St. Augustine, Florida Back Bay
Coastal Storm Risk Management (CSRM) Feasibility Study

MONTHLY PROGRESS MEETING
NOVEMBER 2024

PLEASE MUTE YOUR PHONE AND COMPUTER TO AVOID BACKGROUND DISRUPTIONS.

WE WILL START PROMPTLY AT 1:05

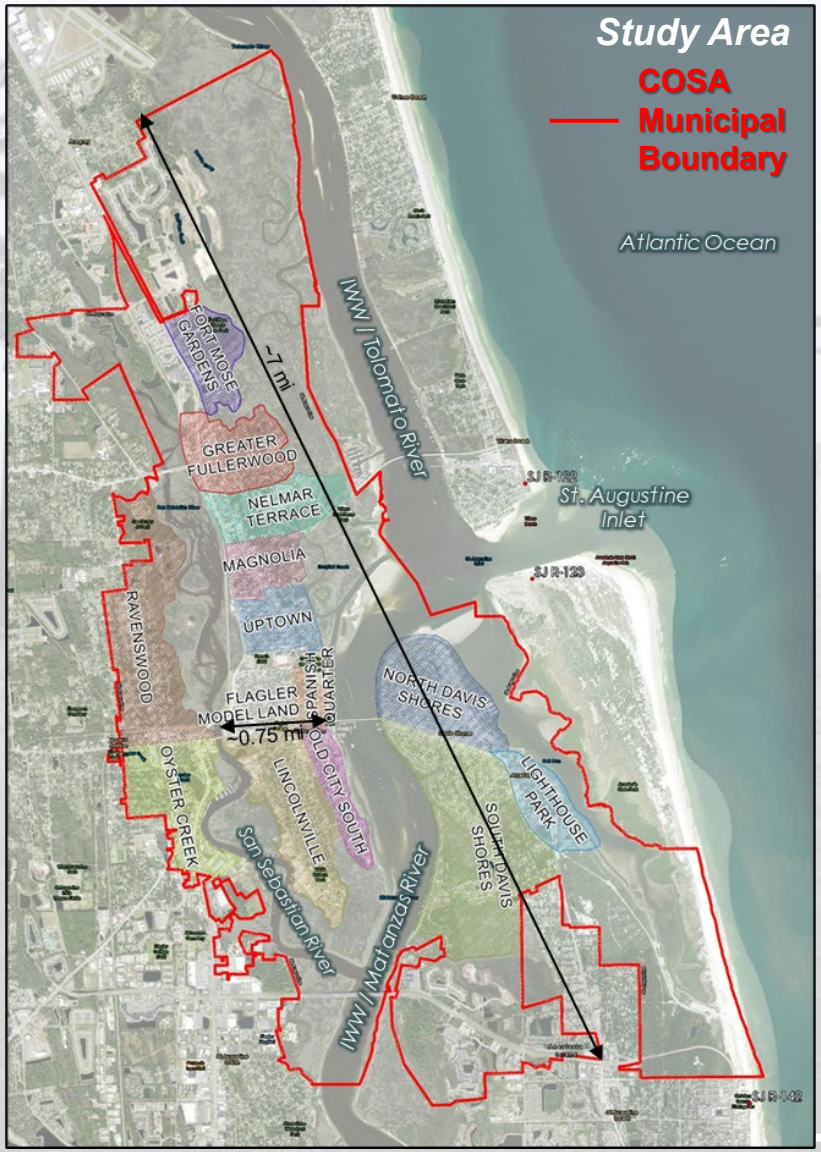
Presented by:
Jason Harrah, Senior Project Manager (Jacksonville District, USACE)
Marty Durkin, Planning Technical Lead (Jacksonville District, USACE)
Jessica Beach, Chief Resiliency Officer (City of St. Augustine)

AGENDA

- Opening Remarks
- Study Overview, Schedule, & Budget
- Study Analysis To Date
- Initial Alternative Features Overview
- Schedule Updates (90-Day Window)
- Discipline Specific Study Updates
- Upcoming Public Engagements
- Sponsor Remarks
- Agency Questions/Comments
- Public Comments
- Closing Remarks

STUDY OVERVIEW

BUILDING STRONG



Study Authority: House Resolution 2646 (June 21, 2000): St. Johns County, Florida

Resolved by the Committee on Transportation and Infrastructure of the United States House of Representatives, That in accordance with Section 110 of the River and Harbor Act of 1962, the Secretary of the Army, acting through the Chief of Engineers, is ***requested to survey the shores of St. Johns County***, Florida, with particular reference to the advisability of providing beach erosion control works in the area north of St. Augustine Inlet, the shoreline in the vicinity of Matanzas Inlet, and adjacent shorelines, as may be necessary in the interest of ***hurricane protection, storm damage reduction, beach erosion control, and other related purposes***.

Non-Federal Sponsor: City of St. Augustine (COSA)

POC: Jessica Beach, P.E., Chief Resilience Officer, jbeach@citystaug.com

Study Area

- Entire COSA Municipal Boundary
- 17 Distinct Neighborhoods
- 3 Separate Land Masses
- Interconnected Water Bodies

Objectives to be achieved within the City of St. Augustine over a 50-year period of analysis from 2035-2085 are to…

1. Manage risk of coastal flood damages.
2. Manage risk to health and life-safety.
3. Manage risk to cultural and natural resources.
4. Manage flooding impacts to the local economy.

STUDY OVERVIEW

We Are Here

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Schedule & Budget Overview: **5 years & 9 months, $7.3M, Cost Share ~50% Fed, 50% Sponsor**

Scoping
(4 months, $650,000)

Alternative Evaluation & Analysis
(3 years & 9 months, $4.9M)

Feasibility-Level Analysis
(9 months, $1.3M)

Chief's Report
(11 months, $450,000)

- **AMM (5/1/2023)**
- **FCSA (1/9/2023)**
- **FWOP Modeling Complete (2/21/2024)**
- ***SAD VTAM to HQ* (5/9/2023)**
- Establish Initial Array of Alternatives (8/21/2024)
- Establish Final Array of Alternatives (6/4/2025)
- Identify the TSP (5/18/2026)
- **TSP (2/2/2027)**
- **Release Draft Report to Public/Agencies (4/2/2027)**
- **ADM (11/3/2027)**
- Final Report Submittal (5/22/2028)
- **Chief's Report Signature (9/15/2028)**

Key Components of the Study Scope:

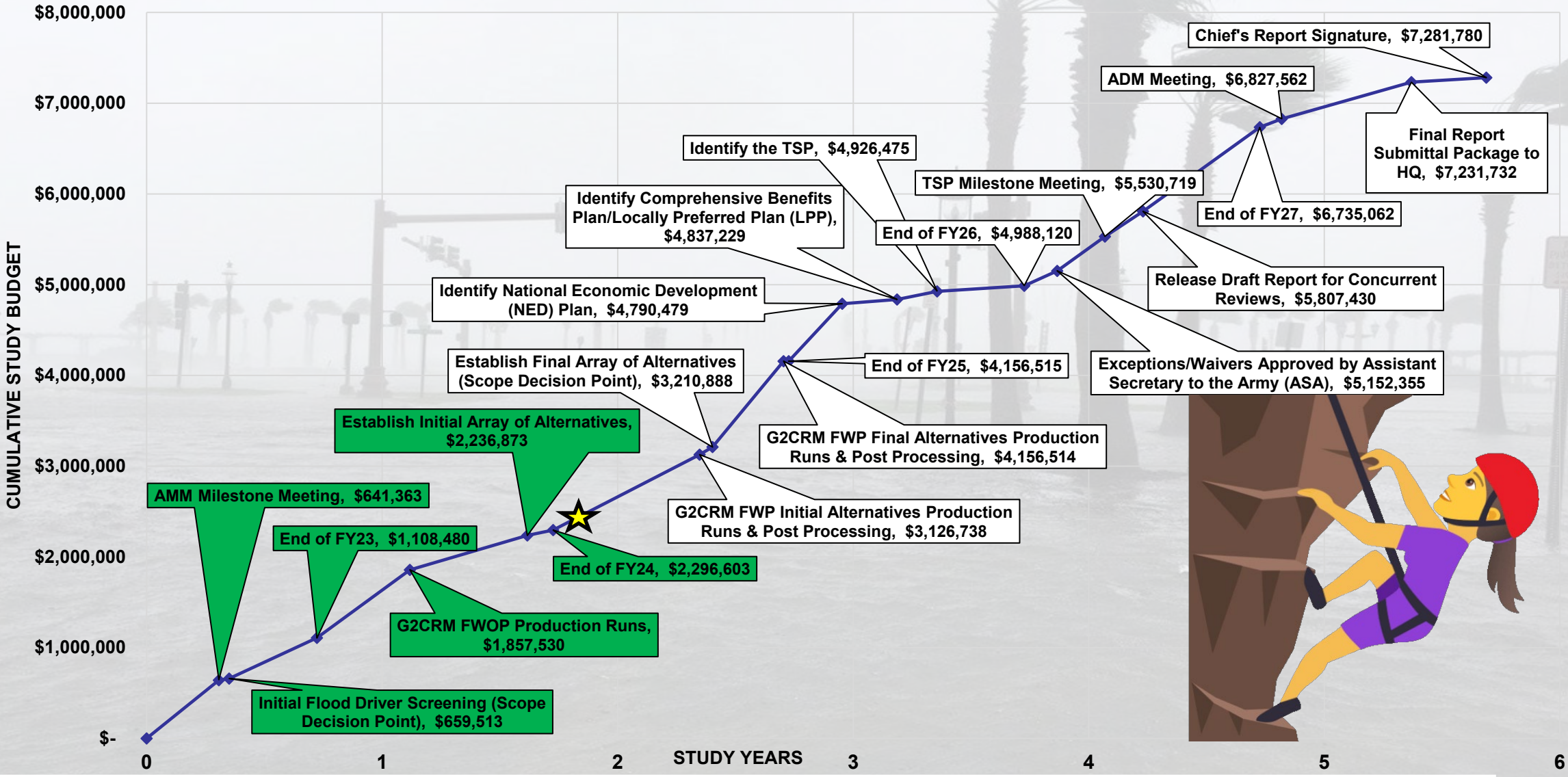
- Entire City of St. Augustine (COSA)
- Compound Flooding
- Full Array of Alternatives & Comprehensive Benefits
- Environmental Impact Statement (EIS) Likely
- Robust Community Outreach

Acronyms

FCSA = Feasibility Cost Share Agreement
AMM = Alternatives Milestone Meeting
FWOP = Future Without Project
SAD = South Atlantic Division
VTAM = Vertical Team Alignment Memo
HQ = Headquarters
TSP = Tentatively Selected Plan
ADM = Agency Decision Milestone

STUDY SCHEDULE & BUDGET

BUILDING STRONG



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RECAP OF STUDY ANALYSIS TO DATE

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6-Step Planning Process

Completed | Ongoing | Next Step

1. IDENTIFY PROBLEMS AND OPPORTUNITIES
2. INVENTORY AND FORECAST CONDITIONS
3. FORMULATE ALTERNATIVE PLANS
4. EVALUATE ALTERNATIVE PLANS
5. COMPARE ALTERNATIVE PLANS
6. SELECT RECOMMENDED PLAN

Established Study Objectives & Benefits Metrics

Compound Flooding Driver Analysis.

Data collection and analysis associated with the key resources throughout the COSA.

Modeling and analysis to forecast future without project conditions. By 2085 under the USACE intermediate sea level change, on average, the COSA could see…

- Over $4 Billion (present value) in Damage to Structures, Content, & Vehicles.
- Potential Life Loss.
- Over 1,000 Residential Displacements.
- 80 Nuisance Flood Days Per Year.
- Over 100 Instances of Damage to Critical Infrastructure.
- Over 600 Acres of Saltwater Marsh Lost.
- Damage to 3,700 Historical Structures.
- Over $400 Million in Lost Tourism Expenditures.

Evaluation of initial alternative features is ongoing…

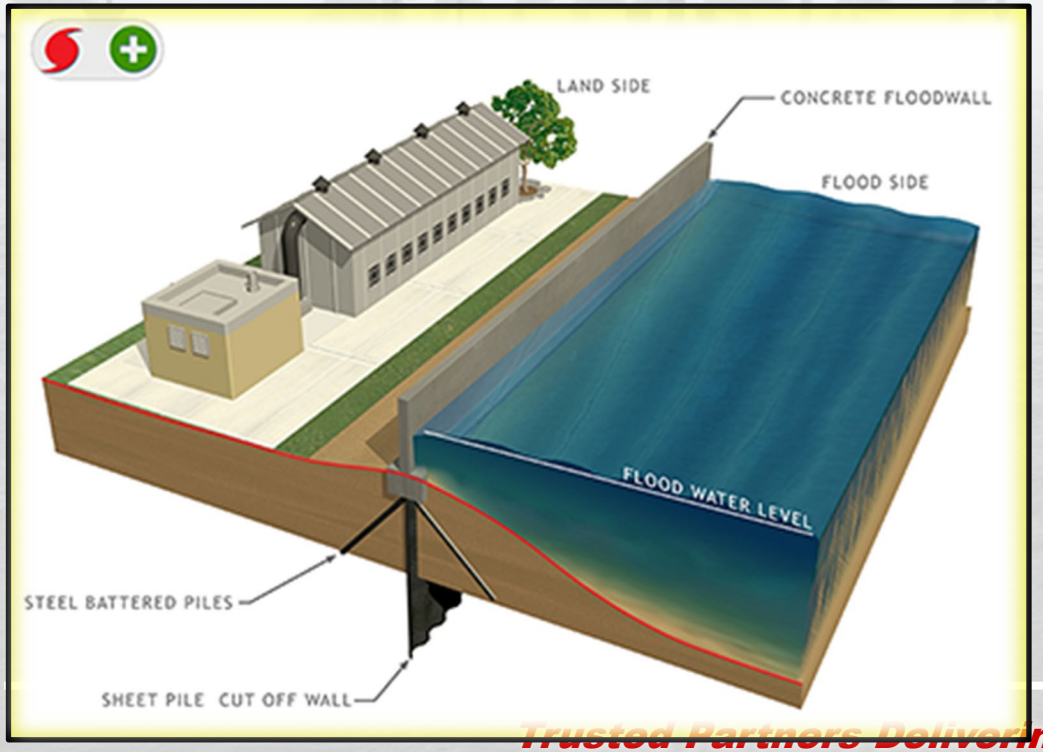
- Walls & Levees
- Surge Barrier Systems
- Nonstructural Measures
- Nature Based Solutions

WALLS & LEVEES

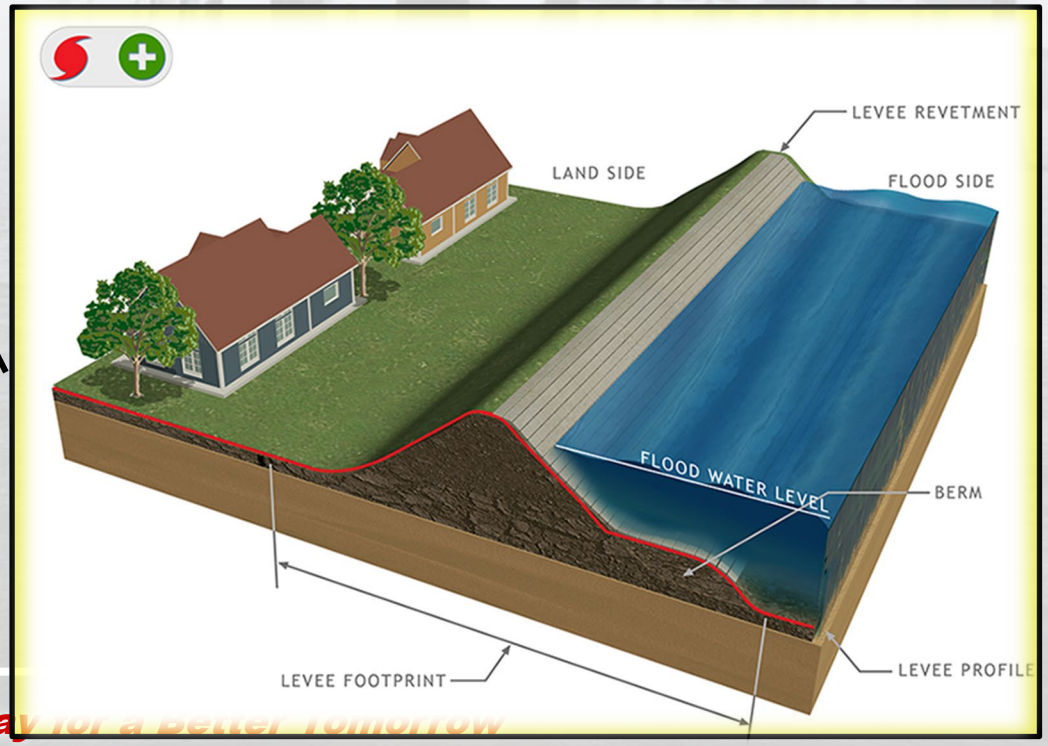
What are Walls and Levees?

Walls are structures used to prevent flooding and to protect relatively small areas with limited space for construction. Levees are embankments constructed along a waterfront to prevent flooding in relatively large areas. Both wall and levee features function to reduce the risk of coastal flooding at the back bay shoreline.

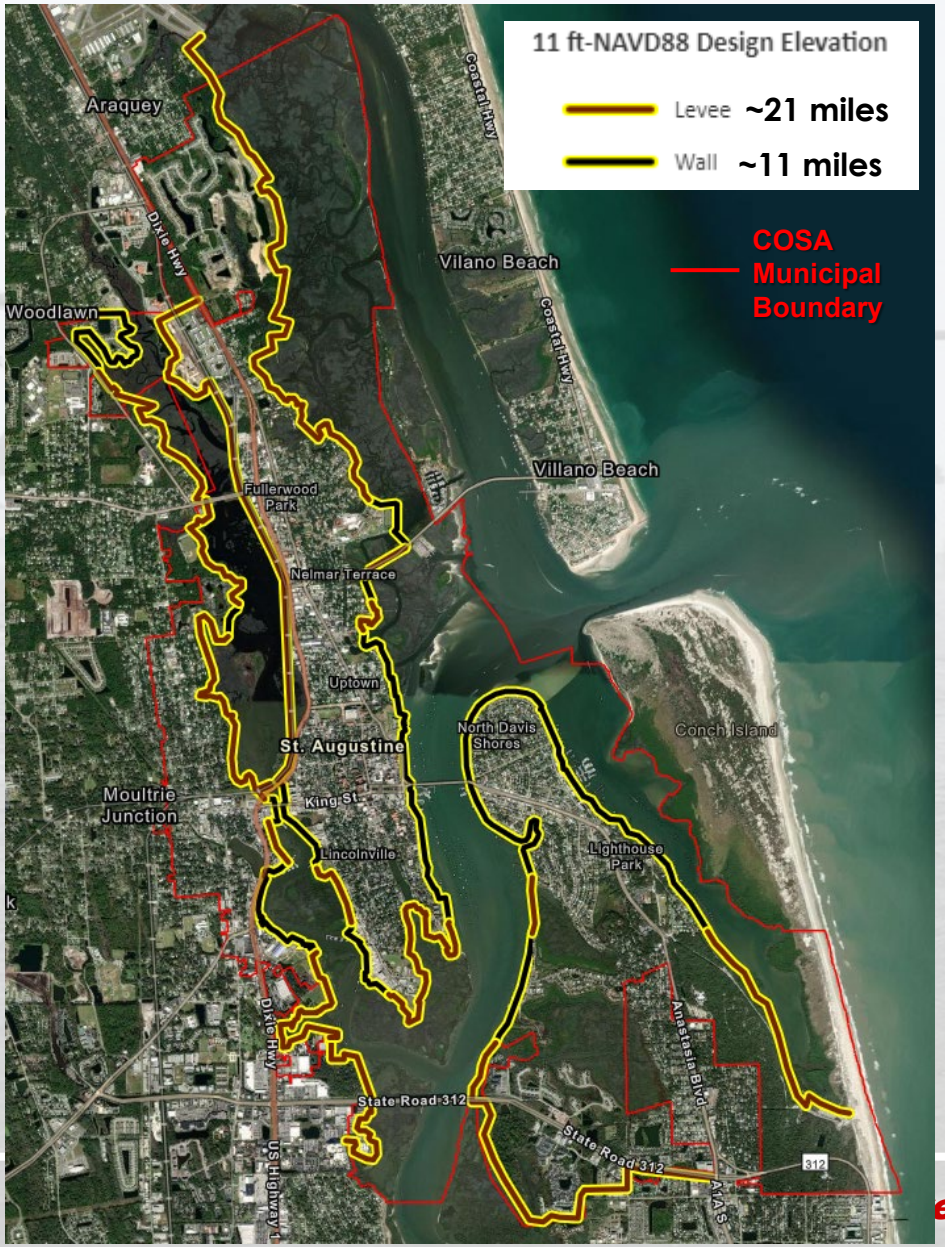
Conceptual Wall in Storm Conditions



Conceptual Levee in Storm Conditions



WALLS & LEVEES

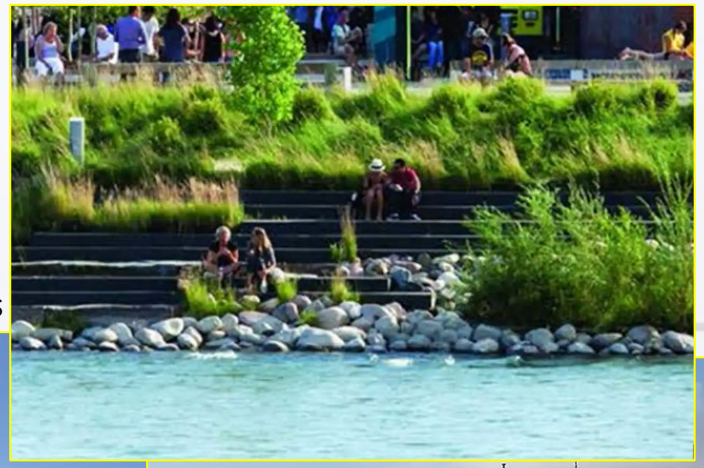


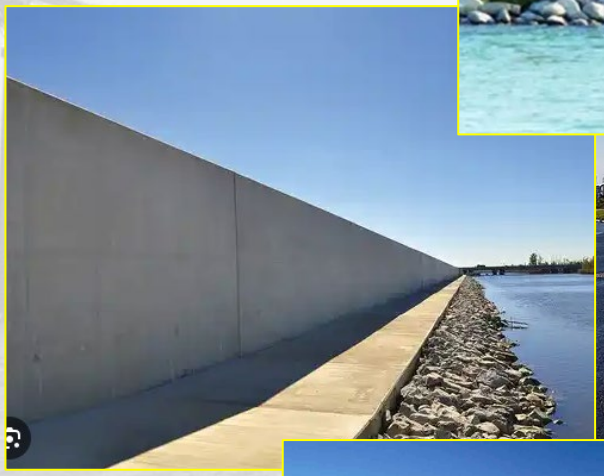
- Existing walls would be elevated.
- Land adjacent to deep water would need to be protected by a wall.
- Levees would be used for areas with more available real estate while walls would be used in land restricted areas.
- Potential Options…
  - Using roads as levees
  - Deployable Walls
  - Integration of Nature Based Features (NBF)
  - Integration of recreational features

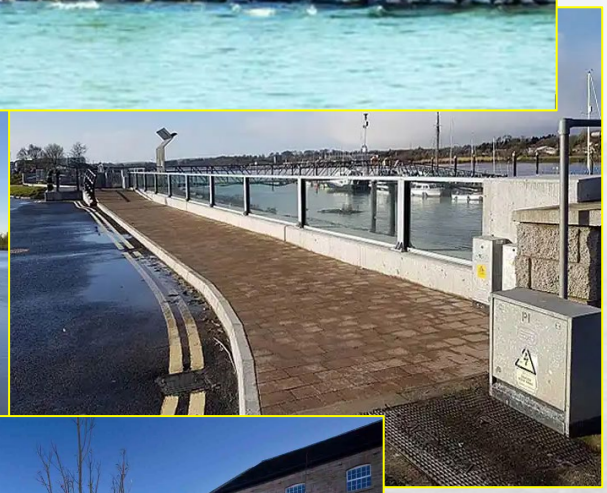
WALLS & LEVEES

BUILDING STRONG

Various Wall Examples







Ohio Creek Levee, Virginia

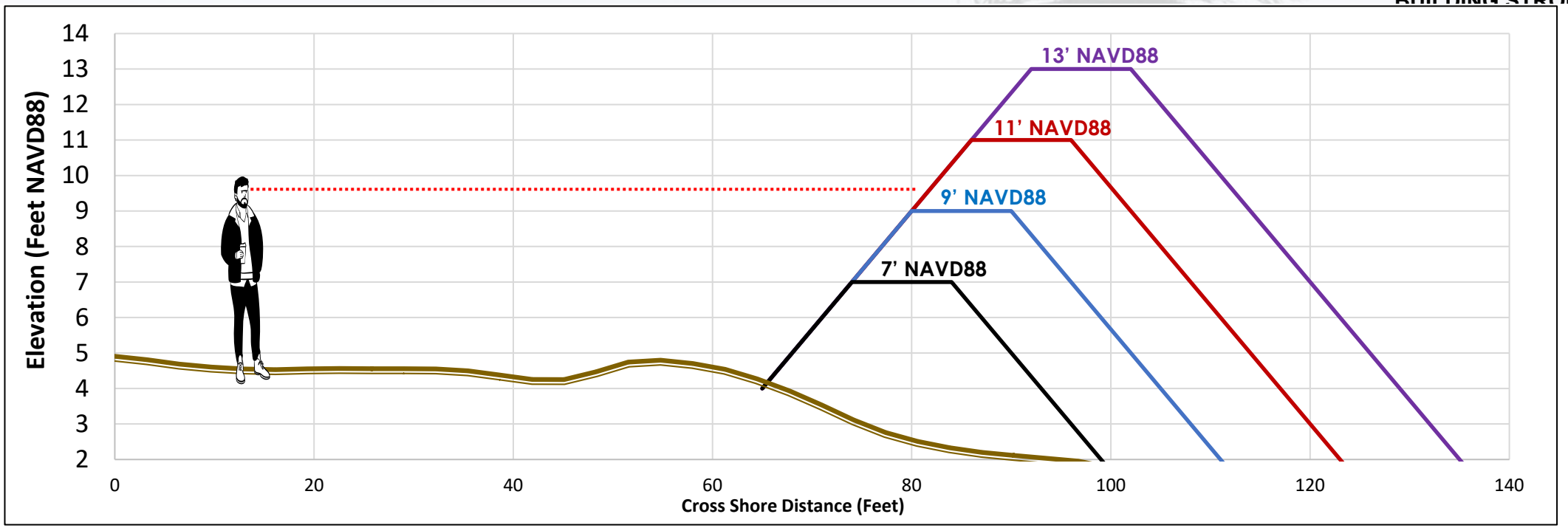
WALLS & LEVEES Helen Street (Ravenswood)

BUILDING STRONG

Existing Ground
7' Levee
9' Levee
11' Levee
13' Levee

~5'5"

Not 1V:1H Scale



WALLS & LEVEES River Road (Oyster Creek)

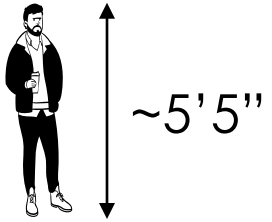
BUILDING STRONG

Existing Ground

9' Wall

11' Wall

13' Wall



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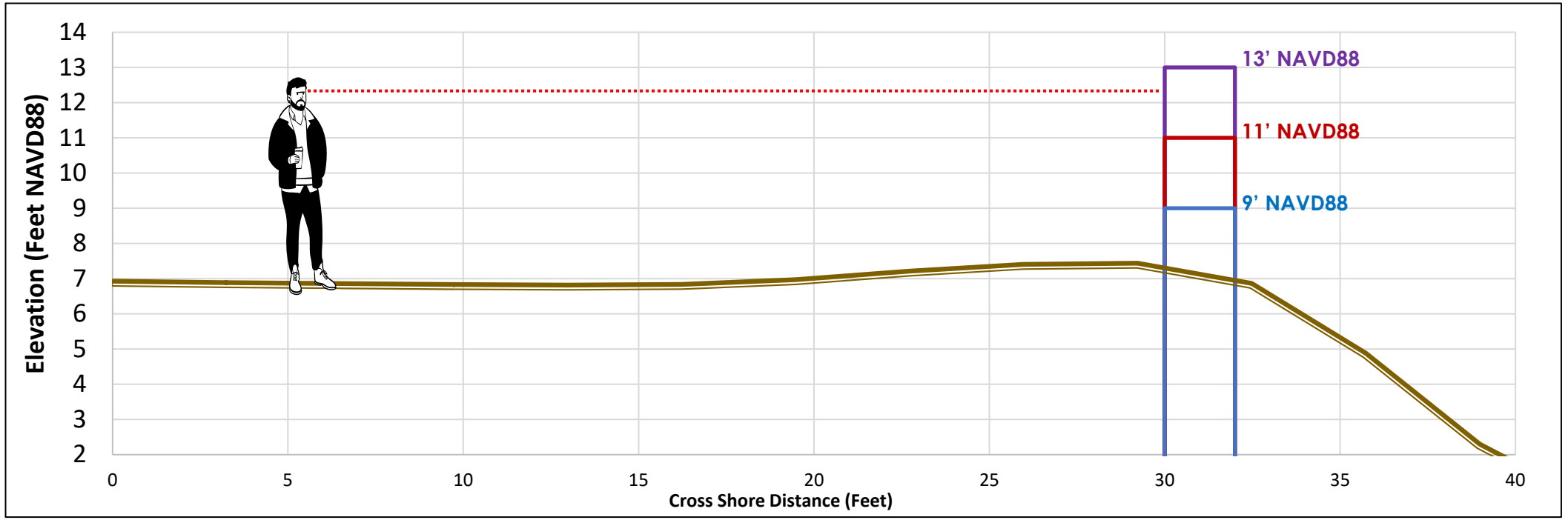
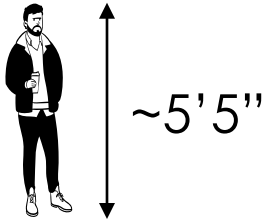


WALLS & LEVEES Fern Street (Greater Fullerwood)

BUILDING STRONG

Existing Ground
7' Levee
9' Levee
11' Levee
13' Levee



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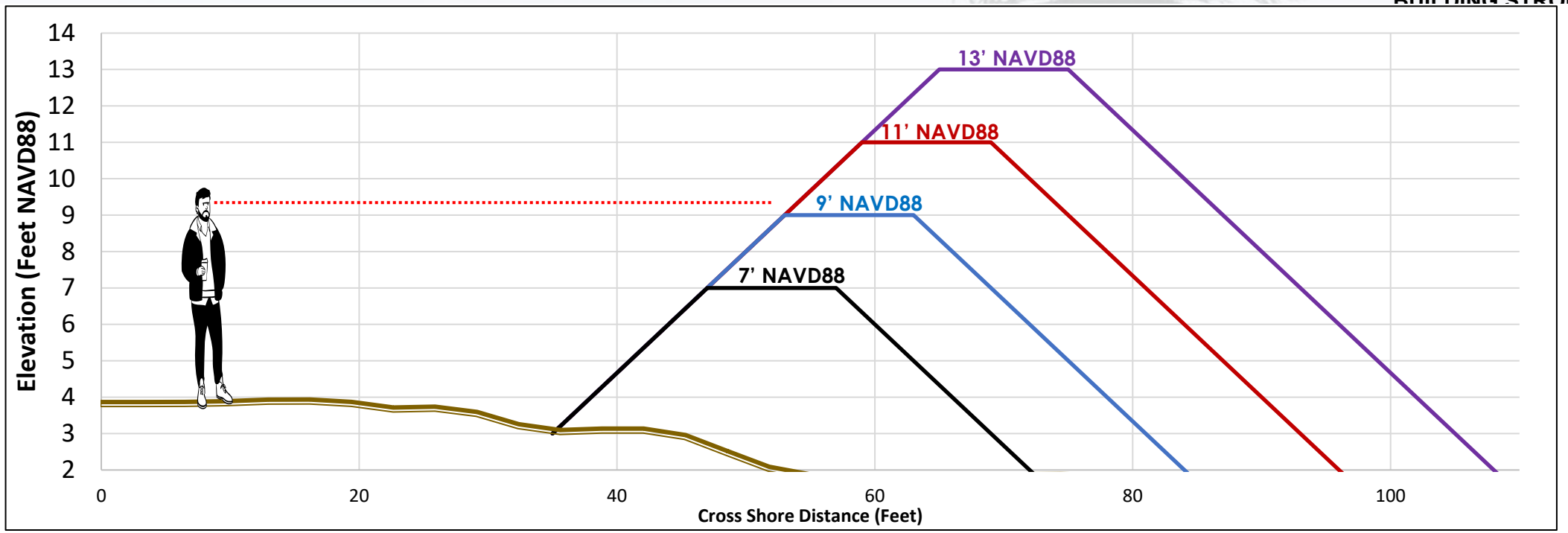
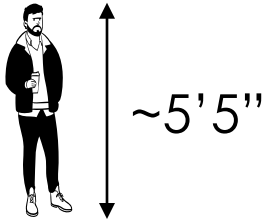


WALLS & LEVEES Avenida Menendez (Spanish Quarter)

BUILDING STRONG

Existing Ground
8.5' Wall
9' Wall
11' Wall
13' Wall



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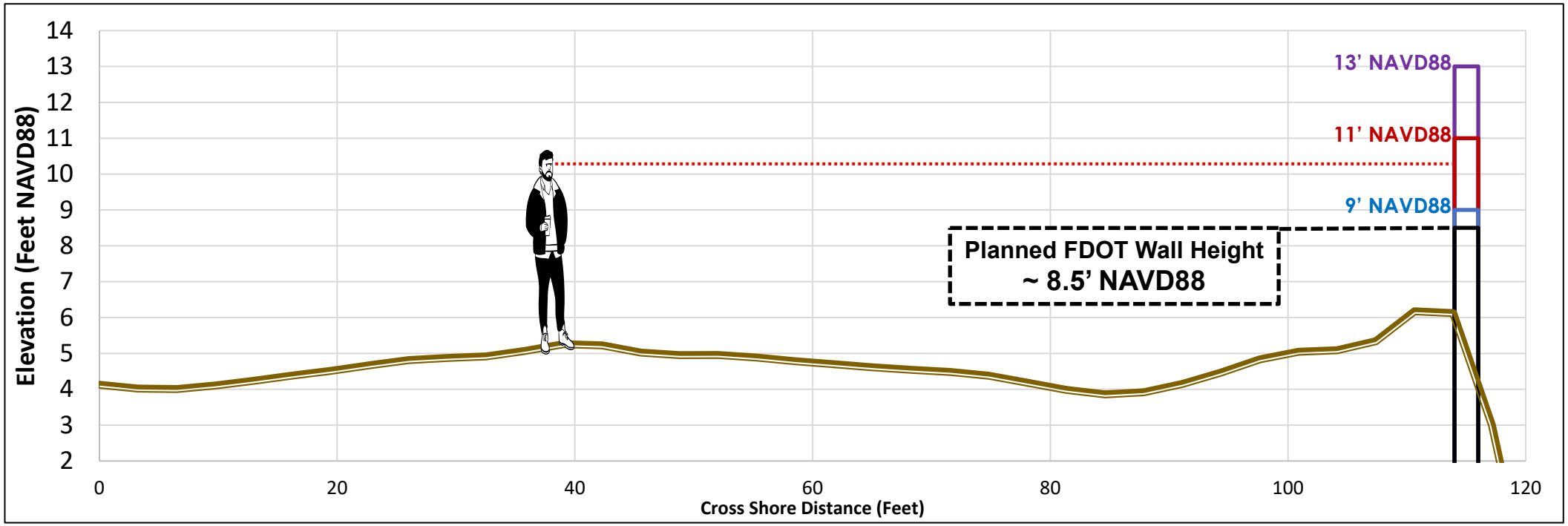
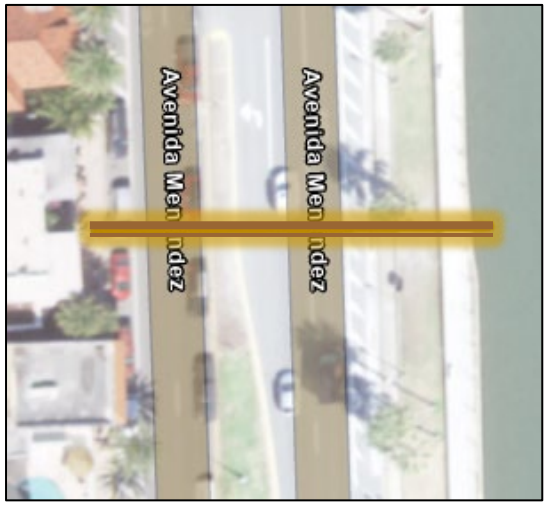




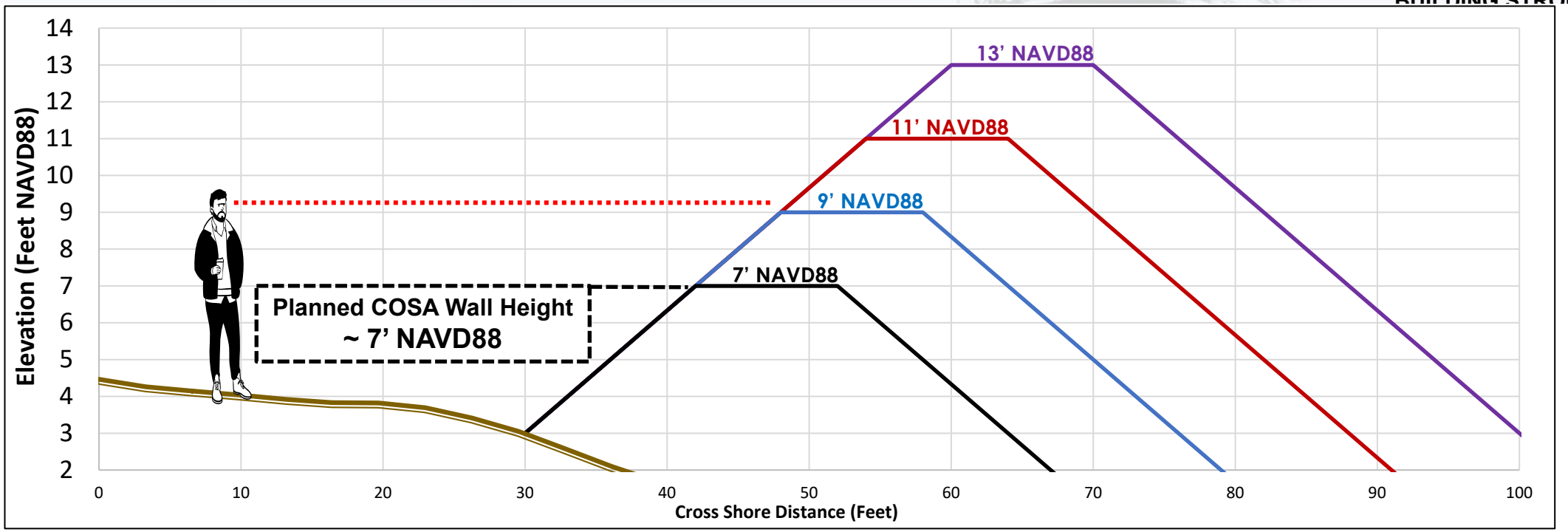
WALLS & LEVEES Washington Street (Lincolnville)

BUILDING STRONG

Existing Ground
7' Levee
9' Levee
11' Levee
13' Levee

~5'5"

Not 1V:1H Scale



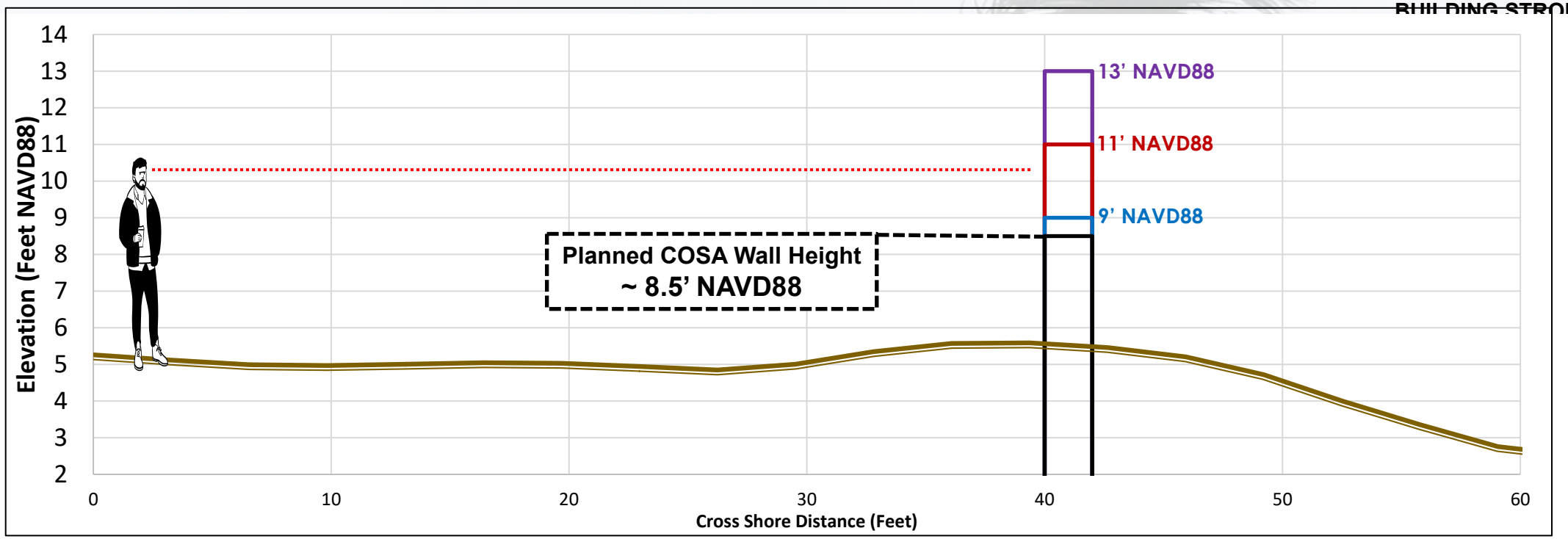
WALLS & LEVEES Inlet Drive (North Davis Shores)

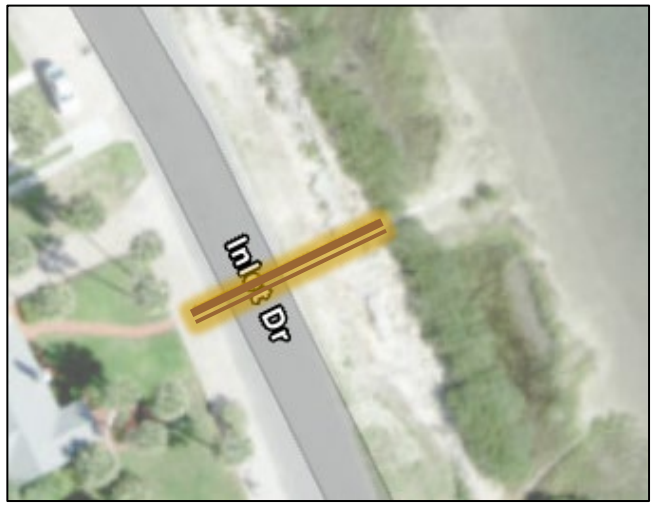
BUILDING STRONG

Existing Ground
7’ Wall
9’ Wall
11’ Wall
13’ Wall

~5’5”

Not 1V:1H Scale





WALLS & LEVEES

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What benefits do walls and levees provide?

- Reduced coastal storm damages from both small and large storm events.
- Reduced nuisance flooding days and impacts.
- Potential for incorporating nature-based features.
- Potential for recreation enhancement.

What resources could walls and levees impact?

- Saltwater marsh habitat
- Visual aesthetics
- Existing interior drainage infrastructure

Implementation considerations and potential options to avoid/minimize/mitigate impacts of walls and levees?

- Minimize direct overlap with existing habitat.
- Avoid/Minimize alignments across creeks.
- Maintain public and private water access.
- Minimize footprint on private property.
- Minimize closure gates.

SURGE BARRIER SYSTEMS

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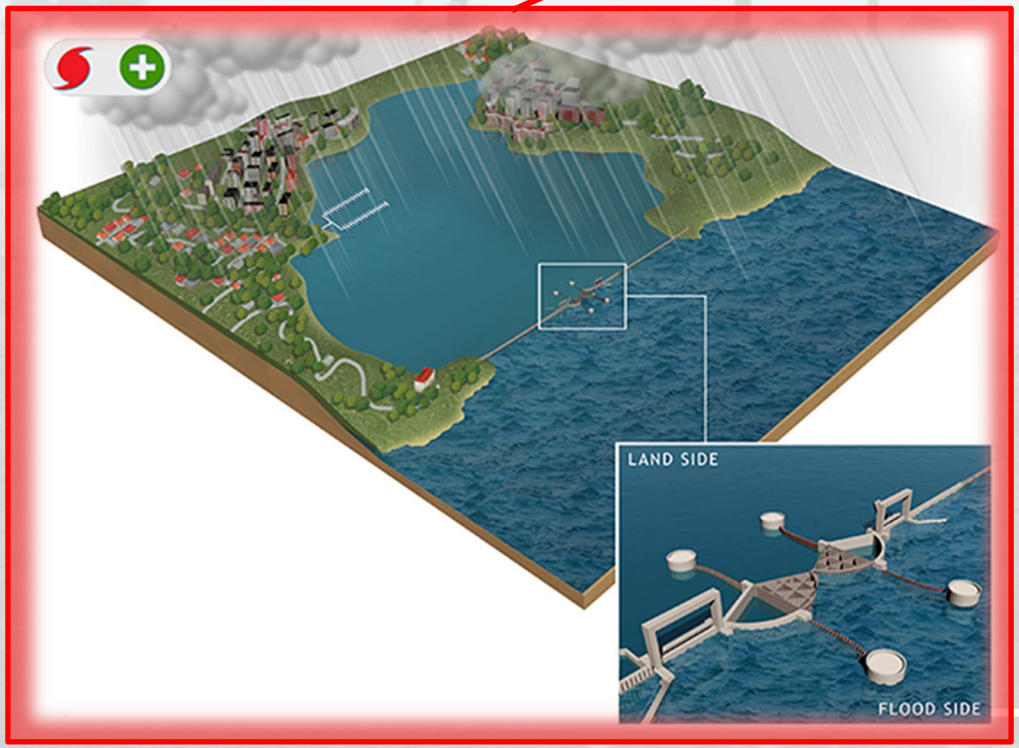
What are Surge Barrier Systems?

Surge Barrier Systems would combine gates across inlets and/or rivers that would close during large storms along with walls, levees, and/or dunes to tie the system into high ground. Surge Barriers reduce the risk of coastal flooding before it gets into the back bay waters

Conceptual Surge Barrier System



Surge Barrier Design Rendering in Galveston, TX.

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SURGE BARRIER SYSTEMS

U.S.ARMY

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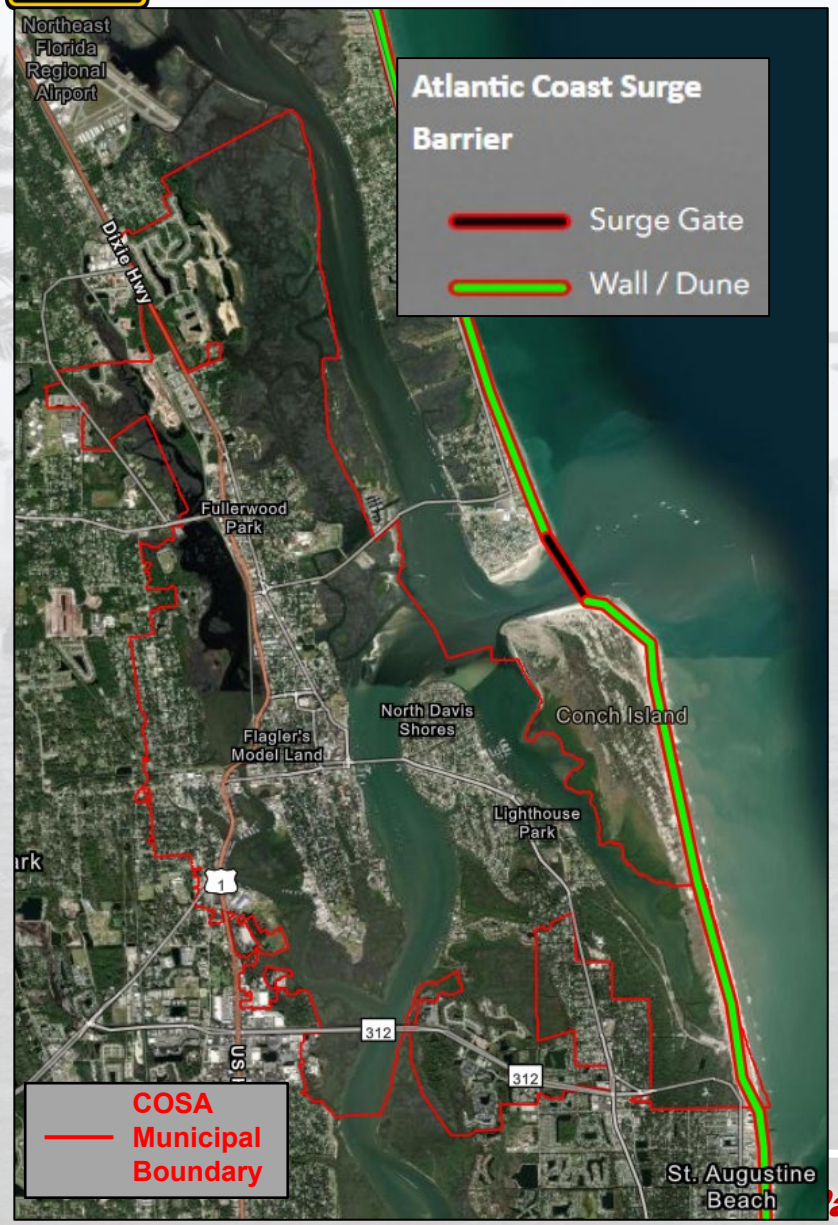

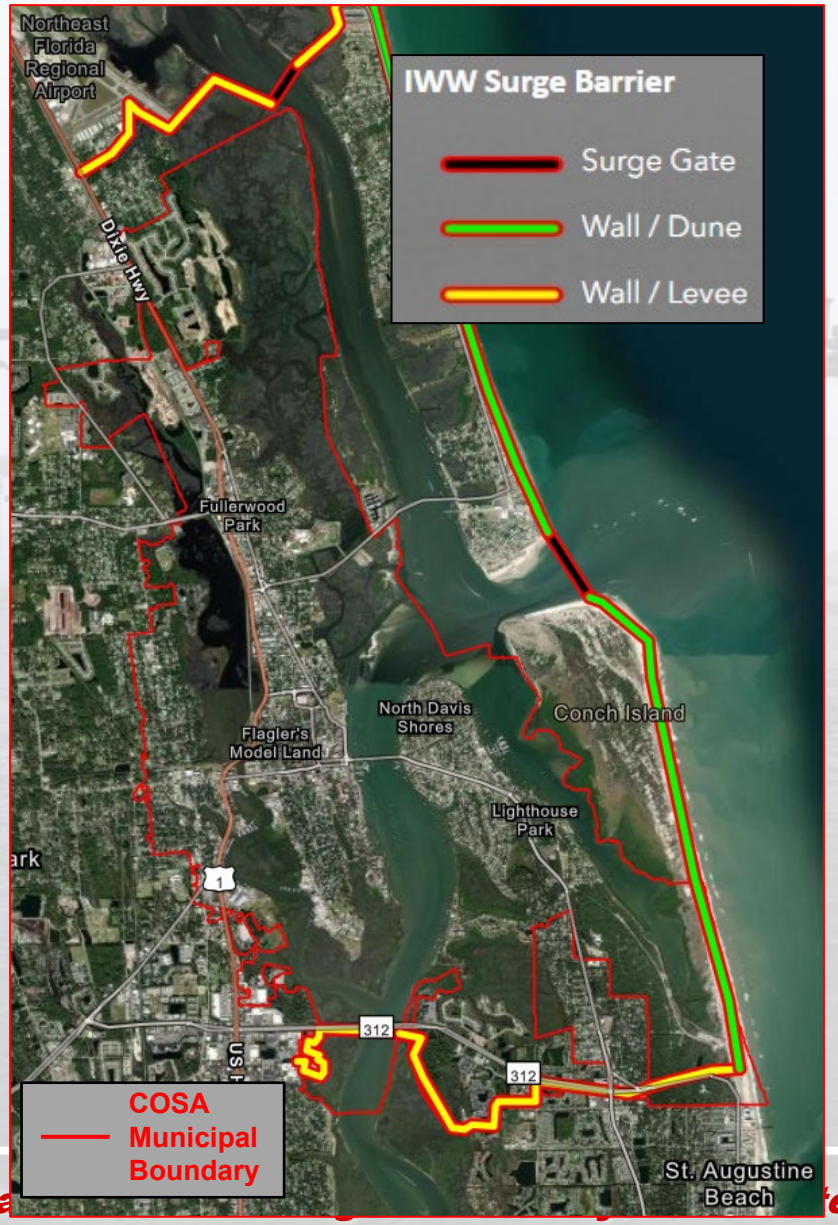

SURGE BARRIER SYSTEMS

BUILDING STRONG

New Orleans Sector Gate

SURGE BARRIER SYSTEMS

Rotterdam Surge Barrier, Netherlands

SURGE BARRIER SYSTEMS

BUILDING STRONG

What benefits do surge barrier systems provide?

- Reduced coastal storm damages from large storm events.
- Maintain inlet access
- Minimize in-city footprint

What resources could surge barrier systems impact?

- Water quality (Matanzas and San Sebastian Rivers, Salt Run)
- Saltwater marsh habitat
- Marine/estuarine animal transit and habitat
- Essential Fish Habitat
- Visual aesthetics
- Beach access (St. Augustine, Porpoise Point)
- Sediment transport (Porpoise Point)

Implementation considerations and potential options to avoid/minimize/mitigate impacts of walls and levees?

- Time to implement
- Operations & Maintenance
- Footprint / Real Estate
- High ground tie in
- Likely not closed for “sunny day” flooding
- Rainfall drainage

SURGE BARRIER SYSTEMS

Coastal Barrier Resources Act (CBRA)

- 3 purposes of CBRA:
  - Minimize loss of human life
  - Minimize wasteful expenditure of federal revenues
  - Minimize damage to fish, wildlife, and other natural resources associated with coastal barriers
- System Units
  - Most new federal expenditures and financial assistance, including federal flood insurance, are prohibited
  - Consultation with USFWS required
- Otherwise Protected Areas
  - Only prohibition is on federal flood insurance, and there is an exception for park-related structures
  - Consultation with USFWS not required
- Federal VS Private Funding

NONSTRUCTURAL MEASURES

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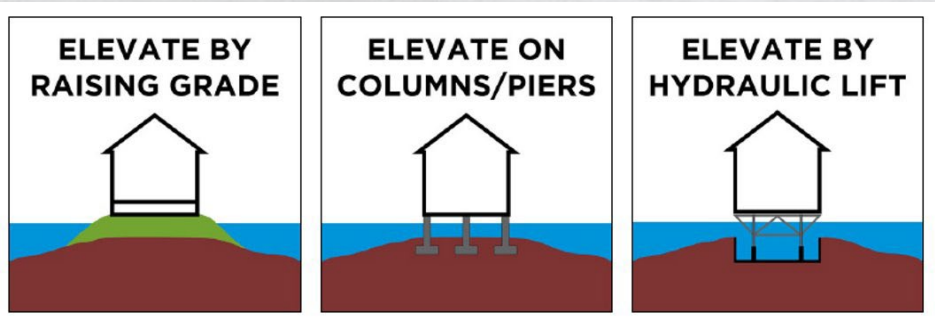
WHAT ARE NONSTRUCTURAL MEASURES?

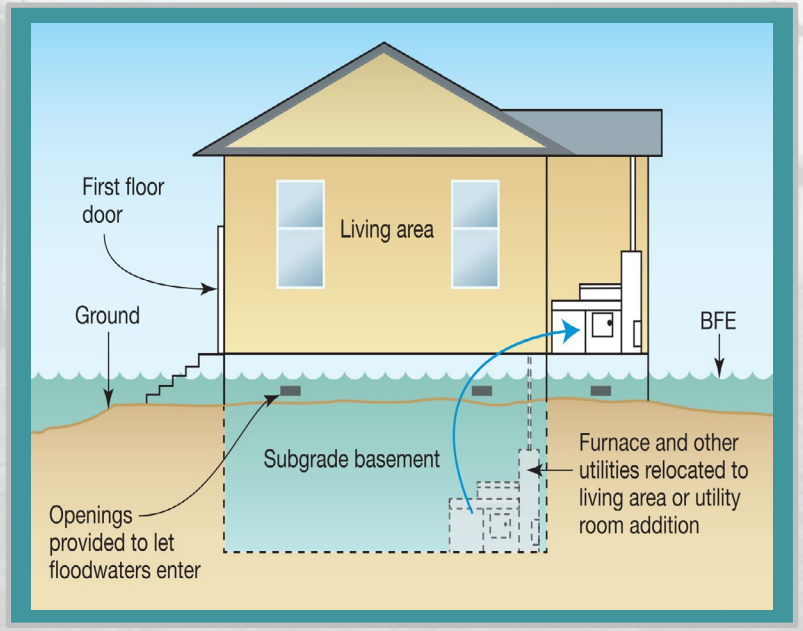
- An array of options used to **adapt to** existing and future coastal flood risks and damage without major modification to floodplain characteristics
- Often, physical and permanent measures retrofitted into existing structures and incorporated into new designs
- Examples:
  - Elevation of Structures
  - Buyout/Relocation of Structures
  - Dry Floodproofing
  - Wet Floodproofing



NONSTRUCTURAL MEASURE EXAMPLES

BUILDING STRONG

Wet Floodproofing: allowing floodwaters to enter/exit with minimal damage



Dry Floodproofing: sealing portion of building, making it impermeable to floodwater

Buyout/Relocation: moving structures from location with flood risk

Examples of nonstructural measures, including dry floodproofing, wet floodproofing, and buyout/relocation.

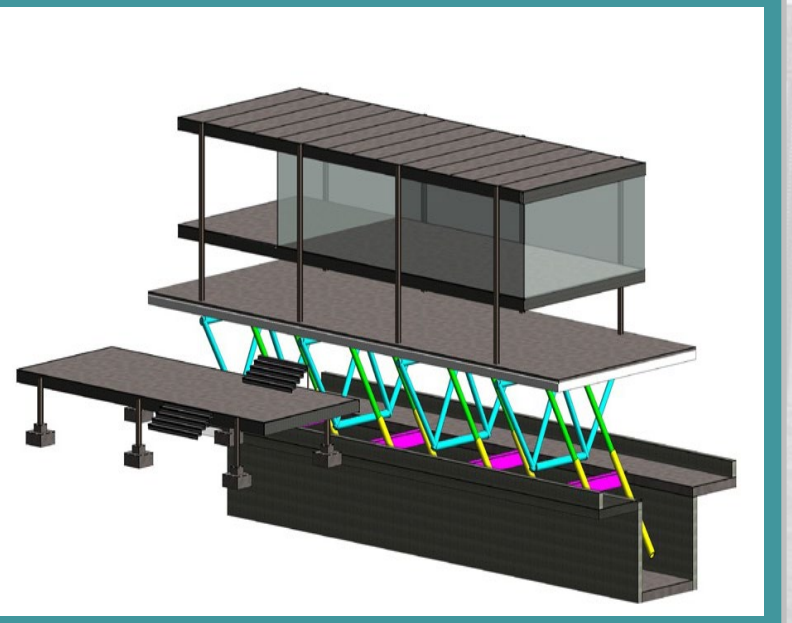
NONSTRUCTURAL MEASURE EXAMPLES

BUILDING STRONG

Elevation
By Raising Grade

Elevation By
Columns/Piers/Slab

Elevation
By Hydraulics



Different approaches to elevating structures.

NONSTRUCTURAL MEASURES

BUILDING STRONG

Elevation for Residential Structures

- Lift an existing structure to an elevation greater than a perceived flooding elevation.
- For example, a **residential** structure with a first-floor elevation below the flooding elevation.

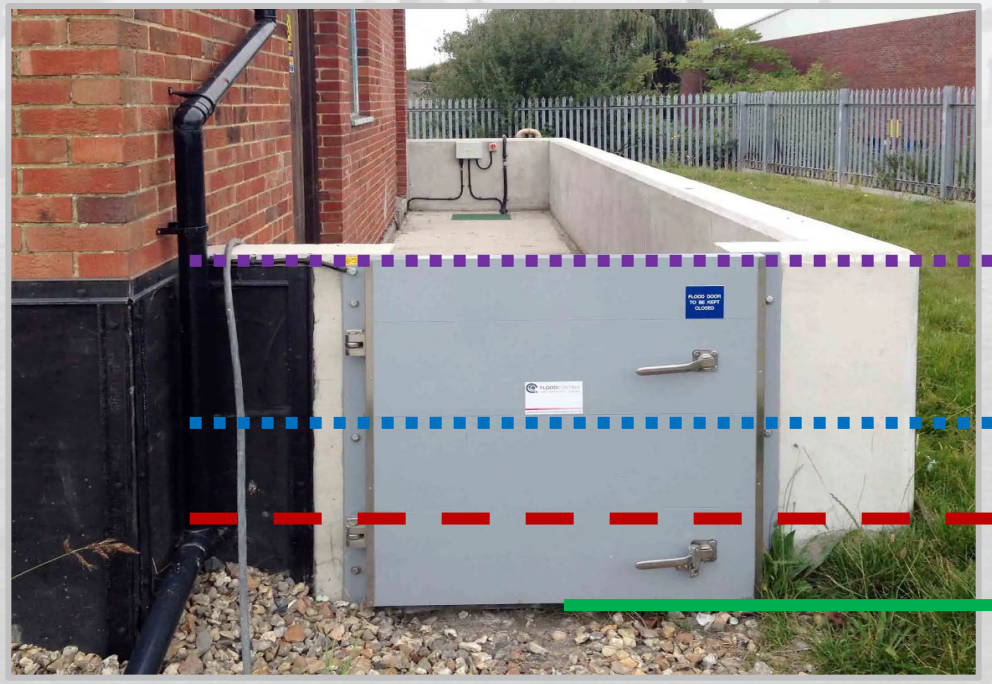
Residential structure **pre-elevation**

Residential structure **post-elevation**

NONSTRUCTURAL MEASURES

Dry Floodproofing for Commercial/Public Structures

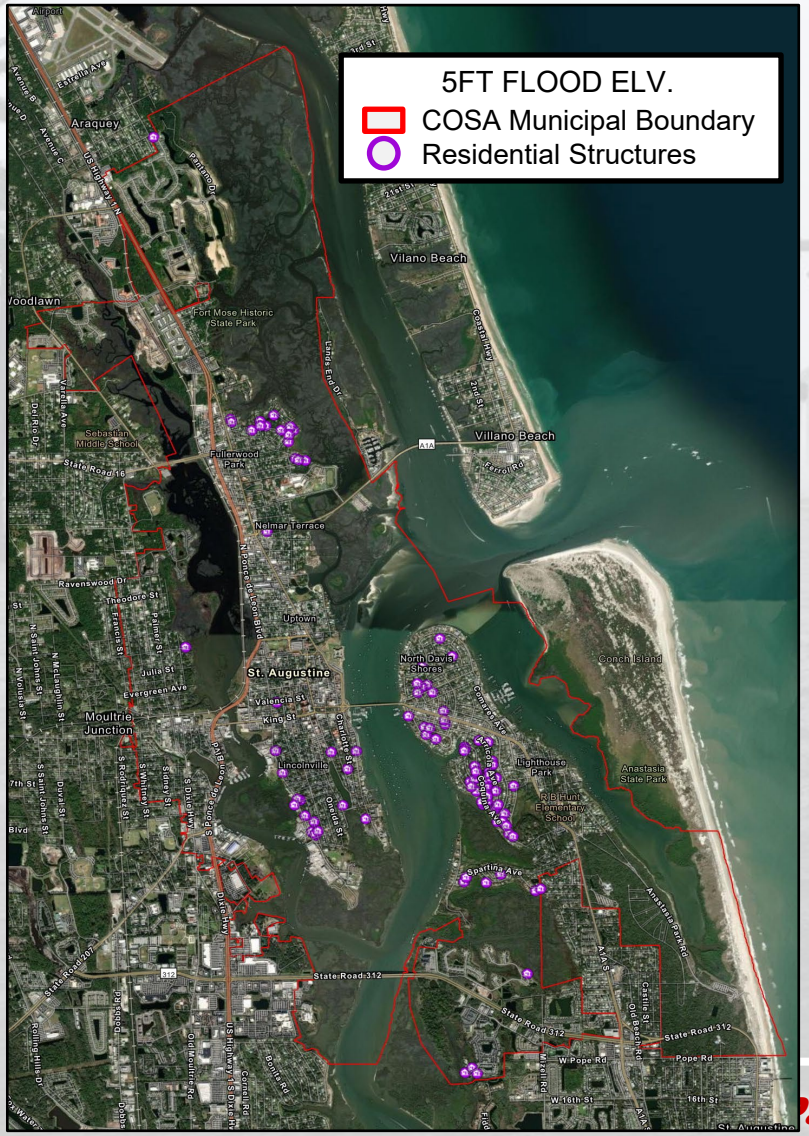
- Waterproofing the structure to prevent floodwater from damaging contents.
- For example, **commercial/public** structure that experiences shallow flooding.

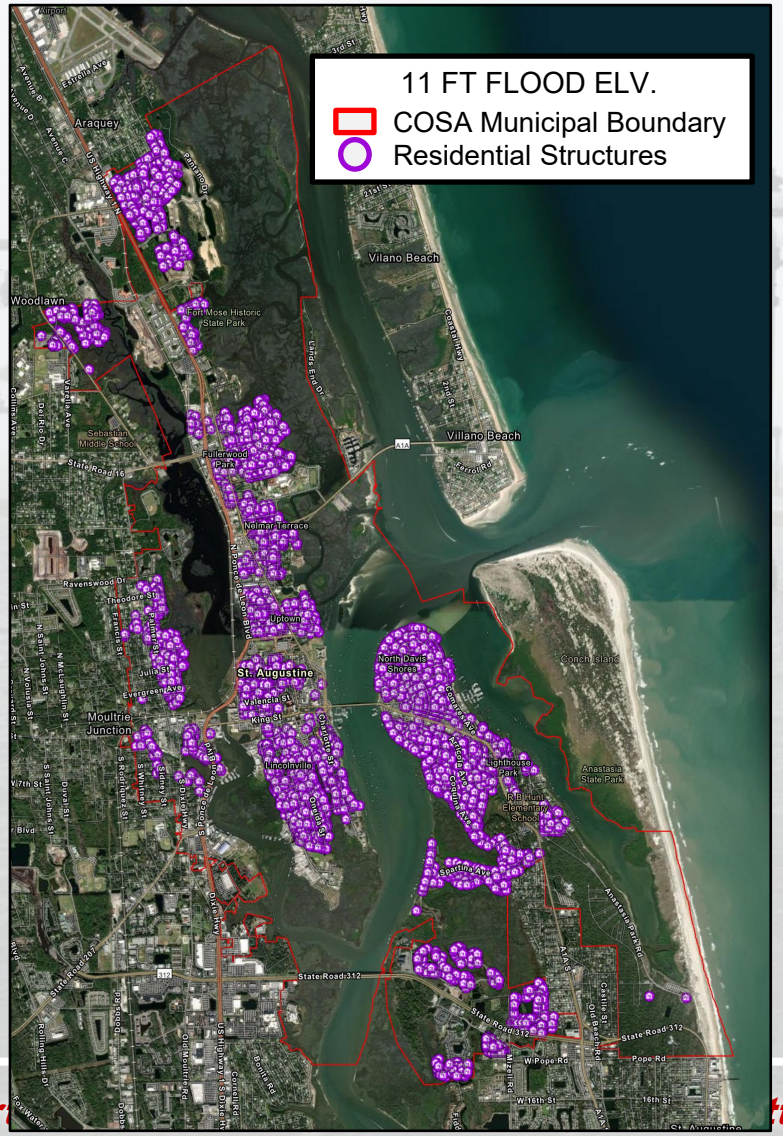


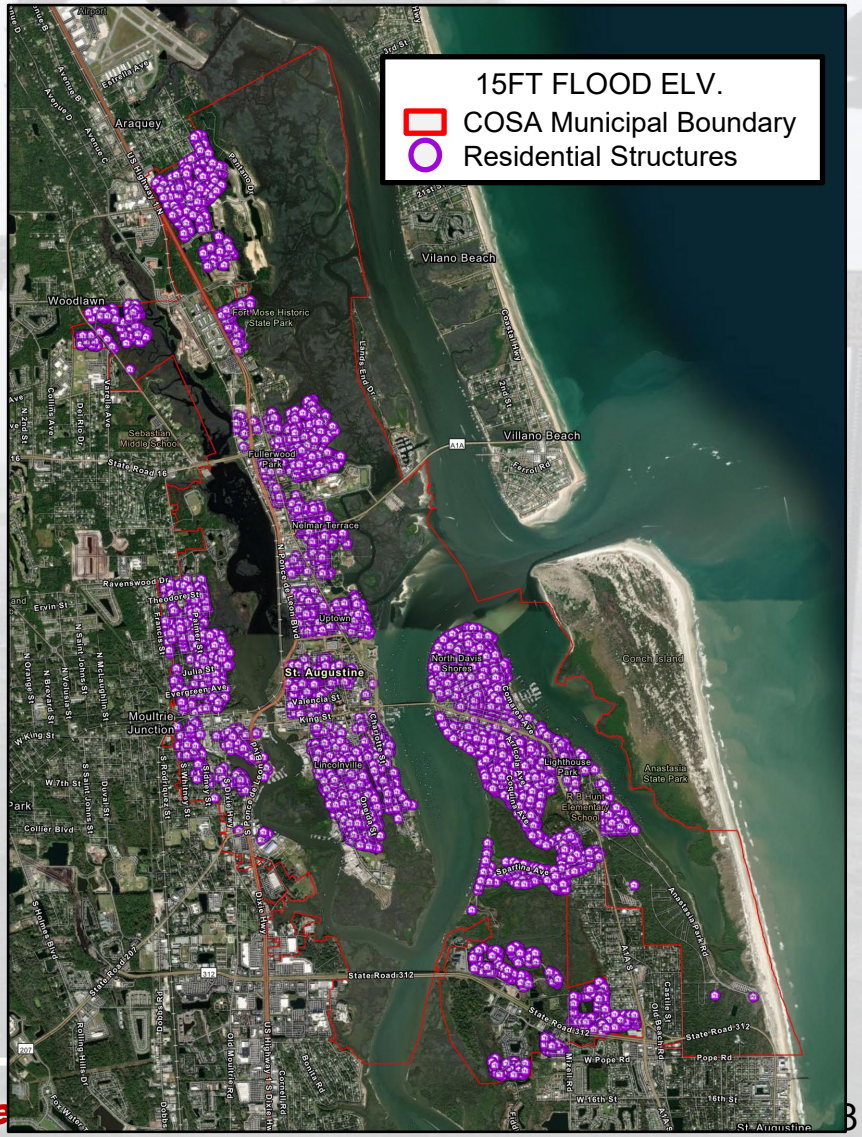
NONSTRUCTURAL MEASURES

BUILDING STRONG

Examples of locations of **residential** structure elevation potential at 5 ft, 11 ft, and 15 ft design (no other protective measures considered).

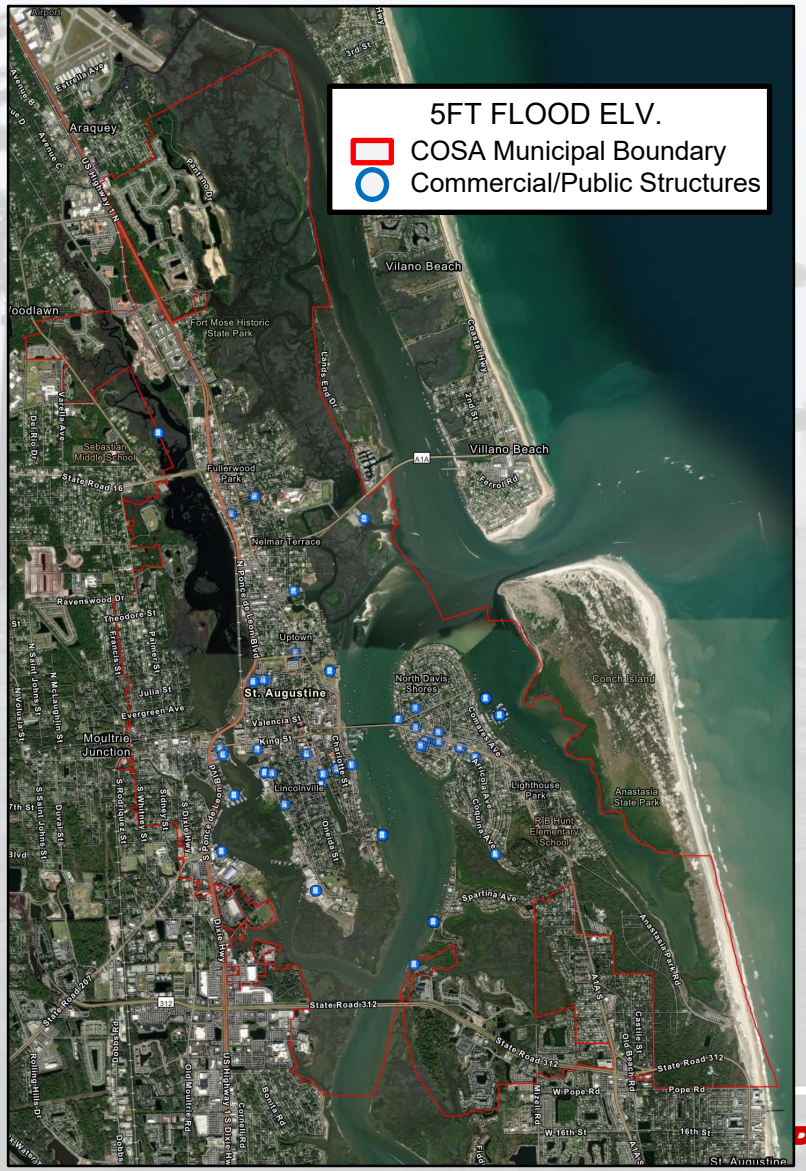


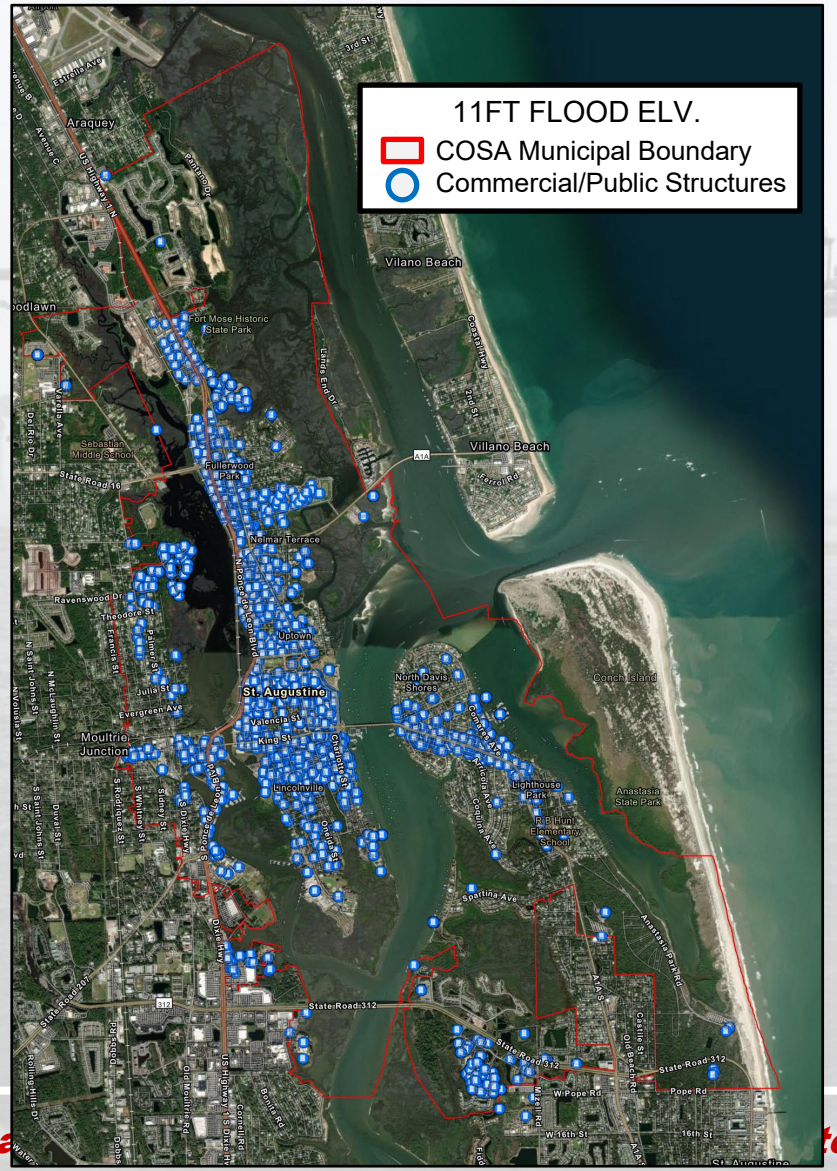


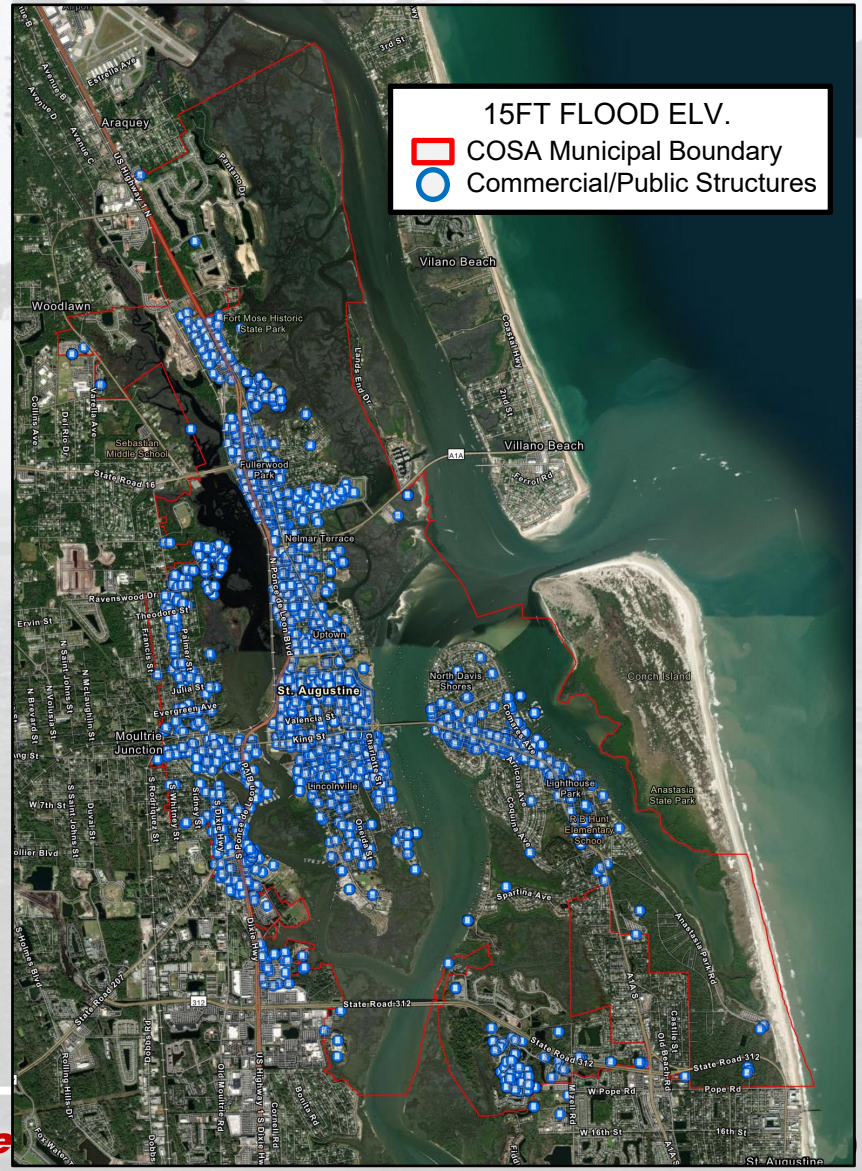


NONSTRUCTURAL MEASURES

Examples of locations of **commercial/public** structure floodproofing potential at 5 ft, 11 ft, and 15 ft design (no other protective measures considered).







NONSTRUCTURAL MEASURES

BUILDING STRONG

What benefits do nonstructural measures provide?

- Reduces risk of coastal flood damage to structure and its contents
- Reduces risk of community displacement due to coastal flooding

What resources may nonstructural measures impact?

- Cultural resources eligible for listing in the NRHP
- Visual or aesthetic resources

Potential options to avoid/minimize/mitigate impacts of implementing nonstructural measures?

- Evaluate impacts to eligible cultural resources
- Adhere to NPS guidelines for flood adaptation for historic properties
- Maintain visual aesthetics
- Use of temporary/deployable structures

ENGINEERING WITH NATURE: NATURE BASED FEATURES

EWN®…the intentional alignment of natural and engineering processes to efficiently and sustainably deliver economic, environmental and social benefits through collaboration.

What are Nature Based Features?

Landscape features used to provide engineering function relevant to coastal flood risk management, while producing additional economic, environmental, and/or social benefits.

Long Beach Island Coastal Storm Damage Reduction

Galveston Beach Nourishment at 61st Street

MacDill Oyster Reef Shoreline Stabilization

West Bay River Diversion Project

Evia Island Bird Habitat

Bayou La Batre (Lightning Point)

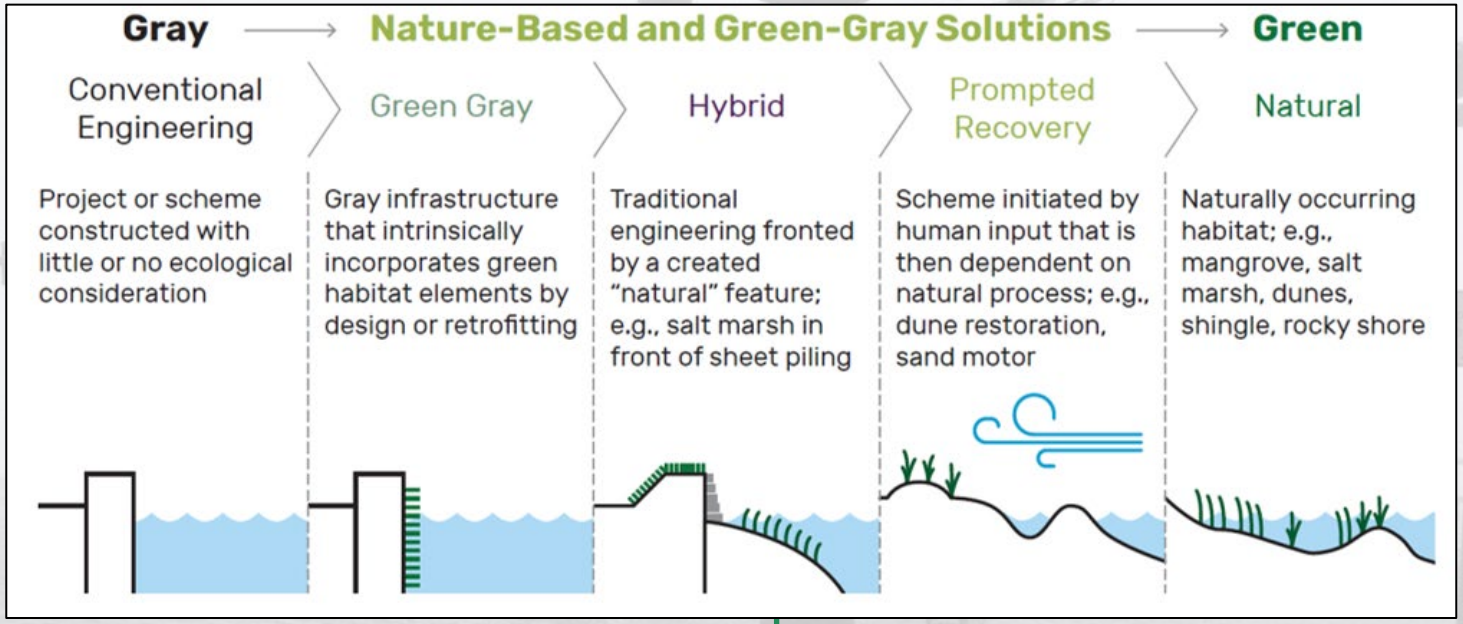
ENGINEERING WITH NATURE: NATURE BASED FEATURES

BUILDING STRONG

How do Nature Based Features deliver Coastal Storm Risk Management benefits?

Coastal Flood Risk Management through:

- Attenuate the energy and height of waves
- Attenuate storm surge water levels along the shoreline
- Provide storage of floodwater in the upper tidal reaches of estuaries
- Reduce erosion of sediments and soils
- Attract and stabilize sediments
- Attract and sustain flora and fauna, which can stabilize structures such as coastal levees



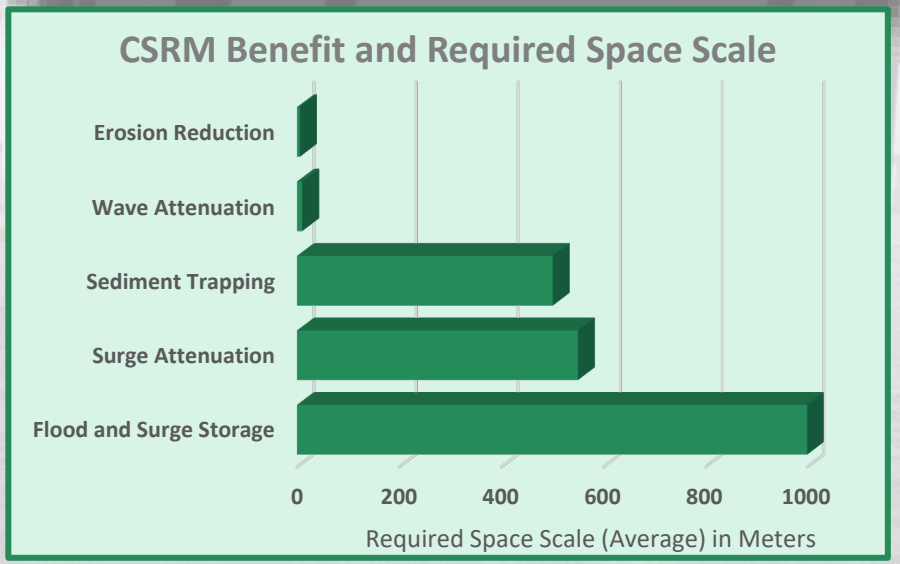
Nature Based Features Considerations:

- Wetland or shoreline location and geometry
- Space constraints (reducing water levels requires more extensive widths than reduction of waves)
- Vegetation constraints (native types and performance)
- Expected storm characteristic

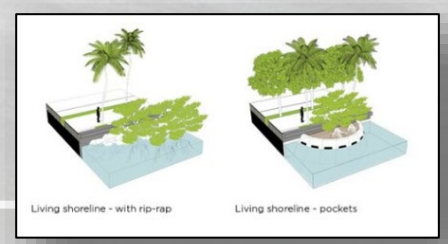
ENGINEERING WITH NATURE: NATURE BASED FEATURES

Nature Based Features Potential Benefits and Required Space Scale for Implementation?

CSRM Benefit	Benefit Description
Erosion Reduction Required Space Scale: 1 to 10 meters	Potential to lower shoreline recession rate
	Potential to prevent erosion at toe of landward structural features
	Potential to reduce maintenance costs of protected structures
	Potential to increases life span of protected structures
Sediment Trapping Required Space Scale: 1 to 1,000s of meters	Potential to maintaining or increasing wetland elevation and extent
	Potential to prevent erosion at toe of landward structural features
	Potential to reduce maintenance costs of protected structures
Wave Attenuation Required Space Scale: > 10s of meters	Potential to reduce flooding by wave overtopping and run-up
	Potential to reduces required height of structural measures
	Potential to reduce maintenance costs of protected structures
Surge Attenuation Required Space Scale: > 100s to 1,000s of meters	Potential to reduce flooding from storm surge (wetland must occupy large proportion of total flow area to provide measurable benefit)
	Potential to reduce required height of structural measures
Flood and Surge Storage Required Space Scale: > 1,000s of cubic meters	Potential to reduces water level
	Potential to provides flood and surge storage
	Potential to store runoff during coastal storms



Adapted from USACEs International Guidelines on Natural and Nature-Based Features for Flood Risk Management



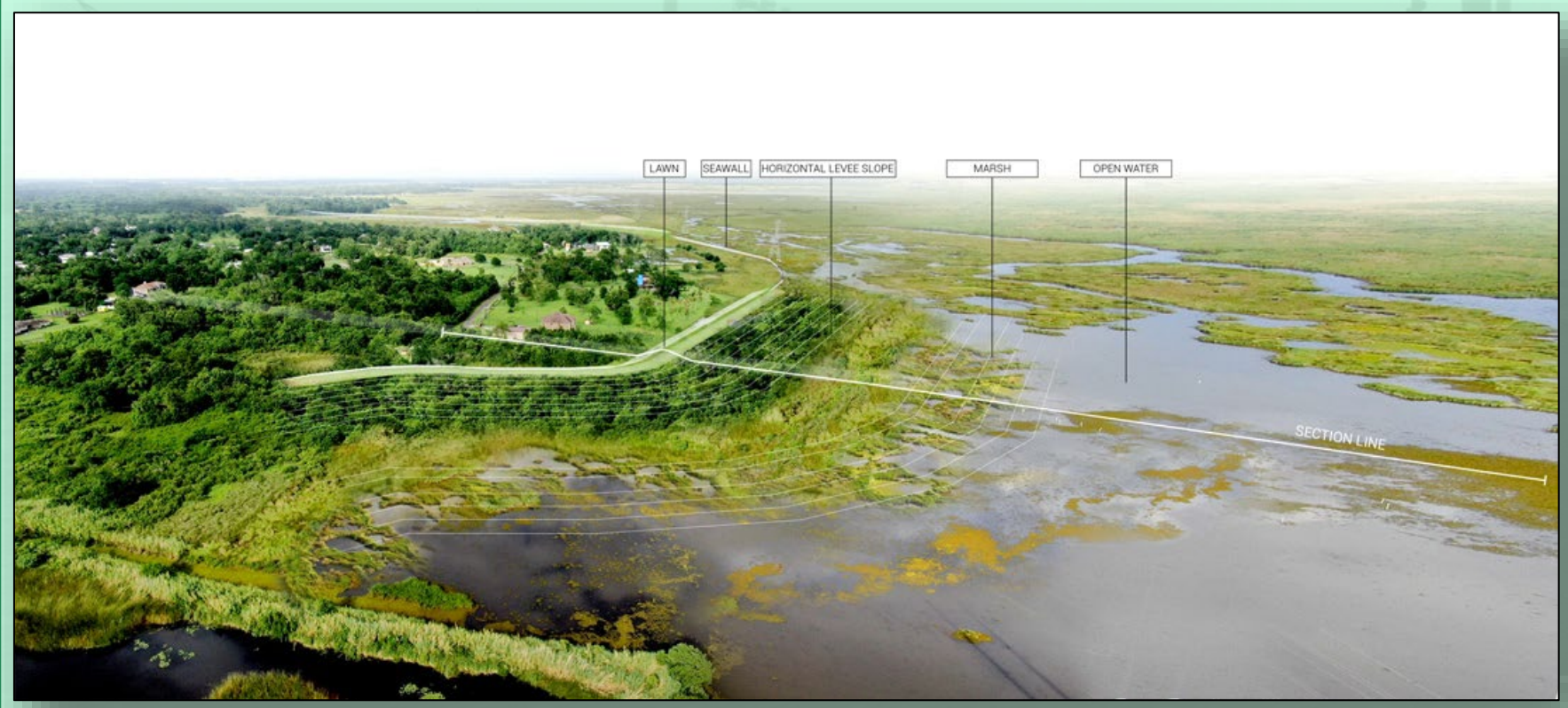
Kind Designs, 2024

ENGINEERING WITH NATURE: NATURE BASED FEATURES

BUILDING STRONG

HORIZONTAL LEVEE

A Nature Based Feature composed of a traditional flood-control levee core with a seaward ecotone slope, grading smoothly to a low marsh elevation. The slope is planted with native wetland and transitional species, restoring habitats, as well as providing adaptive capacity allowing wetlands to adjust landward as sea levels rise.



CSRM Benefits:

- Storm surge attenuation and protection
- Wave attenuation, reduction of wave energy impacts seaward of the shoreline
- Reduce shoreline erosion
- Adaptable to sea level rise
- Possible flood storage

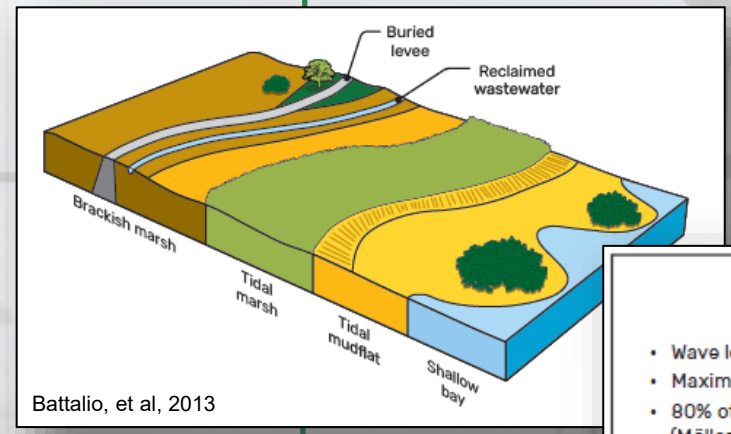
Challenges:

- Greater cost than traditional grey infrastructure
- Larger footprint required
- Easement challenges

ENGINEERING WITH NATURE: NATURE BASED FEATURES

BUILDING STRONG

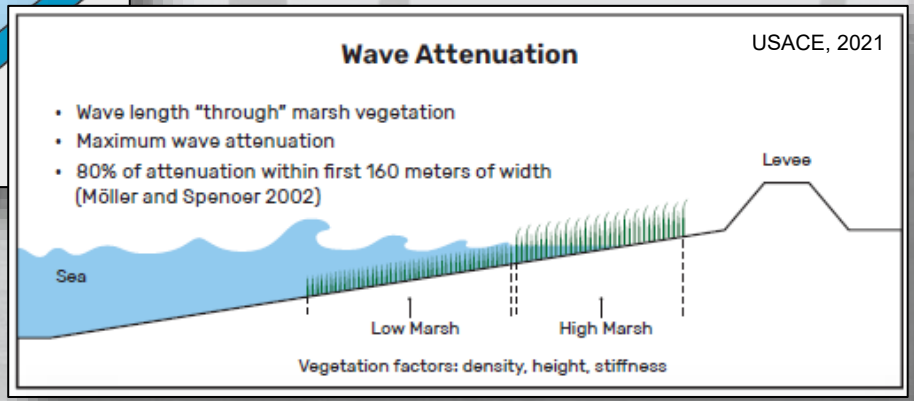
Horizontal Levee – Implementation in the City of St. Augustine Back Bay Coastal Storm Risk Management

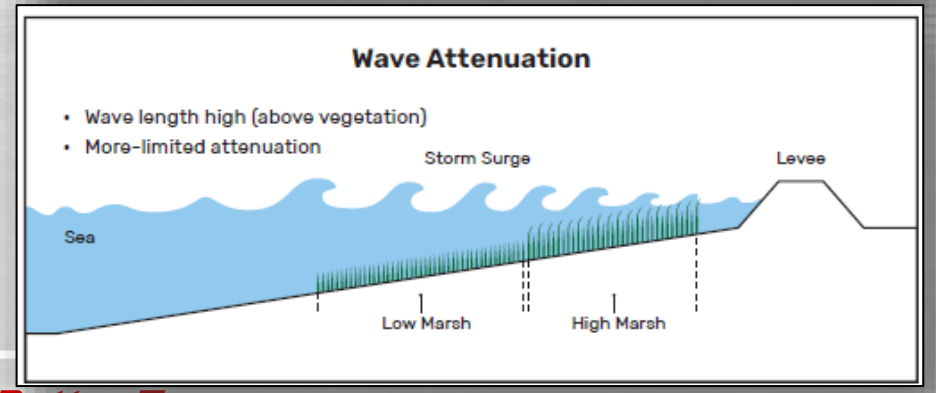


Battalio, et al, 2013

Example of Horizontal Levee in San Francisco Bay paired with freshwater discharged

Works in conjunction with structural levee to reduce coastal storm risk. Reduces wave action intercepted by structure. May require thin layer placement to retain or restore salt marsh.





LIVING SHORELINE

A Nature Based Feature that involves the use of native vegetation to protect against shoreline erosion. Living shorelines have a footprint that is dominated by native elements such as tidal flats, intertidal marshes, or mangroves (or a combination of these). In exposed locations, living shorelines often include a structure parallel to and along the waterward edge of the shore to buffer it against incoming wave energy.

CSRM Benefits:

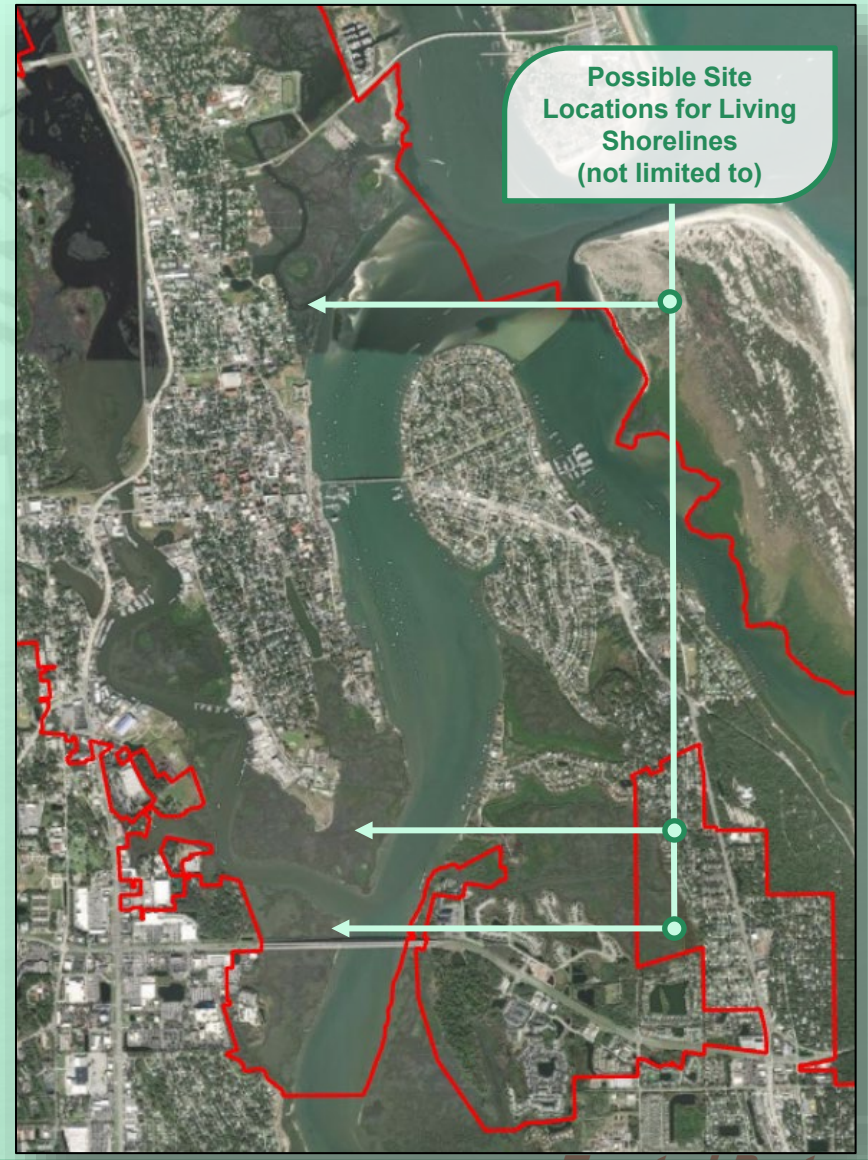
- Wave attenuation, reduction of wave energy impacts seaward of the shoreline
- Reduce shoreline erosion
- Possible cost reduction for traditional grey shore protection structural measures
- Adaptable to sea level rise

Challenges:

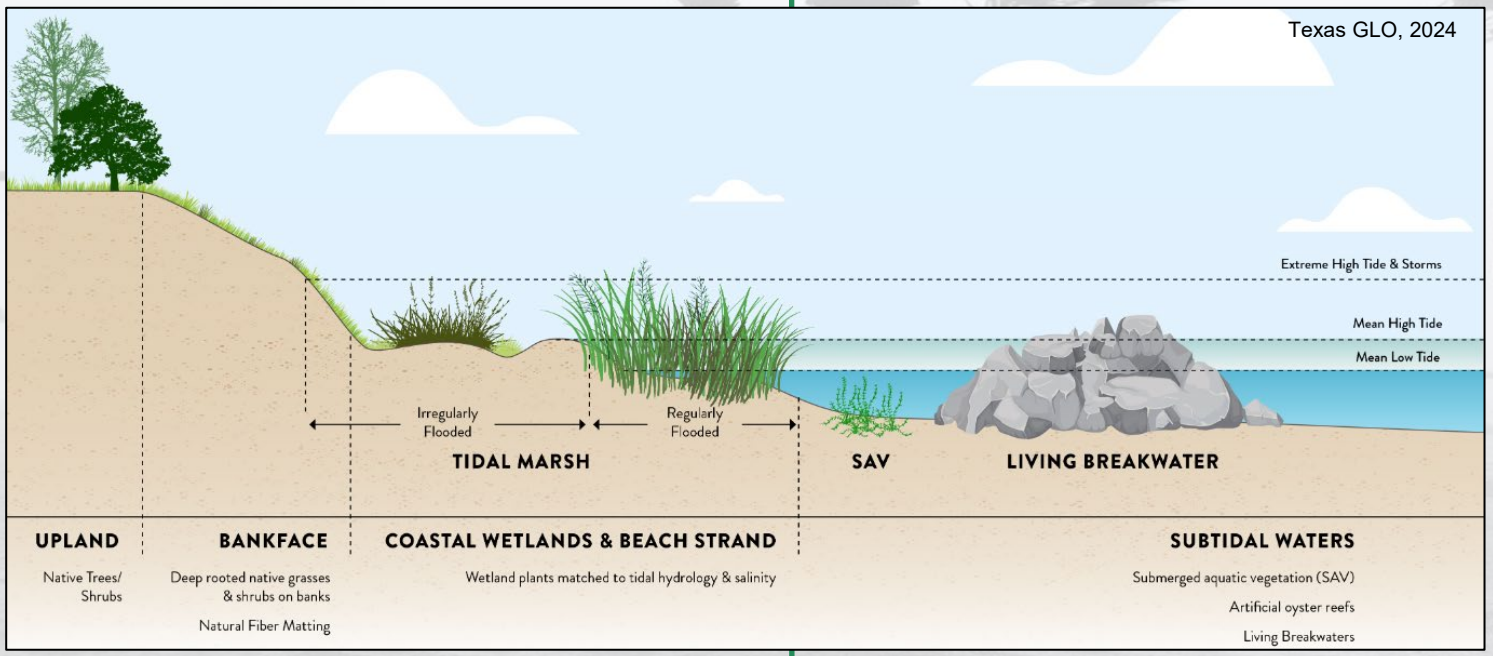
- Not applicable to high energy environments (large waves, high water velocity, high surge)
- Not a standalone CSRM alternative
- Alteration of water and sediment exchange

ENGINEERING WITH NATURE: NATURE BASED FEATURES

BUILDING STRONG



Living Shoreline – Implementation in the City of St. Augustine Back Bay Coastal Storm Risk Management



Shoreline stabilization technique that provides erosion protection and reduction of wave energy fronting existing marsh habitat or marsh habitat with traditional coastal storm risk management structural measures.

HYBRID SEAWALL WITH COASTAL VEGETATION

Combines green and grey infrastructure to achieve both a robust coastal storm protection measure with a seawall while maintaining or restoring ecosystems with implementation of appropriate vegetation. This vegetation buffer offers aesthetic benefits while also fortifying the traditional structural measures.

Bloomberg, 2022

CSRM Benefits:

- Wave attenuation, reduction of wave energy impacts seaward of the shoreline
- Reduce shoreline erosion
- Possible cost reduction for traditional grey shore protection structural measures.

Challenges:

- Not applicable to high energy environments (large waves, high water velocity, high surge)
- Higher cost than traditional seawalls
- Requires more space than traditional seawalls

ENGINEERING WITH NATURE: NATURE BASED FEATURES

BUILDING STRONG

HYBRID SEAWALL WITH COASTAL VEGETATION – Implementation in the City of St. Augustine Back Bay Coastal Storm Risk Management

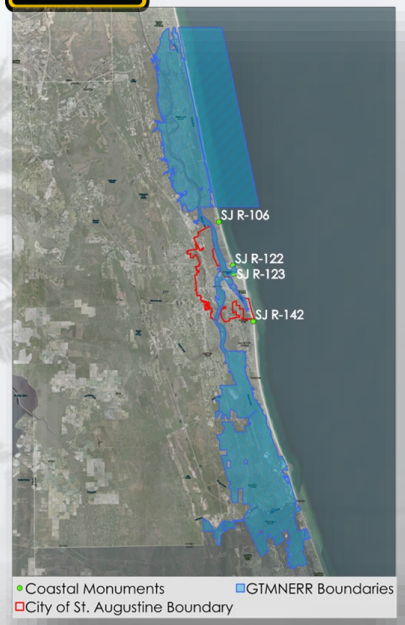

Miami Real Estate, 2021

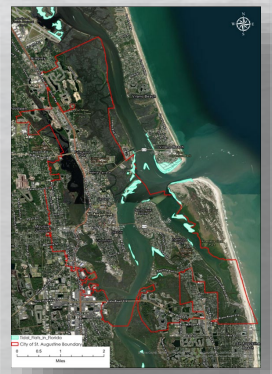

Kind Designs, 2024

Hybrid seawalls may offer wave attenuation and scour prevention for a traditional structure to improve performance and lifespan.

ENGINEERING WITH NATURE: NATURE BASED FEATURES

BUILDING STRONG





What important resources could these features impact?

- GTMNERR extends through the project area and includes many habitat types, including mangroves, oyster reefs, and salt marsh
- Oyster beds throughout the project area, notably within Salt Run
- Wetlands of various types
  - Tidal flats, a specific type of coastal wetland, are also present in the study area.
- Marine/estuarine animals (e.g., manatees, gopher tortoises, shorebirds, etc.) and habitat

Implementation considerations for potential alternatives

- Coastal Barrier Resources Act (CBRA)
- Endangered Species Act
- Essential Fish Habitat
- Cultural Resources
- Aesthetics
- Recreation
- Environmental Justice
- Climate Change/Sea Level Rise
- Space
- Cost

PATH FORWARD

KEY SCHEDULE ACTIVITIES - LOOK AHEAD

BUILDING STRONG

Key Activities	Finish Date
FCSA Executed	1/9/2023
AMM Milestone Meeting	5/1/2023
Initial Flood Driver Screening (Scope Decision Point)	5/17/2023
End of FY23	9/30/2023
G2CRM FWOP Production Runs	2/21/2024
Establish Initial Array of Alternatives	8/21/2024
End of FY24	9/30/2024
G2CRM FWP Initial Alternatives Production Runs & Post Processing	5/15/2025
Establish Final Array of Alternatives (Scope Decision Point)	6/4/2025
G2CRM FWP Final Alternatives Production Runs & Post Processing	9/22/2025
End of FY25	9/30/2025
Identify National Economic Development (NED) Plan	12/22/2025
Identify Comprehensive Benefits Plan/Locally Preferred Plan (LPP)	3/17/2026
Identify the TSP	5/18/2026
End of FY26	9/30/2026
Exceptions/Waivers Approved by Assistant Secretary to the Army (ASA)	11/20/2026
TSP Milestone Meeting	2/2/2027
Release Draft Report for Concurrent Reviews	4/2/2027
End of FY27	9/30/2027
ADM Meeting	11/3/2027
Final Report Submittal Package to HQ	5/22/2028
Chief's Report Signature	9/15/2028

Complete

Ongoing

UPCOMING PUBLIC ENGAGEMENT

BUILDING STRONG

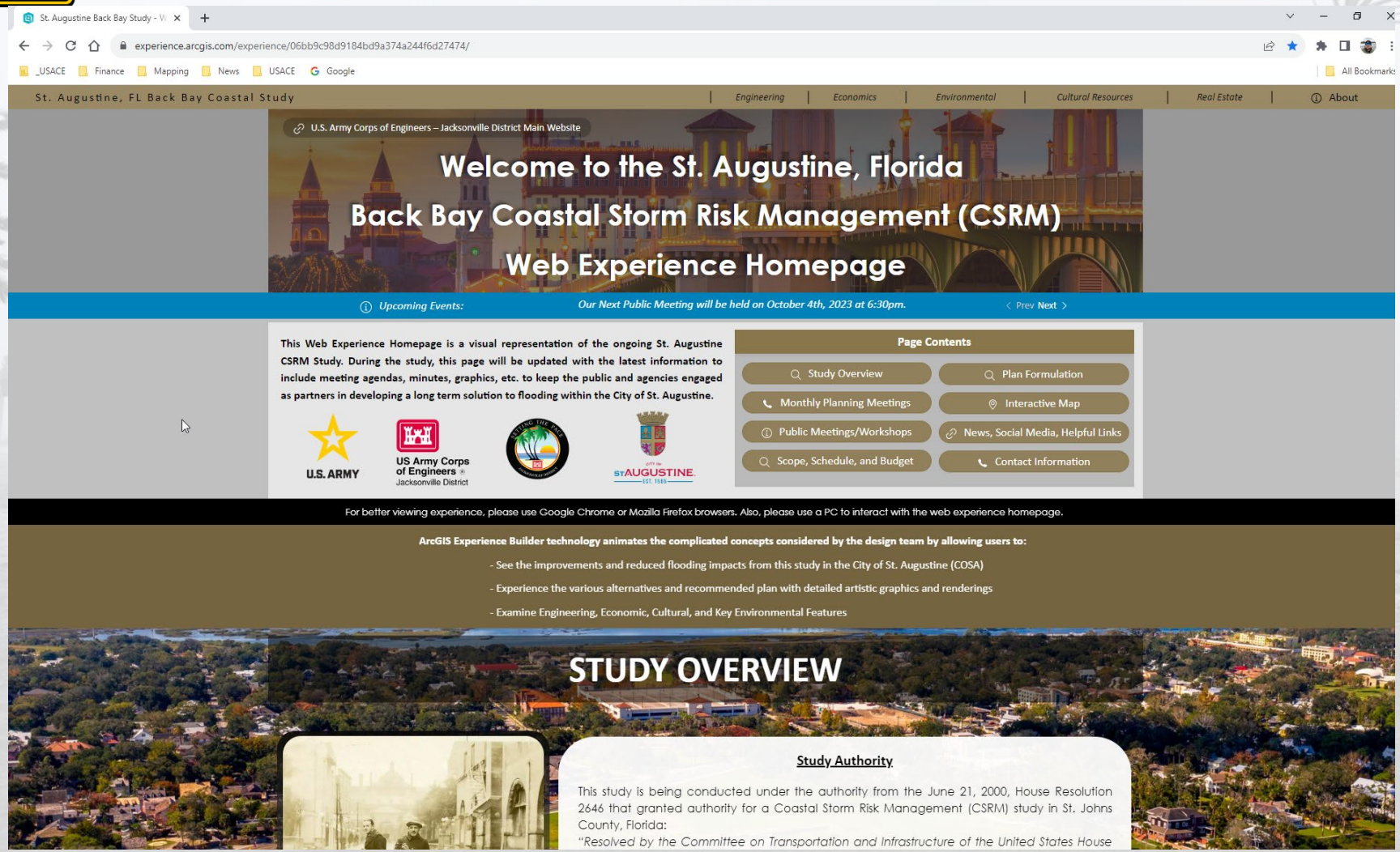
Dates	Events
November 21st, 2024 @ 1:00pm	Monthly Webinar
January 16th, 2025 @ 1:00pm	Monthly Webinar
February 20th, 2025 @ 1:00pm	Monthly Webinar

DISCIPLINE SPECIFIC UPDATES/ACTIONS

- **Planning Technical Lead**: Marty Durkin
- **Engineering Technical Lead**: Patrick Snyder
- **Economics Lead**: Vongmony Var
- **Environmental Lead**: Katie Lebow
- **Cultural Resources Lead**: Zuzana Chovanec
- **Real Estate Lead**: Chris Bukolt
- **Office of Counsel**: Katie Gwin
- **Landscape Architecture Lead:** Sabrina Collins

PUBLIC OUTREACH (STUDY WEBSITE)

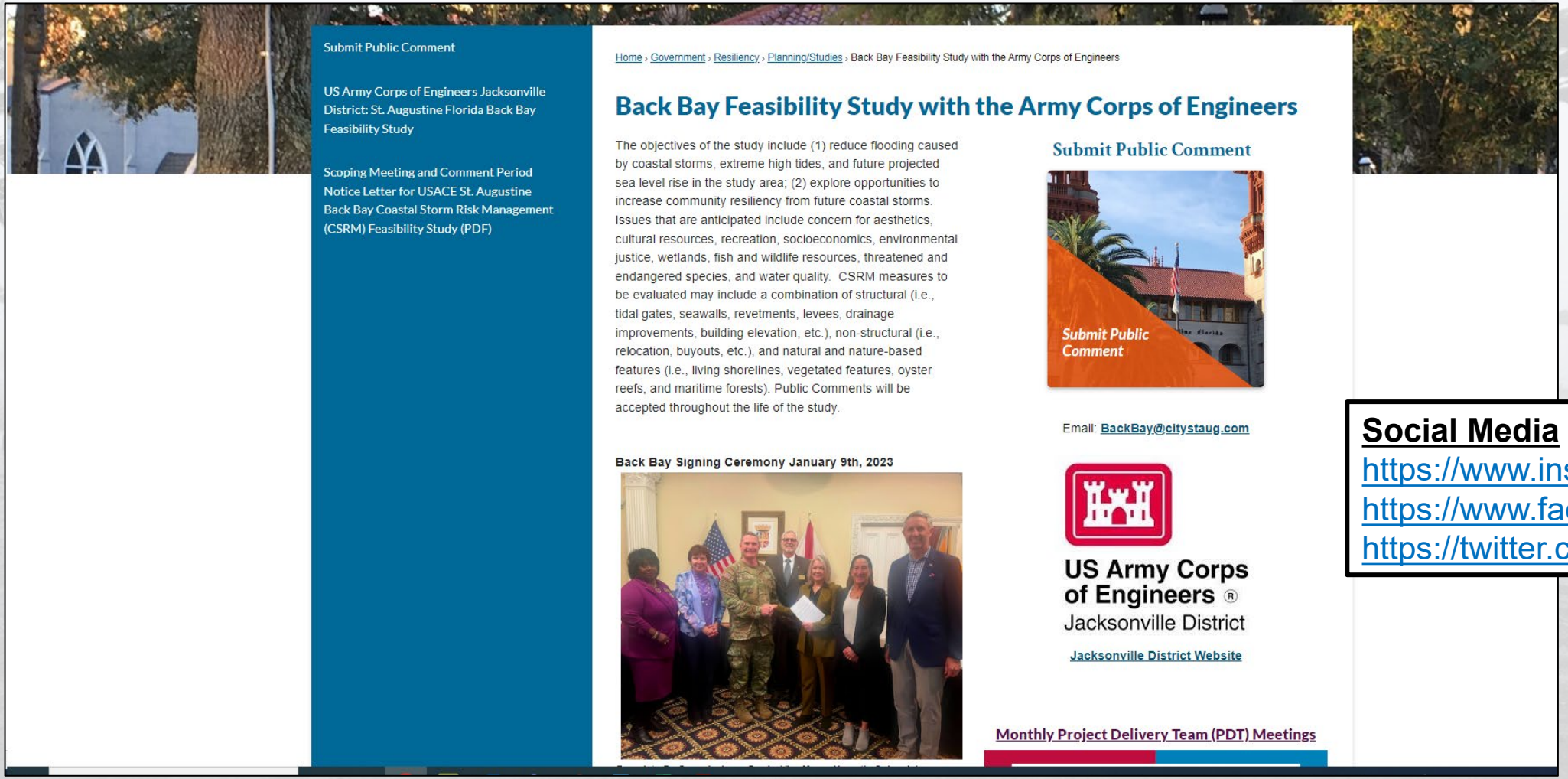
BUILDING STRONG



https://experience.arcgis.com/experience/06bb9c98d9184bd9a374a244f6d27474/

PUBLIC OUTREACH (SPONSOR SITES)

BUILDING STRONG



Submit Public Comment

US Army Corps of Engineers Jacksonville District: St. Augustine Florida Back Bay Feasibility Study

Scoping Meeting and Comment Period Notice Letter for USACE St. Augustine Back Bay Coastal Storm Risk Management (CSRM) Feasibility Study (PDF)

Home › Government › Resiliency › Planning/Studies › Back Bay Feasibility Study with the Army Corps of Engineers

Back Bay Feasibility Study with the Army Corps of Engineers

The objectives of the study include (1) reduce flooding caused by coastal storms, extreme high tides, and future projected sea level rise in the study area; (2) explore opportunities to increase community resiliency from future coastal storms. Issues that are anticipated include concern for aesthetics, cultural resources, recreation, socioeconomics, environmental justice, wetlands, fish and wildlife resources, threatened and endangered species, and water quality. CSRM measures to be evaluated may include a combination of structural (i.e., tidal gates, seawalls, revetments, levees, drainage improvements, building elevation, etc.), non-structural (i.e., relocation, buyouts, etc.), and natural and nature-based features (i.e., living shorelines, vegetated features, oyster reefs, and maritime forests). Public Comments will be accepted throughout the life of the study.

Submit Public Comment

Submit Public Comment

Email: BackBay@citystaug.com

Back Bay Signing Ceremony January 9th, 2023

US Army Corps of Engineers ®
Jacksonville District

Jacksonville District Website

Monthly Project Delivery Team (PDT) Meetings

Social Media

https://www.instagram.com/citystaug/
https://www.facebook.com/citystaug
https://twitter.com/citystaug

https://www.citystaug.com/1046/Back-Bay-Feasibility-Study-with-the-Army

CLOSING REMARKS/QUESTIONS

- Sponsor Remarks
- Federal Agency Questions/Comments
- State Agency Questions/Comments
- Local Agency Questions/Comments
- Public Comments