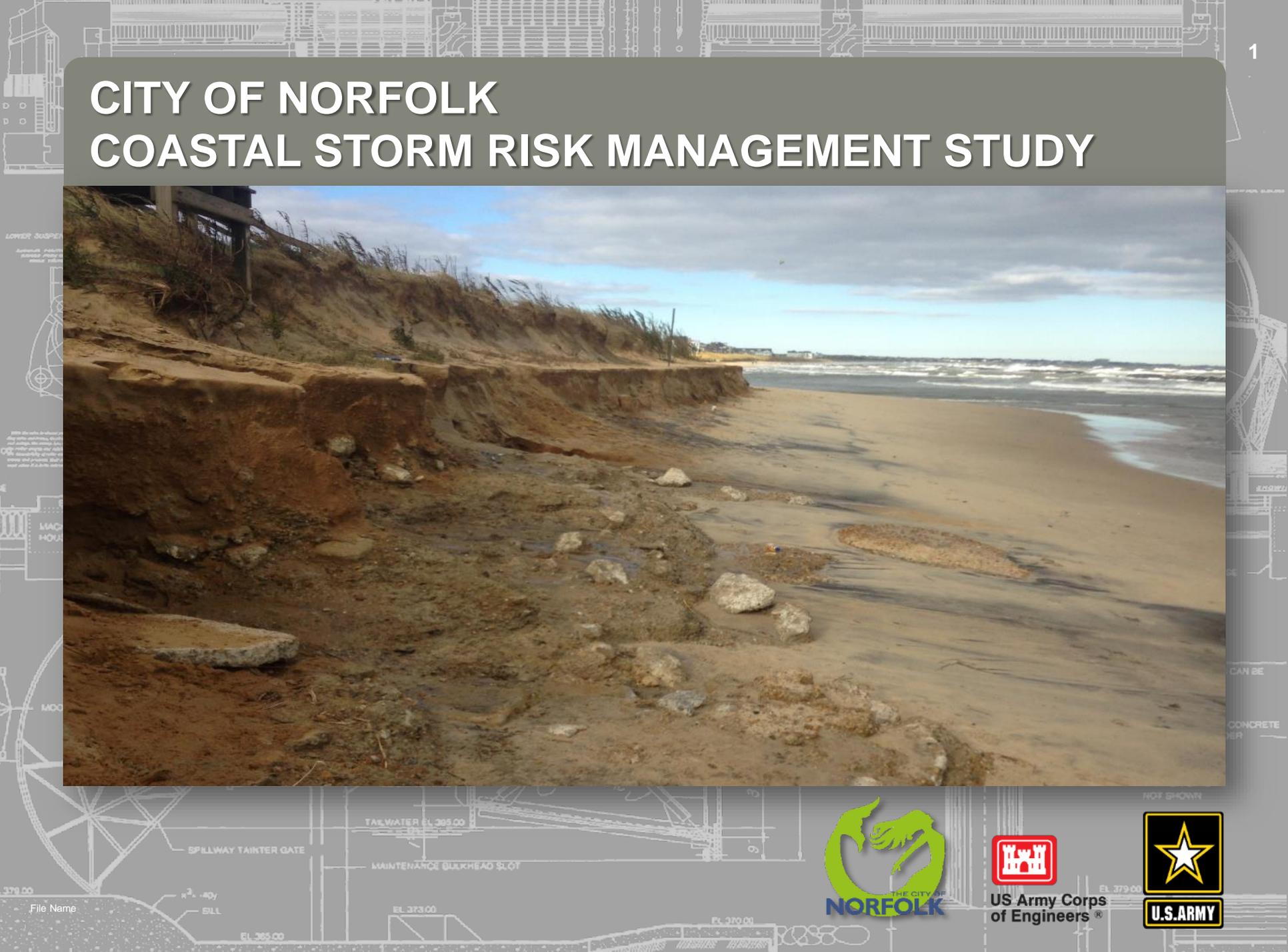


# CITY OF NORFOLK COASTAL STORM RISK MANAGEMENT STUDY



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# PURPOSE



To inform the City Council of the current status of the Norfolk Coastal Storm Risk Management study in preparation for the public meeting scheduled for 8 June at the Lambert's Point Community Center.



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# NORFOLK COASTAL STORM RISK MANAGEMENT (CSRMR) STUDY

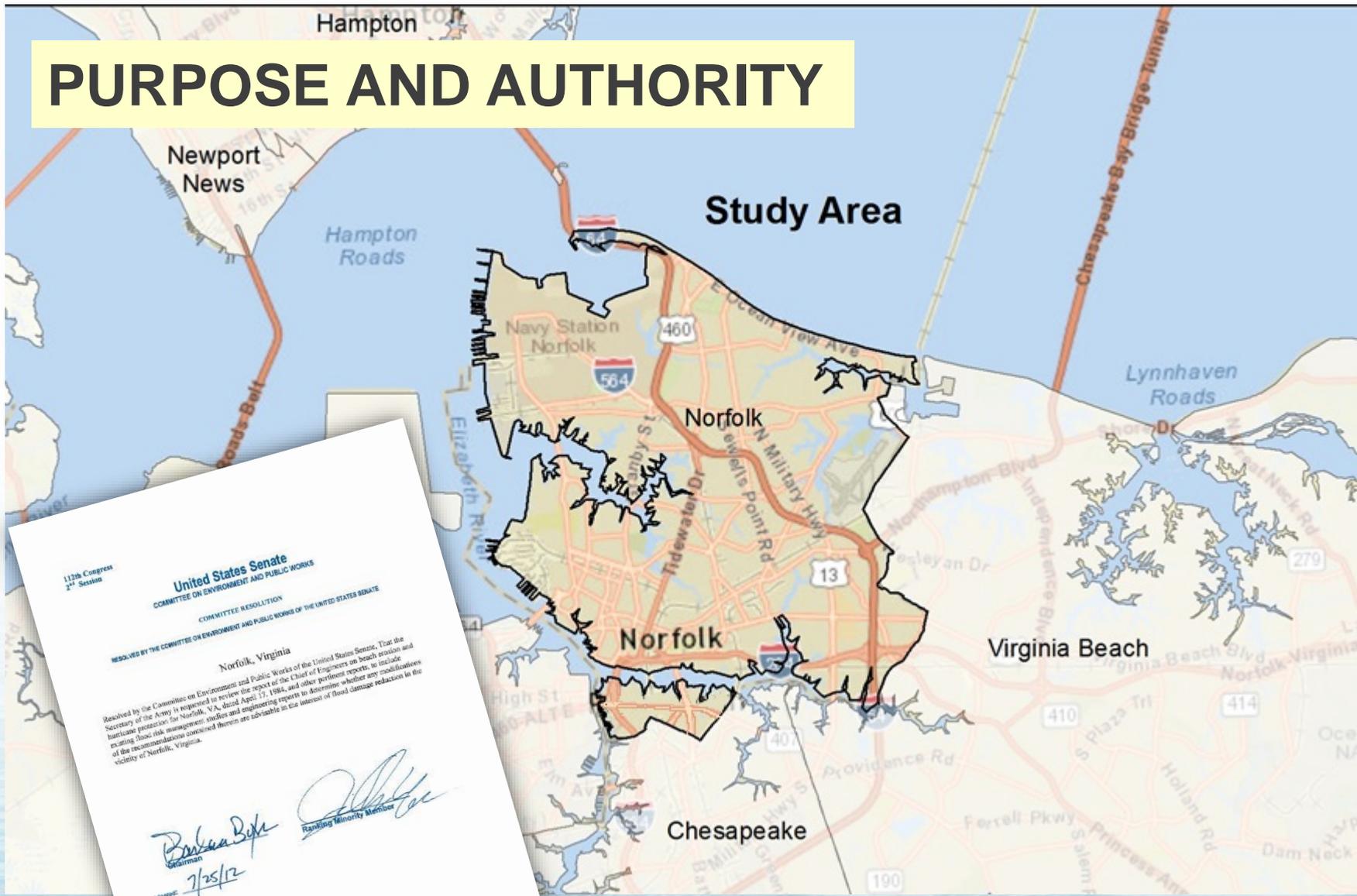
- Partnership between City of Norfolk and USACE
- Study currently scoped at 3 years and \$3 Million
- Stakeholders on team: US Navy, US Coast Guard
- Goal: Congressional Authorization of a project as well as eventual appropriations for project construction (65% Federal, 35% Nonfederal)
- DRAFT measures will continue to be refined and adjusted
- There is not yet a recommended plan
- Environmental Impact Statement will be prepared with US Navy and US EPA as Cooperating Agencies



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# PURPOSE AND AUTHORITY



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# STUDY OVERVIEW

Norfolk has been identified as one of nine areas of high risk by the North Atlantic Coast Comprehensive Study (NACCS)

50 year period of analysis

Sea level rise and land subsidence are considered

Benefit cost ratio is used for plan selection

Benefits are based on damages prevented (generally structural damages)

Costs will include construction, mitigation, operation & maintenance, and real estate



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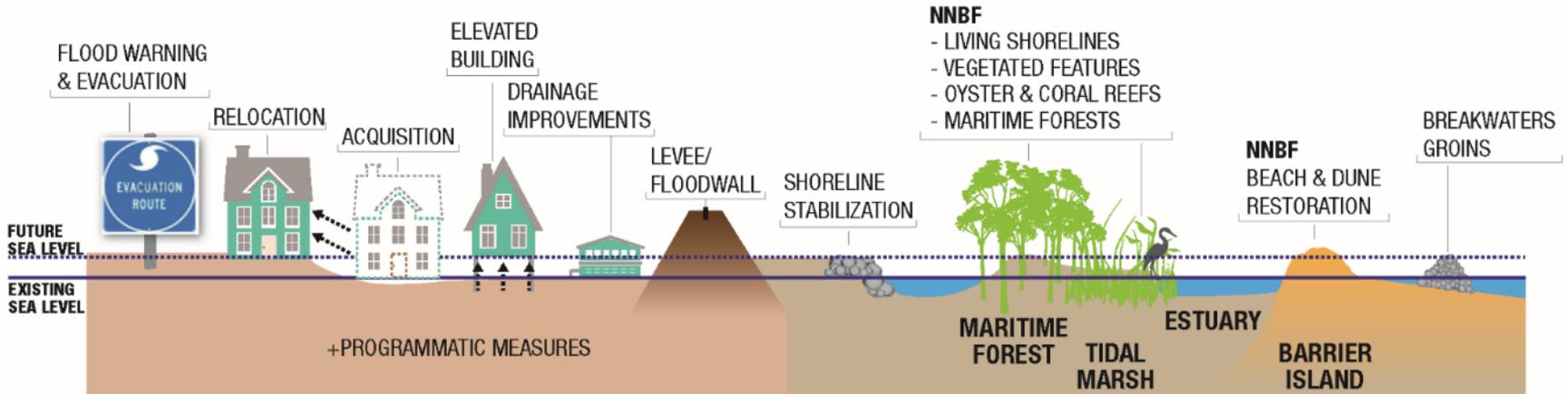


# SMART Feasibility Study Process: City of Norfolk CSRM Study

Up to 36 Months



# PLAN FORMULATION: MANAGEMENT MEASURES



## NONSTRUCTURAL MEASURES CONSIDERED:

- Enhanced Flood Warning, Preparedness, and Evacuation Planning
- Acquisition and Relocation
- Elevation
- Building Retrofit/Floodproofing
- Land Use Management and Floodplain Regulation
- Flood Insurance

## STRUCTURAL MEASURES CONSIDERED:

- Floodwalls and Levees
- Deployable Floodwalls
- Shoreline Stabilization
- Storm Surge Barriers
- Beach Restoration
- Groins
- Breakwaters



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# POTENTIAL STRUCTURAL MEASURES



Storm Surge Barrier New Orleans

Floodwall, Norfolk



Levee, Scottsville, VA



# POTENTIAL STRUCTURAL MEASURES



\*Measures under consideration. Subject to public feedback.

# POTENTIAL NONSTRUCTURAL MEASURES



Elevation



Nonresidential Floodproofing



Building Acquisition / Open Space



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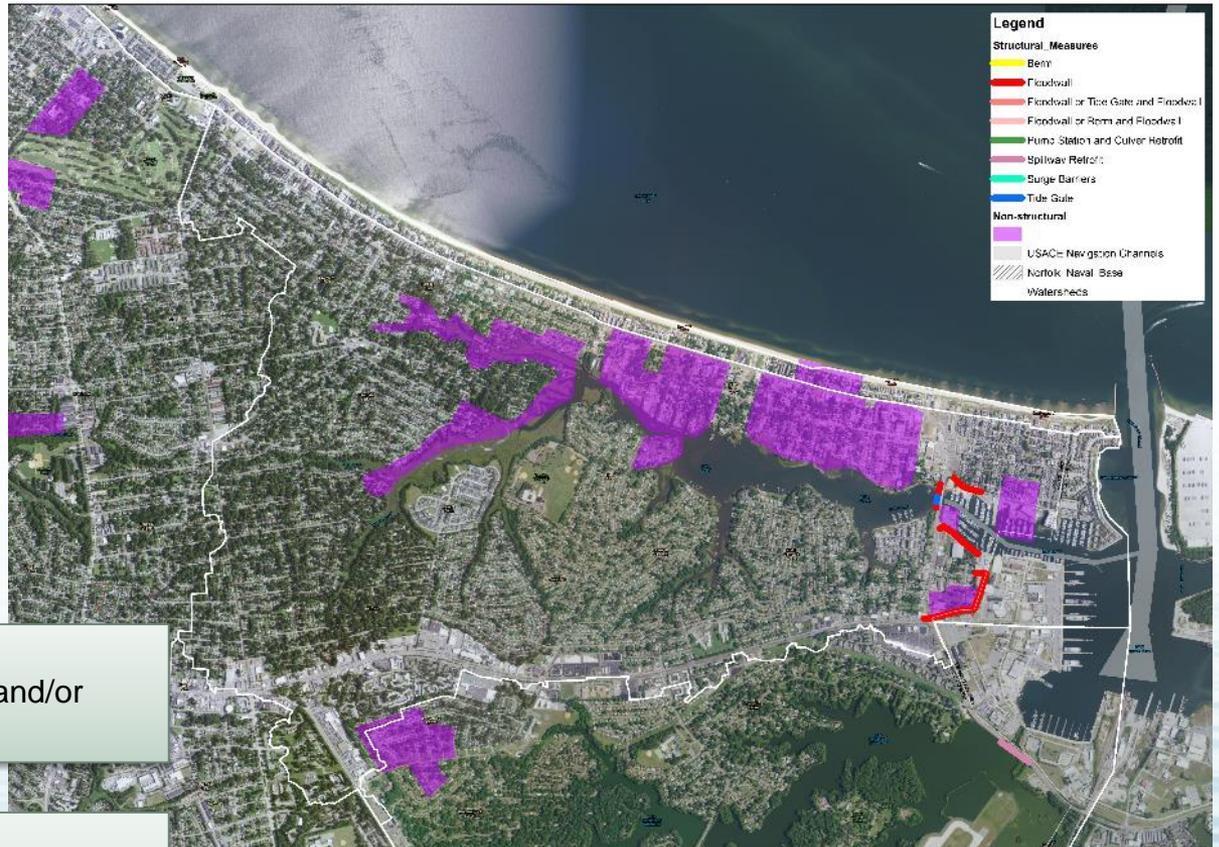
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# POTENTIAL NONSTRUCTURAL MEASURES



**\*Measures under consideration. Subject to public feedback.**

# PRETTY LAKE



## NONSTRUCTURAL

- Real estate raising, acquisition, and/or relocation

## STRUCTURAL

- Storm surge barrier with miter gates at the Shore Drive bridge at Pretty Lake
- A pump station may be required in order to evacuate interior drainage
- The measure includes north and south flanking floodwalls that will tie into high ground

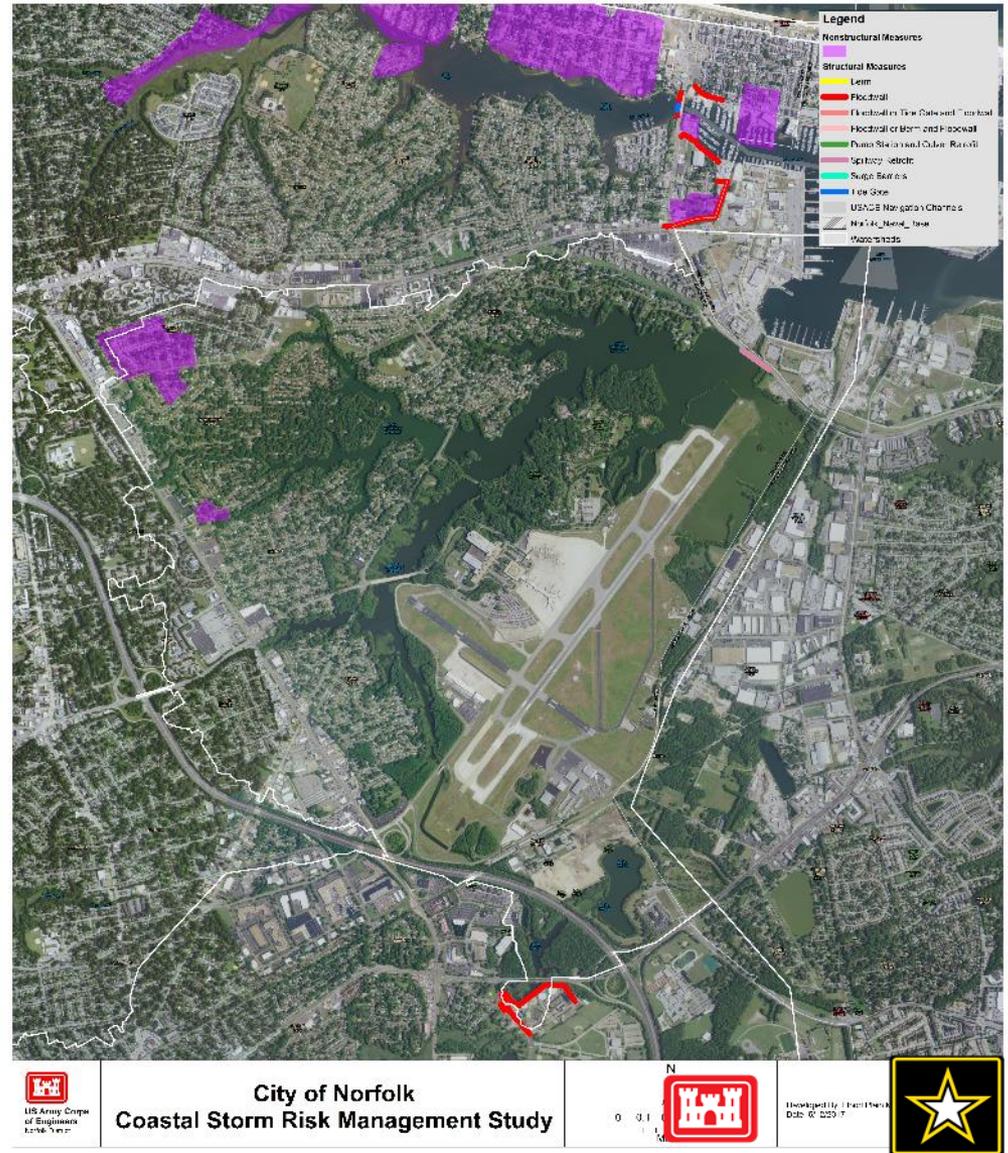
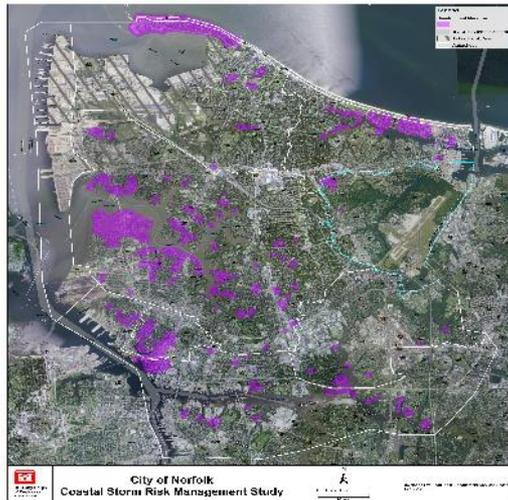


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**\*Measures under consideration. Subject to public feedback.**

# LAKE WHITEHURST



## NONSTRUCTURAL

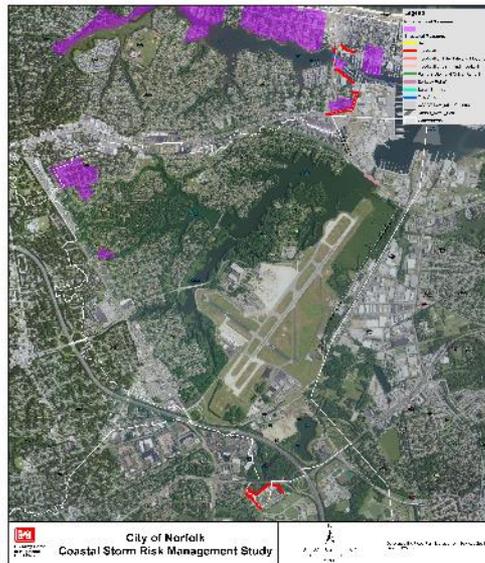
- Real estate raising, acquisition, and/or relocation

## STRUCTURAL

- Raise reservoir spillway and dam to prevent salt water intrusion into the lake
- Pump station may be required to prevent induced flooding caused by a higher spillway

\*Measures under consideration. Subject to public feedback.

# MOORES BRIDGES WATER TREATMENT PLANT



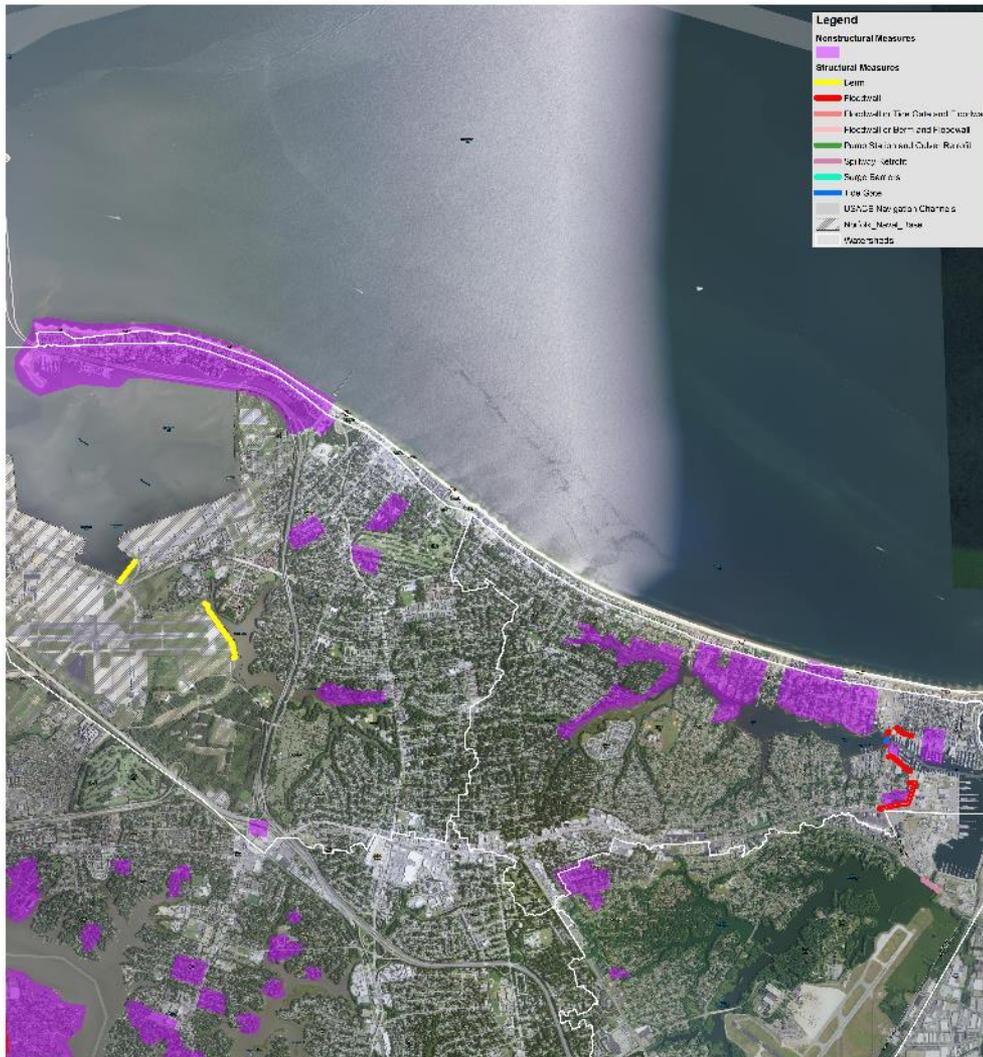
## NONSTRUCTURAL

- Measure designed to protect the Bridges Water Treatment Plant
- Protection would include a floodwall adjacent to the plant tying into high ground

\*Measures under consideration. Subject to public feedback.



# OCEAN VIEW AND WILLOUGHBY BEACH DUNES



## NONSTRUCTURAL

- Real estate raising, acquisition, and/or relocation

## STRUCTURAL

- Beach dune construction from the Little Creek inlet to the western end of Willoughby Spit



City of Norfolk  
Coastal Storm Risk Management Study



Developed by: East Coast Management Services Group  
Date: 01/2017

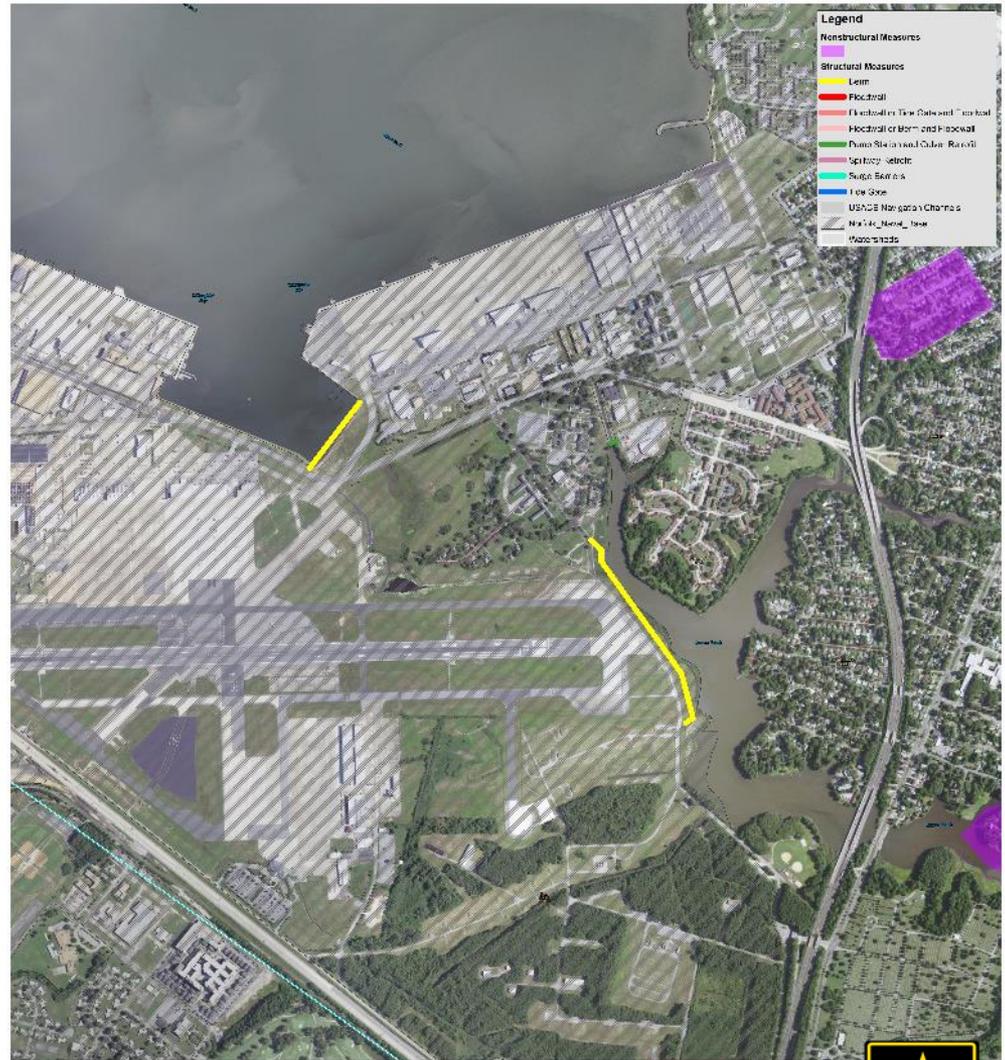


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**\*Measures under consideration. Subject to public feedback.**

# MASON CREEK



## NONSTRUCTURAL

- The measure includes real estate raising, acquisition, and relocation

## STRUCTURAL

- Pump station to evacuate interior drainage in the Mason Creek watershed that will be backed up from the closing of the NAS tide gate
- A berm or floodwall would also be required to prevent floodwaters from passing over NAS and into Mason Creek



City of Norfolk  
Coastal Storm Risk Management Study



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Prepared by: [unreadable]  
Date: 6/2017



\*Measures under consideration. Subject to public feedback.

# LAFAYETTE RIVER STORM SURGE BARRIER (1 OF 3)

## NONSTRUCTURAL

- The measure includes real estate raising, acquisition, and relocation

## STRUCTURAL

- Three storm surge barrier alignment options are proposed for the Lafayette River.
- The storm surge barriers would include miter gates for typical ebb and flow and a sector gate for navigation along the federal navigation channel
- **Outermost Barrier** would connect Norfolk International Terminal (NIT) with Lambert's Point
- **Middle Barrier** would connect NIT with the Larchmont neighborhood and a floodwall would extend down the Larchmont coast to Lambert's Point
- **Innermost Barrier** would be located along Hampton Boulevard and the Hampton Boulevard bridge

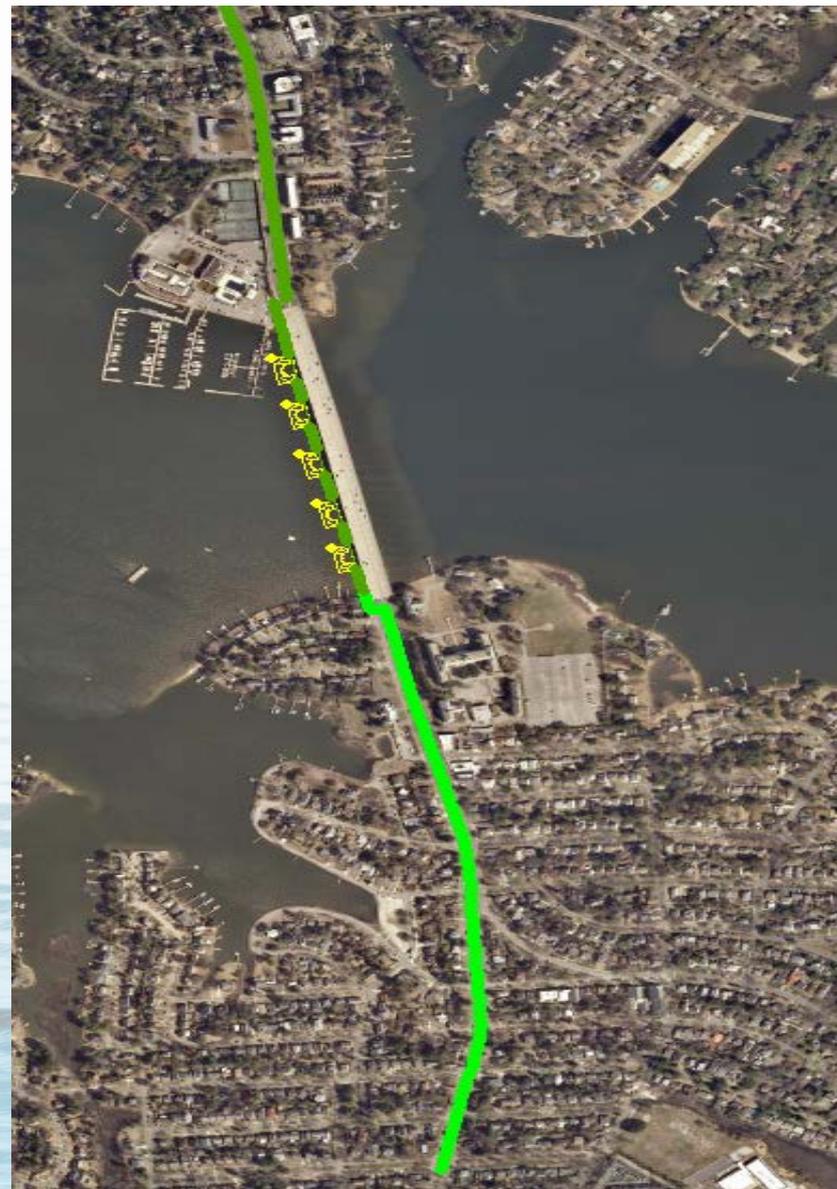


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# LAFAYETTE RIVER STORM SURGE BARRIER (3 OF 3)



**\*Measures under consideration. Subject to public feedback.**

# THE HAGUE (1 OF 2)

## NONSTRUCTURAL

- Relocation, acquisition, and real estate elevation
- Storm water storage improvement and wetlands at Stockley Gardens to mitigate against interior flooding associated with rising coastal tailwater

## STRUCTURAL

- Two options under consideration:
  - **Storm surge barrier** at the Brambleton Road crossing with the Hague with gates
  - This measure plans for floodwalls to protect the Sentara hospital complex.
  - **Permanent floodwall** would separate the Hague from the Elizabeth River.
- Both options include pump station to evacuate interior drainage and floodwalls to protect from flanking storm surge and tie into existing floodwall.

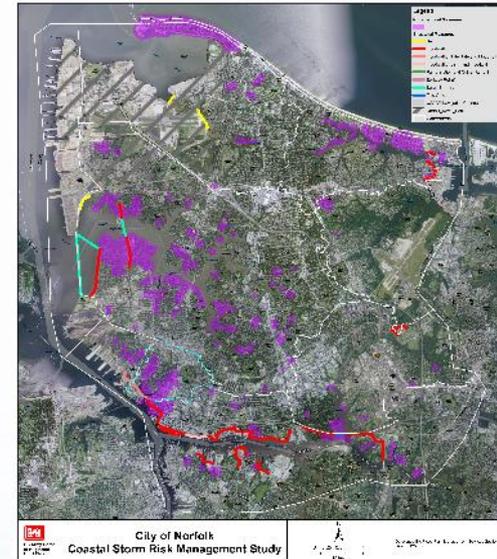
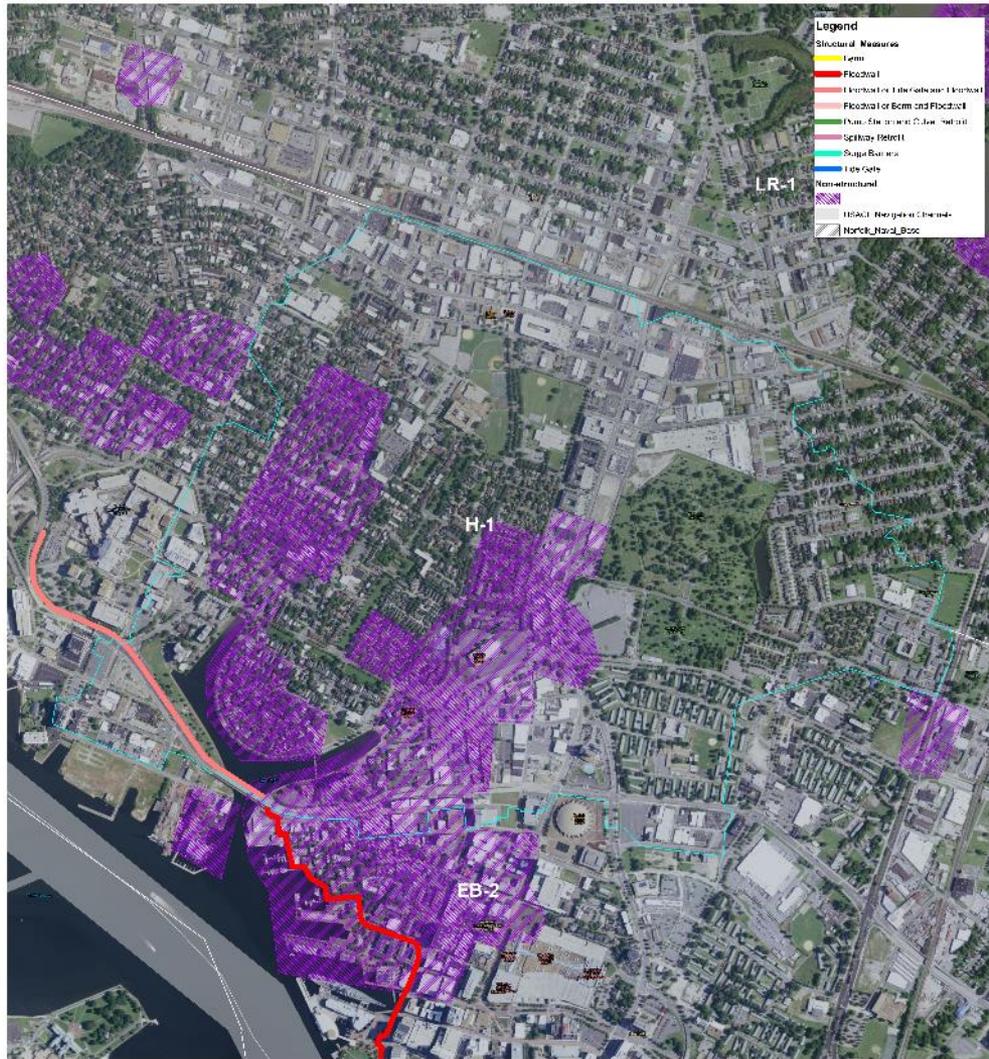


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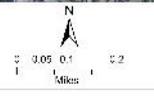


\*Measures under consideration. Subject to public feedback.

# THE HAGUE (2 OF 2)




**City of Norfolk Coastal Storm Risk Management Study**


 0 0.05 0.1 0.2 Miles

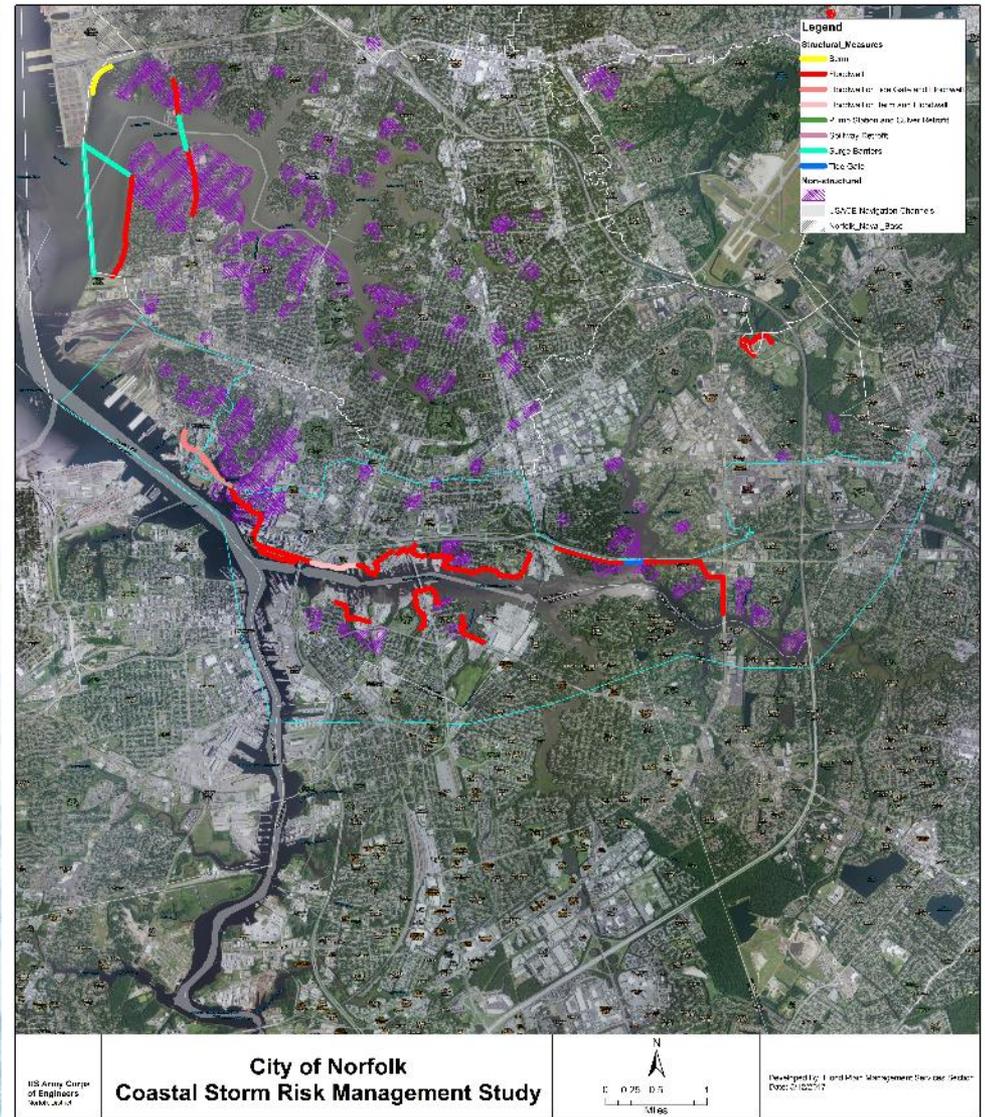
Developed by: 1. Earth Storm Management Services Limited  
 Date: 01/2017


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**\*Measures under consideration. Subject to public feedback.**

# DOWNTOWN AND CHESTERFIELD HEIGHTS (1 OF 2)



## NONSTRUCTURAL

- Real estate raising, acquisition, and relocation. The measure also includes interior improvements to help with stormwater flooding.

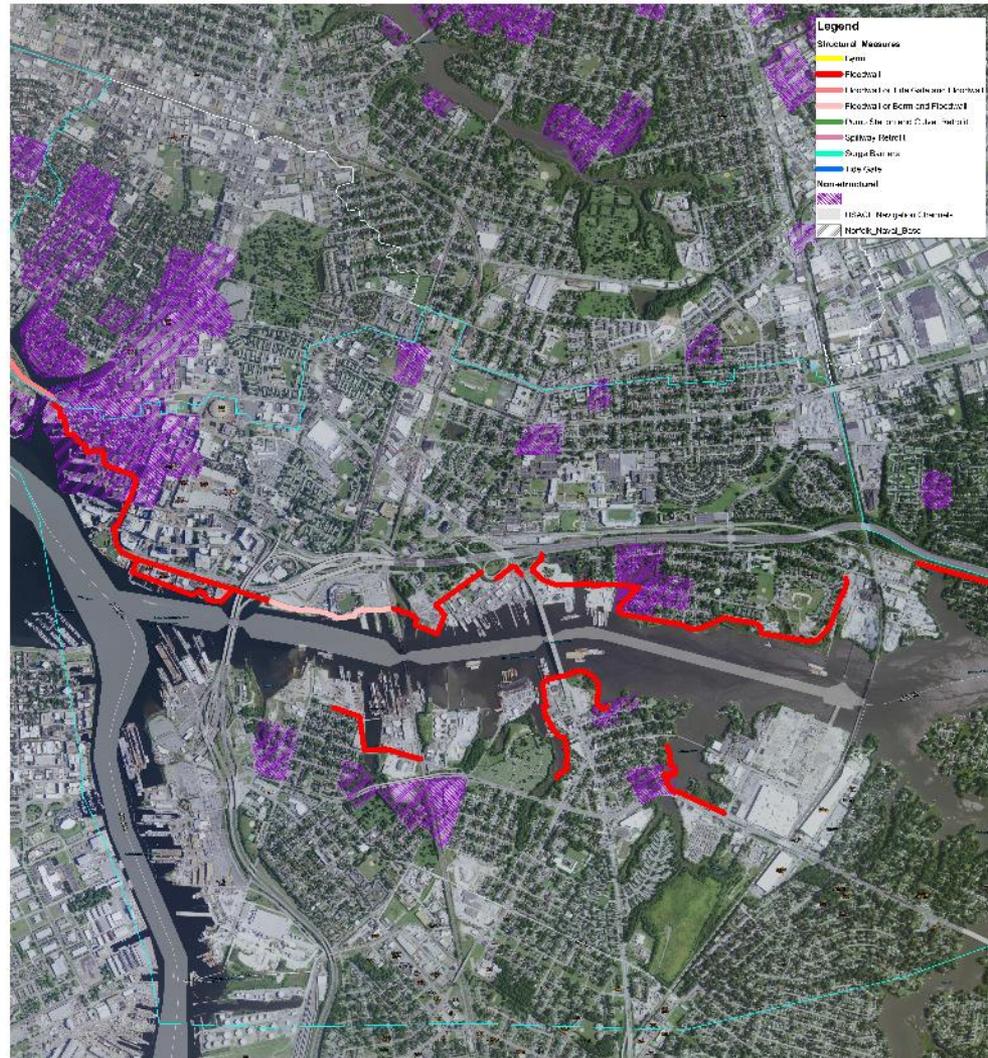
## STRUCTURAL

- Raise the existing downtown floodwall and add a new floodwall and berm system through Harbor Park and terminating just east of Grandy Village
- Pump stations may be required to evacuate interior drainage.

\*Measures under consideration. Subject to public feedback.



# DOWNTOWN AND CHESTERFIELD HEIGHTS (2 OF 2)



US Army Corps  
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June 2023

City of Norfolk  
Coastal Storm Risk Management Study



Developed by: Urban Planning Services Group  
Date: 06/2023



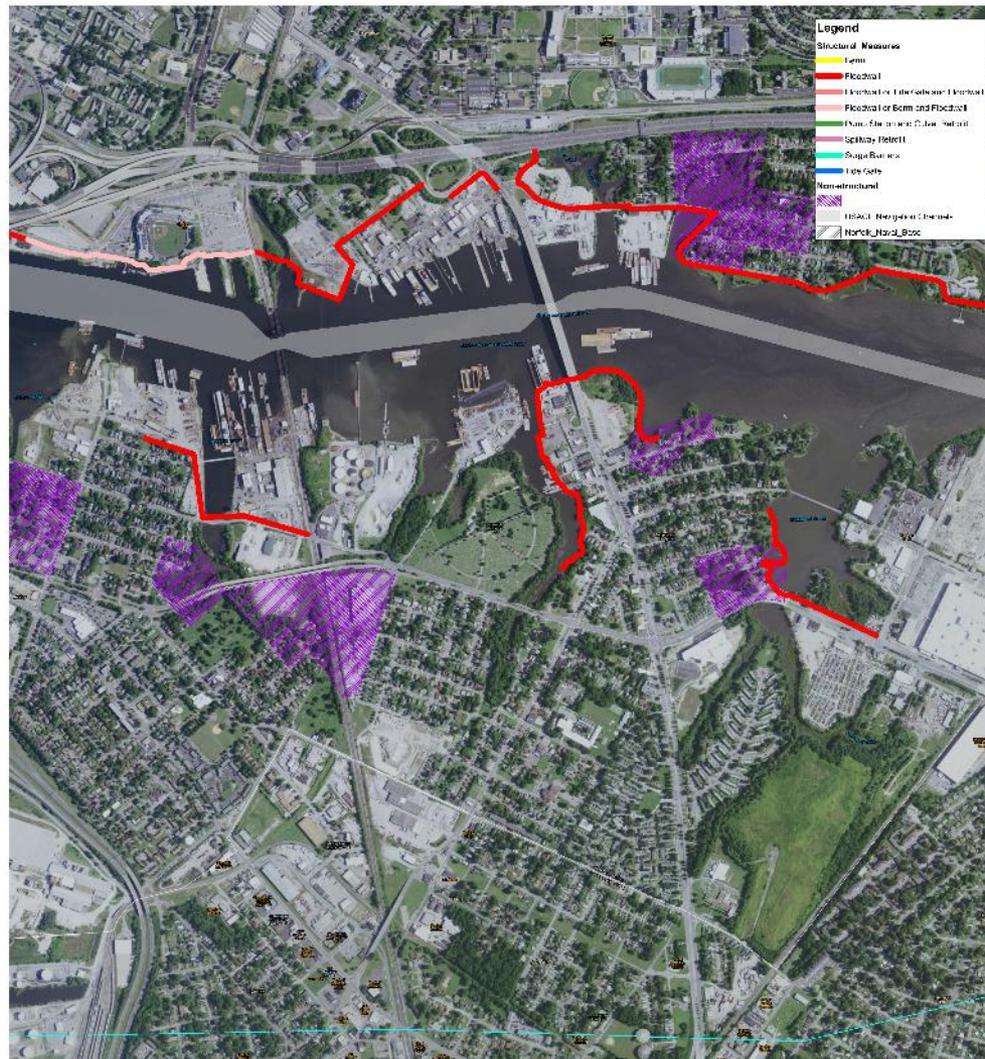
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**\*Measures under consideration. Subject to public feedback.**



# CAMPOSTELLA/BERKLEY (2 OF 2)

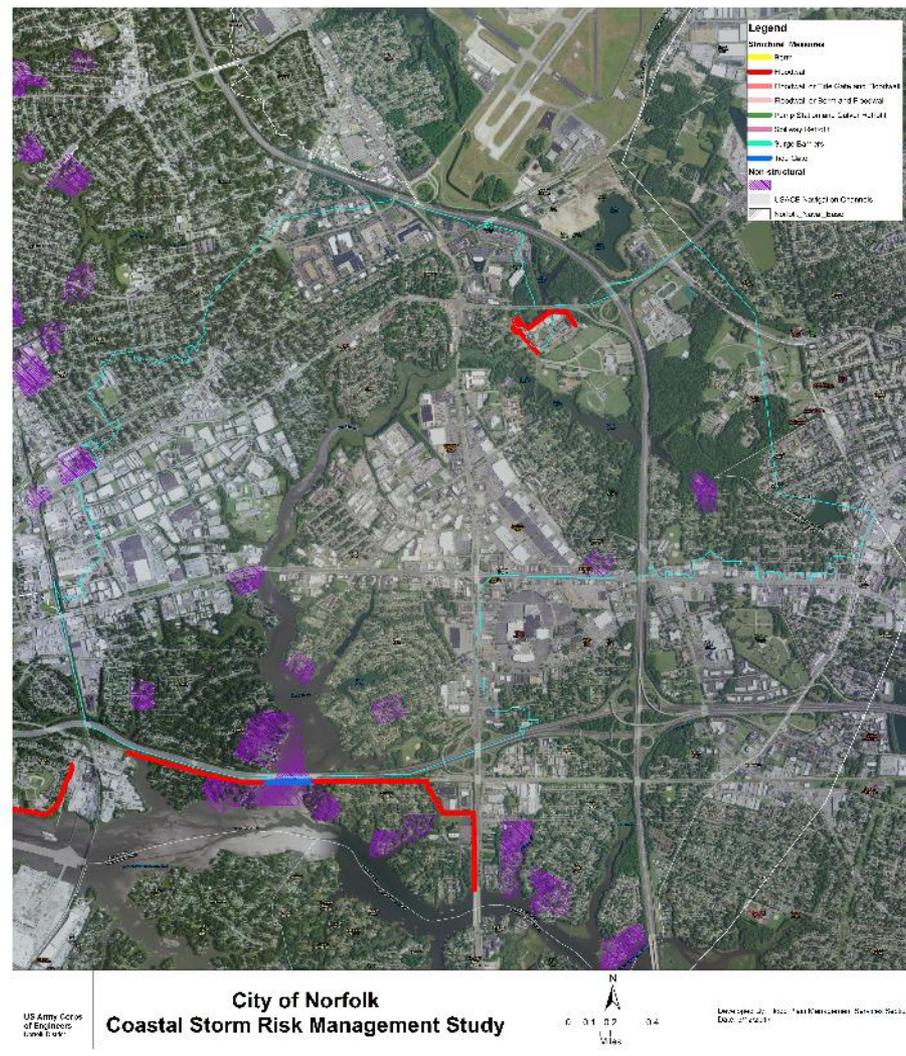


<p>US Army Corps of Engineers 10/16/17</p>	<p><b>City of Norfolk</b> <b>Coastal Storm Risk Management Study</b></p>	<p>N 0 0.05 0.1 0.2 Miles</p>	<p>Developed by: East River Management Services Group Date: 02/2017</p>
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**\*Measures under consideration. Subject to public feedback.**

# BROAD CREEK (1 OF 2)



## NONSTRUCTURAL

- Relocation, acquisition, and real estate elevation

## STRUCTURAL

- Storm surge barrier across Broad Creek at Hwy 264
- The surge barrier will include a system of six gates to allow typical ebb and flow
- Floodwall along the toe of Hwy 264 is proposed to the east and west of Broad Creek
- Pump station will be needed for interior drainage from the Broad Creek basin.

**\*Measures under consideration. Subject to public feedback.**



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# BROAD CREEK (2 OF 2)



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**\*Measures under consideration. Subject to public feedback.**

# MAJOR MILESTONE SCHEDULE

Task	Baseline
Feasibility Cost Sharing Agreement Signed	12 February 2016
Tentatively Selected Plan Milestone	03 August 2017
Release of Draft Integrated Report	03 October 2017
Agency Decision Milestone	06 March 2018
Civil Works Review Board	18 October 2018
Chief's Report	31 January 2019



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Credit: WAVY/Jane Alvarez-Wertz, October 2015



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