormwater Management
  - Underground Storage
  - Pump Station
  - Impervious Cover Reduction
  - Backflow Prevention
- Nature Based Solutions
  - Living Shorelines
  - Salt Marsh Restoration/Creation
  - Dune Restoration

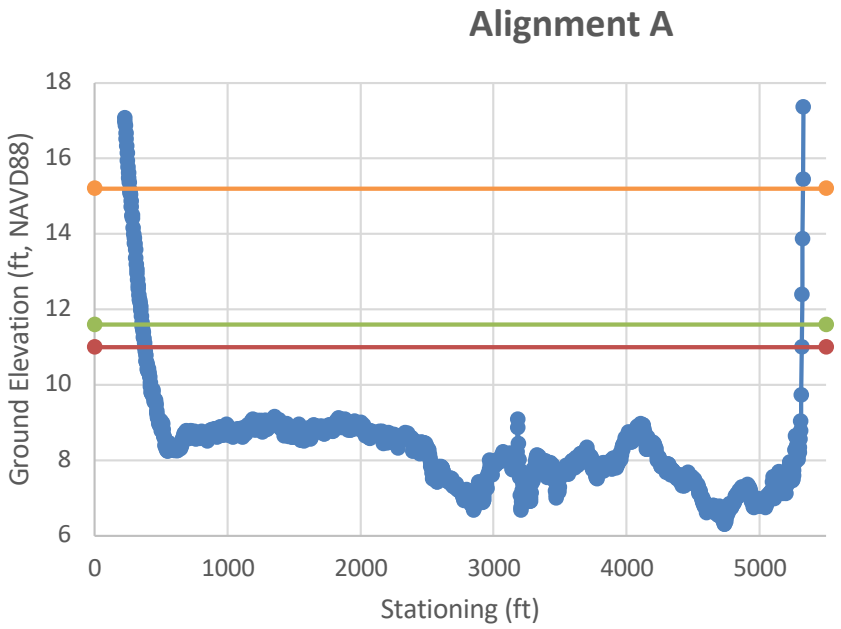
ALIGNMENT | DESIGN STORM FEASIBILITY



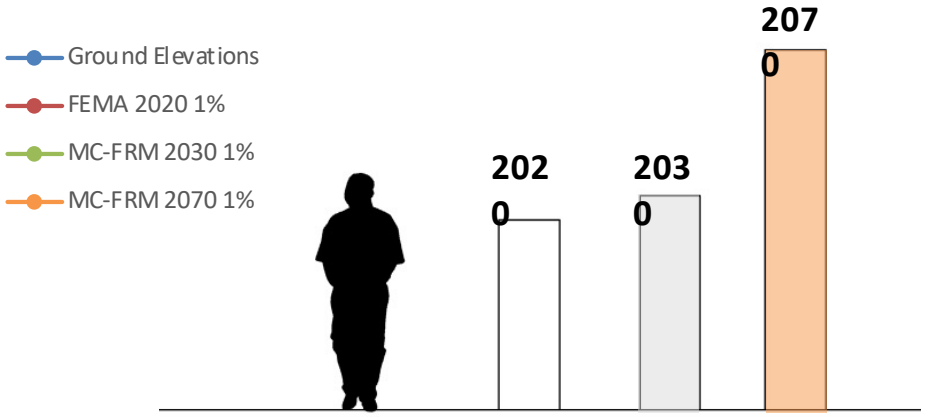
Mills Avenue Residential Protection

Mills Avenue/Riverside Profile

Mills Avenue/Riverside | PROFILE



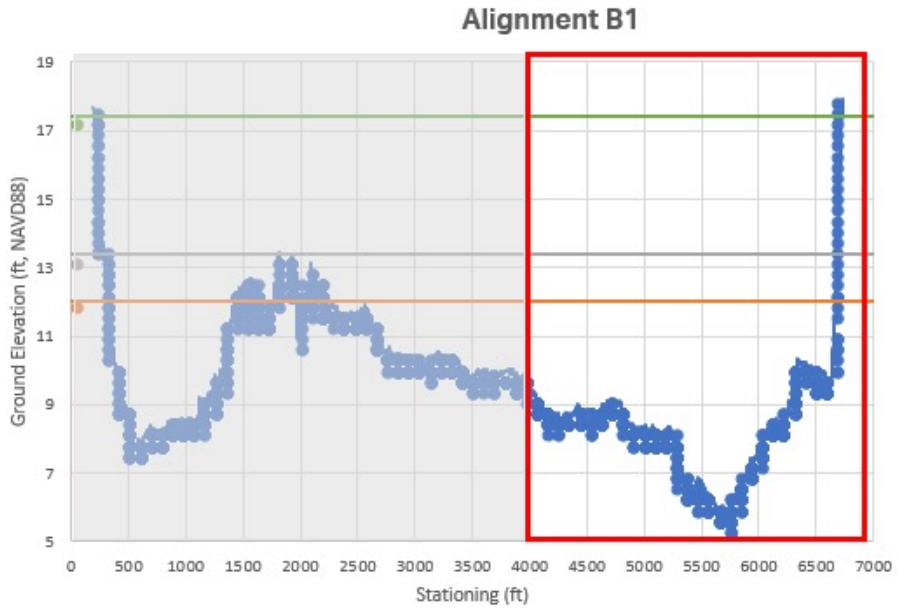
- Min Grade El. 6.3’
- 2020 1% Max HOI 4.7’
- 2030 1% Max HOI 5.3’
- 2070 1% Max HOI 8.9’



Point of Pines Residential Protection

Rice Avenue/Ocean Side Profile

ALIGNMENT B | PROFILE STA 4000-7000



- Min Grade El. 5.7'
- 2020 1% Max HOI 6.3'
- 2030 1% Max HOI 7.7'
- 2070 1% Max HOI 11.7'

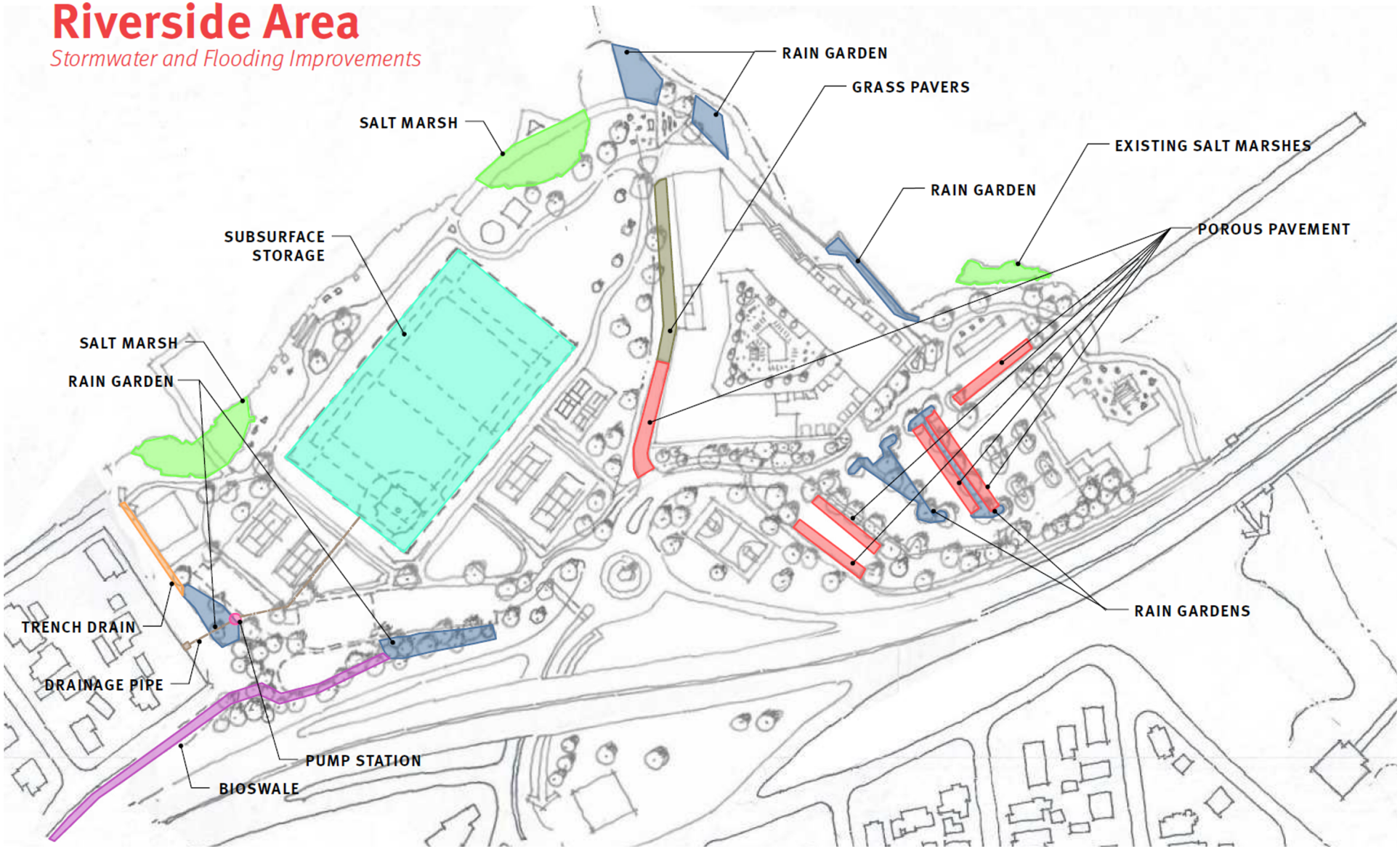
Example Aesthetics

ALIGNMENT A | RESILIENCY MEASURES

Retrofit Examples

ALIGNMENT A | RESILIENCY MEASURES

RiverFront District Master Plan



Conclusions

- Many applicable tools – no “one size fits all”
- Challenging to protect to 2070
    - Lack of high ground
    - Cost
    - Quality of Life
- Benefit/Cost comparison valuable
- Larger scale/regional solutions may be required

Acknowlegements

Elected Officials

- Mayor Brian Arrigo
- Ward 5 Councilor, John Powers

Revere City Staff

- Robert O'Brien – Director, Revere Office of Planning and Development
- Elle Baker – Project Planner
- Frank Stringi – City Planner
- Don Ciaramella, Superintendent Water, Sewer and Drain
- Joe Maglione – Assistant Superintendent Water, Sewer and Drain
- Paul Argenzio – Superintendent Revere Department of Public Works
- Nick Moulaison – Conservation Commission

AECOM

- Jennifer Doyle-Breen
- Aaron Weieneth
- Ricky Torres-Cooban
- Brian Stobbie
- Kira Murphy
- Tom Touchet
- Taelise Ricketts
- John Carel
- Jim Meuse

Project Partners

- Loretta LeCentra – Riverside Area Resident
- Elaine Hurley – Riverside Area Resident
- John Polcari – Point of Pines Beach Association
- Angela Sawaya – Point of Pines Beach Association
- Stacy Livote – The Marina Restaurant
- Carolyn Meklenburg – MVP Regional Coordinator
- Greg Robbins – DCR Waterways
- Mary Lester – Saugus River Watershed Council
- Michelle O'Toole – MEMA, Hazard Mitigation Planning
- Brian Lajiness – MBTA, Manager of Emergency Operations
- Steve Miller –MassDOT, Climate Change

Questions?

- Elle Baker, Open Space and Environmental Project Planner ebaker@revere.org
- Jennifer Doyle-Breen, AECOM, Project Manager jennifer.doyle-breen@aecom.com