RESILIENT MYSTIC

Resilient CT Summit

NOVEMBER 13, 2025

FUSS & O'NEILL

RESILIENT MYSTIC

MEET THE TEAM

Connecticut Institute for Resilience and Climate Adaptation (CIRCA)

John Truscinski, Director of Resilience Planning

Mary Buchanan, Community Resilience Planner
Nicole Govert, Community Resilience Planner

Town of Stonington

Danielle Chesebrough, First Selectman

Deborah Downie, Selectwoman
Clifton Iler, Town Planner

Consultant Team – Fuss & O'Neill

Beth Kirmmse
Andrew Bohne
Ian Concannon
Peyton Debowsky
Allyson Fairweather
Michael Frederick
Faith Long
Rebecca Madsen
Diane Mas
Erik Mas
Katherine McCombs
Sara Morrison
Arnold Robinson
Lara Sup
Benjamin Weintraub
Greg Wilson
Chelsea Zakas
Lynn Rae
Olivia Ahner
Emma Lepisto
Stefan Bengtson
Emily Wright

FUSS & O'NEILL

CIRCA

An Aerial View of Downtown Mystic

PROJECT BACKGROUND AND GOALS

RESILIENT MYSTIC

PROJECT BACKGROUND & GOALS

BACKGROUND

- Climate change is reshaping coastal communities across New England
  - Issues include flooding, extreme heat, and erosion

- Project is a partnership between CIRCA and the Town of Stonington

- Focused on coastal surge and tidal flooding but not stormwater flooding

GOALS

- Prepare Stonington for the changes brought about by climate change

- Develop responses that maintain the area's character and quality of life both near- and long-term

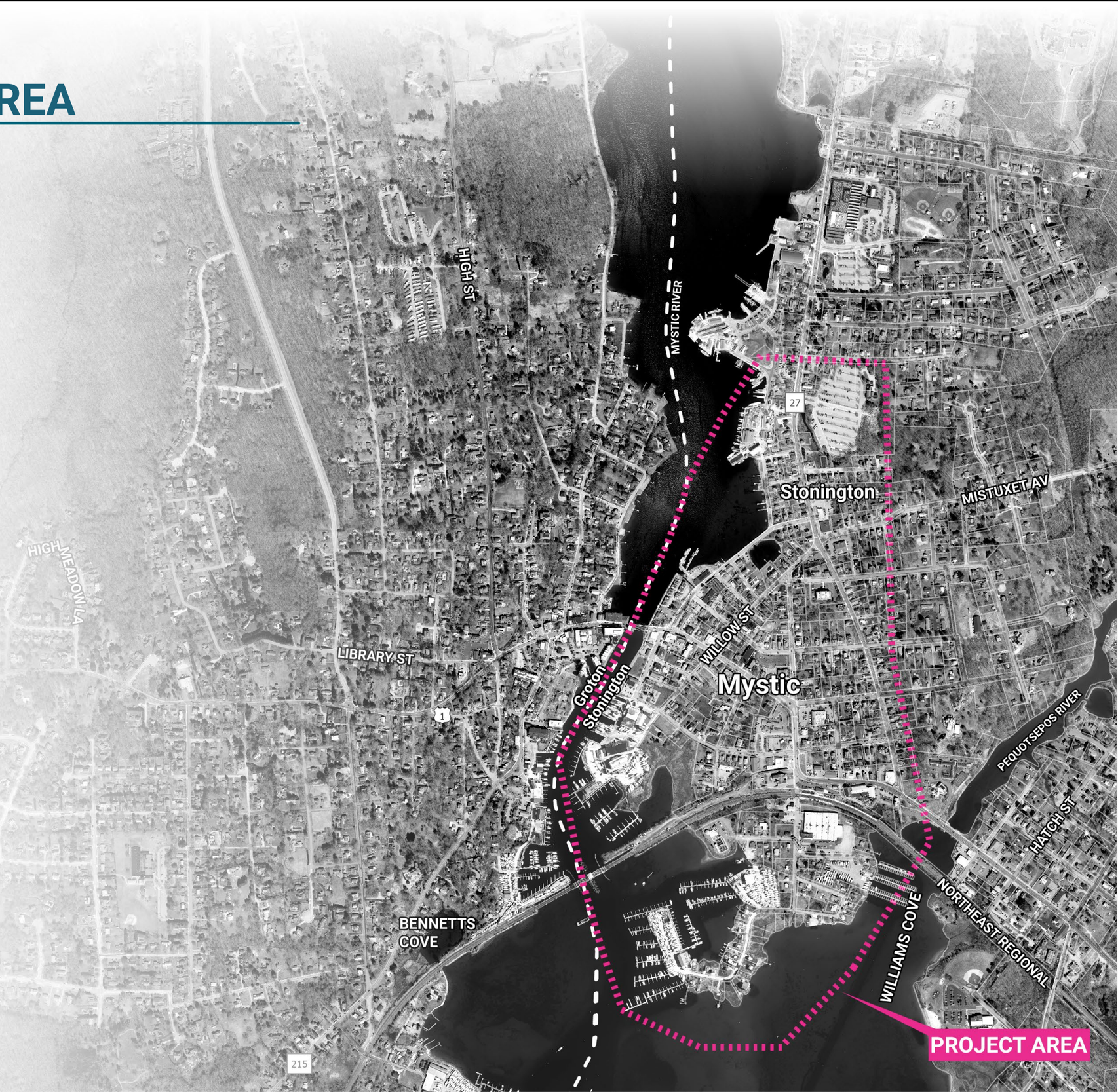
- Living with the water

Photo Credit: Rick Newton

RESILIENT
MYSTIC

PROJECT AREA

- Downtown Mystic within the Town of Stonington
- Highly urbanized area with numerous businesses and tourist attractions
- Mystic River Historic District

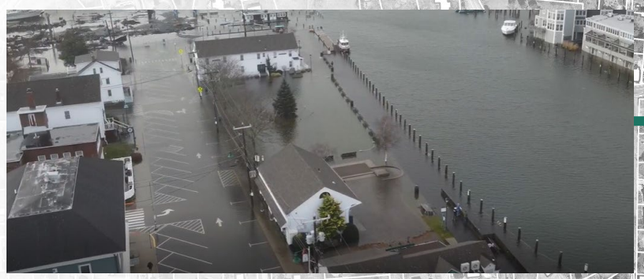


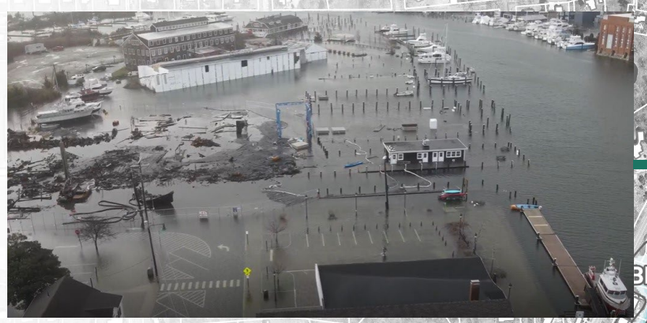
CLIMATE RISK MAPPING

RESILIENT MYSTIC

PRESENT DAY 10% AEP STORM EVENT COASTAL FLOOD DEPTHS

- Documented flood events are already affecting daily life in Mystic
- Present-day flooding driven by multiple processes
- This study focuses on flooding from coastal storms and tidal influence while avoiding worsening stormwater issues





Flooding in December 2022
Photo Credits: Chris Gasiorek)

LEGEND

Present Day Flood Depth

- <1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- > 5 ft
- FEMA Zone AE

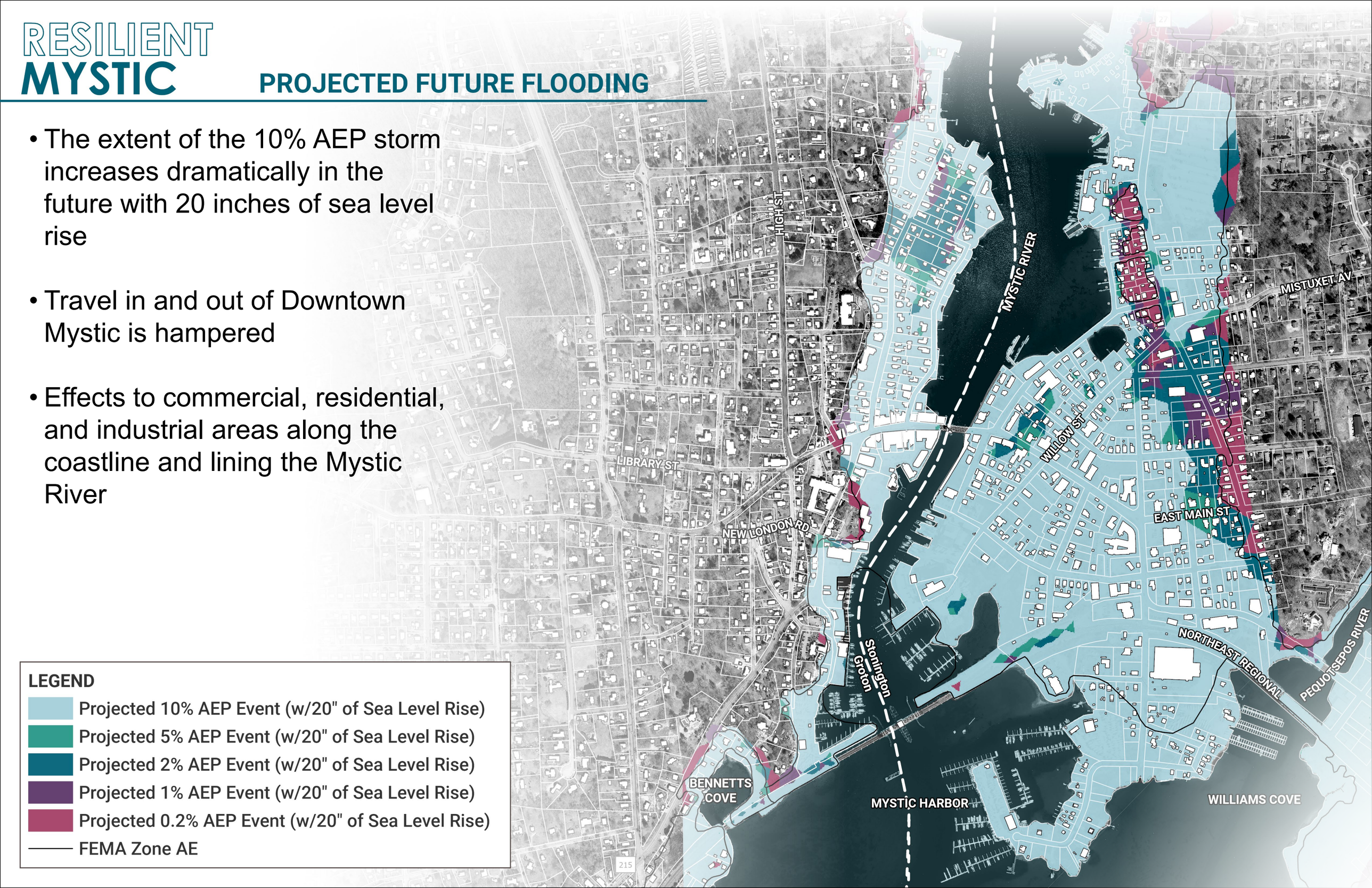
RESILIENT MYSTIC

PROJECTED FUTURE FLOODING

- The extent of the 10% AEP storm increases dramatically in the future with 20 inches of sea level rise

- Travel in and out of Downtown Mystic is hampered

- Effects to commercial, residential, and industrial areas along the coastline and lining the Mystic River



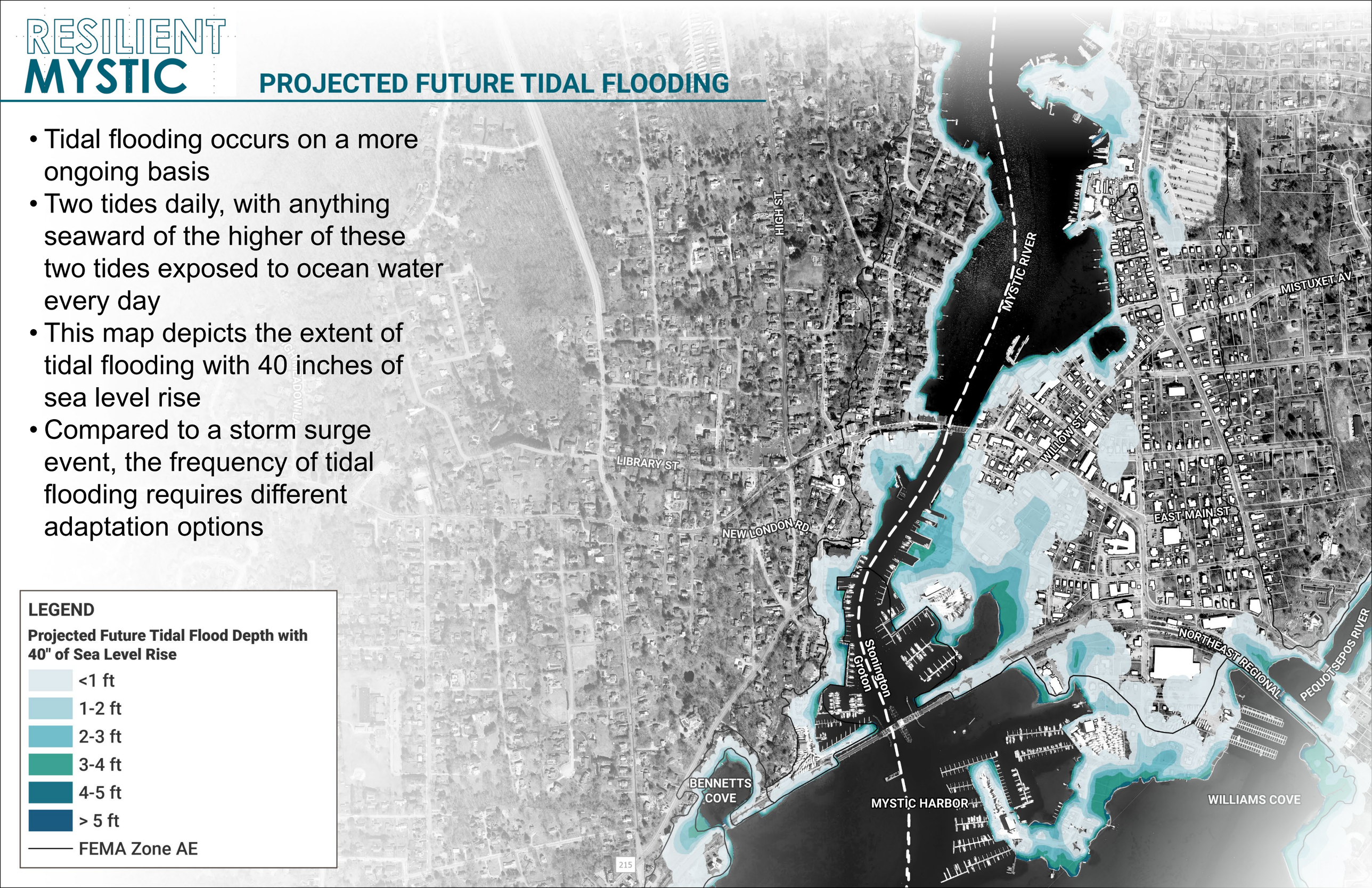
LEGEND

- Projected 10% AEP Event (w/20" of Sea Level Rise)
- Projected 5% AEP Event (w/20" of Sea Level Rise)
- Projected 2% AEP Event (w/20" of Sea Level Rise)
- Projected 1% AEP Event (w/20" of Sea Level Rise)
- Projected 0.2% AEP Event (w/20" of Sea Level Rise)
- FEMA Zone AE

RESILIENT MYSTIC

PROJECTED FUTURE TIDAL FLOODING

- Tidal flooding occurs on a more ongoing basis
- Two tides daily, with anything seaward of the higher of these two tides exposed to ocean water every day
- This map depicts the extent of tidal flooding with 40 inches of sea level rise
- Compared to a storm surge event, the frequency of tidal flooding requires different adaptation options



LEGEND

Projected Future Tidal Flood Depth with 40" of Sea Level Rise

- <1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- > 5 ft
- FEMA Zone AE

RESILIENT MYSTIC

BUILDINGS IMPACTED BY FUTURE FLOODING

- Hundreds of buildings could be affected by coastal flooding in the future with sea level rise, bringing direct and indirect impacts such as residential displacement, business closures, or lost access to critical facilities

BUILDINGS IMPACTED

23 INDUSTRIAL

201 COMMERCIAL

390 RESIDENTIAL

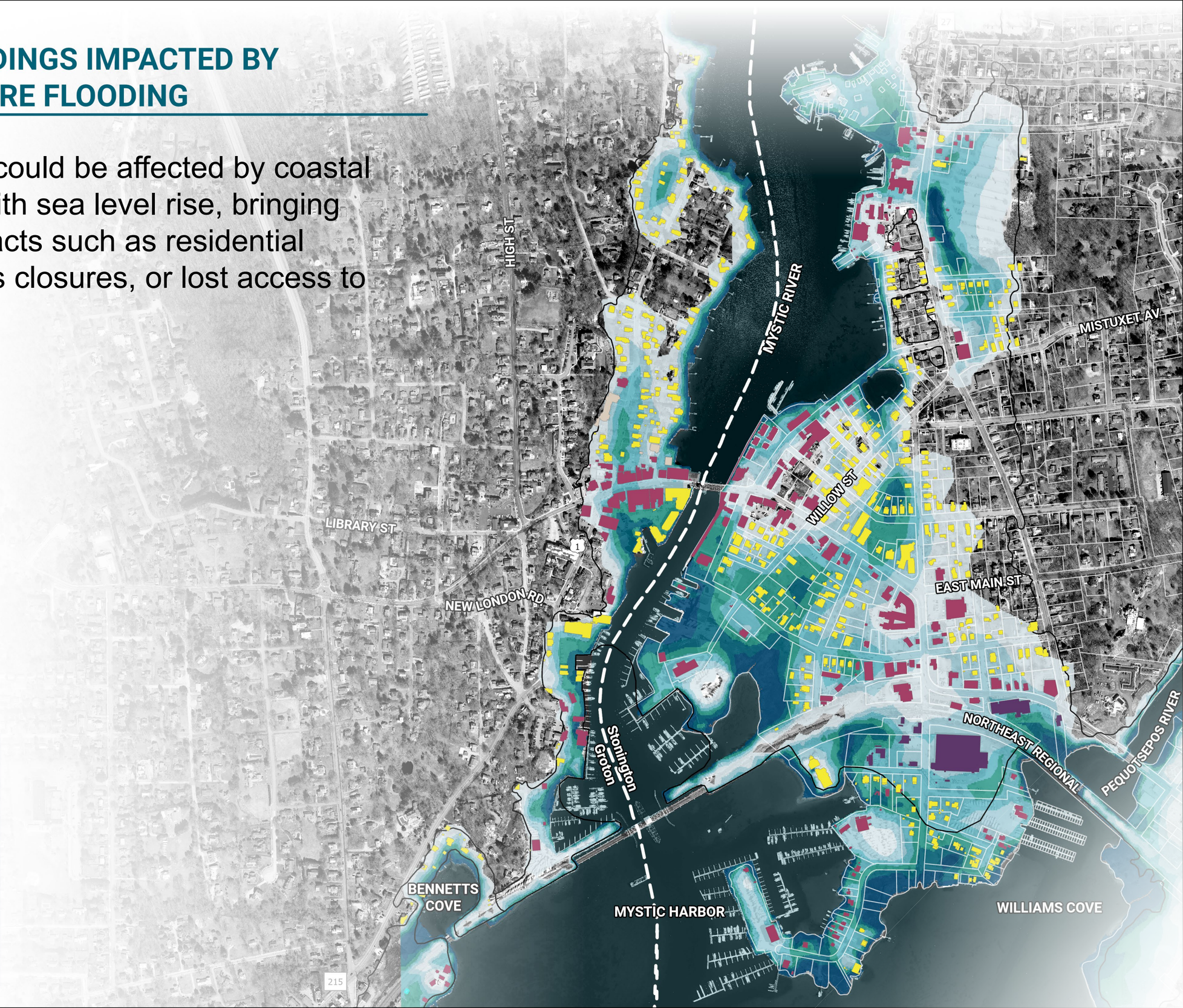
LEGEND

Buildings Impacted By Future Flooding

- Residential
- Industrial
- Commercial / Mixed Use

Projected Future 10% AEP Flood Event Depth with 20" of Sea Level Rise

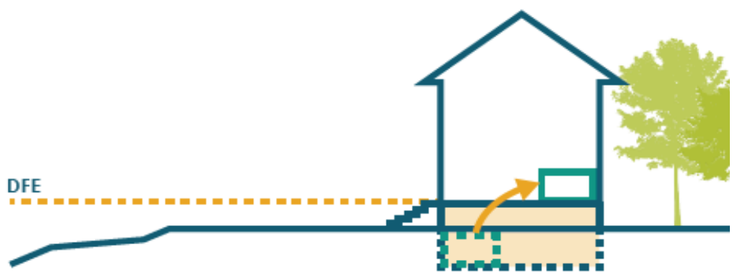
- <1 ft
- 1-2 ft
- 2-3 ft
- 3-4 ft
- 4-5 ft
- > 5 ft



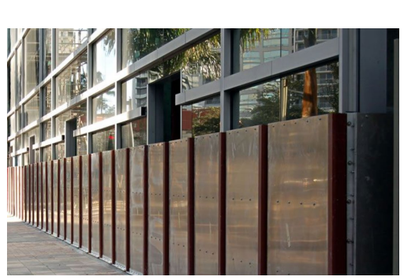
ADAPTATION CONCEPTS

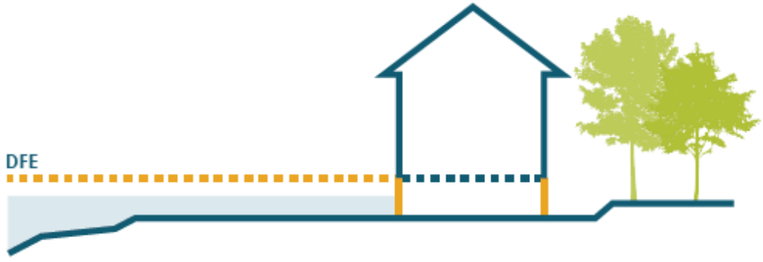
STRUCTURES

ELEVATE BUILDINGS AND CRITICAL SYSTEMS

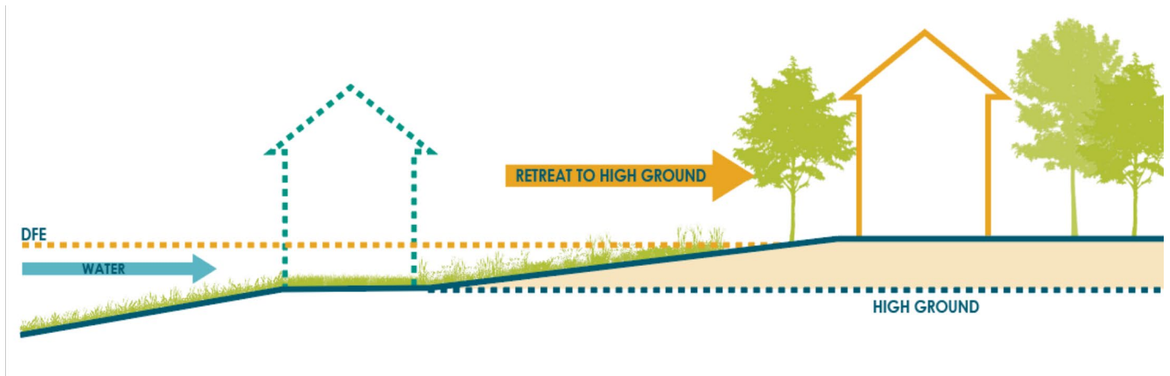


FLOODPROOF LEVELS BELOW DESIGN FLOOD ELEVATION





RELOCATE VULNERABLE STRUCTURES



RESILIENT MYSTIC

STRUCTURES

WHAT IS THE ANTICIPATED FLOOD DEPTH AT THIS LOCATION IN THE 10% AEP STORM SCENARIO WITH 20 INCHES OF SEA LEVEL RISE?

< 1 FT

- What is the building use?
  - **Residential**
    - Are the materials able to withstand inundation or are they flood-resistant? (Reinforced concrete, or treated wood, for example)
      - Yes → **WET FLOODPROOF**
      - No → **DRY FLOODPROOF**
  - **Commercial / Industrial**
    - Evaluate structure and materiality
      - Wet floodproof non-living spaces like attached garages and closures used for parking or storage below the BFE → **DRY FLOODPROOF**

1-3 FT

- What is the building use?
  - **Modern Residential**
    - Will the construction withstand elevation?
      - Yes → **ELEVATE**
      - No → **DRY FLOODPROOF**
  - **Historic Residential**
    - Does the structure fit in one of these categories?
      - Critical Facility → Can it be elevated and maintain functionality?
        - Yes → **ELEVATE**
        - NO: Consider surrounding with a floodwall, Relocate, or Demo
      - Historic Structure → Can it be elevated and maintain functionality?
        - Yes → **ELEVATE**
        - NO: Consider surrounding with a floodwall, Relocate, or Demo
      - Located in a FEMA Velocity (VE) Zone → **ELEVATE ACCORDING TO FEMA GUIDANCE WITHIN VE ZONE**
      - None → Evaluate structure condition, location, and materials
        - Wet floodproof or elevate - If neither is possible, consider relocation or acquisition → **RELOCATE OR DEMO PROPERTY**
  - **Commercial / Industrial**
    - Will the construction withstand elevation?
      - Yes → **ELEVATE**
      - No → **DRY FLOODPROOF**

3 + FT

- What is the building use?
  - **Modern Residential**
    - Will the construction withstand elevation?
      - Yes → **ELEVATE ACCORDING TO FEMA GUIDANCE WITHIN VE ZONE**
      - No → **RELOCATE OR DEMO PROPERTY**
  - **Historic Residential**
    - Will the construction withstand elevation and is safe egress expected within 24 hours of a flood event?
      - Yes → **ELEVATE ACCORDING TO FEMA GUIDANCE WITHIN VE ZONE**
      - No → Will the construction withstand elevation and maintain functionality?
        - Yes → **ELEVATE ACCORDING TO FEMA GUIDANCE WITHIN VE ZONE**
        - No → **RELOCATE OR DEMO PROPERTY**
  - **Commercial / Industrial**
    - Does the structure fit in one of these categories?
      - Critical Facility → Will the construction withstand elevation and maintain functionality?
        - Yes → **ELEVATE ACCORDING TO FEMA GUIDANCE WITHIN VE ZONE**
        - No → **RELOCATE OR DEMO PROPERTY**
      - Historic Structure → Will the construction withstand relocation?
        - Yes → **ELEVATE ACCORDING TO FEMA GUIDANCE WITHIN VE ZONE**
        - No → **RELOCATE OR DEMO PROPERTY**
      - Located in a FEMA Velocity (VE) Zone → **ELEVATE ACCORDING TO FEMA GUIDANCE WITHIN VE ZONE**
      - None → Evaluate structure condition, location, and materials
        - Wet floodproof or elevate - If neither is possible, consider relocation or acquisition → **RELOCATE OR DEMO PROPERTY**

RESILIENT MYSTIC

STORMWATER INFRASTRUCTURE

A **comprehensive evaluation of the project area's stormwater system** is needed, with particular attention to Holmes Street, Washington Street, within the vicinity of the Mystic Fire Station, and out to Murphy Point.

1. Data Collection/Field Assessment
2. H&H Modeling
3. Prioritization of Infrastructure Improvement Locations
4. Conceptual/Schematic Design of Infrastructure Projects

Results:

- GIS database of the stormwater system
- Identification and prioritization of locations for improvements
- Start designing infrastructure projects with the data collected from the field assessment.

Stonington stormwater infrastructure to be assessed

Holmes Street catch basin showing signs of backflow from the Mystic River (Google Streetview)

Stormwater flooding has occurred in the vicinity of St. Patrick's Church on Main Street, in the parking lot, and in Church Street to the east of the church property. (Photo credit: Rick Newton)

RESILIENT MYSTIC

HISTORIC RESOURCES

DATABASE

Maintain detailed records on properties listed or eligible for the State Register of Historic Places (SRHP) or National Register of Historic Places (NRHP) before, during, and after a disaster.

OUTREACH

Conduct early consultation with the State Historic Preservation Office (SHPO) regarding how historic resources could potentially be impacted and formalize the review process with them. Coordinate with SHPO and the Stonington Historical Society on outreach to property owners, informing them of the threats facing their properties, and potential solutions and funding opportunities.

DESIGN STANDARDS

Develop a list of example adaptive solutions (i.e., elevation and floodproofing) and incorporate design guidelines that maintain the historic character of the structure.

Elevated historic structures in Charleston, SC and Newport, RI (Photo Credit: NY Times)

CONCEPT 1

FLOODWALL AND ROAD ELEVATION AT WASTEWATER TREATMENT FACILITY

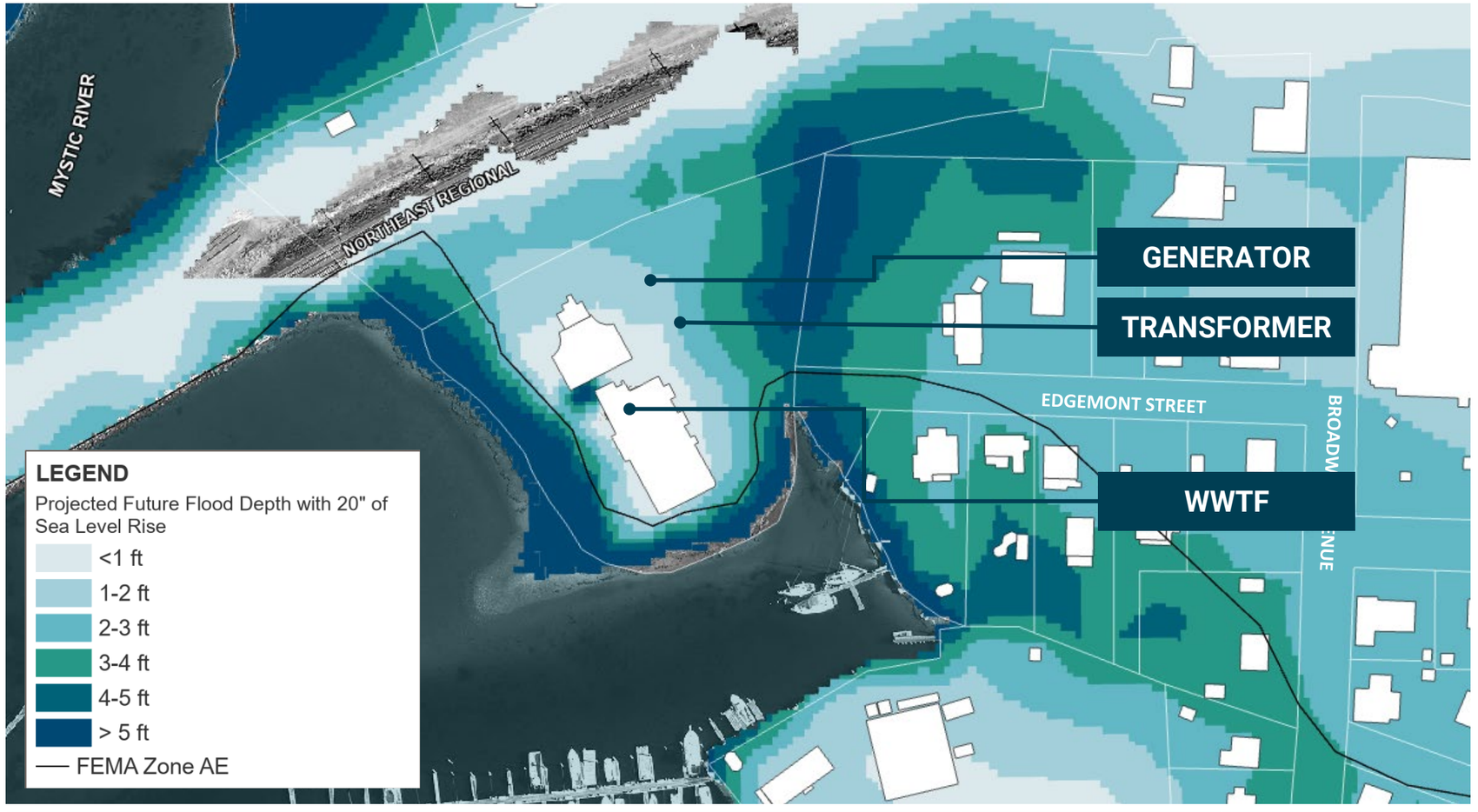
FLOODWALL AND ROAD ELEVATION AT WASTEWATER TREATMENT FACILITY

EXISTING AND FUTURE CONDITIONS

- Several key components already retrofitted
- Flooding remains serious threat
- Flood depths of 1-3 ft expected during the future 10% storm with 20” of SLR
- Low-point on Edgemont Street frequently floods during heavy rain or high tide events
- Town is updating Wastewater Facilities Plan

APPROACH TO FLOOD RISK REDUCTION

- Freeboard Value Approach (FVA)
- 0.2% Annual Chance Flood Approach
- Climate Informed Science Approach (CISA)

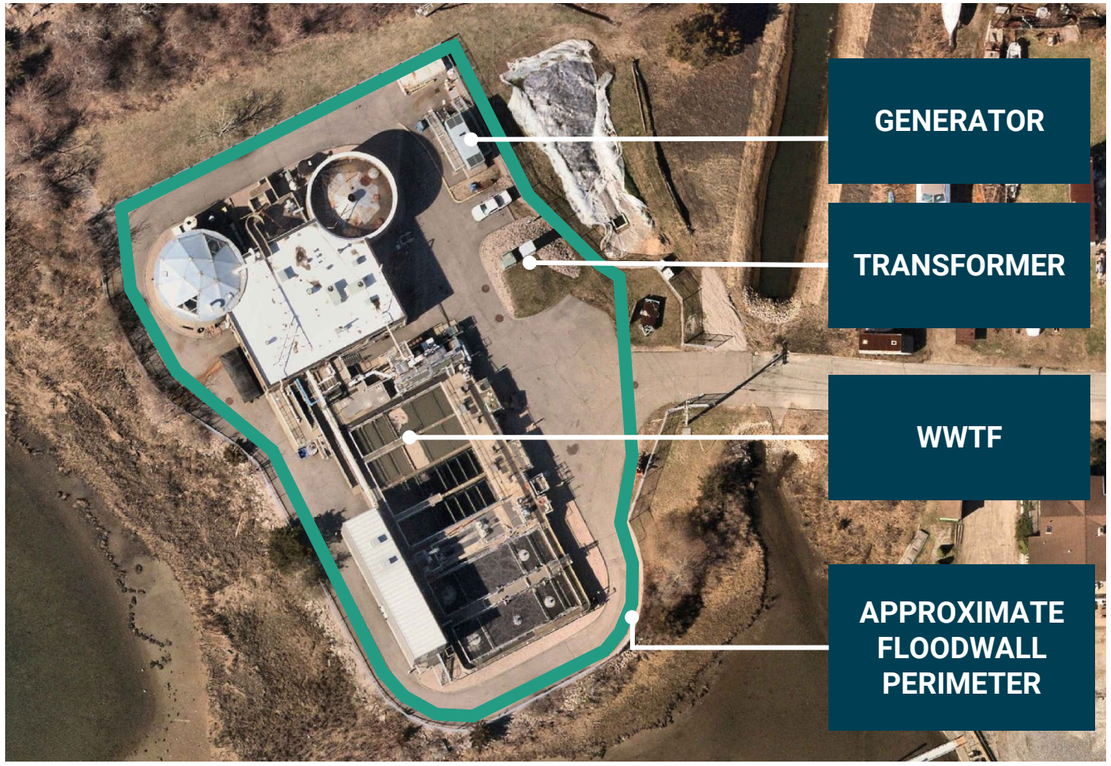


Critical Asset	Ground Elevation	Base Flood Elevation (BFE)	Freeboard Value Approach (FVA)	0.2% Annual Chance Flood Approach	Climate Informed Science Approach (CISA)
	Connecticut Statewide LiDAR 2016	*Equivalent to the current FEMA 1% annual chance flood elevation*	*Equivalent to the current FEMA 1% annual chance flood elevation, plus 3-ft of freeboard*	*Equivalent to the current FEMA 0.2% annual chance flood elevation*	*CIRCA’s future 1% annual chance flood elevation*
Wastewater Treatment Facility (WWTF)	5	11	14	**18.5**	10
Height of Proposed Protective Floodwall (Projected Water Surface Elevation *minus* Ground Elevation)					
Floodwall	5	6	9	**13.5**	5

RESILIENT MYSTIC

FLOODWALL AND ROAD ELEVATION AT WASTEWATER TREATMENT FACILITY

ALTERNATIVE	BENEFITS	CHALLENGES	ESTIMATED COSTS
Temporary (Deployable) Floodwall ★	• Limited permitting process • Can be reused in another location	• Does not protect to the FEMA 0.2% Annual Chance Flood • Ample storage space required when not in use • Must be deployed ahead of the flooding event (requires manpower and proper warning time)	$970,000 to $1.1million + tax
Semi-Permanent Floodwall	• Protects to the FEMA 0.2% Annual Chance Flood • Potentially can be reused in another location (based on manufacturer recommendations) • Portions can potentially be left in place to prevent nuisance flooding	• Storage space required when not in use • Must be deployed ahead of the flooding event (requires manpower and proper warning time)	$2.5 million to $3.5 million
Permanent Sheet Pile Floodwall and Floodgate	• Protects to the FEMA 0.2% Annual Chance Flood • No storage space required • No deployment or advanced warning time required	• Lengthier permitting process • Cannot be reused in another location	$5.5 million to $8.5 million



RECOMMENDED ACTION

- If the Town plans to operate this facility for a relatively short time horizon, the **temporary floodwall** option could provide the best value for investment among the presented concepts.

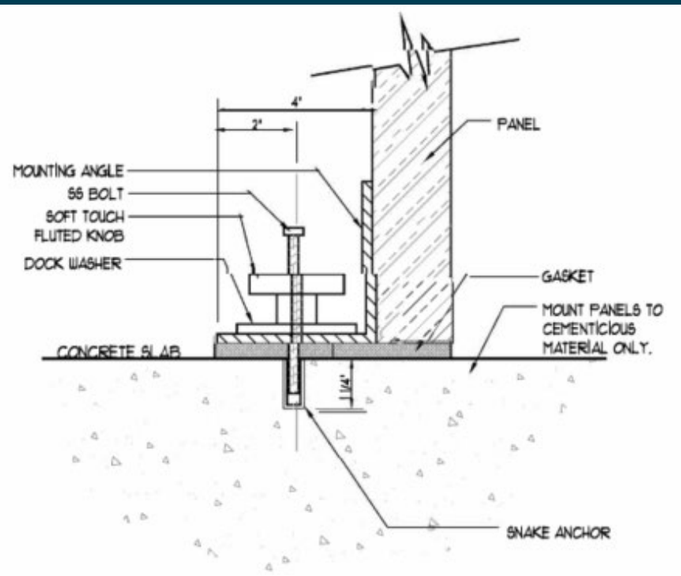
RESILIENT
MYSTIC

TEMPORARY (DEPLOYABLE) FLOODWALL

RESILIENT
MYSTIC

SEMI-PERMANENT (DEPLOYABLE) FLOODWALL

SEMI-PERMANENT FLOODWALL DETAIL



RESILIENT
MYSTIC

PERMANENT FLOODWALL

RESILIENT MYSTIC

FLOODWALL AND ROAD ELEVATION AT WASTEWATER TREATMENT FACILITY

ROADWAY AND PUMP STATION CONSIDERATIONS

- Raise the road elevation from approximately 5 ft to a target level of approximately 11–14 ft (i.e., raising the road by approximately 6-9 ft)
- Taper side slopes to maintain access and drainage
- Install a larger culvert to accommodate higher flow capacity

PERMITTING PATHWAY AND NEXT STEPS

- Permitting through CT DEEP's Coastal Zone Management Program and potentially the U.S. Army Corps of Engineers (USACE) would be required

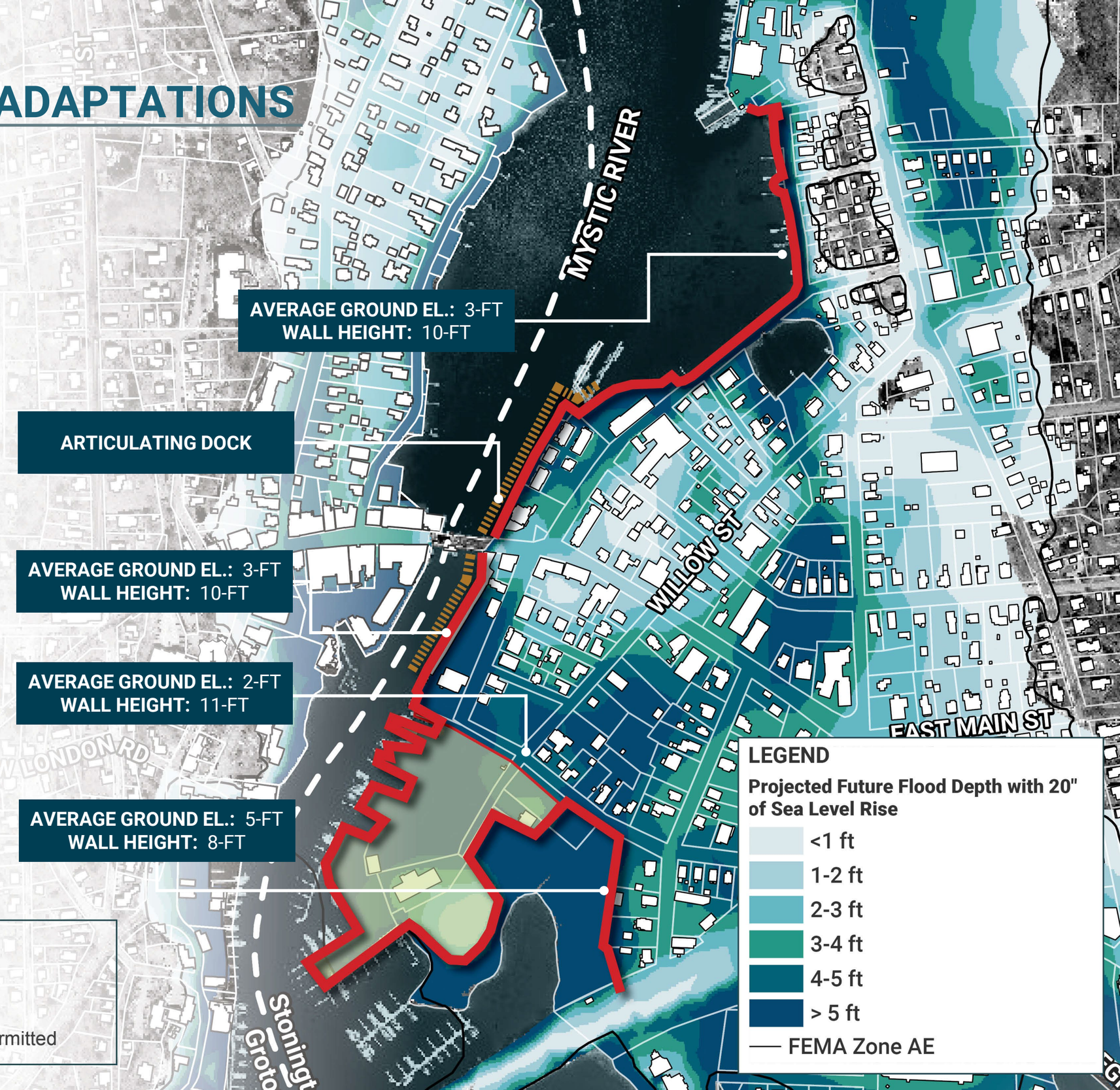
CONCEPT 2

SHORELINE ADAPTATIONS

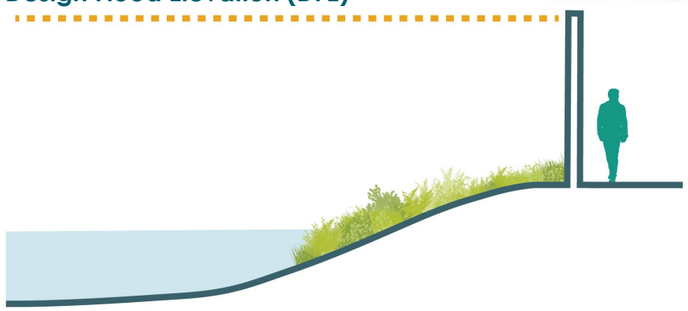
RESILIENT MYSTIC

SHORELINE ADAPTATIONS

- Explored option of a continuous shoreline defense structure between the Amtrak tracks and Mystic Seaport Museum
- To protect against the future 1% AEP storm, the wall would range between 8 and 11 feet, cutting off access to Groton and to the water itself
- Expensive to permit and build



Design Flood Elevation (DFE)



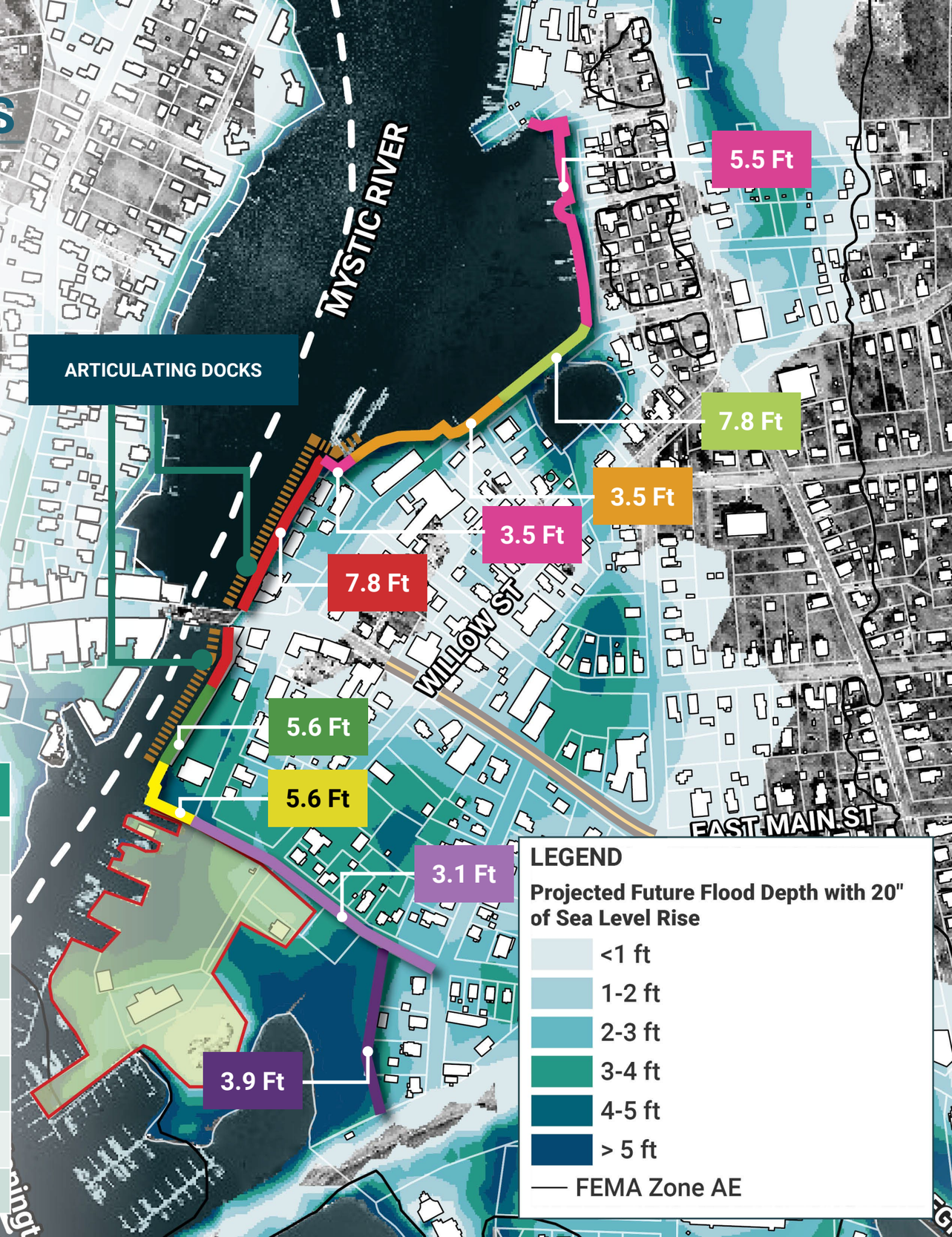
MITIGATION STRATEGY LEGEND

- Floodwall
- Mitigation Strategy by Private Property Owner as Permitted

RESILIENT MYSTIC

SHORELINE ADAPTATIONS

- Smaller-scale shoreline adaptations can complement the implementation of the Resilient Corridor
  - This system would combine seawalls, living shorelines, elevation of open space, and berms
- Designed to reduce the impacts of flooding as a “first line of defense” up to the 10% AEP storm with 20 inches of sea level rise



MITIGATION STRATEGY LEGEND

- SECTION A: Deployable Floodwall
- SECTION B: Living Shoreline Adjacent to Walkway
- SECTION C: Seawall at Schooner Wharf
- SECTION D: Seawall with Articulating Dock
- SECTION E: Elevate Mystic River Park
- SECTION F: Deployable Plank Flood Wall
- SECTION G: Berm with Multi-Use Trail at Washington Street
- SECTION H: Flood Protection Berm
- Elevated Bulkhead - Mitigation Strategy by Private Property Owner as Permitted

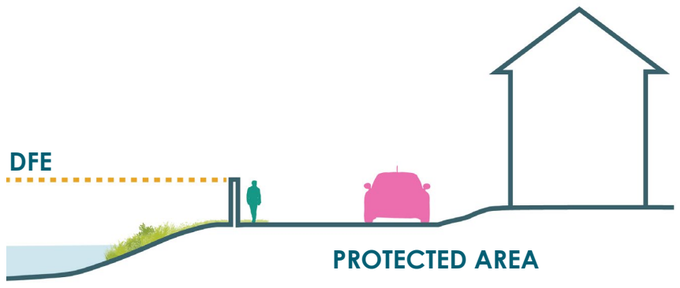
Estimated Costs (not including accompanying traffic studies)
Section A (Deployable Floodwall): **$1.75 million**
Section B (Living Shoreline): **$1.75 million** construction costs
Section C (Seawall): **$870,000**
Section D (Articulating Dock plus seawall: **$7.1 million**
Section E (Elevate Mystic River Park: **$1 million**
Section F (Deployable Plank Floodwall): **$2 million**
Elevated Bulkhead: **$2.1 million**

RESILIENT MYSTIC

SHORELINE ADAPTATIONS

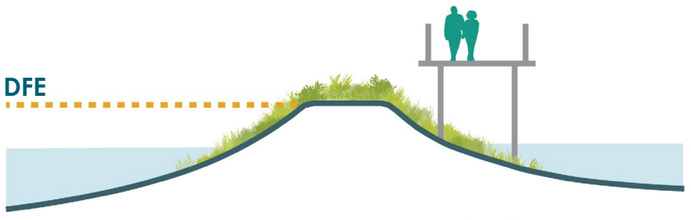
SECTION A:
DEPLOYABLE FLOODWALL

- Deploy a 5.5-ft wall along Bay Street
- Preferable to permanent floodwall in this setting to maintain the relationship between pedestrians and the river



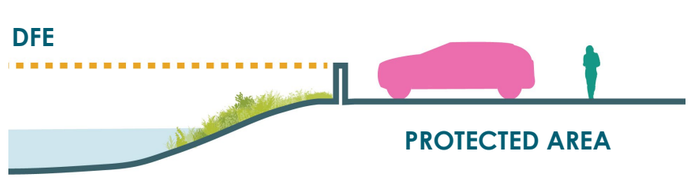
SECTION B:
LIVING SHORELINE ADJACENT TO WALKWAY

- Replace the bulkhead that supports the road from the intersection with Frazier Street and Bay Street with a pedestrian boardwalk, partially submerged living shoreline berm, and tide gate



SECTION C:
SEAWALL AT SCHOONER WHARF

- Mitigate the future 10% AEP storm with a 3.5-ft high seawall along the perimeter of the Schooner Wharf parking lot
- Permanent wall would be set atop grade at the parking lot



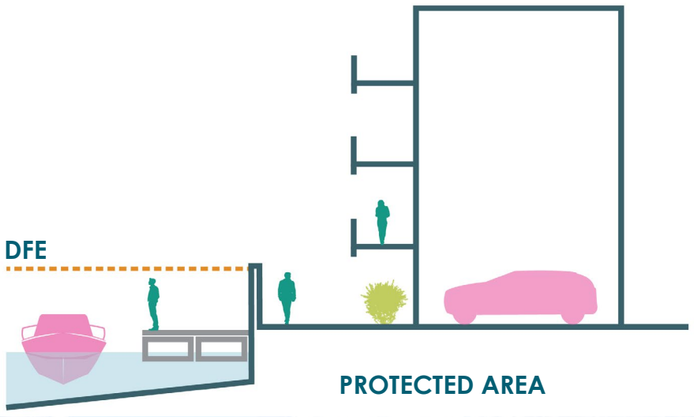
ASSUMPTIONS:
DFE (El. 13-ft) = FEMA BFE (El. 11-ft) + 2-ft for non-critical facilities

RESILIENT MYSTIC

SHORELINE ADAPTATIONS

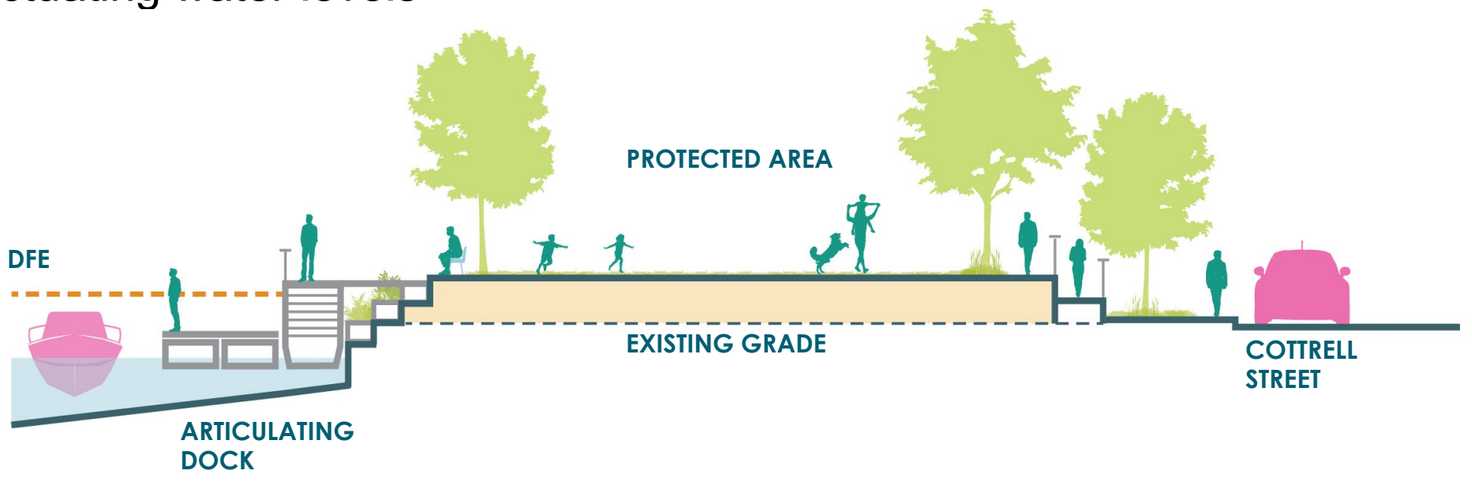
SECTION D:
SEAWALL WITH ARTICULATING DOCK

- A permanent wall is feasible at this location because it would not obstruct views from nearby condos
- Dock would need to articulate



SECTION E:
ELEVATE MYSTIC RIVER PARK

- Elevated park would preserve and/or enhance the recreational value of this amenity against flooding
- Transition existing fixed dock to a floating dock moving in response to fluctuating water levels



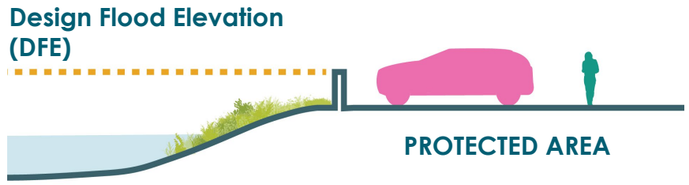
ASSUMPTIONS:
DFE (El. 13-ft) = FEMA BFE (El. 11-ft) + 2-ft for non-critical facilities

RESILIENT MYSTIC

SHORELINE ADAPTATIONS

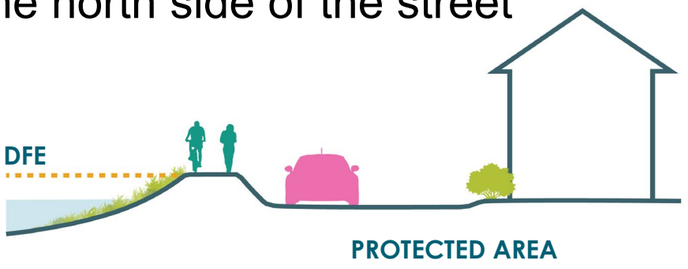
SECTION F:
DEPLOYABLE PLANK FLOOD WALL AT SOUTHERN END OF MYSTIC RIVER PARK

- Semi-permanent flood wall at Mystic River Park would link planks between installed posts to create a barrier during flood events



SECTION G:
BERM WITH MULTI-USE TRAIL AT WASHINGTON STREET

- Repurpose the eastbound lane of Washington Street as a berm crowned by a pedestrian walkway to mitigate mild to moderate flooding on the north side of the street



SECTION H:
FLOOD PROTECTION BERM AT JACKSON AVENUE

- Negotiate easements along the western edge of Jackson Avenue to host a berm to reduce flood risks

CONCEPT 3

ROUTE 1 RESILIENT CORRIDOR

ROUTE 1 RESILIENT CORRIDOR - STREETSCAPE & STRUCTURE ELEVATIONS

- A corresponding strategy should be developed for properties lining the corridor

- Property owners along the Resilient Corridor should consider elevating structures within their current footprints

- Building elevations should be performed in accordance with all relevant guidelines and statutes, including the following elevation standards:
  - Freeboard Value Approach (FVA)
  - 0.2% Annual Chance Flood Approach
  - Climate Informed Science Approach (CISA)

Two cross-sections demonstrating road elevation options within the Resilient Corridor with accompanying structure elevations. Streetscape additions could include an off-street shared-use path, green infrastructure, and building elevations tying into the raised road.

RESILIENT MYSTIC

ROUTE 27 ELEVATION & MYSTIC SEAPORT MUSEUM RESILIENCE HUB

- Although higher than Route 1, Route 27 and the Mystic Seaport Museum parking lot also present flood vulnerabilities in low-lying locations
- The proposed concept would expand an area of floodable open space near the Seaport Museum south parking lot and add a shared structured parking facility

1. **ROUTE 27 ELEVATION**
2. **EXPANDED SALT MARSH AREA**
3. **PROPOSED PARKING DECK**
   Floodable bottom floor with community resilience hub flex space / Parking deck roof capped with resilient solar microgrid feed
4. **SHADE TREES**
5. **POSSIBLE MIDSLOPE CONNECTION TO CARLTON SCIENCE CENTER AT WILLIAMS-MYSTIC & MYSTIC SEAPORT MUSEUM**
6. **SOUTH ENTRANCE TO MYSTIC SEAPORT MUSEUM**
7. **BAY STREET PEDESTRIAN/HOMEOWNER ACCESS**
8. **ELEVATED BOARDWALK / LIVING LABORATORY**
9. **AT-GRADE NATURE TRAIL**

QUESTIONS?