



**VIRGINIA DEPARTMENT OF CONSERVATION  
AND RECREATION:  
2021 VIRGINIA COMMUNITY FLOOD PREPARDNESS  
FUND GRANT**

**Application**

Office of Resilience  
City of Norfolk  
501 Boush Street  
Norfolk, VA 23510



**VIRGINIA DEPARTMENT OF CONSERVATION  
AND RECREATION:  
2021 VIRGINIA COMMUNITY FLOOD PREPARDNESS  
FUND GRANT**

**Application**

United States Army Corps of Engineers (USACE) Coastal Storm Management Study  
Coastal Analysis



## Contents

- Application (Appendix A)
- Scoring (Appendix C)
- Scope of Work Narrative
- Budget Narrative
  - Attachments
- Required Attachments (Appendix D)



## Appendix A: Application Form for Grant Requests for All Categories

*Virginia Department of Conservation and Recreation  
Virginia Community Flood Preparedness Fund Grant Program*

**Name of Local Government:** City of Norfolk

**Category of Grant Being Applied for:** Study

**NFIP/DCR Community Identification Number (CID):** 510104

**Name of Authorized Official:** Dr. Larry H. Filer II DocuSigned by:

**Signature of Authorized Official:** \_\_\_\_\_

9/1/2021 | 7:25 AM PDT

C45AA22E7D6047B...

**Mailing Address:** 810 Union St, Suite 1101

**City:** Norfolk    **State:** VA    **Zip:** 23510

**Telephone Number:** [REDACTED]

**Email Address:** [REDACTED]

**Contact Person (If different from authorized official):** Kyle Spencer, Deputy Resilience Officer

**Mailing Address:** 501 Boush Street

**City:** Norfolk    **State:** VA    **Zip:** 23510

**Telephone Number:** [REDACTED]

Cell Phone Number:

**Email Address:** [REDACTED]

**Is the proposal in this application intended to benefit a low-income geographic area as defined in the Part 1 Definitions?** Yes X No \_\_\_\_\_

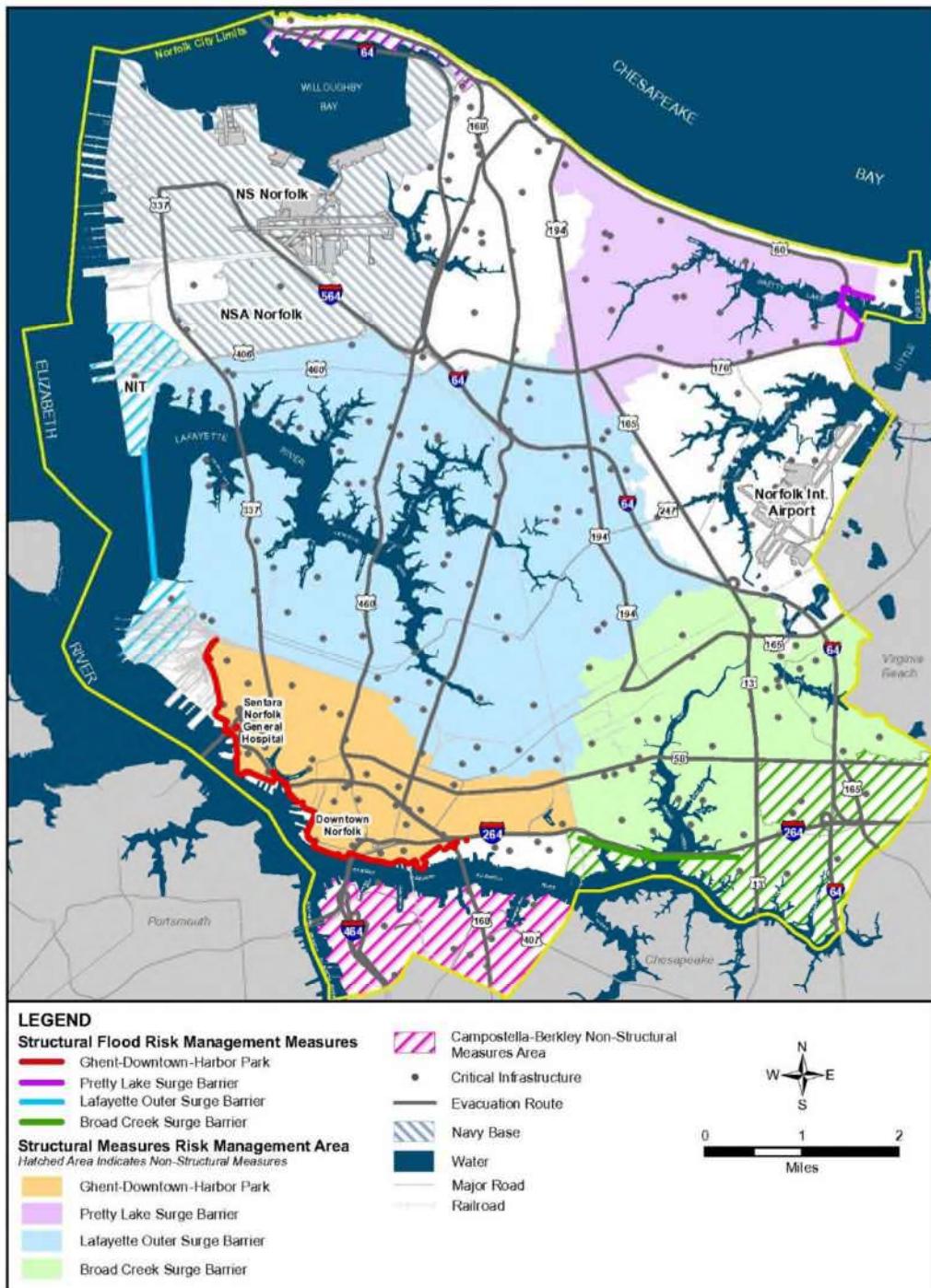


### **Study Grants (Check All that Apply)**

- Studies to aid in updating floodplain ordinances to maintain compliance with the NFIP or to incorporate higher standards that may reduce the risk of flood damage. This must include establishing processes for implementing the ordinance, including but not limited to, permitting, record retention, violations, and variances. This may include revising a floodplain ordinance when the community is getting new Flood Insurance Rate Maps (FIRMs), updating a floodplain ordinance to include floodplain setbacks or freeboard, or correcting issues identified in a Corrective Action Plan.
- Revising other land use ordinances to incorporate flood protection and mitigation goals, standards and practices.
- Conducting hydrologic and hydraulic studies of floodplains. Applicants who create new maps must apply for a Letter of Map Revision or a Physical Map Revision through the Federal Emergency Management Agency (FEMA). For example, a local government might conduct a hydrologic and hydraulic study for an area that had not been studied because the watershed is less than one square mile. Modeling the floodplain in an area that has numerous letters of map change that suggest the current map might not be fully accurate or doing a detailed flood study for an A Zone is another example.
- Studies and Data Collection of Statewide and Regional Significance.
- Revisions to existing resilience plans and modifications to existing comprehensive and hazard.
- Other relevant flood prevention and protection project or study.

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**Location of Project (Include Maps):** Various locations surrounding Norfolk (see map below):



**NFIP Community Identification Number (CID#):** 510104



**Is Project Located in an NFIP Participating Community?**  Yes  No

**Is Project Located in a Special Flood Hazard Area?**  Yes  No

**Flood Zone(s) (If Applicable):** VE, AE, Shaded X (500 year), X (low to moderate)

**Flood Insurance Rate Map Number(s) (If Applicable):** 5101040006H, 5101040007H, 5101040004H, 5101040008H, 5101040009H, 51010400028H, 51010400029H, 51010400011H, 51010400012H, 51010400016H, 51010400014H, 51010400017H, 51010400036H, 51010400037H, 51010400041H, 51010400038H, 51010400039H, 51010400043H, 51010400018H, 51010400019H, 51010400052H, 51010400056H, 51010400057H, 51010400076H, 51010400077H, 51010400081H, 51010400058H, 51010400059H, 51010400078H, 51010400079H, 51010400083H

**Total Cost of Project:** \$1,000,000

**Total Amount Requested:** \$900,000



## Appendix C: Scoring Criteria for Studies

*Virginia Department of Conservation and Recreation  
Virginia Community Flood Preparedness Fund Grant Program*

Applicant Name:		City of Norfolk	
Eligibility Information			
Criterion	Description		Check One
1. Is the applicant a local government (including counties, cities, towns, municipal corporations, authorities, districts, commissions, or political subdivisions created by the General Assembly or pursuant to the Constitution or laws of the Commonwealth, or any combination of these)?			
Yes	Eligible for consideration	<input checked="" type="checkbox"/>	
No	Not eligible for consideration		
2. Does the local government have an approved resilience plan and has provided a copy or link to the plan with this application?			
Yes	Eligible for consideration under all categories	<input checked="" type="checkbox"/>	
No	Eligible for consideration for studies, capacity building, and planning only		
3. If the applicant is <u>not</u> a town, city, or county, are letters of support from all affected local governments included in this application?			
Yes	Eligible for consideration	<input checked="" type="checkbox"/>	
No	Not eligible for consideration		
4. Has this or any portion of this project been included in any application or program previously funded by the Department?			
Yes	Not eligible for consideration		
No	Eligible for consideration	<input checked="" type="checkbox"/>	
5. Has the applicant provided evidence of an ability to provide the required matching funds?			
Yes	Eligible for consideration	<input checked="" type="checkbox"/>	
No	Not eligible for consideration		
N/A	Match not required		



Studies Eligible for Consideration		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Applicant Name:	City of Norfolk		
Scoring Information			
Criterion	Point Value	Points Awarded	
<b>6. Eligible Studies (Select all that apply)</b>			
<b>Revising floodplain ordinances to maintain compliance with the NFIP or to incorporate higher standards that may reduce the risk of flood damage. This must include establishing processes for implementing the ordinance, including but not limited to, permitting, record retention, violations, and variances. This may include revising a floodplain ordinance when the community is getting new Flood Insurance Rate Maps (FIRMs), updating a floodplain ordinance to include floodplain setbacks or freeboard, or correcting issues identified in a Corrective Action Plan.</b>	30	N/A	
<b>Creating tools or applications to identify, aggregate, or display information on flood risk or creating a crowd-sourced mapping platform that gathers data points about real-time flooding. This could include a locally or regionally based web-based mapping product that allows local residents to better understand their flood risk.</b>	15	N/A	
<b>Conducting hydrologic and hydraulic studies of floodplains. Applicants who create new maps must apply for a Letter of Map Revision or a Physical Map Revision through the Federal Emergency Management Agency (FEMA).</b>	35	35	
<b>Studies and Data Collection of Statewide and Regional Significance. Funding of studies of statewide and regional significance and proposals will be considered for the following types of studies:</b>			
<ul style="list-style-type: none"> <li>◦ <b>Updating precipitation data and IDF information (rain intensity, duration, frequency estimates) including such data at a sub-state or regional scale on a periodic basis.</b></li> </ul>	45	N/A	
<ul style="list-style-type: none"> <li>◦ <b>Regional relative sea level rise projections for use in determining future impacts.</b></li> </ul>	45	N/A	



◦ Vulnerability analysis either statewide or regionally to state transportation, water supply, water treatment, impounding structures, or other significant and vital infrastructure from flooding.	45	N/A
◦ Flash flood studies and modeling in riverine regions of the state.	45	N/A
◦ Statewide or regional stream gauge monitoring to include expansion of existing gauge networks.	45	N/A
◦ New or updated delineations of areas of recurrent flooding, stormwater flooding, and storm surge vulnerability in coastal areas that include projections for future conditions based on sea level rise, more intense rainfall events, or other relevant flood risk factors.	45	N/A
◦ Regional flood studies in riverine communities that may include watershed-scale evaluation, updated estimates of rainfall intensity, or other information.	50	N/A
◦ Regional hydrologic and hydraulic studies of floodplains.	45	45
◦ Studies of potential land use strategies that could be implemented by a local government to reduce or mitigate damage from coastal or riverine flooding.	40	40
◦ Other proposals that will significantly improve protection from flooding on a statewide or regional basis	35	N/A
<b>7. Is the study area socially vulnerable? (Based on ADAPT VA's Social Vulnerability Index Score.)</b>		
Very High Social Vulnerability (More than 1.5)	15	
High Social Vulnerability (1.0 to 1.5)	12	
Moderate Social Vulnerability (0.0 to 1.0)	8	8
Low Social Vulnerability (-1.0 to 0.0)	0	
Very Low Social Vulnerability (Less than -1.0)	0	
<b>1. Is the proposed study part of an effort to join or remedy the community's probation or suspension from the NFIP?</b>		
Yes	10	
No	0	0
<b>2. Is the proposed study in a low-income geographic area as defined in this manual?</b>		
Yes	10	10
No	0	



3. Projects eligible for funding may also reduce nutrient and sediment pollution to local waters and the Chesapeake Bay and assist the Commonwealth in achieving local and/or Chesapeake Bay TMDLs. Does the proposed project include implementation of one or more best management practices with a nitrogen, phosphorus, or sediment reduction efficiency established by the Virginia Department of Environmental Quality or the Chesapeake Bay Program Partnership in support of the Chesapeake Bay TMDL Phase III Watershed Implementation Plan?

Yes	5	
No	0	0
Total Points		128



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United States Army Corps of Engineers (USACE)  
Coastal Storm Management Study  
Coastal Analysis

Office of Resilience  
501 Boush Street  
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**United States Army Corps of Engineers (USACE)**  
**Coastal Storm Management Study**  
**Coastal Analysis**  
***Scope of Work and Budget Narratives***

## **1. Study Area and Background**

The City of Norfolk is increasingly at risk from flooding and damage from coastal storms. Located in Southeastern Virginia, the city is a highly urbanized, relatively flat, community with nearly all areas below elevation 15 feet (North American Vertical Datum of 1988). Established in 1682, Norfolk has a long and proud history as a national maritime trading, shipbuilding and military center. Today, a city of approximately 247,421, Norfolk is the commercial center of Hampton Roads which is a region of 1.7 million residents. With a median household income of \$53,253, Norfolk is defined as a low-income community compared to the rest of Virginia, which has a median household income of \$76,448. Within the City's population 13% of the population have a household income of less than \$15,000. 8.9% of the City's population has a household income of between \$15,000 - \$24,999 (Attachment A). As a result, more than 20% of the City's population is living beneath the Federal Poverty Standard of \$26,500. The City is classified as moderately socially vulnerable, with an overall score of 0.59, as identified by ADAPT VA's Social Vulnerability Index. The entire City is routinely impacted by flooding which is precipitated by various occurrences to include coastal flooding, stormwater impacts, and rainfall. With a large part of the city defined as vulnerable populations, it is paramount the City address ongoing flooding impacts.

The low elevations and tidal connections to the Elizabeth River and Chesapeake Bay place a significant percentage of the city at risk of flooding from high tides, nor'easters, hurricanes and other storms. Exacerbating the flooding is the phenomenon of relative sea level rise (RSLR), which is the combination of water level rise and land subsidence. Norfolk is documented as having one of the highest rates of RSLR among Atlantic coastal communities.

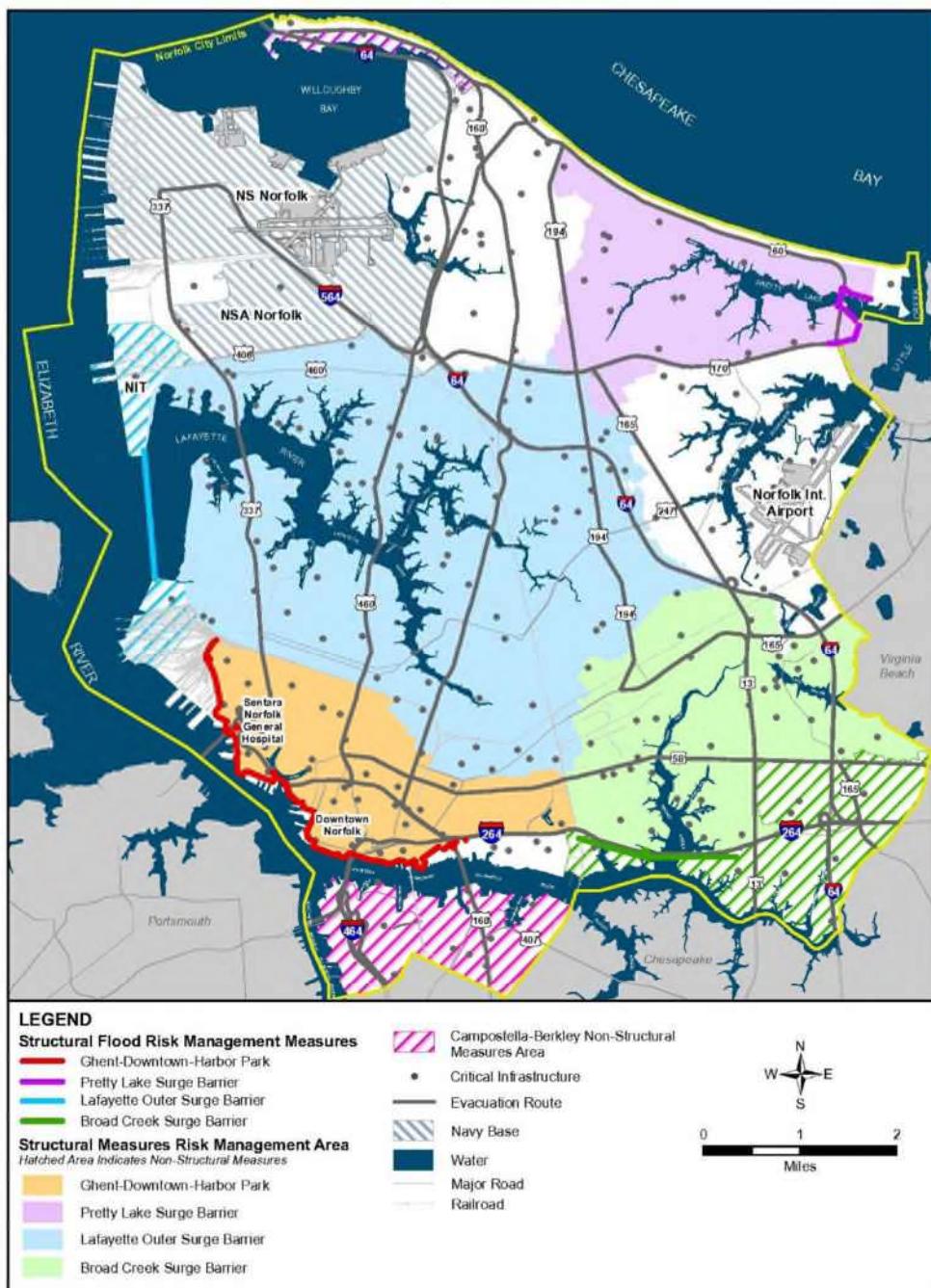
The U.S. Army Corps of Engineers' (USACE) *North Atlantic Comprehensive Coastal Study* (NACCS), as well as studies by others, have given a clearer picture as to the frequency of intense coastal storms and their associated water surface elevations. Add to this the predicted rate of RSLR, and it is clear risks to the city are not static and will increasingly affect the city into the future. Economics are only a part of the picture. The USACE, along with the City of Norfolk, and engaged stakeholders, have also considered impacts to cultural resources, vulnerable populations, the environment, and national security, along with the more traditional economic evaluations.

The USACE Norfolk District entered into an agreement with the City of Norfolk, the non-Federal Sponsor, for a feasibility study in response to identified flood risks in 2016. The study develops and evaluates coastal storm risk management alternatives for Norfolk. These measures are formulated to reduce risk to residents, industries, businesses and infrastructures which are critical to the nation's economy. The long-term strategy for resilience in Norfolk is a layered solution that includes elements executed by the non-Federal sponsor, other Federal agencies, the Commonwealth of Virginia or one of its agencies, and/or non-governmental organizations in addition to the recommendations for implementation by the USACE study. The recommended plan in the study seeks to not only reduce coastal storm risk, but also to build on resilience by implementing strategic approaches that address identified stresses and potential shocks such as nuisance

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flooding risk, major storms, and the impact on residents and economic activity. The resulting documentation from the feasibility study is the Final Integrated City of Norfolk Coastal Storm Risk Management Feasibility Report and Environmental Impact Statement (IFR/EIS). The Recommended Plan from the IFR/EIS is the National Economic Development (NED) Plan and incorporates structural, nonstructural, and natural and nature-based features (NNBF) measures that will reduce future flood risk for the City of Norfolk. Figure 1 below shows an overview of the project alignment throughout the City.

**Figure 1**





The current CSRM considered various alternatives to flooding which include structural, non-structural coastal storm risk management measures and natural/nature-based coastal storm risk management measures. These elements will help to inform regional partners as to options they may consider exploring for flood mitigation implementation. The strategies are further defined below and will be strategically explored in depth in the proposed grant supported study.

- Structural coastal storm risk management measures are man-made, constructed measures that counteract a flood event in order to reduce the hazard or to influence the course or probability of occurrence of the event. This includes gates, levees, and flood walls that are implemented to protect people and property.
- Nonstructural coastal storm risk management measures are permanent or contingent measures applied to a structure and/or its contents that prevent or provide resistance to damage from flooding. Nonstructural measures differ from structural measures in that they focus on reducing the consequences of flooding instead of focusing on reducing the probability of flooding. Relocation, floodproofing, home elevation, and flood warning systems are examples of nonstructural measures.
- Natural or nature-based coastal storm risk management measures work with or restore natural processes with the aim of wave attenuation and storm surge reduction.

*Major features of the recommended plan include the following:*

- Four storm surge barriers
- Approximately 8 miles of floodwall
- Eleven tide / sluice gates
- Seven pump / power stations
- Over 3,000 feet of earthen levee
- Over 1,100 nonstructural measures for areas outside a structural alignment

*The Environmental Mitigation for the Recommended Plan would include the following:*

- Purchasing 1,168 large canopy trees, 2,337 small canopy trees, and 3,505 small shrub credits from the City of Norfolk Monetary Substitution Fund to mitigate the loss of vegetated and porous surface impacts in the Resource Protection Area (riparian buffer);
- Onsite compensatory wetland mitigation to include the construction, monitoring, and adaptive management of approximately 1.14 acres of estuarine intertidal emergent wetlands and 1.8 acres of estuarine intertidal scrub-shrub wetlands; and
- Onsite compensatory reef structure mitigation to include construction, monitoring, and adaptive management of approximately 5.5 acres of reef habitat.

The Chief of Engineer's Report, based on the successful IFR/EIS, was signed on 5 February 2019 by LG Todd T. Semonite allowing the project to proceed into Preconstruction Engineering and Design (PED) Phase. The PED phase activities will be completed under the authority granted in the "America's Water Infrastructure Act of 2018," Section 1203(a)(29) of the Water Resources Development Act of 2018, Public Law 115-270, which identifies the Norfolk CSRM Project for expedited transition to PED. A Design Agreement (DA) for the PED phase was executed on 28 June 2019. The PED Phase will be cost shared at 65% Federal to 35% non-Federal.



## 2. Scope of Work

The scope of work outlined below describes the additional coastal process calculations and value engineering efforts that will be useful to support the continued design of infrastructure featured identified in the Norfolk Coastal Storm Risk Mitigation (CSRM) Feasibility Study and Integrated EIS (FS/EIS).

### Coastal Engineering Calculations:

Coastal engineering calculation along Feasibility Study authorized plan lines of protection is needed to support future detailed design efforts of the recommended plan. The City's USACE Coastal Storm Risk Mitigation (CSRM) Feasibility Study and Integrated EIS (FS/EIS) generally utilized available existing, published information on extreme water levels and wave conditions to support the identification, layout, and preliminary design of engineered structures to mitigate coastal flooding. The data available in the USACE's Coastal Hazards System – resulting from the North Atlantic Coast Comprehensive Study (NACCS) hydrodynamic and wave modeling – was the primary data source utilized in the CSRM FS/EIS for both extreme waves and extreme water levels. The NACCS models and resulting data sets are at relatively high spatial resolution, additional transformation of waves in the local vicinity of proposed CSRM structure may provide a more accurate set of waves for detailed design purposes. In addition, wave loads and wave runup and overtopping calculations are required for detailed design of structures.

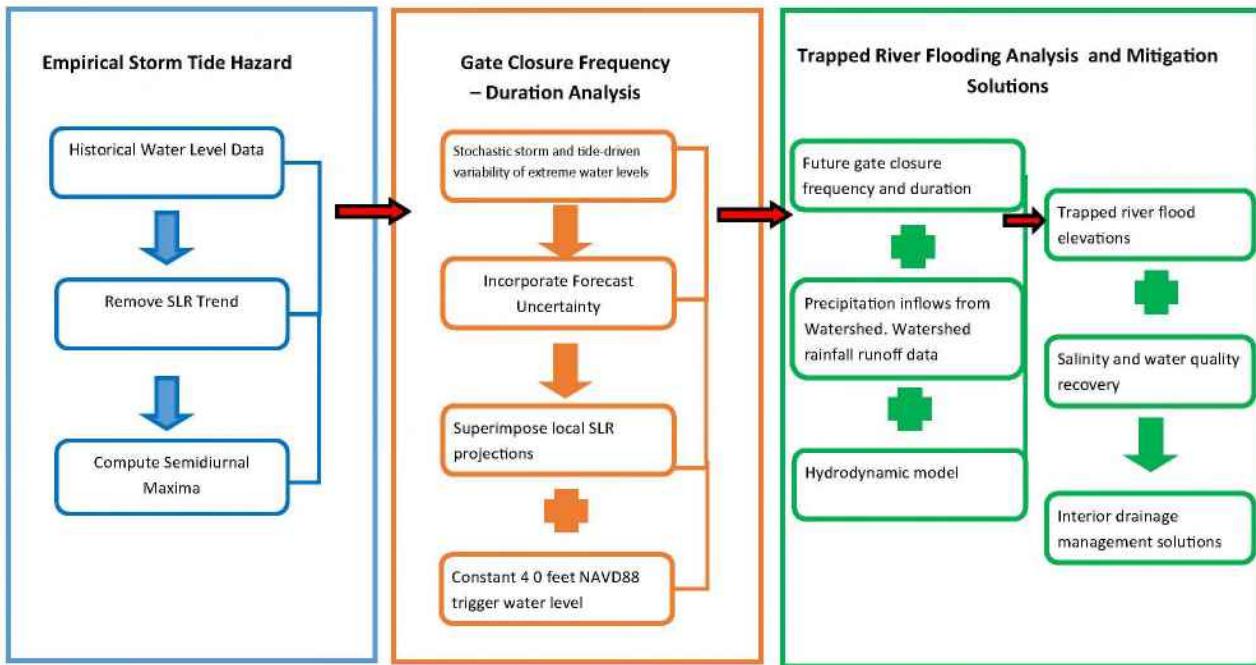
Transect-based non-linear wave transformation calculations would be performed on approximately 50 transects spaced strategically along the perimeter of the CSRM proposed lines of protection. Along the same transects, wave runup and wave overtopping calculations would be performed for structures of type and approximate dimensions as those outlined in the CSRM FS/EIS authorized plan. It is envisioned that a range of structure crest elevations would be evaluated, since wave runup and wave overtopping are dependent on crest elevations and freeboard above design storm surge elevations. The calculations would be documented in a report that City, USACE, their consultants, or others could use to advance the design of CSRM features.

It is not anticipated that the Ocean View beach shoreline would be included in these calculations. Studies have been done previously of the beach and dune geometry required to provide storm surge and wave mitigation along Ocean View. In addition, the CSRM FS/EIS authorized plan did not include additional expansion of the Ocean View beach and dune beyond the prior authorized Limited Reevaluation Report (LRR) template that USACE initially constructed in May 2017.

### Hydrodynamic Modeling (2D/3D):

Extended 2D and 3D modeling of Pretty Lake, Lafayette River, E.B. Elizabeth River and Broad Creek flood protections is needed to better understand the hydrodynamic processes impacted by the flood protection measures. The FS/EIS included 3D hydrodynamic (HD) modeling in the Lafayette River, Pretty Lake and Broad Creek. The Broad Creek model required a larger 3D model of the Elizabeth River and Eastern Branch (EB) Elizabeth River. One of the purposes of these models was to evaluate the potential behavior of the estuaries in the protected area of surge barriers with the gates constructed, for scenarios with gates in both the open and closed positions. The study included development and calibration of 3D HD models and simulation of potential changes in discharge, velocity, salinity and flushing responses in the estuaries during a storm surge event with gates closed and significant rainfall runoff (freshwater) entering the normally brackish estuaries. Sufficient modeling was completed to support the then-immediate needs of the FS/EIS period. However, it was recognized that additional modeling would be needed prior to or during detailed design phases for the various surge barrier projects. Figure 2 below shows the typical workflow of the 2D/3D modeling and analysis proposed for this project.

**Figure 2**



The 3D HD models developed for the FS/EIS would be used as a starting point for additional simulations of salinity and flushing in response to storms with surge barrier gate closures (Attachment B). In addition, 2D or 3D versions of the models would be used to evaluate potential changes in sediment transport processes (such as sediment accretion and shoaling, large-scale scour in channels). These additional modeling needs were identified within the FS/EIS. This effort would not include calculations of local scour around structures, which is more effectively done during the detailed design phase, and which involve different calculation methods than are included in the 2D and 3D models. Additional field investigations in Pretty Lake and Broad Creek are needed to support the extended modeling. The field investigations are described separately below.

#### Field Investigations and Data Collection:

The extended / additional modeling requires additional field data to complete effectively in the Pretty Lake and Broad Creek waterways. One of the purposes of these models was to evaluate the potential behavior of the estuaries in the protected area of surge barriers with the gates constructed, for scenarios with gates in both the open and closed positions. A specific component of the study was simulation of potential changes in salinity in the estuaries during a storm surge event with gates closed and significant rainfall runoff (freshwater) entering the normally brackish estuaries. The modeling performed for the FS/EIS indicated that these results related to salinity recovery are very sensitive to certain advection/dispersion model parameters. The study team was not able to calibrate these sensitive parameters due to a lack of advection/dispersion related data within Pretty Lake and Broad Creek. Further, it is assumed that similar modeling of the Hague cove (another potential storm surge barrier location) would need to be conducted for progressing through detailed design. In addition, the FS/EIS study team indicated that sediment transport modeling would likely be required during detailed design. Such models would be improved by including updated bathymetry obtainable through hydrographic survey of Pretty Lake and Broad Creek. Salinity measurements and dye (or other tracer) measurements would be conducted over typical tidal cycles in Broad Creek, Pretty Lake and the Hague. The results of the measurements would be documented in a



brief report, and the hydrographic survey data would be provided in maps (PDF) and in digital format (AutoCAD and GIS file formats).

Value Engineering Workshop and Documentation:

It is typical to conduct one or more Value Engineering (VE) workshops on large Federal infrastructure projects during the design process. The VE effort provides a framework for selected, invited professionals who were not significantly involved in the earlier design stages to review the proposed project designs and provide unbiased ideas, recommendations and supporting data for options to reduce project cost or otherwise add value to the project. Potential for reduction in both initial construction and long term operation and maintenance costs are considered. In addition, potential ways to achieve greater value for similar cost are also considered. The City's CSRM authorized plan includes many miles of storm surge barriers, overland floodwalls and other coastal flooding mitigation structures, and well as interior drainage management / interior flooding mitigation facilities. Opportunities for Natural and Nature Based Features (NNBF) and non-structural solutions are included in the authorized plan. A VE effort to evaluate a majority of the authorized plan features is warranted, and due to the magnitude of the authorized plan's extent the VE effort will be more significant than a typical single-project magnitude VE study.

A VE effort would be organized and hosted by the City and its consultants, to include a one-week workshop followed by up to one week of follow-up documentation and reporting. It is envisioned that the team of invited VE participants (VE Team) would include professionals from multiple disciplines, such as Civil, Coastal, Structural, and Mechanical/Electrical/Instrumentation (MEI) engineers, Environmental specialists, and Cost Estimating specialists. Due to the magnitude of the CSRM authorized plan, it is expected that some of the disciplines may have more than one participant, in order to complete the workshop within one week. It is also expected that several of the participants will travel to Norfolk from other parts of the country, to assemble an independent team of acknowledged experts in the design of the CSRM feature types. A team of USACE, the City, and their consultants' staff would provide read-ahead materials to the VE Team, and would conduct an initial briefing to the VE Team on the first day of the workshop. USACE and City staff would be available to answer VE Team questions during the workshop as the VE Team develops potential value-increasing design ideas. Following the workshop, the VE Team would document their ideas and would hold one follow-up meeting (hybrid in-person and virtual meeting, as applicable) to brief the USACE and City design team. The product of the VE effort would be a report summarizing the information provided to the VE participants, the participants' VE proposals and supporting information, and minutes of any significant meetings held during the VE workshop.

### **3. Project Team**

This project will be managed through the City of Norfolk's Office of Resilience and the USACE Norfolk District. Through the City's procurement process, an engineering and design consultant team would be selected from either existing on-call consultants or via a competitive request for proposal process. Criteria for the chosen consultant would include: 1) extensive USACE project analysis experience, 2) experience assessing future tidal and precipitation impacts, 3) capacity to start working on the project in an expedited manner. In addition to Resilience's staff and consultants, study team members would include Norfolk staff from the Department of Public Works Stormwater Division, Department of City Planning, and the USACE Norfolk District. Proposed team members are noted below:



**Table 1 – City of Norfolk and USACE Project Team**

John White, PE	Storm Water Engineer	Public Works
Tammy Halstead, PE	Civil Engineer IV	Public Works
Justin Shafer, CFM	Green Infrastructure Project Manager	Public Works
Kyle Spencer, GISP	Deputy Resilience Officer	Resilience
Doug Beaver	Chief Resilience Officer	Resilience
Matthew Simons, CFM	Floodplain Administrator	Planning
Walt Trinkala	Project Manager/Engineer	USACE Norfolk District
Leah Weaver	Co-Design Team Lead	USACE Norfolk District
Robin Williams	H & H Section Chief	USACE Norfolk District

#### **4. Expected Future Use and Applicability Across the Region and State**

Norfolk is an international city and the urban core of the Hampton Roads region. Its location at the mouth of the Chesapeake Bay, one of the richest tidal estuaries in the world, places it at the gateway to the Nation's capital. The coastal analysis proposed will show the impacts of these types of flood barrier systems as there are shared bodies of water with other cities, and they all experience the same types of flooding that would require similar mitigations measures being evaluated in this analysis.

The city is a global security hub, home to the largest naval base in the world, Naval Station Norfolk (NSN), and the only NATO command on U.S. soil. Many of the 65,000 active duty and civilian base personnel employed at NSN commute to work from off the base, making the housing and road infrastructure in Norfolk critical to mission readiness for the US Navy. With ongoing flood impacts this coastal analysis will lead the way in ensuring the measures proposed in the Norfolk CSRM will provide mission readiness for the military sphere and economic hubs.

Norfolk is home to the Port of Virginia's Norfolk International Terminals (NIT), one of Virginia's most significant economic assets with an impact of \$60 billion in economic activity annually and port-related industries generating 374,000 jobs. The city is also home to multiple universities and key medical services supporting the region including Old Dominion University, Norfolk State University, Eastern Virginia Medical School, Sentara Norfolk General Hospital, and The Children's Hospital of the King's Daughters. This analysis will ensure the optimization of the CSRM's recommended plan so that flooding impacts to critical infrastructure such as the industries mentioned above are eliminated or minimized to furthest extent feasible. The analysis will inform the detailed design phases of the recommended plan with critically important data and provide a roadmap for the type of analysis needed for future CSRM studies throughout the Hampton Roads region.

#### **5. Budget Narrative**

The city is categorized as a low-income community compared to the remainder of the state. As a result, the City is seeking funding support of 90% for the proposed Norfolk CSRM Coastal Analysis. The estimated total project cost is \$1,000,000. For estimates on the work to be completed, please see Table 2 below. The City has designated funding to serve as cash funds available for match in the form of the City's Stormwater Reserve Fund which is an account set aside specifically to support large-scale and long-term coastal resiliency efforts. The City has already contributed \$1,500,000 towards the initial CSRM study



development, and an additional \$750,000 for the City's in-kind match towards the PED phase currently underway for one small segment of the recommended plan.

All match funding will go towards contractor and consultant work, along with the requested \$900,000 in grant funds. Table 2 below summarizes project costs associated with each element of the scope of work. In addition to the direct funding as included match, Norfolk also commits to managing all aspects of project management and public outreach using existing qualified staff with support from the USACE Norfolk District. Funds proposed as match are authorized through existing approved budgets and verified on the attached, signed City Manager Transmittal Form outlining grant and match funds for all Norfolk applications to the current Community Flood Preparedness Fund grant cycle. Upon award of grant funds, the City sets up a special revenue account that includes approved match funds and cash funds to cover awarded grant funding until reimbursement is received. This allows Norfolk to move through projects without delays for reimbursement requests.

**Table 2- Project Costs**

	<b>Grant Funds</b>	<b>Match Funds</b>	<b>Total</b>
Coastal Engineering Calculations	\$225,000	\$25,000	\$250,000
Hydrodynamic Modeling (2D/3D)	\$288,000	\$32,000	\$320,000
Field Investigations and Data Collection	\$162,000	\$18,000	\$180,000
Value Engineering Workshop and Documentation	\$225,000	\$25,000	\$250,000
<b>Contracted Consultants Study Work</b>	<b>\$900,000</b>	<b>\$100,000</b>	<b>\$1,000,000</b>



## Attachments

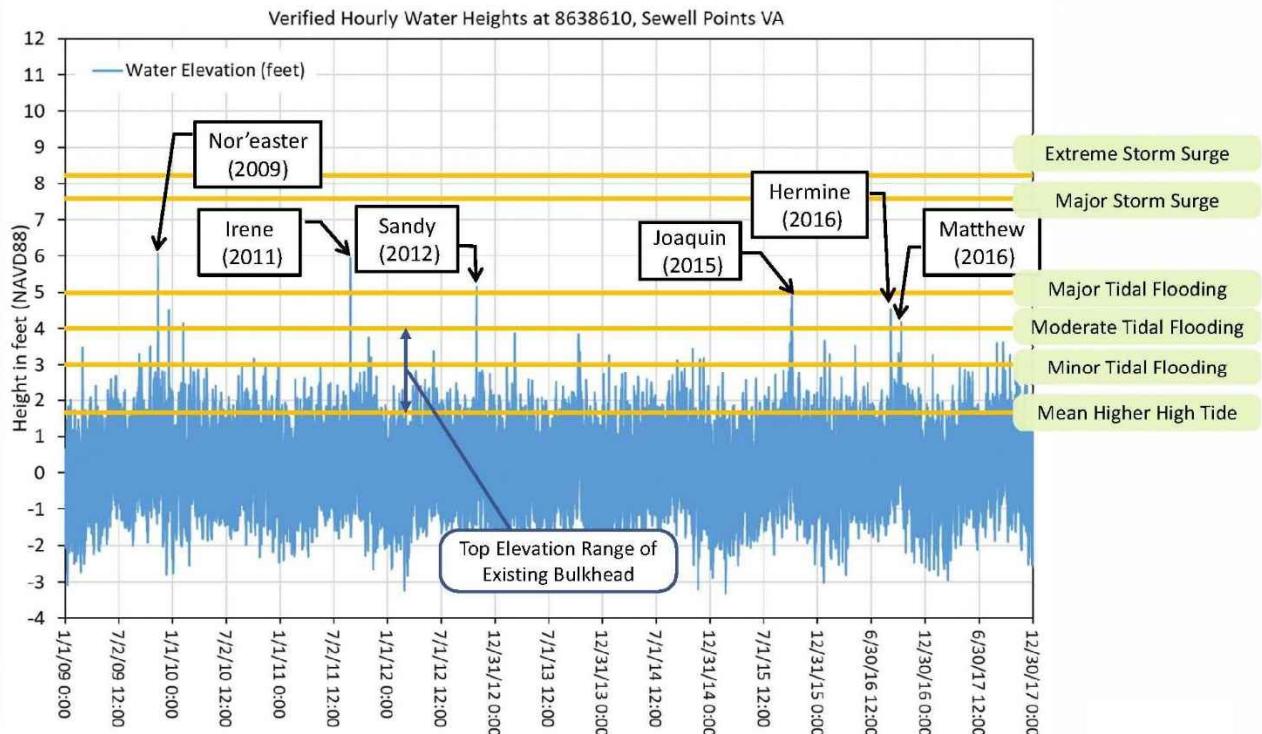
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## Attachment A



## Attachment B

### Tide and Storm Surge Flooding Levels





## Attachment C

*CSRM maps, exhibits, project locations, rep loss areas, historic resources, NNBF's, sea level rise impacts, population and social vulnerability maps.*

## Final Integrated City of Norfolk CSRM Feasibility Study / Environmental Impact Statement

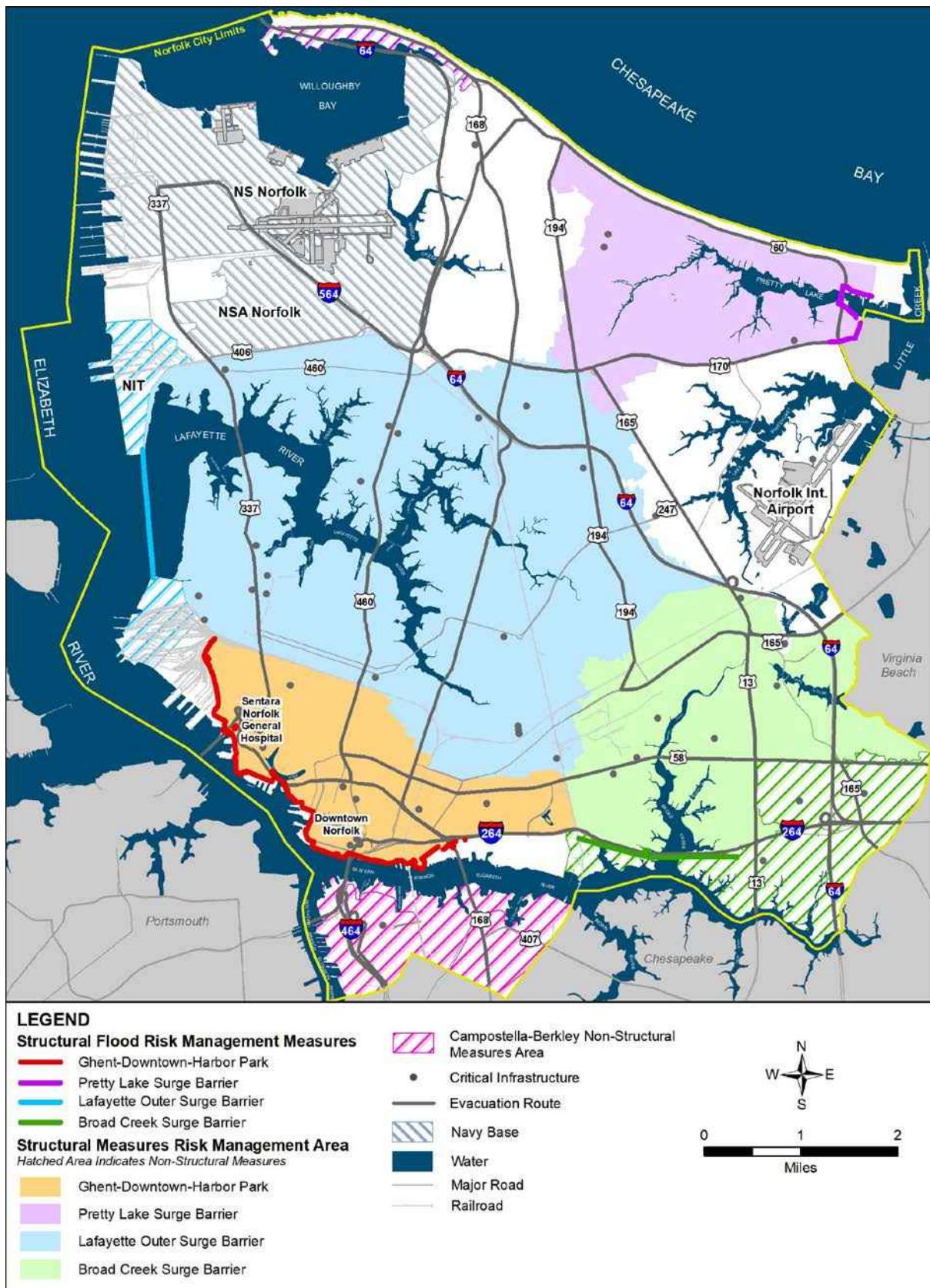


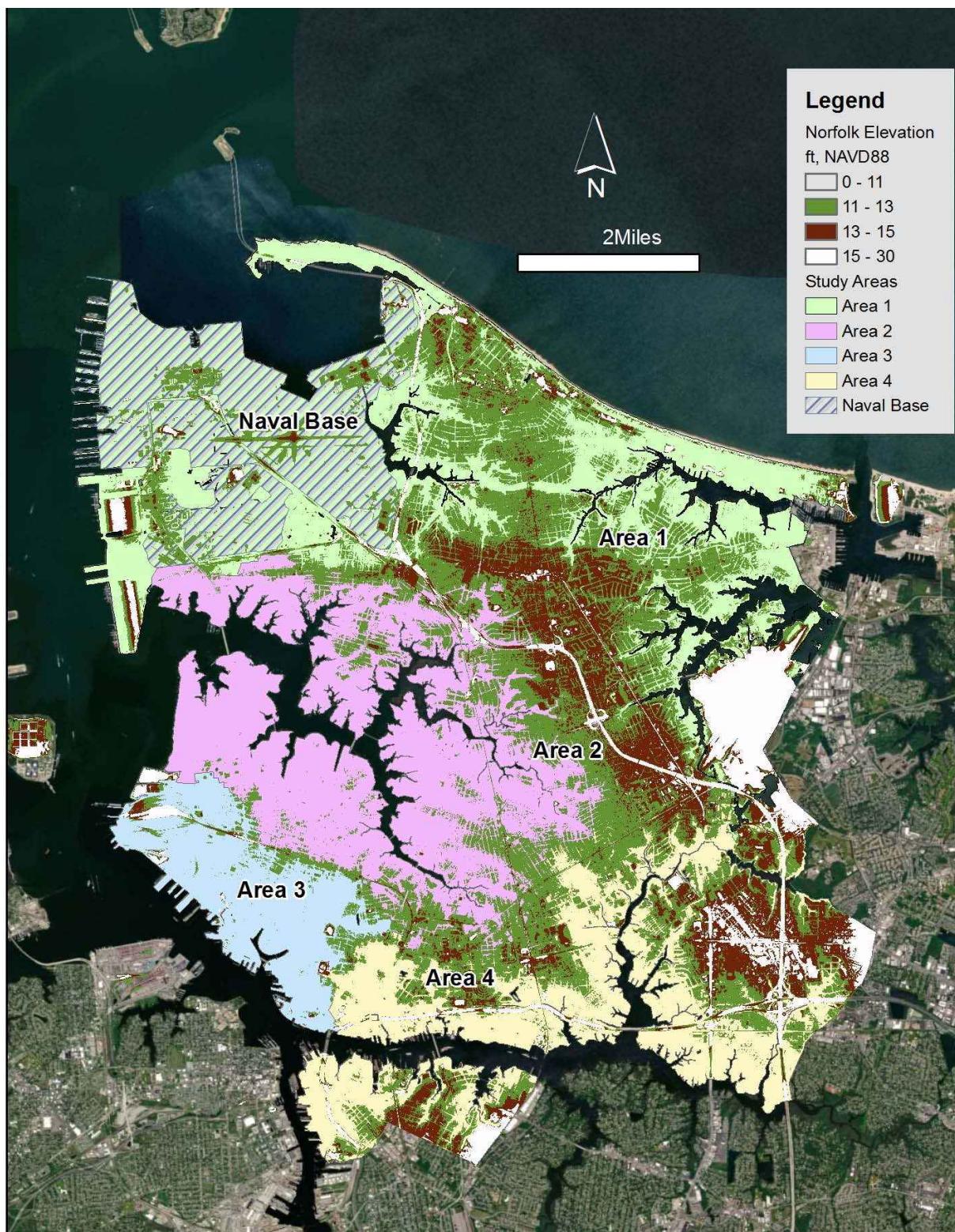
Figure 1. Map Supporting the Description of the Recommended Plan

area specific planning problems and opportunities were identified and used to develop potential measures for these four sub-areas. The following paragraphs review and characterize the current conditions of the entire project area (Norfolk jurisdictional boundaries) and for each of the four areas. Figure 1-2 below shows the major neighborhoods and water features of the Norfolk area.

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

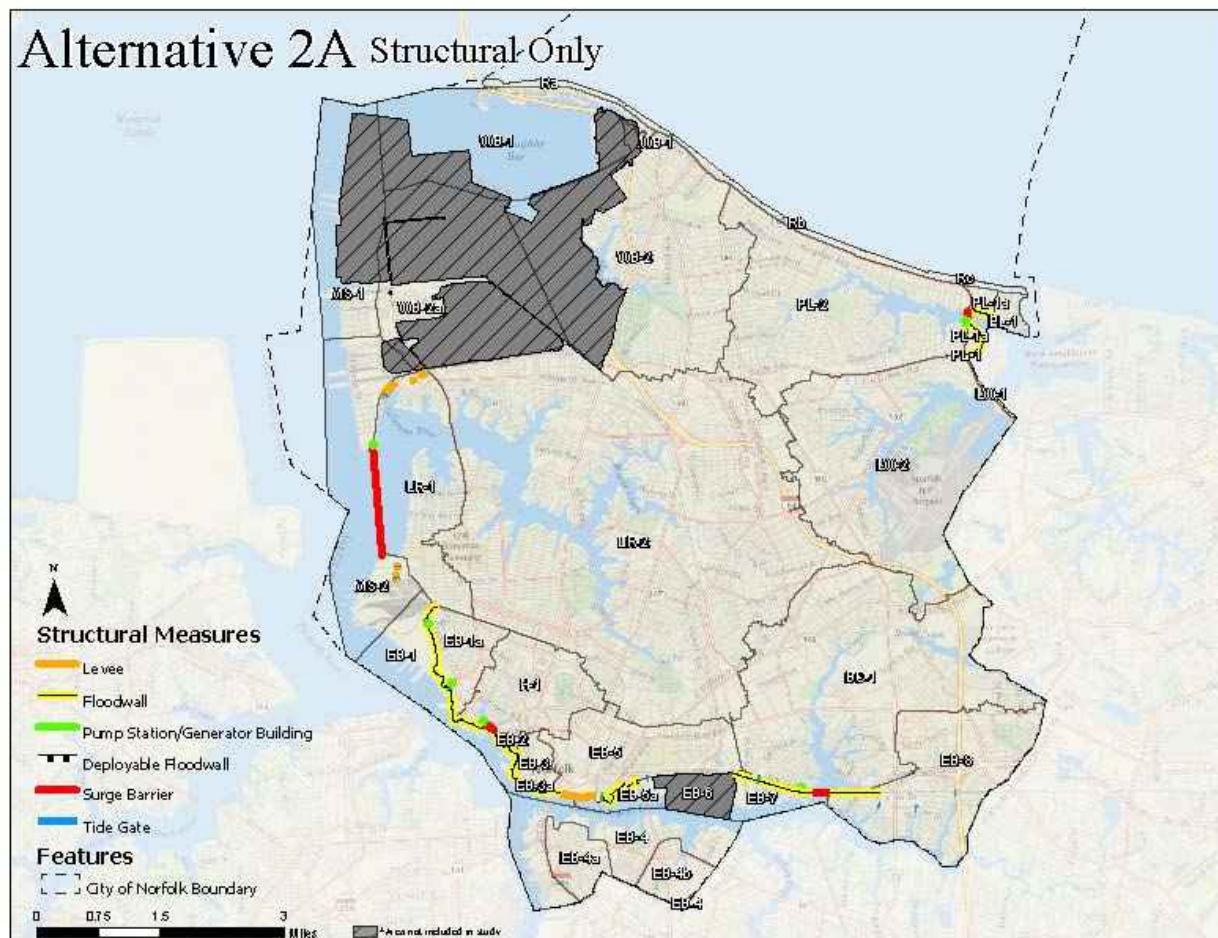


**Figure 1-2. City of Norfolk Area Map**



**Figure 2-2. Topography of Norfolk**

Water surface elevation estimates for storm surge vary in different areas of the city. Generally the storm surge elevations increase from Area 1 to Area 4. The following paragraph and Table 2-3 and Table 2-4 describe and show the WSEL frequencies used in the study and how they are estimated to vary across Norfolk.



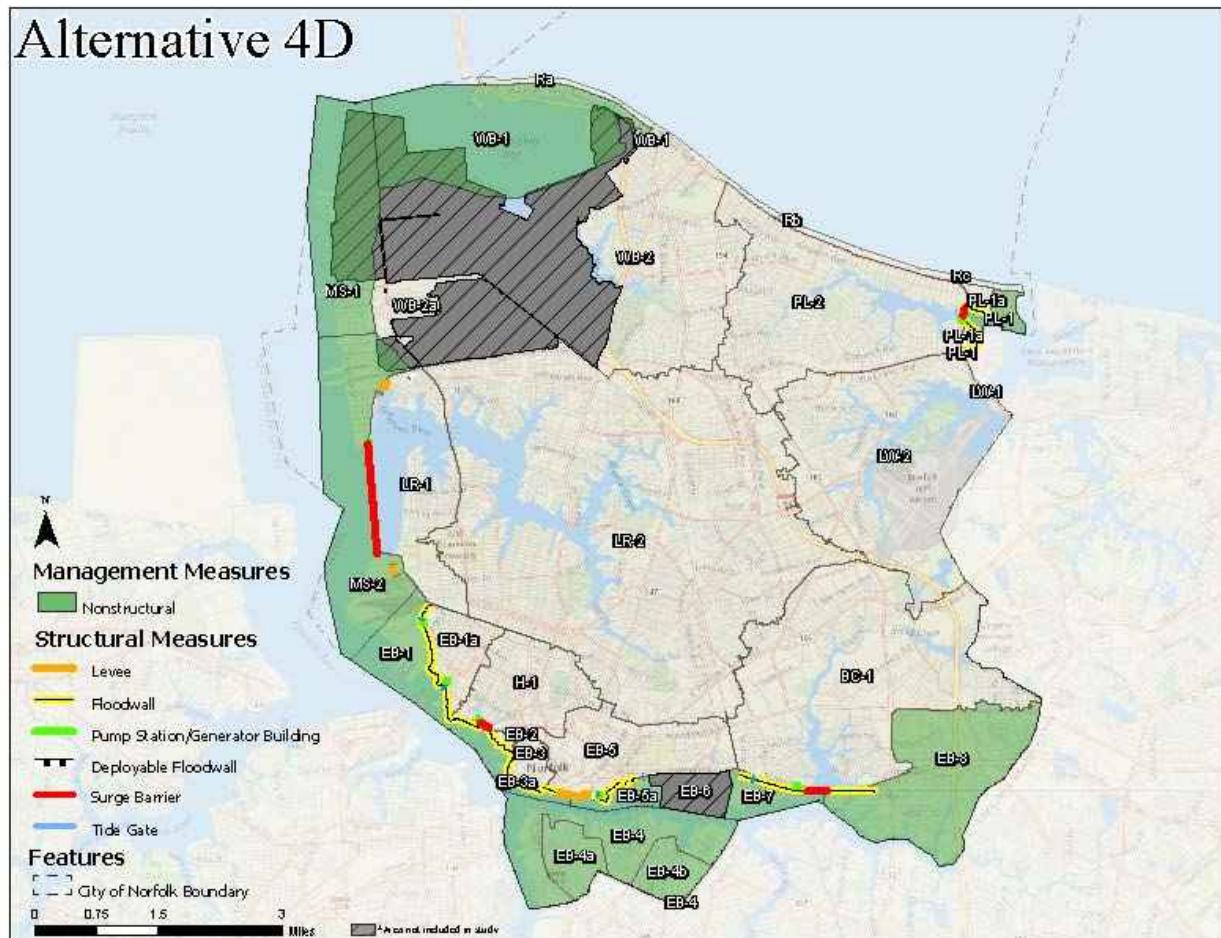
**Figure 8-1. Alternative 2a Structural Only Map**

### 8.2.3 Alternative 3/Nonstructural

Nonstructural coastal storm risk management measures are techniques for reducing accountable flood damages within floodplains. These techniques consist of measures such as acquisition, flood proofing (wet/dry), elevating, flood warning systems, flood emergency preparedness plans, and public education. In addition, ringwalls as discussed previously are included within this alternative. While such items are structural in nature, their implementation will be designed to work in conjunction with other nonstructural features. Areas where no large scale structural features will be implemented may still contain ring walls, and as such, this technique will be considered within areas defined by nonstructural management measures.

This alternative does not provide complete coverage of the project area and only structures and features that are subjected to flood proofing will see direct benefits and reduction of storm related damages. Portions of the project area will see continued damages to structures, content, vehicles, infrastructure, life safety and quick access to emergency services from future storm events. This will result in continued maintenance and reconstruction of houses and roads following storm events. Current estimates for this study indicate that there are over 11,000 structures that will be eligible for nonstructural floodproofing. An assumption was made that 100% participation would occur for the nonstructural program. Figure 8-2 shows a map of the areas of the city that are included in Alternative 3.

subtidal reefs. The subtidal reefs would be constructed adjacent to the living shorelines. The final siting of NNBFs will be contingent on the final engineering design and the ability to attain required real estate protections. NNBF costs were included in the final alternatives. The benefits were not calculated at this point in the study, but are developed for the determination of the Recommended Plan. Further detail on the NNBF in the Recommended Plan can be found in Section 9.3. Because costs are already quantified but NNBF benefits are not yet quantified, the efficiency of the alternatives are likely to increase once NNBF benefits are considered. A broad description of NNBF features are included in Chapter 4 and a more detailed description including feature types with locations are included in Appendix A. Appendix D includes a white paper that details the methodology for assessing and justifying NNBF.



**Figure 8-3. Alternative 4d Structural and Nonstructural Combination Map**

Table 8-5 shows the breakdown of nonstructural measure types for residential, nonresidential, and historic properties.

of water retention benefits and their high costs in relation to benefits. Storage volumes for retaining interior drainage is limited by the water table and available space. The analysis of the storage capacity possibilities in relation to pump station requirements did not show a justifiable benefit. Due to costs for greenway construction in an urban area OSE benefits were determined to not be justifiable.

Living shorelines and the oyster reef structures are estimated to reduce operation and maintenance costs for the structural measures in the RP. Living shorelines are estimated to provide a 10% reduction and the oyster reef structures are estimated to provide a 5% reduction to the overall annual operation and maintenance for the portions of the proposed floodwalls and storm surge barriers that they are adjacent to. The annual O&M costs for the length of wall behind an adjacent NNBF is calculated with the appropriate reduction factor and compared to the costs to construct and maintain the NNBF. If the costs are lower than the benefits (reduced O&M value) then the NNBF is assumed to be economically justified. Figure 9-1 below shows an overview of the NNBF locations that are recommended in the RP.

Table 9-2 and Table 9-3 display the quantities and costs associated with each NNBF measure respectively.

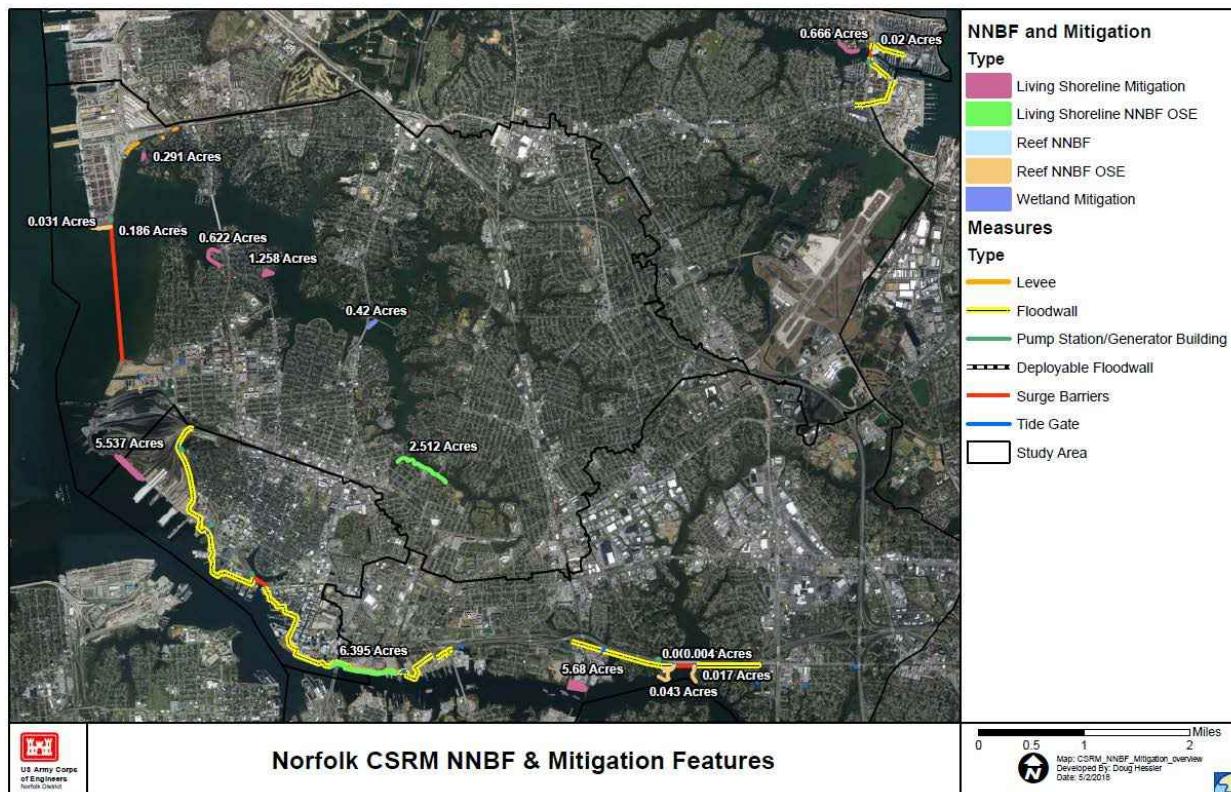
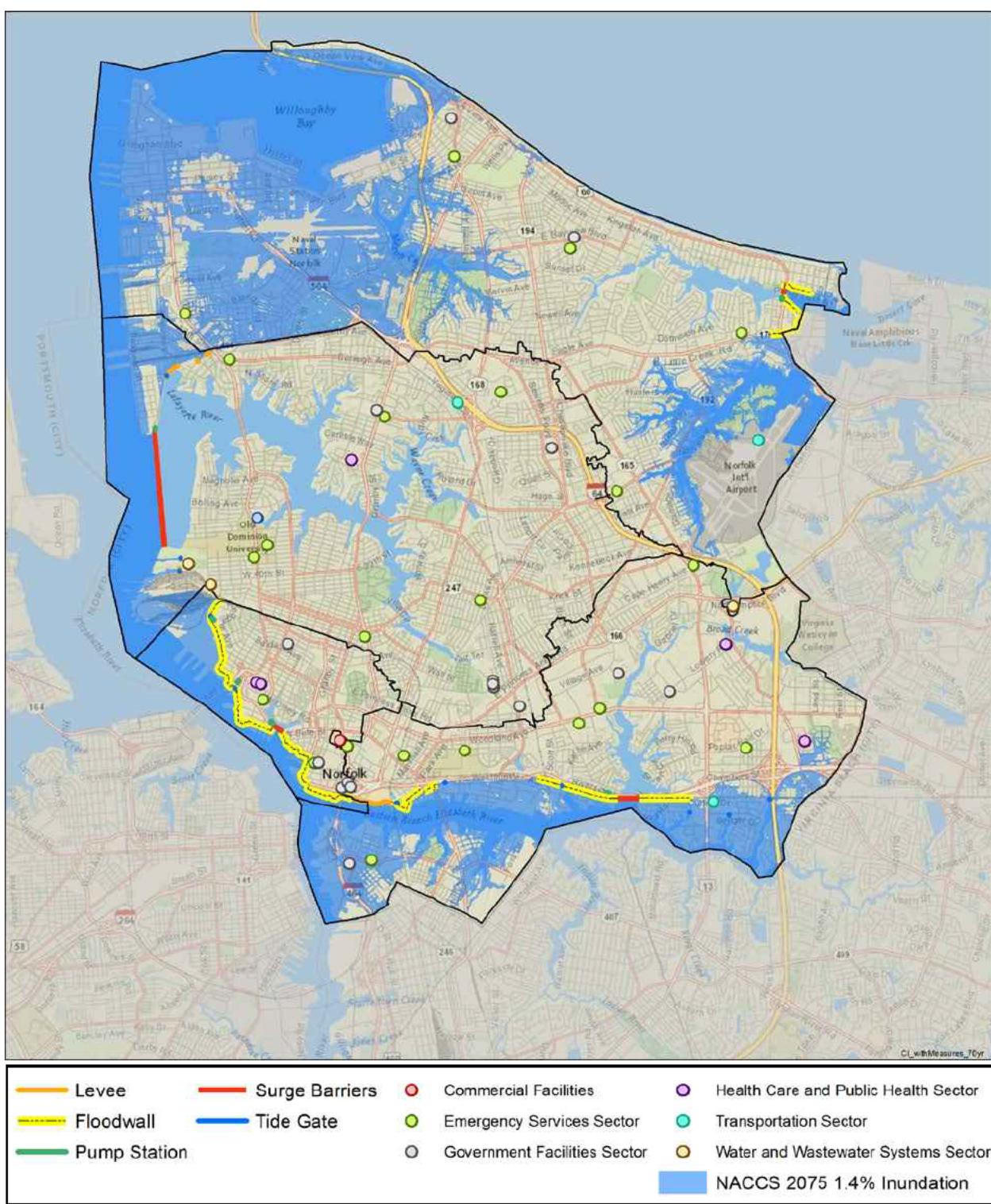


Figure 9-1. Overview Map of NNBF in the Recommended Plan



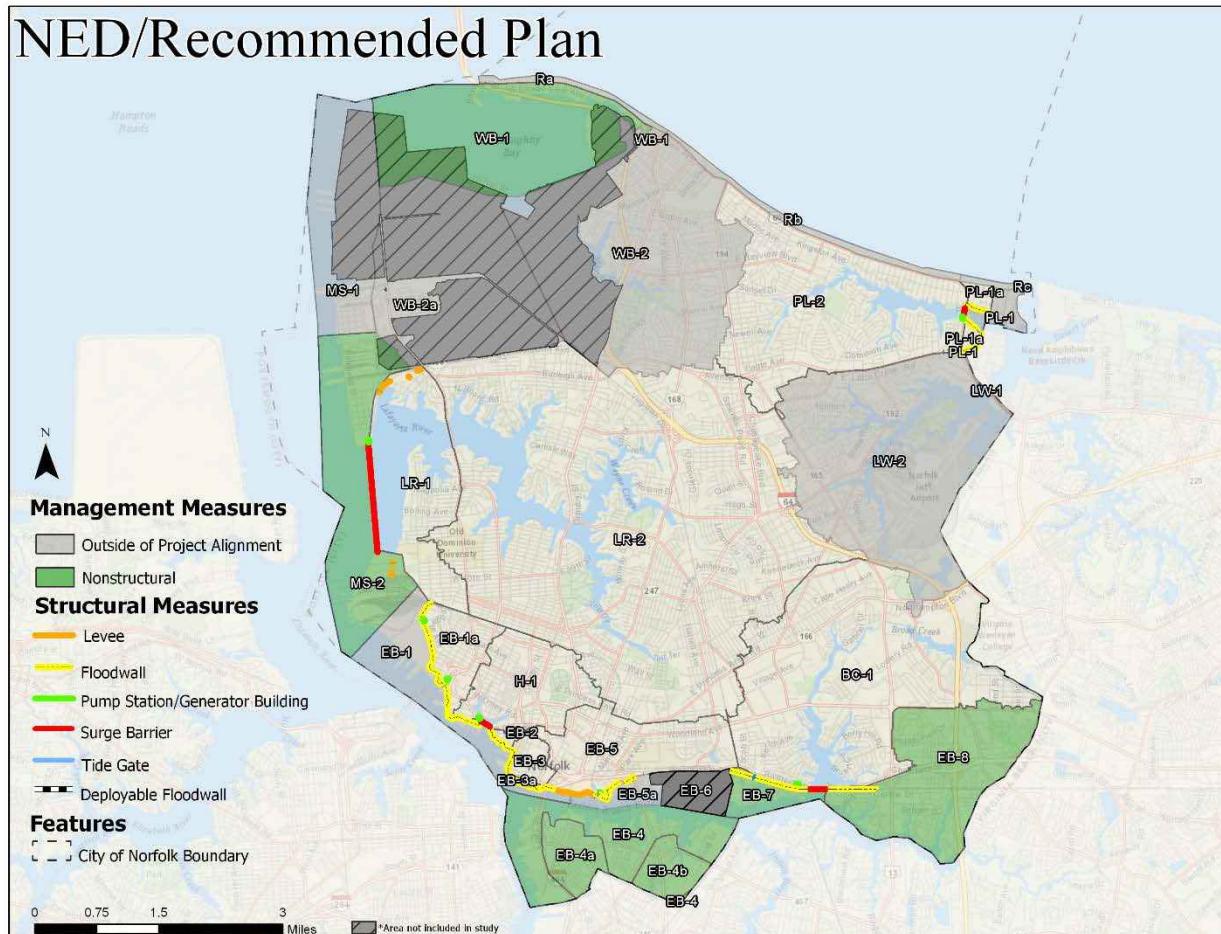
**Figure 9-2. Critical Infrastructure with the Recommended Plan**

## 9.5 ECONOMIC RESULTS OF THE RECOMMENDED PLAN

Table 9-5 below shows the results of the cost and benefits analysis for each measure and the overall project. Note that critical infrastructure costs are provided, however, the benefits for critical infrastructure are embedded in their respective economic reach. Critical infrastructure

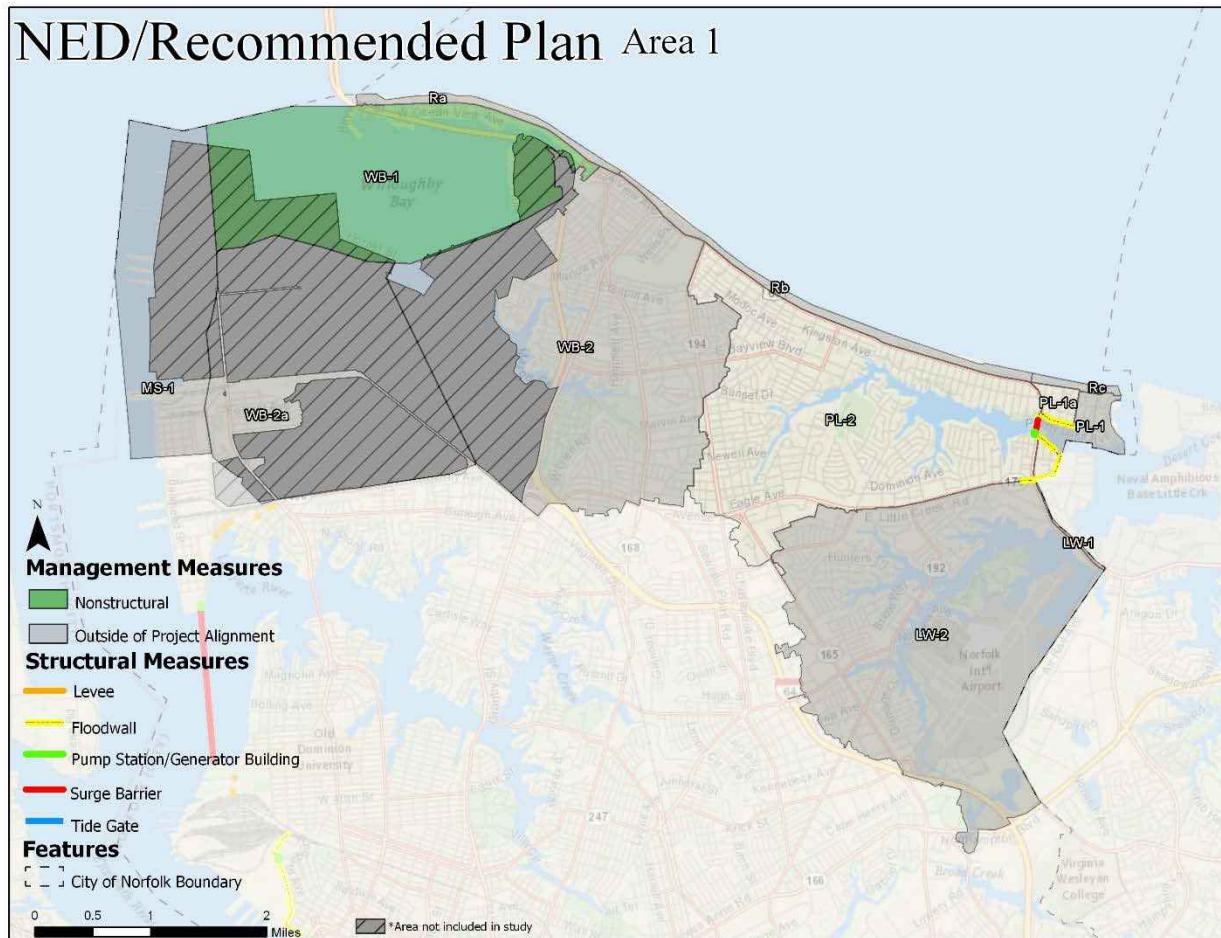
area.

For the purpose of this report, the RP has been broken down within the original four defined sub-areas that were used within the initial formulation of the study. Detailed information and preliminary designs can be found in Appendix A as well as Appendix B.



**Figure 9-3. Recommended Plan Citywide View**

The RP incorporates recommendations in each of the four planning areas. Area 1 would include a SSB, a pump station, and flood walls to isolate Pretty Lake from damaging storm surge. Along the northern coastline, the project will continue to use the Willoughby Spit and Vicinity Coastal Storm Damage Reduction Project, which is part of the Future without Project condition. In addition to the structural measures, nonstructural measures are also recommended for portions of Area 1 on the southern side of Willoughby Spit. Within Area 1 is Norfolk Naval Station. While there are no measures planned that augment the base's resilience, elements of the alternative will accordingly create benefits to the base's military and civilian personnel who live in the immediate areas and/or commute onto the naval base.



**Figure 9-4. Recommended Plan Area 1 Measures.**

Area 2 is largely comprised of the Lafayette storm surge barrier (Figure 9-5). It will cross the Lafayette River connecting high ground from the Norfolk International Terminal (NIT) to the Lamberts Point Golf Course. The storm surge barrier will be comprised of a barrier wall, nine miter gates, and one large sector gate for the navigation channel. In addition, to prevent flanking, a system of levees will be needed on both Lamberts Point and the NIT property. Nonstructural measures are recommended for the protection of infrastructure that will fall outside (west of) the SSB.

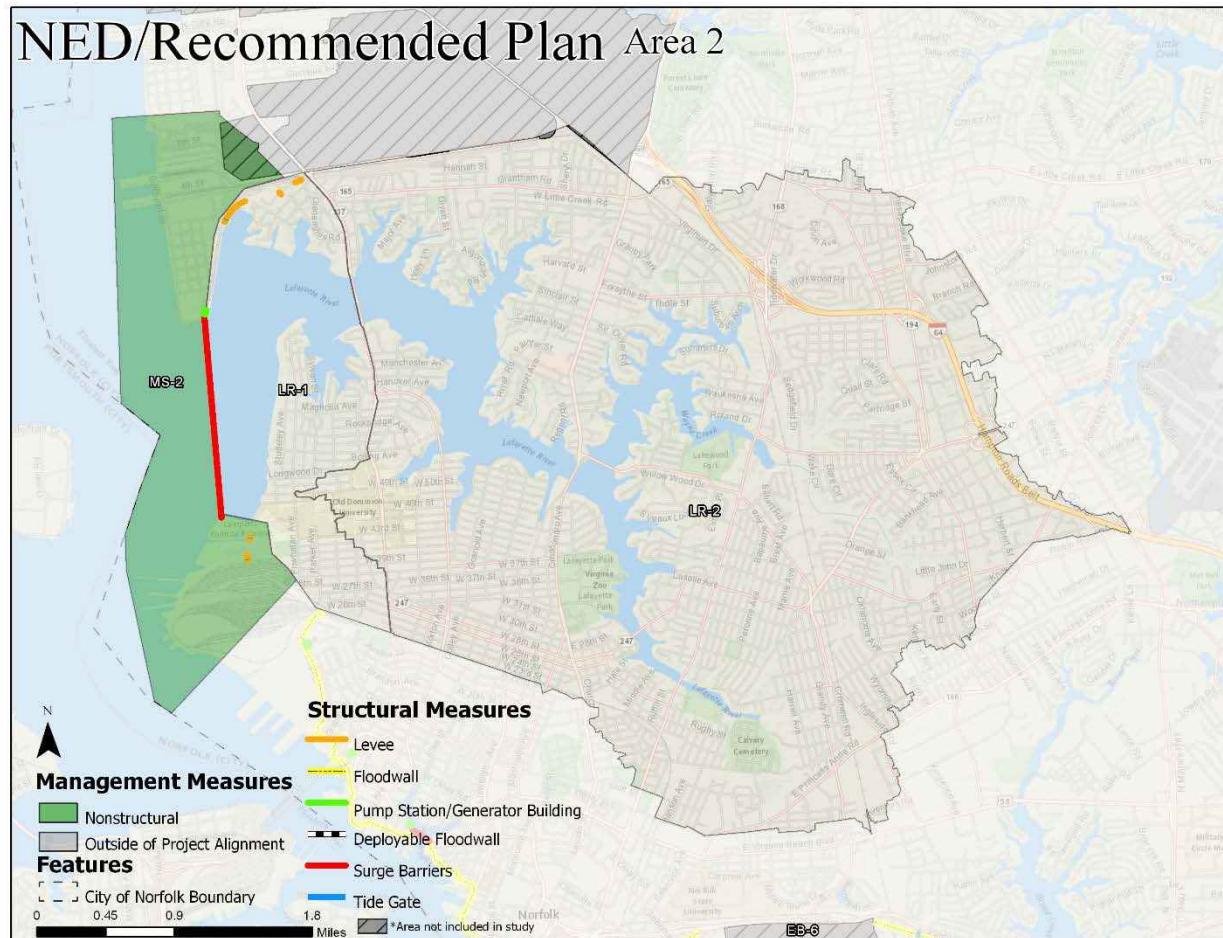


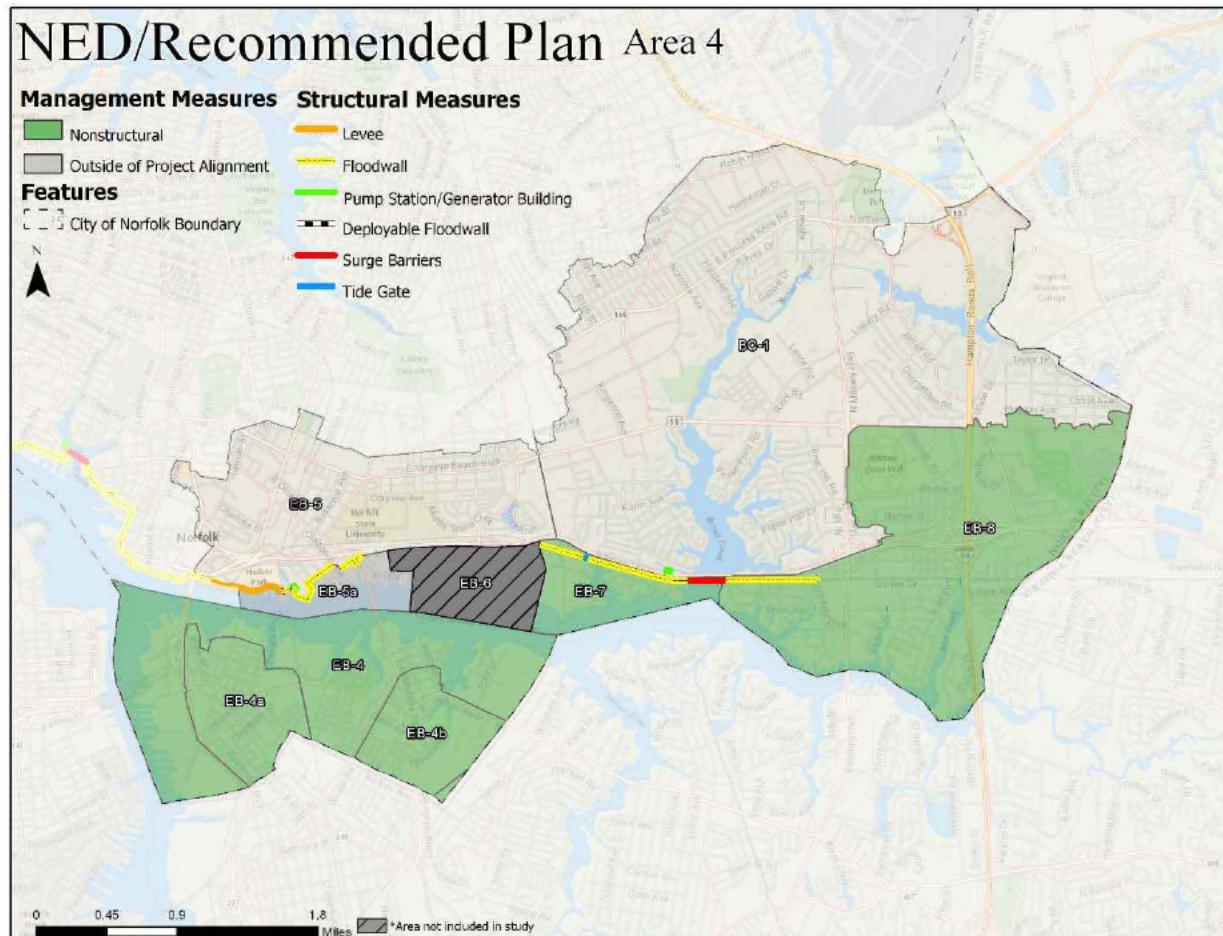
Figure 9-5. Alternative 4d Area 2 Measures.

Area 3 covers most what is considered downtown Norfolk (Figure 9-6). The area is characterized by a protective floodwall measure that runs from the West Ghent neighborhood to just past the Harbor Park area. In places where floodwalls currently exist in the downtown area, they will be modified to meet current standards and the design level identified within this study. In addition, a small storm surge barrier will be placed at the opening of The Hague. The barrier will include miter gates to allow access for small recreation boats. The gates will close during high water level events in order to prevent storm surge from entering The Hague neighborhood. Pump stations will be placed in various locations to control interior drainage and stormwater that may accumulate behind the floodwalls and The Hague SSB. Within the Harbor Park area, a levee will be constructed that ties in the eastern extent of Area 3 and the western extent of Area 4. There is sufficient right-of-way to allow the construction of this feature where in other parts walls are used because of limited space. Nonstructural measures were eliminated from the downtown area due to a lack of economic justification.



**Figure 9-6. Alternative 4d Area 3 Measures.**

Area 4 covers the eastern portion of the city and the neighborhoods of Berkley and Campostella along the southern side of the eastern Branch of the Elizabeth River. The measures in Area 4 include the connection of the levee within Harbor Park with additional floodwall systems along the north bank of the eastern Branch of the Elizabeth River. The floodwall continues to, and terminates at, the eastern side of Chesterfield Heights (EB-6). The Broad Creek barrier system (BC-1S) begins on the western edge of Chesterfield heights with a floodwall running parallel to I-264. The floodwall extends to Broad Creek where a SSB is proposed at the I-264 crossing with Broad Creek. The SSB would be constructed on the downstream (south) side of the I-264 Bridge. Flood walls will tie-in the SSB to the surrounding high ground. The proposed barrier wall would consist of a system of miter gates and floodwalls. Construction will be similar to that of the proposed SSB at Pretty Lake with tide gates and pumps. Nonstructural measures are proposed for the neighborhoods of Ingleside Rd. (EB-7N), Elizabeth Park (EB-8N), as well as Berkley and Campostella (EB-4N, EB-4aN, EB-4bN).

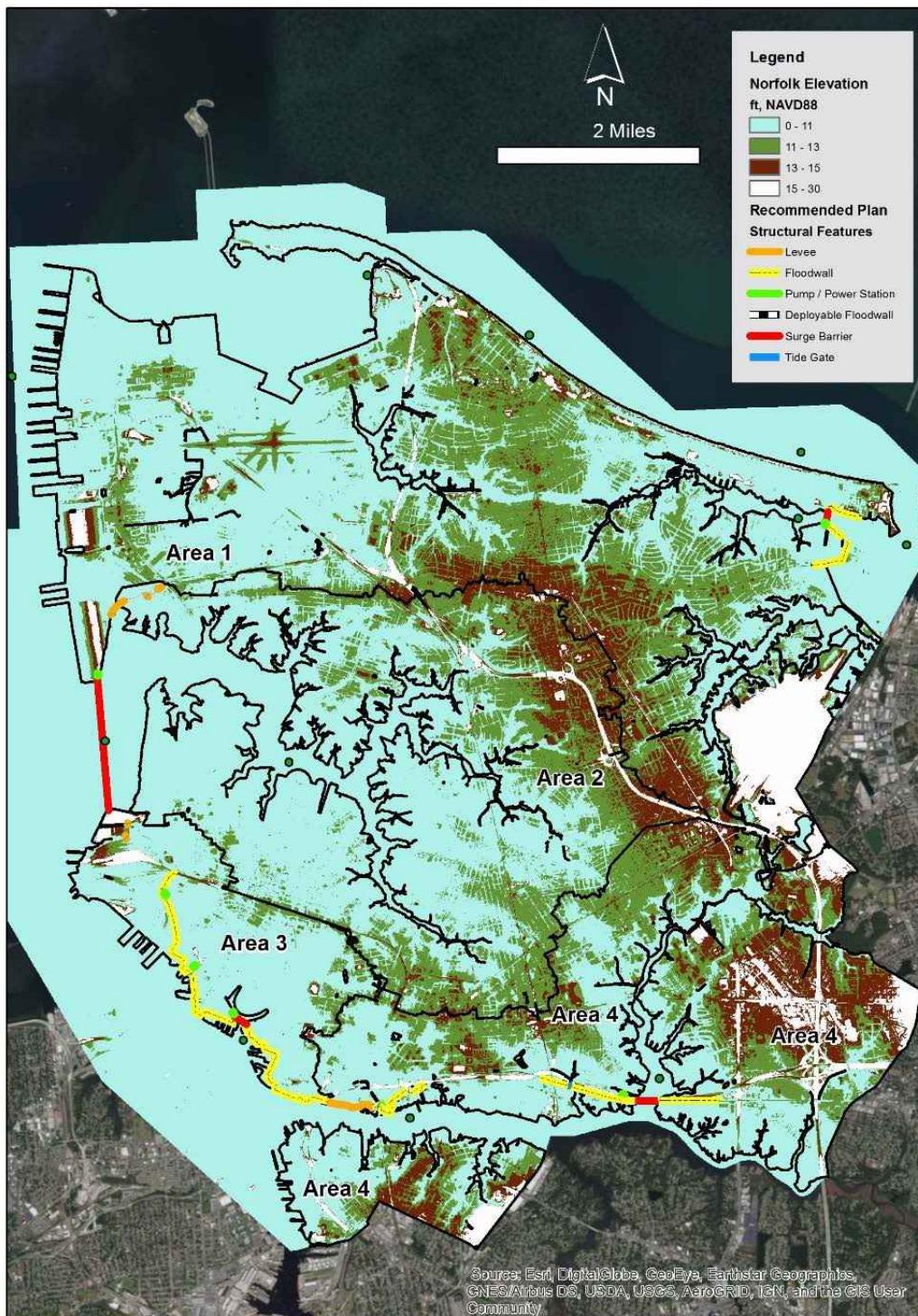


**Figure 9-7. Alternative 4d Area 4 Measures.**

Table 9-6 shows the breakdown in nonstructural measure types that are recommended in the RP. The table breaks down the total structures into residential and nonresidential categories. Residential signifies single family homes and similar structures such as duplexes. Elevation is a typical solutions for residential structures and there is already a precedent for elevating residential structures in the Norfolk area. Nonresidential buildings are commercial and industrial in nature but also include multifamily structures such as apartment and condominium buildings. Nonresidential structures are not likely to be elevated due to their construction type and size. Floodproofing is a common solution for nonresidential buildings. The table below also breaks out the historic structures from the total. Historic structures are noted because they may have higher costs to mitigate and they provide cultural value to an area.

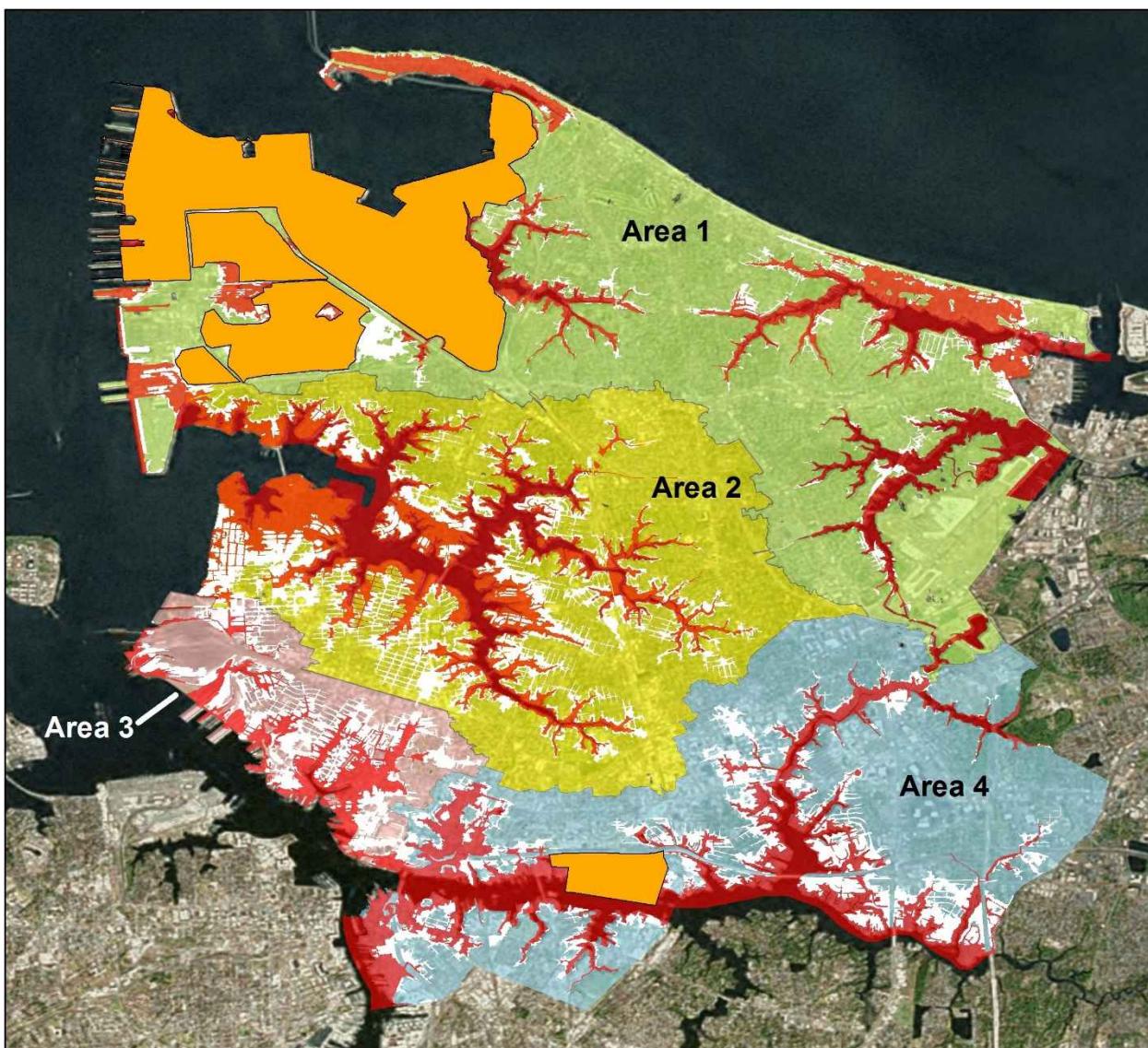
**Table 9-6. Nonstructural Measures within the Recommended Plan**

Nonstructural Measure	Total Structures	Nonresidential	Residential	Historic
<b>Basement Fill</b>	176	1	175	33
<b>Basement Fill + Floodproofing</b>	1	1	0	0
<b>Basement Fill + Elevation</b>	89	0	89	4



**Figure 9-8. Norfolk Elevations**

Figure 9-9 below graphically displays the service level of the project against the low, intermediate, and high rates of RSLR as estimated by the USACE. The figure is for Area 4 of Norfolk. The blue, dashed line indicates the design water level in Area 4 of Norfolk. The elevation of the wall in this area is shown as the yellow bar and is at elevation 16.5 ft NAVD88. The wall elevation is higher than the design water level in order to account for wave runup. As



**Figure 10-7. FEMA 1% (red) and 0.2% (white) Annual Chance Floodplains**

There are approximately 62,000 residential, commercial, and public structures within the City. The total also accounts for about 240 structures considered critical infrastructure, including emergency services, Government facilities and shelters, water and wastewater systems, transportation, communications, healthcare and public health, and commercial facilities. Approximately 7,500 structures are located within the FEMA 1% annual chance floodplain. Out of that number, there are about 760 designated historical structures. At the higher NACCS 1% annual chance water level, there are approximately 25,000 and 3,400, respectively.

The design stillwater flood level for the Norfolk study is the NACCS 3% (35-year) annual chance flood elevation plus sea level rise to the year 2075, ranging from 9.5 feet to 10.5 feet, NAVD88 for the four study areas. The design flood level is generally equal to the FEMA 1% annual chance flood BFE plus three feet of freeboard, which will help to account for uncertainty and future conditions and achieve certification and accreditation of flood protection systems. At the design stillwater flood level, approximately 26,000 structures and 3,400 designated historical structures are located within the floodplain. Figure 10-8 shows the inland extent of the NACCS

3% annual chance floodplain including sea level rise in white color.



**Figure 10-8. NACCS 3% Annual Chance Flood with 2075 Sea Level Rise Floodplain**

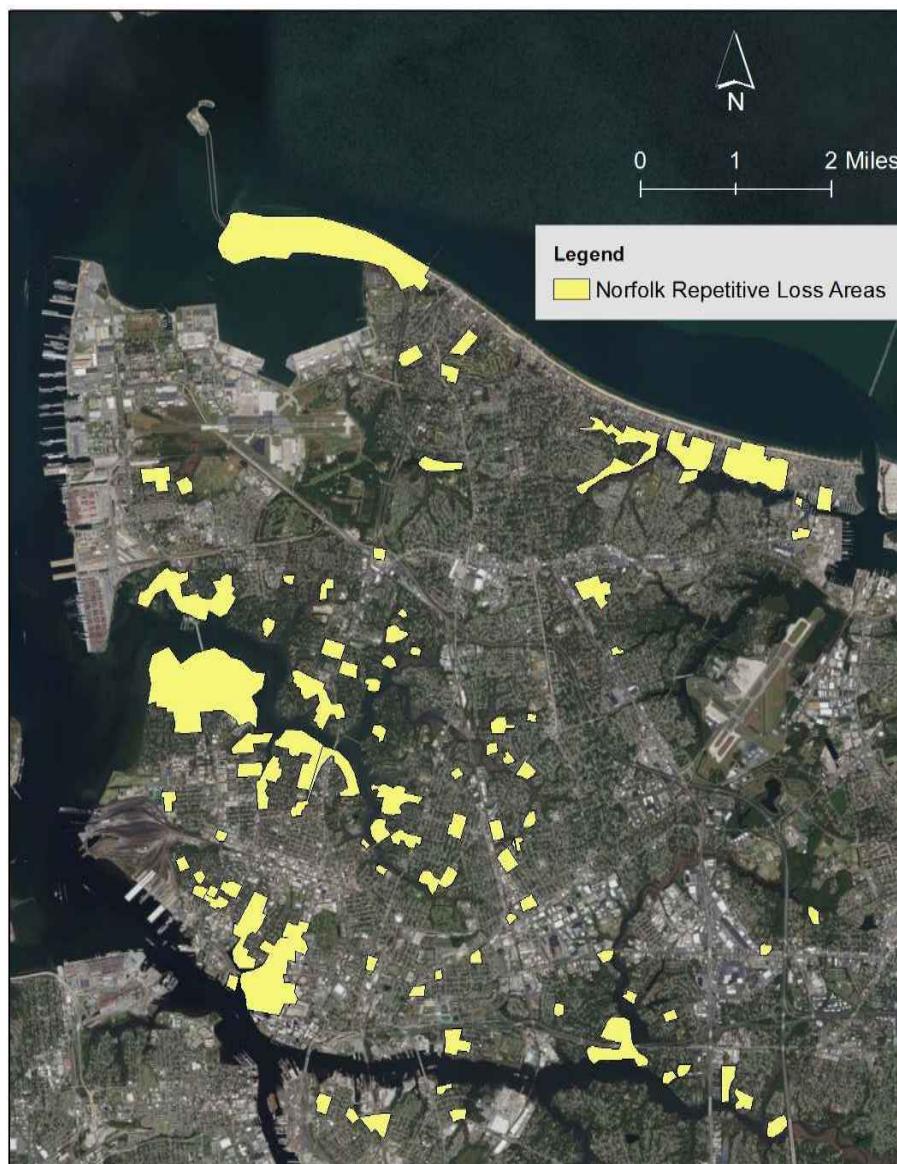
The City became a participant in FEMA's National Flood Insurance Program (NFIP) in 1979. There are approximately 12,000 flood insurance policies in force within the City. As of February 2017 and going back to 1978, the City has had 5,839 paid claims totaling approximately \$67 million. Using FEMA's past historical flood claims data, Figure 10-9 shows a general representation of Repetitive Loss areas in Norfolk.

As of 2016, the City had 944 recognized Repetitive Loss structures. As defined by FEMA, a Repetitive Loss property is any insurable building for which two or more claims of more than \$1,000 were paid by the NFIP within any rolling ten-year period, since 1978. A Repetitive Loss property may or may not be currently insured by the NFIP. In addition, the City had 180 recognized Severe Repetitive Loss structures. Severe Repetitive Loss is defined as a residential property that is covered under an NFIP flood insurance policy and:

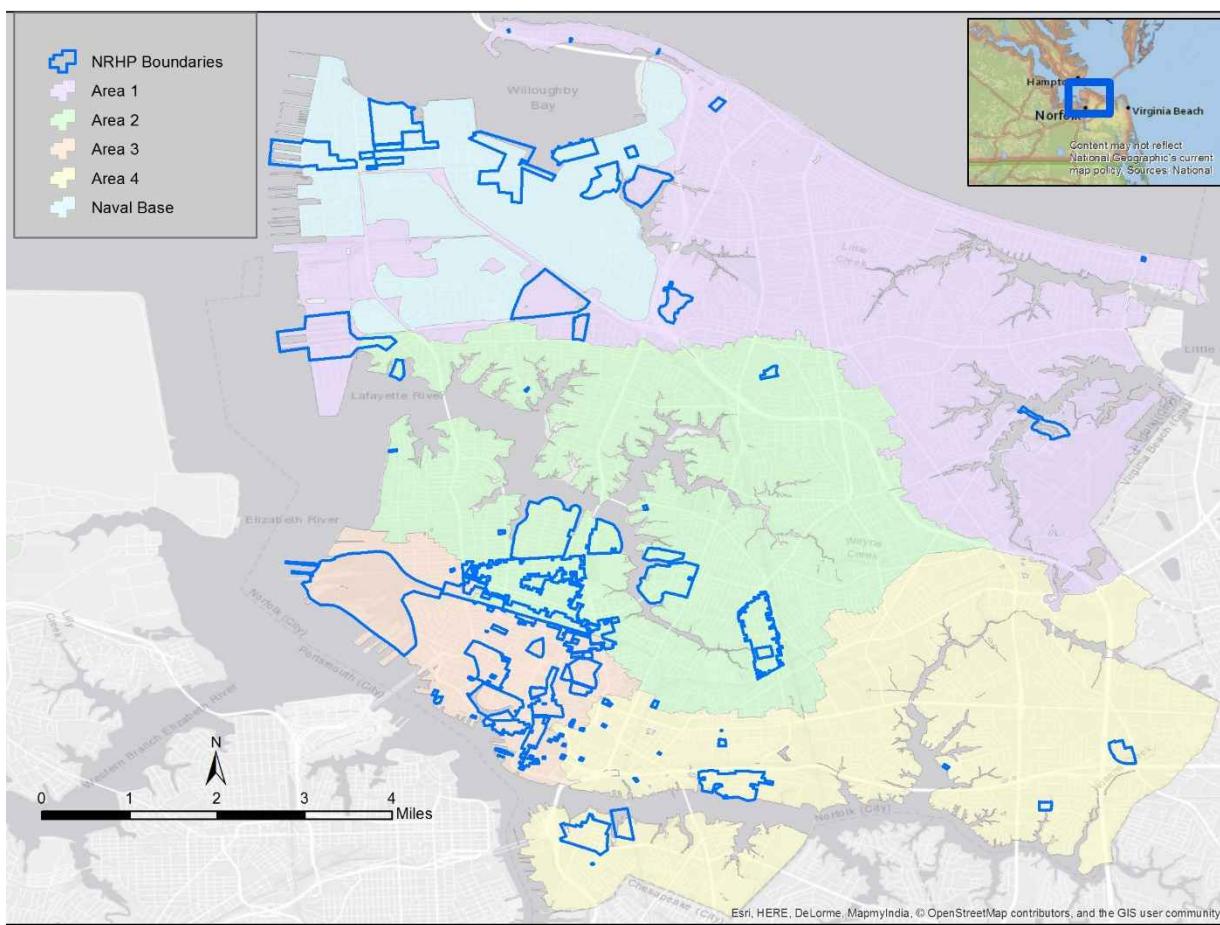
- (a) That has at least four NFIP claim payments (including building and contents) over \$5,000 each, and the cumulative amount of such claims payments exceeds \$20,000; or
- (b) For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.

For both (a) and (b) above, at least two of the referenced claims must have occurred within any ten-year period, and must be greater than 10 days apart.

Considering FEMA's Flood Insurance Rate Maps mainly depict tidal flooding, some Repetitive Loss areas may include damage associated only with rainfall flooding and/or combined tidal and rainfall flooding. Thus, some Repetitive/Severe Repetitive Loss properties may be located beyond or outside the designated FEMA 1% annual chance floodplain.



**Figure 10-9. Norfolk FEMA Repetitive Loss Areas**

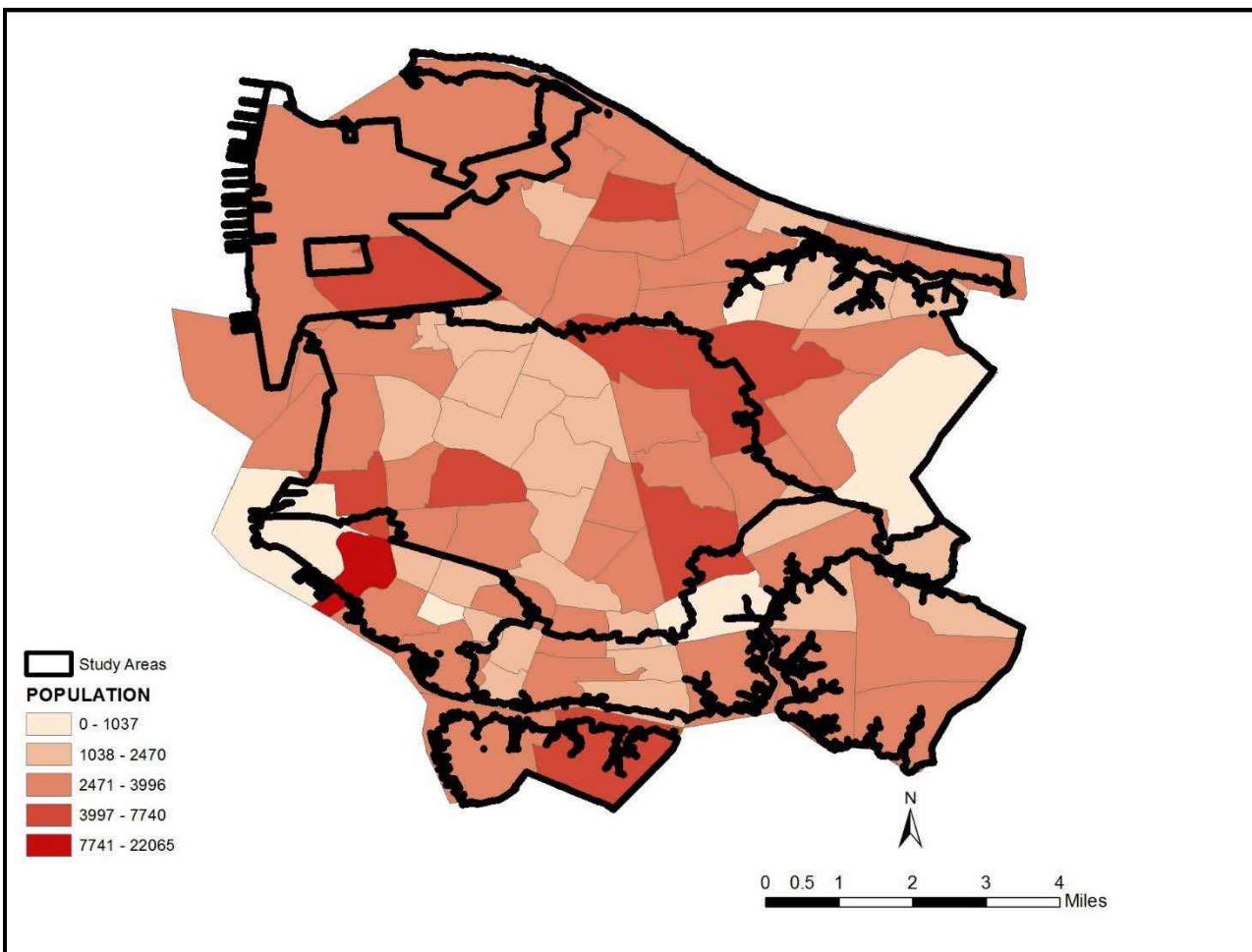


**Figure 10-30. Boundaries of NRHP listed, eligible, or potentially eligible properties in Norfolk from DHR data.**

#### **Potential for Unidentified Historic Properties**

As prodigious as the number of recorded, and evaluated, historic properties in Norfolk is, there may be many more that have not been identified through survey and evaluation of eligibility. Along with listed high profile historic districts like Ghent and West Freemason, large potentially eligible districts along the Lafayette River and potentially in the area of effect of some project measures include Larchmont and Algonquian Park.

Only limited areas have had archaeological survey (Figure 10-31), and nearly a third of the archaeological sites identified in the city, including the two determined NRHP eligible, came from a small areas where an expanded interchange for I-64/264 is planned. Two types of terrain may have elevated potential for archaeological sites. One is the urban waterfront downtown, this and many surrounding areas are extensively composed of filled in areas of the waterfront and creeks. Urban waterfronts frequently yield well preserved historic period sites. Examples include the Richmond floodwall project, the Indigo Hotel site in Alexandria where a ship was found, and the World Trade Center site in New York City where a ship was found as well. In Norfolk during the development of the Waterside mall an 18<sup>th</sup> century cannon was found in fill of brick and cobblestone (site 44NR18). The second high potential terrain are shorelines in suburban areas where there has been less development, and some sites may be relatively intact. Native Americans focused on the waterways for subsistence and transportation, and

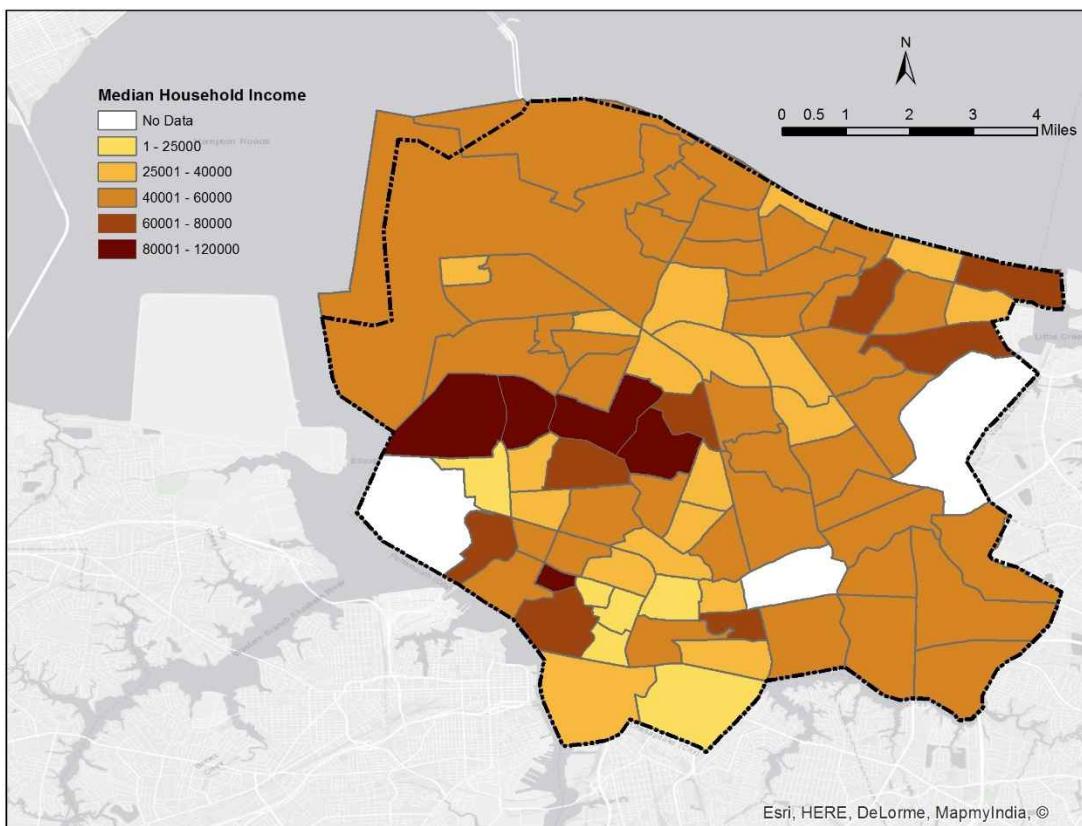


**Figure 10-39. Population by Census Tract, 2010 Census**

Source: (US Census Bureau 2017a)

### **Income**

Income levels for the city's residents are lower than those for the state and slightly lower than those for the nation, based on median household and per capita income estimates. Census data show that 2010 median household income was \$42,677 for Norfolk compared to \$61,406 for the state and \$51,914 for the US as a whole (U.S. Census Bureau, 2012). Per capita income for 2010 was \$23,773 for Norfolk while it was \$32,145 for the state. Norfolk's per capita income was also below the national average of \$27,334. There are strong differences in income between census tracts, as shown in Figure 10-40.

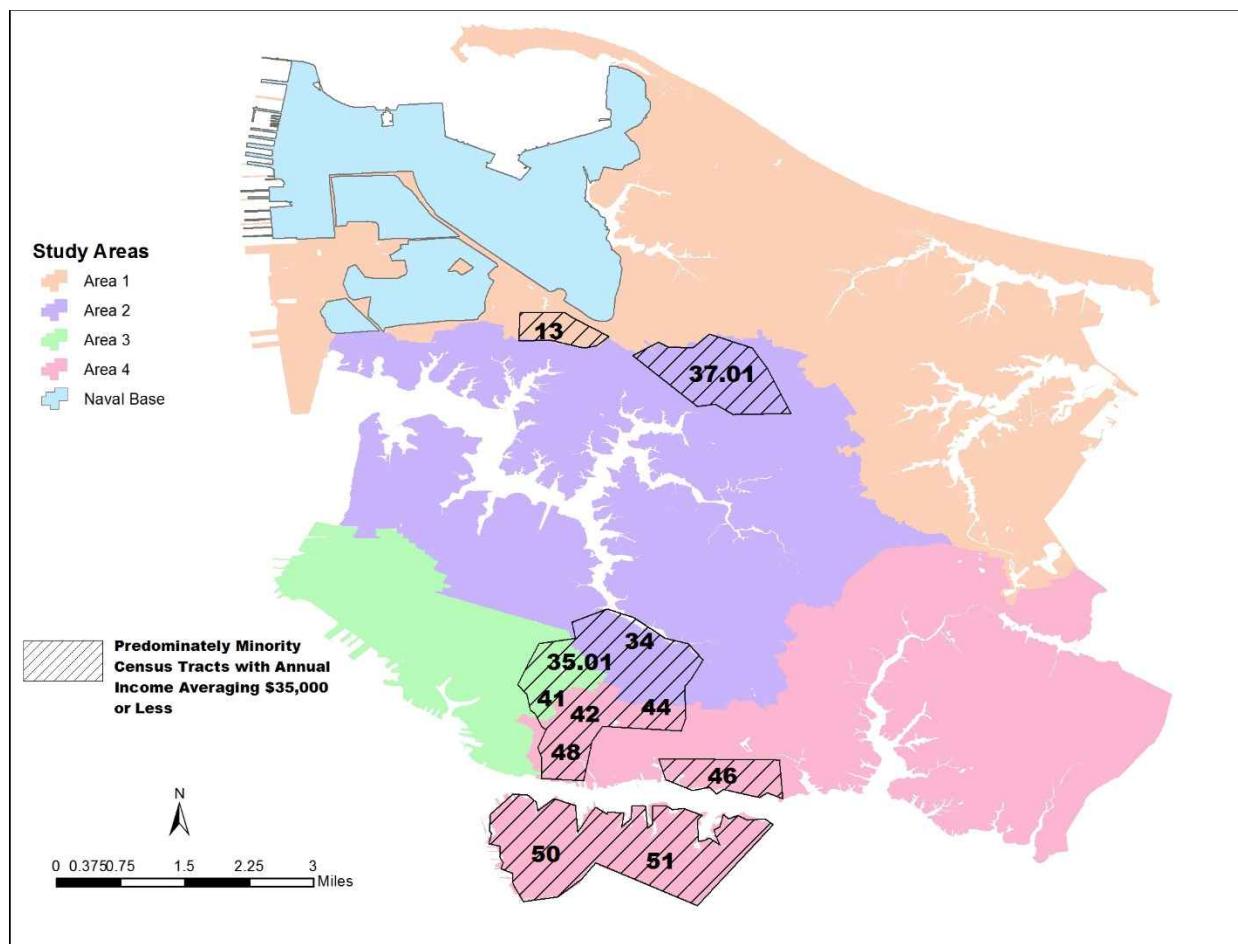


**Figure 10-40. Income by Census Tract**

Source: (US Census Bureau 2017b)

#### ***Environmental Justice and Protection of Children***

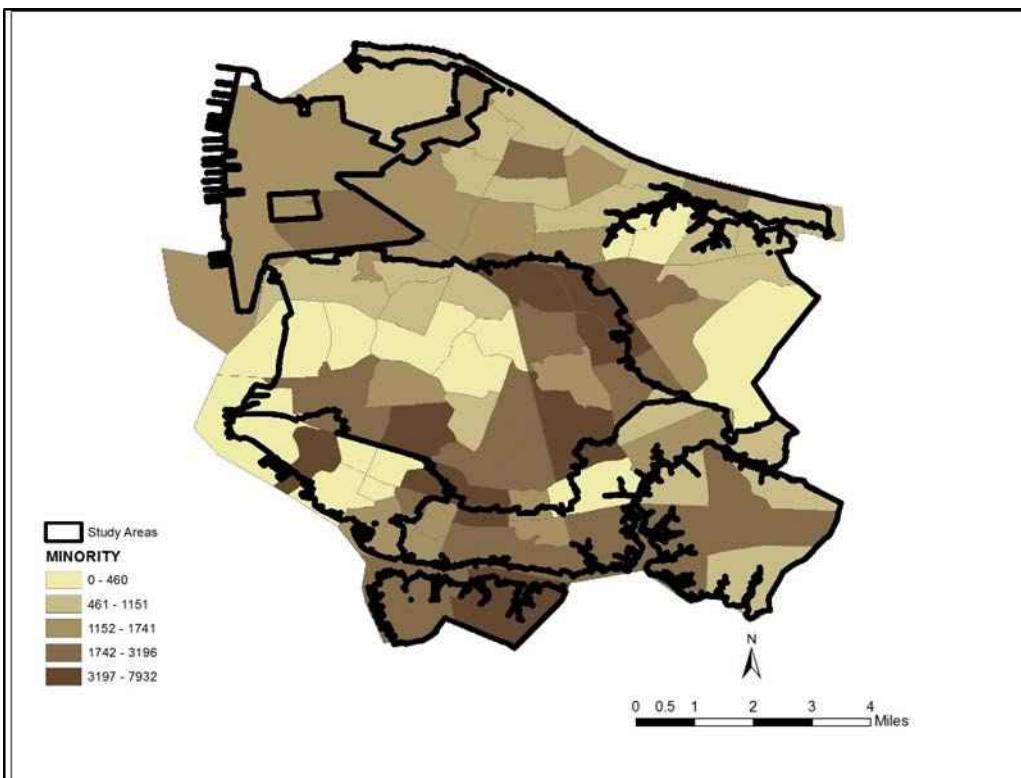
Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations (February 11, 1994) requires Federal agencies to conduct their programs, policies, and activities that substantially affect human health or the environment in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons (including populations) from participation in, denying persons (including populations) the benefits of, or subjecting persons (including populations) to discrimination under such programs, policies, and activities because of their race, color, or national origin. Figure 10-41 shows the distribution of census tracts with predominantly minority populations and average annual incomes of \$35,000 or less in the 2010 census. Census Tract 46, the Chesterfield Heights neighborhood, is the subject of a separate coastal storm risk management project, and is not being considered for measures in this study.



**Figure 10-41. Predominately Minority Low Income Census Tracts**

Source: (US Census Bureau 2017b)

U.S. Census data for 2010 shows that the non-white population for the city of Norfolk as a whole was 52.92 percent. Portions of the study area that may be impacted by specific measures, or consequences of no-action, may have a significant minority population that could be affected by project implementation. Nonstructural measures would be more likely to significantly impact disadvantaged neighborhoods than structural measures protecting properties in their current states. As can be seen in Figure 10-42 and Table 10-14, minority populations are concentrated in certain areas, most notably along the Eastern Branch of the Elizabeth River.

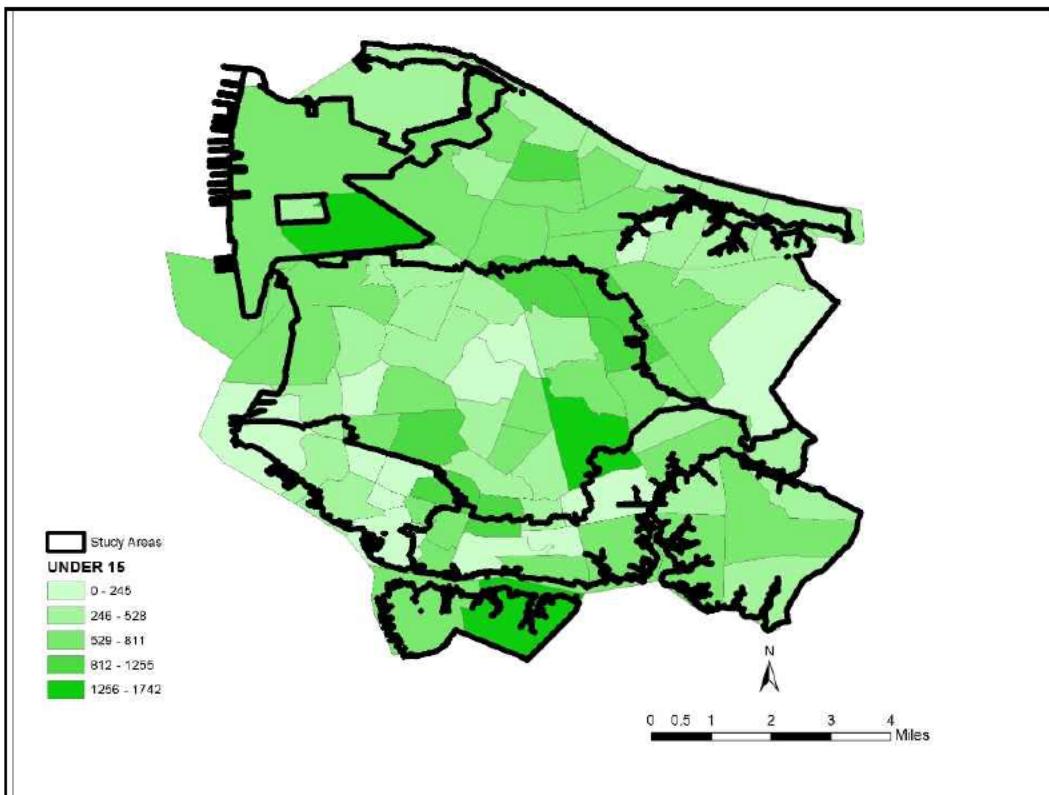


**Figure 10-42. Minority Population by Census Tract**

**Table 10-14. Ethnic Make-Up of Norfolk**

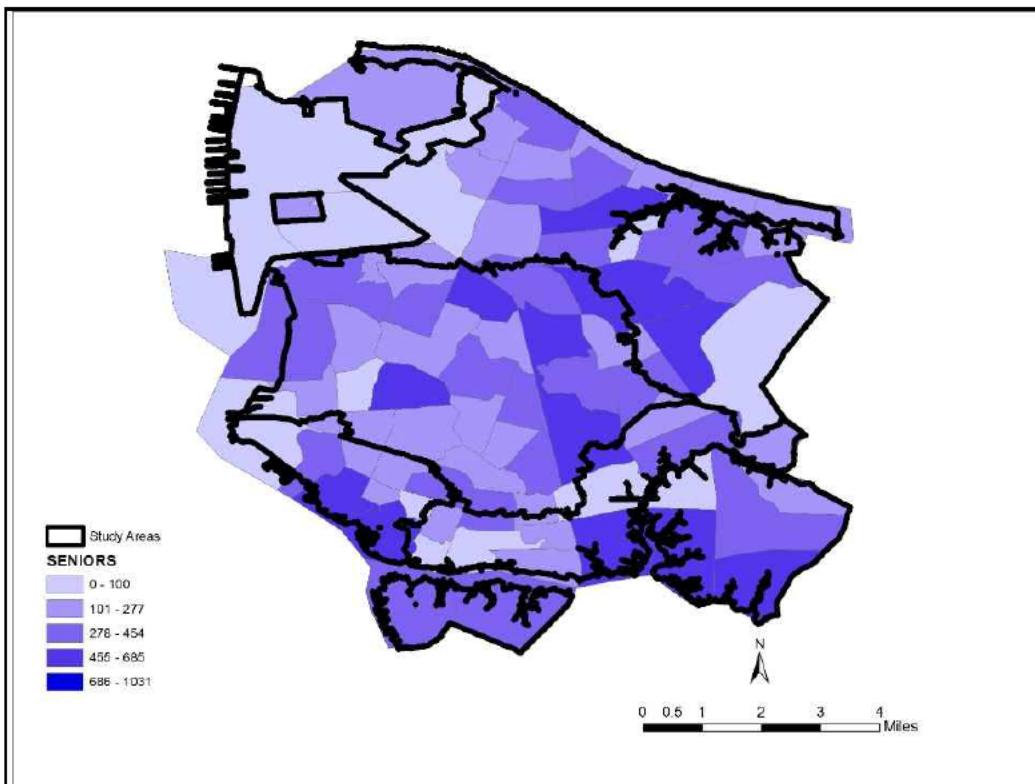
	2010 Population	White	Black	Native American	Hispanic	Percent Below Poverty
City of Norfolk	242,803	47.1	43.1	0.5	6.6	18.2

Younger and older people may be more vulnerable during emergencies, a consideration for preparedness as a non-structural measure. Ages are more evenly distributed through the city than ethnicity or income, as seen in Figure 10-43 and Figure 10-44, and should therefore not be a significant geographic factor in weighing the relative impacts of alternatives.



**Figure 10-43. Population Under 15 by Census Tract, 2010 Census**

Source: (US Census Bureau 2017a)



**Figure 10-44. Population Over 65, 2010 Census**

Source: (US Census Bureau 2017a)

## 10.17 HAZARDOUS MATERIALS AND WASTES

### 10.17.1 Definition of Resource

Hazardous materials include, but are not limited to, hazardous and toxic substances (biological, chemical, and/or physical) and waste, and any materials that pose a potential hazard to human health and the environment due to their quantity, concentration, or physical and chemical properties. Hazardous wastes are characterized by their ignitability, corrosivity, reactivity, and toxicity. Hazardous materials and wastes, if not controlled, may either (1) cause or significantly contribute to an increase in mortality, serious irreversible illness, or incapacitating reversible illness, or (2) pose a substantial threat to human health or the environment.

### 10.17.2 Methodology

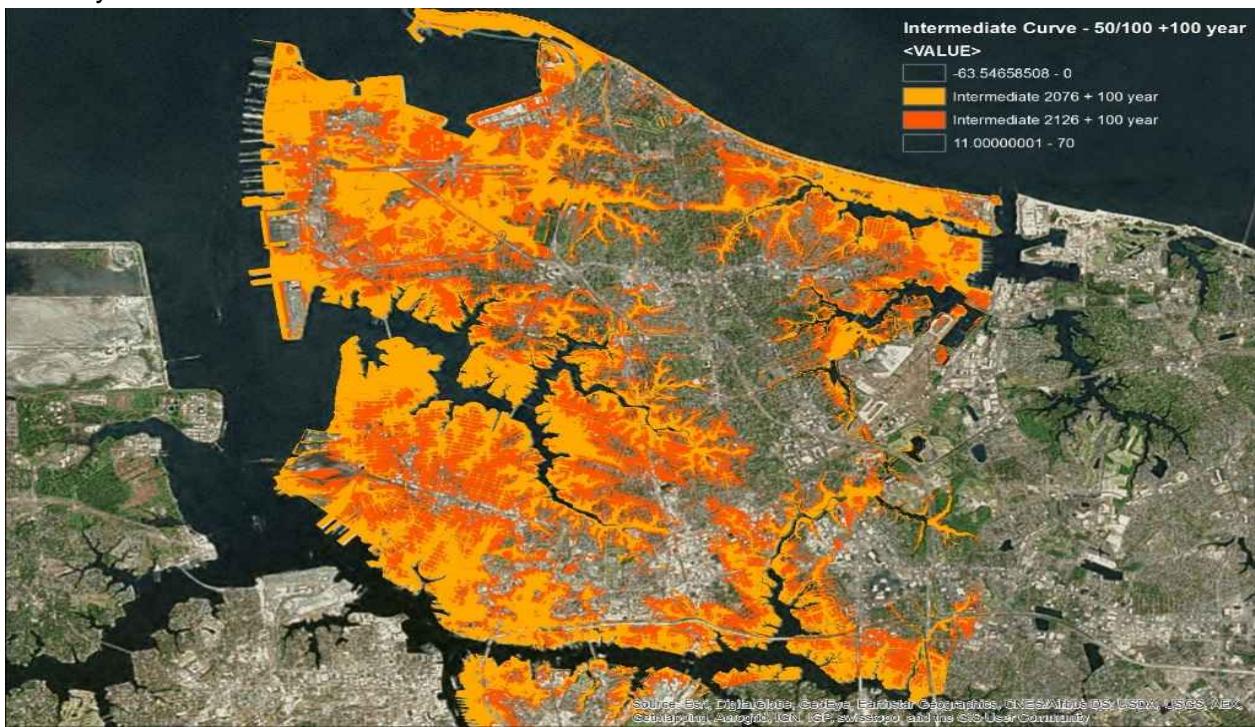
The following analysis of hazardous materials and wastes includes a description of existing contamination and the risk of exposure to hazardous materials and waste related to the contamination and to routine use, storage, and transportation of hazardous materials, along with the associated regulatory framework.

At this phase of the study, we have completed an overview in the form of a database search of Environmental Protection Agency (EPA) and Virginia Department of Environmental Quality (VDEQ) databases, limited visual site inspections, and coordination with appropriate agencies. Phase 1 site assessments will be done as needed during or before the PED phase, but not during this feasibility phase. If contaminated sites are discovered and a Phase 2 or subsequent

project (Fugro, 2012).

In addition, relative sea level in the local area is rising (at a current projected rate of 1.45 feet per 100 years). Assuming that this trend continues (or increases), both nuisance flooding and flooding from storm events capable of causing significant damage will increase. This will further the need to address the issue of coastal flooding on both project-specific and a holistic basis (Fugro, 2012).

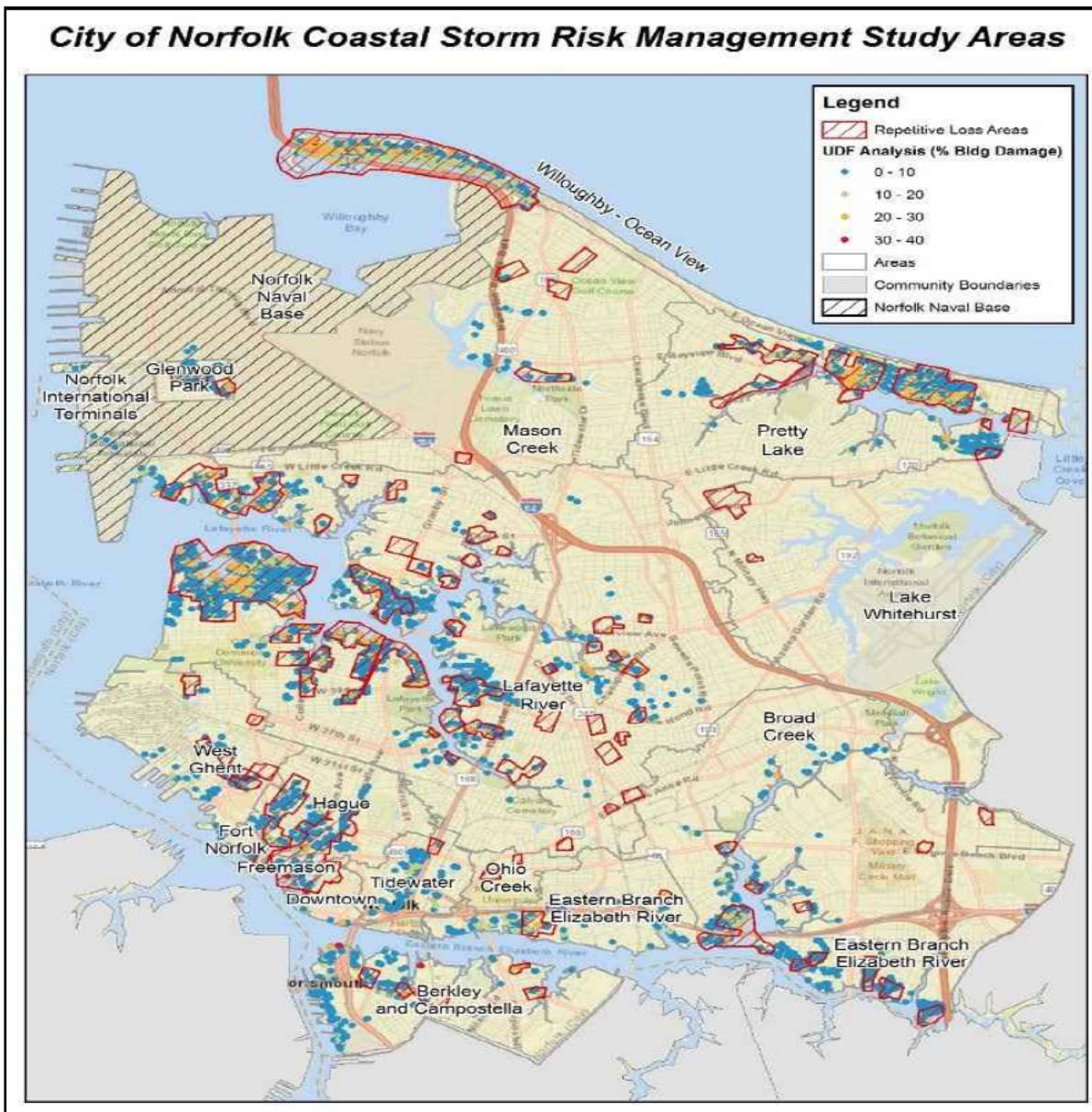
Significant events like the November 2009 Nor'easter and Hurricane Irene have served to: 1) reinforce Norfolk's decision to proactively evaluate coastal flooding and 2) elevate the City's needs and priorities for flood defense mitigation. In addition, smaller events such as the short but intense localized storm over the Broad Creek area in August 2009 can also cause local flooding and damage. Flood damage stemming from such short duration but intense storms can be significantly affected by the tidal conditions at the time of the storm. The August 2009 storm occurred at low tide but the large volume of rainfall captured in the Broad Creek basin caused water levels in the basin to increase by more than 1 foot and were elevated for about 6 hours (as measured by the local tide gauge). While the flooding and damage during that storm were significant, they were much less than would have occurred if that storm had coincided with peak rather than low tide conditions (Fugro, 2012). Figure 10-48 below depicts the projected FEMA base flood elevation (BFE) plus sea level rise for both the 50 year period of analysis and at 100 years.



**Figure 10-48. Projected FEMA 100 Year Floodplain Map**

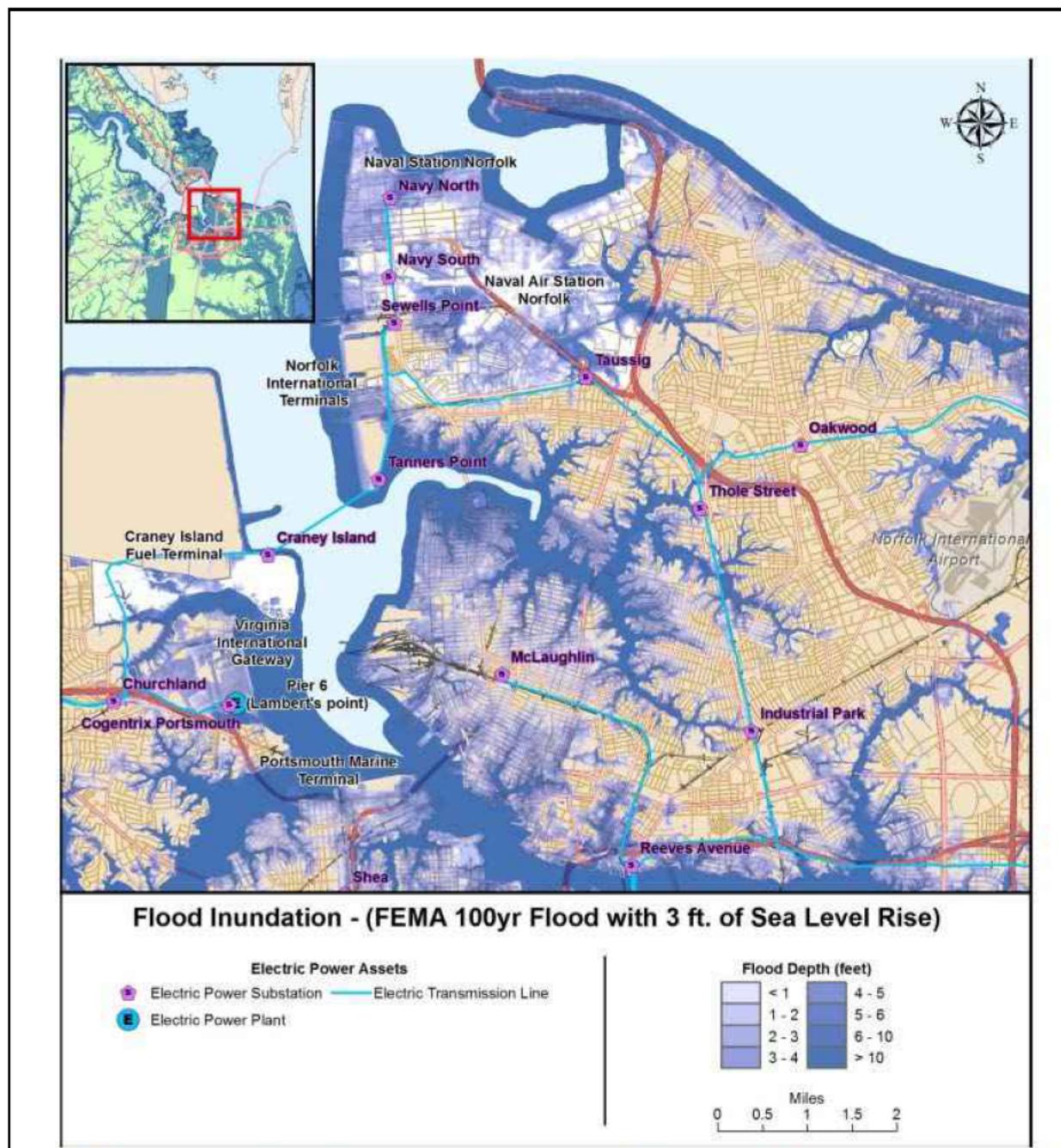
### **Interior Drainage Systems**

Norfolk experiences frequent flooding due to rain. Residents are accustomed to annual events that produce hazards and inconveniences due to road conditions and other flooding-induced safety issues.



**Figure 10-49. UDF Analysis**

Figure 10-49 depicts UDF points symbolized by building percent damage and the repetitive loss polygons. The UDF, or user defined facility, points represent structures whose centroid falls within the 1% annual chance floodplain. The UDF analysis, used in this study, applies depth damage curves to each structure and its contents based on characteristics such as occupancy, foundation type and height and year built to calculate % damage and \$ loss for structures, contents and where applicable, inventory. In the UDF analysis, structures in the Willoughby area show higher damage than depicted in the Tier 2 analysis. Additionally, it should be noted that UDF analysis was conducted on the published FIRMs. Flooding can occur in variety of ways, including precipitation and stormwater, therefore, it is expected that some repetitive loss polygons may include areas outside of the UDF analysis. It is also expected that buildings reporting damage in the UDF analysis may occur outside the repetitive loss polygons due to the unique nature of each storm event including tide, wind direction and precipitation.



**Figure 10-60. Flood Mapping with Transmission Level Electric Power Assets**

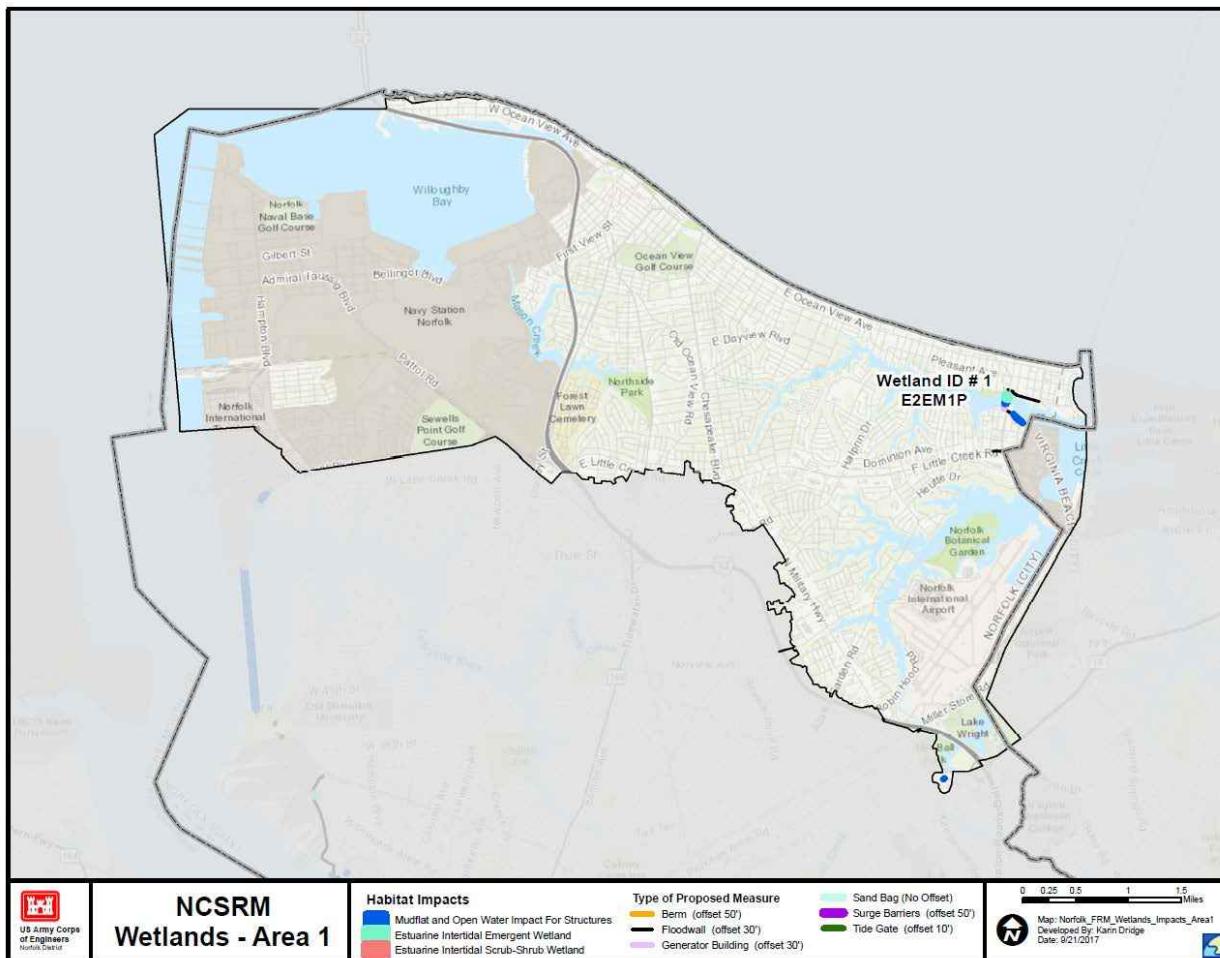
Source: Sandia National Laboratories 2016

### Telecommunications

Multiple carriers serve the city of Norfolk, including Verizon, Cox, NTelos, Sprint, AT&T, U.S. Cellular and Vonage. All communication is directed through wire centers, which are physical locations that contain telecommunications switches, including mobile services. Wire centers are vulnerable to flooding. Few in the City are vulnerable, due to the elevation they are located in as well as back-up centers and back-up power. However, there are some that can be flooded during a major storm event along with +3 feet of sea level rise, with the most vulnerable area in the City for a telecommunications failure being in the Lambert's point area. In general,

minor and not significant.

No wetland impacts would occur within Lake Whitehurst or along the Chesapeake Bay, as no fill or structures are proposed there.



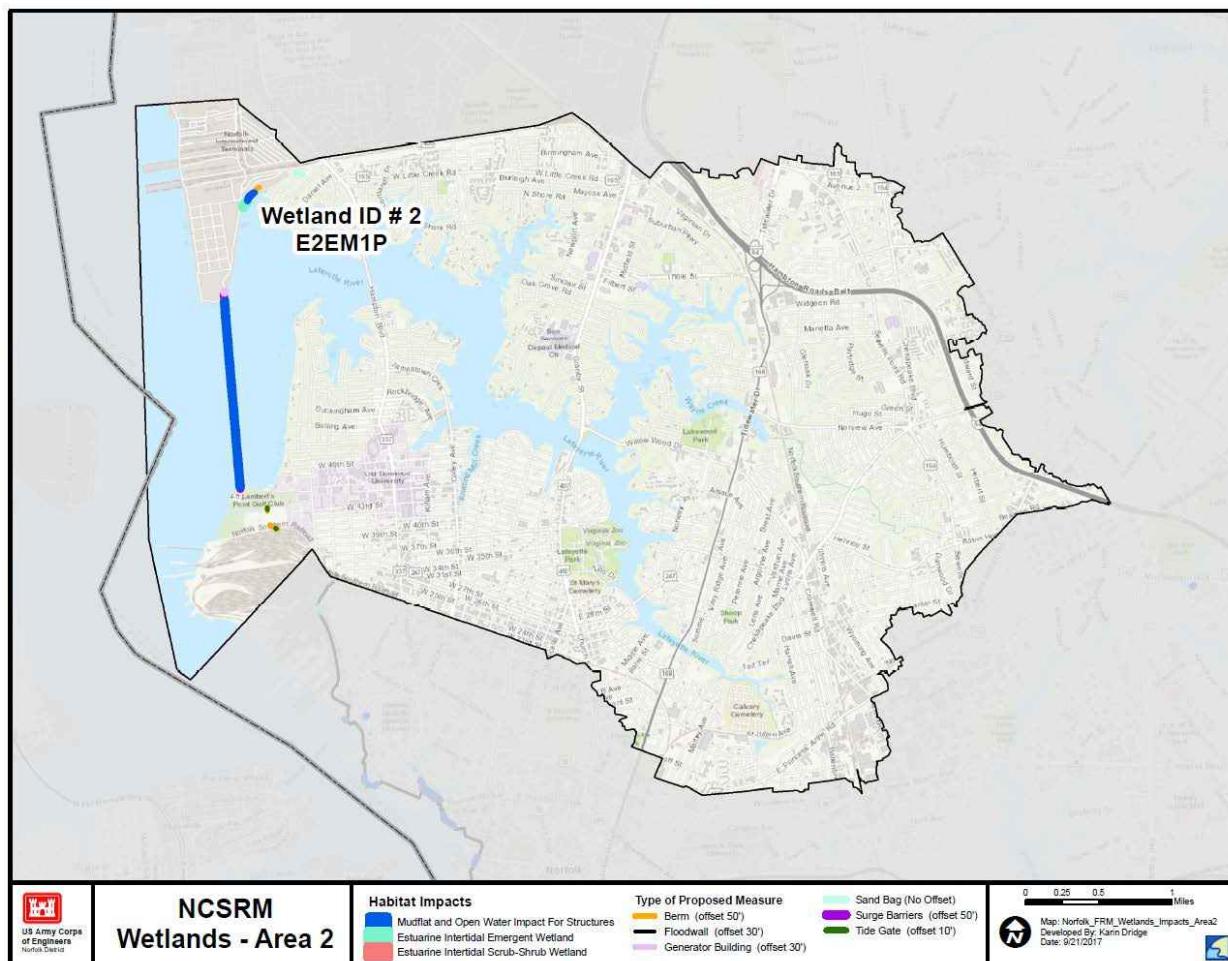
**Figure 11-6. Wetlands -- Area 1**

#### **Area 2: Lafayette River watershed**

There will be no direct short-term or long-term direct impacts on wetlands for the construction of the storm surge barrier at the mouth of the Lafayette River; the entire structure will cross subaqueous bottom. In addition, natural and nature based features, where compatible, may be implemented to the inside or outside of the proposed storm surge barrier. These could help to improve water quality and prevent erosion at this location.

An earthen berm is also proposed adjacent to NIT on the northern bank of the Lafayette River. This berm will be approximately 1,800 feet in length, and will impact approximately 0.2 acres of tidal emergent wetlands.

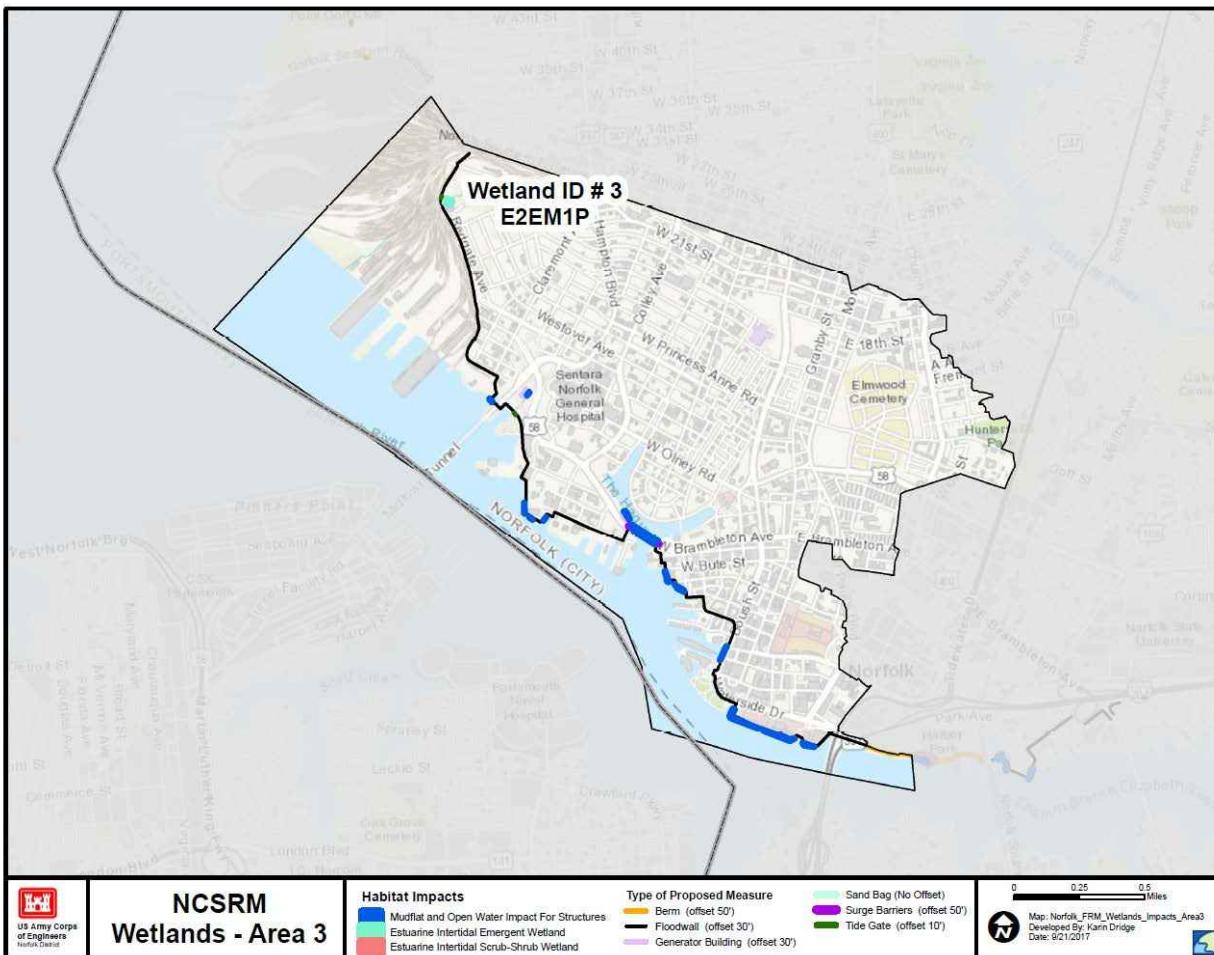
To address the potential short-term and long-term effects to wetlands in the Lafayette watershed from proposed surge barriers and associated tide gates across the mouth of the Lafayette River, water quality modelling was performed by the Virginia Institute of Marine Science (VIMS, 2017). Various parameters were assessed, including chlA (Chlorophyll A, a



**Figure 11-7. Wetlands -- Area 2**

### **Area 3: Elizabeth River, The Hague, Eastern Branch of the Elizabeth River**

In this Area, the only vegetated wetland impact would occur in the wetland community at Lamberts Creek. The floodwall alignment will begin along the Lamberts Point rail lines, abutting them and passing through wetland inlet. Approximately 0.075 acres of direct, permanent impact fill in emergent wetlands will occur there. Additional short-term fills will also be necessary for construction access; there will be determined during the PED phase. A tide sluice gate proposed will be placed in the inlet pipe and will only be closed temporarily, during the design storm event, and for periodic maintenance testing. However, as described above, these temporary closures are not expected to have more than a minor impact on the wetland community.



**Figure 11-8. Wetlands -- Area 3**

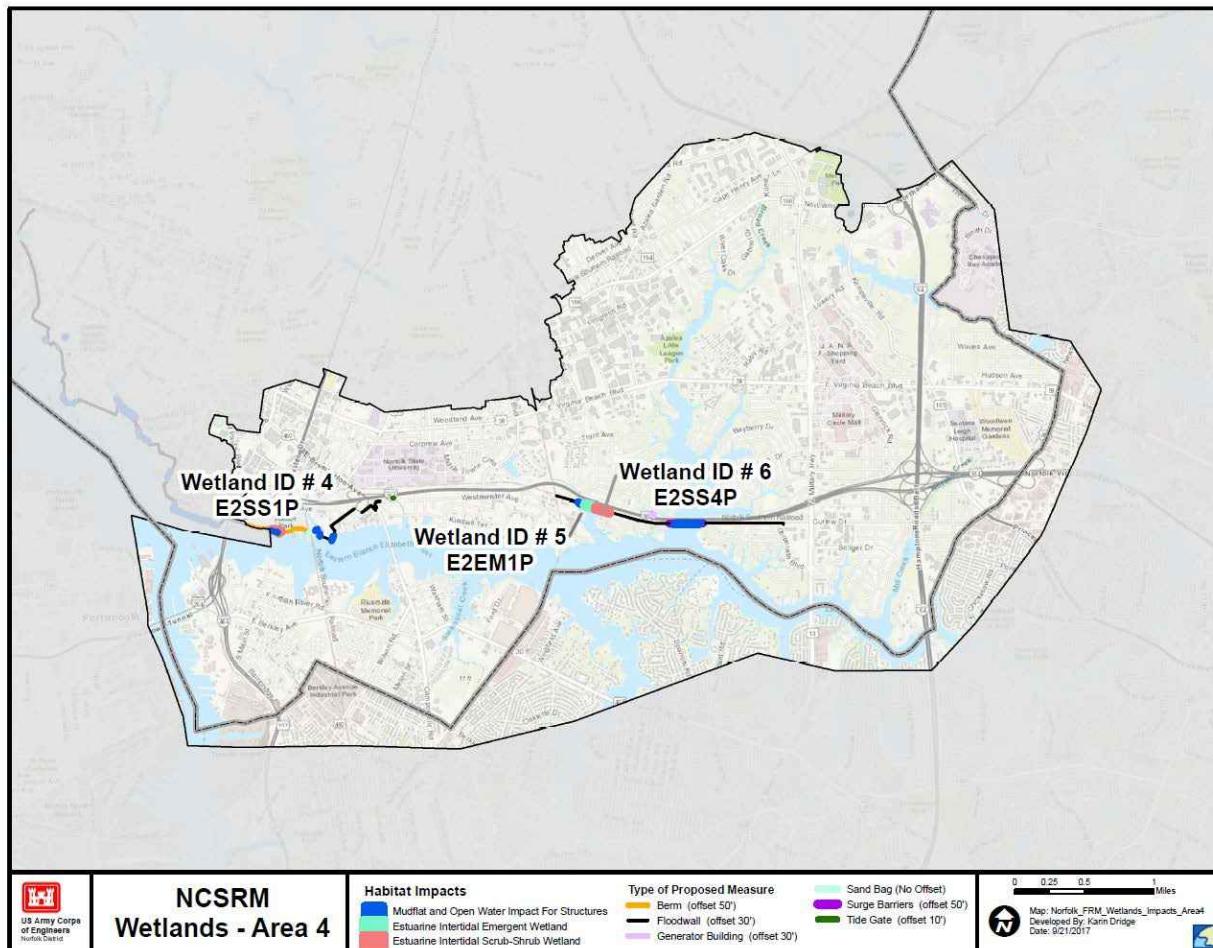
#### **Area 4: Eastern Branch of the Elizabeth River, Broad Bay**

This Area will have multiple wetland impact locations. Approximately 0.59 acres of tidal scrub/shrub wetlands will be permanently impacted by the construction of a berm around Harbor Park. Additional short-term fills may also be necessary for construction access; these will be determined during the PED phase.

Immediately east of Harbor Park, a tide sluice gate will be installed in a tidal canal that contains emergent wetlands. Approximately 0.05 acres of direct, permanent impact fill in emergent wetlands may occur there. Additional short-term fills may also be necessary for construction access; there will be determined during the PED phase. The tide sluice gate proposed will be placed in the inlet pipe and will only be closed temporarily, during the design storm event, and during periodic maintenance testing. However, as described above, these temporary closures are not expected to have more than a minor impact on the wetland community.

The largest direct and permanent wetland impact of the project is parallel to the Tide rail line, along the Eastern Branch of the Elizabeth River. There will be a direct, permanent impact to approximately 0.51 acres of tidal emergent wetland, and 0.606 acres of tidal scrub/shrub wetland for the installation of the floodwall. Further to the east, at the mouth of Broad Creek, there will be a direct permanent fill of approximately 0.02 acres of tidal emergent wetlands for

of a wetland delineation for the project and a design level adequate to determine the project footprint. The preliminary wetland mitigation plan is in the Environmental Appendix.



**Figure 11-9. Wetlands -- Area 4**

### 11.7.3 Alternative 3: Nonstructural Alternative

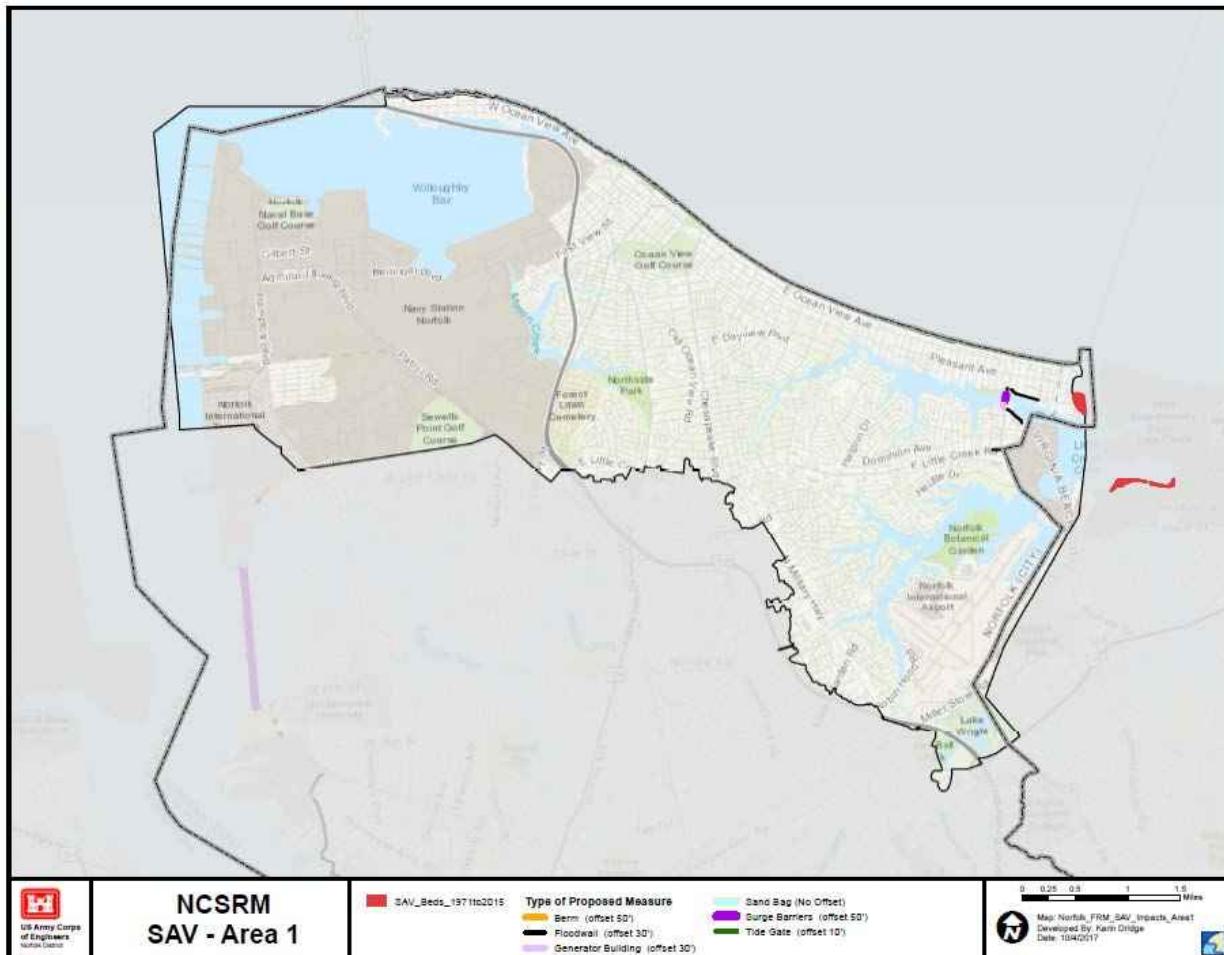
For this and all build alternatives, all of the existing ongoing projects and initiatives described under the No Action Alternative, as well as climate change and sea level rise, would be assumed to occur. The natural and nature-based features described for each Area in Alternative 2a would also apply to this alternative.

As indicated earlier, a wetland delineation has not been conducted. As project plans and impact areas are finalized later in the study, a wetland delineation will be undertaken pursuant to the 1987 Wetland Delineation Manual and the Atlantic and Gulf Coast Regional Supplement, to ascertain the actual footprint of jurisdictional wetlands impacted by the project. Until that time, and until the project is further designed, the wetland impacts can merely be estimated and preliminary, based on existing information, as described under "Methodology."

For this alternative, the nonstructural measures throughout the City are very numerous, and they would likely be installed around the most significant at-risk buildings and structures of the City's land uses. This land disturbance would be mostly limited to those specific structures

than the larger, is still at least 0.3 miles to the east of any proposed structure or fill. Reviews of records from 17 years reflect that SAV beds within the City of Norfolk have not changed much over the course of that time.

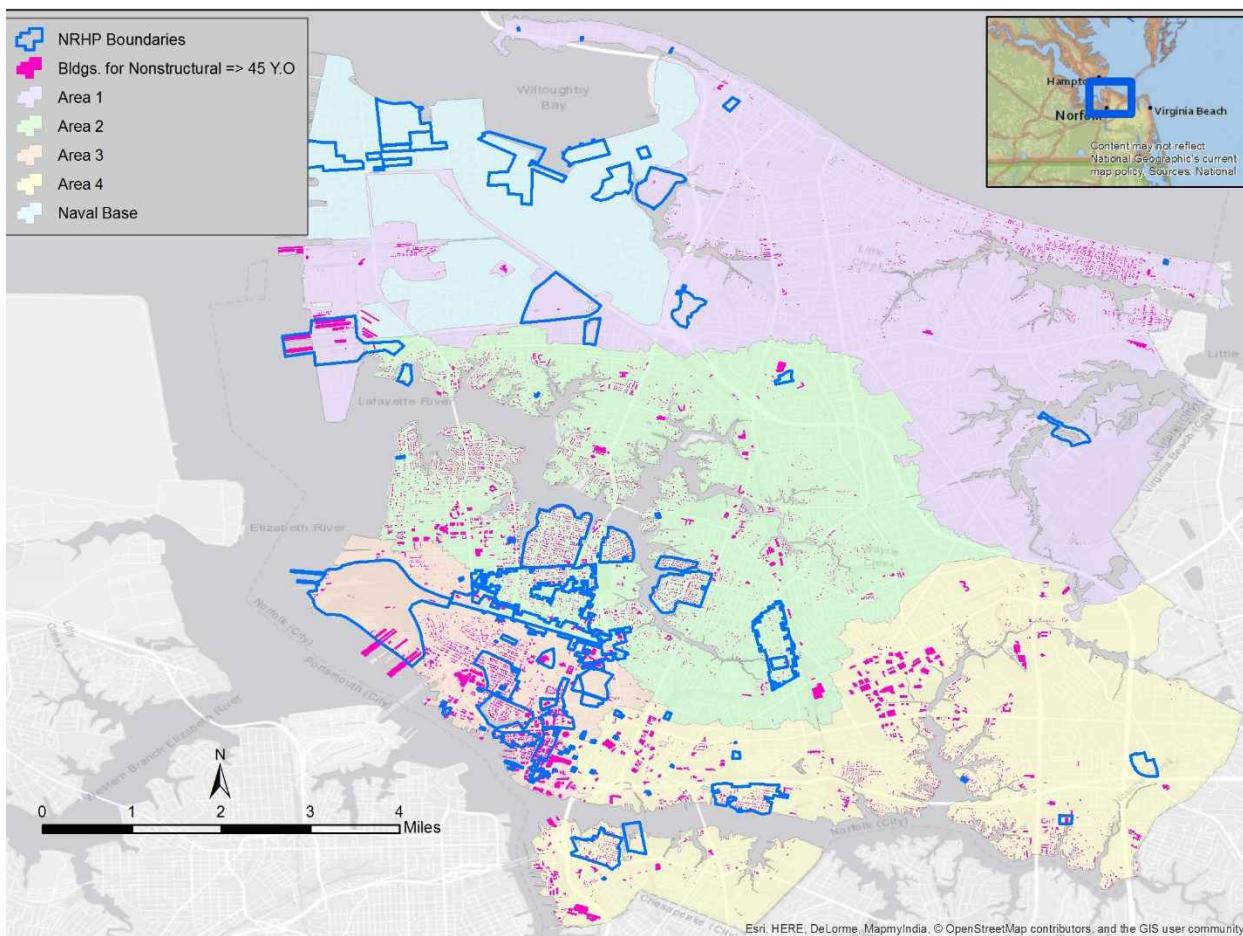
Based on the use of best management practices during construction, no permanent or temporary construction or turbidity impacts on SAVs are anticipated from the project.



**Figure 11-10. SAV - Area 1**

### 11.8.2 Cumulative Impacts

Climatic changes such as sea level rise and increasing global temperatures are predicted to occur as a result of burning of fossil fuels and deforestation. Predicted climate change impacts such as increased temperatures, ocean acidification, sea level rise, and changes in currents, upwelling and weather patterns, have the potential to cause changes in the nature and character of the estuarine ecosystem in the ROI. SAV outside of ROI are at increased risk of damage and loss from potential increases in sea level rise and salinity shifts. The location of these resources may shift in response to climate change and the ensuing sea level rise outside of the ROI. Although climate change has the potential to substantially alter the location, quantity, and SAV in the future outside of the ROI, implementation of any of the alternatives is not predicted to substantially cumulatively or synergistically interact with climate change and/or other effects on SAVs. Therefore, any permanent or temporary, and direct or indirect effects to



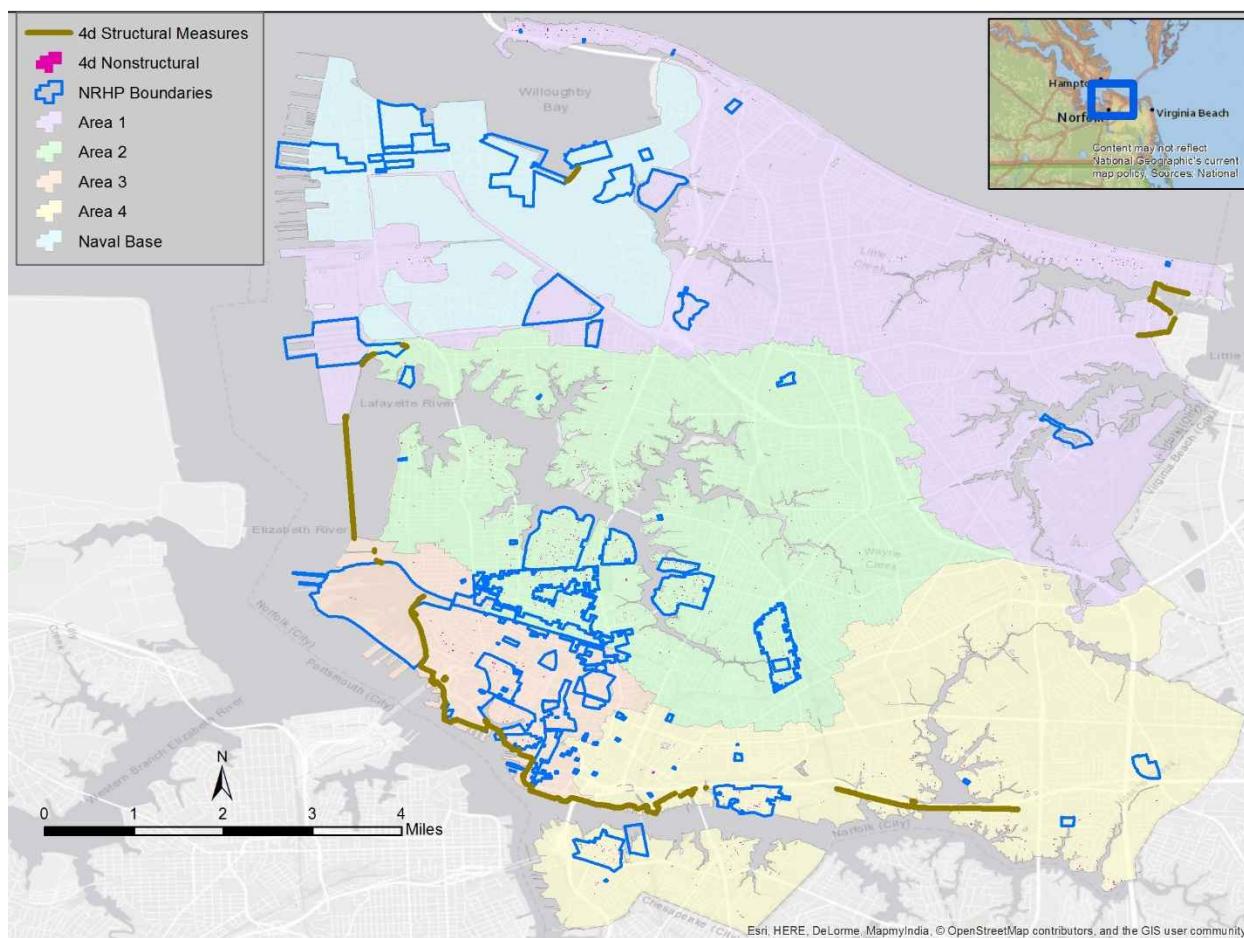
**Figure 11-13. Alternative 3 Nonstructural and Ringwall Treatments on NRHP and Potentially Significant Sites**

**Table 11-11 Number of Buildings Where Nonstructural Measures Would Cause Adverse Effects in Alternative 3**

Buildings 45 years or older identified for nonstructural	11,844
Buildings determined NRHP eligible or listed	2,072
Buildings determined not NRHP eligible	1,083
Buildings 45 or older unevaluated for NRHP eligibility	8,689
Nonstructural measure "buyout" on NRHP listed/eligible	138
Nonstructural measure "buyout" on unevaluated	463
Nonstructural measure "raise" on NRHP listed/eligible	291
Nonstructural measure "basement fill + raise" on NRHP listed/eligible	431
Listed/eligible raised total	722
NS measure " raise " on unevaluated	4,164
NS measure " basement fill + raise " on unevaluated	874
Unevaluated raised total	5,038

#### **Area 1: Willoughby and Oceanview Beaches, Little Creek, Pretty Lake, Mason Creek**

Very few historic buildings are in Area 1 and few were identified for nonstructural measures; however where ringwalls are prescribed there is the potential to impact archaeological sites.

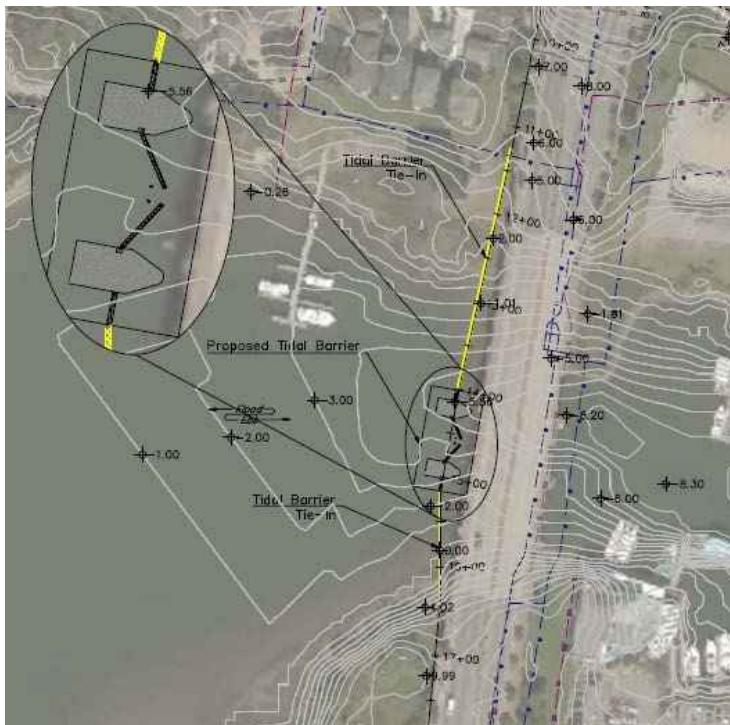


**Figure 11-14. Alternative 4d Measures**

Most of the historic properties affected by nonstructural measures would be along the Eastern Branch. The surge barrier across the mouth of the Lafayette River would protect the five NRHP historic districts as discussed for Alternative 2a above, and a number of individual listings and potentially eligible unevaluated properties, from the adverse effects of nonstructural measures.

The structural measures only Alternative 2a would have 13.99 linear miles of structural measures (berms, seawalls, etc.), while Alternative 4d would have a little less than that with 12.2 linear miles of structural measures. Based on these figures, Alternative 4d would likely result in less adverse effects to archaeological resources than the other two action alternatives.

As previously mentioned, there has been relatively little archaeological survey within the city of Norfolk. As the selection of a plan with extensive structural measures seemed likely early in this study. This would require extensive archaeological surveys and evaluations of effects to the built environment, forcing excessive costs and delays. Due to time and funding constraints it was decided to defer the completions of cultural resources surveys to the PED stage of the project through a Programmatic Agreement. This document will also set up procedures for resolving adverse effects that may be identified. The draft has been reviewed by the Virginia Department of Historic Resources. The Norfolk Historical Society, Naval History and Heritage Command, and the Delaware Nation have also reviewed and provided comments. A copy of the most recent draft of the Programmatic Agreement (PA) is in the Environmental Appendix.



**Figure 11-21. Proposed Miter Gate Across Pretty Lake**

There will be temporary, direct but minor impacts on navigation during construction. The construction area within the waterway will need to be isolated for safety purposes, and restrictions and/or closures of the waterway may be necessary. Construction of these features will require coordination and approval by the U.S. Coast Guard.

The east overland barrier is presently proposed to run along the Little Creek/Fishermans Cove waterfront, and during construction, could have temporary, direct, minor impacts on operations of an existing marina business by impeding access between the waterfront and the marina's yard and dry stack facility. The barrier would need to be designed to minimize these impacts.

Natural or nature-based features (NNBF) may be tied in with the barrier; however, it will not be in the way of navigation. Also, a living shoreline mitigation site is planned within Pretty Lake, along a northern shore, if practicable. This could have a minor impact on navigation, as it would need to be avoided by the construction of piers.

Overall, there will be direct, short-term and long-term, minor impacts to navigation.

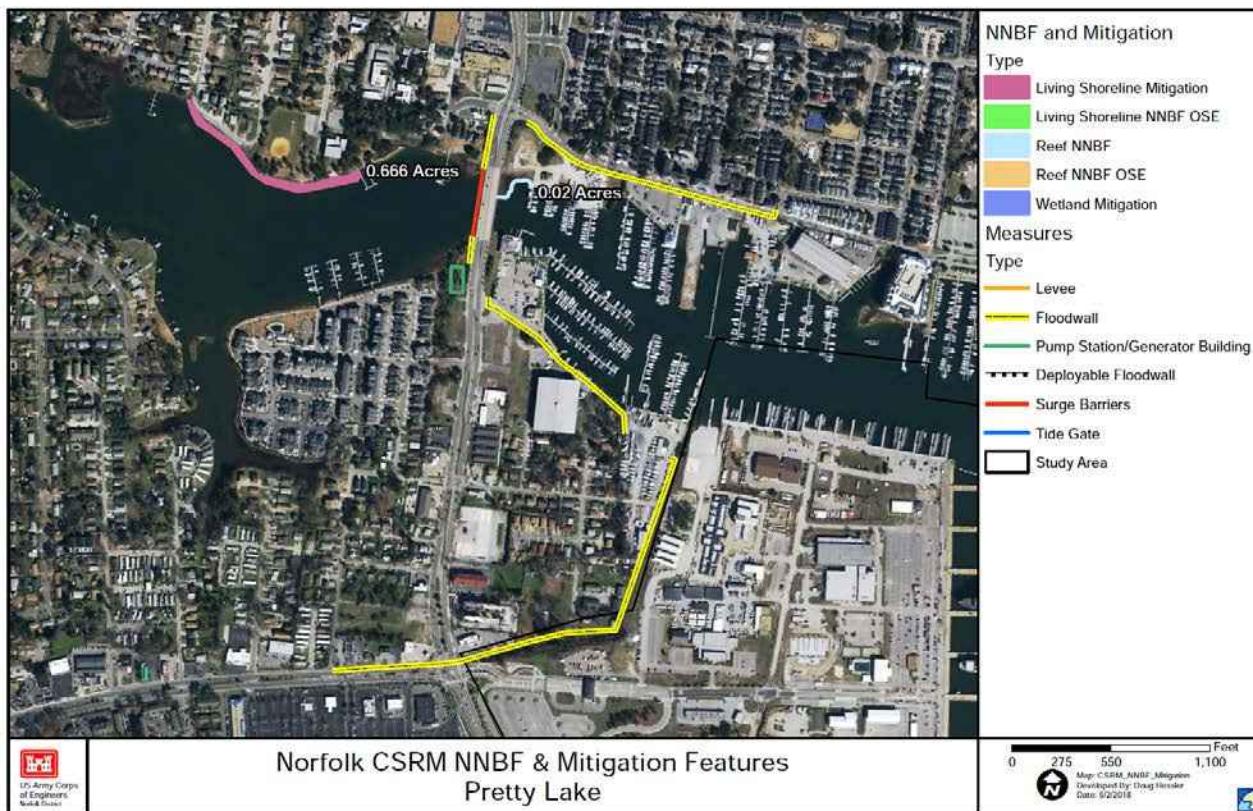


Figure 11-22. Proposed Wetland Mitigation, Living Shorelines, and Reefs – Area 1

other water activities would become limited to ten navigational openings across the mouth. However, USACE Lafayette River channel with its -8 foot depth and 100-foot width would remain in use. A large sector gate with a 150-foot horizontal navigational opening at that channel would be available for all vessel traffic. Generally, commercial businesses are already required by their insurance to utilize only the designated navigation channel, if one is available. In addition to the large sector gate, there will be nine smaller miter gate openings, approximately 600 feet apart, with approximately 50 feet of horizontal navigational clearance each. This is enough width for two small craft recreational vessels to pass safely; larger craft may use the channel. The new structure will require boaters to slow their speed and perhaps alter their use; but it will not unreasonably restrict access to navigable use of the waterway. Likewise, NNBFs as well as mitigation will be incorporated along or near the banks of the Lafayette River, but they will not be near the channel or any gate openings. They are anticipated to have a minor effect on navigation. They will not be near any navigation channels; but they would need to be avoided by the construction of piers.

All gates would remain open except for the necessary closures for design storm events to prevent storm surge from entering the Lafayette River. In addition, periodic testing of the operation, as well as maintenance of the gates would occur. This could result in minor, temporary impacts to navigation. Construction of these features as well as closures of the main navigation channel itself will require coordination and approval by the U.S. Coast Guard.



**Figure 11-24. Proposed Sector Gate at the Lafayette Navigation Channel**

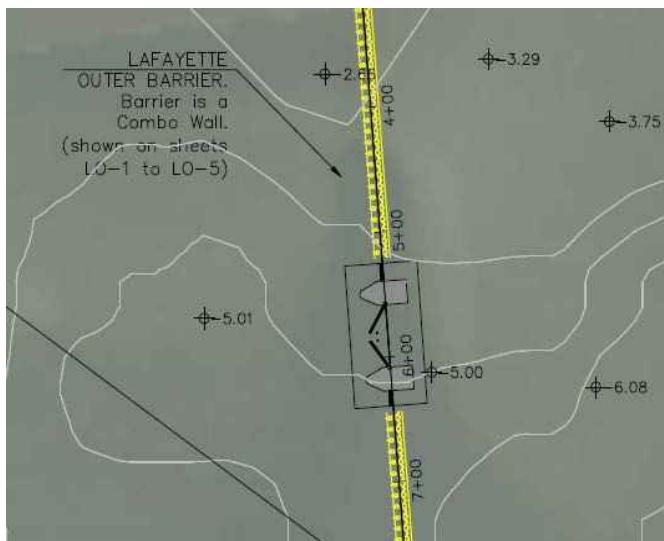


Figure 11-25. Proposed Storm Surge Barrier Wall and Miter Gate

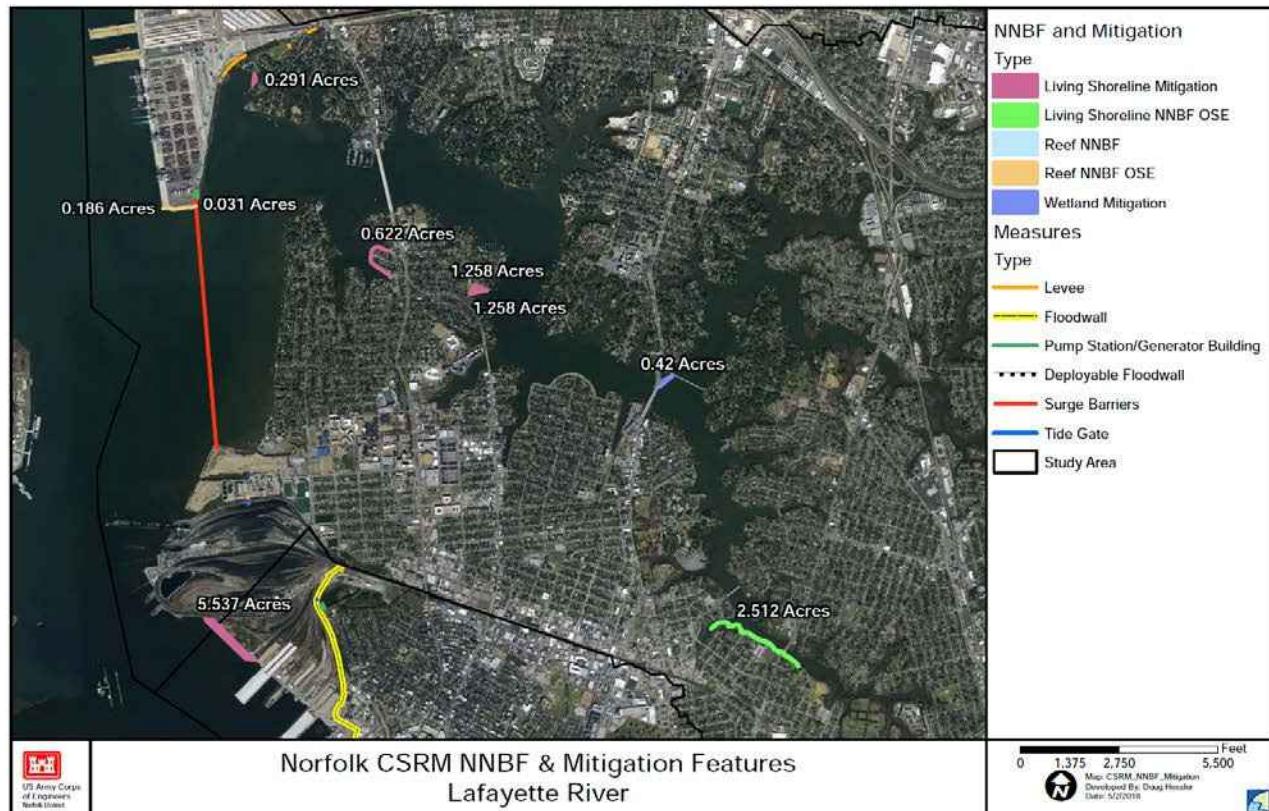
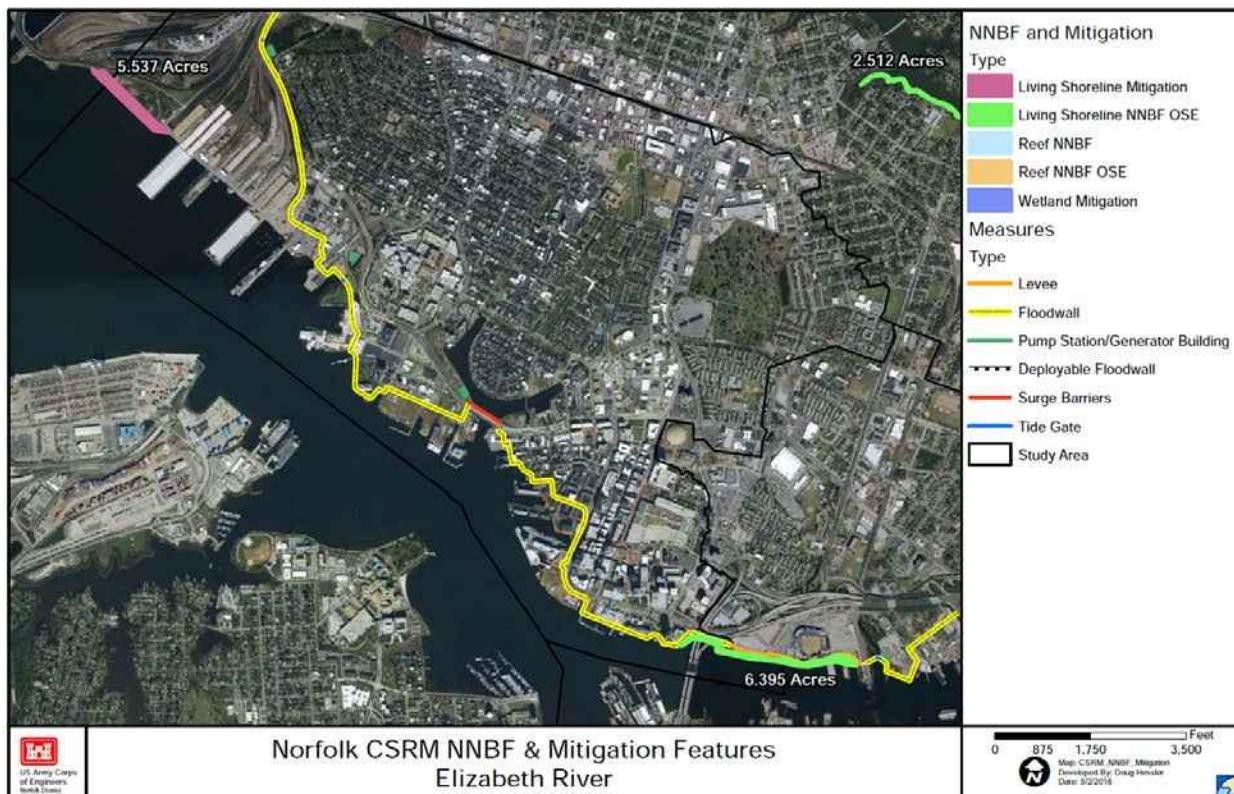


Figure 11-26. Proposed Wetland Mitigation, Living Shorelines, and Reefs – Area 2

locations during construction if possible. Some areas along the Waterside may temporarily be inaccessible to boats that pull up and moor there during construction as well.

NNBFs will be incorporated along or near the banks of the Eastern Branch of the Elizabeth River, but they will not be near the channel or any gate openings. They are anticipated to have a minor effect on navigation, as they are planned along Harbor Park. They will not be near any navigation channels; but they would need to be avoided by the construction of piers. They would be designed not to interfere with the Elizabeth River ferry terminal.



**Figure 11-28. Proposed Wetland Mitigation, Living Shorelines, and Reefs – Area 3, and part of Area 4**

There will be long lengths of floodwalls in Area 4. The number of pedestrian gates to be built into the floodwalls has not been determined at this stage of design; but pedestrian access could be more restricted in places. However, in Area 4, the floodwall will mostly parallel I-264, so this will be a negligible impact.

In addition, an operation and maintenance manual will ultimately be developed for the project. It will have much more detailed information about how and when the gates will close, notification procedures and instructions to the public, and how the maintenance operations will be conducted. The City is also in the midst of completing a Program for Public Information to educate citizens about the project and its operation. The Office of Emergency Preparedness will hold very specific public outreach to the entire city regarding these issues.



**Figure 11-30. Proposed Storm Surge Barrier Wall and Miter Gate at Broad Creek**

**Navigation.** USACE's The Elizabeth River Eastern Branch federal navigation channel which passes through Areas 3 and 4, would continue to be maintained and used. It is not anticipated that the channel itself or maintenance of it would be impacted by any of the structures, either temporarily or permanently.

The HRT Elizabeth River ferry service schedule to Harbor Park could be temporarily disrupted or may need to be altered, or service may need to move to differing locations during construction if possible. It is also possible that the ferry landing could be moved, due to the proposed berm.

Broad Creek, which is located north of I-264 and connects to the Elizabeth River Eastern Branch, is relatively shallow, and has no defined navigation channel; however, a channel could

be dredged in it in the future. It is used by recreational small craft. The six paired miter gates will have a horizontal navigational clearance of approximately 50 linear feet each. Tide gates proposed at Broad Creek inlet would not restrict navigation use clearance-wise. Waterway is almost entirely residential. Even if a channel was dredged there in the future navigation would not be disrupted.

Access to the construction sites may be difficult in some areas along the floodwalls where there is limited space between the floodwall proposed location and the I-264, light rail tracks, and water/marsh areas. Some of the construction may have to be done from barges in difficult-to-reach locations, but these would not be stationed in any navigation channels.

Natural and Nature Based Features will be incorporated along or near the banks of the Broad Creek or the Eastern Branch of the Elizabeth River, but they will not be near the channel or any gate openings, so they will have minor impacts on navigation. Currently, a wetland mitigation site is planned west of the railraod bridge, if practicable. Constructed oyster reef NNBF living shorelines would be placed along the west and east banks at the mouth of Broad Creek. There are some residences there, so these would need to be planned to minimize impacts on residents' navigable access.

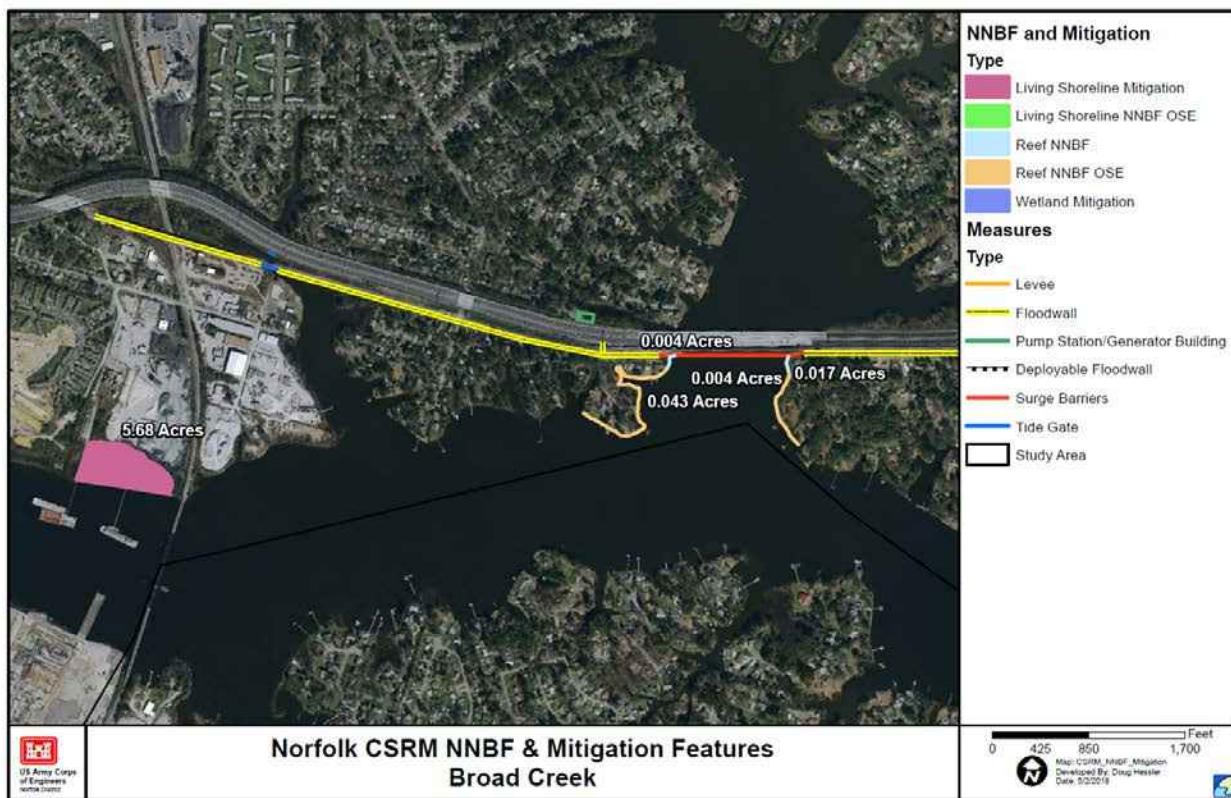


Figure 11-31. Proposed Wetland Mitigation, Living Shorelines, and Reefs – Area 4



## Appendix D

### Required Attachments



## Scope of Work Narrative

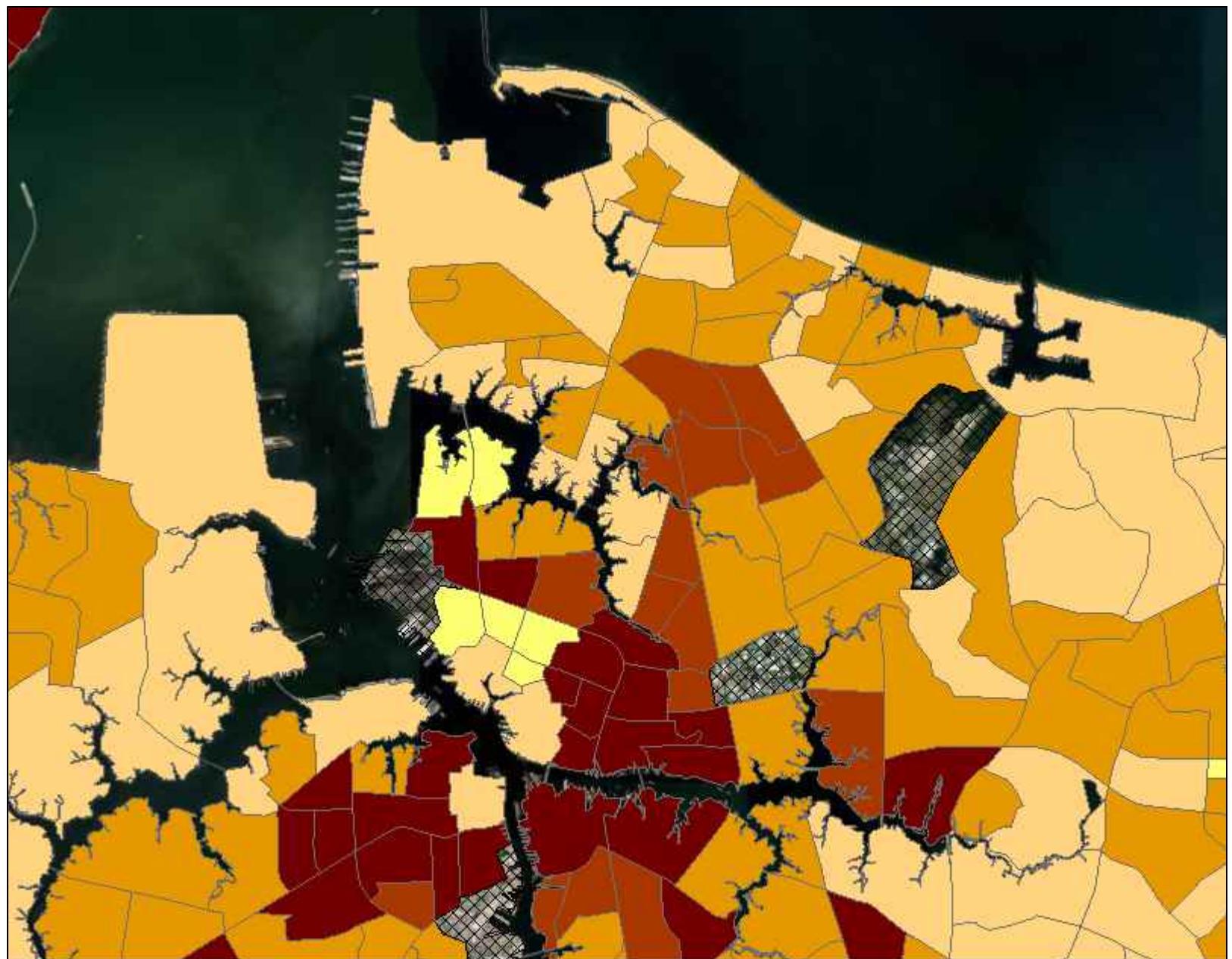
Supporting Documentation	Included
Detailed map of the project area(s) (Projects/Studies)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
FIRMette of the project area(s) (Projects/Studies)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Historic flood damage data and/or images (Projects/Studies)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
A link to or a copy of the current floodplain ordinance	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Non-Fund financed maintenance and management plan for project extending a minimum of 5 years from project close	<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
A link to or a copy of the current hazard mitigation plan	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
A link to or a copy of the current comprehensive plan	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Social vulnerability index score(s) for the project area from <a href="#">ADAPT VA's Virginia Vulnerability Viewer</a>	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
If applicant is not a town, city, or county, letters of support from affected communities	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Completed Scoring Criteria Sheet in Appendix B, C, or D	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A

## Budget Narrative

Supporting Documentation	Included
Authorization to request funding from the Fund from governing body or chief executive of the local government	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A
Signed pledge agreement from each contributing organization	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A

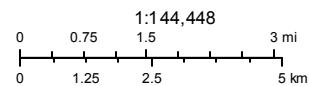
## Social Vulnerability Index Score

- Very Low Social Vulnerability
- Low Social Vulnerability
- Moderate Social Vulnerability
- High Social Vulnerability
- Very High Social Vulnerability
- ☒ Not included in the analysis



August 3, 2021

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



Created from the Virginia Vulnerability Viewer



ADAPTVA

# Norfolk Social Vulnerability Index Score

Census Tract Name	Social Vulnerability Index Score
Census Tract 25, Norfolk city, Virginia	1.69
Census Tract 27, Norfolk city, Virginia	1.71
Census Tract 29, Norfolk city, Virginia	1.37
Census Tract 31, Norfolk city, Virginia	1.40
Census Tract 34, Norfolk city, Virginia	2.33
Census Tract 35.01, Norfolk city, Virginia	2.25
Census Tract 41, Norfolk city, Virginia	3.62
Census Tract 42, Norfolk city, Virginia	4.47
Census Tract 43, Norfolk city, Virginia	2.28
Census Tract 44, Norfolk city, Virginia	1.37
Census Tract 45, Norfolk city, Virginia	1.83
Census Tract 46, Norfolk city, Virginia	2.34
Census Tract 47, Norfolk city, Virginia	2.84
Census Tract 48, Norfolk city, Virginia	3.44
Census Tract 50, Norfolk city, Virginia	1.66
Census Tract 51, Norfolk city, Virginia	2.44
Census Tract 57.01, Norfolk city, Virginia	1.20
Census Tract 59.01, Norfolk city, Virginia	1.22
Census Tract 69.02, Norfolk city, Virginia	1.63
Census Tract 20, Norfolk city, Virginia	1.48
Census Tract 26, Norfolk city, Virginia	0.15
Census Tract 28, Norfolk city, Virginia	0.50
Census Tract 32, Norfolk city, Virginia	1.08
Census Tract 33, Norfolk city, Virginia	1.38
Census Tract 57.02, Norfolk city, Virginia	1.17
Census Tract 58, Norfolk city, Virginia	1.33
Census Tract 62, Norfolk city, Virginia	0.90
Census Tract 64, Norfolk city, Virginia	0.89
Census Tract 70.02, Norfolk city, Virginia	1.28
Census Tract 9.01, Norfolk city, Virginia	0.26
Census Tract 1, Norfolk city, Virginia	-0.42
Census Tract 11, Norfolk city, Virginia	0.00
Census Tract 12, Norfolk city, Virginia	-0.48
Census Tract 13, Norfolk city, Virginia	0.29
Census Tract 14, Norfolk city, Virginia	0.75
Census Tract 15, Norfolk city, Virginia	-0.51
Census Tract 16, Norfolk city, Virginia	0.55
Census Tract 17, Norfolk city, Virginia	0.28
Census Tract 2.01, Norfolk city, Virginia	0.01
Census Tract 2.02, Norfolk city, Virginia	0.38

Census Tract 21, Norfolk city, Virginia	-0.27
Census Tract 22, Norfolk city, Virginia	-0.93
Census Tract 23, Norfolk city, Virginia	-1.28
Census Tract 24, Norfolk city, Virginia	-1.16
Census Tract 3, Norfolk city, Virginia	-0.21
Census Tract 30, Norfolk city, Virginia	-0.08
Census Tract 36, Norfolk city, Virginia	-1.10
Census Tract 37, Norfolk city, Virginia	-1.29
Census Tract 38, Norfolk city, Virginia	-1.31
Census Tract 4, Norfolk city, Virginia	-0.08
Census Tract 40.01, Norfolk city, Virginia	-1.96
Census Tract 40.02, Norfolk city, Virginia	-0.95
Census Tract 49, Norfolk city, Virginia	-0.44
Census Tract 5, Norfolk city, Virginia	0.15
Census Tract 55, Norfolk city, Virginia	0.11
Census Tract 56.01, Norfolk city, Virginia	0.24
Census Tract 56.02, Norfolk city, Virginia	0.23
Census Tract 59.02, Norfolk city, Virginia	0.26
Census Tract 59.03, Norfolk city, Virginia	0.26
Census Tract 6, Norfolk city, Virginia	0.12
Census Tract 60, Norfolk city, Virginia	0.58
Census Tract 61, Norfolk city, Virginia	0.60
Census Tract 65.01, Norfolk city, Virginia	0.43
Census Tract 65.02, Norfolk city, Virginia	-0.56
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Census Tract 66.05, Norfolk city, Virginia	0.64
Census Tract 66.06, Norfolk city, Virginia	-0.03
Census Tract 66.07, Norfolk city, Virginia	0.54
Census Tract 68, Norfolk city, Virginia	-0.07
Census Tract 69.01, Norfolk city, Virginia	0.57
Census Tract 7, Norfolk city, Virginia	-0.17
Census Tract 70.01, Norfolk city, Virginia	0.01
Census Tract 8, Norfolk city, Virginia	-0.31
Census Tract 9.02, Norfolk city, Virginia	-0.32
<b>Norfolk Average Social Vulnerability Index Score</b>	<b>0.59</b>

THE CITY OF  
**NORFOLK**<sup>®</sup>

*Historic Flood Damage Data and Images*

Event	Year	Number of Paid Claims	Total Amount Paid (1,000s)	Average Amount Paid (1,000s)
Hurricane Floyd (1999)	Aug 99	11	\$83	\$7.7
Hurricane Isabel (2003)	Sep 03	1,281	\$27,071	\$21.1
Nor'Ida (2009)	Nov 09	247	\$25,491	\$103.2
Hurricane Irene (2011)	Aug 11	737	\$12,725	\$17.3
Hurricane Sandy (2012)	Oct 12	202	\$2,557	\$12.7
Hurricane Matthew (2016)	Oct 16	295	\$4,774	\$16.2

Source: Federal Emergency Management Agency (FEMA) as of 3/31/2017

Note: Total amount paid was updated to 2017 price level using RS Means historical cost index for Norfolk, VA.



Figure 4-2. Hurricane Joaquin, October 2015. Firefighters rescue a stranded motorist  
Source: Hamptonroads.com

Matthew J. Strickler  
Secretary of Natural and Historic  
Resources and Chief Resilience Officer

Clyde E. Cristman  
Director



**COMMONWEALTH of VIRGINIA**  
**DEPARTMENT OF CONSERVATION AND RECREATION**

Rochelle Altholz  
Deputy Director of  
Administration and Finance

Nathan Burrell  
Deputy Director of  
Government and Community Relations

Darryl M. Glover  
Deputy Director of  
Dam Safety & Floodplain  
Management and Soil & Water  
Conservation

Thomas L. Smith  
Deputy Director of  
Operations

August 9, 2021

Matt Simons, AICP CZA CFM  
Principal Planner and Floodplain Administrator  
Department of Planning and Community Development  
810 Union St, Suite 508  
Norfolk, VA 23510

RE: City of Norfolk Resilience Plan Second Submission - CFPF

Dear Mr. Simons:

Thank you for providing an overview of your Resilience Plan, and informing DCR of the various plans that the City of Norfolk will be utilizing to fulfill the Resilience Plan submission requirements. After careful review and consideration, the Virginia Department of Conservation and Recreation has deemed the Plan complete and meets all the criteria outlined in the June 2021 Community Flood Preparedness Grant Manual. This approval will remain in effect for a period of three years, ending on August 8, 2024.

The following elements were evaluated as part of this review:

**1. Element 1: It is project-based with projects focused on flood control and resilience. DCR RESPONSE**

- a. Project-based: Nine watersheds—each with a defined geographic area, analysis of community social and environmental characteristics, types of flooding, and a tailored flood resilience strategy divided into 15 project areas, each with discrete projects identified.
- b. Projects focused on flood control and resilience included city-wide and various coastal projects and a specific project in Chesterfield Heights.

**2. Element 2: It incorporates nature-based infrastructure to the maximum extent possible. DCR RESPONSE**

- a. Natural and nature-based flood management measures are identified for use in projects throughout the city in the *Final Integrated City of Norfolk Coastal Storm Risk Management Feasibility Study / Environmental Impact Statement*, the *Combined Coastal and Precipitation Flooding Master Plan*, the *Hampton Roads Mitigation Plan* and *A Green Infrastructure Plan for Norfolk: Building Resilient Communities*.

600 East Main Street, 24<sup>th</sup> Floor | Richmond, Virginia 23219 | 804-786-6124

**3. Element 3: It includes considerations of all parts of a locality regardless of socioeconomic or race. DCR RESPONSE**

- a. All parts of a locality: Locality divided into 9 watersheds, with 90 planning districts covering the entirety of the jurisdictional boundary.
- b. Social vulnerability: Social implications of flood hazards and analysis of populations at-risk documented in the USACE *Final Integrated City of Norfolk Coastal Storm Risk Management Feasibility Study / Environmental Impact Statement*, the *Combined Coastal and Precipitation Flooding Master Plan* and in *PlaNorfolk 2030*.
- c. Demographic Analysis: Demographic Analysis conducted by USACE, utilizing U.S. Census Bureau, Bureau of Labor and Statistics, Virginia Employment Commission, and other information from local planning agencies, and incorporated into the *Final Integrated City of Norfolk Coastal Storm Risk Management Feasibility Study / Environmental Impact Statement*.

**4. Element 4: It includes coordination with other local and inter-jurisdictional projects, plans, and activities and has a clearly articulated timeline or phasing for plan implementation. DCR RESPONSE**

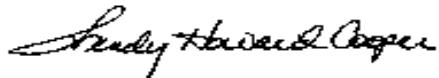
- a. Coordination with other projects, plans, and activities: Contains the planning processes and frameworks which outline local and regional plans used by the City and address resilience; and how they have been integrated for flood adaptation planning.
- b. Clearly articulated timeline or phasing for plan implementation: 5 year timeline presented in the *Combined Coastal and Precipitation Flooding Master Plan*. Phased time-line for completion found within *PlaNorfolk 2030*, *Vision2100*, and *A Green Infrastructure Plan for Norfolk: Building Resilient Communities*. Phased approach for project implementation contained within the *Fugro Atlantic Norfolk Preliminary City-wide Coastal Flooding Mitigation Concept Evaluation and Master Plan Development*. Program phases clearly articulated and an impact statement completed in USACE *Final Integrated City of Norfolk Coastal Storm Risk Management Feasibility Study / Environmental Impact Statement*.

**5. Element 5: Is based on the best available science, and incorporates climate change, sea level rise, storm surge (where appropriate), and current flood maps.**

- a. Technically backed water-resources analysis, sea level rise projections, storm surge, and climate change incorporated into the strategic approach presented in the *Hampton Roads Hazard Mitigation Plan*, the *Final Integrated City of Norfolk Coastal Storm Risk Management Feasibility Study / Environmental Impact Statement*.

VA DCR looks forward to working with you as you work to make the City of Norfolk a more resilient community. If you have questions or need additional assistance, please contact us at cfpf@dcr.virginia.gov. Again, thank you for your interest in the Community Flood Preparedness Fund.

Sincerely,

A handwritten signature in black ink, appearing to read "Wendy Howard Cooper".

Wendy Howard Cooper, Director  
Dam Safety and Floodplain Management

cc: Darryl Glover, DCR

## Resilience Planning Overview for the City of Norfolk

In response to the resilience planning requirements of the **Community Flood Preparedness Fund** (“the CFPF” or “Fund”) outlined within the [2021 CFPF Grant Manual](#) (Appendix G: Elements of Resilience Plans), the City of Norfolk (“the City”) has prepared the following Resilience Planning Overview of formal and relevant plans utilized for resilience planning efforts by the City to prioritize potential projects and to assist the City in its efforts to secure funding for such critical resilience plans, studies and projects.

The **Elements of Resilience Plans** taken from Appendix G of the 2021 CFPF Grant Manual, from which communities are expected to highlight the stated resilience planning contents as they related to CFPF grant applications, are as follows:

1. *It is project-based with projects focused on flood control and resilience.*
2. *It incorporates nature-based infrastructure to the maximum extent possible.*
3. *It includes considerations of all parts of a locality regardless of socioeconomics or race.*
4. *It includes coordination with other local and inter-jurisdictional projects, plans, and activities and has a clearly articulated timeline or phasing for plan implementation.*
5. *Is based on the best available science, and incorporates climate change, sea level rise, storm surge (where appropriate), and current flood maps.*

Norfolk’s resilience planning elements are not contained within an adopted “stand alone” plan. However, Norfolk’s utilizes various plans within a resilience repertoire, which altogether serve multiple needs for various audiences; from technical to public-facing to operational. This Resilience Planning Overview will expressly identify to the grant reviewer, and to the public, how various resilience planning documents of the City of Norfolk satisfy all the CFPF Resilience Plan elements.

The following plans for the City of Norfolk will contribute to this Resilience Planning Overview:

- [plaNorfolk2030](#) (2013, as amended)
- [Vision2100](#) (2016)
- [Hampton Roads Hazard Mitigation Plan](#) (2017)
- [Combined Coastal and Precipitation Flooding Master Plan](#) (2017)
  - Appendix A: [Norfolk Preliminary City-wide Coastal Flooding Mitigation Concept Evaluation and Master Plan Development](#) (Fugro Atlantic)
  - Appendix B: [City-wide Drainage and Watershed Master Plan](#) (Timmons Group)
- [A Green Infrastructure Plan for Norfolk](#) (2018, as amended)
- [USACE Coastal Storm Risk Management \(CSRM\) Feasibility Study and Environmental Impact Statement](#) (2019)
- [Zoning Ordinance of the City of Norfolk](#) (2018, as amended)
- [Development of an Urban Resilience Analysis Framework with Application to Norfolk, VA](#) (2016)

Responses are provided below in red based on the various Norfolk plans for the following example resilience elements outlined in Appendix G of the 2021 CFPF Grant Manual:

- **Equity based strategic policies for local government-wide flood protection and prevention.**  
The [Hampton Roads Hazard Mitigation Plan](#) recommends the highest priority of protection to be reserved towards protection projects for severe repetitive loss areas (Mitigation Actions 8 &

11) in Norfolk. Research in Norfolk has shown that these areas are often places where the most vulnerable residents are housed.

Additionally, Mitigation Action 12 recommends Norfolk begin risk/hazard mitigation efforts equitably by first implementing a major flood control project within the historically black community of Chesterfield Heights; implementation of a \$112M HUD project awarded through the National Disaster Resilience Competition (construction currently underway).

- **Proposed projects that enables communities to adapt to and thrive through natural or human hazards.**

The [Combined Coastal and Precipitation Flooding Master Plan](#) (Norfolk's "Flooding Master Plan") is based on a major multi-year study effort supported by technical analyses and recommendations from Fugro Atlantic within the [Norfolk Preliminary City-wide Coastal Flooding Mitigation Concept Evaluation and Master Plan Development](#) (the "Fugro report"). The Flooding Master Plan is also supporting by a thorough analysis and priority ranking technical guide of the City's drainage conveyance system, [City-wide Drainage and Watershed Master Plan](#) by Timmons Group.

Together, with this technical supporting documentation, the [Flooding Master Plan](#) provides the framework for Norfolk to intelligently review and prioritize flood protections project to enable Norfolk to adapt and thrive to current and future flood threats.

- **Documentation of existing social, economic, natural, and other conditions present in the local government.**

Sandia National Laboratories provided an analysis framework ([Development of an Urban Resilience Analysis Framework with Application to Norfolk, VA](#)) for conceptualizing the resilience needs for Norfolk, including vulnerability assessments for critical infrastructure with the context of local economic and logistical impacts. The findings of which have been incorporated into other resiliency plans such as the USACE Coastal Storm Risk Management Study.

The [USACE Coastal Storm Risk Management \(CSRM\) Feasibility Study and Environmental Impact Statement](#) presents a robust analysis of the best recommendations for City-wide flood protection measures for the City of Norfolk. This report includes 10% engineered designs for the various flood protection measures recommended throughout the entire community, and a preliminary Environmental Impact Statement is included outlining the existing social, economic, natural conditions, vulnerabilities and stressors within the natural and social environment, as well as proposed impacts. See the various CSRM appendices for these detailed conditions and impact reports.

- **Review of the vulnerabilities and stressors, both natural and social in the local government.**  
See CSRM comment above. Additional overview of the vulnerabilities and stressors can be found in the [Hampton Roads Hazard Mitigation Plan](#).

- Forward-looking goals, actionable strategies, and priorities through as seen through an equity-based lens.

Norfolk remains committed to presenting all action plans through an equity-based lens, as found within the actionable strategies of [A Green Infrastructure Plan for Norfolk](#) and the [Hampton Roads Hazard Mitigation Plan](#). Both plans are tactical, and recommendation are based on a 5-year forward-looking outlay. Recommendations of the Fugro report are based on a 50-year outlay, and recommendations of [Vision2100](#) geared towards the year 2100.

- Strategies that guides growth and development away from high-risk locations that may include strategies in comprehensive plans or other land use plans or ordinances or other studies, plans or strategies adopted by a local government.

[Vision2100](#) is serves a land use guide for the City. The plan divides Norfolk up into four main areas by which the City will focus new investments and make necessary steps to prepare for a changing environment:

- ✓ Purple: Low Flood Risk / Low Degree of Civic Assets: Establishing Neighborhoods of the Future
- ✓ Green: Low Flood Risk / High Degree of Civic Assets: Designing New Urban Centers
- ✓ Yellow: High Flood Risk / Low Degree of Civic Assets: Adapting to Rising Waters
- ✓ Red: High Flood Risk / High Degree of Civic Assets: Enhancing Economic Engines (protect!)

- Proposed acquisition of land or conservation easements or identification of areas suitable for conservation particularly areas identified as having high flood attenuation benefit by [ConserveVirginia](#) or similar data driven tools.

[Vision2100](#) provides the framework for selecting the areas suitable for conservation easements. The [Norfolk Zoning Ordinance](#) provides the mechanism for purchasing land conservation easement credits from the [Coastal Resilience Overlay](#) through transferring [Resilient Quotient points](#) to the [Upland Resilience Overlay](#) (requires extinguishment of a density unit – developable dwelling unit). The conservation easement, while recorded on the deed and kept on file with the Planning Department, can be held by the property owner, the Zoning Ordinance also permits it to be placed in a land trust.

- Identification of areas suitable for property buyouts in frequently flooded areas.

See [Vision2100](#) “Yellow” areas (High Flood Risk / Low Degree of Civic Assets: Adapting to Rising Waters) and Coastal Resilient Overlay areas on the [Norfolk Zoning Map](#).

- Identification of critical facilities and their vulnerability throughout the local government such as water and sewer or other types identified as “lifelines” by FEMA.

A list of all critical facilities is contained within the [Norfolk Emergency Operations Manual](#) (2020). See Mitigation Action 5 from [Hampton Roads Hazard Mitigation Plan](#): “Purchase and install generators or other continuous power sources for critical facilities and infrastructure. This action may include, but is not limited to pump stations, EOC (Emergency Operations Center), shelters, underpasses and important traffic signals.” The critical facilities list is available upon request.

- Identified ecosystems/wetlands/floodplains suitable for permanent protection.  
See [A Green Infrastructure Plan for Norfolk](#), this includes an *Action Plan Appendix for Threatened and Endangered Species* within critical floodplain habitats, as well as a detailed ecological inventory with recommendations for floodplain protection measures within an connected open space corridor network.
- Identified incentives for restoring riparian and wetland vegetation.
  - The City's Public Works Division of Stormwater Management offers the [Stormwater Fee Reduction Program](#) for homeowners and businesses who opt to implement water quality improvements on their private property including riparian buffer and shoreline management improvement.
  - [Environmental Conservation Consulting](#) – Norfolk annually funds a contract to coordinate with residential property owners for implementation of water quality improvements on their private property including riparian buffer and shoreline management improvement through a cost-share program. Property owners get a percentage of the project paid through the contractor via the Environmental Conservation Consulting services contract.
  - Norfolk regularly applies for grants to partner with community organizations for implementation of green infrastructure of public lands – projects are reviewed by the **Watershed Management Task Force** to ensure that projects are furthering the goals and objectives of the adopted [Green Infrastructure Plan for Norfolk](#).
- A framework for implementation, capacity building and community engagement.  
The **Watershed Management Task Force** and the recently created Program for Public Information committee are two groups made up of joint staff/citizen/technical expert members, which collectively drive the City's ongoing programing for green infrastructure projects and flood mitigation messaging. Capital Improvement Project funding recommendations from the [Green Infrastructure Plan for Norfolk](#) are also reviewed monthly by the Watershed Management Task Force.
- Strategies for creating knowledgeable, inclusive community leaders and networks.  
The 12-member Norfolk Coastal Management Review Board (CMRB) provides recommendations to the 7-member Erosion Advisory Commission, which is partially comprised of members of the CMRB. The CMRB is made up of elected leaders, civic league presidents/community leaders and technical experts from the Virginia Institute of Marine Science, Virginia Marine Resources Commission, Army Corp of Engineers, Old Dominion University Department of Ocean, Earth and Atmospheric Sciences, and city technical staff, providing workshops, seminars and project assessments of coastal mitigation and erosion projects; specifically intended to build grassroots technical capabilities and citizen champions within the community. The Norfolk CMRB and Erosion Advisory Commission is established by [City Code](#) and guided by the City's adopted [Sand Management Plan](#).
- A community dam safety inventory and risk assessment posed by the location and condition of dams.  
Not applicable in Norfolk – not at dam risk.

- A characterization of the community including population, economics, cultural and historic resources, dependence on the built environment and infrastructure and the risks posed to such infrastructure and characteristics by flooding from climate change, sea level rise, tidal events or storm surges or other weather.

This general characterization is well documented within the general/comprehensive plan for the City of Norfolk – [plaNorfolk2030](#). This includes dozens of resiliency recommendations for flood risk reduction and communication.

- Strategies to address other natural hazards that would cause, affect or result from flooding events including:
  - Earthquakes.
  - Storage of hazardous materials
  - Landslides/mud/debris flow/rock falls.
  - Prevention of wildfires that would result in denuded lands making flooding, mudslides or similar events more likely.
  - Preparations for severe weather events including tropical storms or other severe storms, including winter storms.

The [Hampton Roads Hazard Mitigation Plan](#) is a FEMA-accredited all-hazards plan.



## Required Documents: Links

**FIRM Maps:** <https://drive.google.com/drive/folders/1zISYqMWhmwSFTz1-5gWA61RVpD1GRy45?usp=sharing>

**Comprehensive Plan (plaNorfolk2030):** <https://www.norfolk.gov/DocumentCenter/View/2483>

**Green Infrastructure Plan:** <https://www.norfolk.gov/DocumentCenter/View/38067>

**Vision2100:** <https://www.norfolk.gov/DocumentCenter/View/27768>

**Hampton Roads Hazard Mitigation Plan:** <https://www.hrpdcva.gov/library/view/620/2017-hampton-roads-hazard-mitigation-plan-and-appendices/>

**Norfolk Floodplain Ordinance:** [https://www.norfolkva.gov/norfolkzoningordinance/#Norfolk-ZO/3\\_9\\_Overlay\\_Districts\\_and\\_Designations.htm#\\_Toc502655724?TocPath=Article%25203%253A%2520Zoning%2520Districts%257C3.9%2520Overlay%2520Districts%2520and%2520Designations%257C](https://www.norfolkva.gov/norfolkzoningordinance/#Norfolk-ZO/3_9_Overlay_Districts_and_Designations.htm#_Toc502655724?TocPath=Article%25203%253A%2520Zoning%2520Districts%257C3.9%2520Overlay%2520Districts%2520and%2520Designations%257C) 7

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## DOCUMENT TRANSMITTAL FORM

Use for All City Documents Which Require the City Manager's Staff Approval

For CM Office use only:

DTS # \_\_\_\_\_

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\* PLEASE INDICATE IF THERE IS A LEGITIMATE DUE DATE BY WHICH THE CITY MANAGER MUST RESPOND \*

Due Date: 9/1/2021:

Return Completed Document To: Stephanie Daniel - Resilience

5DEPARTMENT	Public Works / Resilience
<b>A. TO BE COMPLETED FOR CONTRACTS, AGREEMENTS, &amp; GRANTS:</b>	
TITLE	Sept 2021 Community Flood Preparedness Fund application
PARTY (Company and principal's names with which the City is entering into the agreement.)	Virginia Department of Conservation and Recreation (DCR)
EFFECTIVE DATES (Start & end dates)	6/9/2021 – 1/1/25
TOTAL DOLLAR VALUE	\$3,558,977 (\$2,227,488 grant request; \$1,331,489 match)
FUNDING SOURCE (Operating or capital budget; budget year; grant or other source. Show account information)	<b>SOURCE:</b> STORM WATER <b>ACCOUNT:</b> 2300-35-4299-FY21 (\$500,000 for Lake Whitehurst Study); 2300-35-4313-FY21 (\$500,000 for Colley Ave PS); 2300-35-3035-FY20 (\$219,489 for Colley Ave PS); 4000-35-4188-FY16 (\$100,000 for CSRM Studies); 2300-35-010-5303-712 (\$12,000 for Floodplain Management Plan)
TYPE (New or extension)	New
SUMMARY OF SCOPE OF SERVICE/ PROGRAM	Requested grant funds will support 1) Studies required through Coastal Storm Risk Management Study; 2) Flooding study of Lake Whitehurst watershed; 3) Floodplain Management Plan development, and 4) Construction of Colley Ave Pump Station upgrades
VALIDATION OF PROCUREMENT: I HEREBY CERTIFY THAT THE GOODS AND/OR SERVICES TO BE PROVIDED UNDER THIS AGREEMENT WERE PROCURED IN ACCORDANCE WITH THE REQUIREMENTS SET FORTH IN CHAPTER 33.1 OF THE NORFOLK CITY CODE.	N/A
REVIEWED BY PURCHASING: _____ Signature and Date	

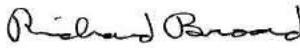
**B. TO BE COMPLETED FOR HUMAN RESOURCES DOCUMENTS:**

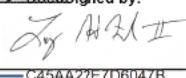
TYPE OF DOCUMENT:	N/A
BRIEF DESCRIPTION:	

**Certificate of Satisfaction:** I (We) hereby certify that all reasonable due diligence has been performed to sufficiently develop the contents and implications of the attached document in a manner to protect and account to the public. Further, all City policies and procedures have been adhered to and therefore, I (we) recommend the City Manager execute this document.

 8/26/21  
Document Owner Date

 8/27/2021  
Department Signature Date

 8/26/2021  
Department Signature Date

Review by DCM Approved by:  Patrick Roberts Deputy City Manager	Approve <input type="checkbox"/> Disapprove <input type="checkbox"/> 8/31/2021   1:33 PM EDT	Review by CM Approved by:  Z. H. S. City Manager	Approve <input type="checkbox"/> Disapprove <input type="checkbox"/> 9/1/2021   7:25 AM PDT
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DESIGN AGREEMENT  
BETWEEN  
THE DEPARTMENT OF THE ARMY  
AND  
THE CITY OF NORFOLK, VIRGINIA  
FOR  
DESIGN  
FOR THE  
CITY OF NORFOLK COASTAL STORM RISK MANAGEMENT PROJECT,  
NORFOLK, VIRGINIA

THIS AGREEMENT is entered into this 28<sup>th</sup> day of June, 2019, by and between the Department of the Army (hereinafter the "Government"), represented by the U.S. Army Engineer, Norfolk District (hereinafter the "District Engineer") and the City of Norfolk, Virginia (hereinafter the "Non-Federal Sponsor"), represented by the City Manager.

WITNESSETH, THAT:

WHEREAS, Federal funds were provided in the Energy and Water, Legislative Branch, and Military Construction and Veterans Affairs Appropriations Act of 2019 (Public Law 115-244) to initiate design of the City of Norfolk Coastal Storm Risk Management Project, Norfolk, Virginia;

WHEREAS, Section 103 of the Water Resources Development Act of 1986, as amended (33 U.S.C. 2213), specifies the cost-sharing requirements applicable to construction of the Project, and Section 105(c) of the Water Resources Development Act of 1986 (33 U.S.C. 2215), provides that the costs of design shall be shared in the same percentages as construction of the Project;

WHEREAS, based on the Project's primary project purpose of flood damage reduction, the parties agree that the Non-Federal Sponsor shall contribute 35 percent of the total design costs under this Agreement;

WHEREAS, pursuant to Section 221(a)(4) of the Flood Control Act of 1970, as amended (42 U.S.C. 1962d-5b(a)), the Non-Federal Sponsor may perform or provide in-kind contributions for credit towards the non-Federal share of the total design costs; and

WHEREAS, the Government and Non-Federal Sponsor have the full authority and capability to perform in accordance with the terms of this Agreement.

NOW, THEREFORE, the parties agree as follows:

## ARTICLE I - DEFINITIONS

A. The term "Project" means the construction of a coastal storm risk management project within the city of Norfolk, Virginia, consisting of various structural, non-structural, and natural and nature-based features, as generally described in the Final Integrated City of Norfolk Coastal Storm Risk Management Feasibility Study/Environmental Impact Statement, dated January 2019, and approved by the Chief of Engineers, Department of the Army, on February 5, 2019.

B. The term "Design" means the performance of all activities related to the detailed preconstruction engineering and design, including preparation of plans and specifications for the initial construction contract, for the Project.

C. The term "total design costs" means the sum of all costs that are directly related to the Design and cost shared in accordance with the terms of this Agreement. Subject to the provisions of this Agreement, the term shall include, but is not necessarily limited to: the Government's costs for engineering and design, economic and environmental analyses, and evaluation; for contract dispute settlements or awards; for supervision and administration; for Agency Technical Review and other review processes required by the Government; for response to any required Independent External Peer Review; and the Non-Federal Sponsor's creditable costs for in-kind contributions, if any. The term does not include any costs for dispute resolution; participation in the Design Coordination Team; audits; an Independent External Peer Review panel, if required; or betterments; or the Non-Federal Sponsor's cost of negotiating this Agreement.

D. The term "in-kind contributions" means those materials or services provided by the Non-Federal Sponsor that are identified as being integral to design of the Project by the Division Engineer for the North Atlantic Division. To be integral, the material or service must be part of the work that the Government would otherwise have undertaken for design of the Project. In-kind contributions also include any investigations performed by the Non-Federal Sponsor to identify the existence and extent of any hazardous substances that may exist in, on, or under real property interests required for the Project.

E. The term "fiscal year" means one year beginning on October 1<sup>st</sup> and ending on September 30th of the following year.

F. The term "betterment" means a difference in the design of a portion of the Project that results from the application of standards that the Government determines exceed those that the Government would otherwise apply to the design of that portion.

## ARTICLE II - OBLIGATIONS OF THE GOVERNMENT AND THE NON-FEDERAL SPONSOR

A. In accordance with Federal laws, regulations, and policies, the Government shall conduct the Design using funds appropriated by the Congress and funds provided by

the Non-Federal Sponsor. The Non-Federal Sponsor shall perform or provide any in-kind contributions in accordance with applicable Federal laws, regulations, and policies. If the Government and non-Federal interest enter into a Project Partnership Agreement for construction of the Project, the Government shall include the total design costs in the calculation of construction costs for the Project in accordance with the terms and conditions of the Project Partnership Agreement.

B. The Non-Federal Sponsor shall contribute 35 percent of total design costs in accordance with the provisions of this paragraph and provide required funds in accordance with Article III.

1. After considering the estimated amount of credit for in-kind contributions, if any, that will be afforded in accordance with paragraph C. of this Article, the Government shall provide the Non-Federal Sponsor with a written estimate of the amount of funds required from the Non-Federal Sponsor for the initial fiscal year of the Design. No later than 30 calendar days after such notification, the Non-Federal Sponsor shall provide the full amount of such funds to the Government.

2. No later than August 1<sup>st</sup> prior to each subsequent fiscal year of the Design, the Government shall provide the Non-Federal Sponsor with a written estimate of the amount of funds required from the Non-Federal Sponsor during that fiscal year to meet its cost share. No later than September 1<sup>st</sup> prior to that fiscal year, the Non-Federal Sponsor shall provide the full amount of such required funds to the Government.

C. The Government shall credit towards the Non-Federal Sponsor's share of total design costs, the costs, documented to the satisfaction of the Government, that the Non-Federal Sponsor incurs in providing or performing in-kind contributions integral to the Design, including associated supervision and administration. Such costs shall be subject to audit in accordance with Article VII to determine reasonableness, allocability, and allowability, and crediting shall be in accordance with the following procedures, requirements, and limitations:

1. As in-kind contributions are completed and no later than 60 calendar days after such completion, the Non-Federal Sponsor shall provide the Government appropriate documentation, including invoices and certification of specific payments to contractors, suppliers, and the Non-Federal Sponsor's employees. Failure to provide such documentation in a timely manner may result in denial of credit.

2. No credit shall be afforded for interest charges, or any adjustment to reflect changes in price levels between the time the in-kind contributions are completed and credit is afforded; for the value of in-kind contributions obtained at no cost to the Non-Federal Sponsor; for any items provided or performed prior to the effective date of this Agreement unless covered by an In-Kind Memorandum of Understanding; for any items not identified as integral in the integral determination report; or for costs that exceed the Government's estimate of the cost for such item if it had been performed by the Government.

3. No reimbursement will be provided for any in-kind contributions that exceed the Non-Federal Sponsor's share of the total design costs under this Agreement. As provided in Article II.A., total design costs, including credit for in-kind contributions, shall be included in the calculation of construction costs for the Project in accordance with the terms and conditions of the Project Partnership Agreement.

D. To the extent practicable and in accordance with Federal laws, regulations, and policies, the Government shall afford the Non-Federal Sponsor the opportunity to review and comment on solicitations for contracts prior to the Government's issuance of such solicitations; proposed contract modifications, including change orders; and contract claims prior to resolution thereof. Ultimately, the contents of solicitations, award of contracts, execution of contract modifications, and resolution of contract claims shall be exclusively within the control of the Government.

E. The Non-Federal Sponsor shall not use Federal Program funds to meet any of its obligations under this Agreement unless the Federal agency providing the funds verifies in writing that the funds are authorized to be used for the Project. Federal program funds are those funds provided by a Federal agency, plus any non-Federal contribution required as a matching share therefor.

F. Except as provided in paragraph C. of this Article, the Non-Federal Sponsor shall not be entitled to any credit or reimbursement for costs it incurs in performing its responsibilities under this Agreement.

G. In carrying out its obligations under this Agreement, the Non-Federal Sponsor shall comply with all the requirements of applicable Federal laws and implementing regulations, including, but not limited to: Title VI of the Civil Rights Act of 1964 (P.L. 88-352), as amended (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto; the Age Discrimination Act of 1975 (42 U.S.C. 6102); and the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and Army Regulation 600-7 issued pursuant thereto.

H. If Independent External Peer Review (IEPR) is required for the Design, the Government shall conduct such review in accordance with Federal laws, regulations, and policies. The Government's costs for an IEPR panel shall not be included in the total design costs.

I. In addition to the ongoing, regular discussions of the parties in the delivery of the Design, the Government and the Non-Federal Sponsor may establish a Design Coordination Team consisting of Government's Project Manager and the Non-Federal Sponsor's counterpart and one senior representative each from the Government and Non-Federal Sponsor to discuss significant issues or actions. Neither the Government's nor the Non-Federal Sponsor's costs for participation on the Design Coordination Team shall be included in the total design costs. The Non-Federal Sponsor's costs for participation

on the Design Coordination Team shall be paid solely by the Non-Federal Sponsor without reimbursement or credit.

J. The Non-Federal Sponsor may request in writing that the Government perform betterments on behalf of the Non-Federal Sponsor. Each request shall be subject to review and written approval by the Division Engineer for the North Atlantic Division. If the Government agrees to such request, the Non-Federal Sponsor, in accordance with Article III.F., must provide funds sufficient to cover the costs of such work in advance of the Government performing the work.

### ARTICLE III - METHOD OF PAYMENT

A. As of the effective date of this Agreement, total design costs are projected to be \$8,308,000, with the Government's share of such costs projected to be \$5,400,000, the Non-Federal Sponsor's share of such costs projected to be \$2,908,000; and the costs for betterments are projected to be \$0. These amounts are estimates subject to adjustment by the Government, after consultation with the Non-Federal Sponsor, and are not to be construed as the total financial responsibilities of the Government and the Non-Federal Sponsor.

B. The Government shall provide the Non-Federal Sponsor with quarterly reports setting forth the estimated total design costs and the Government's and Non-Federal Sponsor's estimated shares of such costs; costs incurred by the Government, using both Federal and Non-Federal Sponsor funds, to date; the amount of funds provided by the Non-Federal Sponsor to date; the estimated amount of any creditable in-kind contributions; and the estimated remaining cost of the Design.

C. The Non-Federal Sponsor shall provide to the Government required funds by delivering a check payable to "FAO, USAED, Norfolk (E4)" to the District Engineer, or verifying to the satisfaction of the Government that the Non-Federal Sponsor has deposited such required funds in an escrow or other account acceptable to the Government, with interest accruing to the Non-Federal Sponsor, or by providing an Electronic Funds Transfer of such required funds in accordance with procedures established by the Government.

D. The Government shall draw from the funds provided by the Non-Federal Sponsor to cover the non-Federal share of the total design costs as those costs are incurred. If the Government determines at any time that additional funds are needed from the Non-Federal Sponsor to cover the Non-Federal Sponsor's required share of the total design costs, the Government shall provide the Non-Federal Sponsor with written notice of the amount of additional funds required. Within 60 calendar days of such notice, the Non-Federal Sponsor shall provide the Government with the full amount of such additional funds.

E. Upon conclusion of the Design and resolution of all relevant claims and appeals, the Government shall conduct a final accounting and furnish the Non-Federal Sponsor with the written results of such final accounting. Should the final accounting determine that additional funds are required from the Non-Federal Sponsor, the Non-Federal Sponsor, within 60 calendar days of written notice from the Government, shall provide the Government with the full amount of such additional funds. Should the final accounting determine that the Non-Federal Sponsor has provided funds in excess of its required amount, the Government shall refund the excess amount, subject to the availability of funds or if requested by the Non-Federal Sponsor, apply the excess amount towards the non-Federal share of the cost of construction of the Project in the event a Project Partnership Agreement is executed for the Project. Such final accounting does not limit the Non-Federal Sponsor's responsibility to pay its share of total design costs, including contract claims or any other liability that may become known after the final accounting.

F. Payment of Costs for Betterments Provided on Behalf of the Non-Federal Sponsor. No later than 30 calendar days after receiving written notice from the Government of the amount of funds required to cover any such costs, as applicable, the Non-Federal Sponsor shall make the full amount of such required funds available to the Government by delivering a check payable to "FAO, USAED, Norfolk (E4)" to the District Engineer, or by providing an Electronic Funds Transfer of such funds in accordance with procedures established by the Government. If at any time the Government determines that additional funds are required to cover any such costs, as applicable, the Non-Federal Sponsor shall provide those funds within 30 calendar days from receipt of written notice from the Government.

#### ARTICLE IV - TERMINATION OR SUSPENSION

A. If at any time the Non-Federal Sponsor fails to fulfill its obligations under this Agreement, the Government may suspend or terminate Design unless the Assistant Secretary of the Army (Civil Works) determines that continuation of the Design is in the interest of the United States or is necessary in order to satisfy agreements with any other non-Federal interests in connection with the Project.

B. If the Government determines at any time that the Federal funds made available for the Design are not sufficient to complete such work, the Government shall so notify the Non-Federal Sponsor in writing, and upon exhaustion of such funds, the Government shall suspend Design until there are sufficient Federal funds appropriated by the Congress and funds provided by the Non-Federal Sponsor to allow Design to resume.

C. In the event of termination, the parties shall conclude their activities relating to the Design and conduct an accounting in accordance with Article III.E. To provide for this eventuality, the Government may reserve a percentage of available funds as a contingency to pay costs of termination, including any costs of resolution of contract claims and contract modifications.

D. Any suspension or termination shall not relieve the parties of liability for any obligation incurred. Any delinquent payment owed by the Non-Federal Sponsor pursuant to this Agreement shall be charged interest at a rate, to be determined by the Secretary of the Treasury, equal to 150 per centum of the average bond equivalent rate of the 13 week Treasury bills auctioned immediately prior to the date on which such payment became delinquent, or auctioned immediately prior to the beginning of each additional 3 month period if the period of delinquency exceeds 3 months.

#### ARTICLE V – HOLD AND SAVE

The Non-Federal Sponsor shall hold and save the Government free from all damages arising from the Design, except for damages due to the fault or negligence of the Government or its contractors.

#### ARTICLE VI - DISPUTE RESOLUTION

As a condition precedent to a party bringing any suit for breach of this Agreement, that party must first notify the other party in writing of the nature of the purported breach and seek in good faith to resolve the dispute through negotiation. If the parties cannot resolve the dispute through negotiation, they may agree to a mutually acceptable method of non-binding alternative dispute resolution with a qualified third party acceptable to the parties. Each party shall pay an equal share of any costs for the services provided by such a third party as such costs are incurred. The existence of a dispute shall not excuse the parties from performance pursuant to this Agreement.

#### ARTICLE VII - MAINTENANCE OF RECORDS AND AUDIT

A. The parties shall develop procedures for the maintenance by the Non-Federal Sponsor of books, records, documents, or other evidence pertaining to costs and expenses for a minimum of three years after the final accounting. The Non-Federal Sponsor shall assure that such materials are reasonably available for examination, audit, or reproduction by the Government.

B. The Government may conduct, or arrange for the conduct of, audits of the Design. Government audits shall be conducted in accordance with applicable Government cost principles and regulations. The Government's costs of audits for the Design shall not be included in total design costs.

C. To the extent permitted under applicable Federal laws and regulations, the Government shall allow the Non-Federal Sponsor to inspect books, records, documents, or other evidence pertaining to costs and expenses maintained by the Government, or at the request of the Non-Federal Sponsor, provide to the Non-Federal Sponsor or independent auditors any such information necessary to enable an audit of the Non-

Federal Sponsor's activities under this Agreement. The costs of non-Federal audits shall be paid solely by the Non-Federal Sponsor without reimbursement or credit by the Government.

## ARTICLE VIII - RELATIONSHIP OF PARTIES

In the exercise of their respective rights and obligations under this Agreement, the Government and the Non-Federal Sponsor each act in an independent capacity, and neither is to be considered the officer, agent, or employee of the other. Neither party shall provide, without the consent of the other party, any contractor with a release that waives or purports to waive any rights a party may have to seek relief or redress against that contractor.

## ARTICLE IX - NOTICES

A. Any notice, request, demand, or other communication required or permitted to be given under this Agreement shall be deemed to have been duly given if in writing and delivered personally or mailed by certified mail, with return receipt, as follows:

If to the Non-Federal Sponsor:

City Manager  
City of Norfolk  
1101 City Hall Building  
810 Union Street  
Norfolk, VA 23510

If to the Government:

District Engineer  
U.S. Army Corps of Engineers  
Norfolk District  
803 Front Street  
Norfolk, VA 23510

B. A party may change the recipient or address for such communications by giving written notice to the other party in the manner provided in this Article.

## ARTICLE X - CONFIDENTIALITY

To the extent permitted by the laws governing each party, the parties agree to maintain the confidentiality of exchanged information when requested to do so by the providing party.

## ARTICLE XII - OBLIGATIONS OF FUTURE APPROPRIATIONS

The Non-Federal Sponsor intends to fulfill fully its obligations under this Agreement. Nothing herein shall constitute, nor be deemed to constitute, an obligation of future appropriations by the City Council of the City of Norfolk, Virginia, where creating such an obligation would be inconsistent with State law, including, but not limited to Article 10, §7 of the Constitution of Virginia and Section 2.2-1819 of the Code of Virginia. If the Non-Federal Sponsor is unable to, or does not, fulfill its obligations under this Agreement, the Government may exercise any legal rights it has to protect the Government's interests.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement, which shall become effective upon the date it is signed by the District Engineer.

DEPARTMENT OF THE ARMY

CITY OF NORFOLK, VIRGINIA

BY: \_\_\_\_\_  
PATRICK V. KINSMAN  
Colonel, U.S. Army  
District Engineer

BY: \_\_\_\_\_  
DOUGLAS L. SMITH  
City Manager  
City of Norfolk, Virginia

ATTEST:

\_\_\_\_\_  
City Clerk

Contents Approved:

  
\_\_\_\_\_  
Chief Resilience Officer

Form & Correctness Approved: 

\_\_\_\_\_  
Deputy City Attorney

## ARTICLE XI - THIRD PARTY RIGHTS, BENEFITS, OR LIABILITIES

Nothing in this Agreement is intended, nor may be construed, to create any rights, confer any benefits, or relieve any liability, of any kind whatsoever in any third person not party to this Agreement.

## ARTICLE XII - OBLIGATIONS OF FUTURE APPROPRIATIONS

The Non-Federal Sponsor intends to fulfill fully its obligations under this Agreement. Nothing herein shall constitute, nor be deemed to constitute, an obligation of future appropriations by the City Council of the City of Norfolk, Virginia, where creating such an obligation would be inconsistent with State law, including, but not limited to Article 10, §7 of the Constitution of Virginia and Section 2.2-1819 of the Code of Virginia. If the Non-Federal Sponsor is unable to, or does not, fulfill its obligations under this Agreement, the Government may exercise any legal rights it has to protect the Government's interests.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement, which shall become effective upon the date it is signed by the District Engineer.

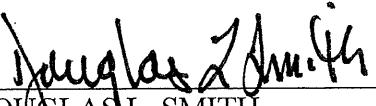
DEPARTMENT OF THE ARMY

BY:

  
PATRICK V. KINSMAN  
Colonel, U.S. Army  
District Engineer

CITY OF NORFOLK, VIRGINIA

BY:

  
DOUGLAS L. SMITH  
City Manager  
City of Norfolk, Virginia

## CERTIFICATION REGARDING LOBBYING

The undersigned certifies, to the best of his or her knowledge and belief that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

BY: \_\_\_\_\_

  
DOUGLAS L. SMITH

City Manager  
City of Norfolk, Virginia

DATE: \_\_\_\_\_

28 June 2019

CERTIFICATION OF FUNDING

I hereby certify that the money required for this Agreement is in the City Treasury to the credit of the fund from which it is to be drawn and not appropriated for any other purpose.

Account No. 4000-35-4188-5303-FY13

Amount \$ 2,908,000

Contract # CT 35-000027621

Vendor Code: FAOLUSA 0100

 5/16/19  
Shirley Bell

Director of Finance

Date

May 20, 2019

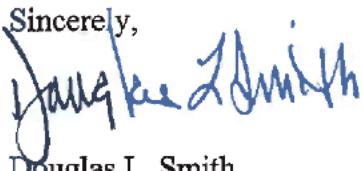
Colonel Patrick Kinsman, P.E.  
District Engineer  
U. S. Army Corps of Engineers, Norfolk District  
803 Front Street  
Norfolk, Virginia 23510

Subject: City of Norfolk Coastal Storm Risk Management Project, Norfolk, VA

Dear Colonel Kinsman:

The draft Design Agreement prepared by the Norfolk District for the City of Norfolk Coastal Storm Risk Management Project, Norfolk, Virginia, has been reviewed by the appropriate staff of the City of Norfolk. Based upon our review, we find the agreement to be satisfactory with regard to legal form and content and it is my intent to sign the agreement at such time that it is approved for execution by Corps of Engineers higher authority. It is also my intent to provide the City's share of the costs of detailed design phase at the appropriate time in accordance with the agreement.

Sincerely,



Douglas L. Smith  
City Manager  
City of Norfolk

CERTIFICATE OF AUTHORITY

I, Adam Melita, do hereby certify that I am the principal legal officer for the City of Norfolk, Virginia, that the City of Norfolk, Virginia is a legally constituted public body with full authority and legal capability to perform the terms of the Design Agreement between the Department of the Army and the City of Norfolk, Virginia in connection with the City of Norfolk Coastal Storm Risk Management Project, and to pay damages, if necessary, in the event of the failure to perform in accordance with the terms of this Agreement, as required by Section 221 of Public Law 91-611, as amended (42 U.S.C. 1962d-5b), and that the person who executed this Agreement on behalf of the City of Norfolk, Virginia, acted within his statutory authority.

IN WITNESS WHEREOF, I have made and executed this certification this  
28<sup>th</sup> day of June 2019.

  
for Adam Melita, Sr. Deputy City Attorney,  
BERNARD A. PISHKO  
City Attorney  
City of Norfolk, Virginia



CFPF, rr &lt;cfpf@dcr.virginia.gov&gt;

## City of Norfolk: Virginia Community Flood Preparedness Fund Grant Application

1 me age

Spencer, Kyle &lt;[REDACTED]&gt;

Fri, Sep 3, 2021 at 3:28 PM

To: "cfpf@dcr.virginia.gov" &lt;cfpf@dcr.virginia.gov&gt;

Cc "Shafer, Ju tin" [REDACTED], "Simon , Matthew" [REDACTED], "Daniel, Stephanie F" [REDACTED]

Good Afternoon,

On behalf of the City of Norfolk, please find attached the City's grant application submission for the Virginia Community Flood Preparedness Fund for review and consideration. Please find attached the following documents which contain four separate grant submissions:

1. CID510104\_CityofNorfolk\_CFPF-1
  - a. (Lake Whitehurst Hydrology and Hydraulics Study)
2. CID510104\_CityofNorfolk\_CFPF-2
  - a. (Colley Avenue Pump Station Upgrade Project)
3. CID510104\_CityofNorfolk\_CFPF-3
  - a. (Floodplain Management Study)
4. CID510104\_CityofNorfolk\_CFPF-4
  - a. (United States Army Corps of Engineers (USACE) Coastal Storm Management Study Coastal Analysis)

Please let us know if you have any questions. Thank you for your time and consideration.

Best Regards,

Kyle

Kyle Spencer

Deputy Reliance Officer



City Manager's Office of Resilience

501 Boush Street

Norfolk, VA 23510



Connect with us:

[www.norfolk.gov](http://www.norfolk.gov)



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#### 4 attachment

- [CID510104\\_CityofNorfolk\\_CFPF-1.pdf](#)  
2790K
- [CID510104\\_CityofNorfolk\\_CFPF-2.pdf](#)  
7773K
- [CID510104\\_CityofNorfolk\\_CFPF-3.pdf](#)  
6618K
- [CID510104\\_CityofNorfolk\\_CFPF-4.pdf](#)  
7705K