US Army Corps of Engineers®

Charleston District

CHARLESTON PENINSULA, SOUTH CAROLINA, A COASTAL STORM RISK MANAGEMENT STUDY

Charleston, South Carolina

ENVIRONMENTAL APPENDIX - F

February 2022

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NOTICE OF INTENT

COPY OF NOTICE OF INTENT TO PREPARE A DRAFT INTEGRATED FEASIBILITY REPORT AND ENVIRONMENTAL IMPACT STATEMENT FOR THE CHARLESTON PENINSULA COASTAL FLOOD RISK MANAGEMENT STUDY, CHARLESTON COUNTY, SOUTH CAROLINA; ORIGINALLY PUBLISHED IN THE FEDERAL REGISTER ON MARCH 23, 2021

www.regulations.gov. Follow the instructions for submitting comments.

DoD Clearance Officer: Ms. Angela James. Requests for copies of the information collection proposal should be sent to Ms. James at *whs.mc-alex.esd.mbx.dd-dod-information-collections@mail.mil.*

Jennifer D. Johnson,

Regulatory Control Officer, Defense Acquisition Regulations System.

[FR Doc. 2021–06010 Filed 3–22–21; 8:45 am]

BILLING CODE 5001–06–P

DEPARTMENT OF DEFENSE

Department of the Army, Corps of Engineers

Notice of Intent To Prepare a Draft Integrated Feasibility Report and Environmental Impact Statement for the Charleston Peninsula Coastal Flood Risk Management Study, Charleston County, South Carolina

AGENCY: Department of the Army, U.S. Army Corps of Engineers, Department of Defense (DoD).

ACTION: Notice of intent to prepare an Environmental Impact Statement.

SUMMARY: Pursuant to the requirements of the National Environmental Policy Act (NEPA) of 1969, as implemented by the Council on Environmental Quality Regulations, the U.S. Army Corps of Engineers (USACE), Charleston District, announces its intent to conduct public scoping and solicit public comments to gather information to prepare a draft Integrated Feasibility Report and Environmental Impact Statement (IFR/EIS). In April 2020, USACE released a draft Integrated Feasibility Report/Environmental Assessment (IFR/EA) with a draft mitigated Finding of No Significant Impacts (FONSI) for the Charleston Peninsula Coastal Flood Risk Management Study. After further agency analysis, review of comments received on the Draft IFR/EA, and continued refinement of the study, USACE concluded that an IFR/EIS with a Record of Decision (ROD) would fulfill NEPA compliance for the study. Comments received during the draft IFR/EA public comment period will be considered as part of the scoping process for the IFR/EIS, and do not need be resubmitted.

DATES: USACE requests comments concerning the scope of the alternatives and identification of relevant information, studies, and analyses. All comments must be received by April 22, 2021. The draft IFR/EIS is scheduled to be released for a minimum 45-day public review in late summer of 2021. The final IFR/EIS is scheduled to be released in the summer of 2022. The ROD will be signed no sooner than 30 days after the release of the IFR/EIS.

ADDRESSES: Send written comments to U.S. Army Corps of Engineers Charleston District, ATTN: Planning and Environmental Branch, 69A Hagood Avenue, Charleston, SC 29403. Send comments via email to *Chs-Peninsula-Study@usace.army.mil.* Submit comments online at the website: *www.sac.usace.army.mil/charlestonpeninsulastudy.*

FOR FURTHER INFORMATION CONTACT: Nancy Parrish, U.S. Army Corps of Engineers, 69A Hagood Avenue, Charleston, SC 29403, (843) 329–8050, or *Chs-Peninsula-Study@usace.army.mil.*

SUPPLEMENTARY INFORMATION: USACE is issuing this notice pursuant to section 102(2)(c) of the National Environmental Policy Act of 1969 (NEPA), as amended, 42 U.S.C. 4321 *et seq.;* and, the Council on Environmental Quality's (CEQ) regulations for implementing the procedural provisions of NEPA, 43 CFR parts 1500 through 1508. USACE is exercising its discretion to employ the 1978 CEQ NEPA regulations to this ongoing NEPA process pursuant to CEQ's Update to the Regulations Implementing the Procedural Provisions of the National Environmental Policy Act, Final Rule, 85 FR 43304, at 43339–43340 (July 16, 2020).

Background: In April 2020, USACE released a draft IFR/EA with a draft mitigated FONSI for the Charleston Peninsula Coastal Flood Risk Management Study. After further agency analysis, review of comments received on the draft IFR/EA, and continued refinement of the study, USACE concluded that NEPA compliance for the study should instead be completed by transitioning to an EIS with a ROD. Portions of the draft EA which remain pertinent and current will be integrated into the draft IFR/EIS, as appropriate. The IFR/EIS culminating in a ROD will enable the agency to develop a more comprehensive and detailed analysis of the study alternatives, cultural, visual, and natural resource impacts (among others), and mitigation proposals, as well as provide enhanced and additional opportunity for resource agency and public input to the process.

Purpose and Need for the Proposed Action: The Charleston Peninsula, South Carolina, is a highly urbanized, relatively flat, low-lying coastal community. It is the historic core and urban center of the City of Charleston. The low elevation and tidal connections to the Charleston Harbor, and Ashley and Cooper Rivers, put the Charleston Peninsula at particular risk of flooding from coastal storms and render it more vulnerable to sea level rise and climate change. The purpose of this proposed action is to reduce risk to human health and safety and reduce economic damages resulting from coastal storm surge inundation on the Charleston Peninsula.

Preliminary Proposed Action and Alternatives: As described in the draft IFR/EA, multiple types of management measures (including structural, nonstructural, and natural or nature-based) were identified to achieve study objectives, take advantage of identified opportunities, and avoid constraints. Management measures were subjected to an initial evaluation assessment and combined into the initial range of alternatives. These were screened against the study's objectives and the four evaluation criteria of the *Economic and Environmental Principles and Guidelines for Water and Land Related Resources Implementation Studies,* resulting in two action alternatives, in addition to the No Action Alternative. Alternative 2 consists of construction of a storm surge wall along the perimeter or nearshore of the peninsula, and nonstructural measures in select areas of the peninsula. Alternative 3 included the measures in Alternative 2 as well as an additional structural measure, the wave attenuator. Since the public release of the draft IFR/EA, Alternative 3 was further refined using modeling and analysis to reduce uncertainty associated with the wave attenuator. This analysis showed that the wave attenuator does not produce additional (incremental) inundation reduction benefits beyond the measures in Alternative 2. Therefore, Alternative 3 is not being carried forward into the final array of alternatives for the IFR/EIS. The final array is expected to include the No Action Alternative and an optimized Alternative 2, now known as the proposed action.

Brief Summary of Expected Impacts: Under this proposed action, the storm surge wall would be strategically aligned to avoid and minimize impacts to existing wetland habitat and cultural resources (substantial avoidance and minimization of wetlands has already taken place as part of the refinement of the proposed action following release of the draft IFR/EA). The wall would be strategically located to allow for continued operation of all ports, marinas, and the Coast Guard Station. The wall would tie into high ground as appropriate, including the existing Battery Wall. Nonstructural measures

would be applied in areas of the peninsula where it is not feasible to construct the storm surge wall. In addition to the storm surge wall and associated access and flow gates, pump stations could be necessary to alleviate interior flooding induced by the wall. Where possible, designs would be modified to adhere to the visual aesthetic of the city.

The draft IFR/EIS will update and expand upon the effects analyzed in the draft IFR/EA which included, but were not limited to, positive and negative impacts to the cultural resources and historic properties, wetlands, visual aesthetics, aquatic and terrestrial resources, water quality, geology, air quality and noise, coastal hydrodynamics, hydrology and hydraulics, recreation, transportation, utilities, socioeconomics, and environmental justice.

Anticipated Permits, Authorizations, Consultations, or Coordination: USACE anticipates that the following will be required for this proposed action:

- Fish and Wildlife Coordination Act Report (already initiated).
- Consultation under Section 106 and Section 110(f) of the National Historic Preservation Act (already initiated).
- Consultations under Magnuson-Stevens Fishery Conservation and Management Act, Endangered Species Act, and Marine Mammal Protection Act.
- Clean Water Act: Section 401 Water Quality Certification, Section 404(b)1 analysis.
- Coastal Zone Management Act consistency determination.

Public Scoping Process: During the development of the draft IFR/EA, USACE engaged Federal, State, and local agencies, stakeholders, and the public through various meetings and the NEPA public comment period. On January 31, 2019, a project information meeting was held where the public was informed on the results of the first two planning iterations and input was solicited both in person and via an online form. USACE also solicited public comments on the draft IFR/EA during the public review period, April 20–June 20, 2020. Comments relevant to scoping that were received in response to the draft IFR/EA public comment period will be considered as part of the scoping process for the IFR/EIS, and do not need to be resubmitted. However, all are welcome to submit to USACE updated, additional, or superseding comments relevant to scoping in response to this NOI.

Information regarding the upcoming public scoping meeting, including date and time, is published on the study's website at: *www.sac.usace.army.mil/charlestonpeninsulastudy.*

Request for Identification of Potential Alternatives, Information, and Analyses Relevant to the Proposed Action: USACE requests assistance with identifying any new potential alternatives to the Proposed Action to be considered. Complete submittals of proposed alternatives would include the purpose of the suggested alternative. USACE also requests assistance with identifying any new potential impacts of the Proposed Action, identifying the activity and the potential impact that should be analyzed. Information interested parties possess which would assist in the analysis of resources issues is also appreciated. As noted above, USACE will consider input received on the draft IFR/EA pertinent to the scoping of potential alternatives and impacts. This information will be used in the determination of the scope of issues for analysis in the EIS.

Special Assistance for Public Meeting. The scoping meeting will be virtual. People needing special assistance to attend and/or participate in the meeting should contact U.S. Army Corps of Engineers Charleston District, ATTN: Planning and Environmental Branch, 69A Hagood Avenue, Charleston, SC 29403 or via email to *Chs-Peninsula-Study@usace.army.mil.* To allow sufficient time to process special requests, please contact no later than one week before the public meeting.

Public Disclosure Statement. If you wish to comment, you may use the online form or mail or email your comments as indicated under the **ADDRESSES** section of this notice. Before including your address, phone number, email address, or any other personal identifying information in your comment, you should be aware that your entire comment—including your personal identifying information—may be made available to the public at any time. While you can request in your comment for us to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Jason E. Kelly,

Project Management Professional.

[FR Doc. 2021–05929 Filed 3–22–21; 8:45 am]

BILLING CODE 3720–58–P

DEPARTMENT OF EDUCATION

[Docket No.: ED–2020–SCC–0183]

Agency Information Collection Activities; Submission to the Office of Management and Budget for Review and Approval; Comment Request; Application for the U.S. Presidential Scholars Program

AGENCY: Office of Communication and Outreach (OCO), Department of Education (ED).

ACTION: Notice.

SUMMARY: In accordance with the Paperwork Reduction Act of 1995, ED is proposing an extension of a currently approved information collection.

DATES: Interested persons are invited to submit comments on or before April 22, 2021.

ADDRESSES: Written comments and recommendations for proposed information collection requests should be sent within 30 days of publication of this notice to *www.reginfo.gov/public/do/PRAMain.* Find this information collection request by selecting ''Department of Education'' under ''Currently Under Review,'' then check ''Only Show ICR for Public Comment'' checkbox. Comments may also be sent to *ICDocketmgr@ed.gov.*

FOR FURTHER INFORMATION CONTACT: For specific questions related to collection activities, please contact Simone Olson, 202–205–8719.

SUPPLEMENTARY INFORMATION: The Department of Education (ED), in accordance with the Paperwork Reduction Act of 1995 (PRA) (44 U.S.C. 3506(c)(2)(A)), provides the general public and Federal agencies with an opportunity to comment on proposed, revised, and continuing collections of information. This helps the Department assess the impact of its information collection requirements and minimize the public's reporting burden. It also helps the public understand the Department's information collection requirements and provide the requested data in the desired format. ED is soliciting comments on the proposed information collection request (ICR) that is described below. The Department of Education is especially interested in public comment addressing the following issues: (1) Is this collection necessary to the proper functions of the Department; (2) will this information be processed and used in a timely manner; (3) is the estimate of burden accurate; (4) how might the Department enhance the quality, utility, and clarity of the information to be collected; and (5) how might the Department minimize the

FISH AND WILDLIFE COORDINATION ACT REPORT

Fish and Wildlife Coordination Act Report for the Charleston Peninsula Coastal Flood Risk Management Study Charleston, South Carolina

Charleston District

U.S. Army Corps of Engineers

Charleston Ecological Services Field Office

U.S. Fish & Wildlife Service

Habitat Conservation Division, Southeast Regional Office

NOAA National Marine Fisheries Service

July 2021

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1 Introduction

1.1 Study Purpose

The Charleston Peninsula in South Carolina is vulnerable and at risk to coastal storms as evidenced by past events. The impacts of coastal storms are expected to increase as a result of a combination of sea level rise and climate change over the 50-year study period. Without a plan to reduce damages from coastal storm surge inundation, the peninsula's vulnerability is expected to increase over time. The purpose of the Charleston Peninsula Coastal Flood Risk Management Feasibility Study is to investigate and recommend potential structural and nonstructural solutions to reduce damages and life/safety impacts from coastal storms.

1.2 Authorities

The Charleston Peninsula Coastal Flood Risk Management Feasibility Study is one of multiple Coastal Storm Risk Management (CSRM) studies currently in process throughout the Nation by the U.S. Army Corps of Engineers (USACE). The authority to study coastal South Carolina, including the Charleston Peninsula, was provided in the Rivers and Harbors Act of 1962, P.L. 87- 874, Section 110, and a subsequent Senate Committee Resolution. Section 110 reads in part:

"The Secretary of the Army is hereby authorized and directed to cause surveys to be made at the coastal areas of the United States and its possessions, including the shores of the Great Lakes, in the interest of beach erosion control, hurricane protection and related purposes."

On 22 April 1988, a Senate Environment and Public Works Committee Resolution authorized the Secretary of the Army to study the entire coast of South Carolina pursuant to Section 110.

The Bipartisan Budget Act of 2018 (Public Law 115-123), Division B, Subdivision 1, Title IV, appropriates funding for the study at full Federal expense. As identified under this "Supplemental Appropriation" bill, the study is subject to additional reporting requirements and is to be completed within three years and for $3 million dollars.

1.3 Purpose and Scope of CAR

This Fish and Wildlife Coordination Act Report (CAR) is authorized by the Fish and Wildlife Coordination Act (FWCA) (16 U.S. Code Section 661 through 667e; the Act of March 10, 1934; Ch. 55; 48 Stat. 401). It provides for the U.S. Fish and Wildlife Service's (USFWS) involvement in evaluating potential impacts to fish and wildlife resources from proposed water resource development projects, to make recommendations for preventing their loss or damage, and to offer improved measures. The Charleston District of USACE prepared this CAR in collaboration with the USFWS and the NOAA National Marine Fisheries Service (NMFS).

During the early scoping phase of this study, the USFWS and NMFS issued a letter to USACE on January 31, 2019 indicating that a full FWCA investigation was not necessary. This was based on early understanding of the proposed measures being implemented in the urbanized, upland portions of the study area so that the USFWS and NMFS (here out referred to as the Services) suggested that the preliminary alternatives did not represent a significant threat to federally protected threatened or

endangered (T&E) species, Essential Fish Habitat (EFH), or federally managed fishery species. As study scoping continued, USACE determined that it would not be feasible to limit implementation of measures to only the uplands. As a result, the Draft Integrated Feasibility Report/Environmental Assessment (IFR/EA) released in February 2020 included alternatives, and a Tentatively Selected Plan, with proposed measures to be constructed in estuarine waters of the US. In their comments to USACE on the Draft IFR/EA on May 26, 2020, the Services found that a full FWCA investigation and report was now appropriate and recommended, due to the potential for significant impacts to estuarine habitat.

Since study objectives and alternatives have already been defined, and a Draft IFR/EA has already been prepared, USACE and the Services agreed to build upon that work. The primary focus of the CAR is further discovery of information about the types of impacts to fish and wildlife resources from the proposed measures, as well as potential strategies for minimization and mitigation. Since the time that the Draft IFR/EA was released, USACE has completed a period of "optimization," during which steps were taken to refine the alternative plans by reducing costs and impacts to the environment. This resulted in considerable adjustments to the measures that avoided impacts to natural resources where feasible. Measures and alternatives were presented to the Services on September 16, 2020. With avoidance actions for protection of fish and wildlife already considered, this CAR focuses on recommendations for minimizing and mitigating those potential impacts to fish and wildlife resources that remain for the "optimized" alternative plan.

Additionally, the CAR focuses primarily on potential impacts to aquatic and benthic resources, as the potential for adverse effects are most likely in these supporting habitats. Descriptions of upland habitats and terrestrial resources in the study area, and potential effects of the proposed measures on those resources, were included in the Draft IFR/EA. The CAR also focuses on potential permanent impacts to aquatic resources. Most of the temporary impacts expected from construction-related activities were addressed in the IFR/EA, which are expected to be minor with implementation of standard best management practices. However, noise-related impacts on aquatic resources are expanded on in the CAR.

2 Study Description and Tentatively Selected Plan

2.1 Study Objectives

As stated previously, the purpose of this feasibility study is to investigate and recommend potential structural and nonstructural solutions to reduce damages and life/safety impacts from coastal storms. The following objectives have been identified to help achieve the study goal:

- Reduce risk to human health and safety from coastal storm surge inundation on the Charleston Peninsula through the 50-year life of the project.
- Reduce economic damages resulting from coastal storm surge inundation on the Charleston Peninsula through the 50-year life of the project.

2.2 Study Area and Region of Influence

The Charleston Peninsula study area is approximately eight square miles, and is mostly urbanized. It is located between the Ashley and Cooper Rivers, which join off the southern end of the peninsula to form the Charleston Harbor before discharging into the Atlantic Ocean (Figure 1). The Charleston Harbor is a natural tidal estuary sheltered by barrier islands. The peninsula is relatively flat, with nearly all areas

below elevation 20 feet North American Vertical Datum of 1988 (NAVD88). The area has undergone dramatic shoreline changes since the first European settlers arrived in Charleston around 1670, predominantly by landfilling of the intertidal zone on the southern and western side of the peninsula. Tidal creeks that have not been filled and developed have all been altered to varying degrees. While most of the peninsula is developed, 2016 high-resolution landcover data (NOAA 2019) shows that approximately 555 acres of estuarine emergent wetlands, or salt marsh, remain in the study area.

Charleston played an important role in Colonial, Revolutionary, antebellum, and Civil War America. Today, the Charleston Peninsula is the historic core and urban center of the City of Charleston. It is a popular tourist destination and home to approximately 40,000 people, a medical district, multiple colleges, and a port.

The regions of influence (ROI) for assessing environmental impacts of the study were described in the Draft IFR/EA. The ROI for wetlands includes perimeter tidal wetlands, primarily on the Ashley River-side of the Peninsula, that will be directly filled, dredged, excavated or otherwise converted to another use as a result of construction, or indirectly affected through such factors as tidal flow, sedimentation, water chemistry, and erosion.

Tidal wetlands along shorelines directly across waterways from the Charleston Peninsula (Charleston Harbor, Ashley River, and Cooper River) are also in the ROI. To assess impacts to these areas requires additional modeling, which is being conducted as part of the feasibility study. Results are not available at the time of CAR preparation. If adverse effects are determined from the modeling, additional information discovery about impacts to fish and wildlife resources will be needed. If appropriate, potential mitigation measures will be proposed and incorporated into the feasibility study.

For aquatic and benthic resources, the ROI includes the estuarine tidal creeks and mudflats of the Charleston Peninsula, and the adjacent waterways of the Charleston Harbor, lower Ashley River, and lower Cooper River.

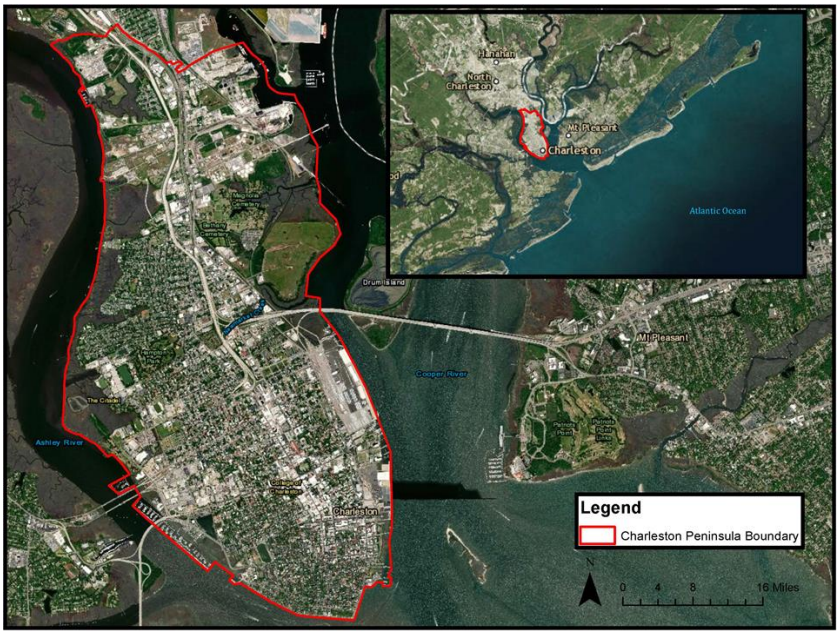

Figure 1. Charleston Peninsula study area, outlined in red.

2.3 Status of Planning Efforts to Date

The scoping phase for the feasibility study started in the fall of 2018. An Interagency Coordination Team was formed for the study, and a planning meeting was held with the City of Charleston, agencies, and stakeholders to get input on problem statements, opportunities, objectives and constraints. A public meeting was also held. A list of possible structural and nonstructural measures and natural or nature-based features was generated. An initial array of eight conceptual alternatives were formulated as a result of the meetings. Several of the alternatives were then screened due to their effectiveness in meeting study objectives, feasibility, cost, and other factors. The final array of alternatives included a no action alternative (or a Future Without Project alternative) and two action alternatives: a perimeter protection + nonstructural alternative, and a perimeter protection + nonstructural + wave attenuating structure alternative. A Draft Integrated Feasibility Study/Environmental Assessment (IFR/EA) was prepared that described the initial array of conceptual alternatives and the final array in detail. Initial costs, engineering, and the potential for adverse environmental impacts of final array of alternatives were evaluated as part of the Draft IFR/EA, which was released with a Draft Finding of No Significant Impact to the public and agencies for review in April of 2020.

Based on feedback from stakeholders and agencies, USACE further refined the action alternatives to optimize their cost effectiveness and reduce environmental impacts after the Draft IFR/EA was released. These were presented to the ICT in the fall of 2020. Also in response to feedback and additional analyses, USACE determined that significant adverse effects may result from the action alternatives, so a Draft Integrated Feasibility Report/Environmental Impact Statement (IFR/EIS) is now being prepared for the study in accordance with the National Environmental Policy Act.

2.4 Tentatively Selected Plan

At the time of preparation of this CAR, the Tentatively Selected Plan that is being carried forward in the Draft IFR/EIS is action alternative 2, which proposes construction of a storm surge wall of 12 ft elevation NAVD88 along portions of the perimeter of the peninsula, and nonstructural measures in the form of elevating and flood proofing for a limited number of structures. Approximately 7.1 non-continuous miles of the perimeter storm surge wall would be constructed on land; approximately 1.5 non-continuous miles would be constructed through saltmarsh wetlands. The wall would be constructed of concrete, and on land it would be a T-wall design and in the marsh it would be a combination design (these designs were described in the Draft IFR/EA and are being updated in the Draft IFR/EIS). For the combination wall, 12x12 ft prestressed concrete sheet piles are being proposed that would be battered at an inclination from vertical, typically at 5 to 30 degrees from vertical, using a hammer.

The optimized Tentatively Selected Plan is also being updated in the IFR/EIS to reflect the use of 5 permanent and 5 temporary pump stations of low to moderate size, ranging from 20 to 90 cfs; a series of upland access gates for pedestrians and transportation; and storm surge gates in the form of sluice gates to allow for tidal exchange at creeks and drainage channels in a few locations (several peninsula creeks do not fall within the footprint of the wall and will not be impacted). Five storm surge gates would be installed in the combination wall at Halsey Creek. Five storm surge gates would be installed at existing culverts where creeks or channels pass under roads. A walking path is also planned on top of portions of the storm surge wall where it is on land. This plan was determined to be the National Economic Development Plan (meaning it maximizes the storm risk reduction benefits for the cost) and

to have the least environmental impacts of the action alternatives in the Draft IFR/EA, but is still the tentative plan for the Draft IFR/EIS; USACE has not determined a Recommended Plan yet.

2.5 Summary of Proposed Mitigation

A Draft Mitigation Plan was prepared as part of the Draft IFR/EA for initial comment. It proposed a number of best management practices to reduce temporary environmental impacts during construction. With respect to aquatic resources, the Mitigation Plan also explained that the study will avoid and minimize placement of the storm surge wall in the aquatic environment to the maximum extent practicable, except where placement is necessary for effective storm risk management. This has been demonstrated through USACE's optimization efforts of the alternatives. Placement of hydraulic pumps in the aquatic environment will also be avoided except where determined necessary to minimize interior flooding induced by the storm surge wall.

The Mitigation Plan indicated that permanent, direct losses of saltmarsh wetlands (including intertidal flats) from the storm surge wall that cannot be avoided would be compensated. This included a buffer area on both sides of the combination wall. Additionally, losses in saltmarsh wetlands landward from the storm surge wall that cannot be practicably minimized will be compensated, as well as those wetlands functions lost after minimization.

To promote resilience to saltmarshes and minimize adverse impacts that may occur seaward of the storm surge wall, construction of living shorelines along the associated marsh shorelines has been proposed.

Additional minimization measures for adverse impacts to aquatic and benthic resources are being explored as part of the new IFR/EIS.

3 Current Fish and Wildlife Resources

3.1 Current Resources

Many species of aquatic and benthic resources including invertebrates, fish, and a few sea turtles and marine mammals can be found in the ROI, in varying proximity to the study area. There are also species of birds that depend on coastal habitats found in the study area. Some of these resources are listed as threatened or endangered species under the Endangered Species Act of 1973, as amended (16 USC §1531), for which the Services have jurisdiction. Table 1 shows the federally-listed aquatic and avian species that could be found in the ROI. There are also five species of whales listed as endangered, the endangered hawksbill sea turtle, the threatened giant manta ray, and the threatened oceanic white tip shark that can be found in offshore waters of South Carolina, but are not likely to be in the ROI for this study. Terrestrial wildlife in the ROI and potential impacts from the alternatives are presented in the Draft IFR/EA.

Table 1. Federally-listed Threatened and Endangered Species Under Jurisdiction of the Services in the Study's Region of Influence

Species Common Name	Scientific Name	Status
Atlantic sturgeon*	*Acipenser oxyrinchus*	E, CH
Shortnose sturgeon*	*Acipenser brevirostrum*	E
American wood stork**	*Mycteria americana*	T
Eastern black rail**	*Laterallus jamaicensis jamaicensis*	T
West Indian manatee	*Trichechus manatus*	E
Green sea turtle	*Chelonia mydas*	T
Kemp's ridley sea turtle	*Lepidochelys kempii*	E
Leatherback sea turtle	*Dermochelys coriacea*	E
Loggerhead sea turtle	*Caretta caretta*	T, CH

Key:

E - Endangered T - Threatened CH - Critical Habitat

* These species are under the sole jurisdiction of National Marine Fisheries Service

** These species are under the sole jurisdiction of US Fish and Wildlife Service

Sources: NOAA 2020; USFWS IPaC (n.d.)

3.1.1 Marine Benthic Macroinvertebrates

Marine benthic macroinvertebrates of the ROI are found living in or on the bottom of tidal creeks, tributaries and tidal flats. Marine benthic macroinvertebrates fall into two benthic communities. Epifaunal communities live attached to surfaces such as rocks, pilings, or on the surface of the bottom. Infauna communities burrow and live within benthic sediments. Macroinvertebrates sort within the tidal zones by habitat stressors such as benthic sediment size, soil salinity and wave energy (Sanger and Parker 2016).

Marine benthic macroinvertebrates are a primary food source for larger, economically important crustaceans and fish. Their size, abundance, and species diversity are valuable indicators of surrounding environmental conditions (Sanger and Parker 2016). Typical marine benthic macroinvertbrates that could be found in the ROI include mollusks, polycheates, oligochaetes, nematodes, and amphipods.

3.1.2 Invertebrates

Common aquatic invertebrates found in waterways and salt marshes in the ROI include penaeid shrimp, grass shrimp (*Palaemonetes vulgaris*), blue crabs (*Callinectes sapidus*), horseshoe crabs (*Limulus*

polyphemus), knobbed whelk (*Busycon carica*), eastern oysters (*Crassostrea virginica*), ribbed mussels (*Geukensia demissa*), hard clams (*Mercenaria mercenaria*), Eastern mud snails (*Ilyanassa obsolete*) and marsh periwinkles (*Littoraria irrorata*) (Sanger and Parker, 2016). Some of these organisms rely entirely on salt marsh-tidal creek systems, while others such as penaeid shrimp and blue crabs are transient and use them as nursery grounds. Many of these species are economically important in South Carolina. More information on habitat significance of salt marshes for invertebrates can be found in Section 3.2.

3.1.3 Fish

Common demersal fish that can be found in waters of the ROI include Atlantic croaker (*Micropogonias undulates*), bay anchovy (*Anchoa mitchilli*), mummichog (*Fundulus heteroclitus*), red drum (*Sciaenops ocellatus*), black drum (*Pogonias cromis*), silver perch (*Bairdiella chrysoura*), spot (*Leiostomus xanthurus*), spotted seatrout (*Cynoscion nebulosus*), Atlantic menhaden (*Brevoortia tyrannus*), blackcheek tonguefish (*Symphurus plagiusa*), and southern flounder (*Paralichthys lethostigma*) (Sanger and Parker, 2016). Several of these species, such as red and black drum, flounder, spot, and spotted sea trout have commercial and/or recreational value. Threats to many of these species include habitat loss, pollutants, and degraded water quality.

Two federally protected fish species also commonly occur in the Charleston Harbor and the Cooper River. As noted in Table 1, they include the shortnose sturgeon (*Acipenser brevirostrum*) and the Atlantic sturgeon (*Acipenser oxyrhynchus*). Shortnose sturgeon spend most of their time as adults in fresh and brackish water but do venture into lower coastal reaches and the ocean on rare occasions. Atlantic sturgeon is a subtropical, anadromous species that typically migrates up rivers in the late summer to fall in this region to spawn. Both are bottom feeders. Historically, over-fishing affected sturgeon populations. Current prominent threats to these species include habitat loss or fragmentation, dredging, migration/passage barriers, decreased water quality, and entanglement in fishing gear, as well as vessel strikes for Atlantic sturgeon. Shortnose sturgeon are currently found in the Cooper River, and the Carolina Distinct Population of Atlantic sturgeon is found throughout the Charleston Harbor, with portions of the Cooper River designated at Critical Habitat for the Atlantic sturgeon (NOAA, n.d.). Both species have also been found in Ashley River. Tagging and tracking by the SCDNR of shortnose and Atlantic sturgeon confirm movement throughout the Charleston Harbor, and in the Cooper River with the highest usage of the Cooper River by shortnose sturgeon roughly between river km 30 and 45 where the freshwater-to-saltwater interface occurs. This is well upstream of the study area. Adult and sub-adult Atlantic sturgeon in the Cooper River are believed to be transient populations from other river systems.

Cartilaginous fishes, such as the Atlantic stingray (*Dasyatis sabina*) and the bonnethead shark (*Sphyrna tiburo*), can also be found in the ROI. Sharks move into estuaries in the spring, and then move offshore in the fall.

3.1.4 Marine Mammals

Marine mammals known in the ROI include bottlenose dolphin (*Tursiops truncates*) and West Indian manatee (*Trichechus manatus*). Both are afforded Federal protection under the Marine Mammal Protection Act (MMPA) of 1972, as amended (16USC 1461).

There are two recognized subspecies of the West Indian manatee; the Antillean manatee (*Trichechus manatus manatus*) and the Florida manatee (*Trichechus manatus latirostris*). The Florida manatee inhabits the Southeastern coast of the United States, however both subspecies are commonly referred to as the West Indian manatee. As noted in Table 1, the West Indian manatee is a federally-listed threatened species. Manatees can inhabit both salt and fresh waters and are found at shallow depths (5-20'). In the waters of the continental US, they and are most abundant in the warm waters of peninsular Florida. During the summer months manatees on the eastern coast of Florida have been reported to travel as far north as Cape Cod, Massachusetts (USFWS 2008). Manatees that inhabit and travel through South Carolina waters during the warmer months will feed on salt marsh grasses at high tide and submerged algae beds at low tide. Manatees have been sited near the Charleston Peninsula in the Cooper River, the Ashley River, the Atlantic Intracoastal Water Way, and Shem Creek; a tidally influenced saltwater creek that drains directly into Charleston Harbor before draining into the Atlantic Ocean.

While common bottlenose dolphins can be found in nearshore coastal waters and estuaries of the Atlantic Coast from New York to Florida, a resident single-stock of bottlenose dolphins inhabits the Charleston Harbor and main channels of the Ashley, Cooper, and Wando Rivers. The Charleston Estuarine System (CES) Stock spans the estuarine waters and tributaries from Price Inlet (near Capers Island) to the Stono River. The stock is threatened by entanglement with blue crab traps/pots and other fishing gear, disease, and urban pollution, especially in the tidal rivers more so than in the open waters of the Charleston Harbor (NOAA 2016). Bottlenose dolphins, who fall into the mid-frequency generalized hearing range for cetaceans of 150 Hz to 160 kHz, are susceptible to hearing impacts from underwater noise (NOAA, 2018). The size of the CES Stock is currently unknown, but it is considered to be a "strategic stock under the MMPA" (NOAA 2016).

3.1.5 Sea Turtles

There are four species of sea turtles known to occur in or near waters of Charleston, SC, all of which are federally-listed as threatened or endangered species (see Table 1): Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*) and green (*Chelonia mydas*). Leatherback sea turtles, found in offshore waters, and Kemp's ridley sea turtles, found in nearshore waters, could be but are less likely to be, in the ROI. Loggerhead and green sea turtles are the most common species in South Carolina waters, and their distribution at different life stages varies including offshore waters, bays, inlets, river mouths, salt marshes, creeks, ship channels, and sandy beaches for nesting. Subadult and adult loggerheads move into coastal waters, such as Charleston Harbor, to prey on mollusks, crustaceans, and fish (USFWS 2015). Studies done in Virginia and Delaware show loggerhead sea turtle eating preference to be horseshoe crab, then blue crab, then finfish. Ultimately, reduction of salt marsh acreage could lead to alteration of the loggerhead sea turtle food web (Boutin & Targett, 2013; Seney & Musick, 2007).

A trawling study conducted within the Charleston Harbor shipping channel between 2004-2007 showed that loggerhead sea turtles are present in the channel in increased numbers, and are of increased size, compared to the early 1990s (Arendt et al, 2012). Although loggerheads and greens could be found in the Cooper and Ashley Rivers, they are unlikely to wander into the shallow, altered tidal creeks of the peninsula.

Threats to sea turtles include vessel strikes, dredging, fishing by-catch and entanglement, degradation of foraging habitat, pollution, and disease. They are also threatened by various natural and anthropogenic impacts to their nesting habitat, such as beach erosion, beach armoring, artificial lighting, and nest predation. In the Charleston area, Critical Habitat for nesting loggerhead sea turtles has been federally-designated for Folly Beach and Morris Island, but these are well outside of the ROI.

3.1.6 Birds

Tidal marshes and flats harbor many species of birds including larger wading birds such as herons and egrets as well as smaller birds like redwing black birds and seaside sparrows. Marshes serve as nesting and foraging grounds for these and other birds. Foraging may occur at various tidal stages with birds seeking small fish and crabs, the marsh periwinkle (*Littorina spp*.), and other macroinvertebrates as described in 3.1.1. Of particular interest for this study are two species that are listed as threatened under the ESA (see Table 1): the American wood stork and eastern black rail (BLRA). The BLRA was officially listed in 2020.

The American wood stork is a long legged water bird species that uses freshwater and estuarine wetlands as feeding, nesting, and roosting sites. The stork constructs nests in trees, usually in gregarious colonies (called rookeries). Often the rookeries and roosting areas are in association with herons, egrets, and other species. Stork feeding behavior is typically along the marsh vegetation and open water interface seeking small fish and macroinvertebrates (USFWS, 1990). The existing tidal wetlands on the Peninsula could serve as potential foraging habitat for the wood stork, but there are no known roosting areas or rookeries.

While wood storks are habitat generalists, foraging and reproductive grounds are decreasing due to encroaching development. Additionally, storks are especially sensitive to environmental conditions at breeding sites and may fly relatively long distances either daily or between regions annually seeking adequate food resources (USFWS, 1990).

The BLRA is a wetland dependent bird found in a variety of salt, brackish, and freshwater wetland habitats that can be tidally or non-tidally influenced requiring dense overhead cover and soils that are moist to saturated (occasionally dry) and interspersed with or adjacent to very shallow water. The BLRA nests within dense clumps of vegetation over moist soil or shallow water to provide shelter from the elements and protection from predators. The primary threats to the eastern black rail included habitat degradation through marsh draining and ditching as well as fragmentation from conversion of habitat to agricultural lands or urban areas (USFWS, 2019). Presence of BLRA in the study area is questionable since the marsh habitat has varying tidal fluctuations, but the possibility remains for this recently-listed species (M. Caldwell, USFWS personal communication).

3.2 Supporting Habitats

3.2.1 Wetlands

Many of the species described above are supported by tidal wetlands found along the Lower Ashley and Lower Cooper Rivers. Habitats include emergent tidal marshes dominated by cordgrass (*Spartina alterniflora*) and black rush (*Juncus roemerianus*), as described in the Wetlands section of the IFR/EA.

While high marsh is limited in the study area, it typically includes sea oxeye (*Borrichia frutescens*), salt grass (*Distichlis spicata*) and salt meadow hay (*Spartina patens*), along with scrub shrub wetlands that support wax myrtle (*Myrica cerifera*), salt marsh elder (*Iva frutescens*) and groundsel tree (*Baccharis halimifolia*) (Sanger and Parker, 2016). The tidal creeks and tributaries in the study area, along with their adjacent saltmarshes and oyster reefs are designated Essential Fish Habitat (EFH) under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) because they provide nursery habitat for juvenile development of penaeid shrimp, specifically white and brown shrimp. These habitats are also considered a Habitat Area of Particular Concern for fishes in the snapper-grouper complex. The snapper-grouper complex includes ten families of fishes containing 73 managed species. The Habitat Area of Particular Concern includes the areas of depth inshore of the 100-foot contour in Charleston Harbor. The habitat designation is specific to nearshore snapper-grouper species and target life stages that are estuarine dependent (NOAA 2020b).

3.2.2 Tidal Flats

Tidal flats are the foundation for coastal wetlands as they accumulate sediments on gently sloping beds in estuaries or other low energy marine environments. Tidal flats are important to intertidal chemistry as they recycle organic matter and nutrients from both terrestrial and marine sources. They are also areas of high primary productivity and can support an abundance of microorganisms, benthic organisms, fin fish, shellfish, and wading birds.

Tidal flats can be differentiated by tidal elevation zones. Supratidal flats are found in the supratidal elevation zone. This is the tidal zone above high tide. Intertidal flats are found in the intertidal elevation zone. This is the tidal zone between high and low tides. The Intertidal flats are non-vegetated, soft sediment habitats composed of fine-grained sediments (e.g. mud). Subtidal flats are found in the subtidal elevation zone. This is the tidal zone that is below low tide and is rarely exposed to the atmosphere. The subtidal flats are generally made up of larger grained sediments such as sand and are found lower in the tidal zone. The submerged ocean floor of Charleston Harbor is made up of unconsolidated sediments and is considered deep water habitat. Subtidal flats and the ocean floor in the ROI are considered EFH. These areas are designated EFH to protect marine benthic macroinvertebrates in support of economically important marine resources.

3.2.3 Water Column

The water columns of the Charleston Harbor, the lower Ashley River and the lower Cooper River are also considered EFH. They serve as the connecting water bodies between inshore estuarine nursery grounds and offshore marine habitats used for spawning and growth to maturity of several marine species.

4 Future Fish and Wildlife Resources

If current trends in land use and climate change continue into the future, aquatic resources in coastal South Carolina will continue to be affected. Over the past several decades, habitats within South Carolina have become increasingly fragmented. Habitat decline, increases in invasive species, shifting climate regimes and salinity profiles, increasing development in coastal areas, and rising sea levels represent constraints and barriers to dispersal and migration of fish, wildlife and plant species. Migratory corridors are essential for the ability of wildlife and fishes to find suitable habitat and for population maintenance. Habitat loss is the most important factor contributing to species decline (SCDNR, 2021).

4.1 Land Use

Increased development within coastal watersheds leads to increased salinity ranges, increased nutrient loading, bacteria and pathogens, and contaminants in tidal creeks that impair oyster health, reduce biological productivity, and alter the food web. The intertidal headwater areas of tidal creeks in small coastal watersheds are especially sensitive to changes in land use. When these small watersheds are characterized by 20-30% impervious surface, ecological processes in tidal creeks are impaired (Sanger, et al., 2015). All of the tidal creeks on the Charleston Peninsula would meet this classification. For example, New Market Creek drains only a 199 ha area that contains 70% impervious cover (Sanger, et al., 2015).

4.2 Climate Change

Estuaries and the species they support are at risk from climate change impacts such as changes in temperature, sea levels, salinity, dissolved oxygen levels, and ocean acidification. Table 2 summarizes some of the potential impacts and consequences of climate change.

4.2.1 Temperature

Current climate models predict continued warming across the southeast United States, with the predicted temperature increases in the summer months ranging between 4.5°F and 10.5°F. Higher temperatures create a higher risk of drought as rates of evapotranspiration increase leading to increased frequency, duration, and intensity of drought in the coming years. Warmer ocean temperatures can provide more energy to hurricanes creating conditions for more intense storms adding to flooding concerns. Though temperatures are trending upward, temperature days below freezing are slightly increasing in South Carolina. Temperature change is expected to shift species and their habitats in both time and space affecting species diversity and interactions at all trophic levels. Temperature has a direct effect on the physiology, maturation, and survivability of aquatic species whose metabolic rates fluctuate with environmental temperature. Temperature changes will likely affect the rate of energy transfer between the trophic levels as well. The timing and extent of species distributions and migration could also be affected by warming waters (SCDNR, 2021).

4.2.2 Sea Level Rise

It is anticipated that sea level rise will accelerate within the next 100 years. The Cooper River Entrance Tidal Gage (8665530), also known as the Charleston Harbor or Custom's House gage, is the most extensive and continuous record of tides for the City of Charleston. The Charleston Harbor tide gauge has been measuring sea level continuously since 1921. In that nearly 100-year time span, local sea level has risen 1.07 ft (NOAA, n.d.). One way to track local impacts from sea level rise is documenting "minor coastal flooding." Commonly called nuisance, sunny day, or high tide flooding, "minor coastal flooding" is a threshold from the National Weather Service that indicates when the tide has reached a certain height (7.0 ft. MLLW in the Charleston Harbor). At this height, low-lying areas on land begin to flood. For example, Lockwood Blvd begins to flood at 7.2 ft. MLLW (or 4.06 ft. NAVD88).

Potential impacts of rising sea level on total water levels along the South Carolina coastline include overtopping of waterside structures, increased shoreline erosion, and flooding of low lying areas. As sea levels rise, storm surge will extend farther inland and deeper. The predicted flood hazard will also increase and more areas will be flooded more often with high tides and King Tides.

Sea level rise will also affect coastal habitats such as estuaries, creeks, marshes, dunes and beaches by modifying patterns of sea water encroachment, flooding, erosion and deposition. It will also affect fish and wildlife species that depend on these habitats. As discussed in Section 3.2, estuarine flats, salt marshes and creeks are essential habitat for the juvenile stages of many marine species that are important fisheries. These habitats also sustain other small species that serve as prey for crabs and birds. Rising sea levels could contribute to a reduction in the area of intertidal marsh available, especially if coastal development impedes their inland expansion in response to inundation. This could also be limiting for shellfish beds if they cannot migrate landward, or they become destabilized through other habitat changes (SCDNR, 2021). Due to the urbanized nature of the Charleston Peninsula, there are already limited places were existing perimeter salt marsh and oyster reefs can migrate inland, if the sea level rise trends that NOAA predicts continue.

4.2.3 Salinity

Estuarine systems are at risk to impacts of climate change as a result of changes in sea level and variation in rainfall that may shift salinity profiles and changes in biotic composition. Rainfall and streamflow are tied directly to seasonal climatic conditions and shifts in salinity profiles in the estuarine system depend entirely upon freshwater input and rainfall. Changes in the location of the saltwater/freshwater interface will affect many freshwater and diadromous fish species. Saltwater will move further up the river systems as sea level rises. The success of species with low salt tolerances and diadromous fish will be limited by their ability to move upstream into better quality habitat due to habitat fragmentation (SCDNR, 2021).

In South Carolina, the past decade has been dominated by drought conditions accompanied by shifts in species distribution within estuaries. Changes in biotic composition and the prevalence of disease are expected to continue. Salinity profiles in estuaries are expected to change as a result of both sea level rise and changes in precipitation patterns. Sea level rise accompanied by drought will push salinity regimes up estuaries and landward compressing the available habitat. Coastal development will add to habitat compression resulting in reduction of saltmarsh habitat in the optimal salinity ranges. Estuarine species are able to tolerate salinity shifts over a tidal cycle, but they have optimal ranges and move in accordance with prevailing conditions. Sea level rise accompanied by drought would also lead to a reduction in abundance and reproduction of estuarine species that could affect all trophic levels. Extended drought leads to drying out and dieback of coastal marshes as a result of acidification of the estuary. Salt marsh dieback will reduce primary productivity and increase vulnerability to predators of juvenile fishes and invertebrates due to reduction in cover (SCDNR, 2021).

4.2.4 Dissolved Oxygen

Oxygen levels in coastal waters can also be affected by increasing temperatures and decreasing the solubility of oxygen, increasing primary productivity, and stratifying the water column. These factors can result in dead zones in coastal and estuarine waters. Hypoxia often is the result of increased nutrient run-off coupled with a stratified water column impacting benthic or demersal species that can result in losses to important fisheries. Numerous dead zone events have occurred in South Carolina during the last two decades, although most have occurred in small estuarine creeks for short durations. Only a few large events have been experienced. Increased occurrences of coastal hypoxia could result from climate-induced changes in ocean and wind circulation patterns (SCDNR, 2021).

4.2.5 Ocean Acidification

Increasing ocean acidification (decreasing pH) is related to increasing carbon dioxide levels in the Earth's atmosphere. Further deceases in pH can result from increasing acid rain and development within the coastal zone. The effects of low pH become greater as temperatures rise. In South Carolina, the concern is for the impact of ocean acidification on oysters, crustaceans, and primary producers. Decreased pH is known to impact a variety of physiological and immune functions in these aquatic organisms (SCDNR, 2021).

Table 2. Climate Change Impacts, and Consequences as Identified by the SCDNR Climate Change Technical Working Group (adapted from SCDNR, 2021).

Potential Impacts	Potential Consequences
• Changes in precipitation cycles increasing evapotranspiration (e.g. frequency and duration of droughts) • More problems with invasive species • Spatial changes in species' ranges • Changes in timing of aquatic organism migration and competition for available resources as food chains are altered • Increased coastal flooding • Increased coastal erosion • Rising water tables • Saltwater intrusion • Increased nonpoint source pollution • Increases in toxic substances flowing from upstream to coastal areas • Increases in numbers of threatened and endangered species	• Decline in water quality and quantity • Surface and sea-water pH changes • Decline in productivity and availability of fish and other aquatic species • Economic losses directed toward business associated with natural resource management in coastal zones • Loss of beaches • Increased storm surge flooding • Impacts to coastal infrastructure • Salt marsh conversion to open water • Freshwater marsh conversion to salt marsh • Loss of important recreational and commercial fishing and shell fishing habitats • Extinction of threatened and endangered species

5 Potential Impacts of the Tentatively Selected Plan on Fish and Wildlife Resources

The goals of coastal storm risk management projects are to improve life safety and reduce property damages resulting from storms. Historically, beach nourishments and traditional coastal defense structures such as groins, seawalls, revetments, breakwaters and jetties have been used to reduce wave action and erosion along ocean-facing shorelines. The impacts of implementing these measures have been studied over time and their impacts on fish and wildlife resources are generally understood.

Coastal risk management projects are, increasingly, considering the use of traditional riverine flood control structures, such as levees and flood walls, to address storm surge along coastal shorelines. Hardened structures in these situations may be placed in the estuarine environment where the resulting impacts on estuarine fish and wildlife resources are not as well understood.

What is known about hardened structures, such as bulkheads, in estuaries is that they can cause damage to natural landforms. Hardened structures can interfere with the natural transport of sediments. They can lead to loss of wetlands. They can be visually undesirable, and they can restrict recreational access (Rangel-Buitrago et al., 2017). Numerous studies show that placing structures in tidal creek-salt marsh networks alter the food web by reducing biological productivity, changing species composition, abundances, and diversity. Hardened structures can directly affect sessile biota and indirectly shape amphipod assemblages causing cascading effects (Sedano et al., 2020; Sanger et.al., 2015).

5.1 Storm Surge Wall

While the perimeter storm surge wall proposed in the TSP is not designed the same as a seawall on a beach, nor for the same purposes as a bulkhead, its interactions with the estuarine environment may be similar. Seawalls and bulkheads are artificial coastal defense structures that fortify soft-shore coastlines into static, hard structures for the primary function of preventing shoreline erosion. The introduced hard surface associated with such structures is less dynamic than the substrate they replace. They can lead to intertidal habitat change and habitat loss as the area normally flooded by the tide is limited by the structure. This can cause a shift in the benthic community resulting in a significant decline in the abundance, biomass and size of organisms, including macroinvertebrates, in the tidal zone where the structure is located (see more below). Working up the food web, these alterations can affect the species richness and abundance of shorebirds as they rely on near shore habitat for food and rearing young (Schoonees, et al., 2019).

The design profile of a seawall can also artificially create steeper slopes in the environment. These steeper slopes find organisms that used to live in different vertical zones to be in much closer proximity to one another. This change in proximity causes change in ecological interactions as they are, now, competing for resources in an altered stress environment. This competition typically results in alterations in the food web by altering species composition and abundance (Schoonees et al., 2019).

Seawalls reflect wave energy seaward. The reflection can create turbulence, capable of suspending sediments, leading to increased erosion, or scour, at the foot of the wall (Bush et al 2001; Walton and Sensabaugh, 1979). The scouring can impact the tidal mudflat habitat and reduce water clarity. The impact on the outer edge of the marsh may be even greater. A 2018 thesis study looked at the long-term effects of bulkheads on salt marsh loss in North Carolina, including the role of wave energy on marsh loss (Burdick, 2018). Rates of outer edge marsh loss were observed to be higher when adjacent to bulkhead sites than to natural shorelines. The rates were not significantly different under different wave energy regimes (high, medium, low).

The storm surge wall and gates, as proposed in the TSP, could also have similar environmental effects in the aquatic environment as roads and culverts do. Road networks, including culverts, are the primary mechanism for changing the volume and timing of peak flows in a watershed. Roads and ditches transport water through systems more quickly concentrating flow, and culverts and dikes constrict the

flow. The result is increased stream power that erodes channel beds and banks. Incising or aggrading of the channel can occur around the culverts (Castro, 2003). Culverts impact aquatic (and terrestrial) species by disrupting the longitudinal continuity, or connectedness, of the channel. They can be passage barriers for aquatic resources due to high velocities, shallow depths, reduced lengths of resting areas, or excessive height (Castro, 2003). In tidal creek-salt marsh systems, culverts could mean limited access to nursery habitat for fish, shrimp and crabs.

5.2 Storm Surge Gates and Tidal Exchange

This section reviews the few studies that could be found that examine the changes in tidal flow from water control structures or flow gates in estuaries, and their indirect impacts on vegetation, fish and wildlife resources, and water quality.

5.2.1 Changes in Tidal Inundation on Vegetation

The vertical distribution of tidal zone species has been attributed to species preference to environmental stressors such as soil salinity and tidal chemistry. These stressors are strongly determined by the elevation of the tidal zone in which the species occur. De Leeuw et al. (1994) studied the effects of a sluice gate installation on tidal zone vegetation at the mouth of the Oosterschelde Estuary, The Netherlands, where the tidal range is 11-12 ft (double the tidal range found in the Charleston Harbor). The sluice gate reduced the width of the mouth of the estuary and decreased the inundation frequencies. They reported that extreme reduction in tidal inundation can reduce the salinity of the soils and alter tidal zone vegetation composition. They found that infrequently inundated intertidal zone sediments displayed a lower salinity in the seasons when rainfall exceeded evapotranspiration. In their study, rainfall exceeded evapotranspiration 3 of the 4 seasons. They found that habitat upland of the sluice gate was more suitable for annual vegetation establishment than it was for perennial vegetation establishment. The authors speculated that seeds of annual species were able to germinate at a faster rate under low salinity conditions than perennial species. When tidal flats were once again inundated with tide waters, the salinity favored perennial species and they were able to reestablish (De Leeuw et al., 1994).

5.2.2 Changes in Tidal Inundation on Marine Organisms

(All the information in this section comes from Ritter et al., 2008.)

Ritter et.al. (2008) compared estuarine habitats with unrestricted and artificially restricted tidal flows due to employment of water control structures in Elkhorn Slough, Central California, USA. It should be noted that while the tidal range in this estuary is similar to the Charleston Harbor, Elkhorn Slough experiences mixed diurnal tides and Charleston Harbor has a semi-diurnal tide exchange. In Central California, there are also distinct wet and dry seasons.

Water control structures can permit a tidal flow gradient that extends from substantial tidal influence to minimal tidal influence. The investigators sampled a broad variety of marine organisms and water quality parameters then compared community composition patterns and responses to the varying gradients of tidal restrictions within this single estuary. To compare organism responses, they placed organisms into three different habitat categories and three different tidal exchange categories: estuarine /brackish, marine/coastal, or terrestrial/freshwater habitats and “full”, “muted” or moderately restricted, or “minimal” tidal exchange categories, respectively. The muted tidal exchange would be

similarly classified for the proposed storm surge wall and sluice gates in the Charleston Peninsula Coastal Flood Risk Management Study.

Community Composition

Ritter et.al. (2008) found that there were differences between community composition in the three tidal exchange categories. In the algal community, there were significant differences (95% confidence interval) between the algal community composition in the minimal tidal exchange and the full and muted tidal exchange. In the invertebrate community there were significant differences between the invertebrate community composition in the minimal tidal exchange and the full and muted tidal exchange. There were marginal differences (90% confidence interval) in the invertebrate community composition between the full tidal exchange and the muted tidal exchange. In the fish and crab community there were significant differences between the minimal tidal exchange and the full and muted tidal exchange. There were no significant differences between the fish and crab community composition in the full tidal exchange and the muted tidal exchange.

In the plant community, at the marsh-upland ecotone, there were marginal differences between the plant community composition in the muted tidal exchange and the minimal and full tidal exchange. There were no significant differences between the plant community composition at the marsh-upland ecotone in the minimal tidal exchange and the full tidal exchange. There were marginal differences between the community composition of organisms found on artificial surfaces in the full tidal exchange and the muted tidal exchanges (no minimal tidal exchange sites were assessed). There were significant differences between the bird community composition in the minimal tidal exchange and the full and muted tidal exchanges. There were significant differences between the shorebird community composition in the full tidal exchange and the minimal tidal exchange, but no differences between the shorebird community composition in the muted tidal exchange and the minimal and full tidal exchange. There were significant differences between the mammal community composition in the minimal tidal exchange and the full and muted tidal exchanges.

Ritter, et.al. (2008) also found that large culverts, which were present at some of the sites, created muted tidal exchanges that allowed for colonization of muted habitats by muted aquatic organisms. At minimal tidal exchange sites, they found that biotic communities were different from communities in the full and muted tidal exchange sites, possibly due to differing environmental conditions resulting from structural barriers. They also concluded that birds and upland plant movement is not restricted by water control structures as their dispersal mechanisms are able to clear the barriers.

Community Structure

Community structure is the number of species present and their relative abundance. Certain species emerged as significant in explaining differences between community structure in the three tidal exchange categories in the Ritter, et.al. (2008) study. Western/least sandpipers, sanderlings, Olympic oysters, salt grass, alkali heath, three-spine sticklebacks, long-jaw mudsuckers, and poison hemlock were the significant species contributing to differences in community structure between the full and muted tidal exchange categories. Gulls, long-billed curlews, Japanese mud snails, amethyst gem clams, European shore crabs, yellow shore crabs, water boatmen, fleshy jaumea, California brackish snails, and poison hemlock were the significant species contributing to differences in community structure between full and minimal tidal exchange categories. Long-billed curlew, staghorn sculpins, Japanese mud snails,

European shore crabs, yellow shore crabs, water boatmen, soft chess, salt grass, alkali heath, and curly dock were the significant species contributing to differences in community structure between muted and minimal tidal exchange categories.

For plant community structure, they found marginal differences between the plant community structure in the muted tidal exchange and the minimal and full tidal exchanges. There were no differences between the plant community structure in the minimal tidal exchange sites and the full tidal exchange sites.

Ritter, et.al. (2008) concluded that tidal restrictions accentuate the natural sea-to-land gradient of key physical factors. These restrictive structures affect environmental conditions leading to differences in habitat structure and water quality. Restricted sites in this study had far less area of intertidal mudflats than did the full tidal exchange sites. This may explain the lower frequency of most shorebird species in restricted tidal exchange sites (both minimal and muted exchange) versus the full tidal exchange sites.

Midge larvae and sinistral snails were found, only, in minimal exchange sites. Most of the marine algae and invertebrates were found in the minimal exchange, as well.

Species Richness

Species richness is the number of different species present in a community. Ritter, et.al. (2008) found that a mosaic of tidal exchange categories maximizes estuary-wide species richness. They also found that species richness was greatest in the full tidal exchange, then muted tidal exchange, and lowest at the minimal tidal exchange. Primary producers and invertebrates were more common across all tidal exchange categories than fish or birds. Primary producer species were greater in the full and minimal tidal exchanges and lower in the muted tidal exchange. Invertebrate species were greatest in the full tidal exchange, then in the muted tidal exchange, and lowest in the minimal tidal exchange. Bird species were greatest in the muted tidal exchange than they were in the full and minimal tidal exchanges. Fish species were greater in the full and muted tidal exchanges than in the minimal tidal exchange.

Species Richness Patterns by Habitat and Tidal Exchange Categories:

Species richness for terrestrial and freshwater species was greatest in the minimal tidal exchange, then the full tidal exchange, and lowest in the muted tidal exchange.

Species richness for estuarine species was greatest in the full tidal exchange, then the muted tidal exchange, and lowest in the minimal tidal exchange. Species richness for estuarine primary producers were greater in the full and minimal tidal exchange than in the muted tidal exchange. Species richness for estuarine invertebrate species were greater in the full and muted tidal exchanges than in the minimal tidal exchange. Estuarine fish species richness was greatest in the minimal tidal exchange.

Seventy-nine marine species were identified in the study area. Marine species richness was greater in the full tidal exchange than in the muted tidal exchange, and lowest in the minimal tidal exchange. Most of the fish species, half of the invertebrate and bird species, and a third of primary producers identified in the study were marine species. Marine invertebrates and fish were noticeably scarce at the minimal tidal exchange sites.

Fifty-six non-native species were identified in the study area. Non-native species richness was similar and greater at the full and muted tidal exchange sites that at the minimal tidal exchange sites. Most

non-native species and the majority of primary producers across all tidal exchange categories identified in this study were upland plant species. There were many non-native invertebrates identified. The majority were estuarine species found in the full and muted tidal exchanges. There was 1 non-native fish and no non-native birds identified.

5.2.3 Water Quality

Water quality varied between tidal exchange categories in the Ritter, et.al. (2008) study, and the different water quality parameters helped to define the categories.

The water quality parameters most important in defining differences between full tidal exchange and minimal tidal exchange were tidal range, rainy season salinity, and phosphate (greater in minimal). The water quality parameters most important in defining differences between muted tidal exchange and minimal tidal exchange were rainy season salinity, phosphate, ammonia, and turbidity (greater in minimal). Phosphate and pH were important in defining the minimal tidal exchange category. The minimal tidal exchange category was most distinct, where water quality in the full and muted tidal exchange categories were somewhat similar. The water quality parameters most important in defining differences between full tidal exchange and muted tidal exchange were tidal range, temperature, pH, DO, and dry season salinity.

Water quality upstream of the estuarine water control structures often showed lower salinity, higher temperature, higher nutrient concentrations and higher suspended heavy metal concentrations. The minimal tidal exchange sites in the study, on average, had far less salinity than the muted or full tidal exchange sites. This, in part, was due to the water control structures serving as partial freshwater impoundments. Salinity is a key determinate of biotic community composition.

Water in the muted tidal exchange underwent extreme, diel, biogeochemical cycling. Temperature, salinity, and DO recorded in the muted tidal exchange showed considerable daily variation relative to full tidal exchange. This extreme, diel, biogeochemical cycling includes cycling between supersaturated oxygen and hypoxic conditions. Hypoxia is known to affect estuarine communities particularly invertebrates and fishes.

5.3 Hydraulic Pumps

Studies show that hydraulic pumps may impact aquatic resources through potential exposure to hydraulic fluid used in the pumps, and through exposure to noise generated by the pumps. They can also expose aquatic resources to concentrated water quality as a point source of stormwater effluent. Additionally, if pumps are placed in an aquatic environment, there could be the potential for organisms to become entrapped in the pumps; however, no studies were located that reported on this effect.

5.3.1 Hydraulic Fluid Toxicity

Most "environmentally friendly" hydraulic fluid is largely made up of vegetable oil. It is considered "environmentally friendly" because it has a favorable LD50 for trout in a tank, not in-situ. The effects of vegetable oil on in the marine environment or on the marine food web are not considered in toxicity testing (High Performance environmentally Acceptable Hydraulic Fluid Patent-online). However, a hydraulic fluid spill might interrupt the food web beginning with diatoms and possibly affecting other marine species. Vegetable oil is a polyunsaturated fatty acid that can induce oxylipin production in

diatoms. Diatoms are primary producers found in all ecosystems and are represented by thousands of species. They are a preferred food source of copepods, who are an important food source for many other marine organisms, but oxylipins interfere with copepod reproduction. (Russo et.al., 2018).

5.3.2 Pump Noise

There are many marine organisms at various trophic levels that use sound for communication or predation (Tyack, 2008). Sound travels three times faster in water than it does through the air. If the frequency of a sound source is outside of the hearing range of a species then the likelihood of hearing loss caused by that sound source is low (NMFS 2018). A small marine pump operates at 50/60 Hz; hydraulic pumps at other frequencies could interfere with the health of aquatic resources, such as bottlenose dolphin who have a hearing range of about 75 Hz- 150 kHz.

5.3.3 Pumps and Water Quality

When operating, hydraulic pumps can become a source of point discharge of the water they move, such as rainfall and stormwater runoff. Bottlenose dolphins are sensitive to significant/abrupt shifts in salinity and may be harmed if long duration or frequent pumping of freshwater into tidal waters lowers salinity levels. If the extent and duration of pumped stormwater effluent were to reach the Cooper River, it could affect sturgeon and Atlantic sturgeon Critical Habitat (Andrew Herndon, NOAA Fisheries, personal communication, April 2021).

Nutrients and pollutants in storm water effluent can also cause algal blooms, which can be harmful to aquatic resources such as bottlenose dolphins, particularly if they produce toxins, by increasing mortality, reducing prey availability, and increasing likelihood of entanglement or ingestion of fishing gear. Algal blooms may also lower dissolved oxygen concentrations to levels that are harmful to sturgeon (Andrew Herndon, NOAA Fisheries, personal communication, April 2021). It should be noted that algal blooms are very rare in the Charleston Harbor estuary with respect to current pumping and stormwater discharges from the Charleston Peninsula and other surrounding communities.

5.4 Storm Surge Wall Construction

While a range of temporary impacts from construction related activities for the TSP are covered in the Draft IFR/EA, noise from installing the concrete battered piles for the storm surge wall in the tidal creek-salt marsh environment was not well covered for its effect on aquatic resources.

Sound propagation in shallow waters is complicated by multiple reflections, refractions, and by sound wave scattering, but studies that assess impacts of multi-pulse sound associated with pile installation using hydraulic impact hammers show mostly negative effects on mammals and birds. Marine mammals near pile driving have been found to suffer temporary hearing loss, increased stress levels, and whole populations have developed avoidance behavior that has led to habitat loss. The extent of the damage to these mammals depends on noise frequency, duration, and auditory characteristics of the species (Middel & Verones, 2017 and Tsouvalas, 2020).

NOAA also reports that marine mammal hearing can be impacted through acoustic exposure from impulsive underwater sound (NMFS 2018). The cumulative weighted temporary onset acoustic threshold shift for mid-frequency cetaceans, which includes bottlenose dolphins like those found in the

Charleston Estuarine System Stock, is 178 dB SEL (takes into account both received level and duration of exposure) (NMFS 2018).

The type and intensity of underwater sound associated with pile driving depends on the type and size of the pile, the firmness of the substrate and water depth, and the type and size of the pile-driving hammer and material. The pressure waves generated from wood or concrete driving are generally considered less harmful than driving steel piles. For reference, vibratory driving of a 30-inch battered steel pile during a ferry dock construction resulted in an underwater average Root Mean Square of 168 dB, and sound exposure level (SEL) of 210 dB (Washington State DOT, 2012). This occurred at a 37-foot depth.

5.5 Nonstructural Measures and Recreational Features

Nonstructural measures of elevating and floodproofing existing structures do not typically result in direct impacts to aquatic resources if they do not take place in the aquatic environment. There could be the potential for indirect impacts to aquatic resources if pollutants or soil particles from ground disturbance are released during construction of the nonstructural measures and become concentrated in runoff that reaches local waterways. This could temporarily alter water quality conditions that aquatic resources depend on.

It is not uncommon for traditional coastal storm risk management projects, such as beach renourishment projects, to include recreational features that increase access or use of coastal resources and could in turn impact aquatic resources. In the proposed plan, a walking path for pedestrians and recreational transportation (i.e., bicycles) along portions of the storm surge wall is being proposed (primarily where sidewalks will be lost due to construction of the wall), but only for segments of the wall that are on land, not in the salt marsh.

5.6 Summary and Potential for Cumulative Effects

In summary, hardened structures in tidal creek-salt marsh networks can result in direct and indirect impacts to aquatic resources. If multiple adverse effects result in a location, there is the potential for them to have a compound or additive effect on fish and wildlife in that tidal creek-salt marsh network. If multiple tidal creek-salt marsh networks are significantly affected, then there is the potential for the effects to be cumulative.

Traditional coastal defense structures can limit access to habitat, lead to loss of habitat, alter habitat, and alter food webs. Similar impacts could occur from a flood wall constructed in tidal creek-salt marsh networks such as the storm surge wall proposed for the TSP. Water control structures with gates in an estuary will influence tidal exchange and inundation of vegetation, soils, and organisms behind the control structure. Severity of effects on water quality, community composition and structure, and species richness depend on the degree of tidal flow control/restriction, with the greatest impacts expected under minimal tidal exchange compared to full or muted exchange. Muted (moderate) tidal exchange is most similar to what could be expected from the storm surge wall and open sluice gates that are proposed in the TSP. The storm surge wall and associated gates could also contribute to localized scouring and channel incising.

Use of hydraulic pumps during storm surge events, as proposed in the TSP, could impact aquatic resources if the duration and frequency changes the water quality that aquatic resources are exposed to from this point source.

Temporary construction activities could impact the hearing of aquatic resources if the noise travels underwater and levels fall within ranges of sensitive species. Runoff from constructing structural and nonstructural measures could also result in impacts, if standard best management practices are not implemented.

6 Potential Conservation Measures for Fish and Wildlife Resources

While not all conservation measures may be applicable to the environmental conditions of the Charleston area nor to the specific measure proposed in the TSP, several studies provide ideas for avoiding or minimizing impacts to aquatic resources from building traditional coastal defense structures in estuarine environments. Some of these are already planned for the study (see Section 2.5).

6.1 Measures to Avoid Impacts

Direct impacts to aquatic resources can be avoided by not building coastal defense structures in the estuarine environment. However, even land-based structures can have indirect impacts by changing the physical landscape that contributes to estuaries. Impacts from upland construction of defense structures could also have indirect impacts. So while most direct impacts could be avoided, minimization measures are likely need to reduce indirect impacts. Some impacts to aquatic resources could be avoided by considering non-structural measures to achieve coastal defense if they don't involve construction, such as policy changes or outreach and education.

6.2 Measures to Minimize Impacts

6.2.1 Seawall

Consider ecological engineering tactics that may encourage colonization and survivability of intertidal species to offset some of the impacts of sea walls or other traditional coastal defense structures. For example, the underwater portion of a seawall could be built using riprap or fine-scale surface textures to facilitate early colonization and support biodiversity (Rangel-Buitrago et al., 2017; Coombes et al., 2015). Place seawalls as low in the intertidal zone as possible to promote habitat variety and diversity. Modify or lower certain stretches along the seawall to restore sediment movement and ecological connectivity if possible. Seawalls can be constructed of steps or with cavities left between the seawall blocks or rocks (Schoonees et al., 2019). Seawall surfaces should be heterogeneous, rough and have large irregularities for a greater variety of habitat and to promote higher biodiversity. This can be achieved by incorporating tiles, different textures and microhabitats. Rock structures should have both soft and hard rock (i.e. carbonate and igneous rock). Rock sizes should be mixed. If the structure can be porous, valuable habitats can form within the internal compartments. This will support greater species richness and diversity (Schoonees et al., 2019). Roughening the structures by adding holes and grooves will improve habitat and increase the potential for increasing biotic diversity and abundance (Hall et al., 2018). Make simple adjustments to the traditional engineering design by including modified structures that enhance habitat complexity to mitigate the ecological impact of the construction (Borsje et al., 2011).

Use models to predict the shoreline response to help to optimize design for mitigating physical changes on the adjacent coast from seawalls (Schoonees, et al., 2019). Monitor the structure throughout its lifetime to identify unintended morphologic and hydrodynamic changes. Hard structure adaptations for ecological enrichment should be considered early in the design phase and be designed in close collaboration with ecologists (Schoonees et al., 2019).

6.2.2 Tide Gates

Keep tide gates open as much as possible. Connectivity between marine, estuarine and freshwater/terrestrial communities is critical to biodiversity in the estuarine ecosystem (Ritter, et.al., 2008). Keep gates in good working order to ensure they are open when not in use.

6.2.3 Hydraulic Pumps

Avoid placement in the aquatic environment. Have a fluid containment structure around hydraulic pumps in case of spill or malfunction. To reduce potential impacts of hydraulic spills on the localized environment, a containment system around each pump should be employed. Hydraulic spills should be cleaned up as soon as possible so fluid doesn't escape containment area.

Pumps should be used in a manner that meet state water quality standards, including treating stormwater if needed.

6.2.4 Pile Driving

Consider another device than a hammer and use sound reduction techniques if necessary (Tsouvalas, 2020). Different pile driving procedures can be used to alter the noise and reduce noise emission at the pile driving location (e.g. modify force exerted by the impact hammer or switch to other methods such as vibratory, BLUE, or Gentle Driving of piles). Along with this, an anti-noise barrier can be created around the pile (e.g. air bubble curtain, use casings to form air-column around pile, resonator-based noise mitigation system (sound dampers) or a combination of mitigation techniques). Noise reduction techniques are optimal at frequencies above 200 Hz, and no technique can reduce noise levels below 20 Hz. Only a combination of techniques reduces noise levels >20 dB for frequencies between 125 Hz to 8 kHz (Klusek et al., 2014 and Tsouvalas, 2020).

Use noise attenuation and minimization measure during pile driving such as these best management practices offered by NOAA and the Federal Highway Administration (NMFS and FHWA, 2017):

- Surround piles with an air bubble curtain system, turbidity curtain isolation casing, or dewatered cofferdam
- Drive piles in the day or during low water conditions for intertidal areas
- Use vibratory hammers and/or construction phasing to minimize acoustic impacts
- Minimize number and size of temporary and permanent piles
- Limit daily window for pile driving activities to no more than approximately 12 hours wherever feasible
- Provide a 12-hour quiet (recovery) period between pile driving days wherever feasible
- Use a "soft start" or "ramping up" pile driving (e.g., driving does not begin at 100% energy)
- For load-bearing piles, driving piles as deep as possible with a vibratory hammer prior to using an impact hammer wherever feasible
- Using cushion blocks when using an impact hammer wherever feasible
- Using drilled shafts for permanent construction instead of hammered piles where appropriate and feasible

6.2.5 Wave attenuation and Sediment Dynamics

Oysters and mussels filter algae, silt, and organic particles from the water column and their beds provide shelter and nesting areas for fish and crustacean species. Use oyster beds, mussel beds and vegetation to trap and stabilize sediment. Soil accretes and elevations rise, helping to attenuate waves. Oyster beds are more effective in wave attenuation than mussel beds, but both can help stabilize the intertidal sediment in front of coastal defense structures. Oyster beds serve the same function as groins or revetments on a macro-scale and influence ecology on a micro-scale (Borsje et al., 2011).

7 Recommendations and Position of Services

The Service's finds that the proposed peninsula surge wall, while intended as a measure to protect against severe storm damage, is likely to result in the loss of natural resources surrounding the peninsula of Charleston. Natural resource communities surrounding The City of Charleston have been historically eliminated through fill and development as the City grows and expands. The addition of a storm surge wall represents a continuation of this expansion. While the project does not propose fill to be placed landward of the wall the salt marsh between the surge wall and uplands will be gradually lost through restriction of tidal sheet flow hindering native vegetative growth vital to many fauna dependent upon the salt marsh system. The walled salt marsh will also entrap storm debris as well as human produced litter and trash further degrading the marsh and negatively affecting scenic vistas.

The Service recommends the USACE and the City of Charleston consider the following measures to minimize, or preferably avoid, impacts to the salt marsh habitat.

- Relocating the storm surge wall to high-ground wherever possible. Alternatively, reduce the height and width of the surge wall and locate it closer to the marsh/upland interface.
- The USACE and the City of Charleston should continue to seek additional opportunities to raise vulnerable structures within the peninsular limits.
- A maintenance and operations plan for the pumps and storm gate operation should be developed. The plan should encompass contingencies in the event of gate or pump failure.
- Compensation for impacts to marsh should include direct and indirect losses as well as consider the loss of marsh over time. It is preferred that a Permittee Responsible Mitigation plan be developed within the local watershed.

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ENDANGERED SPECIES ACT COMPLIANCE WITH U.S. FISH & WILDLIFE SERVICE

United States Department of the Interior
FISH AND WILDLIFE SERVICE
176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407

August 12, 2021

Lt. Colonel Andrew Johannes, District Engineer
U.S. Army Corps of Engineers
69A Hagood Avenue
Charleston, South Carolina 29403-5107

Attn: Nancy Parrish

Re: Threatened and Endangered Species Evaluation, Charleston Peninsula Coastal Flood Risk Management Study, Charleston, South Carolina, FWS Log# 2021-I-0973

Dear Colonel Johannes:

The U.S. Fish and Wildlife Service (Service) has reviewed the above-referenced evaluation submitted on August 6, 2021. The Department of the Army (Department) is undertaking a Coastal Flood Risk Study for the City of Charleston Peninsula, Charleston County, South Carolina. The City of Charleston requested this study and is the non-Federal sponsor. Pursuant to section 7 of the Endangered Species Act, as amended (16 U.S.C. 1531-1543) (ESA) the Department is seeking concurrence from this office on its determination of affects the action may have upon federally threatened or endangered species within the project area. This response is submitted in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and the ESA.

The purpose of the Charleston Peninsula Coastal Flood Risk Management Feasibility Study is to investigate and recommend potential structural and nonstructural solutions to reduce damages and life and safety impacts from coastal storms. The proposed Federal action to meet the study objectives includes construction of a storm surge wall along portions of the perimeter of the Charleston Peninsula, and nonstructural measures in the form of elevating and flood proofing for a limited number of structures. Approximately seven non-continuous miles of the perimeter storm surge wall would be constructed on land; approximately one and one-half non-continuous miles would be constructed through saltmarsh wetlands. The study area covers approximately eight square miles of the lower Charleston Peninsula wholly within the City of Charleston's jurisdiction.

A determination of *no effect* for the following listed species was made by the Department: the frosted flatwoods salamander, Bachman's warbler, piping plover, red knot, red cockaded woodpecker, northern long-eared bat, American chaffseed, Canby's dropwort, pondberry, and seabeach amaranth. These species do not occur in the study area as there is no suitable habitat

present. Consultation under section 7 on the ESA is not required for *no effect* determinations. No further action is required for these species at this time.

The Department determined that the proposed Federal action *may affect, but is not likely to adversely affect* the West Indian manatee, the American wood stork, and eastern black rail due to the presence of potentially suitable habitat for each of these species. The planned storm surge wall in the marsh would permanently impact approximately 35 acres of salt marsh wetlands, limiting potential foraging habitat for wood storks and eastern black rails. There are no known American wood stork roosting areas or rookeries on the peninsula, and utilization of marshes on the peninsula by the eastern black rail is questionable. West Indian manatees inhabit and travel through South Carolina waters during the warmer months of the year feeding on salt marsh grasses and other aquatic vegetation. West Indian manatees have been sited throughout the coastal waters of South Carolina including the Charleston Peninsula.

Due to the known presence suitable habitat for the American wood stork, eastern black rail, and West Indian manatee within the project area, the Department determined that the proposed project *may affect, but is not likely to adversely affect* these species. The Service concurs with your determination. Please note that obligations under section 7 of the ESA must be reconsidered if (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered, (2) this action is subsequently modified in a manner which was not considered in this assessment, or (3) a new species is listed or critical habitat is determined that may be affected by the identified action.

The Service appreciates the opportunity to review and provide comments on the submitted permit. If you should need further assistance, please contact Mark Caldwell at (843) 300-0426, or by email; mark_caldwell@fws.gov and reference FWS Log# 2020-I-0973.

Sincerely,

Thomas D. McCoy

Thomas D. McCoy
Field Supervisor

TDM/MAC

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, CHARLESTON DISTRICT
69A HAGOOD AVENUE
CHARLESTON, SOUTH CAROLINA 29403-5107

06 August 2021

Planning and Environmental Branch

Mr. Tom McCoy
Ecological Services, South Carolina Field Office
U.S. Fish and Wildlife Service, Region 2
176 Croghan Spur Road, Suite 200
Charleston, South Carolina 29407

Dear Mr. McCoy:

In accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 USC 1531), and 50 CFR 402.13 (Informal consultation), the U.S. Army Corps of Engineers, Charleston District (USACE) is providing the following letter regarding the potential for effects to threatened and endangered species with respect to the federal action proposed in the Charleston Peninsula Coastal Flood Risk Management Study. USACE has determined that the federal action will have either no effect, or may affect but is not likely adversely affect, threatened and endangered species, nor will it adversely modify designated Critical Habitat, for which U.S. Fish and Wildlife Service (USFWS) has jurisdiction. In light of its conclusions regarding the ESA, USACE also believes that further action under the Marine Mammals Protection Act of 1972 (16 USC 1371, et seq) is not required.

This letter has been revised from the August 3, 2021 informal consultation request letter submitted by USACE to reflect a not likely to adversely affect determination for the American wood stork and Eastern black rail, rather than the no effect determination made in the first letter. This revision is informed by conversations held between Mark Caldwell of USFWS and Bethney Ward of USACE on August 3, 2021 as part of the Section 7 informal consultation process. Therefore, USACE seeks USFWS' concurrence on the determinations for all listed species in this letter, dated August 6, 2021. More information on the federal action, listed species, and effect determinations are provided below.

Description of Federal Action

The purpose of the Charleston Peninsula Coastal Flood Risk Management Feasibility Study is to investigate and recommend potential structural and nonstructural solutions to reduce damages and life and safety impacts from coastal storms. The authority to study coastal South Carolina, including the Charleston Peninsula, was provided in the Rivers and Harbors Act of 1962, P.L. 87- 874, Section 110, and a subsequent Senate Committee Resolution dated 22 April 1988. Funding for the study

was appropriated by the Bipartisan Budget Act of 2018 (Public Law 115-123), Division B, Subdivision 1, Title IV. The City of Charleston requested this study and is the non-Federal sponsor. The study area covers approximately 8 square miles of the lower Charleston Peninsula that is within the City's jurisdiction. The following objectives have been identified in the study:

- Reduce risk to human health and safety from coastal storm surge inundation on the Charleston Peninsula through the 50-year life of the project, estimated to be 2032 to 2082.
- Reduce economic damages resulting from coastal storm surge inundation on the Charleston Peninsula through the 50-year life of the project, estimated to be 2032 to 2082

After several iterations of scoping, the proposed federal action to meet the study objectives includes construction of a storm surge wall of 12 ft elevation NADV88 along portions of the perimeter of the Charleston Peninsula, and nonstructural measures in the form of elevating and flood proofing for a limited number of structures. Approximately 7.1 non-continuous miles of the perimeter storm surge wall would be constructed on land; approximately 1.5 non-continuous miles would be constructed through saltmarsh wetlands. The wall would be constructed of concrete, and on land it would be a T-wall design and in the marsh, it would be a combination design (these designs are described in previous reports provided to USFWS). For the combination wall, 12x12 ft prestressed concrete sheet piles are proposed that would be battered at an inclination from vertical, using a hammer.

Other features of the proposed plan include the installation of 5 permanent and 5 temporary pump stations of low to moderate size, ranging from 20 to 90 cfs; a series of access gates for pedestrians and transportation; and storm gates in the form of sluice gates to allow for tidal exchange at creeks that intersect with the proposed wall. Five storm gates would be installed in the combination wall at Halsey Creek. Five storm gates would be installed at existing culverts that intersect several altered creeks or channels. A walking path is also planned on top of portions of the storm surge wall where it is on land. Finally, natural and nature-based features in the form of approximately 9,3000 linear feet of oyster reef-based living shorelines are also planned.

The location of the action or region of influence (ROI) for effects from the proposed federal action for terrestrial species has been defined as the Charleston Peninsula study area (approximately 8 square miles of the lower Charleston Peninsula within the City's jurisdiction, see Figure 1). For fish, marine mammals, and other aquatic species, the location of the action or ROI covers the estuarine tidal creeks of the Charleston Peninsula and the adjacent waterways including the Charleston Harbor, lower Ashley River, and lower Cooper River.

Figure 1. Map of the Charleston Peninsula Coastal Flood Risk Management Study Area

Consultation History

USACE is currently preparing a Draft Integrated Feasibility Report and Environmental Impact Statement (IFR/EIS) for the Charleston Peninsula Coastal Flood Risk Management Study. The USFWS Charleston Field Office has provided technical assistance throughout the study process. USACE has engaged USFWS through the study's Interagency Coordination Team, as a Cooperating Agency for the EIS, and under the Fish and Wildlife Coordination Act.

The USFWS provided initial comments during the scoping phase of the study in a letter dated January 31, 2019. At that time, minimal impacts to fish and wildlife resources were anticipated. In April of 2020, USACE issued a Draft Integrated Feasibility Report/Environmental Assessment (Report) and a mitigated Draft Finding of No Significant Impact for the study, prior to preparing the current Draft IFR/EIS. The Report did not include an ESA determination at that time. USFWS provided comments on the Draft Report on May 26, 2020, requesting that a Fish and Wildlife Coordination Act Report be prepared due to the potential for adverse impacts to fish and wildlife

resources. In direct response to USFWS' comments, a Coordination Act Report has been drafted and is currently being finalized.

ESA-Listed Species and Critical Habitat

The following threatened and endangered species under the jurisdiction of the USFWS can be found in Charleston County (IPaC Tool, accessed June 17, 2021):

Species Common Name	Scientific Name	Status
Frosted flatwoods salamander	*Ambystoma cingulatum*	T, CH
Bachman's warbler	*Vermivora bachmanii*	E
Eastern black rail	*Laterallus jamaisensis ssp. jamaicensis*	T
Piping plover	*Charadrius melodus*	T, CH
Red knot	*Calidris canutus rufa*	T
Red-cockaded woodpecker	*Picoides borealis*	E
American wood stork	*Mycteria americana*	T
West Indian manatee	*Trichechus manatus*	E
Northern long-eared bat	*Myotis septentrionalis*	T
American chaffseed	*Schwalbea americana*	E
Canby's dropwort	*Oxypolis canbyi*	E
Pondberry	*Lindera melissifolia*	E
Seabeach amaranth	*Amaranthus pumilus*	T

NOTES:

E - Federally Endangered T - Federally Threatened CH - Critical Habitat

Additionally, Critical Habitat for the threatened loggerhead sea turtle (*Caretta caretta*) has been designated for some nesting areas in Charleston County. Nesting loggerheads are under shared jurisdiction between the USFWS and NOAA Fisheries.

Most of the federally-listed species above, and the habitat they depend on, are not known to occur within the ROI. The January 31, 2019 letter from USFWS confirmed there are no known populations of listed wildlife or plant species in the terrestrial ROI. According to USFWS, the existing tidal wetlands on the Peninsula could serve as potential foraging habitat for the wood stork, but there are no known roosting areas or

rookeries. The presence of eastern black rails in the study area is questionable since the marsh habitat has varying tidal fluctuations, but the possibility remains. For marine species, the West Indian manatee is found within the aquatic ROI. There is no designated Critical Habitat for any of these species in either ROI.

There are a number of At-Risk-Species (ARS) in Charleston County, which are also State-listed species, but the terrestrial ROI does not support suitable habitats for most of them. Two that could be found on the Peninsula include the salt marsh sparrow (*Ammospiza caudacuta*) and the monarch butterfly (*Danaus plexippus*). At-Risk-Species are not afforded any Federal protections and therefore are not discussed in this letter, but are considered in the Draft IFR/EIS.

Species Assessment and Effect Determination

USACE has determined that the proposed federal action will have no effect for the following listed species, nor for designated Critical Habitat associated with any of them: frosted flatwoods salamander, Bachman's warbler, piping plover, red knot, red cockaded woodpecker, northern long-eared bat, American chaffseed, Canby's dropwort, pondberry and seabeach amaranth. These species do not occur in the study area or ROI nor does suitable habitat to support them. Therefore, there is no route of exposure to effects from the proposed federal action.

USACE has determined that the proposed federal action may affect, but is not likely to adversely affect, the American wood stork and Eastern black rail. The American wood stork is a long legged water bird species that uses freshwater and estuarine wetlands as feeding, nesting, and roosting sites. The stork constructs nests in trees, usually in gregarious colonies (called rookeries). Often the rookeries and roosting areas are in association with herons, egrets, and other species. Stork feeding behavior is typically along the marsh vegetation and open water interface seeking small fish and macroinvertebrates. The Eastern black rail is a wetland dependent bird found in a variety of salt, brackish, and freshwater wetland habitats that can be tidally or non-tidally influenced, requiring dense overhead cover and soils that are moist to saturated (occasionally dry) and interspersed with or adjacent to very shallow water. The black rail nests within dense clumps of vegetation over moist soil or shallow water to provide shelter from the elements and protection from predators. The planned storm surge wall in the marsh would permanently impact approximately 35 acres of salt marsh wetlands, limiting potential foraging habitat for wood storks and eastern black rails. As stated above, there are no known wood stork roosting areas or rookeries on the peninsula, and utilization of marshes on the peninsula by the eastern black rail is questionable. These species would be able to migrate to other areas to forage. Therefore, the effect of the proposed federal action on these species is deemed insignificant and discountable.

USACE has determined that the proposed federal action may affect, but is not likely to adversely affect, the West Indian Manatee. There are two recognized

subspecies of the West Indian manatee; the Antillean manatee (*Trichechus manatus manatus*) and the Florida manatee (*Trichechus manatus latirostris*). The Florida manatee inhabits the Southeastern coast of the United States, however both subspecies are commonly referred to as the West Indian manatee. Manatees can inhabit both salt and fresh waters and are found at shallow depths (5-20'). In the waters of the continental US, they and are most abundant in the warm waters of peninsular Florida. During the summer months manatees on the eastern coast of Florida have been reported to travel as far north as Cape Cod, Massachusetts. Manatees that inhabit and travel through South Carolina waters during the warmer months will feed on salt marsh grasses at high tide and submerged algae beds at low tide. Manatees have been sited near the Charleston Peninsula in the Cooper River, the Ashley River, the Atlantic Intracoastal Waterway, and Shem Creek.

There is the potential for construction activities of the combination wall in the salt marsh to have temporary effects on manatees. Effects could include underwater sound impacts from pile driving, increased sedimentation and total suspended solids around the location of construction, and the potential for vessel strikes from movement of waterborne construction equipment. Construction impacts would be minimized through implementation of the Standard Manatee Conditions for In-Water Work published by the Florida Fish and Wildlife Commission which has been adopted by USFWS (see enclosure), with updated information on reporting manatee collisions or injuries to the South Carolina Department of Natural Resources wildlife hotline and the USFWS South Carolina Ecological Services office. Noise associated with pile driving is primarily a concern for marine mammals when the sound travels through water. The majority of pile driving for the combination wall would occur in the marsh where water depths range from a few inches to a few feet across the tidal cycle, which limits noise exposure for marine mammals. In areas where pile driving will occur along the nearshore of the Charleston Harbor, pile driving would be limited to low tide, when water depths will likely be a few feet. This will primarily apply to construction of the combination wall by the current U.S. Coast Guard Station on Tradd Street. Nearshore topobathy data will be used to help define a low-tide construction window prior to construction. Additionally, construction impacts in saltmarsh wetlands will be minimized through the use of a worksite trestle, similar to that currently being used by the City of Charleston for their construction of the Spring/Fishburne St. pump station. The trestle will extend out over the mash to facilitate construction operations from the land so that no heavy equipment operates on the marsh surface. This temporary structure is described in more detail in the IFR/EIS. Once the trestle is removed, any minor marsh disturbance from the trestle will be restored.

Pumps that will be temporarily used as part of the proposed plan are not expected to have adverse effects on manatees. Direct interference with the pumps will not occur since the pumps will be located either on land or in shallow wetland areas behind the storm surge wall where manatees would not be present. Rain and storm

water discharged from temporary pumping operations during occasional storm surge events would be expected to meet state water quality standards.

The proposed action may have some permanent effects on potential manatee habitat, but these are deemed to be insignificant and discountable. As described for the wood stork and black rail, the storm surge wall in the marsh would permanently impact approximately 35 acres of salt marsh wetlands. While this would limit to some degree potential manatee habitat and food sources, it is noted that South Carolina is at the northern edge of the manatees' range and most of the salt marsh wetlands in question regularly lack sufficient depth to provide for manatee access. Finally, while it is possible for manatees to be injured or killed during closure of one of the five water control structures (sluice gates) currently planned in the combination wall at Halsey Creek, this is not anticipated to occur. At this location, water depths range from a few inches to a few feet, so the presence of manatees is unlikely. In addition, since closure of the gates will be limited to occasions of storm surge events, and since the gates will be manually closed on those occasions only after visual observations for clearance of any marine mammals by the gate operators (to be included in the Operations and Maintenance Manual for the project), the likelihood of injury will be further reduced to a discountable level.

Summary

USACE has determined that the proposed federal action for the Charleston Peninsula Coastal Flood Risk Management Study may affect, but is not likely to adversely affect, the American wood stork, Eastern black rail, and West Indian manatee. The proposed federal action will have no effect on the frosted flatwoods salamander, Bachman's warbler, piping plover, red knot, red cockaded woodpecker, northern long-eared bat, American chaffseed, Canby's dropwort, pondberry and seabeach amaranth.

USACE requests concurrence from USFWS on these determinations. We look forward to your response to this letter within 60 days of receipt of this letter.

Sincerely,

Nancy Parrish

Nancy Parrish
Chief, Planning and Environmental Branch

From: Caldwell, Mark
To: Parrish, Nancy A CIV USARMY CESAC (USA); Ward, Bethney P CIV USARMY CESAC (USA)
Cc: Hadley, Hannah F CIV USARMY CENWW (USA); McCoy, Thomas; Olds, Melanie J
Subject: [Non-DoD Source] RE: [EXTERNAL] Charleston Peninsula Study - ESA Consultation FWS Log# 2021-I-0973
Date: Wednesday, January 12, 2022 8:26:42 AM
Attachments: image001.png

Nancy,

The Service has received the updated project information, and the follow-up map, regarding the Charleston Peninsula Study. Due to the addition of project components, the US Army Corps of Engineers is seeking to re-consult under section 7 of the Endangered Species Act (ESA). The proposed changes consist of a relatively minor realignment of the storm surge wall at the Columbus Terminal, the addition of gates, and construction of living shorelines in several locations on the Ashley River. While these changes entail work not considered under the original consultation request, our office does not find them to be of such magnitude to warrant a new consultation action. The letter provided to your office on August 12, 2021, will serve to provide section 7 concurrence for the additional work.

As always, obligations under section 7 of the ESA must be reconsidered if (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered, (2) this action is subsequently modified in a manner which was not considered in this assessment, or (3) a new species is listed or critical habitat is determined that may be affected by the identified action.

Mark
Mark A. Caldwell
Deputy Field Supervisor
US Fish and Wildlife Service
South Atlantic-Gulf Region
South Carolina Ecological Services
176 Croghan Spur Road, Suite 200
Charleston, SC 29407
843-300-0426 (direct line)
843-870-0041 (cell)
843-300-0189 – facsimile

From: Parrish, Nancy A CIV USARMY CESAC (USA) <Nancy.A.Parrish@usace.army.mil>

Sent: Tuesday, January 11, 2022 7:41 AM
To: McCoy, Thomas <thomas_mccoy@fws.gov>; Caldwell, Mark <mark_caldwell@fws.gov>
Cc: Ward, Bethney P CIV USARMY CESAC (USA) <Bethney.P.Ward@usace.army.mil>; Hadley, Hannah F CIV USARMY CENWW (USA) <Hannah.F.Hadley@usace.army.mil>
Subject: [EXTERNAL] Charleston Peninsula Study - ESA Consultation FWS Log# 2021-I-0973

Dear Mr. McCoy,
Pursuant to Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 USC 1531), and 50 CFR 402.13 (Informal consultation), the US Army Corps of Engineers, Charleston District (USACE) would like to re-initiate consultation for the Charleston Peninsula Coastal Flood Risk Management Study, FWS Log# 2021-I-0973, due to new/additional information. The information is as follows:

1) As part of the proposed Federal action, approximately 9,300 linear feet of oyster reef-based living shoreline sills would be constructed in association with the proposed storm surge wall. The reef-based living shoreline sills would be placed in the intertidal zone and parallel to the vegetated shoreline for the purpose of reducing wave energy between the sill and the wall, leading to reduced shoreline erosion and marsh scour, while trapping sediments to stabilize and enhance marshes. Proposed locations are along the Ashley River of the Charleston Peninsula in three locations where erosion is currently occurring – near the intersection of Lockwood Blvd and Broad street, along Brittlebank Park, and along the Wagener Terrace neighborhood (see figure included at the end of this email). Small scale living shoreline reefs have already been established in some of these locations and the new reefs would expand on these and provide continuous segments of erosion control.

   The reef-based sills would meet the definition and project standards for living shorelines found in sections R.30-1D(31) and R.30-12.Q of state regulations S.C. Code Sections 48-39-10 et seq. The specific design/materials for the reefs would be identified during the design phase of the project if the project is authorized for funding, but would be constructed of either bagged oyster shell, oyster castles, or manufactured wire reefs. The living shorelines would mimic natural oyster reef functions. Construction would likely occur from the water-side with small, shallow boats to reach the intertidal zone to avoid damage to the marsh during construction. The potential for harmful vessel strikes with marine mammals and other aquatic resources is lower with such watercrafts. Standard manatee construction protocols for in-water work would be followed. No heavy equipment would be used. Construction would be limited to times of low tide for proper placement. Some sediment disturbance is typical with construction of living shorelines, but has not required the use of devices or treatments to reduce water quality impacts. Sedimentation in the Ashley River and any turbidity plumes would be short-term and quickly dispersed. While unlikely, any lost marsh vegetation due to construction would be replaced. Some minor disturbance to micro and macro benthic fauna could occur. Fish, wading birds, and marine mammals -- including wood storks, eastern black rails, and West Indian manatees – may be temporarily deterred by construction activities and would have limited access to the marsh edge during construction. These adverse effects would be considered minor. The oyster reef-based living shorelines could benefit these species once the construction is complete by enhancing

existing estuarine wetland habitat.

USACE has determined that the proposed reef-based living shoreline sills do not change USACE's Section 7 ESA determinations already made in this consultation that the proposed Federal action *may effect but is not likely to adversely affect* the wood stork, eastern black rail, and West Indian manatee, and will have *no effect* for the listed species previously identified in this consultation.

2) The alignment of the storm surge wall along the South Carolina Port Authority (SCPA) properties in the study area (Columbus Street Terminal and Union Pier) has been modified since this ESA consultation was originally initiated, as a result of stakeholder/public input of the proposed Federal action sought under the National Environmental Policy Act. USACE worked with the SCPA to optimize a segment of the storm surge wall that previously paralleled portions of East Bay Street, Washington Street, and Morrison Drive. The storm surge wall was moved to the eastern edge of the SCPA's properties and on to Johnson Street (an access road to the port). This increased the total length of wall (on land) by 0.2 miles. Along with the shift in the wall, the location of two temporary pump stations in this area would shift from along East Bay Street onto SCPA property. The wall realignment would also necessitate ~10 additional pedestrian or vehicle access gates be added and 1 new storm (tidal flow) gate. The newly added gates would be similar to all of the other gates already proposed in the Federal action, constructed with the same methods, and operated in the same manner, which involves remaining open except during storm surge events. All of the same minimization measures proposed for the storm surge wall and associated gate and pump features would be applied. The figure at the end of this email shows the realignment modifications.

   The storm gate would be added under Johnson Street where the street crosses over Vardell's Creek via an ~80 ft bridge. Vardell's Creek is a previously altered tidal creek off of the Cooper River in an urbanized area. At this location, the storm gate (or series of gate panels) would span the entire width under the bridge and be affixed to the existing bridge infrastructure. The storm gate is not expected to significantly alter current conditions in Vardell's Creek when the gate is open, nor for use by listed species such as the West Indian manatee, wood stork, and eastern black rail. When the gate is temporarily closed during surge events, the conditions would be similar to those evaluated for closure of storm gates on existing road culverts in the proposed Federal action. USACE has determined that the realignment of the storm surge wall and resulting changes in project features (gates, pumps) do not result in any different types of environmental effects than those already evaluated under NEPA or in the existing ESA consultation.

   The modification would eliminate condemnation of some private properties, reduce potential impacts on cultural/historical resources and visual resources in this area, and provide additional storm surge risk reduction benefits to critical port infrastructure. Overall, the realignment results in lower implementation costs and higher coastal storm risk reduction benefits.

   USACE has determined that the storm surge wall realignment and modification of features do not change USACE's Section 7 ESA determinations already made that the proposed Federal action *may effect but is not likely to adversely affect* the wood stork, eastern black rail, and West Indian manatee, and *no effect* determination for the listed species previously identified in this consultation.

USACE seeks concurrence from the USFWS that the proposed Federal action for the Charleston Peninsula Coastal Flood Risk Management Study, inclusive of the new information provided in this correspondence, *may affect, but is not likely to adversely affect*, the American wood stork, Eastern black rail, and West Indian manatee; and will have *no effect* on the frosted flatwoods salamander, Bachman's warbler, piping plover, red knot, red cockaded woodpecker, northern long-eared bat, American chaffseed, Canby's dropwort, pondberry and seabeach amaranth.

Please note that there is the potential for continuing realignment of the storm surge wall due to

ongoing efforts to optimize the project. Should this study continue into the next phase of Preconstruction, Engineering and Design (PED), USACE expects these optimization efforts to continue. In many cases, a realignment will *not* result in the addition of one or more storm gates. Where such a realignment or other optimization results in no material adverse or a beneficial change with regard to the basis for ESA effects determinations, USACE will alternatively keep USFWS informed of any future changes via your participation on the Interagency Coordination Team (ICT).

Thank you in advance for your prompt attention to this re-initiation request. If you have any questions, feel free to contact Ms. Hannah Hadley at (208) 220-0961 or Hannah.F.Hadley@usace.army.mil.

Thank you
Nancy

Nancy Parrish, RPA
Chief, Planning and Environmental Branch
USACE - Charleston District
O: 843-329-8050
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ENDANGERED SPECIES ACT COMPLIANCE WITH NOAA FISHERIES

DEPARTMENT OF THE ARMY
CHARLESTON DISTRICT CORPS OF ENGINEERS
69A HAGOOD AVENUE
CHARLESTON, SOUTH CAROLINA 29403

September 23, 2021

Planning and Environmental Branch

Dr. Andy Strelcheck
Southeast Regional Office
NOAA Fisheries
263 13th Avenue South
St. Petersburg, FL 33701

Dear Dr. Strelcheck:

In accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 USC 1531), and 50 CFR 402.13 (Informal Consultation), the U.S. Army Corps of Engineers, Charleston District (USACE) is providing the following letter regarding the potential for effects to threatened and endangered species with respect to the Federal action proposed in the Charleston Peninsula Coastal Flood Risk Management Study. USACE has determined that the Federal action may affect but is not likely to adversely affect, threatened and endangered species, nor will it adversely affect designated Critical Habitat, for which the National Marine Fisheries Service (NMFS) has jurisdiction. USACE seeks concurrence from NMFS on these determinations.

This letter includes the following information with respect to this informal consultation request:

- A description of the proposed Federal action and its region of influence;
- A summary of the consultation history with NMFS for this study
- Relevant descriptions of listed species and designated Critical Habitat that are under the jurisdiction of NMFS that may be in the region of influence
- An analysis of the potential effects on those listed species and Critical Habitat
- Final effect determination.

In addition to this information, USACE has recently released a draft integrated Feasibility Report and Environmental Impact Statement (FR/EIS) for the Charleston Peninsula Coastal Flood Risk Management Study. It includes more information on the planning process and the final array of alternative considered, more detailed descriptions of proposed measures including engineering-level descriptions and graphics, and a comprehensive evaluation of the potential beneficial and adverse effects of the proposed action on the human environment. The draft FR/EIS is available online for your reference here:
http://www.sac.usace.army.mil/CharlestonPeninsulaStudy.

Description of Federal Action

The purpose of the Charleston Peninsula Coastal Flood Risk Management Feasibility Study is to investigate and recommend potential structural and nonstructural solutions to reduce damages and life and safety impacts from coastal storms. The authority to study coastal South Carolina, including the Charleston Peninsula, was provided in the Rivers and Harbors Act of 1962, P.L. 87- 874, Section 110, and a subsequent Senate Committee Resolution dated 22 April 1988. Funding for the study was appropriated by the Bipartisan Budget Act of 2018 (Public Law 115-123), Division B, Subdivision 1, Title IV. The City of Charleston requested this study and is the non-Federal sponsor. The study area covers approximately 8 square miles of the lower Charleston Peninsula that is within the City's jurisdiction (see Figure 1). The following objectives have been identified in the study:

- Reduce risk to human health, safety, and emergency access from coastal storm surge inundation on the Charleston Peninsula through the 50-year life of the project, estimated to be 2032 to 2082.
- Reduce economic damages resulting from, and increase resilience to, coastal storm surge inundation on the Charleston Peninsula through the 50-year life of the project, estimated to be 2032 to 2082

Figure 1. Map of the Charleston Peninsula Coastal Flood Risk Management Study Area

After several iterations of scoping, the proposed Federal action that has been identified to meet the study objectives includes construction of a storm surge wall of 12 ft elevation NAVD88 along portions of the perimeter of the Charleston Peninsula, nonstructural measures in the form of elevating and flood proofing for a limited number of structures, and natural and nature-based features in the form of large-scale oyster reef-based living shorelines. Additional features associated with the storm surge wall are access gates and hydraulic pumps. The approximate locations of these planned measures are shown in Figure 2 and are described in much more detail in the Draft FR/EIS, including conceptual diagrams, dimensions, and materials in Appendix B - Engineering. A summary of some key features of the measures is provided here.

Storm Surge Wall: Approximately 7.1 non-continuous miles of the perimeter storm surge wall would be constructed on land, and approximately 1.5 non-continuous miles would be constructed through salt marsh wetlands. On the east side of the Peninsula which aligns the Cooper River, the storm surge wall would be entirely on land. On the west side of the Peninsula that aligns the Ashley River, segments of the wall would be on land, while some segments would be sited just off the shoreline (approximately 35 ft) in salt marsh wetlands where it would not be feasible to construct the wall on land due to the proximity of existing infrastructure to the shoreline. The actual height of the wall at any given location will vary depending on the existing ground elevation, so that in total the height of the land and the wall reaches 12 ft NAVD88 to reduce the impacts of storm surges up to this height.

The storm surge wall would be constructed of concrete, and on land it would be a T-wall design with traditional concrete stem walls and pile supported bases. In the marsh, the storm surge wall would be a combination design which consists of continuous vertical piles on the storm surge side and angled piles on the landward side, connected by a concrete cap. The supporting piles would be 12x12 ft prestressed concrete piles that would need to be battered at an inclination from vertical, using a hammer. The Engineering, Structural Sub-Appendix in the Draft FR/EIS can be referred to for more detailed descriptions of the wall types, dimensions, and preliminary renderings.

Recreational features for the storm surge wall were not justified per USACE policy. However, a walking path for pedestrian transportation is planned on top of portions of the storm surge wall where it is located on land in the place of current sidewalks. The walking path would be similar to the promenade on the current Battery seawalls. The wall would also include aesthetic design features that are consistent with the current character of the Charleston Peninsula, which will be determined in a later design phase, if the project is authorized for funding.

Figure 2. Map showing the approximate locations of the measures in the proposed Federal action.

Gates: A series of gates would be needed in the T-wall to allow for daily access by pedestrians and transportation where the wall would intersect with existing infrastructure. The preliminary number and conceptual locations of the upland gates are discussed in more detail in the Draft FR/EIS. Typically, the gates would remain open, and gate closure procedures would be initiated when major flooding is expected based on storm surge predictions from the National Weather Service. Timing of the closure of upland gates would be dependent on evacuation needs and the anticipated arrival of rising water levels that close transportation arteries. Details of the gate closure protocols would be finalized during a later phase of the of the project, if it is authorized for funding.

Storm gates in the form of sluice gates are proposed in the combination wall to allow for daily tidal exchange in one location. Where the storm surge wall crosses Halsey Creek, five 15 ft-wide storm gates would be installed in the wall, for a total opening of 75 ft in that segment of the wall. No other storm gates in the wall are planned. However, storm gates (sluice gates) would need to be installed at five existing culvert locations where roads cross several creeks or channels on the lower Peninsula. These include the culverts at Morrison Drive and New Market Creek; at Morrison Drive and Vardell's Creek; at Lockwood Blvd and Colonial Lake; at Lockwood Blvd and Alberta Long Lake; at Lockwood Blvd and Gadsen Creek; and the box culvert at the stormwater channel that runs behind the Joe Riley Baseball Stadium (that drains from the Citadel Marsh to the Ashley River). These gates are needed to obstruct storm surge from entering and flooding the interior of Peninsula. The sites of the storm surge gates are shown in Figure 3, with all of them located on the west side of the Peninsula with the exception of the culvert at New Market Creek on the east side. The culvert storm gates would also remain open except when major flooding from storm surge is predicted. When storm gates close for a storm surge event, it would occur on a low tide. As stated above, details of the protocol would be finalized during a later phase of the project.

Figure 3. Locations of proposed storm surge gates.

Hydraulic Pumps: Preliminary modeling of water surface elevations with and without the proposed Federal action conducted by USACE show that five permanent and five temporary pump stations would need to be installed. The purpose of the hydraulic pumps is to mitigate for impacts from rainfall flooding that may occur in the interior of the proposed wall. All of the pumps would be of low to moderate size, ranging from 20 to 90 cubic feet per second (cfs). These pumps would be consistent in size with the smaller and medium pumps currently permitted and operated by the City of Charleston, but would only be operated during a storm surge event, which would be occasional and temporary.

The permanent pump stations would consist of a wet well installed in a low-lying area where water naturally runs off, such as near marshes and tidal creeks (but not in the marsh or creek – note that this is a modification from what was previously communicated to resource agencies). The wet well would consist of a concrete inlet box with mesh screens for debris and wildlife protection, and a hinged lid for pump removal for maintenance, etc. The outlet from the wet well would be routed to the wall and would either pass over the wall or through it with a check valve to prevent inflow of tidal waters. The wet well connects to a pump house. The pump house would be elevated and would hold the electrical infrastructure and other operating equipment, and a backup generator to minimize pump failure. More information and diagrams of such a pump station can be found in Appendix B - Engineering of the draft FR/EIS.

The tentative locations and capacity of the five permanent pump stations are as follows (also see Figure 4):

- by Halsey Creek (3 pumps @ 30 cfs)
- behind Joe Riley Stadium (marsh side) (3 pumps @ 30 cfs)
- by Alberta Long Lake (3 pumps @ 20 cfs)
- next to the US Coast Guard Station (Tradd Street side) (3 pumps @ 20 cfs)
- by New Market Creek (3 pumps @ 30 cfs).

The other five pump locations would each need 20 cfs of pumping capacity, which is considered small, and would be temporary stations. These were shown to be needed in locations where there is not a low-lying natural feature such as a marsh wetland, and where existing roads, houses, and other infrastructure are not conducive to installation of permanent stations (see Figure 4). At these locations, an inlet pipe would be installed which would tap into the existing storm drainage system for the Peninsula, and an outlet pipe that goes over or through the wall. For storm events, a portable pump would be brought to the location and hooked up to the inlet and outlet pipes to efficiently move the rainfall in that area over the wall to avoid the “ponding” effect that the new wall would otherwise create. The temporary pumps would have built-in backup generators to allow them to function even if grid power fails, and would be trailer-mounted and portable to move and store off site when not in use.

The permanent and temporary pumps are not intended to redirect runoff; they would move it where it would have drained without the wall. When operating, the pumps

would be a point source of stormwater discharge and would be expected to be compliant with state water quality standards.

Figure 4. Approximate locations of proposed permanent and temporary hydraulic pump stations.

Nonstructural Measures: For nonstructural measures, elevating and floodproofing of structures have been proposed in residential areas where construction of the storm surge wall would not be practicable due to topography and other constructability constraints. For example, dry floodproofing measures would be applied to the Bridgeview Village neighborhood and elevation measures would be applied to the Rosemont neighborhood due to the nature of the construction materials and techniques used in these communities. Wet floodproofing measures, such as elevating utilities, would be applied in the Lowndes Point neighborhood because residential structures are already elevated above 12 feet NAVD88.

Living Shorelines: In association with the storm surge wall, approximately 9,3000 linear feet of oyster reef-based living shoreline sills would be constructed in several locations to reduce coastal storm impacts to natural shorelines and other resources seaward of the wall. The living shoreline sills would reduce erosion of existing wetland marsh, while reducing scour at the base of the proposed storm surge wall. The living shorelines would also provide other environmental benefits, such as habitat for fish and wildlife.

The specific design/technique of the reef-based living shoreline sills would be determined in a later phase of the project if funded, but would be constructed with similar methods as those already used in South Carolina and that meet the definition and project standards for living shorelines in new sections R.30-1.D(31) and R.30-12.Q of S.C. Code Sections 48-39-10 et seq. They would also be constructed to compliment small scale reefs already in place in some locations around the Peninsula.

Pre-construction Engineering and Design Tasks: Should the proposed Federal action be approved, recommended to Congress for implementation, authorized, and appropriated by Congress, then some additional tasks would need to be completed during the Pre-Construction Engineering and Design (PED) phase of the project. These are listed in full in Chapter 8 of the Draft FR/EIS, for reference. A few that may be of relevance to this ESA consultation are described here. It should be noted that if any modifications made to the Federal action as a result of tasks performed in the PED phase could result in effects on natural resources that were not evaluated in the study phase FR/EIS or under existing environmental laws and regulations, then consultation would be re-initiated at that time.

- Appropriate changes to the alignment of the storm surge wall may occur as a result of new developments in technology or construction methodologies, additional engineering analyses, unforeseen cultural and historic resources, the presence of buried utilities not discovered during feasibility, and real estate acquisition challenges. Any such changes are more likely to apply to the wall alignment on land than in the marsh.
- Subsurface data will need to be collected along the proposed alignment of the storm surge wall to complete the engineering design since detailed information is not currently available. In addition to determining stratigraphy, it will be important to verify locations of man-made fill or construction debris that may affect construction and pile installation. This could result in minor modification in

engineering design or realignments of the wall, both on land or in the salt marsh.

- A final interior hydrology analysis will be performed. Preliminary modeling of the interior hydrology for this feasibility study was based on early assumptions about the number of upland and storm gates that would be installed and when they would be closed, and based on an assumption that all rainfall drains from the Peninsula through overland flow. In fact, most of the stormwater drains through the City's subsurface drainage system, so the modeling results are considered conservative. As the number and locations of gates are refined, and more information is provided from the City about their stormwater management system, the interior hydrology will be re-analyzed. This will increase the certainty of the modeling results, which may result in some changes in the number, size, and locations of pumps, either increasing or decreasing the pumping requirements. However, a change in magnitude of the hydraulic pumping requirements is not expected.
- New geospatial bathymetric and topographic data will be collected to refine hydrodynamic and engineering analysis. This includes determining the wall height needed in a given location and informing other construction considerations.
- Wetland delineations will be conducted at the potential wetland impact locations once engineering surveys have determined final coordinates for the storm surge wall. This could result in slight increases or decreases in the required mitigation acreage but should not change considerably.
- Living shorelines site suitability surveys will be conducted and methods/ techniques for the reef-based living shorelines sills will be determined (e.g, bagged shell, oyster castles, crab traps or other). Different methods may be more appropriate at different locations. This information will help to refine sites and materials for living shorelines implementation.
- The Draft Mitigation Plan will transition to a Final Mitigation Plan, through continued coordination with resource agencies.
- Gate closure protocols will be finalized, and included in the Operations and Maintenance Manual. It will be informed by the final number and locations of gates (particularly upland gates which will be re-evaluated in PED), the final interior hydrology analysis, and best available information on storm and flooding forecasts from expert sources, such as the National Weather Service.
- An Operations and Maintenance Manual will be developed for the City of Charleston to keep gates, pumps, and other features of the project operational. Annual inspections by USACE include a storm surge wall inspection checklist, which includes 125 specific items dealing with the operation and maintenance of floodwalls, interior drainage, pump stations, channels, operation and trial erections of closure structures, and inspection/video inspection of pipes/conduits that pass through the project alignment to ensure the system is working as designed. The Manual will be a legally binding document that is accepted by the City of Charleston when they sign a Project Partnership Agreement with USACE.

Region of Influence

Pursuant to 50 C.F.R. § 402.02, the term *action area* is defined as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." Accordingly, the action area typically includes the affected jurisdictional waters and other areas affected by the authorized work or structures within a reasonable distance. The action area, or region of influence (ROI) as it is referred to in the NEPA process, for effects from the proposed Federal action for fish, marine mammals, and other aquatic species, includes the fringing marsh and tidal creek systems in the study area, and the adjacent waterways of the Charleston Harbor, Lower Ashley River, and Lower Cooper River. The deeper waters and subtidal habitats of the Charleston Harbor out to the Charleston Harbor jetties are beyond the ROI, considering the types and locations of measures that have been proposed for the study.

Consultation History

NMFS has provided technical assistance throughout the current feasibility study. USACE has engaged NMFS through the study's Interagency Coordination Team and regularly-schedules working meetings with natural resource agencies, as a Cooperating Agency for the EIS, and under the Fish and Wildlife Coordination Act.

NMFS provided initial comments during the scoping phase of the study in a joint letter dated January 31, 2019 with USFWS. At that time, all of the proposed measures were identified to be on land, and minimal impacts to fish and wildlife resources were anticipated. The Services indicated that a full Fish and Wildlife Coordination Act report was not needed.

In April of 2020, USACE issued a draft integrated Feasibility Report and Environmental Assessment (FR/EA) with a mitigated Draft Finding of No Significant Impact (FONSI) for the study, prior to preparing the current draft FR/EIS. The draft FR/EA did not include an ESA determination at that time. NMFS Habitat Conservation Division (HCD) and USFWS provided joint comments on the draft FR/EA on May 26, 2020, requesting that a Fish and Wildlife Coordination Act Report be prepared due to the potential for adverse impacts to fish and wildlife resources. In direct response to those comments, a Coordination Act Report has been completed, and is available for reference.

NMFS HCD also provided their own letter with comments on the draft FR/EA and draft mitigated FONSI on June 19, 2020. NMFS indicated in their letter that the draft report lacked detailed project information to evaluate the potential for adverse effects. It was also NMFS' view that the NEPA document and mitigated FONSI did not meet the environmental review and disclosure requirements of NEPA, and that it was not reasonable to foresee the availability of sufficient resources to provide mitigation for all anticipated adverse impacts.

As a result of further internal agency analysis, and in response to various agency and public comments, USACE re-initiated the scoping phase for the study, optimized the proposed Federal action, and prepared the current draft FR/EIS. In accordance with NEPA, the draft FR/EA and draft mitigated FONSI have been superseded with the current draft FR/EIS that will result in a Record of Decision.

With respect to ESA, USACE and NMFS Protected Resources Division (PRD) first discussed consultation under ESA during a meeting on April 2, 2021 at which time USACE indicated their intent to pursue informal consultation. A number of emails and working meetings followed, for which NMFS PRD participated in.

On June 9, 2021, NMFS accepted USACE's request to participate as a Cooperating Agency on development of the FR/EIS, and concurred with the consultation timetable in accordance with Executive Order 13807 (One Federal Decision). In that letter, NMFS also indicated concern about having sufficient information on the proposed action to initiate consultation under the Magnuson Stevens Act and ESA needed to meet the consultation timeline.

On July 27, 2021 NMFS was provided an opportunity to provide feedback, as a Cooperating Agency under NEPA, on the draft FR/EIS (not inclusive of consultation documentation) prior to public release of the report. NMFS HCD responded at that time it had "no major comments or concerns at this time related to the material provided in the document" but also noted its preference that compensatory mitigation be of comparable salinity regime and in close proximity. No response was received from NMFS PRD.

ESA-Listed Species and Critical Habitat

Table 1 identifies the fish and wildlife resources listed as threatened or endangered species under the Endangered Species Act of 1973, as amended (16 USC §1531) that could be found in the ROI, some for which NMFS has jurisdiction. There are also five species of whales listed as endangered, the endangered hawksbill sea turtle, the threatened giant manta ray, and the threatened oceanic white tip shark that can be found in offshore waters of South Carolina, but are not in the ROI for this study. Those species and designated Critical Habitat that could be in the ROI are discussed below.

Table 1. Federally-listed Threatened and Endangered Species in the Region of Influence

Species Common Name	Scientific Name	Status
Atlantic sturgeon* (South Atlantic DPS)	*Acipenser oxyrinchus*	E, CH
Shortnose sturgeon*	*Acipenser brevirostrum*	E
American wood stork**	*Mycteria americana*	T
Eastern black rail**	*Laterallus jamaicensis jamaicensis*	T
West Indian manatee	*Trichechus manatus*	E
Green sea turtle	*Chelonia mydas*	T
Kemp's ridley sea turtle	*Lepidochelys kempii*	E
Leatherback sea turtle	*Dermochelys coriacea*	E
Loggerhead sea turtle	*Caretta caretta*	T, CH

Key:

E - Endangered T - Threatened CH - Critical Habitat

* These species are under the sole jurisdiction of National Marine Fisheries Service

** These species are under the sole jurisdiction of US Fish and Wildlife Service

Sources: NOAA 2020; USFWS IPaC (n.d.)

Sturgeon Species: The two federally-protected fish species that commonly occur in the ROI, particularly the Charleston Harbor and the Cooper River, are the shortnose sturgeon (*Acipenser brevirostrum*) and the Atlantic sturgeon (*Acipenser oxyrhynchus*). Shortnose sturgeon spend most of their time as adults in fresh and brackish water but do venture into lower coastal reaches and the ocean on rare occasions. Atlantic sturgeon is a subtropical, anadromous species. They spend the majority of their lives in nearshore waters, returning to their natal rivers to spawn (Wirgin et al. 2002).

In this region, Atlantic sturgeon typically migrate up tidal rivers in the late summer to fall to spawn. Shortnose sturgeon are currently found in the Cooper River, and the Carolina Distinct Population Segment (DPS) of Atlantic sturgeon is found throughout the Charleston Harbor, with portions of the Cooper River designated as Critical Habitat for the Atlantic sturgeon (NOAA, n.d.). Telemetry studies done by the SCDNR of shortnose and Atlantic sturgeon confirm movement throughout the Charleston Harbor, and in the

Cooper River with the highest usage of the Cooper River by shortnose sturgeon roughly between river km 30 and 45 where the freshwater-to-saltwater interface occurs. This is well upstream of the ROI. Adult and sub-adult Atlantic sturgeon in the Cooper River are believed to be transient populations from other river systems. Both species have been detected in the Ashley River. The Ashley River is not used for spawning, so SCDNR believes sturgeon detections are most likely from juveniles or transient adults (personal communication, Bill Post, SCDNR Diadromous Fish Coordinator).

Atlantic sturgeon are bottom feeders and forage on mollusks, crabs, and other crustaceans, worms, and bottom dwelling fish; likewise, shortnose sturgeon foraging habitat includes sandy and muddy bottoms of rivers where they feed on insects, worm, mollusks, and crabs and other crustaceans. While it's possible for sturgeon to enter small, shallow tidal creeks of the Peninsula to forage, this would not be common.

Historically, over-fishing affected sturgeon populations. Current prominent threats to these species include habitat loss or fragmentation, dredging, migration/passage barriers, decreased water quality, and entanglement in fishing gear, as well as vessel strikes for Atlantic sturgeon.

Sturgeon Critical Habitat: The Cooper River (up to the confluence of the East and West Branches) is designated as part of the Santee-Cooper Critical Habitat Unit (C7) of the Carolina DPS. Only the lower part of this Critical Habitat Unit falls within the ROI. Figure 5 shows the location of the C7 Designated Critical Habitat in relation to the study area and proposed measures. Four physical and/or biological features (PBFs) essential to the conservation of the species have been identified for Atlantic sturgeon Critical Habitat. PBFs are defined as the features that support the life history needs of the species, including but not limited to, water characteristics, soil type, geologic features, sites, prey, vegetation, symbiotic species or other features (NOAA 2017). The four PBFs identified for critical habitat for Atlantic sturgeon are:

1. Hard Substrate in Freshwater – Hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0 to 0.5 ppt range) for settlement of fertilized eggs, development of eggs, and larval development. This PBF is not present in the ROI.
2. Salinity Gradient and Soft Substrate Below Spawning Areas – Aquatic habitat inclusive of waters with a gradual downstream gradient of 0.5 up to as high as 30 ppt, and soft substrate (e.g., sand, mud) between the river mouth and spawning sites for juvenile foraging and physiological development. This PBF is not present in the ROI.
3. Unobstructed Water of Appropriate Depth – Water between the river mouth and spawning sites of appropriate depth and absent of physical barriers to passage (e.g., locks, dams, thermal plumes, turbidity, sound, reservoirs, etc.).
4. Water Quality – Water quality conditions, especially in the bottom meter of the water column, with temperature and oxygen values necessary to support annual and inter-annual larval survival, growth, development, and recruitment.

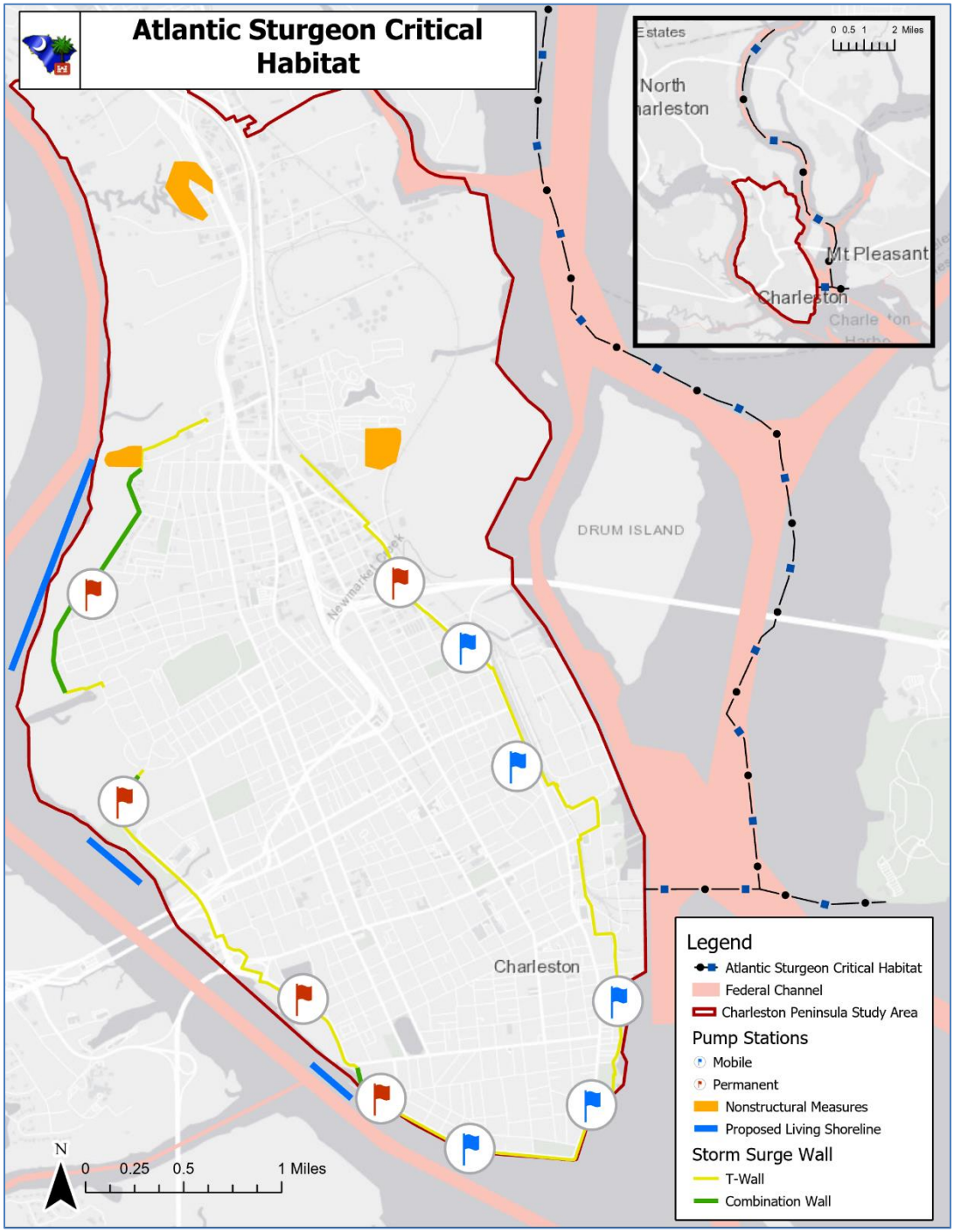

Figure 5. Location of the Santee-Cooper Critical Habitat Unit of the Carolina DPS of Atlantic sturgeon in relation to the proposed measures of the Federal action.

Sea Turtle Species: There are four species of sea turtles known to occur in or near waters of Charleston, all of which are federally-listed as threatened or endangered species: Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*) and green (*Chelonia mydas*). Leatherback sea turtles, found in offshore waters, and Kemp's ridley sea turtles, found in nearshore waters,

could be, but are less likely to be, in the ROI. Loggerhead and green sea turtles are the most common species in South Carolina waters, and their distribution at different life stages varies including offshore waters, bays, inlets, river mouths, salt marshes, creeks, ship channels, and sandy beaches for nesting. Subadult and adult loggerheads move into coastal waters, such as Charleston Harbor, to prey on mollusks, crustaceans, and fish (USFWS 2020). Loggerhead sea turtle eating preferences tend to be horseshoe crab, then blue crab, then finfish. Ultimately, reduction of salt marsh acreage could lead to alteration of the loggerhead sea turtle food web (Boutin & Targett, 2013; Seney & Musick, 2007).

A trawling study conducted within the Charleston Harbor shipping channel between 2004-2007 showed that loggerhead sea turtles are present in the channel in increased numbers, and are of increased size, compared to the early 1990s (Arendt et al, 2012). Although loggerheads and greens could be found in the Cooper and Ashley Rivers, they are less likely to be in the small, shallow tidal creeks of the Peninsula.

Threats to sea turtles include vessel strikes, dredging, fishing by-catch and entanglement, degradation of foraging habitat, pollution, and disease. They are also threatened by various natural and anthropogenic impacts to their nesting habitat, such as beach erosion, beach armoring, artificial lighting, and nest predation. In the Charleston area, Critical Habitat for nesting loggerhead sea turtles has been federally-designated for Folly Beach and Morris Island, but these are well outside of the ROI.

Route(s) of Effects to Listed Sturgeon and Sea Turtle Species

Construction- and Maintenance-Related Activities: There is the potential for construction activities of the combination wall in the salt marsh to have temporary direct and indirect effects on sturgeon and/or sea turtles. Effects could include underwater sound impacts from pile driving, physiological and behavioral changes from increased sedimentation and total suspended solids near the location of construction, and the potential for vessel strikes from movement of waterborne construction equipment if used. However, the effects, which are described below, are not expected to be significant. The effects would not likely be cumulative since it is assumed that construction of the proposed Federal action would be phased, and would not occur at multiple sites at the same time. Additionally, USACE would take steps to limit exposure and implement the use of best management practices and other minimization measures.

Construction activities related to the proposed nonstructural measures on the uplands, and of the storm surge wall both in the marsh and on land, have the potential to disturb soils and sediments or create debris that could run off with stormwater into local waterways. This is typical of most residential or marine construction. If minimization measures are not used, the disturbance could result in increased turbidity and suspended solids in shallow waters that could degrade localized water quality, including temporary changes in salinity, pH and reduced dissolved oxygen levels,

depending on the volume and duration of sediment resuspension, the oxygen demand of the sediment, and other factors. Sturgeon in these waters could experience physiological stress, and/or mortality if there are substantial reductions in dissolved oxygen. Water quality changes could result in a temporary avoidance displacement by sturgeon or sea turtles, or affect their ability to feed. Water quality effects from construction would be expected to be localized to the area of construction in marshes or to waterways in close proximity to upland construction, and last only for the duration of construction in a particular area. Additionally, typical construction best management practices such as erosion blankets, silt fences, settling basins, and cofferdams would be used to minimize erosion, sedimentation, and turbidity impacts.

Construction activities related to the reef-based living shorelines could also disturb marsh sediments and vegetation as workers and small boats access shorelines for reef construction. However, the techniques generally used for this in South Carolina, which the proposed Federal action would conform to, are generally considered to have low-impact and localized effects on the environment, with insignificant and discountable adverse effects on listed species.

Noise associated with pile driving is primarily a concern for fish (and marine mammals) when the sound travels through water. Sound propagation in shallow waters is complicated by multiple reflections, refractions, and by sound wave scattering, but studies that assess impacts of multi-pulse sound associated with pile installation using hydraulic impact hammers show mostly negative effects on aquatic resources. The extent of the damage depends on noise frequency, duration, and auditory characteristics of the species (Tsouvalas, 2020). The type and intensity of underwater sound associated with pile driving depends on the type and size of the pile, the firmness of the substrate and water depth, and the type and size of the pile-driving hammer and material. The pressure waves generated from wood or concrete driving are generally considered less harmful than driving steel piles. For reference, vibratory driving of a 30-inch battered steel pile during a ferry dock construction resulted in an underwater average Root Mean Square of 168 dB, and sound exposure level (SEL) of 210 dB (Washington State DOT, 2012). This occurred at a 37-foot depth. For the proposed Federal action, the pilings that would be used for the proposed storm surge wall would be made of concrete, not steel. Additionally, the majority of pile driving would occur in the marsh where water depths range from a few inches to a few feet across the tidal cycle, which limits underwater noise exposure, and where sturgeon and sea turtles are less likely to be found. In the one area where pile driving would occur in shallow waters of the Charleston Harbor by the current U.S. Coast Guard Station on Tradd Street the potential for noise impacts from pile driving would be reduced by limited battering to low tide, when water depths will likely be a few feet. Nearshore topobathy data would be used to help define a low-tide construction window prior to construction. Other minimization measures could include limiting the days and times of days when construction would occur, and use of noise control techniques on equipment, such as mufflers and intake silencers.

Additionally, construction impacts in salt marsh wetlands will be minimized through the use of a worksite trestle, similar to that currently being used by the City of Charleston for their construction of the Spring/Fishburne St. pump station. The trestle will extend out over the mash to facilitate construction operations from the land so that no heavy equipment operates on the marsh surface, reducing effects on marsh vegetation, sediments, and water quality. This temporary structure is described in more detail, including photos, in the draft FR/EIS. Once the trestle is removed, any minor marsh disturbance from the trestle will be restored. The use of the worksite trestle also allows for construction equipment be transported and staged on land, not in the water or marsh. Therefore, no vessel strikes with sturgeon or sea turtles should occur as a result of constructing the proposed Federal action.

Of the maintenance activities expected for the proposed measures and features of the proposed Federal action, the potential for effects would most likely to be related to water quality. In particular, opening and closing of gates would be tested a few times a year for a few hours, as would the hydraulic pumps. Any hydrology or water quality changes would be negligible considering the short and occasional durations. The proposed storm surge wall may also need to be occasionally surveyed for damage and repaired. Since access to the wall would primarily be from the top of the wall, the likelihood for adverse effects on listed species is negligible.

Hydraulic pumps: The hydraulic pumps that would be temporarily used as part of the proposed Federal action are not expected to adversely affect water quality to the extent that there would be adverse effects on sturgeon and sea turtle species. As mentioned previously, the purpose of the permanent and temporary pump stations in the proposed Federal action is to minimize impacts of interior flooding that would be induced by the storm surge wall when the gates are closed during a storm surge event. Hydraulic pumps would only operate occasionally and temporarily, and are not needed everywhere. For example, in the one location where preliminary modeling of the interior hydrology showed a water elevation over 4 ft while the gates are closed compared to with no wall (all other locations showed less than 2 ft or no increase, regardless of number of gates), there is no pump (nor gate) planned at this location. This is because the elevated water level does not induce flooding impacts. Therefore, there would be no effect on water quality outside of the wall from the elevated stormwater in this location because no pumping of the stormwater would occur.

For locations where pumps are planned, effects from discharged stormwater on water quality outside of the proposed storm surge wall is expected to be minimal. Pumping volumes would be low, concentrations would be similar to that of overland flow since they would not collect stormwater from within the marsh (see below), and the discharge would be immediately mixed with wave action and storm surge occurring outside of the wall during an event. In several locations, the discharged stormwater would travel several thousand feet over land or salt marsh before entering into tidal rivers. This would be the case for the one permanent pump location on the east side of the Peninsula at New Market Creek. In this location, any stormwater discharge pumped during a storm surge event would travel approximately 3,500 ft and through another

tidal restriction at a railroad embankment, through storm surge, before reaching the confluence of the Cooper River. While it is remotely possible that water quality conditions could be affected in the Cooper River, which is designated Critical Habitat for Atlantic sturgeon at this location, it is extremely unlikely. Additionally, listed species would need to be in close proximity to the localized changed water quality in order to be affected. Yet the presence of listed species to be exposed to any degraded water quality conditions from the pumps during a storm surge event is unclear. NMFS was unable to provide any information about where protected species such as sturgeon, turtle or dolphins “go” during a hurricane when requested.

Regardless, the extent of pumping would be minimized by reducing the time the gates would need to be closed and pumps would be active to the shortest time possible. Furthermore, pumps would be expected to meet state water quality standards. Small, manufactured treatment devices or sediment settling bases could be added in some locations if necessary.

As described previously, the pumps that would be near salt marsh wetlands would be placed in low lying areas but not directly in marshes or creeks so would not interact with aquatic resources. Regardless, on the permanent pump stations, mesh screens would be installed for debris and wildlife protection. The City of Charleston would be responsible for removing debris from pump stations (as well as from inside the storm surge wall). All pump stations would have a backup generator to minimize pump failure if electrical power is not available during the storm surge event. During the PED phase, refined modeling of the interior hydrology will be performed and USACE will look for opportunities to further reduce the number and size of pumps to further minimize the potential for effects on water quality, while still addressing flood mitigation needs.

Any adverse effects related to water quality would be insignificant and discountable on listed species.

Storm surge wall: Sturgeon and sea turtles can be found in estuaries. They may use them to feed, and for access to/from upstream tidal freshwater spawning habitat for sturgeon. Many of their food sources depend on estuaries for part of their life cycles. Salt marshes and tidal creek systems play an important role in the health of estuaries, therefore, they indirectly support sturgeon and sea turtles. The proposed storm surge wall in the Federal action has the potential to adversely affect approximately 35 acres of salt marsh wetland function in the study area. This contribution to estuarine quality could indirectly affect listed species, but would be considered a minor indirect effect to sturgeon and sea turtle species. Regardless, USACE plans to offset the lost salt marsh function through compensatory wetland mitigation.

With respect to the potential for direct effects of the wall, the majority of the proposed storm surge wall is planned along the Ashley River upland shoreline (~35 ft away in most locations) in fringing marsh where water depths and habitat conditions do not reasonable support sea turtles or sturgeon. Presence of sturgeon is limited in the Ashley River, as described previously. In locations where storm surge gates are

planned (five at Halsey Creek and five at road culverts), there is the remote possibility that a sea turtle or sturgeon could be affected by the closing of the storm surge (sluice) gates. An individual could become injured if the gate closed while they passed through it, and they could also be "trapped" on the interior of the gate when it temporarily closes during a storm surge event. During this time, water quality behind the gate could degrade to the point of causing mortality or impairment for listed species in the very rare instance they are in these systems. For the culvert gates, it is highly unlikely that listed species would be present. Some are too small for these species to pass, and all lead to highly altered and shallow habitat that is also not their preferred habitat. In one location (New Market Creek), individuals would have to pass through a previous tidal restriction before reaching the storm surge gate. Regardless, the potential for adverse effects on species "trapped" behind the gates during a storm surge event would be minimized by reducing the time that the gates would be closed to the greatest degree that is feasible and practicable to safely operate them before and after a storm surge event. The gates would also be closed on a low tide to reduce the likelihood of exposure to mobile aquatic resources, as most would move out with the tide. Considering the above, adverse effects on sturgeon or sea turtles from the proposed storm surge wall would be insignificant and discountable.

Route(s) of Effects to Atlantic Sturgeon Designated Critical Habitat

The proposed Federal action will have no effect on the PBFs of Hard Substrate in Freshwater and of Salinity Gradient and Soft Substrate Below Spawning Areas of designated Critical Habitat because they do not exist in the ROI.

The proposed Federal action would not likely have an adverse effect on the PBF for Unobstructed Water of Appropriate Depth. The proposed Federal action does not occur in designated Critical Habitat (so no structural barrier would be created by the proposed storm surge wall). All of the proposed storm surge wall on the east side of the Peninsula, which aligns the designated Critical Habitat, is planned on land and there is no in-water construction that would lead to sound or water quality impacts. There is a slight possibility that runoff from land based construction of the proposed storm surge wall could lead to a turbidity barrier, or localized water quality changes that affect the Water Quality PBF. The potential for these affects would be minimized through the use of construction best management practices as described earlier.

There is the remote possibility that storm water discharge from the hydraulic pump planned near New Market Creek on the east side of the Peninsula when operating during a storm surge event could alter water quality conditions in designated Critical Habitat. Considering that the pump would operate occasionally and temporarily; meet state water quality standards; be discharging 3,500 feet upstream of designated critical habitat and into turbulent storm surge conditions, the potential for adverse effects on Water Quality PBF in designated Critical Habitat for Atlantic sturgeon would not likely adversely affect a sturgeon's ability to survive, grow, develop, and recruit.

Effect Determination

USACE has reviewed the proposed Federal action for potential effects on federally listed threatened and endangered species and their designated Critical Habitat for which NMFS has jurisdiction and that may be in the ROI, or action area. USACE has determined that the proposed Federal action for the Charleston Peninsula Coastal Flood Risk Management Study may affect, but is not likely to adversely affect, the shortnose sturgeon, Atlantic sturgeon, green sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. The proposed Federal action is also not likely to adversely affect or modify Atlantic sturgeon designated Critical Habitat.

USACE requests concurrence from NMFS on these determinations. We look forward to your timely response to this informal consultation request letter. If you have questions, please contact Ms. Bethney Ward of our Planning and Environmental Branch at (843) 329-8162 or Bethney.p.ward@usace.army.mil.

Sincerely,

Nancy Parrish
Chief, Planning and Environmental

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
https://www.fisheries.noaa.gov/region/southeast

F:SER/BR

Colonel Andrew Johannes, District Commander
Charleston District, U.S. Army Corps of Engineers
69 Hagood Avenue
Charleston, SC 29412

Attention: Nancy Parrish, Hannah Hadley, Bethney Ward, Wesley Wilson

Re: Charleston Peninsula Coastal Flood Risk Management (FRM) Study Consultation Milestones

Dear Commander Johannes:

NOAA's National Marine Fisheries Service (NMFS) has received your October 22, 2021, correspondence regarding the consultation milestones for the Charleston Peninsula CFRM study as well as a follow-up email from Andrew LoSchiavo on October 29, 2021. As reflected in our June 9, 2021, letter, in which we provided our concurrence on the consultation milestone schedule for the project, we voiced concerns about the USACE's ability to provide sufficient information to meet Essential Fish Habitat (EFH) and Endangered Species Act (ESA) consultation milestones during the feasibility study stage.

Specifically, we requested information pertaining to water quality issues associated with the pumping of impounded stormwater resulting from the project. On May 18, 2021, the USACE provided the interagency natural resources working group a summary of the interior drainage analysis for the proposed project; that summary focused on water quantity, not quality. During a natural resource working group meeting on June 8, 2021, the USACE presented their plan for storm gates which involved a dramatic reduction in the number of gates in the wall. Our Habitat Conservation Division biologist pointed out that the number of gates was a critical component of the analysis and inquired whether or not the USACE planned to redo the water quality analysis based on the reduction in the number of gates. The USACE stated they would not provide water quality analysis during the feasibility study phase of the project.

As of this letter's writing, we have not received adequate information to support initiation of consultation under the MSA or ESA. Our Habitat Conservation and Protected Resources Divisions have specifically identified deficiencies (Appendix A and Appendix B) that we believe must be addressed before we can conduct meaningful effects analysis of the proposed action and provide complete EFH and ESA consultations.

We encourage the USACE to consider deferring requests for initiation of consultation under the ESA and MSA until a later point in the development of the project; preferably during the pre-construction, engineering, and design (PED) phase, at which time more detailed information about project design and potential impacts to NOAA trust resources will be available. Deferring these consultations would help both agencies to better understand the important questions to ask regarding those resources and risks, to determine the information or studies needed to answer those questions, and ultimately, to reduce risk to our trust resources.

Given that the EFH and ESA consultations will likely not occur within the feasibility study phase of the project and the milestone date for initiation of both consultations is today, we believe that it would be prudent to mark these consultations as "Cancelled" on the Permitting Dashboard. We are happy to assist your staff with identifying when sufficient consultation information has been provided in order to initiate consultations under the MSA and ESA.

We are committed to providing technical assistance in our role as a cooperating agency under the National Environmental Policy Act. We want to emphasize that if consultation is deferred to later in the USACE's SMART Planning process for conducting civil works feasibility studies, we will continue to provide early, robust technical assistance throughout the feasibility study phase, assist with the identification of NOAA trust resources at risk as well as measures to avoid, minimize, and mitigate potential effects, and aid with the preparation of consultation support documents to provide our agency with specific information about project design and impacts so the respective consultations can be more efficient.

We appreciate your continued coordination on this project. For questions pertaining to the MSA or ESA, please direct correspondences to Ms. Cynthia Cooksey (cynthia.cooksey@noaa.gov) or Mr. Andrew Herndon (andrew.herndon@noaa.gov), respectively.

Sincerely,

MCGOVERN.JOHN.CLARKE.1365840861

Digitally signed by MCGOVERN.JOHN.CLARKE.1365840861
Date: 2021.11.23 09:14:45 -05'00'

for Andrew J. Strelcheck
Regional Administrator

Appendices
cc: F, Chabot
F/PR1, Daly
F/PR5, Youngkin
F/SER, Strelcheck, Blough, Silverman, Rosegger
F/SER3, Bernhart, Shotts, Reece, Herndon, Horstman
F/SER4, Fay, Wilber, Cooksey, Karazsia

APPENDIX A
HABITAT CONSERVATION DIVISION: REQUEST FOR ADDITIONAL INFORMATION

This letter responds to your request for consultation with the National Marine Fisheries Service (NMFS), pursuant to Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation Management Act (MSA) for the Charleston Peninsula Coastal Flood Risk Management Study. Our Habitat Conservation Division (HCD) first engaged with this project on November 6, 2018, and continues to monitor the project's progress. We believe early coordination with your staff provides a valuable opportunity to integrate conservation of NOAA's trust resources into coastal storm risk management.

Consultation under the MSA is initiated when we receive an Essential Fish Habitat (EFH) assessment from a Federal Agency that concludes the work may adversely affect EFH. We received the EFH assessment for the proposed study and letter requesting initiation of consultation on September 24, 2021. We also reviewed the draft Feasibility Report/Environmental Impact Statement (draft FR/EIS) dated September 2021. The first step in the consultation process is determining if there is adequate information from the action agency to fully evaluate the reduction of quality or quantity of EFH resulting from the project. As indicated in the draft FR/EIS, the purpose of the proposed action is to identify the optimal structural and non-structural solution that reduces human health and safety risks, as well as economic risks from coastal storm surge inundation and increases resilience to coastal storm surge inundation. Because feasibility studies are intended to identify problem areas, develop solutions to address them, and not provide specific engineering and design information, there is inherently less information available for considering impacts to EFH and federally managed species.

We have identified the following deficiencies in the EFH assessment and believe they must be addressed before we can conduct a meaningful evaluation of the proposed action and complete EFH consultation:

1) We requested the USACE provide information related to water quality issues associated with the pumping of impounded stormwater resulting from the project. On May 18, 2021, the USACE provided the interagency natural resources working group a summary of the interior drainage analysis for the proposed project. That summary focused on water quantity, not quality, and found the future with-project water surface elevation (WSEL) causes minimal increases in most of the project area except for residential areas north of Hasley Creek along the Ashley River. Location 1 in the analysis, north of Hasley Creek, displayed an increase of 1.59 feet WSEL during a 10% Annual Exceedance Probability rainfall event. Additionally, the analysis acknowledged uncertainty regarding pump locations, pump numbers, whether pumping would occur during a storm event, whether pumping would occur before a storm event, the duration of pumping after a storm, and when storm gates would be reopened relative to tidal recession. Although considerable uncertainty exists related to pumping and the potential for adverse effects from pumping, the USACE stated they would not provide water quality analysis during the feasibility study phase of the project. The USACE indicated it will address this issue during the PED phase.

   The scope of the USACE's proposed action considered in this feasibility study has impacts extending well beyond the USACE's construction and future operations. Environmental resource consultations will need to consider the impacts from those reasonably foreseeable connected

actions and can not be segmented until a later date/project. Uncertainty surrounding potential water quality impacts from project operations makes evaluating the impacts to EFH and federally managed fishery species difficult. Specifically, it is unclear at this time what effect pumping impounded water, which may become hypoxic, will have on overall concentrations of dissolved oxygen in the Ashley or Cooper Rivers. Likewise, the prevalence of changes to the concentrations of dissolved oxygen is unclear.

The future operating schedule for the pumps is uncertain due to climate change and transition of operations to the City of Charleston. We recognize the USACE intends to only use the pumps under certain circumstances and those circumstances are the basis of this study's analysis. However, ultimately control and ownership of the pumps will be turned over to the City of Charleston. It is unlikely the City would only operate the pumps in the same manner as the USACE, considering the potential for use to mitigate flooding already occurring on the Charleston Peninsula, such as the record tidal flooding occurring in November 2021. The City of Charleston has reported to news organizations, in November 2021, that from 1922 to 2014, there were fourteen times the City experienced tides over eight feet. Since 2015, the City has experienced twenty-three instances of eight-foot tides or higher (tides at which the gates would close). The USACE's analysis should include an assessment of the potential effects likely to occur in the future due to increased frequency of gate closures not related to storms and the potential for pumping. Also, given the results of the interior drainage analysis, the possibility exists that additional pumps may need to be installed and operated to mitigate for WSEL increases due to the project in some areas.

2) The description of the living shoreline is brief and it is unclear how, for the areas identified in Figure 1 of the EFH assessment, the living shoreline relates to the proposed project's purpose. Because site suitability surveys have not been completed at this time, it is unclear if these areas are experiencing erosion. If they are, how proximal is the threatened infrastructure? How will the living shoreline be installed? What materials will be installed? How much material will be installed? Will it be done from the uplands, vessels, both? This information is needed for us to determine if best practices for minimizing impacts to EFH are sufficient or if additional minimization measures are needed. Shoreline erosion is a natural process supplying important sediment to coastal habitats. If shoreline erosion is not a concern, leaving a natural shoreline is preferred to maintain existing ecosystem services. However, taking action to stabilize a shoreline may be necessary where infrastructure is located very close to eroding shorelines.

   All types of EFH provide unique ecosystem services including emergent wetlands, intertidal unconsolidated soft bottom, hardbottom, and oyster reefs. We encourage the use of living shoreline techniques to provide, maintain, or improve habitat or ecosystem function and enhance coastal resilience. However, we encourage shoreline protection methodologies that avoid or minimize channelward encroachment into subtidal habitat. We do not promote the use of living shorelines as a means for land reclamation. It is unclear from section 7.3 of the EFH assessment if a purpose of the proposed living shoreline is to create emergent wetlands by converting intertidal or subtidal habitats. There are many ways to increase resilience to coastal storm surge inundation, and living shorelines are only one approach and should only be used when warranted.

We appreciate the USACE using the White Shrimp Habitat Suitability Index to assess functional habitat loss, and the USACE's ongoing efforts to find ways to avoid and minimize adverse effects to EFH and federally managed species. We look forward to continuing engagement with the USACE staff and providing technical assistance throughout this process.

APPENDIX B
PROTECTED RESOURCES DIVISION: REQUEST FOR ADDITIONAL INFORMATION

This letter responds to your request for consultation with us, the National Marine Fisheries Service (NMFS), pursuant to Section 7 of the Endangered Species Act (ESA) for the Charleston Peninsula Coastal Flood Risk Management Study. Our Protected Resources (PRD) first engaged with this project in April 2021 and has remained involved ever since. Because the project could impact Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*) and green (*Chelonia mydas*) sea turtles, shortnose sturgeon (*Acipenser brevirostrum*), Atlantic sturgeon from the Carolina distinct population segment (*Acipenser oxyrinchus oxyrinchus*), as well as Carolina Unit 7 of Atlantic sturgeon critical habitat we appreciate the opportunity to be involved in the evolution of this project. We believe that early coordination with your staff provides a valuable opportunity to integrate conservation of NOAA's trust resources into coastal storm risk management.

We initiate consultation under the ESA when we receive adequate information from the action agency to fully consider the potential impacts of a project on ESA-listed species. As you indicated in your draft FR/EIS, the purpose of the proposed action is to identify the optimal structural and non-structural solution that reduces human health and safety risks, as well as economic risks from coastal storm surge inundation and increases resilience to coastal storm surge inundation. Because feasibility studies are intended to identify problem areas, develop solutions to address them, and not provide specific engineering and design information, there is inherently less information available for considering impacts to ESA-listed species.

We have specifically identified the following deficiencies that we believe must be addressed before we can conduct a meaningful effects analysis of the proposed action and provide a complete ESA consultation:

- Information needed to conduct a full noise analysis - What type of materials will be driven (i.e., steel sheet piles, concrete, wood); what is the size of these materials (i.e., sheet width for sheet piles; pile diameter); anticipated number of strikes per pile/sheet; anticipated number of piles likely to be driven per day; whether vibratory hammers will be used.
- Use of Best Management Practices - Will USACE implement the protected species construction conditions and follow entrapment reduction measures?
- Will the project footprint for all in-water work ensure migratory pathways are not blocked?
- Will in-water construction be conducted only during daylight hours or will it occur 24 hours a day? Is construction-related noise likely to propagate into open water?
- Information on what contaminants are likely to be pumped into the rivers during pump-out events.
- How will the living shoreline be installed? What materials will be installed? How much material will be installed? Is entanglement/entrapment of listed sea turtles a potential route of effect? Will it be done from the uplands, vessels, both? If vessels will be used will USACE follow our vessel strike avoidance guidance?

We cannot provide a complete ESA consultation with the level of detail currently provided and encourage you to consider delaying your request to initiate the ESA consultation until a later point in the development of the project; preferably during the design and engineering phase, at which time more

detailed information about project design and potential impacts to NOAA trust resources will be available.

We want to emphasize that while we wait for more information to become available, we will continue to provide robust technical assistance throughout the feasibility study phase to assist your agency in identifying NOAA trust resources at risk. Deferring full consultation until the proposed action is better-developed would also help both agencies to better understand the important questions to ask regarding those resources and risks, to determine the information or studies needed to answer those questions, and ultimately, to reduce risk to our trust resources. Our robust technical assistance during the feasibility study phase will assist the USACE in preparing your consultation support documents to provide our agency with specific information about project design and impacts so the consultation on the proposed actions can be more efficient.

While there is not enough information available at this time for us to complete an ESA consultation, the level of detail provided does allow us to make preliminary conclusions regarding potential impacts for certain portions of the project.

Analysis of Potential Routes of Effect to Critical Habitat

The final rule designating critical habitat for Atlantic sturgeon identified the key conservation objectives for the Carolina DPS are to increase their abundance by facilitating increased survival of all life stages and facilitating adult reproduction and juvenile and subadult recruitment into the adult population (82 FR 39160; August 17, 2017). The physical features determined to be essential to conservation of the species that may require special management considerations or protection, which support the identified conservation objectives, are in the following table.

Physical and Biological Features (PBF) of Atlantic Sturgeon Critical Habitat

PBF		**Purpose/Role of PBF**
"Hard Substrate" *(PBF 1)*	Hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0-0.5 parts per thousand [ppt] range)	Necessary for the settlement of fertilized eggs and refuge, growth, and development of early life stages
"Salinity Gradient and Soft Substrate" *(PBF 2)*	Aquatic habitat inclusive of waters with a gradual downstream gradient of 0.5 up to as high as 30 ppt and soft substrate (e.g., sand, mud) between the river mouth and spawning sites	Necessary for juvenile foraging and physiologi development

"Unobstructed Water of Appropriate Depth" *(PBF 3)*	Water of appropriate depth and absent physical barriers to passage (e.g., locks, dams, thermal plumes, turbidity, sound, reservoirs, gear, etc.) between the river mouth and spawning sites	Necessary to support: Unimpeded movement of adults to and from spawning sites; Seasonal and physiologically dependent movement of juvenile Atlantic sturgeon to appropriate salinity zones within the river estuary; and Staging, resting, or holding of subadults or spawning condition adults. Water depths in main river channels must also be deep enough (at least 1.2 meters) to ensure continuous flow in the main channel at all times when any sturgeon life stage would be in the river
"Water Quality" *(PBF 4)*	Water quality conditions, especially in the bottom meter of the water column, with suitable temperature and oxygen values	Necessary to support: Spawning; Annual and inter-annual adult, subadult, larval, and juvenile survival; and Larval, juvenile, and subadult growth, development, and recruitment. Appropriate temperature and oxygen values will vary interdependently, and depending on salinity in a particular habitat. For example, 6.0 mg/L dissolved oxygen or greater likely supports juvenile rearing habitat, whereas dissolved oxygen less than 5.0 mg/L for longer than 30 days is less likely to support rearing when water temperature is greater than 25°C. In temperatures greater than 26°C, dissolved oxygen greater than 4.3 mg/L is needed to protect survival and growth. Temperatures of 13 to 26 °C are likely to support spawning.

No in-water work appears to be planned within the boundaries of the Carolina Unit - 7 (Santee-Cooper River) of Atlantic sturgeon critical habitat; thus, we do not anticipate these portions of the project will impact any of the PBFs of critical habitat.

Runoff/turbidity/etc. may degrade water quality and those plumes of turbidity or water with low dissolved oxygen concentrations could be transported inside the boundaries of Atlantic sturgeon critical habitat.

We agree with your conclusion that these potential impacts will not impact PBF 1 (hard substrate in freshwater). Based on our current understanding of the project, we also believe there is a very low likelihood that degraded water pumped into the Ashley or Cooper Rivers will impact PBF 2 (Salinity Gradient with Soft Substrate), PBF 3 (Unobstructed Water of Appropriate Depth) or PBF 4 (Water Quality) to an extent that it measurably interrupts the purpose/role of the PBFs, but we believe a more complete assessment of the project's operations and water quality impacts is required to confirm this.

Analysis of Potential Routes of Effect to Species

We agree with your assessment that shortnose sturgeon are unlikely to be near the project area. Data we received from the South Carolina Department of Natural Resources (SCDNR) for an unrelated project confirm your statements that shortnose sturgeon spend the vast majority of their time well outside the Region of Influence, and only occasionally occur near the confluence of the Cooper and Ashley rivers where the majority of the work will be completed. Shortnose sturgeon do not use the Ashley River for spawning, nor do they exhibit migratory behavior in the river.

Atlantic sturgeon are more likely to be found in the action area than shortnose sturgeon. The best available information indicates they use the Cooper River more frequently than the Ashley River. Atlantic sturgeon do not use the Ashley River for spawning, nor do they exhibit migratory behavior in the river.

Unpublished telemetry data of Atlantic sturgeon movements in the Cooper River provided by SCDNR for an unrelated project, indicated between 88-99 tagged Atlantic sturgeon were detected in the Cooper River each year from 2016-2018. A number of those detections were in the Charleston Harbor. We believe any animal in the Charleston Harbor could potentially be found in the action area.

Either species of sturgeon could be physically injured if struck by construction equipment, vessels, or materials. You have indicated that the majority of the actual seawall construction will be in the uplands, away from ESA-listed species. Assuming that remains the case, we acknowledge there will likely be no threat of physical injury to any ESA-listed species for work that occurs entirely out of the water. For the in-water portions of the project, our current understanding suggests this work would occur in the Ashley River where sturgeon are less likely to be present. The current discussion of the project also mentions the potential use of unspecified best management practices (BMPs). Assuming BMPs or construction conditions that are effective in reducing impacts to sturgeon are ultimately implemented, we anticipate a low likelihood of sturgeon being physically injured if struck by construction equipment, vessels, or materials.

Construction activities, construction-related noise, and the use of turbidity curtains may prevent or deter sturgeon from using the area. Unfortunately, there is not enough information currently available to assess the potential for these aspects of the project to adversely affect species. When considering these potential routes of effect, the most important aspects of our analysis is where the activities will occur and their duration. The current description of the project does not include these details. In the Ashley River, the project footprint appears likely to be very close to shore. If the project footprint here extends only a short distance into the river, we would anticipate any obstruction from the deployment of turbidity curtains or construction activities would be relatively small since the remaining portion of the river would remain free of obstruction; though construction-related noise could propagate further into the river. However,

until more information is available on the likely source location of construction-related noise and its duration, we cannot assess the significance of its potential impact, if any.

Potential impacts from noise created by pile driving activities during construction remains a significant concern for us but the information currently available is insufficient for us to assess the potential impacts. Our concerns are related to both physical injury and changes to animal behavior.[1] The likelihood of either occurring depends greatly on what type of materials will be driven, the duration of driving, location of the driving, and the number of piles driven per day. We acknowledge that certain aspects of the project as currently described (i.e., pile driving in marsh habitat) could significantly reduce the severity, location, and duration of noise impacts. Similarly, you also mention other minimization measures *could* be used (e.g., limiting the days and times of days when construction would occur or requiring the use of noise abatement measures such as mufflers and intake silencers). However, until more information is available about the actual location and timing of pile installations and whether or not minimization measures will be used, we are unable to accurately assess the potential impacts to species. Using noise abatement measures (e.g., cushion blocks) or driving piles behind de-watered cofferdams can greatly reduce any potential noise effects. Similarly, you mention the installation of a temporary work trestle. If piles will be driven to support the trestles, their location will be important during our consideration of whether noise-related impacts may propagate into the river.

Degraded water quality (i.e., low dissolved oxygen concentrations, chemical/pollutant discharge) caused by hydraulic pumping is also of concern. You have stated that without minimization measures, localized water quality could be degraded, including temporary changes in salinity, pH and reduced dissolved oxygen levels, depending on the volume and duration of sediment resuspension, the oxygen demand of the sediment, and other factors. You then mentioned that sturgeon in these waters could experience physiological stress, and/or mortality if there are substantial reductions in dissolved oxygen. We recognize that you believe impacts this severe are unlikely, but can you provide more information on what minimization measures are planned? Additionally, based on our current understanding of the project, we are unclear as to whether anything in the water may ultimately cause lasting degradation to water quality following discharge. For example, the EIS identifies a number of Brownfield and Resource Conservation and Recovery Act sites in the study area. We are unclear whether there is a risk that pollutants from these sites will be pumped into the Cooper or Ashley rivers. Because sturgeon are benthic feeders, accumulated toxic materials in the sediment could be consumed by sturgeon. You note "small, manufactured treatment devices or sediment settling bases could be added in some locations if necessary." Inclusion of mitigation measures such as these would likely reduce or eliminate potential risks to ESA-listed species if implemented. However, at this time, it is unclear if these measures are planned.

You noted that sea turtles and sturgeon may become trapped behind the storm surge wall, but that the likelihood of that event is low. Based on our understanding of the project as currently proposed, we also believe there is a very low likelihood of any ESA-listed species becoming trapped behind the storm surge wall. You also note that in the unlikely event an animal became trapped behind the sea wall, they could

[1] Physical injury onset for fish and sea turtles occurs during a single-strike event at 206 dB peak pressure; prolonged exposure to noise energy can also cause injury for fish and sea turtles occurs at 187 dB cumulative SEL; noise-induced impacts to behavior are anticipated at 150 dB (RMS) for fish and 160 dB (RMS) for sea turtles.

be injured if water quality becomes significantly degraded. We recommend you consider establishing a plan of action for what to do if an animal is observed trapped behind the sea wall. We believe having such an action plan in place will significantly mitigate the already low likelihood of injury being caused.

The description of reef-based living shoreline installation is brief. Would this work be done from the uplands/boats/both? We suspect the risk to ESA-listed species from the installation of this feature is very low; however, we cannot solidify that conclusion without more details. For example, is there any risk of vessel strikes if vessels are used? It is encouraging to hear that the techniques used are "*generally considered to have low-impact and localized effects on the environment*" but is any more information available on what will be installed? What materials will be installed? How much material will be installed? Is entanglement/entrapment of listed sea turtles a potential route of effect?

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, CHARLESTON DISTRICT
69 A HAGOOD AVENUE
CHARLESTON SC 29403-5107

January 14, 2022

Mr. Andrew Strelcheck
Regional Administrator
Southeast Regional Office
NOAA Fisheries
263 13th Avenue South
St. Petersburg, FL 33701

Dear Mr. Strelcheck:

Please find attached the US Army Corps of Engineers, Charleston District's (USACE) response to your request for additional information received from the National Marine Fisheries Service (NMFS) via letter singed on 23 November 2021. This information pertains to USACE's request for informal consultation under the Endangered Species Act, as amended, submitted to NMFS on 23 September 2021 for the Charleston Peninsula Coastal Storm Risk Management Study. If for some reason USACE has overlooked a question from the 23 November 2021 letter, please let us know immediately so that we may address it.

USACE is also providing new information with respect to a modification made to the structural measure and some related features of the Charleston Peninsula Coastal Storm Risk Management Study since informal consultation was initiated (see attached). USACE has evaluated this modification with respect to Section 7 of the ESA and determined the proposed modification does not change USACE's determinations already made that the proposed Federal action may affect but is not likely to adversely affect, the shortnose sturgeon, Atlantic sturgeon, green sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle; nor that the proposed Federal action is not likely to adversely affect or modify Atlantic sturgeon designated Critical Habitat. USACE continues to seek concurrence on these determinations, inclusive of the new information, for the Charleston Peninsula Coastal Storm Risk Management Study.

USACE has requested that NMFS review the information provided in this response to their request for additional information by 28 January 2022. If further clarification is needed, please do reach out to Ms. Hannah Hadley at (208) 220-0961 or via email at hannah.f.hadley@usace.army.mil during this time to discuss any technical issues before responding on 28 January 2022 so that we can collectively resolve them and move the informal consultation forward. Thank you very much.

Sincerely,

Nancy Parrish
Chief, Planning and Environmental

CHARLESTON PENINSULA CSRM SUPPLEMENTAL INFORMATION FOR EVALUATION UNDER ESA SECTION 7

The alignment of the storm surge wall along the South Carolina Port Authority (SCPA) properties in the study area (Columbus Street Terminal and Union Pier) has been modified since this ESA consultation was originally initiated 23 September 2021, as a result of stakeholder/public input of the proposed Federal action sought under the National Environmental Policy Act. USACE worked with the SCPA to optimize a segment of the storm surge wall that previously paralleled portions of East Bay Street, Washington Street, and Morrison Drive. The storm surge wall was moved to the eastern edge of the SCPA's properties and on to Johnson Street (an access road to the port). This increased the total length of wall (on land) by 0.2 miles. Along with the shift in the wall, the location of two temporary pump stations in this area would shift from along East Bay Street onto SCPA property. The wall realignment would also necessitate ~10 additional pedestrian or vehicle access gates be added and 1 new storm (tidal flow) gate. The newly added gates would be similar to all of the other gates already proposed in the Federal action, constructed with the same methods, and operated in the same manner, which involves remaining open except during storm surge events. All of the same minimization measures proposed for the storm surge wall and associated gate and pump features would be applied. The figure below shows the realignment modification.

The storm gate would be added under Johnson Street where the street crosses over Vardell's Creek via an ~80 ft bridge. Vardell's Creek is a previously altered tidal creek off of the Cooper River in an urbanized area. At this location, the storm gate (or series of gate panels) would span the entire width under the bridge and be affixed to the existing bridge infrastructure. The storm gate is not expected to alter current hydrologic conditions in Vardell's Creek when the gate is open, nor for use by special status species such as endangered shortnose or Atlantic sturgeon, listed species of sea turtles, or bottlenose dolphins. When the gate is temporarily closed during storm surge events, the conditions would be similar to those evaluated for closure of storm gates on existing road culverts in the proposed Federal action, including for the storm gate at Morrison Drive and New Market Creek (see p. 6 and 7 of consultation request). The effects would be the same as already described for the storm gates on p. 16-17 of the consultation request, and similar to the hydraulic pumps described on p. 18 and 20 of the consultation request, which are described in much more detail in Sections 6.4.2 and 6.8.2 of the draft FR/EIS. The same minimization measures would be applied to the additional storm gate as all other storm gates. While NMFS did not take a position on water quality as a concern of the proposed plan nor provide any conservation recommendations for water quality in its Fish and Wildlife Coordination Act for the study (finalized July 2021), if there are other minimization strategies NMFS would like to offer to reduce the potential temporary effects on water quality for listed species, USACE will consider them.

The modification would eliminate condemnation of some private properties, reduce potential impacts on cultural/historical resources and visual resources in this area, and provide additional storm surge risk reduction benefits to critical port infrastructure. Overall, the realignment results in lower implementation costs and higher coastal storm risk reduction benefits.

USACE has determined that the realignment of the storm surge wall and resulting changes in project features (gates, pumps) do not result in any different types of environmental effects than those already evaluated under NEPA or in the existing ESA consultation. They do not alter USACE's Section 7 ESA determinations already made that the proposed Federal action may affect, but is not likely to adversely

affect, the shortnose sturgeon, Atlantic sturgeon, green sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle, nor that the Federal action is not likely to adversely affect or modify Atlantic sturgeon designated Critical Habitat

PROTECTED RESOURCES DIVISION: REQUEST FOR ADDITIONAL INFORMATION (from Appendix B)

USACE offers the following responses to requested information found in Appendix B – Protected Resources Division: Request for Additional Information of NMFS' letter to USACE from Mr. Strelcheck signed on November 23, 2021. The questions posed by NMFS are included below, with USACE's responses provided under each in blue text. Where applicable, USACE notes page numbers or section numbers where this information was already provided in either USACE's consultation request or in the integrated Draft Feasibility Report and Environmental Impact Statement (FR/EIS) and related appendices. USACE hopes NMFS finds the information that is compiled here into one location to be helpful for consideration in the ongoing ESA Section 7 consultation. Likewise, these pages/sections can be referred to for more detailed or robust information.

- **Information Needed to conduct full noise analysis –**
    - What type of materials will be driven (i.e., steel sheet piles, concrete, wood)?
        - For the storm surge wall, pilings of prestressed concrete will be used (p. 3 and 17 of consultation request)
        - For the temporary worksite trestle, pilings of wood will be used
        - It is currently assumed that an impact hammer will be used
    - What is the size of these materials (i.e., sheet width for sheet piles; pile diameter)?
        - Pile size is 12"x12" for the storm surge wall (p. 3 of consultation request although was mislabeled as feet)
        - Pile size has not been determined yet for the wood pilings of the worksite trestle
    - Anticipated number of strikes per pile/sheet; anticipated number of piles likely to be driven per day?
        - Only one segment of storm surge wall would be constructed in open water, approximately 35 feet off of the shoreline where the low tide depth is estimated at 4-6 ft (1-2m) based on existing information. This is the marsh impact site by the US Coast Gard Station along the Ashley River (p. 17 of consultation request). Length of wall to be constructed is ~955 ft (0.18 mi), which will connect the existing Battery Sea Wall to the new storm surge wall on Broad Street/Lockwood Blvd (see figure provided here which shows estimated wall length and provides spatial perspective of distance to shoreline and depth).
        - Pre-augured holes (auger cast piles) will be drilled for the pilings so that the piles would only be hammered the final depth to reach the Cooper Marl (embedment depth assumed to be 5 feet – p. 25 Appendix B Engineering – Geotechnical Subappendix of the FR/EIS). All major develop in the study area now requires foundation to the Cooper Marl to meet earthquake standards.
        - The City of Charleston has a noise ordinance that will limit pile driving to the hours of 7:00 a.m. to 7:00 p.m. on weekdays, and 9:00 a.m. to 7:00 p.m. on Saturdays, Sundays, and certain holidays (Section 4.15 of draft FR/EIS). USACE will implement a conservation measure that restricts pile driving in open water (this location) to low tide. The low tide window will be identified during PED once new high resolution nearshore bathymetry is collected for the area (p. 17

of consultation request, Section 6.15.2 in draft FR/EIS). Since the study area experiences diurnal tide cycles, only one low tide cycle will generally occur during the allowable noise ordinance timeframe. Therefore, pile driving would only occur once a day, and during the daytime, at this location.

- Horizontal spacing of piles for the storm surge wall is currently estimated to be five feet. If the length of wall is approximately 955 ft, approximately 200 piles will need to be driven in this location. Since pile driving would be limited by tide and daylight hours at this location, and limited in depth to subsurface (see below), it might be expected that five pilings would be driven per day at this location. Could not find appropriate proxy for number of strikes (thank you for providing the test calculator but it was confusing to use without training)

- whether vibratory hammers will be used
  - A vibratory hammer will be used to install the sheet pile of the storm surge wall. The sheet pile will be made of prestressed concrete (p. 12 Appendix B Engineering - Structural Subappendix of draft FR/EIS), and would be limited to the same tide and timing restrictions as the battered pile driving at the open water site.

        - Vibratory monitoring will be required during construction, particularly for historic structures, so a general construction vibratory monitoring and mitigation plan will be developed during PED that will likely present a tiered approach to mitigation. It will range from ensuring standard noise control devices on equipment are operational, to actions that can be taken to reduce vibratory hammer load or insulate noise, to focused response measure. Thresholds and measures would be determined in PED for the plan. If NMFS has specific minimization measures that are relevant to the environmental conditions for this study that wouldn't otherwise be minimized by the measures already proposed, please provide them for USACE to consider, since none were provided in the Fish and Wildlife Coordination Act Report.
    - (interpreted from p. 10) clarify what minimization measures would be used
        - To minimize the potential for noise impacts on aquatic resources related to construction in open water (one site) the following measure will be used: pile driving will be limited to low tide for a water depth of approximately 1-2m; pile driving will be limited to (roughly) daylight hours, which in combination with the preceding measure, pile driving would only occur once a day; auger cast piles would be used to limit the extent of pile driving by hammer; a vibratory monitoring and mitigation plan will be developed and implemented.
    - (interpreted from p. 10) will piles be used to install the temporary work trestle and what is their location and potential for noise propagation into the river?
        - The temporary work trestle would be similar to that currently being used by the City of Charleston for construction of another project that is made of wood, except that it would not need a dewatering pump nor shored sheet pile (p. 14, 35, 36 of Appendix B Engineering – Structural Subappendix of draft FR/EIS). Dimensions of the trestle will not be determined until PED, but will be of sufficient width to operate a crane and receive construction materials. The trestle would be used at all construction areas in estuarine wetlands, but only this location is open water. Number of wood piles to be driven for installation at this location cannot be determined until trestle is designed in PED. However, considering the short lengths of storm surge wall at this location, wood materials, low tide and time window for pile driving at this location, noise propagation potential into the Ashely River is expected to be low.

- **Use of Best Management Practices –**
    - Will USACE implement the protected species construction conditions and follow entrapment reduction measures?
        - Thank you for providing a copy of NMFS' "Protected Species Construction Conditions." Yes, these construction conditions will be implemented to the extent that they apply to in water or estuarine wetland construction, or land-based construction that extends into the water. The application of the conditions will be limited since the majority of the project will be land based, and construction operations for in-water and estuarine wetland construction will be conducted from the worksite trestle. With the worksite trestle, no

construction equipment will be operated in or from the waterside, with the exception of the reef-based living shoreline sills in the intertidal zone (see response below for more information on this feature). Adoption of these measures will be added to Section 3.0 Avoidance and Minimization Measures of the Draft Mitigation Plan, as well as in Section 6.7 Special Status Species of the FR/EIS.

- Thank you for providing a copy of NMFS' "Measures for Reducing Entrapment Risk to Protected Species." Yes, these measures will be followed for construction in open water and estuarine wetland areas of the project. Adoption of these measures will be added to Section 3.0 Avoidance and Minimization Measures of the Draft Mitigation Plan, as well as in Section 6.7 Special Status Species of the FR/EIS.

- (interpreted from p. 9) clarify where construction activities will occur and their duration with respect to distance into the river
  - All construction related to nonstructural measures (elevating and floodproofing of homes) will occur on land. Construction methods would not extend into any waterbodies. While entire neighborhoods have been identified for implementation of nonstructural measures, the individual structures within have not. For example, some homes in the neighborhoods have already been elevated so only those that have not would need this type of retrofitting. Since the individual homes have not been identified, the distance to waterbodies is not known. Likewise, duration for such construction is not known at this time. Typical best management practices to control erosion and runoff from upland construction would be implemented, monitored for effectiveness, and detailed out in an erosion and sediment/soil control plan for construction (p. 17 of consultation request and Section 6.4.2 of the FR/EIS). After additional consideration, BMPs of settling basins and coffer dams for construction would not be appropriate for this study since no considerable earthwork or excavation is expected; no dredging will occur.
  - Construction of the hydraulic pump stations and installation of wet wells will be on land and would not extend into any water bodies. The temporary pump stations require minimal construction of new infrastructure and no earth movement since they would be adjoined to the existing municipal drainage system. The locations of the permanent pump stations are approximate, but are within close proximity ranging from roughly 50 ft to 150 ft from the closest waterbody. Duration to construct is unknown at this time but would be similar to duration to construct other upland structures with small footprint of roughly 3,600 square ft. for the pump house. Typical best management practices to control erosion and runoff from upland construction runoff would be implemented, monitored for effectiveness, and detailed out in an erosion and sediment/soil control plan for construction (p. 17 of consultation request and Section 6.4.2 of the FR/EIS). After additional consideration, BMPs of settling basins and coffer dams for construction would not be appropriate for this study

since no considerable earthwork or excavation is expected; no dredging will occur.

- Approximately 7.2 miles of storm surge wall will be constructed on land. Duration for construction is unknown at this time, but will be broken into four construction phases. Locations are also approximate, with some areas of the wall in close proximity to waterbodies, particularly along the Charleston Harbor and west side of the study area. While it is premature to summarize the exact distances for the entire 7.2 miles of upland wall here, in some locations, it can be assumed that the wall may be within 20 ft from the shoreline. While no construction for upland wall would extend into the water, typical best management practices to control erosion and runoff from upland construction would be implemented, monitored for effectiveness, and detailed out in an erosion and sediment/soil control plan for construction. After additional consideration, BMPs of settling basins and coffer dams for construction would not be appropriate for this study since no considerable earthwork or excavation is expected; no dredging will occur. A 25 ft buffer is planned for construction, so depending on the proximity to open water at any particular location, turbidity curtains may be used temporarily in open water, or other sediment/silt containment structure in estuarine wetlands, if upland silt fences are not adequate. Given the planned buffer size, the turbidity curtains (or other) would be within in roughly 20 ft or less from the upland shoreline.
- Approximately 1.5 miles of storm surge wall will be constructed in estuarine wetlands along the Ashley River, approximately 35 ft from the upland shoreline, with approximately 0.18 miles of that in an area considered open water. Duration of construction is unknown at this time, but the one area of construction in open water (by US Coast Guard Station) is planned for a different construction phase than the other areas of wall to be constructed in estuarine wetlands. Typical best management practices to control sedimentation and turbidity would be implemented, monitored for effectiveness, and detailed out in an erosion and sediment/soil control plan for construction (p. 17 of consultation request and Section 6.4.2 of the FR/EIS). After additional consideration, BMPs of settling basins and coffer dams for construction would not be appropriate for this study since no dredging of sediments would occur.

- (interpreted from p. 9) clarify use and location of turbidity curtains
  - Turbidity curtains will likely be used temporarily during construction of the storm surge wall in open water by the US Coast Guard station (refer to figure provided above). It is expected they would be placed roughly 25ft seaward and parallel to the construction footprint of the wall. Other turbidity barriers suitable for marshes, possibly choir logs, may be temporarily used for construction of the storm surge wall in estuarine wetland areas. As noted above, NMFS' "Measures for Reducing Entrapment Risk to Protected Species" would be followed for the turbidity curtains or other type of turbidity and sedimentation barrier as appropriate.

        - As described above, for land based construction that is in close proximity to open water or marsh, and where upland silt fencing is not adequate, turbidity curtains (or other turbidity barrier suitable for marshes) may need to be temporarily used. As described above, they are expected to be placed parallel and very close to upland shoreline (<20 ft) since the upland construction does not actually extend into the water. Turbidity barrier would be installed in compliance with NMFS' "Measures for Reducing Entrapment Risk to Protected Species." Adoption of these measures will be added to Section 3.0 Avoidance and Minimization Measures of the Draft Mitigation Plan, as well as in Section 6.7 Special Status Species of the FR/EIS.

- **Will the project footprint for all in-water work ensure migratory pathways are not blocked?**
    - Yes, all in-water work and construction in estuarine wetlands of either the storm surge wall or living shorelines (see more below) would occur parallel and in close proximity to the shoreline and would not block migratory pathways for listed species. Construction of the storm surge wall will permanently intersect with Halsey Creek, but five openings/gates in the wall of 15 ft each are planned.

- **Will in-water construction be conducted only during daylight hours or will it occur 24 hours a day? Is construction-related noise likely to propagate into open water?**
    - There is the potential for construction related noise to propagate into open water at one site. This is the site where ~955ft of the storm surge wall would be constructed in shallow (estimated 4-6 ft) open water approximately 35 ft. off of the shoreline of the Ashley River by the US Coast Guard Station. Construction noise that could propagate would primarily be related to the pile driving and vibratory sheet pile installation (see related responses above). As described above, these types of construction activities would only occur during daylight hours and during one low-tide cycle a day, including pile driving related to installing the wood worksite trestle. Since the worksite trestle will be used to stage and operate all construction equipment above the water/marsh, noise related to other construction operations would not propagate through water. Construction activities at this site that are unrelated to pile driving could occur beyond daylight hours if they are consistent with the City's noise ordinance (which is targeted at restricting repetitive/pulsing construction noise).

- **Information on what contaminants are likely to be pumped into the rivers during pump-out events?**
    - According to the City of Charleston's Department of Stormwater Management, there are not high pollutant loads for nutrients in the storm water because the study area is highly urbanized area. Sediment can be an issue in stormwater, so for the existing stormwater pumps that are currently permitted and operated on the Charleston Peninsula, and discharge directly in surrounding waterbodies, this is addressed with water quality treatment devices on the pumps. For example, at the City's current pump station at Spring and Fishburne Streets, a sediment basin has been installed to remove solids and the pollutants that bind to them, such as metals, phosphorous, BOD/COD,

etc. The treated water is then piped and discharged into the Ashley River. The City's current pump station at Concord Street which operates similarly, discharges into the Cooper River. The Department of Stormwater Management indicated that the pumps are "activated infrequently" because it takes a significant rainfall event to activate them.

A full assessment of current stormwater quality is beyond the scope of this study because the concentrations in the stormwater that would be discharged by pumps in the proposed Federal action during a storm event would be the same as in the stormwater without the Federal action (or Future Without Project). This is due to the location and functions of the proposed pumps. First, the City's subsurface drainage system would receive and drain (and pump in some locations) the majority of the rainfall and stormwater runoff with or without the Federal project. Note the City is currently building and has permits for additional stormwater pump stations to be built in the study area. For the new permanent pump stations in the proposed Federal action, the pumps would collect/receive the rainfall/ stormwater runoff as it flows over land towards the new storm surge wall, in the same manner as the existing pump stations, except that they are located closer to the wall. The pumps are intended to mitigate for rainfall flooding by collecting and removing the water before it causes flood damages. USACE modified the locations of the pumps so that they are not below the high tide line, and are not collecting and pumping stormwater after it has ponded by the wall (p. 18-19 of the consultation request). The pumps in the proposed Federal action would treat the stormwater using the same criteria required for the existing permitted pump stations, and discharge it to surrounding waterbodies just as the existing pump stations do (except through or over the wall, not piped).

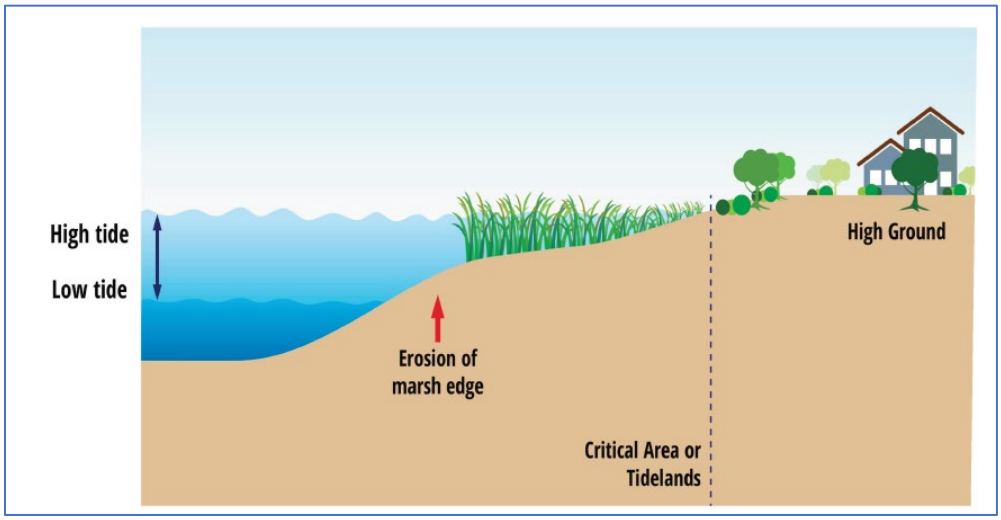
- (interpreted from p. 10) Can you provide more information on what minimization measures are planned for potentially degraded water quality and the manufactured treatment devices, including for toxic pollutants from RCRA sites?
  - The permanent hydraulic pump stations in the proposed Federal action will be designed and function similarly to the existing pump stations that are already operating in the study area. The manufactured treatment devices would likewise be similar to those permitted for the existing pump stations (note the proposed pump stations are similar in size/capacity or would be smaller). USACE is not aware of any special water quality requirements for the existing pump stations beyond what is currently being implemented, such as for toxic pollutants from RCRA sites.

- **(interpreted from p. 10) Does USACE have a plan of action for what to do if an animal is observed trapped behind the sea wall (can significantly mitigate the already low likelihood of injury being caused)?**
  - No, USACE has not developed a plan of action for what to do if an animal is observed trapped behind the storm surge wall, since there is a very low likelihood of this happening if the storm gates are closed at low tide, and since most of the storm gates are at culverts. USACE does plan on implementing the following minimization measure to reduce the potential for direct injury to special status species during closure of the

storm gates, which was overlooked in our original initiation request. However, it was included in our Section 7 ESA consultation with the US Fish & Wildlife Service with respect to manatees, and USACE intends to apply it to sea turtles, sturgeon and dolphins. The measure is for the storm gates at Halsey Creek and at Vardell's Creek (since these are not culvert locations) would be manually closed only after visual observations for clearance of marine mammals, sea turtles and sturgeon are made by the gate operator, to the best of their ability (to be further described and included in the Operations and Maintenance manual).

Making observations of the entire creek system behind the gate may not be feasible given the limited timeframe that gate operators will have before the onset of a surge event and the low likelihood of any special status species being present at low tide (roughly half a foot at Halsey Creek). Please let us know if NMFS has other suggestions for USACE to consider.

- **How will the living shoreline be installed?**
  - What materials will be installed?
    - As with the other features of the proposed Federal action, the living shoreline sills will not be designed until PED. However, the materials used for the living shorelines would be limited to those that are proven as successful substrates for oyster recruitment in South Carolina tidal waters to form the reef-based sills desired. These include either bagged oyster shells, oyster castles, or manufactured wire reefs (e.g., concrete-coated crab traps) (SCDNR 2019), and will be dependent on the site conditions at each of the planned locations for the sills. USACE provided NMFS with the draft engineering description of the reef-based living shoreline sills on 12/1021 which has more details about this planned feature; please let us know if you need it again.
  - How much material will be installed?
    - The reef substrate will cover approximately 9,300 linear feet of shoreline at multiple locations along the Ashley River shoreline of the study area. The typical height of oyster reef-based living shoreline sills in South Carlina is 1-2 ft, depending on the material used and the vertical growth over time. Locations for all measures and features of the proposed Federal action are approximate and will be finalized in PED. Until the planned locations are verified and the most suitable substrate material for each location is selected and the sill is designed, the materials cannot be quantified.
  - Is entanglement/entrapment of listed sea turtles a potential route of effect?
    - No. The reef-based living shoreline sills would be placed parallel to the shoreline in the intertidal zone, between the low and high tide (see red arrow in figure below from SCDNR 2019). They are shown to mimic natural reef processes, especially as natural oyster growth overtakes the underlying substrate. Oyster reef habitat in the intertidal zone is not typical for sea turtles, and USACE is not aware of any entanglement or entrapment issues with these types of sills and sea turtles (or any other listed species) in South Carolina.



- Will it be done from the uplands, vessels, both? If vessels will be used will USACE follow our vessel strike avoidance guidance?
  - Construction of the living shoreline sills will occur from the water-side with small, shallow boats to reach the intertidal zone to avoid damage to the marsh during construction, and during low tide for proper placement. Small outboard motor boats ranging from roughly 13 to 23 feet in length are typically used. There are several boat landings within in a few nautical miles of the sill locations so travel distances will be short.
  - Thank you for providing a copy of NMFS' "Vessel Strike Avoidance Measures." These measures will be followed, with the exception of those that apply to North Atlantic Right Whales because this species is not present in the ROI. Adoption of these measures will be added to Section 3.0 Avoidance and Minimization Measures of the Draft Mitigation Plan, as well as in Section 6.7 Special Status Species of the FR/EIS.

South Carolina Department of Natural Resources (SCDNR). 2019. Summary of Living Shoreline Research to Inform Regulatory Decision-Making in South Carolina. Charleston, SC: South Carolina Marine Resources Division. Technical Report No. 110. 49 p.

ESSENTIAL FISH HABITAT ASSESSMENT / MAGNUSONS STEVENS ACT COMPLIANCE

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, CHARLESTON DISTRICT
69 A HAGOOD AVENUE
CHARLESTON SC 29403-5107

September 23, 2021

Dr. Pace Wilber
Habitat Conservation Division, Southeast Regional Office
NOAA National Marine Fisheries Service
219 Fort Johnson Road
Charleston, SC 29412-9110

Dear Dr. Wilber:

The U.S. Army Corps of Engineers, Charleston District (USACE) is requesting consultation with the NOAA National Marine Fisheries Service pursuant to section 305(b)(2) of the Magnuson-Stevens Fishery Conservation Management Act for the Charleston Peninsula Coastal Flood Risk Management Study. An EFH Assessment of the proposed Federal action identified in the study is enclosed.

Additionally, USACE has recently completed a draft integrated Feasibility Report and Environmental Impact Statement for the study, which provides more detail on the study process, alternatives and measures considered, the potential adverse and beneficial effects on the human environment, and planned mitigation measures. You are encouraged to use this as a reference if you have questions about the study, or you may contact Ms. Bethney Ward at Bethney.p.ward@usace.army.mil or (843)329-8162.

USACE appreciates NOAA's collaboration on this study to date, and we look forward to your response to this consultation request.

Sincerely,

Nancy Parrish
Chief, Planning and Environmental Branch

Enclosure

Essential Fish Habitat Assessment for the Charleston Peninsula Coastal Flood Risk Management Study

September 2021

1.0 INTRODUCTION

The U.S. Army Corps of Engineers, Charleston District (USACE) is currently conducting the Charleston Peninsula Coastal Flood Risk Management Feasibility Study to investigate and recommend potential structural, nonstructural, and natural or nature-based solutions to reduce damages and life safety impacts from coastal storms. The authority to study coastal South Carolina, including the Charleston Peninsula, was provided in the Rivers and Harbors Act of 1962, P.L. 87- 874, Section 110, and a subsequent Senate Committee Resolution dated 22 April 1988. Funding for the study was appropriated by the Bipartisan Budget Act of 2018 (Public Law 115-123), Division B, Subdivision 1, Title IV. The City of Charleston requested this study and is the non-Federal sponsor. The study area covers approximately 8 square miles of the lower Charleston Peninsula that is within the City's jurisdiction (see Figure 1). The following objectives have been identified and refined for the study:

- Reduce risk to human health, safety, and emergency access from coastal storm surge inundation on the Charleston Peninsula through the 50-year life of the project, estimated to be 2032 to 2082.
- Reduce economic damages resulting from, and increase resilience to, coastal storm surge inundation on the Charleston Peninsula through the 50-year life of the project, estimated to be 2032 to 2082.

To meet the study objectives, USACE identified an array of alternatives, and has proposed a Federal action that includes a combination of structural, nonstructural, and nature-based measures.

The Magnuson-Stevens Fishery Conservation and Management Act requires that the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) identify essential fish habitat (EFH) for federally-managed fisheries. This includes all of the habitats that are used by a species for its entire life cycle. Pursuant to section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), Federal agencies shall consult with NMFS regarding actions that may adversely affect EFH, including any actions proposed to be authorized, funded, or undertaken, as is the case with this feasibility-level study.

NMFS has provided technical assistance throughout the current feasibility study. USACE has engaged NMFS through the study's Interagency Coordination Team, as a Cooperating Agency for the EIS, and under the Fish and Wildlife Coordination Act. At the request of both the U.S. Fish and Wildlife Service and NMFS, a Fish and Wildlife Coordination Act Report for the study has been prepared and is available for reference.

Pursuant to the National Environmental Policy Act, USACE has prepared a Draft Integrated Feasibility Report and Environmental Impact Statement (FR/EIS) for the Charleston Peninsula Coastal Flood Risk Management Study which is located here for reference: https://www.sac.usace.army.mil/Missions/Civil-

Works/Supplemental-Funding/Charleston-Peninsula-Study/. It is currently available for public and agency comment through October 25, 2021.

Prior to preparing the current Draft FR/EIS, USACE issued a draft integrated Feasibility Report and Environmental Assessment (FR/EA) and a draft Mitigated Finding of No Significant Impact for the study in April of 2020. The previous draft FR/EA did not include an EFH Assessment nor a request for formal consultation under the Magnuson-Stevens Act at that time. NMFS reviewed the draft FR/EA and provided a letter to USACE dated June 19, 2020, offering technical assistance and informal guidance, which included, among other comments, that USACE consider preparing a full Environmental Impact Statement for the study.

USACE has prepared this EFH Assessment for the Charleston Peninsula Coastal Flood Risk Management Study. It includes a description of the proposed Federal action, an inventory of the habitats and managed fishery resources that are present within the study's region of influence (ROI), an assessment of potential effects of the proposed Federal action on them, and a summary of steps that USACE would implement to reduce the potential for adverse effects. Information in this document can be supplemented with more detailed information about the Federal action and the comprehensive effects evaluation and mitigation planning found in the Draft FR/EIS, and can be used as a reference.

2.0 PROPOSED FEDERAL ACTION

The proposed Federal action to meet the study objectives includes construction of a storm surge wall of 12 ft elevation NAVD88 along portions of the perimeter of the Charleston Peninsula, nonstructural measures in the form of elevating and flood proofing for a limited number of structures, and natural and nature-based features in the form of large-scale oyster reef-based living shorelines. Additional features associated with the storm surge wall are access gates and hydraulic pumps. The approximate locations of these planned measures are shown in Figure 1 and are described in much more detail in the Draft FR/EIS, including conceptual diagrams, dimensions, and materials in the Engineering Appendix. A summary of some key features of the measures is provided here.

For the purpose of this EFH Assessment, the ROI of the proposed Federal action includes all tidally influenced waters and habitats in the 8-square mile study area, and the waterways of the Charleston Harbor, lower Ashley River, and lower Cooper River where they are adjacent to the study area.

Figure 1. Map showing the study area and the approximate locations of the measures in the proposed Federal action.

2.1 Storm Surge Wall

Approximately 7.1 non-continuous miles of the perimeter storm surge wall would be constructed on land, and approximately 1.5 non-continuous miles would be constructed through saltmarsh wetlands. On the east side of the Peninsula which aligns the Cooper River, the storm surge wall would be entirely on land. On the west side of the Peninsula that aligns the Ashley River, segments of the wall would be on land, while some segments would be sited just off the shoreline (approximately 35 ft) in salt marsh wetlands where it would not be feasible to construct the wall on land due to the proximity of existing infrastructure to the shoreline. The actual height of the wall at any given location will vary depending on the existing ground elevation, so that in total the height of the land and the wall reaches 12 ft NAVD88 to reduce the impacts of storm surges up to this height.

The storm surge wall would be constructed of concrete, and on land it would be a T-wall design with traditional concrete stem walls and pile supported bases. In the marsh, the storm surge wall would be a combination design which consists of continuous vertical piles on the storm surge side and angled piles on the landward side, connected by a concrete cap. The supporting piles would be 12x12 ft prestressed concrete piles that would need to be battered at an inclination from vertical, using a hammer. The Engineering, Structural Sub-Appendix in the Draft FR/EIS can be referred to for more detailed descriptions of the wall types, dimensions, and preliminary renderings.

Recreational features for the storm surge wall were not justified per USACE policy. However, a walking path for pedestrian transportation is planned on top of portions of the storm surge wall where it is located on land in the place of current sidewalks. The walking path would be similar to the promenade on the current Battery seawalls. The wall would also include aesthetic design features that are consistent with the current character of the Charleston Peninsula, which will be determined in a later design phase, if the project is authorized for funding.

2.2 Gates

A series of gates would be needed in the T-wall to allow for daily access of pedestrians and transportation where the wall would intersect with existing infrastructure. The preliminary number and conceptual locations of the upland gates are discussed in more detail in the Draft FR/EIS. Typically, the gates would remain open, and gate closure procedures would be initiated when major flooding is expected based on storm surge predictions from the National Weather Service. Timing of the closure of upland gates would be dependent on evacuation needs and the anticipated arrival of rising water levels that close transportation arteries. Details of the gate closure protocols would be finalized during a later phase of the of the project, if it is authorized for funding.

Storm gates in the form of sluice gates are proposed in the combination wall to allow for daily tidal exchange in one location. Where the storm surge wall crosses Halsey Creek, five 15 ft wide storm gates would be installed in the wall, for a total opening of 75 ft in that segment of the wall. No other storm gates in the wall are planned. However, storm gates (sluice gates) would need to be installed at five existing culvert locations where roads cross several creeks or channels on the lower Peninsula. These include the culverts at Morrison Drive and New Market Creek; at Morrison Drive and Vardell's Creek; at Lockwood Blvd and Colonial Lake; at Lockwood Blvd and Alberta Long Lake; at Lockwood Blvd and Gadsen Creek; and the box culvert at the stormwater channel that runs behind the Joe Riley Baseball Stadium (that drains from the Citadel Marsh to the Ashley River). These gates are needed to obstruct storm surge from entering and flooding the interior of Peninsula. The sites of the storm surge gates are

shown in Figure 2. The storm gates would also remain open except when major flooding from storm surge is predicted. When storm gates close for a storm surge event, it would occur on a low tide. As stated above, details of the protocol would be finalized during a later phase of the project.

Figure 2. Locations of proposed storm surge gates: five at Halsey Creek, five at road culverts.

2.3 Hydraulic Pumps

Preliminary modeling of water surface elevations with and without the proposed Federal action conducted by USACE show that five permanent and five temporary pump stations would need to be installed. The purpose of the hydraulic pumps is to mitigate for impacts to rainfall flooding that may occur in the interior and as a result of the proposed wall. All of the pumps would be of low to moderate size, ranging from 20 to 90 cubic feet per second (cfs). These pumps would be consistent in size with the smaller and medium pumps currently permitted and operated by the City of Charleston, but would only be operated during a storm surge event, which would be occasional and temporary.

The permanent pump stations would consist of a wet well installed in a low-lying area where water naturally runs off, such as near marshes and tidal creeks (but not in the marsh or creek – note that this is a modification from what was previously communicated to resource agencies). The wet well would consist of a concrete inlet box with mesh screens for debris and wildlife protection, and a hinged lid for pump removal for maintenance, etc. The outlet from the wet well would be routed to the wall and would either pass over the wall or through it with a check valve to prevent inflow of tidal waters. The wet well connects to a pump house. The pump house would be elevated and would hold the electrical infrastructure and other operating equipment, and a backup generator to minimize pump failure. More information and diagrams of such a pump station can be found in Appendix B -Engineering of the draft FR/EIS.

The tentative locations and capacity of the five permanent pump stations are as follows (also see Figure 3):

- by Halsey Creek (3 pumps @ 30 cfs)
- behind Joe Riley Stadium (marsh side) (3 pumps @ 30 cfs)
- by Alberta Long Lake (3 pumps @ 20 cfs)
- next to the US Coast Guard Station (Tradd Street side) (3 pumps @ 20 cfs)
- by New Market Creek (3 pumps @ 30 cfs).

The other five pump locations would each need 20 cfs of pumping capacity, which is considered small, and would be temporary stations. These were shown to be needed in locations where there is not a low-lying natural feature such as a marsh wetland, and where existing roads, houses, and other infrastructure are not conducive to installation of permanent stations (see Figure 3). At these locations, an inlet pipe would be installed which would tap into the existing storm drainage system for the peninsula, and an outlet pipe that goes over or through the wall. For storm events, a portable pump would be brought to the location and hooked up to the inlet and outlet pipes to efficiently move the rainfall in that area over the wall to avoid the “ponding” effect that the new wall would otherwise create. The temporary pumps would have built-in backup generators to allow them to function even if grid power fails, and would be trailer-mounted and portable to move and store off site when not in use.

The permanent and temporary pumps are not intended to redirect runoff; they would move it where it would have drained without the wall. When operating, the pumps would be a point source of stormwater discharge and would be expected to be compliant with state water quality standards.

Figure 3. Approximate locations of proposed permanent and temporary hydraulic pump stations.

2.4 Nonstructural Measures

For nonstructural measures, elevating and floodproofing of structures have been proposed in residential areas where construction of the storm surge wall would not be practicable due to topography and other constructability constraints. For example, dry floodproofing measures would be applied to the Bridgeview Village neighborhood and elevation measures would be applied to the Rosemont neighborhood due to the nature of the construction materials and techniques used in these communities. Wet floodproofing measures, such as elevating utilities, would be applied in the Lowndes Point neighborhood because residential structures are already elevated above 12 feet NAVD88.

2.5 Living Shorelines

In association with the storm surge wall, approximately 9,3000 linear feet of oyster reef-based living shoreline sills would be constructed in several locations to reduce coastal storm impacts to natural shorelines and other resources seaward of the wall. The living shoreline sills would reduce erosion of existing wetland marsh, while reducing scour at the base of the proposed storm surge wall. The living shorelines would also provide other environmental benefits, such as habitat for fish and wildlife.

The specific design/technique of the reef-based living shoreline sills would be determined in a later phase of the project if funded, but would be constructed with similar methods as those already used in South Carolina and that meet the definition and project standards for living shorelines in new sections R.30-1.D(31) and R.30-12.Q of S.C. Code Sections 48-39-10 et seq. They would also be constructed to compliment small scale reefs already in place in some locations around the Peninsula.

2.6 Pre-Construction, Engineering, and Design Phase Tasks

Should the proposed Federal action be approved, recommended to Congress for implementation, authorized, and appropriated by Congress, then some additional tasks would need to be completed during the Pre-Construction Engineering and Design (PED) phase of the project. These are listed in full in Chapter 8 of the Draft FR/EIS, for reference. A few that may be of relevance to this EFH Assessment are described here. It should be noted that if any modifications made to the Federal action as a result of tasks performed in the PED phase could result in effects on natural resources that were not evaluated in the study phase FR/EIS or under existing environmental laws and regulations, then consultation would be re-initiated at that time.

- Appropriate changes to the alignment of the storm surge wall may occur as a result of new developments in technology or construction methodologies, additional engineering analyses, unforeseen cultural and historic resources, the presence of buried utilities not discovered during feasibility, and real estate acquisition challenges. Any such changes are more likely to apply to the wall alignment on land than in the marsh.
- Subsurface data will need to be collected along the proposed alignment of the storm surge wall to complete the engineering design since detailed information is not currently available. In addition to determining stratigraphy, it will be important to verify locations of man-made fill or construction debris that may affect construction and pile installation. This could result in minor modification in engineering design or realignments of the wall, both on land or in the salt marsh.
- A final interior hydrology analysis will be performed. Preliminary modeling of the interior hydrology for this feasibility study was based on early assumptions about the number of upland and storm gates that would be installed and when they would be closed, and based on an assumption that all rainfall drains from the Peninsula through overland flow. In fact, most of the stormwater drains through the City's subsurface drainage system, so the modeling results are considered conservative. As the number and locations of gates are refined, and more

information is provided from the City about their stormwater management system, the interior hydrology will be re-analyzed. This will increase the certainty of the modeling results, which may result in some changes in the number, size, and locations of pumps, either increasing or decreasing the pumping requirements. However, a change in magnitude of the hydraulic pumping requirements is not expected.

- New geospatial bathymetric and topographic data will be collected to refine hydrodynamic and engineering analysis. This includes determining the wall height needed in a given location and informing other construction considerations.
- Wetland delineations will be conducted at the potential wetland impact locations once engineering surveys have determined final coordinates for the storm surge wall. This could result in slight increases or decreases in the required mitigation acreage but should not change considerably.
- Living shorelines site suitability surveys will be conducted and methods/techniques for the reef-based living shorelines sills will be determined (e.g, bagged shell, oyster castles, crab traps or other). Different methods may be more appropriate at different locations. This information will help to refine sites and materials for living shorelines implementation.
- The Draft Mitigation Plan will transition to a Final Mitigation Plan, through continued coordination with resource agencies.
- Gate closure protocols will be finalized, and included in the Operations and Maintenance Manual. It will be informed by the final number and locations of gates (particularly upland gates which will be re-evaluated in PED), the final interior hydrology analysis, and best available information on storm and flooding forecasts from expert sources, such as the National Weather Service.
- An Operations and Maintenance Manual will be developed for the City of Charleston to keep gates, pumps, and other features of the project operational. Annual inspections by USACE include a storm surge wall inspection checklist, which includes 125 specific items dealing with the operation and maintenance of floodwalls, interior drainage, pump stations, channels, operation and trial erections of closure structures, and inspection/video inspection of pipes/conduits that pass through the project alignment to ensure the system is working as designed. The Manual will be a legally binding document that is accepted by the City of Charleston when they sign a Project Partnership Agreement with USACE.

3.0 RESOURCE SIGNIFICANCE OF THE STUDY AREA

Many aquatic and benthic resources including invertebrates, fish, and a few sea turtles and marine mammals can be found in the ROI of the proposed Federal action, in varying proximity to the study area. While not the focus of this assessment, there are also species of important birds that depend on estuarine habitats found in the study area. Some of the fish and wildlife resources are listed as threatened or endangered species under the Endangered Species Act of 1973, as amended (16 USC §1531). Table 1 shows the federally-listed aquatic and avian species that could be found in the ROI, some for which NMFS has jurisdiction. There are also five species of whales listed as endangered, the endangered hawksbill sea turtle, the threatened giant manta ray, and the threatened oceanic white tip shark that can be found in offshore waters of South Carolina, but are not likely to be in the ROI for this study.

Table 1. Federally-listed Threatened and Endangered Species in the Region of Influence

Species Common Name	Scientific Name	Status
Atlantic sturgeon*	*Acipenser oxyrinchus*	E, CH
Shortnose sturgeon*	*Acipenser brevirostrum*	E
American wood stork**	*Mycteria americana*	T
Eastern black rail**	*Laterallus jamaicensis jamaicensis*	T
West Indian manatee	*Trichechus manatus*	E
Green sea turtle	*Chelonia mydas*	T
Kemp's ridley sea turtle	*Lepidochelys kempii*	E
Leatherback sea turtle	*Dermochelys coriacea*	E
Loggerhead sea turtle	*Caretta caretta*	T, CH

Key:

E - Endangered T - Threatened CH - Critical Habitat

* These species are under the sole jurisdiction of National Marine Fisheries Service

** These species are under the sole jurisdiction of US Fish and Wildlife Service

Sources: NOAA 2020; USFWS IPaC (n.d.)

Terrestrial wildlife in the ROI are described in more detail in the Draft FR/EA for reference. An overview of important aquatic resources that may be found in the ROI are provided here. Detailed descriptions of the NMFS-managed fisheries and their habitat dependencies can be found in Sections 4 and 5 of this document.

3.1 Marine Benthic Macroinvertebrates

Marine benthic macroinvertebrates of the ROI are found living in or on the bottom of tidal creeks, tributaries and tidal flats. Marine benthic macroinvertebrates fall into two benthic communities. Epifaunal communities live attached to surfaces such as rocks, pilings, or on the surface of the bottom. Infaunal communities burrow and live within benthic sediments. Macroinvertebrates sort within the tidal zones by habitat stressors such as benthic sediment size, soil salinity and wave energy (Sanger and Parker 2016).

Marine benthic macroinvertebrates are a primary food source for larger, economically important crustaceans and fish. Their size, abundance, and species diversity are valuable indicators of surrounding environmental conditions (Sanger and Parker 2016). Typical marine benthic macroinvertbrates that could be found in the ROI include mollusks, polycheates, oligochaetes, nematodes, and amphipods.

3.2 Invertebrates

Common aquatic invertebrates found in waterways and salt marshes in the ROI include penaeid shrimp, grass shrimp (*Palaemonetes vulgaris*), blue crabs (*Callinectes sapidus*), horseshoe crabs (*Limulus polyphemus*), knobbed whelk (*Busycon carica*), eastern oysters (*Crassostrea virginica*), ribbed mussels (*Geukensia demissa*), hard clams (*Mercenaria mercenaria*), Eastern mud snails (*Ilyanassa obsolete*) and marsh periwinkles (*Littoraria irrorata*) (Sanger and Parker, 2016). Some of these organisms rely entirely on salt marsh-tidal creek systems, while others such as penaeid shrimp and blue crabs are transient and use them as nursery grounds. Many of these species, especially penaeid shrimp and blue crabs, are economically important in South Carolina.

3.3 Fish

Common demersal fish that can be found in waters of the ROI include Atlantic croaker (*Micropogonias undulates*), bay anchovy (*Anchoa mitchilli*), mummichog (*Fundulus heteroclitus*), red drum (*Sciaenops ocellatus*), black drum (*Pogonias cromis*), silver perch (*Bairdiella chrysoura*), spot (*Leiostomus xanthurus*), spotted seatrout (*Cynoscion nebulosus*), Atlantic menhaden (*Brevoortia tyrannus*), blackcheek tonguefish (*Symphurus plagiusa*), and southern flounder (*Paralichthys lethostigma*) (Sanger and Parker, 2016). Several of these species, such as red and black drum, flounder, spot, and spotted sea trout have commercial and/or recreational value. Threats to many of these species include habitat loss, climate change, pollutants, and degraded water quality.

Two federally-protected fish species also commonly occur in the Charleston Harbor and the Cooper River. As noted in Table 1, they include the shortnose sturgeon (*Acipenser brevirostrum*) and the Atlantic sturgeon (*Acipenser oxyrhynchus*). Shortnose sturgeon spend most of their time as adults in fresh and brackish water but do venture into lower coastal reaches and the ocean on rare occasions. Atlantic sturgeon is a subtropical, anadromous species that typically migrates up rivers in the late summer to fall in this region to spawn. Both are bottom feeders. Historically, over-fishing affected sturgeon populations. Current prominent threats to these species include habitat loss or fragmentation, dredging, migration/passage barriers, decreased water quality, and entanglement in fishing gear, as well as vessel strikes for Atlantic sturgeon. Shortnose sturgeon are currently found in the Cooper River, and the Carolina Distinct Population of Atlantic sturgeon is found throughout the Charleston Harbor, with portions of the Cooper River designated at Critical Habitat for the Atlantic sturgeon (NOAA, n.d.). Telemetry studies done by the SCDNR of shortnose and Atlantic sturgeon confirm movement throughout the Charleston Harbor, and in the Cooper River with the highest usage of the Cooper River by shortnose sturgeon roughly between river km 30 and 45 where the freshwater-to-saltwater interface occurs. This is well upstream of the study area. Adult and sub-adult Atlantic sturgeon in the Cooper River are believed to be transient populations from other river systems. Both species of sturgeon have been detected in the Ashley River. The Ashley River is not used for spawning, so SCDNR believes sturgeon detections are most likely from juveniles or transient adults (personal communication, Bill Post SCDNR Diadromous Fish Coordinator). While it's possible for sturgeon to enter small, shallow tidal creeks of the Peninsula to forage, this would not be common.

Cartilaginous fishes, such as the Atlantic stingray (*Dasyatis sabina*) and the bonnethead shark (*Sphyrna tiburo*), can also be found in the ROI. Sharks tend to move into estuaries in the spring or for juvenile development, and then move offshore in the fall. They are less likely to be found in the small, shallow tidal creeks of the Peninsula.

3.4 Marine Mammals

Marine mammals known in the ROI include bottlenose dolphin (*Tursiops truncates*) and West Indian manatee (*Trichechus manatus*). Both are afforded Federal protection under the Marine Mammal Protection Act (MMPA) of 1972, as amended (16USC 1461).

There are two recognized subspecies of the West Indian manatee; the Antillean manatee (*Trichechus manatus manatus*) and the Florida manatee (*Trichechus manatus latirostris*). The Florida manatee inhabits the Southeastern coast of the United States, however both subspecies are commonly referred to as the West Indian manatee. As noted in Table 1, the West Indian manatee is a federally-listed threatened species. Manatees can inhabit both salt and fresh waters and are found at shallow depths (5-20'). In the waters of the continental US, they and are most abundant in the warm waters of peninsular Florida. During the summer months manatees on the eastern coast of Florida have been reported to travel as far north as Cape Cod, Massachusetts (USFWS 2008). Manatees that inhabit and travel through South Carolina waters during the warmer months will feed on salt marsh grasses at high tide and submerged algae beds at low tide. Manatees have been sited near the Charleston Peninsula in the Cooper River, the Ashley River, the Atlantic Intracoastal Water Way, and Shem Creek; a tidally influenced saltwater creek that drains directly into Charleston Harbor before draining into the Atlantic Ocean.

While common bottlenose dolphins can be found in nearshore coastal waters and estuaries of the Atlantic Coast from New York to Florida, a resident single-stock of bottlenose dolphins inhabits the Charleston Harbor and main channels of the Ashley, Cooper, and Wando Rivers. The Charleston Estuarine System (CES) Stock spans the estuarine waters and tributaries from Price Inlet (near Capers Island) to the Stono River. The stock is threatened by entanglement with blue crab traps/pots and other fishing gear, disease, and urban pollution, especially in the tidal rivers more so than in the open waters of the Charleston Harbor (NOAA 2016). Bottlenose dolphins, who fall into the mid-frequency generalized hearing range for cetaceans of 150 Hz to 160 kHz, are susceptible to hearing impacts from underwater noise (NOAA, 2018). The size of the CES Stock is currently unknown, but it is considered to be a "strategic stock under the MMPA" (NOAA 2016).

These marine mammals are also less likely to be found in the small, shallow tidal creeks of the Peninsula.

3.5 Sea Turtles

There are four species of sea turtles known to occur in or near waters of Charleston, all of which are federally-listed as threatened or endangered species (see Table 1): Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*) and green (*Chelonia mydas*). Leatherback sea turtles, found in offshore waters, and Kemp's ridley sea turtles, found in nearshore waters, could be but are less likely to be, in the ROI. Loggerhead and green sea turtles are the most common species in South Carolina waters, and their distribution at different life stages varies including offshore waters, bays, inlets, river mouths, salt marshes, creeks, ship channels, and sandy beaches for nesting. Subadult and adult loggerheads move into coastal waters, such as Charleston Harbor, to prey on mollusks, crustaceans, and fish (USFWS 2015). Loggerhead sea turtle eating preferences tend to be horseshoe crab, then blue crab, then finfish. Ultimately, reduction of salt marsh acreage could lead to alteration of the loggerhead sea turtle food web (Boutin & Targett, 2013; Seney & Musick, 2007).

A trawling study conducted within the Charleston Harbor shipping channel between 2004-2007 showed that loggerhead sea turtles are present in the channel in increased numbers, and are of increased size,

compared to the early 1990s (Arendt et al, 2012). Although loggerheads and greens could be found in the Cooper and Ashley Rivers, they are less likely to be in the small, shallow tidal creeks of the Peninsula.

Threats to sea turtles include vessel strikes, dredging, fishing by-catch and entanglement, degradation of foraging habitat, pollution, and disease. They are also threatened by various natural and anthropogenic impacts to their nesting habitat, such as beach erosion, beach armoring, artificial lighting, and nest predation. In the Charleston area, Critical Habitat for nesting loggerhead sea turtles has been federally-designated for Folly Beach and Morris Island, but these are well outside of the ROI.

4.0 ESSENTIAL FISH HABITATS IN THE ROI

The Magnuson-Stevens Act defines EFH as "those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity." The Act applies to species under the management of regional fishery management councils, such as the South Atlantic Fishery Management Council (SAFMC) primarily for this region. They must develop fishery management plans that identify and describe EFH for the fishery, minimize adverse effects from fishing on the fishery, and sustainably manage the resource.

EFH in the ROI includes all of the Estuarine Emergent Vegetation, Tidal Creeks, Oyster Reefs, Estuarine Water Column, and Intertidal Flats, as well as Subtidal Flats (unconsolidated bottom) to some degree but this extends out into the Charleston Harbor beyond the ROI. Many of these habitats foster growth and provide food and protection from predators and are integral to producing healthy populations of commercially and recreationally important species.

4.1 Estuarine Emergent Vegetation

Wetland distribution is influenced, among other factors, by water elevation and salinity concentration, which fluctuates in response to daily tides, rainfall and freshwater drainage, and winds. Wetland information for the Charleston Peninsula Coastal Flood Risk Management Study was derived from literature and the U.S. Fish and Wildlife Services' (USFWS) National Wetlands Inventory, which is based on the classification system of Cowardin et al. (1979) dated 2011 for the Charleston area. More recent high-resolution land cover mapping from NOAA's Coastal Change Analysis Program and Google Earth imagery were also used to verify wetland distribution. An official delineation of potentially affected wetlands will be completed in the PED phase of the project (if the project is authorized for funding), in accordance with the Corps of Engineers 1987 Wetland Delineation Manual and Regional Supplements, which USACE uses pursuant to Section 404 of the Clean Water Act.

Most of the wetlands in the study area are polyhaline, meaning they have a salinity range between 18 and 30 ppt, and include estuarine emergent marshes, or salt marshes, characterized by Estuarine Emergent Vegetation of smooth cordgrass (*Spartina alternaflora*) and black rush (*Juncus roemerianus*). High marsh is limited in the study area, but typically includes sea oxeye (*Borrichia frutescens*), salt grass (*Distinchlis spicata*) and salt meadow hay (*Spartina patens*), along with scrub shrub wetlands that support wax myrtle (*Myrica cerifera*), salt marsh elder (*Iva frutescens*) and groundsel tree (*Baccharis halimifolia*) (Sanger and Parker, 2016). Salt marshes in the study area are characterized by sediments with fine particle-size (mud) and high organic matter. Figure 4 shows the distribution of salt marsh, or estuarine emergent wetlands, within the study area, with most of the wetlands found around the perimeter of the Peninsula.

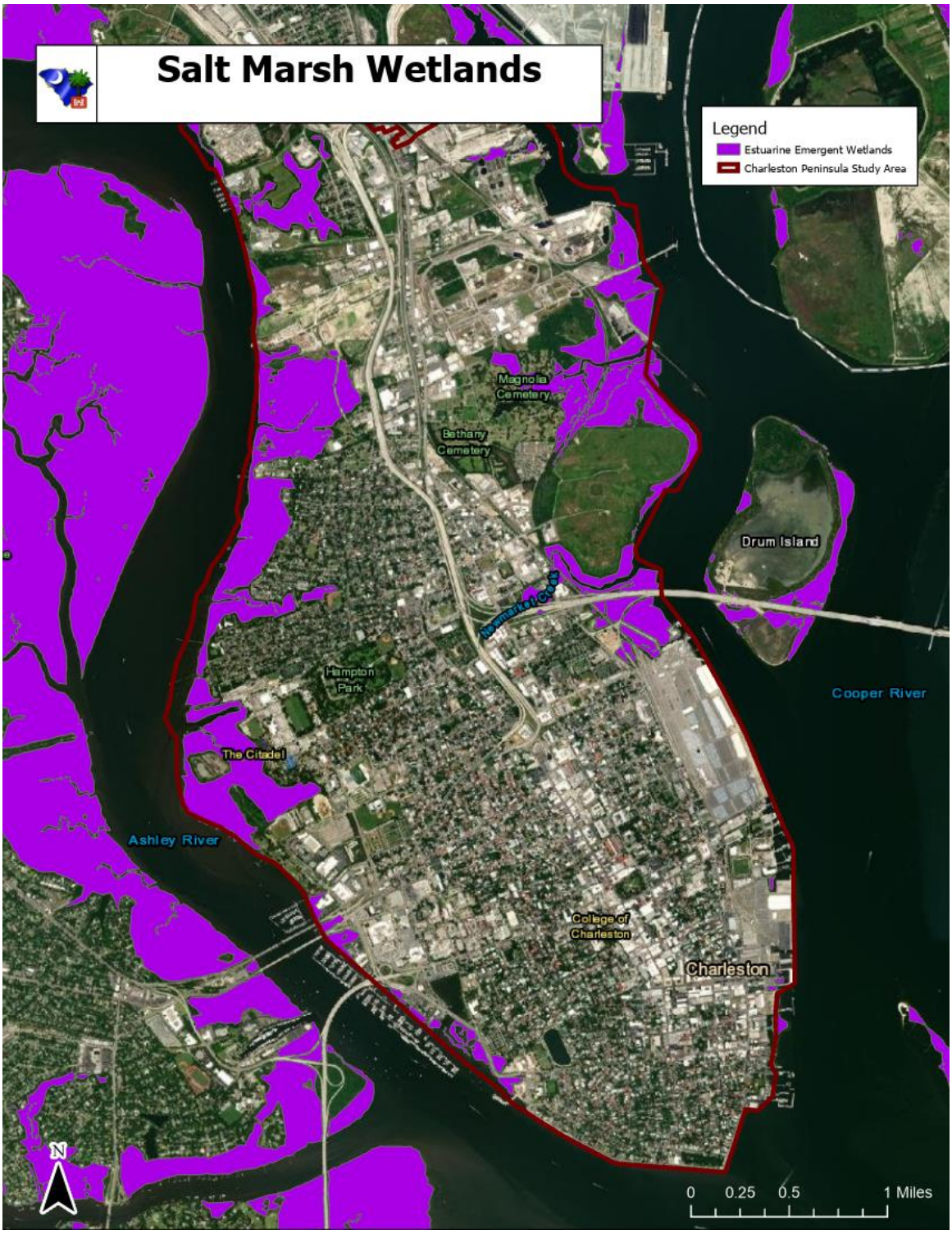


Figure 4. Existing estuarine emergent wetlands in the Charleston area, as mapped by the NOAA Coastal Change Analysis Program in 2016.

Salt marshes are one of the most biologically productive ecosystems in the world, supporting primary and secondary production. Salt marshes support small prey fishes that link estuarine production with

transient predatory fish populations. Edge or fringing marsh are used as feeding areas for blue crabs, red drum, flounder, sea trout and other large fish. Salt marshes drain waters through tidal creeks or rivers. The marsh adjacent to tidal creeks serve as nursery areas for larval and juvenile finfish, crustaceans, and mollusks, and as important habitat for many adult fish species (see more below under Tidal Creeks). The "vast majority" of commercially harvested finfish and shellfish species are considered dependent on estuarine wetlands, with some species being more dependent on Estuarine Emergent Vegetation for refuge and/or foraging areas than other. Of all of the species managed for EFH in the ROI, penaeid shrimp are the most dependent on salt marshes and their Estuarine Emergent Vegetation.

Considerable portions of the Charleston Peninsula's salt marsh wetlands have been filled over time (changes in land use in the study area are described in more detail in the Draft FR/EIS). Approximately 555 acres of estuarine emergent marsh (salt marsh) remain in the study area. Sea level rise also threatens existing salt marshes, and the fish (and wildlife) species that depend on them. Rising sea levels contribute to a reduction in the area of intertidal marsh (including Estuarine Emergent Vegetation) available, especially if coastal development impedes inland expansion in response to inundation (SCDNR, 2021). Due to the urbanized nature of the Charleston Peninsula, there are already limited places where perimeter salt marsh can migrate inland. If current trends in land use and climate change continue into the future, managed species in coastal South Carolina will continue to be affected, irrespective of the proposed Federal action.

4.2 Tidal Creeks

Variable in size and water depth, coastal Tidal Creeks are nursery grounds for larvae and juvenile fish species. As an interface between estuarine habitats and the freshwater confluence of upstream flow, tidal creeks are characterized by their oyster reefs, mud flats, and intertidal rivulets. At high tide when predators can access these creeks, juvenile fishes take advantage of the protection afforded by the marsh. As the tide ebbs and predators are forced to leave the shallow creeks, juveniles move off the marsh surface and concentrate in the creeks where their abundances can be high.

The South Carolina Department of Natural Resources (SCDNR) monitors biological communities throughout the state's coastal habitats. In general, densities of fish, crabs, and shrimps are higher in creek habitats compared to open water habitats, likely due to the importance of shallower creek habitats as refuge and nursery grounds for many of these species. State data supports that recreationally and commercially important species of spot, white shrimp, brown shrimp, and Atlantic blue crabs are generally more abundant in creek habitats than open water habitats state-wide (Sanger et al, 2020).

Tidal creeks of the Charleston Peninsula that have not been filled or partially filled, have all been altered to varying degrees. Figure 5 shows the remaining tidal creeks in the study area. Two historic tidal creeks (Major Daniel's Creek and Vanderhorst's Creek) have been completely lost to development. Belvidere Creek and New Market Creek are each restricted by multiple road crossings with culverts, as well as a railroad embankment. Tidal flow is also restricted in Vardells Creek and Gadsen Creek by multiple culverts, and in Halsey Creek by one culvert. At Koppers Creek, tidal restrictions include embankments and one road culvert. The Citadel Channel is dredged for boat access while a berm and dredge spoil area have been constructed within the marsh next to the Citadel Channel. A stormwater culvert and drainage channel currently connects the interior marsh and the Ashley River. Alberta Long Lake is a tidally influenced lake on artificial fill with a primary connection to the Ashley River through a culvert under

Lockwood Blvd. Cummings Creek is also restricted by a culvert under Lockwood Blvd. The emerged creek then flows through an underground pipe network to Colonial Lake, where a water control device keeps the lake from draining. Colonial Lake is approximately 7 acres and is classified as a freshwater pond, not tidal habitat.

Figure 5. Current tidal creeks of the Charleston Peninsula.

4.3 Oyster Reefs

Oyster reefs form in the intertidal zone in South Carolina when spat from Eastern oysters (*Crassostrea virginica*) attach to hard surfaces, preferably other oyster shells. The juvenile oysters continue to grow and build on each other, forming a reef structure. Oyster reefs create living habitat, improve water quality by filtering out particles, and stabilize shorelines from erosion (Sanger and Parker 2016). Oyster reefs are distributed throughout the ROI, but all are closed to shellfish harvesting per state regulations.

Oyster Reefs as EFH provide habitat value to managed species through their hard substrate (for settlement/refuge/prey), complex vertical structure (for settlement/refuge/prey), and food (feeding sites for larger predators). There are a few species of fish that fully reside on Oyster Reefs, and these resident fish are prey for transient species (species that use shellfish reefs for food and refuge but also use other habitats) and for facultative predator species (species that use shellfish reefs for food, but other habitats for refuge). A variety of fish, shrimp, and crab species forage on worms, algae, crustaceans, mollusks, and other invertebrates found on and in Oyster Reefs, including blue crabs, black sea bass and southern flounder. Some of the managed fish species that use Oyster Reefs as nursery habitat for juvenile development include penaeid shrimp, stone and blue crabs, snappers, gag, and sheepshead (SAFMC 2009).

4.4 Estuarine Water Column

Water column habitat is defined as “the water covering a submerged surface and its physical, chemical, and biological characteristics.” The water column has horizontal salinity gradients that influence the distribution of organisms and of vegetation, and gradients of nutrients. The water column also has vertical gradients stratified by salinity, oxygen concentrations, nutrients, contaminants, and pathogens that may affect distribution of organisms. Fisheries resources are most affected by the water column properties of temperature, salinity, dissolved oxygen, total suspended solids, nutrients (nitrogen, phosphorous), and cholorophyll a, while depth, pH, velocity, and clarity can also affect their distribution. Waters of the ROI are primarily polyhaline (18 to 30 ppt salinity).

The Estuarine Water Column EFH is used as habitat by many species of fish and shellfish during their life cycle, especially for “meroplankton” who use it as a corridor to transport them to nursery areas, such as penaeid shrimp and blue crabs. Some species use the Estuarine Water Column for spawning. Examples of important estuarine spawners include oysters and spotted seatrout. Juvenile development also occurs in the Estuarine Water Column for some species. Survival of juveniles is dependent on estuarine nursery areas providing the biological, physical, and chemical characteristics needed for growth. Pelagic fisheries forage on suspended organic matter in the water. Finally, the Estuarine Water Column can provide a basic refuge function for adult finfish and invertebrates.

4.5 Intertidal Flats and Subtidal Flats (Unconsolidated Bottom)

Tidal flats are the foundation for coastal wetlands because they accumulate sediments in estuaries or other low energy marine environments. While generally unvegetated, they are afforded the same legal protections as vegetated wetland areas. Tidal flats are important to the chemistry of estuaries since they recycle organic matter and nutrients from both terrestrial and marine sources. They are also areas of high primary productivity and can support an abundance of microorganisms, benthic organisms, finfish, shellfish, and wading birds.

Tidal flats can be differentiated by tidal elevation zones: supratidal, intertidal, and subtidal. Supratidal flats are found in the tidal zone above high tide. Subtidal flats are found in the subtidal elevation zone.

This is the tidal zone that is below low tide and is rarely exposed to the atmosphere. The subtidal flats are generally made up of larger grained sediments such as sand, and are found lower in the tidal zone. The submerged ocean floor of Charleston Harbor is made up of unconsolidated sediments and is considered deep water habitat, which part of the ROI, but extends well beyond the ROI. It is not a focus of this study.

Intertidal Flats are found in the intertidal elevation zone and are the most prevalent EFH flat in the study area. This is the tidal zone between high and low tides. The Intertidal Flats are non-vegetated, soft sediment habitats composed of fine-grained sediments (e.g. mud), although sometimes may be sandy. They play an important role in primary production, secondary production, and water quality in estuaries through the benthic communities that occupy the sediments. Intertidal Flats provide nursery habitat for early development of many estuarine dependent species, refuge and feeding habitat for a variety of forage and juvenile species, and significant trophic support to fish and shellfish. Some commercially important fisheries that utilize Intertidal Flats as nursery grounds are flounder, spotted seatrout, gray snapper, blue crab, and penaeid shrimp. Juvenile spot and croaker, and black sea bass and gag grouper are examples of species that seek Intertidal Flats for refuge. Since Intertidal Flats may be above water much of the time, they are rich feeding ground for species adapted to shallow waters (SAFMC 2009).

5.0 HABITAT AREAS OF PARTICULAR CONCERN

Within the areas designated as Essential Fish Habitat, there are concentrated habitats that provide important ecological functions called Habitat Areas of Particular Concern (HAPC). A specific habitat may be designated based on one or more of the following criteria: importance of the ecological function provided by the habitat; extent to which the habitat is sensitive to human-induced environmental degradation; whether, and to what extent, development activities are, or will be, stressing the habitat type; and rarity of the habitat type.

The HAPC designation does not necessarily confer additional protection or restrictions upon an area, but helps prioritize and focus conservation efforts. Although these habitats are particularly important for healthy fish populations, other EFH areas that provide suitable habitat functions are also necessary to support and maintain sustainable fisheries and a healthy ecosystem. A HAPC can be geographically grouped by managed species to better describe needs/uses of these sensitive habitats. HAPC for penaeid shrimp can be found in the ROI, while HAPC for snapper grouper is not in the ROI, but is located offshore of South Carolina as described here:

- **Penaeid Shrimp**: includes all Coastal Inlets, all state-designated nursery habitats of particular importance to shrimp, and state-identified overwintering areas. However, recent clarification from the SAFMC and NMFS explains that no state-identified overwintering grounds have been identified for penaeid shrimp. Additionally, there are no state designated areas that function as nursery habitat in the ROI. The definition of Coastal Inlets was also clarified as “the throat of the inlet as well as shoal complexes associated with the inlets. Shoals formed by waters moving landward through the inlet are referred to as flood tidal shoals, and shoals formed by waters moving waterward through the inlet are referred to as ebb tidal shoals” (SAFMC and NOAA 2020). Figure 6 shows the extent of penaeid shrimp HAPC in the Charleston area.

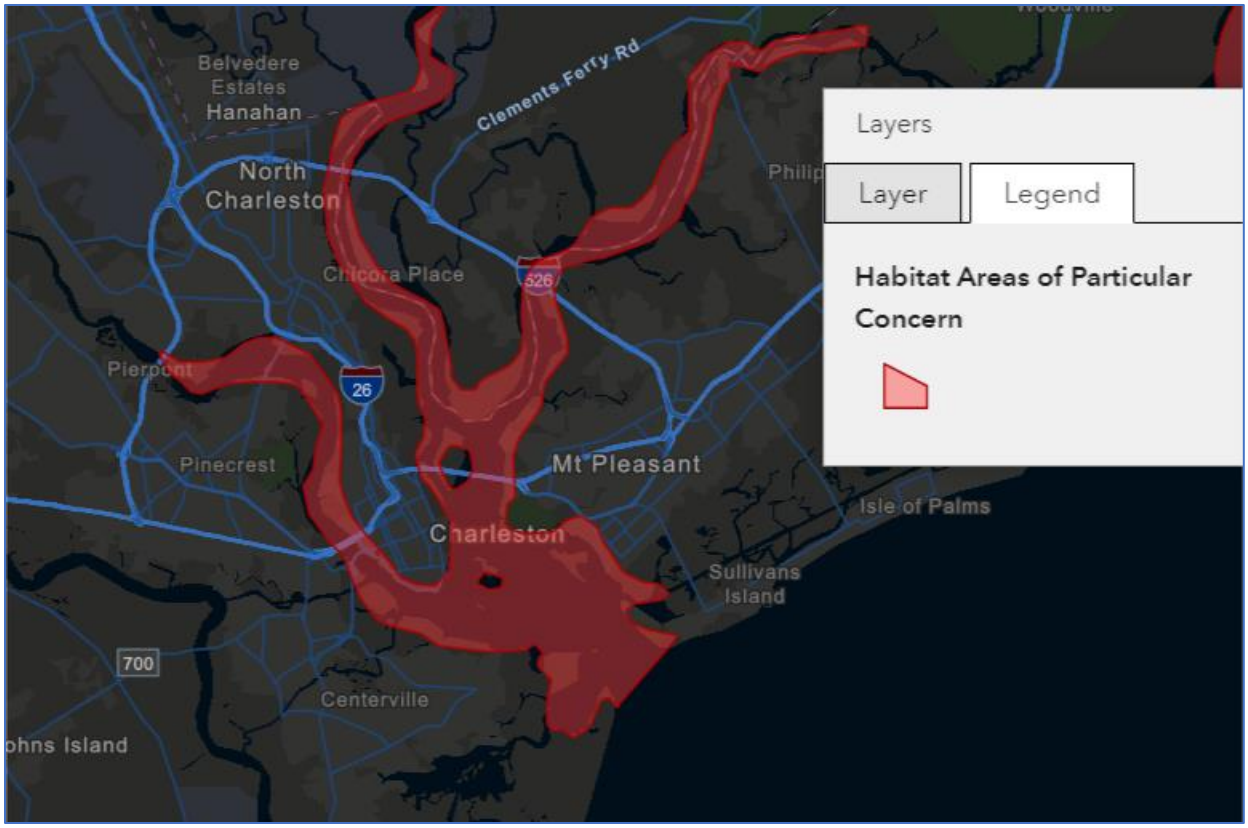


Figure 6. Spatial extent of the Habitat Areas of Particular Concern for penaeid shrimp near Charleston, SC. (Source: NOAA Essential Fish Habitat Mapper, accessed August 2021)

- **Snapper Grouper Complex:** includes medium to high profile offshore hard bottoms where spawning normally occurs; localities of known or likely periodic spawning aggregations; nearshore hardbottom areas; …..The Charleston Bump (South Carolina); …..oyster/shell habitat; all coastal inlets; all state-designated nursery habitats of particular importance to snapper grouper; ….and Council-designated Artificial Reef Special Management Zones (SMZs). For Black Sea Bass, estuarine ebb and flows are critical to provide transport, refuge, and feeding/development areas for all life stages. Recent clarification from the SAFMC and NOAA provided the same definition for Coastal Inlets as for penaeid shrimp and confirmed that there are no state designated areas that function as nursery habitat in the ROI (SAFMC and NOAA 2020).

6.0 MANAGED SPECIES

6.1 Penaeid Shrimps

The South Atlantic Fisheries Management Council (SAFMC) manages penaeid shrimp in the southeastern United States, where the shrimp industry is dominated by white shrimp (*Litopenaeus setiferus*), brown shrimp (*Farfantepenaeus aztecus*), pink shrimp (*Farfantepenaeus duorarum*), and the deeper water rock shrimp (*Sicyonia brevirostri*). The royal red shrimp (*Pleoticus robustus*) also occurs in deeper water and sustains a limited harvest. As described above, Coastal Inlets have been classified as HAPC. Within the ROI, this extends into the Estuarine Water Column of the Charleston Harbor, Lower Cooper River, and

Lower Ashley River. Inshore nursery areas are designated EFH for penaeid shrimp, which includes all of the Estuarine Emergent Vegetation and all of the Intertidal Flats (in other words, salt marsh wetlands) in the ROI. EFH for rock shrimp and royal red shrimp occurs in deeper offshore water and is not in the ROI.

***Representative species profile: White shrimp*.** White shrimp are especially important in South Carolina. The species is subject to both recreational and commercial fisheries. The local agency responsible for management of white shrimp stocks within South Carolina waters is the SCDNR. Below are several important life-history, environmental, and resulting management considerations for the species (relevant text excerpted and transcribed from Whitaker 2012):

> "The spawning season for white shrimp during spring is obvious by the large catches of mature shrimp by the commercial fleet. The exact timing of the spawning period seems to be set by water temperature during spring, but white shrimp typically spawn during May and early June with a few individuals spawning as late as July and early August… Post larval shrimp seem to settle out in the shallow waters in the upper ends of saltmarsh tidal creeks. Shrimp will remain in this 'nursery habitat' about two or three months until they are about four inches in length. During high tide, juveniles move into the marsh grass to feed and escape predators. At low tide, when the water level is below the saltmarsh grass, shrimp concentrate in creek beds. The smallest shrimp remain near the creek bank while larger juveniles tend to be in deeper creek waters… Both brown and white shrimp seem to prefer muddy bottom...
>
> "As shrimp become larger, they leave the brackish waters and move gradually toward the higher salinity waters of the ocean… Shrimp usually begin moving into coastal rivers when they reach about 4 inches in length. Further growth occurs in the rivers until the shrimp are ready to move into the lower reaches of sounds, bays and river mouths. These lower reaches, termed 'staging areas' by some biologists, serve to accumulate shrimp just prior to dispersal into the ocean. When white shrimp are in the staging areas, many will move into the shallow peripheral areas to feed at night… In years when shrimp are very abundant, they may migrate into the ocean at a size of about 4 to 5 inches in length. When not abundant, however, average size of shrimp may be 6 inches or more before they leave the estuaries. The difference in size between the years of high stock abundance and low abundance seems to be related to…density-dependent growth… Heavy rainfall, resulting in very low salinities, can force juvenile shrimp from nursery areas. When forced into the inhospitable open-water areas, growth and survival rates are poorer because of less available food and suitable habitat.
>
> "Extreme environmental conditions such as droughts or unusually warm fall weather may result in delaying emigration of white shrimp into the ocean. Tagged white shrimp released into coastal waters of South Carolina in September have been observed to remain in the estuaries for two months or more before moving seaward. Heavy rainfall or river discharge along with the accompanying drops in water salinity…have been known to cause shrimp to move into the ocean prematurely… In a wet year, the majority of the white shrimp may move into the ocean in August, about a month ahead of normal. The result would be a poor shrimp baiting season and poor harvest by commercial trawlers in October, normally one of the better months for shrimping. The areas typically most severely affected are Charleston Harbor and Winyah Bay, which receive relatively large amounts of upstate river discharge… Without significant rainfall and/or river discharge during fall, white shrimp appear to remain in the estuaries until water temperature falls to about 60-65˚F

and then migration seems to occur primarily during the large tides associated with new and full moons...

"White shrimp abundance fluctuates more than that of brown shrimp. The primary cause of these large fluctuations is the occasional near-total loss of spawning stocks. The white shrimp is a subtropical species and, being such, is susceptible to cold temperatures. During late fall, larger white shrimp that aren't caught by recreational or commercial fishermen migrate south as far as Cape Canaveral, Florida. This has been repeatedly documented by tagging studies. Unfortunately, most of these shrimp are caught before they have an opportunity to return north the next spring (assuming they would if allowed). Therefore, we in South Carolina are dependent upon the small white shrimp that overwinter in our estuaries to be our primary spawning stock. During winters in which water temperature falls to 46˚F or below for seven or more days, most of the overwintering brood stock are wiped out. In some years, cold-related mortalities have been noted as far south as the Georgia-Florida border. Following cold kills, the roe shrimp harvest is usually less than 50,000 pounds and often zero. Fall commercial landings also suffer, being less than 20 percent of the long-term average.

"If an adequate number of spawners is present, the next most important factor for white shrimp abundance seems to be water salinity in the nursery habitat in August and perhaps July. Low landings seem to be related to unusually dry summers resulting in higher than average salinity values. However, unusually wet summers can be detrimental also. Moderate rainfall and river discharge appear to create ideal conditions for white shrimp in most of the state's coastal marshes."

6.2 Snapper Grouper Complex

Ten families of fish containing 73 species are managed in the snapper grouper complex by the SAFMC. There is variation in specific life history patterns and habitat use among the snapper grouper species complex. Snapper grouper species utilize both benthic and pelagic habitats during their life cycle. They live in the water column and feed on zooplankton during their planktonic larval stage, while juveniles and adults are demersal and usually associate with hard structures with high relief. EFH for these species in the ROI includes all of the Estuarine Emergent Vegetation and Oyster Reefs (in other words, salt marshes). Coastal Inlets, including those that provide access to the Charleston Harbor, Lower Cooper River, and Lower Ashley River are HAPC for the snapper grouper complex. These areas are critical for spawning activity, as well as feeding and daily movements.

Balistidae: Collectively, triggerfishes (fishes of the family Balistidae) inhabit shallow inshore areas (e.g., bays, harbors, lagoons, sandy areas, grassy areas, rubble rock, coral reefs, artificial reefs, or dropoffs adjacent to offshore reefs) to offshore waters as deep as 275 m. These triggerfish are generally associated with deeper waters than found in the ROI and with Hardbottom and Sargassum EFH, which are not found in the ROI. As such, they are not a focus of this EFH Assessment.

Carangidae: EFH for carangid species (commonly referred to as "jacks") utilize offshore and possibly inshore areas of the Charleston Harbor. Spawning takes place in offshore waters associated with a major current system such as the Gulf Stream from February through September (Berry 1959). Juveniles may migrate into inshore waters (Berry 1959) while some juveniles and sub-adults triggerfish species have a high affinity for *Sargassum* and other floating objects in the Gulf Stream (Goodwin and Finucane 1985). Since these habitats are not found in the ROI, this subgroup is not a focus of this EFH Assessment.

Ephippidae: The Charleston Harbor and its tributaries are designated as EFH for the spadefish because as a juvenile, it inhabits shallow sandy beaches, estuaries, jetties, wharves, and other inshore areas, as well as deeper offshore habitats as adults. Spawning, which takes place from May to September, involves an offshore migration as far as 64.4 km (Chapman 1978; Thresher 1984). Although no data exists regarding egg and larvae development in nature, small individuals (approximately 1-2 cm TL) appear inshore in early summer (Walker 1991). These small juveniles are commonly observed drifting motionless alongside vegetation (e.g., *Sargassum*). It has been suggested that spadefish mimic floating debris and vegetation to escape predation. As spadefish mature, they move further offshore where large schools will take residence around wrecks, oil and gas platforms, reefs, and occasionally open water. Spadefish are opportunistic feeders; preying upon a variety of items including small crustaceans, worms, hydroids, sponges, sea cucumbers, salps, anemones, and jellyfish. In certain areas, the spadefish is an important game fish.

Haemulidae: Collectively, grunts inhabit shallow inshore areas, coral reefs, rock outcrops, and offshore waters as deep as 110 m. As a reef-dwelling species, grunts take refuge and forage over reefs. They also forage over sandy flats. They spawn along the outer reef. The juveniles are commonly found in seagrass beds, near mangroves and other inshore, shallow areas (Darcy 1983). These habitats are not characteristic of the ROI so this subgroup is not a focus of this EFH Assessment.

Labridae: Fishes of the Labridae family that are of particular importance are the puddingwife and hog snapper. The EFH for both species ranges from shallow reef and patch reefs, areas of hard sand and rock, and/or along areas inshore or offshore of the main reef. While these species have been documented in the Charleston Harbor, their habitats are not found in the ROI and as such are not a focus of this EFH Assessment.

Lutjanidae: The EFH of snappers ranges from shallow estuarine areas (e.g., vegetated sand bottom, mangroves, jetties, pilings, bays, channels, mud bottom) to offshore areas (e.g., hard and live bottom, coral reefs, and rocky bottom) as deep as 400 m (Allen 1985; Bortone and Williams 1986). Like most snappers, these species participate in group spawning, which indicates either an offshore migration or a tendency for larger, mature individuals to take residency in deeper, offshore waters. Data suggest that adults tend to remain in one area. Both the eggs and larvae of these snappers are pelagic (Richards et al. 1994). After an unspecified period of time in the water column, the planktivorous larvae move inshore and become demersal juveniles. The diet of these newly settled juveniles consists of benthic crustaceans and fishes. Juveniles inhabit a variety of shallow, estuarine areas including vegetated sand bottom, bays, mangroves, finger coral, and seagrass beds. As adults, most are common to deeper offshore areas such as live and hardbottoms, coral reefs, and rock rubble. However, adult mutton, gray, and lane snapper also inhabit vegetated sand bottoms with gray snapper less frequently occurring in estuaries and mangroves (Bortone and Williams 1986). The diet of adult snappers includes a variety of fishes, shrimps, crabs, gastropods, cephalopods, worms, and plankton. All species are of commercial and/or recreational importance. In particular, the mutton, gray, lane, and yellowtail snapper are targeted species.

Serranidae: This family includes sea basses and groupers. The EFH of sea bass ranges from shallow estuarine areas (e.g., seagrass beds, jetties, mangrove swamps) to offshore waters as deep as 300 m (Heemstra and Randall 1993; Jory and Iverson 1989; Mercer 1989). Like all other serranids, the six species are protogynous hermaphrodites; functioning initially as females only to undergo a sexual transformation at a later time to become functional males. In addition, these species produce offshore

planktonic eggs, moving into shallow, inshore water during their post-larval benthic stage. Juveniles inhabit estuarine, shallow areas such as seagrass beds, bays, harbors, jetties, piers, shell bottom, mangrove swamps, and inshore reefs. Juveniles feed on estuarine dependent prey such as invertebrates, primarily crustaceans, which comprise the majority of their diet at this developmental stage. As sub-adults and adults, migration occurs further offshore where refuge consists of rocky, hard, or live bottom, on artificial or coral reefs, in crevices, ledges, or caverns associated with rocky reefs. During this stage in their lives, the bulk of their diet consists of fishes supplemented with crustaceans, crabs, shrimps, and cephalopods. Except for the Goliath grouper, the sea bass species have some importance to commercial and/or recreational fisheries.

Representative species profile: black sea bass. Black sea bass (*Centropristis striata*) are temperate fish distributed from Massachusetts to Florida and into the Gulf of Mexico. From Cape Hatteras, NC to Key West, FL the stock is managed by the SAFMC in the snapper grouper complex. Here they spawn from February through May. Larvae move into coastal and estuarine waters and migrate to inshore and mid-shelf reefs as they grow and mature. Rough shell/sandy bottoms, SAVs, and man-made structures provide post-larvae and juveniles an environment suitable for development and growth. Adult black sea bass also associate with structures such as piers, jetties, wrecks, and reefs. Black sea bass are protogynous hermaphrodites, meaning they change their sex from female to male. They are opportunistic feeders, eating crabs, shrimp, worms, small fish, clams and whatever is available.

Estuarine habitats are considered EFH for post-larval, juvenile, and adult black sea bass, providing transport, refuge, and feeding/development areas, including in the ROI.

Sparidae: EFH for porgies ranges from shallow inshore waters (e.g., vegetated areas, jetties, piers, hard and rock bottoms), to deeper offshore waters with natural or artificial reefs, offshore gas and oil platforms, or live bottom habitat (Darcy 1986). Although nothing is known regarding the sexuality of the jolthead porgy, it is most likely a hermaphroditic species which is widely documented in sparids (Thresher 1984). On the other hand, the sheepshead has been determined to be a protogynous hermaphrodite through histological investigations (Render and Wilson 1992). Information regarding tropical sparids is limited, but in general, it suggests long spawning seasons. Little is known about spawning behavior, but it is presumed that both the sheepshead and the jolthead porgy produce pelagic eggs some distance off the bottom. Aggregations have not been documented. Settlement of sheepshead larvae to the bottom occurs at about 25 mm TL (Thresher 1984). Based on their dentition, both species are well suited for benthic feeding of sessile and motile invertebrates (e.g., copepods, amphipods, mysids, shrimp, bivalves, gastropods) which are bitten off from hard substrates and vegetation. Neither sparid is considered a schooling species, although they will form small groups composed of several individuals occasionally. There is no direct commercial or sport fishery associated with either sparid; however, both are fished in coastal waters. Both species are an important constituent of communities in shallow water and live bottom communities in deeper water (Darcy 1986).

6.3 Coastal Migratory Pelagics

King mackerel and cobia are two recreationally or commercially important coastal migratory pelagic species that are managed by the SAFMC. Spanish mackerel was previously managed, but successful conservation has rebuilt the stock.

EFH for these coastal migratory pelagics include inlets and high-salinity bays and estuaries. Figure 7 shows that designated EFH near Charleston is beyond the ROI of this study; however, the species could

be present in the ROI. For king mackerel, all phases of development occur on continental shelf, using nearshore, offshore, and live bottom habitats. Temperature and salinity govern their distribution. In South Carolina, spawning occurs from April to September, and larvae stay in high salinity waters through development. Juveniles are found in mid-shelf to inshore waters (SCDNR 2013a). King mackerel and cobia both tend to associate with hard structures including reefs and wrecks. While coastal migratory pelagics may be limited in estuaries, they can be considered dependent on estuaries because many of their prey species use estuaries for a portion of their lives. Cobia, for example, are opportunistic feeders, eating different crustaceans, cephalopods, benthic and pelagic fishes, and are known to follow other larger marine resources to take advantage of their prey (ASFMC 2015).

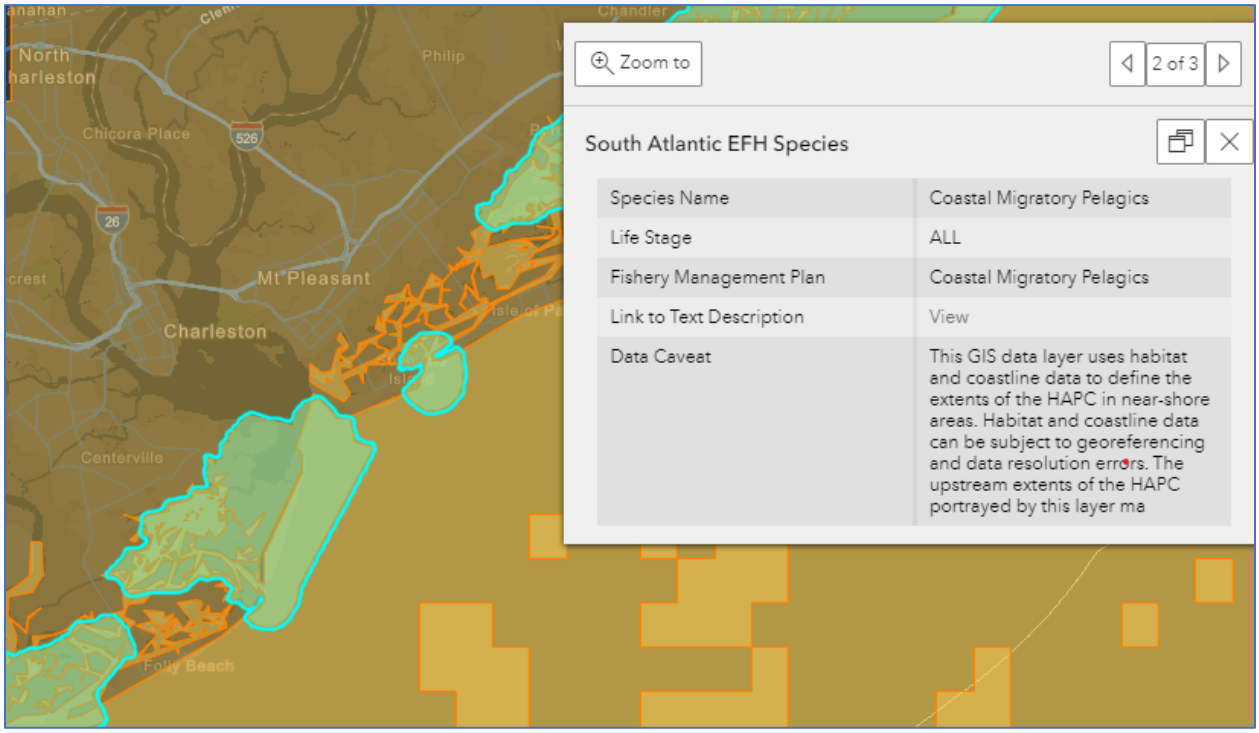


Figure 7. Designated EFH for coastal migratory pelagics (outlined in blue) near Charleston, SC. (Source: NOAA Essential Fish Habitat Mapper, Accessed August 2021)

6.4 Bluefish

Bluefish are managed by the Mid-Atlantic Fishery Management Council. Bluefish are a migratory and pelagic species inhabiting most temperate coastal regions and are found along the entire east coast of the United States. Populations along the U.S. Atlantic Coast range from Maine to Florida with many wintering or spawning near the Mid-Atlantic Bight (Shepherd et. al., 2006). Offshore spawning occurs within discrete groups at different times, which are referred to by the season of spawning: the spring-spawn cohort and the summer-spawned cohort. Recently a fall-spawned cohort has been identified, showing that bluefish spawning has become “expansive and prolonged” (ASFMC 2018). Bluefish are voracious predators and feed primarily on squid and fish (Buckel et al. 1999; Fahay et al. 1999).

Bluefish are a very popular recreational fishery. EFH for juvenile and adult bluefish includes pelagic waters over the continental shelf (from the coast out to the limits of the EEZ) from Nantucket Island, Massachusetts, south to Cape Hatteras, North Carolina. South of Cape Hatteras, EFH consists of all

pelagic waters over the continental shelf (from the coast out to the eastern wall of the Gulf Stream) through Key West, Florida. Inshore, EFH includes all major estuaries between Penobscot Bay, Maine, and St. Johns River, Florida, which includes the Charleston Harbor. Bluefish access these estuaries by migrating through Coastal Inlets. In estuaries, juveniles prefer sandy bottom habitats, but also use mud, silt, and clay bottoms and areas of salt marsh vegetation.

In general, juvenile bluefish occur in South Atlantic estuaries March through December and adults occur from May through January within the "mixing" and "seawater" zones (Shepherd 2006; Shepherd and Packer 2006). Bluefish generally prefer salinities greater than 25ppt.

6.5 Summer Flounder

Summer flounder (*Paralichthys dentatus*) are managed jointly by the Mid Atlantic Fishery Management Council and the Atlantic States Marine Fisheries Council. Their range has been shown to extend from Nova Scotia to Florida. Summer flounder generally occur in shallow coastal and estuarine waters during warmer months and occupy outer continental shelf areas in colder months. Juveniles occupy bottom waters of inshore areas and bays. Adults burrow in sandy substrates where they prey on small fish, squid, sea worms, shrimp and other crustaceans (ASFMC 2018c). Designated EFH for larvae, juveniles, and adults can be found in the ROI. Summer flounder are a popular target for local anglers.

Local representative species profile: summer flounder. Below are several important life-history, environmental, and resulting management considerations for summer flounder (excerpted and transcribed from SCDNR 2013b):

> "Adults inhabit lower to middle reaches of estuaries, coastal bays, and shallow nearshore shelf waters; typically burrow into sandy to slightly muddy bottoms; occupy a variety of estuarine habitats including tidal creeks and areas with submerged vegetation; also around inlets, jetties, beaches and nearshore reefs. Juveniles utilize bays, estuaries, tidal creeks, submerged vegetation and oyster reefs as nursery habitats. Larvae enter lower salinity waters in upper reaches of estuary whereas juveniles typically reside in moderate salinity waters.
>
> "Spawning occurs along the continental shelf during seasonal migrations to offshore overwintering grounds; exact spawning locations unknown. In the South Atlantic Bight, spawning occurs November – February. Fish return to inshore habitats by way of coastal inlets during spring. Young larvae develop offshore as plankton; older larvae utilize tidal currents and vertical migrations in water column to enter estuaries through inlets during winter and spring. Postlarvae complete metamorphosis to bottom-dwelling fish after settlement in the estuary.
>
> "Less abundant in South Carolina waters than *P. lethostigma* (southern flounder)... In South Carolina, may overwinter in estuaries or deeper nearshore waters… Tolerate a wide salinity range; however, typical habitat is higher salinity than that of the southern flounder and growth is apparently optimal at intermediate (≥ 10 ppt) salinities. Adults generally prefer salinities ≥ 28 ppt. Conservation concerns: lack of knowledge regarding summer flounder biology and movements in South Carolina waters; degradation or loss of estuarine nursery habitat."

Summer flounder are recreationally and commercially important in South Carolina as described here (excerpted and transcribed from SCDNR 2013c):

"Recreational catch in South Carolina for summer flounder is highly cyclical due to South Carolina being at the southern end of their distribution range. Peak years occurred in 1984, 1991, and 2004-2006, with catch levels in most of the other years well below the most recent 10 year average (47,141 fish per year). Catches after 2006 dropped off and have stayed well below the 10 year average.

"Commercial flounder landings are not tracked by species, but combined as a group to include all species of the genus *Paralichthys*. Total commercial landings for flounder in South Carolina have been steadily declining since the 1980's…. 10 year average (2001-2011) of 3,148 live pounds is significantly less than landings in the 1980's (52,972 live pounds) and the 1990's (12,108 live pounds). The primary gear targeting flounder in South Carolina in recent years include both trawls and gigs."

6.6 Sharks

Coastal sharks are managed as part of the Atlantic Highly Migratory Species Management Plan. They are fished commercially and recreationally, and play an important role in ocean ecosystems. Coastal sharks range from Maine to the US Caribbean and into the Gulf of Mexico, and move between offshore deepwater habitats and inshore estuarine habitats. Some species are temperate, and some use estuaries as nursery areas, where pups find refuge and feed on crustaceans and small fish. Sharks also associate with structures, such as reefs, wrecks, and hardbottom (ASFMC 2018b). EFH includes Coastal Inlets and the Estuarine Water Column in the ROI for the following species at these life stages:

- Blacktip shark (neonate)
- Spinner shark (neonate)
- Tiger shark (juvenile, adult)
- Blacktip shark, Altantic stock (all)
- Bonnethead shark, Atlantic stock (juvenile, adult)
- Finetooth shark (all)
- Sand tiger shark (adult)
- Lemon shark (juvenile, adult)
- Sandbar shark (juvenile)

For the bonnethead shark, EFH is limited to the Charleston Harbor and does not extend up the tidal rivers. EFH for the Finetooth shark is only designated for the Charleston Harbor and the Lower Cooper River, and EFH for sand tiger sharks, lemon sharks, and sandbar sharks is only designated for the Charleston Harbor and the Lower Ashley River (NOAA EFH Mapper, accessed August 2021).

7.0 POTENTIAL EFFECTS TO ESSENTIAL FISH HABITAT

This assessment considers potential direct, indirect, permanent, and temporary effects of the measures, construction of the measures, and maintenance of the measures of the proposed Federal action on EFH. Effects on EFH may occur either from modification or degradation of habitat used by managed fish species, or from limited, restricted, or lost use of EFH by managed fishery species. Adverse effect is defined in the MSA (50 CFR 600.810(a)) as:

"Adverse effect means any impact that reduces quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss

of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions."

The below assessment pertains to the EFH types and HAPCs identified in Sections 4 and 5 as being present in the ROI. The Federal action is assumed to have no effect on other EFH types for managed fish species because they do not occur in the ROI. **This section also assesses the effects without consideration of minimization and mitigation measures, which can have a considerable contribution to reducing effects.** The proposed measures for minimizing and mitigating potential adverse effects on EFH for this study are discussed in Section 8.

7.1 Estuarine Emergent Vegetation

Estuarine Emergent Vegetation is expected to be permanently and directly adversely affected by the proposed Federal action in some locations. Effects in these locations can be characterized by complete loss of EFH, and by fully restricted access to EFH. In one location, Estuarine Emergent Vegetation would be permanently indirectly affected by the proposed Federal action. Effects here can be characterized by degraded quality and reduced access to EFH. Finally, there would be temporary direct and indirect effects on EFH from construction and maintenance activities related to the Federal action. These are discussed below.

Approximately 1.5 non-continuous miles of the proposed storm surge wall with a ~46 ft-wide footprint would be constructed in several segments through salt marsh wetlands along the perimeter of the Charleston Peninsula. In this footprint of the storm surge wall, approximately 8.5 acres of Estuarine Emergent Vegetation would be permanently lost. This conservative estimate includes 36 ft of buffer along the wall where vegetation and marsh are assumed to be affected due to scouring, shading, etc. closest to the wall.

The wall would serve as a barrier to incoming tidal waters and sediments, and to overland flow of rainfall from draining on the interior. Without the influx of tidal waters, and receiving of only freshwater, the water quality regime would dramatically shift, potentially including salinity, dissolved oxygen, nutrients, temperature and pH (see Section 7.4). The change in water quality would lead to an indirect change in biological composition behind the wall, including to vegetation. The locations where this effect would occur from the storm surge wall include small portions of fringing marsh along the Ashley River by Wagener Terrace, in the Citadel marsh behind Joe Riley Stadium, and by the US Coast Guard Station on Tradd Street.

At these locations of fringing salt marsh where tidal flow and fish access would become fully restricted would result in permanent impoundment of the salt marsh behind the wall. Over time, the changes in water quality conditions would result in a permanent loss of EFH of approximately 23.6 acres.

In total, the estimated extent of Estuarine Emergent Vegetation that would be permanently lost as a result of the proposed Federal action is 27.7 acres. This includes the footprint of the proposed storm surge wall and the areas permanently impounded behind the wall, in the following locations (also see Figure 8):

- Along the interior shoreline of Diesel Creek (~1.2 acre)
- Along the Ashley River, roughly from north of Halsey Creek to Lowndes Point (~6.4 acres)
- Halsey Creek (~0.6 acres)
- Along the Ashley River, roughly from south of Halsey Creek to north of the Citadel boat channel (~4.6 acres)
- Citadel marsh behind Joe Riley Baseball Stadium (~11.5 acres)
- US Coast Guard marsh and coastal waters by Lockwood Blvd. and Tradd Street (3.4 acres)

In one location, Halsey Creek, there is the potential for the storm surge wall to indirectly affect Estuarine Emergent Vegetation through potential changes in water and sediment flow and water quality that could permanently degrade the quality of estuarine emergent vegetation but not deplete it, and limit access but not fully restrict access to EFH. Because this location is the site of a tidal creek system, the effects of the Federal action on EFH are described more fully in the section below on Tidal Creeks. The location of the potential direct and indirect affects at Halsey Creek are shown in Figure 8.

Temporary adverse effects on Estuarine Emergent Vegetation EFH could result from activities associated with construction of the proposed Federal action if minimization measures are not implemented. For example, the use of heavy equipment and movement by workers to construct the storm surge wall in areas of the marsh could result in some direct loss of vegetation. Construction of the storm surge wall in the marsh and on land, as well as for home raising or flood proofing for the non-structural measures, could result in indirect effects on Estuarine Emergent Vegetation through temporary changes in water quality in the marsh. This potential effect on EFH is described more fully as it relates the Estuarine Water Column later in this document. Construction activities related to the proposed reef-based living shorelines could also affect marsh vegetation as workers and small boats access shorelines for reef construction. However, the techniques generally used for this in South Carolina, which the proposed Federal action would conform to, are generally considered to have low-impact and localized effects on the environment. The reef-based living shoreline sills also have the potential to benefit Estuarine Emergent Vegetation EFH, however this is described more fully as it pertains to Oyster Reef EFH.

Maintenance activities related to the proposed Federal action are more directly associated with other EFH and are assessed elsewhere in this document.

Figure 8. Map showing areas of salt marsh (estuarine emergent marsh) potentially affected by the storm surge wall where it would be constructed in the marsh.

7.2 Tidal Creeks

The storm surge wall of the proposed Federal action has the potential to adversely affect one of the nine remaining tidal creeks on the Charleston Peninsula. Approximately 0.1 mile of storm surge wall would be constructed through a portion of Halsey Creek and its salt marsh system. To avoid fully impounding the area of creek and marsh behind the wall, five sluice gates (referred to in the Draft FR/EIS as storm gates) of 15 ft-wide each would be installed in this section of the wall to allow for daily tidal flow and fish passage, for a total opening of 75 ft in the wall. Tidal Creek EFH behind the wall in this location (which includes patches of Estuarine Emergent Vegetation, Tidal Mudflats, Oyster Reefs and Estuarine Water Column) have the potential to be indirectly affected. While not fully restricted, tidal flow and sheet flow and sediment distribution would be altered because of the wall and gates. In a study of water control structures in estuaries in California, a partial, or muted, tidal flow structure showed that temperature, salinity, and dissolved oxygen levels varied relative to sites with full tidal exchange. Dissolved oxygen changes were of particular concern, with cycling between supersaturated oxygen and hypoxic conditions (Ritter et al., 2008). Since dissolved oxygen levels are already impaired in the Ashley River (Sanger et al, 2020), which could be assumed to extend into small tributaries of the Ashley River like Halsey Creek, the proposed storm surge wall and gates could compound impairment of dissolved oxygen behind the wall. With the potential changes in water quality behind the wall at Halsey Creek, Tidal Creek, Estuarine Water Column, and Estuarine Emergent Vegetation EFH would likely be degraded. This in turn has the potential to indirectly affect managed fish species that could commonly use Halsey Creek, such as white shrimp (*Litopenaeus setiferus*).

USACE used a published habitat suitability index (HSI) model for white shrimp (Turner and Brody, 1983) to determine how much habitat (i.e., EFH) function would be lost due to the potential degradation that could result from the proposed Federal action, in acres. One time use of the HSI model for this study was approved by USACE's Ecological Planning Center of Expertise, which was needed to apply it to South Carolina estuaries since the model was originally developed for the Gulf of Mexico region. NMFS also agreed with the appropriateness and use of the White Shrimp HSI (Turner and Brody, 1983) for determining functional losses of habitat for this feasibility study.

The output of the White Shrimp HSI model is an index between 0.0 and 1.0, which reflects total shrimp production or carry capacity for an area. Turner and Brody (1983) suggest that "generalized statements about habitat requirements cannot be applied equally to all populations," and "each variable in the model should be evaluated and modified as necessary for best results in a local situation." There are four habitat variables: V1 - percentage of marsh cover; V2 - substrate composition (soft, muddy, course); V3 - salinity (summertime mean); and V4 - Temperature (summertime mean). The first two variables relate to postlarvae and juvenile white shrimp life requisites for food and cover, and the last two relate to water quality life requisites. The suitability index values are derived from graphical relationships with values for each habitat variable, and then are combined for the food/cover requisite component and for the water quality requisite component, respectively. The HSI is equivalent to the lowest value of either of the two life requisite values. The HSI also gives special consideration to physical structures, such as levees or roads, when evaluating habitat suitability for shrimp, which would apply to the proposed storm surge wall in this study. If a physical structure would close off the hydrologic connection between estuarine shrimp habitat and the offshore habitat, a modifier is applied to the HSI calculation. The modifier states that if the hydrologic connection is ≤10% of the length of the confining boundary when

considering the unconfined outline of the natural hydrologic unit, the site is assumed to be unsuitable for white shrimp habitat requirements, and the HSI score defaults to zero.

For assessing the loss of habitat function to the Tidal Creek EFH behind the proposed storm surge wall and gates at Halsey Creek, the creek area was evaluated with respect to its suitability to provide habitat for white shrimp, both with the storm surge wall present, and without the wall (which represents the current habitat conditions). The HSI value, or score, for the Halsey Creek area based on current conditions, without the proposed wall, was computed to be 0.63. Recall that Halsey Creek is currently impacted by one existing tidal restriction and surrounding suburban development of the Wagener Terrace neighborhood. For calculating the HSI value for the potentially-affected Halsey Creek area by the proposed wall, the modifier was used, but because of the gates, it was assumed that only 90% of the habitat function would be lost, not 100%, so the HSI score was computed to be 0.06. The HSI score with the wall present (0.06) was subtracted from the current condition HSI score (0.63) to compute a loss of the function HSI score (0.57), then multiplied by the number of acres of the impact area (12.6). The results of the White Shrimp HSI model indicate that the equivalent of 7.1 acres of habitat function (i.e., EFH) would be lost at Halsey Creek due to the proposed Federal action.

It should be noted that the natural resource agencies requested that the calculation used for percent cover in the White Shrimp HSI calculations be verified with the use of high-resolution imagery. Once this has been performed, the HSI score and impact acreage will be updated accordingly. Resource agencies will be consulted if the change is considerably different.

7.3 Oyster Reefs

Direct and indirect adverse effects could occur to Oyster Reef EFH, therefore limiting HAPC for species of the snapper grouper complex, however this would occur in limited locations. Any oyster reefs that are in the footprint and buffer area of the proposed storm surge wall would be directly lost. Oyster reefs that are behind the proposed storm surge wall and gates at Halsey Creek (which have been observed to be present) would be indirectly affected by changes in hydrology, sediments, and water quality, and are assumed to be part of the overall EFH affected in that area. Sparse patches of live oysters are also present in the salt marsh wetland area that would be potentially affected by the storm surge wall at the Citadel marsh near the Joe Riley Baseball stadium (see Figure 9) and growing on rip rap near the US Coast Guard Station (see Figure 10). The quality of contribution of these oyster resources to EFH at these locations is unclear, never the less are considered to be part of the overall EFH affected behind the wall as discussed above for Estuarine Emergent Vegetation EFH that is being compensated for in these

Figure 9. Oysters in the Citadel marsh behind Joe Riley Baseball Stadium (Source: USACE)

locations. No oyster reefs were observed in the other marsh areas that would be affected behind the proposed storm surge wall.

Figure 10. Oysters growing on rip rap of shoreline by US Coast Guard Station (Source: USACE)

The oyster reef-based living shoreline sills that are part of the proposed Federal action have the potential to beneficially affect EFH. While the habitat benefits have not been quantified for the living shoreline sills that are being proposed for coastal storm resilience, they would provide co-benefits of creating oyster reef and salt marsh habitat for fish and invertebrates (Peterson et al. 2005). If planting of marsh grass is involved with the living shoreline design (this would be determined in PED phase) that would result in an immediate increase in Estuarine Emergent Vegetation. As the living shoreline sills reduce wave action, and sediments fill in behind the sill over time, the marsh is expected to expand. At a minimum, they would also contribute to reducing erosion and maintaining existing salt marsh habitat that is currently available to managed species.

7.4 Estuarine Water Column

Both temporary and permanent effects to the Estuarine Water Column are anticipated from the proposed Federal action. They are described here.

Construction activities related to the proposed nonstructural measures on the uplands, and of the storm surge wall both in the marsh and on land, have the potential to disturb soils and sediments or create debris that could run off with stormwater into local waterways. This is typical of most residential or marine construction. If minimization measures are not used, the disturbance could result in increased turbidity and suspended solids in shallow waters that could degrade localized water quality, including temporary changes in salinity, pH and reduced dissolved oxygen levels, depending on the volume and duration of sediment resuspension, the oxygen demand of the sediment, and other factors. Fish utilizing the water column in these areas could experience physiological stress and/or mortality if there are substantial reductions in dissolved oxygen. Salinity influences species distribution so changes in salinity could result in a temporary avoidance displacement by fish, or affect availability of prey species who are sensitive to salinity. Effects on Estuarine Water Column would be expected to be localized to the area of construction in marshes or to waterways in close proximity to upland construction, and occur only for the duration of construction in a particular area. Permanent effects on Estuarine Water Column EFH would not occur from construction activities.

Potential permanent effects on the Estuarine Water Column as a result of changes in hydrology and water quality from the proposed storm surge wall were already considered as part of the full loss to Estuarine Emergent Vegetation EFH and degraded Tidal Creek EFH discussed above.

The storm surge gates that are not part of the storm surge wall but would be installed on some culverts where EFH could be present, would temporarily affect water quality in the water column behind those culverts/gates during the occasional closure for a storm surge event. This would pertain the Estuarine Water Column of Gadsen Creek beyond the Lockwood Blvd culvert, of Cummings Creek beyond the Lockwood Blvd. culvert, and of the portions of New Market Creek beyond the second of the three tidal restrictions on this creek (please refer back to Section 2.2 for description of gates). This would also pertain to Estuarine Water Column EFH behind Halsey Creek when those storm gates are closed.

During the situation when the storm gates would be closed during a storm surge event, salinity concentrations are assumed to decrease (becoming less saline) in these four creeks with the input of rainwater and runoff that are not drained by the underground stormwater system. This is supported by a study (Moffet & Nichol, 2017) conducted in Norfolk, VA for similar planned coastal storm risk management measures (storm surge wall with gates) when gates are closed for up to five days for a storm surge event. Substantial decreases in salinity were predicted for polyhaline (higher salinity) areas, but in the next reach of the waterway, the salinity dropped but stayed in the mesohaline (5 to 18 ppt) range. The salinity changes that resulted during temporary closure of the storm gates were not considered great enough to induce mortality of benthic organisms, which are food sources for many managed fish species. The study indicates that salinity levels would fluctuate for several days once the gates reopened after the storm, but would return to pre-closure conditions. Moffet & Nichol (2017) concluded that the temporary change in salinity in that study was minor and not significant. The Moffet & Nichol (2017) study did not model for changes in dissolved oxygen; however, it is assumed for this study that there would be decreases in dissolved oxygen levels during a temporary closure of the gates at the four gated-creek locations. For this study, the significance in the changes in the Estuarine Water Column when the gates are occasionally and temporarily closed on managed fish species would depend on the duration of a gate closure for any given storm, the existing conditions and quality of the affected EFH, and for direct effects on species -- the extent to which they are present during these short-term closures.

When the gates are closed, this would also temporarily restrict access by managed fish species to EFH behind the wall through the water, to the extent that they pass through the existing tidal restrictions (e.g., culverts) at these locations under normal conditions. It is unclear whether managed (or endangered) fish species would normally inhabit the small, shallow tidal creeks of the Peninsula during a storm surge event. NMFS was unable to provide USACE with information on where such species “go” during a hurricane.

Water quality in the Estuarine Water Column at specific locations on the outside of the proposed storm surge wall could be affected by storm water effluent that is pumped by the five permanent or five temporary hydraulic pump stations that are part of the proposed Federal action, if environmental conditions were static and the pumps did not meet state water quality standards. When operating, the pumps would be a point source of stormwater discharge similar to the small- and medium-sized pumps that are already permitted and used by the City of Charleston on a regular basis on the Charleston Peninsula, but would only be operated occasionally and temporarily. The pumps would collect and discharge runoff, not “impounded” stormwater. The limited conditions under which the pumps would be operated and how they would be operated are described in Section 2.3 of this document. In the one location that USACE’s modeling of interior hydrology with and without the wall (described in Section 2.6, and extensively in the Engineering Appendix of the draft FR/EIS) where over 3 ft of elevated water was

shown to result inside of the wall is in the ~1 acre of salt marsh along the inner shoreline of Diesel Creek. At this location, no gates or pumps are planned because the elevated water level was not determined to induce flooding impacts. Therefore, no EFH on the outside of the wall would be affected at this location. Water quality effects on EFH on the inside of the wall at this location (Diesel Creek) are considered as part of the ~1.2 acre affected area of Estuarine Emergent Vegetation described in Section 7.1, and would be compensated for.

Of the maintenance activities expected for the proposed measures and features of the proposed Federal action, the potential for effects are most likely to be on Estuarine Water Column EFH. In particular, opening and closing of gates would be tested, as would the hydraulic pumps. These are anticipated to occur a few times a year for about 1-2 hours. Any hydrology or water quality effects on Estuarine Water Column EFH would be negligible considering the short and occasional durations. The proposed storm surge wall may also need to be occasionally surveyed for damage and repaired. Since access to the wall would primarily be from the top of the wall and since a buffer area of impact at the base of the wall has already been accounted for, no additional effects on Estuarine Emergent Vegetation would occur. Testing and maintaining the measures of the proposed Federal action would contribute considerably to lowering the risk of failure, which has been documented in depth by the required engineering risk assessment that was performed on the proposed Federal action. The risk assessment can be found in Appendix B of the draft FR/EIS for reference.

7.5 Intertidal Flats and Subtidal Flats (Unconsolidated Bottom)

Potential direct and indirect effects on Intertidal Mudflat EFH were not assessed individually for this assessment because their locations in the study area are not mapped nor quantified. Within the study area, Intertidal Flats are found in association within creeks and marshes. As such, the acreage of affected EFH for Tidal Creek and Estuarine Emergent Vegetation areas also accounts for Intertidal Mudflats and the services they provide to managed fish species. The areas of fringing salt marsh along the Ashley River and at Halsey Creek behind the proposed storm surge wall would result in a loss of some Intertidal Mudflat EFH for potential feeding, juvenile development, and refuge for a number of species of shallow water fish and invertebrates (as well as birds) and are part of the overall loss of EFH assessed elsewhere in this document.

In addition to the Intertidal Mudflats in association with salt marshes, the proposed storm surge wall would adversely affect a small area (~0.5 acre) of sandy Intertidal Flat EFH near the existing high Battery seawall and the Charleston Yacht Club, known locally as “Battery Beach” (see Figure 11). Due to dense infrastructure along the shoreline near this location, it would not be feasible to construct the wall on land. The storm surge wall would be built just off the shoreline here, where the shoreline is already hardened by the Battery sea wall, and a sea wall with rip rap that runs in front of the yacht club. Once the proposed storm surge wall would be built, tidal flow would no longer reach this small Intertidal Flat area, and over time the tidal flat would no longer function (ecologically) as an Intertidal Flat that fish (or birds) might utilize. Furthermore, fish access to the flat would also be permanently restricted by the proposed wall.

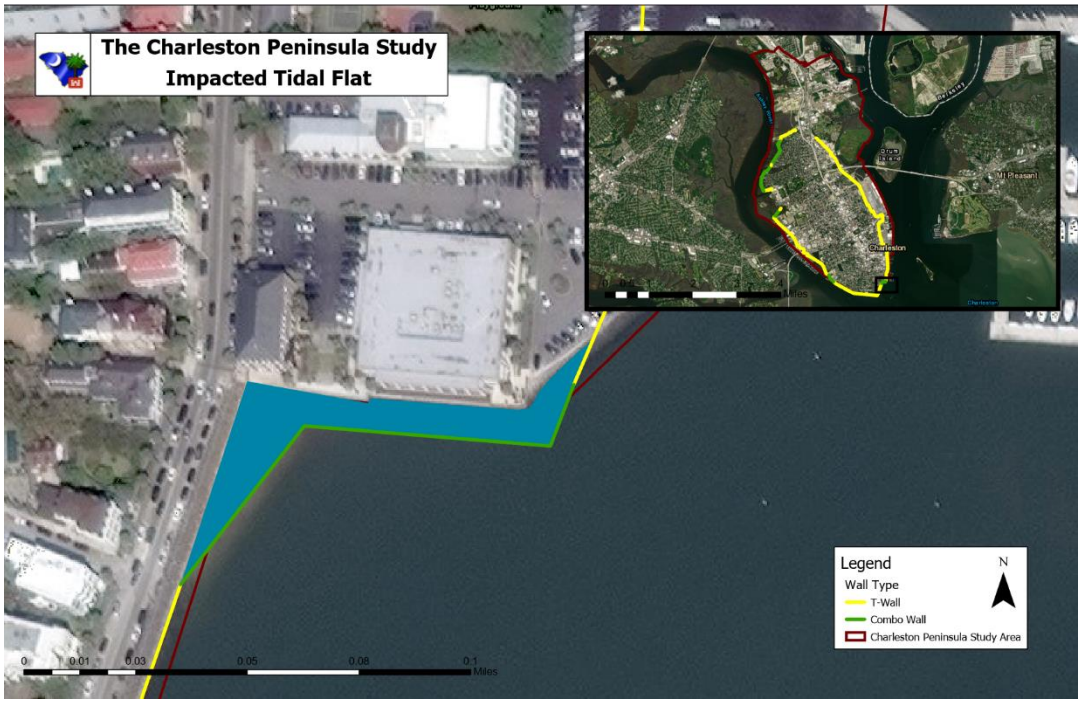


Figure 11. Location of intertidal sand flat (shaded in blue) that would be affected by the proposed storm surge wall at the northern end of the High Battery Seawall.

At this location, this is the only portion of the proposed storm surge wall that is not built on the upland where the public would be allowed to walk along the top of the wall. While the purpose of the walking path is for pedestrian transportation, not recreation, recreational uses would likely not be prohibited. USACE does not expect that limited recreational uses, such as fishing on the water-side of the wall as is commonly done from the current Battery wall promenade, would affect EFH or managed fish species. There would be no tidal flow on the interior of the wall (at the tidal flat) so fishing could not be supported.

7.6 Coastal Inlets and Beyond the ROI

The area between the Atlantic Ocean and the Charleston Harbor that is defined by the Charleston Harbor jetties is important Coastal Inlet EFH and HAPC for shrimp species, summer flounder, and species of the snapper grouper complex. Many of the species that are subject to this EFH Assessment utilize this inlet for migrating between nursery habitat, spawning habitat, and other life stages. It is unknown whether the presence of the existing Battery sea walls has any adverse effects on the Charleston Harbor Coastal Inlet, which is beyond the scope of this study. Based on the location where the new storm surge wall would be located for the proposed Federal action, most of the Charleston Harbor Coastal Inlet is beyond the ROI.

For shorelines and infrastructure outside of the study area, USACE used a series of models to understand wave action from potential reflection and refraction of waves encountering the proposed storm surge wall on the Charleston Peninsula. The ADCIRC model is a high-performance, cross-platform, finite element numerical ocean circulation model popular in simulating storm surge, tides, and coastal circulation problems. The numerical model SWAN (Simulating WAves Nearshore) was used for the computation of wave conditions in shallow water with ambient currents. The model is based on a fully

spectral representation of the action balance equation, with all physical processes modelled explicitly, and is often coupled with ADCIRC. STWAVE (STeady State Spectral WAVE) is a steady-state, finite difference, spectral model based on the wave action balance equation. STWAVE allows coastal project engineers to numerically model wave generation and transformation over complex bathymetry, interaction of waves with currents and structures, and propagation of waves in entrances and harbors. Available SWAN results (obtained from FEMA) were comprised of time series of bulk scalar parameters, including wave height, period, and direction used for storm surge simulation. This modeling and the results are described in more detail in Appendix B, Coastal Sub-Appendix of the draft FR/EIS for reference.

The results showed a nominal change in wave action on shorelines outside of the study area and across major waterways, such Mount Pleasant, Daniel Island, James Island, West Ashley and North Charleston, suggesting they are outside of the ROI for effects. Under normal conditions, wave heights vary around the Charleston Peninsula depending on location, such as sheltered vs. exposed areas. Aside from these variations, the results did not show a difference in wave height in the surrounding areas with the new storm surge wall present, when compared to without the new wall. This is consistent with the understanding that local wind waves within the surrounding rivers and Charleston Harbor nearshore area would be limited in wave height and period during a storm surge event by the limited fetches. Waves would be dissipated by marshes and shallow foreshore areas, and land in some locations, before encountering the wall which would scatter the remaining waves, causing them to dissipate within a few wavelengths. Scattering would be due to directional/frequency spread of the short-period waves, irregularities in the wall, near-wall bathymetry, adverse wind (wind from the coastal storm blowing against the reflected waves), and complex bathymetry of the far-field (river channels/nearshore).

7.0 POTENTIAL EFFECTS ON MANAGED SPECIES

Potential effects on managed fish species from the proposed Federal action include possible mortality, physiological stress, or behavior if hypoxic conditions are created or salinity is significantly reduced for a long period of time during temporary closure of the storm surge gates for a storm surge event. Estuarine species are generally adapted to short term changes in water quality conditions, but the wall and gates create a barrier so that fish and mobile invertebrates would not be able to migrate away from unsuitable conditions. There is the possibility that larval, juvenile, or small species of fish and invertebrates could become “trapped” in the instance when the storm gates in the wall are closed during a storm surge event.

If discharged storm water runoff that is not collected by the current underground storm water system, yet collected by the permanent or temporary pumps, creates an abrupt change in salinity or dissolved oxygen to the water column outside of the wall, then sensitive managed fish species (and marine mammals) could be adversely affected. The likelihood of this is unclear since storm water would be discharging into wave action and storm surge and managed fish species would have to be in close proximity.

Turbidity and suspended sediments that may result in waterways of the study area from construction activities could affect managed fish species and their behavior if minimization measures are not used. This could interfere with feeding for species such as bluefish and black sea bass. It is expected that most managed species would migrate away from sources of reduced water quality, which would be

temporary and generally localized near any particular site of construction. It is also assumed that construction of the proposed Federal action would be phased, so construction affects would not likely occur at multiple sites at the same time.

Hearing injury could be possible in managed species from underwater noise associated with construction, particularly pile driving. Sound propagation in shallow waters is complicated by multiple reflections, refractions, and by sound wave scattering, but studies that assess impacts of multi-pulse sound associated with pile installation using hydraulic impact hammers show mostly negative effects on aquatic resources. The extent of the damage depends on noise frequency, duration, and auditory characteristics of the species (Tsouvalas, 2020). The type and intensity of underwater sound associated with pile driving depends on the type and size of the pile, the firmness of the substrate and water depth, and the type and size of the pile-driving hammer and material. The pressure waves generated from wood or concrete driving are generally considered less harmful than driving steel piles. For reference, vibratory driving of a 30-inch battered steel pile during a ferry dock construction resulted in an underwater average Root Mean Square of 168 dB, and sound exposure level (SEL) of 210 dB (Washington State DOT, 2012). This occurred at a 37-foot depth. For the proposed Federal action, the locations where pile driving would take place in marshes are at relatively shallow water depths that range from a few inches to a few feet across the tidal cycle, which would limit noise exposure to managed species. Additionally, the pilings that would be used for the proposed storm surge wall would be made of concrete, not steel.

The proposed Federal action would adversely affect about 35 acres of Estuarine Emergent Vegetation, Tidal Creek, Estuarine Water Column or oyster reef habitat out of 555 acres of salt marsh wetlands in the study area possibly used by penaeid shrimp, juvenile bluefish and summer flounder, and a number of species in the snapper grouper complex, reducing the amount of habitat available to feed, find refuge, and/or grow and develop.

Effects on coastal migratory pelagics and sharks from the proposed Federal action are expected to be nominal. The areas of fringing estuarine emergent vegetation that would be permanently lost due to the storm surge wall would be about 35 ft from the shoreline where the depth is extremely shallow at high tide (approximately one foot observed) and dry for the rest of the tidal cycle that likely wouldn't support these species. While it's possible that coastal migratory pelagics or sharks could use Halsey Creek, there presence is unlikely. The area where the wall would be constructed (several hundred feet from the confluence of the creek with the Ashley River) is also shallow, ranging from about half a foot to several feet over the tidal cycle based on observation). Indirect effects could result from the loss of the 35 acres of EFH for prey species such as shrimp that would be affected by the storm surge wall as described above. Prey species could also be impaired by short term turbidity or noise impacts during construction of the proposed Federal action, if minimization measures are not used.

8.0 MINIMIZATION AND MITIGATION MEASURES

Incorporation of avoidance and minimization measures into the proposed Federal action may eliminate or lessen the likelihood that EFH and managed fish species will be adversely affected.

8.1 Avoidance Actions

USACE has already taken considerable actions to avoid adverse effects to natural resources, including EFH. During optimization of the Federal action over the past year, USACE assessed the feasibility of moving portions of the proposed storm surge wall from salt marsh wetlands to the land to avoid impacts to wetlands and aquatic resources. Since all of the salt marsh wetlands in the study area are also EFH, this would avoid impacts to any Estuarine Emergent Vegetation, Tidal Creeks, Oyster Reefs, Intertidal Flats, and the Estuarine Water Column in those locations. Due to limited construction space in the urbanized landscape of the Charleston Peninsula, this was not feasible everywhere. The following modifications were made to the earlier conceptualization of the storm surge wall:

- moved storm surge wall from marsh along Ashley River on to (alongside of) Lockwood Blvd, from US Coast Guard Station to Brittlebank Park
- reduced length of storm surge wall through the Citadel marsh by tying into high ground along most of the Citadel shoreline

The change in alignment resulted in a large reduction of roughly 71 acres of salt marsh wetlands potentially affected from the previous conceptualization of the storm surge wall in the draft FR/EA released in April 2020, as described in Section 1.0, to the current conceptualization in the draft FR/EIS – from approximately 111 acres to 40 acres. The effects on salt marsh wetlands (and associated EFH) were then further reduced to only 35 acres of lost wetland habitat function through minimization measures (described below).

With the reduced alignment of the proposed storm surge wall near the Citadel, the wall would no longer cross the Citadel boat channel. This eliminated the need for the miter gate that was originally proposed at the Citadel boat channel, avoiding the habitat disturbance that larger gates like this may have had, and also avoiding access restrictions for managed fish species at this location.

Additionally, a large water-attenuation structure, or breakwater, that was originally considered as a cost-effective way to reduce damages from coastal storm surge inundation, has been eliminated from the proposed Federal action. In the draft FR/EA released in April 2020, this measure was included in one of the final array of alternatives under consideration for placement offshore of the existing Battery seawalls in the Charleston Harbor. However, because the economics of the breakwater did not justify its continued inclusion, it was eliminated from further consideration in the proposed Federal action. While this decision was economically-driven up front, it had the positive effect of avoiding direct effects on aquatic resources and Subtidal Flat EFH in the Charleston Harbor, as well as viewshed and other effects, and is illustrative of the continued effort to refine the Federal action to optimal storm surge risk reduction while limiting the extent of structural measures.

8.2 Minimization Measures

A number of important minimization measures are planned to reduce adverse effects from the proposed Federal action. Those that relate to EFH are listed here; a full list can be found in the Draft FR/EIS for reference.

Storm Surge Wall Alignment. Where placement of the proposed storm surge wall in salt marsh wetlands could not be avoided, the extent of salt marsh (and EFH) lost behind the 1.5 miles of wall would be minimized by planning the alignment as close as feasible to the upland. A distance of at least 35 feet from the shoreline would be needed to implement the wall, so the conceptual alignment of the

wall is located about this distance from the shoreline in most locations where it would be located in the marsh. This is planned specifically in response to concerns from natural resource agencies to minimize the extent of salt marsh wetland impacts.

Storm Surge (Sluice) Gates. To minimize the potential for adverse effects ate Halsey Creek, the only Tidal Creek EFH that the proposed storm surge wall would directly impact, a series of storm surge gates would be installed in the short stretch of wall across Halsey Creek to allow for daily tidal flow. With this measure, the wall would create only a partial tidal restriction, not fully restrict tidal flow into the creek that would have otherwise resulted in impoundment and total loss of the Tidal Creek, Estuarine Emergent Vegetation, Intertidal Flat, Oyster Reef, and Estuarine Water Column EFH behind the wall. Sluice gates have been proposed because they have a smaller footprint with simpler operation than other water control structures/gates and are considered to create less disturbance to natural resources. As described in Section 7.2, the gates at Halsey Creek would be numbered and sized based on results of the White Shrimp HSI (Turner and Brody 1973) to allow for the 75 feet of opening in the wall that is needed to continue to support basic life requisites, or EFH functions, for this species. White shrimp were acknowledge by NMFS as being the most representative managed species to utilize and potentially be affected in this area.

Gate Protocols. As described above, adverse effects could result for any managed species, particularly penaeid shrimp, and for the Estuarine Water Column on the occasions that the storm surge (sluice) gates would be closed during a storm surge event. To minimize the effects on managed fish species and water quality from the storm surge gates during a surge event, the time that the gates would be closed would be reduced to the greatest degree that is feasible and practicable to safely operate them before and after a storm surge event. Currently, storm surge forecasts for a tropical storm event are not issued by the National Hurricane Center until 48 hours prior to the onset of storm impacts, so storm gates would not be closed any earlier than that time. The storm surge gates would also be closed upon low tide to reduce the abundance of managed fish species and mobile prey species behind the wall when the gates would be closed. The depth at low tide in Halsey Creek, for example, where the wall would be placed is roughly six inches so many aquatic resources would naturally move out with the tide to deeper waters. Real-time local water level and other meteorological information from the National Weather Service's Charleston Weather Forecast Office would also be used to inform decisions about gate closing and opening. Gate closure/opening protocols would be finalized during the PED phase and include such conservation measures. The protocols would be legally-binding in the operation and maintenance manual between USACE and the City of Charleston. An Operations, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R) Manual will be written specifically for the local non-Federal Sponsor, City of Charleston, who will have the primary responsibility for operating and maintaining the proposed Federal action after it would be constructed. The intent of the document is to provide the local non-Federal Sponsor with comprehensive information on the operation and maintenance of the measures and features. It would describe how to plan and prepare for storm surge events, and lay out the steps to be executed during and after events, including implementation of conservation measures. It would also describe the maintenance needed over time, and explain the types of assistance that the USACE can provide. Monitoring and inspections by USACE would occur to ensure that the constructed project functions as designed and that the City of Charleston implements all OMRR&R requirements.

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Hydraulic Pump Operations. The purpose of the permanent and temporary pump stations in the proposed Federal action is to minimize impacts of damaging flooding that would be induced by the storm surge wall when the gates are closed during a storm surge event. Hydraulic pumps would only operate occasionally and temporarily, and are not needed everywhere. For example, in the one location where preliminary modeling of the interior hydrology showed a water elevation over 4 ft while the gates are closed compared to with no wall (all other locations showed less than 2 ft or no increase, regardless of number of gates), there is no pump (nor gate) planned at this location. This is because the elevated water level does not induce flooding impacts. Therefore, there would be no effect to EFH outside of the wall from the elevated stormwater in this location because no pumping of the stormwater would occur. While the interior of the wall at this location that is receiving the elevated stormwater is a ~1.2 acre area of estuarine emergent vegetation, there is no gate planned and it is a wetland impact site (Diesel Creek) that would be offset for its loss of wetland functions (including EFH) by compensatory mitigation (see Section 9.3).

For locations where pumps are planned, effects from discharged stormwater on water quality in the estuarine water column outside of the proposed storm surge wall is expected to be minimal since pumping volumes would be low, concentrations would be similar to that of overland flow since they would not collect stormwater from within the marsh (see below), and the discharge would be immediately mixed with wave action and storm surge occurring outside the wall during an event. In several locations, the discharged stormwater would travel several thousand feet over land or salt marsh before entering into tidal rivers. Regardless, the extent of pumping would be minimized by reducing the time the gates would need to be closed and pumps would be active to the shortest time possible. Furthermore, pumps would be expected to meet state water quality standards. Small, manufactured treatment devices or sediment settling bases could be added in some locations if necessary.

Pumps that would be near salt marshes or tidal creeks would be placed in low lying areas but not directly in marshes or creeks. On the permanent pump stations, mesh screens would be installed for debris and wildlife protection. The City of Charleston would be responsible for removing debris from pump stations (as well as from inside the storm surge wall). All pump stations would have a backup generator to minimize pump failure if electrical power is not available during the storm surge event. During the PED phase, refined modeling of the interior hydrology will be performed and USACE will look for opportunities to further reduce the number and size of pumps to further minimize the potential for effects on water quality and EFH, while still addressing flood mitigation needs.

Construction Best Management Practices. Temporary adverse effects on EFH and managed fish species from construction of the proposed Federal action would be minimized through a number of practices commonly used for construction projects. USACE would require that various construction best management practices (BMPs) be included in contractor construction plans. These may include use of erosion blankets, silt fences, settling basins, and cofferdams to minimize erosion, sedimentation, and turbidity impacts on Estuarine Water Column EFH or the health of managed species.

BMPs to reduce the potential for noise effects on fish species could include limiting the days and times of days when construction would occur, and use of noise control techniques on equipment, such as mufflers and intake silencers. Pile driving in shallow open water areas (only relevant near the US Coast Guard Station) would be limited to low tide to reduce the potential for underwater sound impacts on fish (and marine mammals).

A special minimization feature that would be used is a workload trestle for keeping heavy equipment off the marsh surface during construction of the combination wall. It would be similar to a trestle currently being used by the City of Charleston for another construction project to reduce impacts to the marsh. Any direct impacts the trestle itself may have on Estuarine Emergent Vegetation would be minor compared to the effects of heavy equipment, and any lost vegetation would be re-planted post-construction. The use of the workload trestle also allows for construction of the storm surge wall in the marsh to occur from the land side, not waterside, so that equipment will be transported and staged on land, not in the water or marsh.

8.3 Compensatory Mitigation

Section 2036(a) of the Water Resources Development Act (WRDA) of 2007 required, among other things, that USACE Civil Works mitigation plans meet the applicable mitigation standards and policies of the Regulatory programs administered by the Secretary of the Army. On April 10, 2008, USACE and U.S. Environmental Protection Agency (USEPA) published regulations at 33 CFR Part 332 entitled, "Compensatory Mitigation for Losses of Aquatic Resources" ("Mitigation Rule"). The primary goal of these regulations was to improve the quality and success of compensatory mitigation plans that are designed and implemented to offset impacts to aquatic resources authorized by Department of the Army regulatory permits.

For the proposed Federal action, permanent direct losses of salt marsh wetlands, which would include all EFH associated with these areas, in the footprint and buffer of the wall, and behind the wall, that cannot be avoided or minimized would be offset through compensatory wetland mitigation consistent with the Mitigation Rule. The Mitigation Rule explains that compensatory mitigation is necessary to offset unavoidable impacts to aquatic resource functions and services and to meet the programmatic goal of "no overall net loss" of aquatic resource functions and services. The regulations emphasize the strategic selection of mitigation sites on a watershed basis and establish equivalent standards for all types of compensatory mitigation (mitigation banks, in-lieu fee programs, and permittee-responsible mitigation plans). They define compensatory mitigation as the restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of wetlands, for the purpose of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization has been achieved. The three mechanisms for providing compensatory mitigation listed in order of preference in the regulation are as follows: mitigation banks, in-lieu fee programs, and permittee-responsible mitigation.

The South Carolina Coastal Tidelands and Wetland Act of 1977 also requires that impacts to wetlands be mitigated. It states that avoidance is preferable to mitigation, and that mitigation shall be performed at a ratio of 1:1 wetland created to wetland altered, for projects deemed in the public interest.

In compliance with Federal and state regulations, USACE and City of Charleston intend to compensate for non-negligible direct losses, and indirect losses in habitat function and quality of salt marsh wetlands as a result of the proposed Federal action. For this study, those areas of wetlands also include some combination of Estuarine Emergent Vegetation, Tidal Creek, Oyster Reef, Intertidal Flat, and Estuarine Water Column EFH for managed species such as penaeid shrimp and juvenile bluefish and summer flounder. Per USACE policy, effects on salt marsh wetlands will be evaluated by habitat function and quality (measured in habitat units) and accomplished through in-kind mitigation to the extent incrementally justified, and employing a watershed approach. As this time, the action to be taken to

achieve the mitigation for salt marsh wetland (including EFH) has not been determined but is currently being evaluated. It is anticipated to be either the purchase of credits from an approved salt marsh Mitigation Bank and/or a Permittee-Responsible Mitigation alternative. Per USACE policy, whichever is determined to be the most cost-effective will be the selected mitigation alternative during this feasibility study. USACE has demonstrated that it is reasonable to assume compensatory mitigation can be achieved. USACE has estimated costs for the purchase of wetland mitigation bank credits, and has laid out a framework for evaluating PRM alternatives during the remainder of the feasibility study. Potential PRM sites would also be evaluated with the White Shrimp HSI to ensure they are suitable for offsetting the loss of EFH. The framework for selecting a mitigation alternative is described in detail in the Draft Mitigation Plan in the Appendix F of the draft FR/EIS, for reference.

After considering all applicable regulation and policies, USACE in consultation with natural resource agencies, has determined the estimate of salt marsh wetlands needed to be offset, or compensated, for non-negligible impacts after avoidance and minimization, as a result of the proposed Federal action is approximately 34.8 acres. This includes 27.1 acres at 5 sites at a ratio 1:1, and the equivalent of 7.7 acres of lost wetland function, or 90% loss of EFH function, at Halsey Creek as determined by the White Shrimp HSI (see Table 2). As stated previously, this is a feasibility study and the final acreage potentially affected will be refined with the use of high-resolution imagery and upon wetland delineation done in the PED phase once engineering-level design of the wall is completed. Compensatory wetland mitigation requirements and alternatives will be adjusted accordingly

Table 2. Summary of Required Compensatory Wetland Mitigation for Impacted Wetlands and EFH.

MARSH LOCATION	ESTIMATED REQUIRED MITIGATION (acres)
Ashley River along Wagener Terrace – North end	6.4
Halsey Creek	7.7*
Ashley River along Wagener Terrace – South end	4.6
Citadel Marsh (behind Joe Riley Stadium)	11.5
Diesel Creek	1.2
USCG Marsh	3.4
TOTAL	**34.8**

*Includes estimation of habitat function lost, not total acreage impacted

In addition, the potential loss of the sandy Intertidal Flat EFH at “Battery Beach” would also be offset through compensatory wetland mitigation since it meets the regulatory definition of a wetland. Compensatory mitigation would either include purchasing the equivalent wetland mitigation bank credits, or PRM of like habitat type.

9.0 CONCLUSIONS

The following list summarizes potential effects of the proposed action on EFH and managed fish species as detailed in the sections above:

1. Approximately 35 acres of existing EFH associated with salt marsh-tidal creeks systems for managed fish species, particularly for penaeid shrimp, blue fish, summer flounder, and some snapper grouper complex species used for nursery grounds, refuge, and/or feeding would be permanently lost where the storm surge wall is planned in the marsh, and behind the wall in the marsh. The loss of EFH, which encompasses portions of Estuarine Emergent Vegetation, Tidal Creek, Oyster Reef, Intertidal Flats, and Estuarine Water Column depending on location, would all be offset through compensatory salt marsh wetland mitigation, resulting in no net loss of EFH.

2. When storm surge gates are closed, access to EFH behind the gates at Halsey Creek and possible EFH beyond the culverts at Gadsen Creek, Cummings Creek, and New Market Creek by managed fisheries species, such as penaeid shrimp, would be temporarily restricted for the duration of a given storm surge event. This effect would be minor.

3. When storm gates are closed, Estuarine Water Column EFH for managed fish species and some prey species (particularly benthic invertebrates) at the four locations described above could be adversely affected by reduced water quality conditions. The extent of effects range from restricted movement, to possible mortality (due to hypoxia) or physiological impairment, to loss of prey species. Severity of effects will be dependent upon on the duration of gate closure, which would be temporary and minimized to the degree practicable but which would vary depending on the nature of any given storm; on the presence of managed fish species at the time of gate closure, which would be minimized by closing at low tide; and existing conditions/quality of EFH behind the gates at Gadsen Creek, Cummings Creek, and New Market Creek, which are all highly altered creeks (90% of lost EFH at Halsey Creek is already planned for compensation; 100% of lost EFH at the Citadel Marsh behind the culvert is already planned for compensation).

4. Effects on water quality to EFH and managed fish species from the hydraulic pumps would be minimal when considering their temporary use, the environmental conditions and manner in which they would be operated, and their requirement to meet state water quality standards. Even if the number and size of pumps are modified during PED, the forementioned considerations would still apply, and the pumps would be a fraction of the number of existing storm water outfalls in the study area discharging the same runoff into local waterways, and comparative or smaller in size to hydraulic pumps that are already permitted to discharge storm water on a daily basis. Finally, considering that the same volume of stormwater runoff would be drained during a storm surge event in the future without project either through the underground stormwater system or through overland flow, but would meet state water quality standards, then implementation of the proposed pumps would not result in a cumulative adverse effect.

5. Effects to either EFH (such as turbidity in the water column) or directly on managed fish species (such as noise) from construction related activities would be minimal with the use of multiple BMPs and minimization measures planned for the proposed Federal action.

6. Based on the location of the proposed Federal action being primarily on land and in shallow estuarine marshes and waters, and the localized potential effects on EFH, and when considering the use of construction BMPs and other minimization measures (including compensatory mitigation for lost salt marshes that support prey species), adverse effects on managed species of sharks and migratory pelagics are not likely and would be nominal.

7. Effects on EFH or managed fish species from implementation of the reef-based living shoreline sills would either be nominal (from construction) or would be beneficial.

Consideration has been given to USACE's current Post 45 Charleston Harbor Deepening Project with respect to the proposed Federal action to assess the potential for cumulative effects on EFH and managed fish species. USACE has concluded that the proposed Federal action would not result in a cumulative adverse effect since most of the EFH types and the life stages of species that could be affected by the Post 45 Project are not the same as for this study. While one of the long term effects may result in changes to salinity regimes and vegetation in the Cooper and Ashley Rivers from the deepening project, this would occur outside of the ROI of this study. Monitoring is planned for the Post 45 Project to determine if such an effect would even occur. USACE also considered the City of Charleston's current Spring and Fishburne Drainage Improvement Project and has concluded there would not be cumulative effects on EFH and managed species. It is USACE's understanding that direct impacts on EFH for the City's project have already been compensated for. Additionally, the discharge that could affect EFH would be minor based on the size and capacity of occasional pumping from the proposed Federal action, when compared or combined with the daily potential discharge from the large-scale Spring and Fishburne pumps.

With the exception of lost EFH for managed fish species that would be offset with compensatory salt marsh wetland mitigation, none of the other measures or features of the proposed Federal action, neither individually nor in sum, and with use of the many minimization measures that are planned, are expected to have more than minor adverse effects on managed fish species or their EFH.

USACE requests initiation of consultation pursuant to the MSA with submittal of this EFH Assessment, and requests that it be based on best available information and concluded for the feasibility phase of this study in accordance with USACE policy requirements and 50 CFR § 600.920 (i)(4). USACE looks forward to NMFS' response and issuance of conservation recommendations.

USACE realizes that offsetting adverse effects to EFH is dependent on selection of a compensatory wetland mitigation alternative. USACE has demonstrated that there are feasible mitigation alternatives, which can be incrementally justified and are compliant with USACE policy. While it is standard for the Draft Mitigation Plan to not be finalized until the PED phase by the nature of activities that come after Congressional authorization and funding, engineering level design, real estate transactions, etc., USACE is committed to selecting/identifying a mitigation alternative during the remainder of the feasibility study. USACE has shown that there are compensatory wetland mitigation options that are feasible and compliant with Federal and state regulations and USACE policy. USACE has laid out a policy-compliant framework for selection of a mitigation alternative in the Draft Mitigation Plan, and the last status update on progress towards identify PRM options was discussed at an agency working meeting on July 20, 2021 and captured in the subsequent meeting notes sent to NMFS and other participating agencies. USACE looks forward to continuing to work with NMFS and other natural resource agencies through selection of a compensatory mitigation alternative.

If changes or additional relevant information emerge with respect to the proposed Federal action during the PED phase that could affect EFH or managed fish species that have not already been evaluated, then USACE would reinitiate consultation pursuant to the MSA at that time.

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UNITED STATES DEPARTMENT OF COMMERCE
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Colonel Andrew Johannes, District Commander
Charleston District, U.S. Army Corps of Engineers
69 Hagood Avenue
Charleston, SC 29412

Attention: Nancy Parrish, Hannah Hadley, Bethney Ward, Wesley Wilson

Re: Charleston Peninsula Coastal Flood Risk Management (FRM) Study Consultation Milestones

Dear Commander Johannes:

NOAA's National Marine Fisheries Service (NMFS) has received your October 22, 2021, correspondence regarding the consultation milestones for the Charleston Peninsula CFRM study as well as a follow-up email from Andrew LoSchiavo on October 29, 2021. As reflected in our June 9, 2021, letter, in which we provided our concurrence on the consultation milestone schedule for the project, we voiced concerns about the USACE's ability to provide sufficient information to meet Essential Fish Habitat (EFH) and Endangered Species Act (ESA) consultation milestones during the feasibility study stage.

Specifically, we requested information pertaining to water quality issues associated with the pumping of impounded stormwater resulting from the project. On May 18, 2021, the USACE provided the interagency natural resources working group a summary of the interior drainage analysis for the proposed project; that summary focused on water quantity, not quality. During a natural resource working group meeting on June 8, 2021, the USACE presented their plan for storm gates which involved a dramatic reduction in the number of gates in the wall. Our Habitat Conservation Division biologist pointed out that the number of gates was a critical component of the analysis and inquired whether or not the USACE planned to redo the water quality analysis based on the reduction in the number of gates. The USACE stated they would not provide water quality analysis during the feasibility study phase of the project.

As of this letter's writing, we have not received adequate information to support initiation of consultation under the MSA or ESA. Our Habitat Conservation and Protected Resources Divisions have specifically identified deficiencies (Appendix A and Appendix B) that we believe must be addressed before we can conduct meaningful effects analysis of the proposed action and provide complete EFH and ESA consultations.

We encourage the USACE to consider deferring requests for initiation of consultation under the ESA and MSA until a later point in the development of the project; preferably during the pre-construction, engineering, and design (PED) phase, at which time more detailed information about project design and potential impacts to NOAA trust resources will be available. Deferring these consultations would help both agencies to better understand the important questions to ask regarding those resources and risks, to determine the information or studies needed to answer those questions, and ultimately, to reduce risk to our trust resources.

Given that the EFH and ESA consultations will likely not occur within the feasibility study phase of the project and the milestone date for initiation of both consultations is today, we believe that it would be prudent to mark these consultations as "Cancelled" on the Permitting Dashboard. We are happy to assist your staff with identifying when sufficient consultation information has been provided in order to initiate consultations under the MSA and ESA.

We are committed to providing technical assistance in our role as a cooperating agency under the National Environmental Policy Act. We want to emphasize that if consultation is deferred to later in the USACE's SMART Planning process for conducting civil works feasibility studies, we will continue to provide early, robust technical assistance throughout the feasibility study phase, assist with the identification of NOAA trust resources at risk as well as measures to avoid, minimize, and mitigate potential effects, and aid with the preparation of consultation support documents to provide our agency with specific information about project design and impacts so the respective consultations can be more efficient.

We appreciate your continued coordination on this project. For questions pertaining to the MSA or ESA, please direct correspondences to Ms. Cynthia Cooksey (cynthia.cooksey@noaa.gov) or Mr. Andrew Herndon (andrew.herndon@noaa.gov), respectively.

Sincerely,

MCGOVERN.JOHN.CLARKE.1365840861

Digitally signed by MCGOVERN.JOHN.CLARKE.1365840861
Date: 2021.11.23 09:14:45 -05'00'

for Andrew J. Strelcheck
Regional Administrator

Appendices
cc: F, Chabot
F/PR1, Daly
F/PR5, Youngkin
F/SER, Strelcheck, Blough, Silverman, Rosegger
F/SER3, Bernhart, Shotts, Reece, Herndon, Horstman
F/SER4, Fay, Wilber, Cooksey, Karazsia

APPENDIX A
HABITAT CONSERVATION DIVISION: REQUEST FOR ADDITIONAL INFORMATION

This letter responds to your request for consultation with the National Marine Fisheries Service (NMFS), pursuant to Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation Management Act (MSA) for the Charleston Peninsula Coastal Flood Risk Management Study. Our Habitat Conservation Division (HCD) first engaged with this project on November 6, 2018, and continues to monitor the project's progress. We believe early coordination with your staff provides a valuable opportunity to integrate conservation of NOAA's trust resources into coastal storm risk management.

Consultation under the MSA is initiated when we receive an Essential Fish Habitat (EFH) assessment from a Federal Agency that concludes the work may adversely affect EFH. We received the EFH assessment for the proposed study and letter requesting initiation of consultation on September 24, 2021. We also reviewed the draft Feasibility Report/Environmental Impact Statement (draft FR/EIS) dated September 2021. The first step in the consultation process is determining if there is adequate information from the action agency to fully evaluate the reduction of quality or quantity of EFH resulting from the project. As indicated in the draft FR/EIS, the purpose of the proposed action is to identify the optimal structural and non-structural solution that reduces human health and safety risks, as well as economic risks from coastal storm surge inundation and increases resilience to coastal storm surge inundation. Because feasibility studies are intended to identify problem areas, develop solutions to address them, and not provide specific engineering and design information, there is inherently less information available for considering impacts to EFH and federally managed species.

We have identified the following deficiencies in the EFH assessment and believe they must be addressed before we can conduct a meaningful evaluation of the proposed action and complete EFH consultation:

1) We requested the USACE provide information related to water quality issues associated with the pumping of impounded stormwater resulting from the project. On May 18, 2021, the USACE provided the interagency natural resources working group a summary of the interior drainage analysis for the proposed project. That summary focused on water quantity, not quality, and found the future with-project water surface elevation (WSEL) causes minimal increases in most of the project area except for residential areas north of Hasley Creek along the Ashley River. Location 1 in the analysis, north of Hasley Creek, displayed an increase of 1.59 feet WSEL during a 10% Annual Exceedance Probability rainfall event. Additionally, the analysis acknowledged uncertainty regarding pump locations, pump numbers, whether pumping would occur during a storm event, whether pumping would occur before a storm event, the duration of pumping after a storm, and when storm gates would be reopened relative to tidal recession. Although considerable uncertainty exists related to pumping and the potential for adverse effects from pumping, the USACE stated they would not provide water quality analysis during the feasibility study phase of the project. The USACE indicated it will address this issue during the PED phase.

   The scope of the USACE's proposed action considered in this feasibility study has impacts extending well beyond the USACE's construction and future operations. Environmental resource consultations will need to consider the impacts from those reasonably foreseeable connected

actions and can not be segmented until a later date/project. Uncertainty surrounding potential water quality impacts from project operations makes evaluating the impacts to EFH and federally managed fishery species difficult. Specifically, it is unclear at this time what effect pumping impounded water, which may become hypoxic, will have on overall concentrations of dissolved oxygen in the Ashley or Cooper Rivers. Likewise, the prevalence of changes to the concentrations of dissolved oxygen is unclear.

The future operating schedule for the pumps is uncertain due to climate change and transition of operations to the City of Charleston. We recognize the USACE intends to only use the pumps under certain circumstances and those circumstances are the basis of this study's analysis. However, ultimately control and ownership of the pumps will be turned over to the City of Charleston. It is unlikely the City would only operate the pumps in the same manner as the USACE, considering the potential for use to mitigate flooding already occurring on the Charleston Peninsula, such as the record tidal flooding occurring in November 2021. The City of Charleston has reported to news organizations, in November 2021, that from 1922 to 2014, there were fourteen times the City experienced tides over eight feet. Since 2015, the City has experienced twenty-three instances of eight-foot tides or higher (tides at which the gates would close). The USACE's analysis should include an assessment of the potential effects likely to occur in the future due to increased frequency of gate closures not related to storms and the potential for pumping. Also, given the results of the interior drainage analysis, the possibility exists that additional pumps may need to be installed and operated to mitigate for WSEL increases due to the project in some areas.

2) The description of the living shoreline is brief and it is unclear how, for the areas identified in Figure 1 of the EFH assessment, the living shoreline relates to the proposed project's purpose. Because site suitability surveys have not been completed at this time, it is unclear if these areas are experiencing erosion. If they are, how proximal is the threatened infrastructure? How will the living shoreline be installed? What materials will be installed? How much material will be installed? Will it be done from the uplands, vessels, both? This information is needed for us to determine if best practices for minimizing impacts to EFH are sufficient or if additional minimization measures are needed. Shoreline erosion is a natural process supplying important sediment to coastal habitats. If shoreline erosion is not a concern, leaving a natural shoreline is preferred to maintain existing ecosystem services. However, taking action to stabilize a shoreline may be necessary where infrastructure is located very close to eroding shorelines.

   All types of EFH provide unique ecosystem services including emergent wetlands, intertidal unconsolidated soft bottom, hardbottom, and oyster reefs. We encourage the use of living shoreline techniques to provide, maintain, or improve habitat or ecosystem function and enhance coastal resilience. However, we encourage shoreline protection methodologies that avoid or minimize channelward encroachment into subtidal habitat. We do not promote the use of living shorelines as a means for land reclamation. It is unclear from section 7.3 of the EFH assessment if a purpose of the proposed living shoreline is to create emergent wetlands by converting intertidal or subtidal habitats. There are many ways to increase resilience to coastal storm surge inundation, and living shorelines are only one approach and should only be used when warranted.

We appreciate the USACE using the White Shrimp Habitat Suitability Index to assess functional habitat loss, and the USACE's ongoing efforts to find ways to avoid and minimize adverse effects to EFH and federally managed species. We look forward to continuing engagement with the USACE staff and providing technical assistance throughout this process.

APPENDIX B
PROTECTED RESOURCES DIVISION: REQUEST FOR ADDITIONAL INFORMATION

This letter responds to your request for consultation with us, the National Marine Fisheries Service (NMFS), pursuant to Section 7 of the Endangered Species Act (ESA) for the Charleston Peninsula Coastal Flood Risk Management Study. Our Protected Resources (PRD) first engaged with this project in April 2021 and has remained involved ever since. Because the project could impact Kemp's ridley (*Lepidochelys kempii*), leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*) and green (*Chelonia mydas*) sea turtles, shortnose sturgeon (*Acipenser brevirostrum*), Atlantic sturgeon from the Carolina distinct population segment (*Acipenser oxyrinchus oxyrinchus*), as well as Carolina Unit 7 of Atlantic sturgeon critical habitat we appreciate the opportunity to be involved in the evolution of this project. We believe that early coordination with your staff provides a valuable opportunity to integrate conservation of NOAA's trust resources into coastal storm risk management.

We initiate consultation under the ESA when we receive adequate information from the action agency to fully consider the potential impacts of a project on ESA-listed species. As you indicated in your draft FR/EIS, the purpose of the proposed action is to identify the optimal structural and non-structural solution that reduces human health and safety risks, as well as economic risks from coastal storm surge inundation and increases resilience to coastal storm surge inundation. Because feasibility studies are intended to identify problem areas, develop solutions to address them, and not provide specific engineering and design information, there is inherently less information available for considering impacts to ESA-listed species.

We have specifically identified the following deficiencies that we believe must be addressed before we can conduct a meaningful effects analysis of the proposed action and provide a complete ESA consultation:

- Information needed to conduct a full noise analysis - What type of materials will be driven (i.e., steel sheet piles, concrete, wood); what is the size of these materials (i.e., sheet width for sheet piles; pile diameter); anticipated number of strikes per pile/sheet; anticipated number of piles likely to be driven per day; whether vibratory hammers will be used.
- Use of Best Management Practices - Will USACE implement the protected species construction conditions and follow entrapment reduction measures?
- Will the project footprint for all in-water work ensure migratory pathways are not blocked?
- Will in-water construction be conducted only during daylight hours or will it occur 24 hours a day? Is construction-related noise likely to propagate into open water?
- Information on what contaminants are likely to be pumped into the rivers during pump-out events.
- How will the living shoreline be installed? What materials will be installed? How much material will be installed? Is entanglement/entrapment of listed sea turtles a potential route of effect? Will it be done from the uplands, vessels, both? If vessels will be used will USACE follow our vessel strike avoidance guidance?

We cannot provide a complete ESA consultation with the level of detail currently provided and encourage you to consider delaying your request to initiate the ESA consultation until a later point in the development of the project; preferably during the design and engineering phase, at which time more

detailed information about project design and potential impacts to NOAA trust resources will be available.

We want to emphasize that while we wait for more information to become available, we will continue to provide robust technical assistance throughout the feasibility study phase to assist your agency in identifying NOAA trust resources at risk. Deferring full consultation until the proposed action is better-developed would also help both agencies to better understand the important questions to ask regarding those resources and risks, to determine the information or studies needed to answer those questions, and ultimately, to reduce risk to our trust resources. Our robust technical assistance during the feasibility study phase will assist the USACE in preparing your consultation support documents to provide our agency with specific information about project design and impacts so the consultation on the proposed actions can be more efficient.

While there is not enough information available at this time for us to complete an ESA consultation, the level of detail provided does allow us to make preliminary conclusions regarding potential impacts for certain portions of the project.

Analysis of Potential Routes of Effect to Critical Habitat

The final rule designating critical habitat for Atlantic sturgeon identified the key conservation objectives for the Carolina DPS are to increase their abundance by facilitating increased survival of all life stages and facilitating adult reproduction and juvenile and subadult recruitment into the adult population (82 FR 39160; August 17, 2017). The physical features determined to be essential to conservation of the species that may require special management considerations or protection, which support the identified conservation objectives, are in the following table.

Physical and Biological Features (PBF) of Atlantic Sturgeon Critical Habitat

PBF		**Purpose/Role of PBF**
"Hard Substrate" *(PBF 1)*	Hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0-0.5 parts per thousand [ppt] range)	Necessary for the settlement of fertilized eggs and refuge, growth, and development of early life stages
"Salinity Gradient and Soft Substrate" *(PBF 2)*	Aquatic habitat inclusive of waters with a gradual downstream gradient of 0.5 up to as high as 30 ppt and soft substrate (e.g., sand, mud) between the river mouth and spawning sites	Necessary for juvenile foraging and physiologi development

"Unobstructed Water of Appropriate Depth" *(PBF 3)*	Water of appropriate depth and absent physical barriers to passage (e.g., locks, dams, thermal plumes, turbidity, sound, reservoirs, gear, etc.) between the river mouth and spawning sites	Necessary to support: Unimpeded movement of adults to and from spawning sites; Seasonal and physiologically dependent movement of juvenile Atlantic sturgeon to appropriate salinity zones within the river estuary; and Staging, resting, or holding of subadults or spawning condition adults. Water depths in main river channels must also be deep enough (at least 1.2 meters) to ensure continuous flow in the main channel at all times when any sturgeon life stage would be in the river
"Water Quality" *(PBF 4)*	Water quality conditions, especially in the bottom meter of the water column, with suitable temperature and oxygen values	Necessary to support: Spawning; Annual and inter-annual adult, subadult, larval, and juvenile survival; and Larval, juvenile, and subadult growth, development, and recruitment. Appropriate temperature and oxygen values will vary interdependently, and depending on salinity in a particular habitat. For example, 6.0 mg/L dissolved oxygen or greater likely supports juvenile rearing habitat, whereas dissolved oxygen less than 5.0 mg/L for longer than 30 days is less likely to support rearing when water temperature is greater than 25°C. In temperatures greater than 26°C, dissolved oxygen greater than 4.3 mg/L is needed to protect survival and growth. Temperatures of 13 to 26 °C are likely to support spawning.

No in-water work appears to be planned within the boundaries of the Carolina Unit - 7 (Santee-Cooper River) of Atlantic sturgeon critical habitat; thus, we do not anticipate these portions of the project will impact any of the PBFs of critical habitat.

Runoff/turbidity/etc. may degrade water quality and those plumes of turbidity or water with low dissolved oxygen concentrations could be transported inside the boundaries of Atlantic sturgeon critical habitat.

We agree with your conclusion that these potential impacts will not impact PBF 1 (hard substrate in freshwater). Based on our current understanding of the project, we also believe there is a very low likelihood that degraded water pumped into the Ashley or Cooper Rivers will impact PBF 2 (Salinity Gradient with Soft Substrate), PBF 3 (Unobstructed Water of Appropriate Depth) or PBF 4 (Water Quality) to an extent that it measurably interrupts the purpose/role of the PBFs, but we believe a more complete assessment of the project's operations and water quality impacts is required to confirm this.

Analysis of Potential Routes of Effect to Species

We agree with your assessment that shortnose sturgeon are unlikely to be near the project area. Data we received from the South Carolina Department of Natural Resources (SCDNR) for an unrelated project confirm your statements that shortnose sturgeon spend the vast majority of their time well outside the Region of Influence, and only occasionally occur near the confluence of the Cooper and Ashley rivers where the majority of the work will be completed. Shortnose sturgeon do not use the Ashley River for spawning, nor do they exhibit migratory behavior in the river.

Atlantic sturgeon are more likely to be found in the action area than shortnose sturgeon. The best available information indicates they use the Cooper River more frequently than the Ashley River. Atlantic sturgeon do not use the Ashley River for spawning, nor do they exhibit migratory behavior in the river.

Unpublished telemetry data of Atlantic sturgeon movements in the Cooper River provided by SCDNR for an unrelated project, indicated between 88-99 tagged Atlantic sturgeon were detected in the Cooper River each year from 2016-2018. A number of those detections were in the Charleston Harbor. We believe any animal in the Charleston Harbor could potentially be found in the action area.

Either species of sturgeon could be physically injured if struck by construction equipment, vessels, or materials. You have indicated that the majority of the actual seawall construction will be in the uplands, away from ESA-listed species. Assuming that remains the case, we acknowledge there will likely be no threat of physical injury to any ESA-listed species for work that occurs entirely out of the water. For the in-water portions of the project, our current understanding suggests this work would occur in the Ashley River where sturgeon are less likely to be present. The current discussion of the project also mentions the potential use of unspecified best management practices (BMPs). Assuming BMPs or construction conditions that are effective in reducing impacts to sturgeon are ultimately implemented, we anticipate a low likelihood of sturgeon being physically injured if struck by construction equipment, vessels, or materials.

Construction activities, construction-related noise, and the use of turbidity curtains may prevent or deter sturgeon from using the area. Unfortunately, there is not enough information currently available to assess the potential for these aspects of the project to adversely affect species. When considering these potential routes of effect, the most important aspects of our analysis is where the activities will occur and their duration. The current description of the project does not include these details. In the Ashley River, the project footprint appears likely to be very close to shore. If the project footprint here extends only a short distance into the river, we would anticipate any obstruction from the deployment of turbidity curtains or construction activities would be relatively small since the remaining portion of the river would remain free of obstruction; though construction-related noise could propagate further into the river. However,

until more information is available on the likely source location of construction-related noise and its duration, we cannot assess the significance of its potential impact, if any.

Potential impacts from noise created by pile driving activities during construction remains a significant concern for us but the information currently available is insufficient for us to assess the potential impacts. Our concerns are related to both physical injury and changes to animal behavior.[1] The likelihood of either occurring depends greatly on what type of materials will be driven, the duration of driving, location of the driving, and the number of piles driven per day. We acknowledge that certain aspects of the project as currently described (i.e., pile driving in marsh habitat) could significantly reduce the severity, location, and duration of noise impacts. Similarly, you also mention other minimization measures *could* be used (e.g., limiting the days and times of days when construction would occur or requiring the use of noise abatement measures such as mufflers and intake silencers). However, until more information is available about the actual location and timing of pile installations and whether or not minimization measures will be used, we are unable to accurately assess the potential impacts to species. Using noise abatement measures (e.g., cushion blocks) or driving piles behind de-watered cofferdams can greatly reduce any potential noise effects. Similarly, you mention the installation of a temporary work trestle. If piles will be driven to support the trestles, their location will be important during our consideration of whether noise-related impacts may propagate into the river.

Degraded water quality (i.e., low dissolved oxygen concentrations, chemical/pollutant discharge) caused by hydraulic pumping is also of concern. You have stated that without minimization measures, localized water quality could be degraded, including temporary changes in salinity, pH and reduced dissolved oxygen levels, depending on the volume and duration of sediment resuspension, the oxygen demand of the sediment, and other factors. You then mentioned that sturgeon in these waters could experience physiological stress, and/or mortality if there are substantial reductions in dissolved oxygen. We recognize that you believe impacts this severe are unlikely, but can you provide more information on what minimization measures are planned? Additionally, based on our current understanding of the project, we are unclear as to whether anything in the water may ultimately cause lasting degradation to water quality following discharge. For example, the EIS identifies a number of Brownfield and Resource Conservation and Recovery Act sites in the study area. We are unclear whether there is a risk that pollutants from these sites will be pumped into the Cooper or Ashley rivers. Because sturgeon are benthic feeders, accumulated toxic materials in the sediment could be consumed by sturgeon. You note "small, manufactured treatment devices or sediment settling bases could be added in some locations if necessary." Inclusion of mitigation measures such as these would likely reduce or eliminate potential risks to ESA-listed species if implemented. However, at this time, it is unclear if these measures are planned.

You noted that sea turtles and sturgeon may become trapped behind the storm surge wall, but that the likelihood of that event is low. Based on our understanding of the project as currently proposed, we also believe there is a very low likelihood of any ESA-listed species becoming trapped behind the storm surge wall. You also note that in the unlikely event an animal became trapped behind the sea wall, they could

[1] Physical injury onset for fish and sea turtles occurs during a single-strike event at 206 dB peak pressure; prolonged exposure to noise energy can also cause injury for fish and sea turtles occurs at 187 dB cumulative SEL; noise-induced impacts to behavior are anticipated at 150 dB (RMS) for fish and 160 dB (RMS) for sea turtles.

be injured if water quality becomes significantly degraded. We recommend you consider establishing a plan of action for what to do if an animal is observed trapped behind the sea wall. We believe having such an action plan in place will significantly mitigate the already low likelihood of injury being caused.

The description of reef-based living shoreline installation is brief. Would this work be done from the uplands/boats/both? We suspect the risk to ESA-listed species from the installation of this feature is very low; however, we cannot solidify that conclusion without more details. For example, is there any risk of vessel strikes if vessels are used? It is encouraging to hear that the techniques used are "*generally considered to have low-impact and localized effects on the environment*" but is any more information available on what will be installed? What materials will be installed? How much material will be installed? Is entanglement/entrapment of listed sea turtles a potential route of effect?

DEPARTMENT OF THE ARMY
CHARLESTON DISTRICT CORPS OF ENGINEERS
69A HAGOOD AVENUE
CHARLESTON, SOUTH CAROLINA 29403

December 22, 2021

Planning and Environmental Branch

Ms. Cynthia Cooksey
Habitat Conservation Division
Southeast Regional Office
NOAA Fisheries
331 Fort Johnson Road
Charleston, SC 29412

Dear Ms. Cooksey:

The U.S. Army Corps of Engineers, Charleston District (USACE) is in receipt of a letter from Mr. Andrew Strelcheck (no date; signed 11/23/2021 by Mr. John McGovern) regarding "Charleston Peninsula Study Coastal Flood Risk Management Study Consultation Milestones." In that letter, Mr. Strelcheck encouraged USACE to consider deferring requests for initiation of consultation until a later time, preferably during the preconstruction, engineering, and design (PED) phase, and marking the consultation as "cancelled" in the Permitting Dashboard. However, pursuant to section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), USACE has already initiated consultation with the NOAA Fisheries for this study. USACE does not intend to defer the consultation to the PED phase.

In Mr. Stelcheck's letter, the Habitat Conservation Division (HCD) of the Southeast Regional Office of NOAA Fisheries identified information (found in Appendix A) that they believe is needed to "conduct meaningful effects analysis of the proposed action and provide complete…EFH consultation(s)." While it is USACE's intent to address the request for additional information found in Appendix A to continue MSA consultation, HCD's request is currently too broad or vague for USACE to adequately respond. The Habitat Conservation Division must provide more specificity related to the following numbered Request of Additional Information's (RAI) in Appendix A.

1) HCD has requested information related to water quality issues associated with pumping of stormwater. They identify dissolved oxygen levels in the Ashley and Cooper Rivers as being a concern. While the focus of comment 1) is on the hydraulic pumps, it also mentions effects of gate closures.
    - USACE has determined that any effects of the proposed measures and features on water quality would be localized. It is not reasonably expected that water quality across the entire 8.5 square mile study area, nor the entire surrounding region of influence (ROI), would be affected by the proposed action. Therefore, HCD must identify specific locations in the

study area or ROI for which it is concerned about water quality for USACE to respond to their concerns about the water quality effects analysis. There are currently 10 pump stations planned as part of the proposed plan, which are in different locations with respect to EFH, of different sizes/capacity, and with different designs and operations (e.g, some are permanent, and some are temporary stations, and their stormwater collection processes differ). Further, the permanent pumps will be equipped with a treatment system minimizing effects to water quality while in operation. USACE asks that HCD identify the specific pump stations for which it is concerned about water quality and how they potentially relate to EFH or NOAA trust resources at those locations for USACE to respond to the requested information about water quality effects. The locations and descriptions of the pump stations can be found in Section 2.3 of the EFH Assessment, with more detailed information and diagrams found in the Structural Engineering Appendix of the draft Feasibility Report/Environmental Impact Statement. USACE highly encourages HCD to re-read the functional descriptions of the permanent and temporary pump stations in Section 2.3 and the planned minimization measures in Section 8.2 of the EFH Assessment.

- With respect to the storm gates, there are currently seven gate locations identified. The nature of these gates also differ by location and in their relation to EFH (e.g., at one gate location there is no EFH on the interior of the gate [Alberta Long Lake]) and in some locations compensatory mitigation is already planned. USACE asks that HCD identify the specific gate locations that it has water quality concerns about that have not already been addressed, and whether the water quality concern is related to EFH or trust resources on the interior of the gate or the exterior of the gate, in order for USACE to respond to the requested information about water quality effects. The storm gate locations and descriptions can be found in Section 2.2 of the EFH Assessment, and the newly proposed storm gate is described in meeting correspondence provided to HCD on December 10, 2021.

2) No clarification needed from HCD regarding the RAI on the planned living shorelines. USACE has already provided information to HCD that would address this RAI in an email dated December 10, 2021, however, USACE will provide it again as part of their formal response to the RAI.

Once USACE receives a more specific request from HCD about its needs for more water quality information for effects analysis, USACE intends to respond to HCD's RAI so that the MSA consultation can be completed. Since Mr. LoShavio from USACE had already requested in his email dated October 29, 2021 that NOAA Fisheries provide more specificity in its forthcoming RAI than it had in its previous letters, USACE expects to receive a revised RAI from HCD within two weeks from receipt of this letter, as not to delay the consultation any longer than necessary.

When USACE responds to HCD's revised RAI, USACE will also provide at that time supplemental information for the EFH Assessment to inform the MSA consultation regarding a modification that has been made to the proposed plan. This modification has been made in response to public/stakeholder input that was received during the public review period of the draft Environmental Impact Statement, since it is the intent of NEPA to solicit and consider public input in proposed federal actions. The modification to the plan has already been shared with the Cooperating Agencies during a meeting on December 6, 2021, which is documented in the subsequent meeting notes that were sent to the agencies (including HCD) on December 10, 2021. While this information is already available for your consideration, it will be provided again as it relates to the MSA. USACE will also provide a copy of the Draft Mitigation Plan again to HCD, which includes an updated statement that no permittee-responsible mitigation opportunities were identified to meet the mitigation requirement, which has already been disclosed to the Cooperating Agencies. The Draft Mitigation Plan also states more definitively that manufactured treatment devices would be added to all permanent pump stations.

USACE requests that all future correspondence from NOAA Fisheries pertaining to the MSA consultation for this study be specific to this consultation only, and no longer be combined with issues, needs, determinations, etc. directed at other environmental consultations that do not pertain specifically to the MSA. Likewise, USACE will be sending correspondence to NOAA Fisheries that pertains only to the specific consultation at hand in relation to that specific environmental law.

If you have any questions concerning this letter or the existing MSA consultation request, please reach out to me at (843) 329-8050 or Nancy.A.Parrish@usace.army.mil.

Sincerely,

Nancy Parrish
Chief, Planning and Environmental

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
https://www.fisheries.noaa.gov/region/southeast

January 21, 2022 F/SER47:CC/jk

(Sent via Electronic Mail)

Lt. Colonel Andrew Johannes, Commander
Charleston District, U.S. Army Corps of Engineers
69 Hagood Avenue
Charleston, SC 29412

Attention: Nancy Parrish and Hannah Hadley

Dear Commander Johannes:

NOAA's National Marine Fisheries Service (NMFS) reviewed the correspondence, dated December 22, 2021, from the U.S. Army Corps of Engineers (USACE) requesting more detail on the information needed by NMFS to complete the Essential Fish Habitat (EFH) consultation under the Magnuson-Stevens Fishery Conservation and Management Act for the Charleston Peninsula Coastal Flood Risk Management Study (Charleston Study). Our request for additional information, provided by letter dated November 23, 2021, is focused on water quality and operations, living shorelines, and compensatory mitigation, and our concerns are limited to the operating parameters of the project as they are currently stated by the USACE; i.e., flooding attributed to storm surge. During our meeting with the USACE on January 12, 2022, Dr. Larry McCallister noted the USACE may pursue separately a study of flooding from other causes, such as sea level rise (i.e., sunny day flooding), and the NMFS is prepared to assist the USACE with that study when asked.

Water quality and operations
To complete the EFH consultation for the Charleston Study, the NMFS needs to evaluate whether water discharges from the project will adversely affect emergent marsh, tidal creeks, and benthic riverine habitat along the Ashley and Cooper Rivers used by fishery species, Endangered Species Act-listed species, or their prey. The permanent pumping stations of greatest concern are those at Joe Riley Stadium, Long Lake, New Market, and Halsey's Creek due to their proximity to emergent wetlands and tidal creeks. The temporary pumping station at Vardell Creek may also be of concern if the outfall will be moved due to the recent changes to the plan for the nearby flood wall. Water quality impacts from discharges resulting from opening the gates and from pumping impounded stormwater are a concern. The USACE's current modelling is incomplete as it focuses only on the *quantity* of water discharged, not the *quality*. The modeling also needs updating because it assumed more discharge locations (i.e., gates) than currently planned.

In order to complete an EFH consultation, please provide a description of:

- Gate operations, including when gates would close (a clearly identified trigger so an assessment of trigger frequency can be determined) and expected and worst case estimates of how long gates would remain closed.

- Pumping operations, including when pumping would occur (during a storm, after a storm has passed, or both) and the amount of time required to fully pump out impounded water. Please also clarify if heavy rainfall will require pumping at any of the mobile or permanent stations even when gates are kept open due to the wall and gates slowing runoff to the rivers.
- Water quality treatment before discharging via open gates or pumps, including specifications on technologies used, water quality targets, and monitoring done before discharges to verify targets are met. At a minimum, the treatment and monitoring should focus on temperature, salinity, and the concentration of dissolved oxygen (DO).
- Estimates of the effects of all discharges on overall DO concentrations and other water quality parameters in adjacent tidal creeks and emergent wetlands, including the distance from each point-source that impacts will be detectable during the design flood event. This will help us evaluate the effects of the discharge to NOAA-trust resources.

Living shorelines[1]

To evaluate a living shoreline project, NMFS requires the information described in *Guidance for Considering the Use of Living Shorelines*[2], which include assessments of site suitability and benefits to upland infrastructure and habitat. While neither the project's Environmental Impact Statement nor EFH Assessment has this information for the proposed living shorelines, our past work with the South Carolina Department of Natural Resources (SCDNR) provides this information for the site on the Ashley River by Lockwood Blvd and Broad Street and for the site at Brittlebank Park, and we are prepared to help the USACE include this information from SCDNR in the project's administrative record. We are not aware of information available for evaluating the site on the Ashley River by Wagener Terrace. The living shoreline descriptions provided on December 10, 2021, do not provide the information in NOAA's guidelines and the USACE indicates (in Section 6.2 of the updated living shoreline description) the information will not be available until the pre-construction, engineering, and design (PED) phase.

In order to complete an EFH consultation, please provide the following items[3] including a description of the:

- Physical site conditions including wave energy and history of erosion.
- Quality of habitats and characterization of fish utilization along the shoreline.
- Sea level rise considerations incorporated into project design.
- Habitat considerations reflected in the design.
- Compliance with local regulations, including verification that the size of the structure minimizes impacts to subtidal habitats while also protecting upland infrastructure. Please ensure that living shorelines will not encroach into subtidal habitat any more than necessary to protect threatened infrastructure as South Carolina regulations (R.30-12.Q. of state regulations S.C. Code Sections 48-39-10 et seq.) indicate that impacts to non-vegetated habitats should be minimal, and the size and extent of living shorelines should be limited to what is reasonable.

[1] Our comments on living shorelines are based on the EFH Assessment and the updated living shoreline description received from the USACE via email dated December 10, 2021

[2] https://coastalscience.noaa.gov/news/noaa-releases-guidance-for-the-use-of-living-shorelines/

[3] Modified from pages 15 to 25 of the *Guidance for Considering the Use of Living Shorelines*

- Site suitability including the proximity of infrastructure to erosional habitat to justify altering the natural shoreline.
- Public access considerations, e.g., addressing NMFS Protected Resources Division concerns about fishing line and entanglement.

Compensatory mitigation amounts and type
A mitigation plan describing how project related impacts would be fully offset is needed. During a meeting on December 6, 2021, with the Cooperating Agencies, the USACE substantially revised the mitigation plan and indicated it will not to mitigate impacts for all tidal creeks, including Vardell Creek. The USACE is now pursuing mitigation at banks in the Savannah River estuary; i.e., not within the watershed impacted by the project. For more than ten years, the NMFS has consistently opposed using mitigation banks in the Savannah River estuary to offset impacts in Charleston Harbor due to the mismatch in landscape position and salinity regime, which affect the services to fishery resources, in addition to the offsets not occurring in the impacted area.

In order to complete an EFH consultation, please provide:
- A mitigation plan that includes measures to offset impacts at Vardell Creek.
- Mitigation that would improve ecological services in the Charleston Harbor watershed. and in the same salinity regime as impacted areas.
- Re-initiation triggers if the plan is modified.

Closing
We look forward to continuing to work with you on the Charleston Study. Please direct correspondence related to the EFH consultation to the attention of Ms. Cynthia Cooksey at our Charleston Area Office at (843) 460-9922 or by e-mail at Cynthia.Cooksey@noaa.gov.

Sincerely,

/ for

Pace Wilber
Acting Assistant Regional Administrator
Habitat Conservation Division

cc: COE, Parrish, Hadley
F/SER, Strelcheck, Fay, Rosegger
F/SER3, Bernhart, Shotts, Herndon
F/SER4, Cooksey, Karazsia, Wilber

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, CHARLESTON DISTRICT
69 A HAGOOD AVENUE
CHARLESTON SC 29403-5107

February 11, 2022

Mr. Andrew Strelcheck
Regional Administrator
Southeast Regional Office
NOAA Fisheries
263 13th Avenue South
St. Petersburg, FL 33701

Dear Mr. Strelcheck:

Please find attached the US Army Corps of Engineers, Charleston District's (USACE) response to the revised request for additional information from the National Marine Fisheries Service (NMFS) Habitat Conservation Division's letter dated 21 January 2022. This information pertains to USACE's request for consultation pursuant to Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act submitted to NMFS on 24 September 2021 for the Charleston Peninsula Coastal Storm Risk Management Study. If for some reason USACE has overlooked a question from the 21 January letter, please let us know immediately so that we may address it.

USACE is also providing new information in the attached letter with respect to a modification made to the structural measure and some related features of the Charleston Peninsula Coastal Storm Risk Management Study since the Essential Fish Habitat (EFH) Assessment was prepared and consultation was initiated. USACE has assessed the potential for effects of the modification on EFH and managed fishery resources and concluded that the proposed modification of the structural measure, which occurs entirely on land, will have no permanent, direct adverse effects that require compensatory mitigation. USACE has also concluded that the modification does not change USACE's other conclusions made with respect to other effects of the measures and features from the proposed Federal action that, either individually or in sum, would not have more than minor adverse effects on EFH and managed fishery resources, with implementation of the same minimization measures. USACE continues to seek a timely response from NMFS and the issuance of conservation recommendations, inclusive of the new information, for the Charleston Peninsula Coastal Storm Risk Management Study.

USACE requests that NMFS review the information provided in this response to their request for additional information by 18 February 2022. If further clarification is needed, please do reach out to Ms. Hannah Hadley at (208) 220-0961 or via email at

hannah.f.hadley@usace.army.mil during this time to discuss any technical issues before responding on 18 February 2022 so that we can collectively resolve them and move the consultation forward. Thank you very much.

Sincerely,

Nancy Parrish

Nancy Parrish
Chief, Planning and Environmental

SUPPLEMENTAL INFORMATION FOR THE ESSENTIAL FISH HABITAT ASSESSMENT FOR THE CHARLESTON PENINSULA CSRM STUDY

The alignment of the storm surge wall along the South Carolina Port Authority (SCPA) properties in the study area (Columbus Street Terminal and Union Pier) has been modified since the EFH Assessment was prepared for this study and consultation per the Magnuson-Stevens Fishery Conservation and Management Act was initiated on September 24, 2021, as a result of stakeholder/public input of the proposed Federal action sought under the National Environmental Policy Act. USACE worked with the SCPA to optimize a segment of the storm surge wall that previously paralleled portions of East Bay Street, Washington Street, and Morrison Drive. The storm surge wall was moved to the eastern edge of the SCPA's properties and on to Johnson Street (an access road to the port). This increased the total length of wall (on land) by 0.2 miles. Along with the shift in the wall, the location of two temporary pump stations in this area would shift from along East Bay Street onto SCPA property. The wall realignment would also necessitate ~10 additional pedestrian or vehicle access gates be added and 1 new storm (tidal flow) gate. The newly added gates would be similar to all of the other gates already proposed in the Federal action, constructed with the same methods, and operated in the same manner, which involves remaining open except during storm surge events. All of the same minimization measures proposed for the storm surge wall and associated gate and pump features would be applied. The figure below shows the realignment modification.

The storm gate would be added under Johnson Street where the street crosses over Vardell's Creek via an ~80 ft bridge. Vardell's Creek is a previously altered tidal creek off of the Cooper River in an urbanized area. At this location, the planned storm gate (or series of gate panels) would span the entire width under the bridge and clear the entire height under the bridge. The gate would be affixed to the existing bridge infrastructure. The storm gate is not expected to alter current conditions (or the future without project conditions) in Vardell's Creek when the gate is open, nor alter use by any managed fisheries species, such as penaeid shrimp. When the gate is occasionally, temporarily closed during surge events, the conditions would be similar to those evaluated for closure of storm gates on existing road culverts as a result of the proposed plan, including for the storm gate at Morrison Drive and New Market Creek. The effects on EFH and managed fisheries would be the same as already described for the storm gates in Conclusions #2 and #3 in the EFH Assessment, and the same for the hydraulic pumps described in Conclusion #4 in the EFH Assessments. These effects are also described in more detail in Sections 6.4.2 and 6.8.2 of the draft FR/EIS. The same minimization measures would be applied to the additional storm gate as all other storm gates, and the same minimization measures would be used for all hydraulic pump stations, including the use of water quality treatment devices on permanent pump stations. While NMFS did not take a position on water quality as a concern of the Federal action nor provide any conservation recommendations for water quality in the joint USFWS and NMFS' Fish and Wildlife Coordination Act Report for the study (finalized July 2021), if there are other minimization strategies NMFS would like to offer to reduce the potential for temporary effects on water quality for EFH that would reduce the future with-project condition to the future without project condition, USACE will consider them.

The alignment modification would eliminate condemnation of some private properties, reduce potential impacts on cultural/historical resources and visual resources in this area, and provide additional storm surge risk reduction benefits to critical port infrastructure. Overall, the realignment results in lower implementation costs and higher coastal storm risk reduction benefits.

USACE has determined that the realignment of the storm surge wall and resulting modifications in project features (gates, pumps) do not result in any different types of environmental effects than those already

evaluated under NEPA or in the existing EFH Assessment. They do not alter USACE's conclusion that the measures and features of the proposed Federal action, either individually or in sum, and with the use of the many minimization measures that are planned, would not have more than minor adverse effects on managed fish species or their EFH (with the exception of the permanent, direct saltmarsh impacts that will be compensated for, but the modified plan will have no effect on this).

HABITAT CONSERVATION DIVISION: REQUEST FOR ADDITIONAL INFORMATION

USACE offers the following responses to requested information found in NMFS' letter dated January 21, 2022 providing clarifications to USACE's letter dated December 22, 2021 that suggested the original request was too vague for USACE to appropriately respond. Only the first bullet below was retained from NMFS' original request in Appendix A – Habitat Conservation Division: Request for Additional Information letter to USACE from Mr. Strelcheck signed on November 23, 2021, in order to document that it was already satisfied.

The questions/information requested by NMFS are included below, with USACE's responses provided under each in blue text. The responses are informed by best available information, as required by the MSA, and are reflective of information typically evaluated during USACE Feasibility Studies.

Water quality and operations

- The future operating schedule for the pumps is uncertain due to climate change and transition of operations to the City of Charleston. We recognize the USACE intends to only use the pumps under certain circumstances and those circumstances are the basis of this study's analysis. However, ultimately control and ownership of the pumps will be turned over to the City of Charleston. It is unlikely the City would only operate the pumps in the same manner as the USACE, considering the potential for use to mitigate flooding already occurring on the Charleston Peninsula, such as the record tidal flooding occurring in November 2021. The City of Charleston has reported to news organizations, in November 2021, that from 1922 to 2014, there were fourteen times the City experienced tides over eight feet. Since 2015, the City has experienced twenty-three instances of eight-foot tides or higher (tides at which the gates would close). The USACE's analysis should include an assessment of the potential effects likely to occur in the future due to increased frequency of gate closures not related to storms and the potential for pumping. Also, given the results of the interior drainage analysis, the possibility exists that additional pumps may need to be installed and operated to mitigate for WSEL increases due to the project in some areas.
    - At the January 12, 2022 meeting between USACE and NMFS, NMFS' leadership verbally acknowledged their understanding that the proposed project would be operated for storm surge events only. As such, the requested assessment is not relevant to this study and will not be produced.

- Please provide a description of the following:
    1. Gate operations, including when gates would close (a clearly identified trigger so an assessment of trigger frequency can be determined) and expected and worst case estimates of how long gates would remain closed.
        - Note that NMFS did not specify which gates it is requesting information for. As such, USACE is limiting the response here to the storm gates, not upland gates, but it should be recognized that the operations and timing of the different access gates (transportation, pedestrian, rail, tidal flow, etc.) will vary so the information provided here will not apply universally to all gate types. While NMFS also did not specify locations of the gates it was requesting information for, the purpose and functions of the 11 storm gates at the seven planned locations will be the same, which is described below. It should be noted, though, that the surrounding environmental conditions at each storm gate location differ (for example, some storm gates exchange tidal flow to/from man-made lakes not tidal creeks) but since NMFS did not specify any specific locations, that level of detail will not be reiterated here, and can be referred to in the Draft FR/EIS.

Normal operations of the storm gates will consist of the storm gates remaining in the open position to allow for daily ebb and flow of the tide, passage of overland flow and aquatic resources, etc. In order for the proposed storm gates to function as intended, which is to contribute to reducing risks to life safety and property damages, all storm gates will be closed and watertight seals verified during the last low tide cycle prior to the "arrival of impacts" (NWS terminology) from a surge-producing event. If the last low tide cycle is too close to the onset of impacts that personnel cannot efficiently and safely close the gates, then the gates would be closed during the prior low tide cycle. Since a low tide occurs approximately every 12 hours, the gates should not be closed for any longer than 24 hours prior to the onset of storm impacts. This information would be described in the detailed Operations and Maintenance Plan developed for the project in the PED phase, and incorporated into the City of Charleston's emergency management plans.

Closure of the storm gates will likely require personnel to physically visit each location. Gates will be lowered via mechanical operators, either manual or electric, until closure is confirmed. Personnel will visually inspect that no debris or physical obstructions prevent the gate from fully closing, and that marine mammals (e.g, manatees, dolphins), sea turtles, or large fishes are not present at the immediate location of the storm gate before closing it, in order to prevent injuring them. Considering the tide level at time of closure and the existing man-made structures at most of the locations of the storm gates, their presence is unlikely. Considering the relatively short window of time between gate closure and onset of storm impacts (roughly 12 hours), it will be recommended that at least two crews work at closing storm gates simultaneously. For safety, it will also be recommended that there are at least two people per crew. Such gate closure protocols will be further developed during the PED phase of the project after the gates have been designed.

The actual time of gate closure will be dependent on any particular coastal storm, since each has their own individual timing, severity, and duration. After storm conditions pass, real-time local water level information and other meteorological products (to be defined) can be used to determine when the storm gates can be re-opened. Safe access will be the primary timeline driver for reopening the storm gates. Priority will be given to storm gates over other gates, except as needed for access to said storm gates e.g. a vehicle gate is required to be opened to gain access to storm gate location. As safe access conditions allow, storm gates could be opened within 12 hours after storm conditions pass from the area, but would be dependent on the post-storm conditions. Such gate opening protocols will be further developed during the PED phase of the project, after the gates have been designed.

A specific trigger(s) for when storm gates are warranted to close and re-open will be determined by USACE and the City of Charleston during the PED phase with input from experts based on relevant information such as predicted surge levels, measured water levels, emergency management information, and other considerations yet to be determined in PED. This information will be documented and incorporated into the project's Operations and Maintenance Plan, and the City's emergency management plans.

Historical information, albeit limited, can be a reference to understanding the potential sporadic frequency of storm gate closure. According to National Hurricane Center (NHC) data (https://www.nhc.noaa.gov/gis/), only four storm surge warning or watches have been issued for the Charleston area over the last five years (since 2017, which is when the NHC started issuing such forecasts). Of these, only 3 were storm surge warnings, and 1 was

a storm surge watch. Only one storm surge warning or watch was issued per year from 2017 to 2020, and none were issued in the year 2021. This is evidence that in some years, the proposed project could not be operated at all. While it might be reasonable to expect that in some years the project could be operated more than one time per year, this could still be considered infrequent considering that roughly 40 tropical storms were identified per year during that time period.

For the interior drainage modeling that was conducted for this study – which was for the purpose of determining if, when and how much rainfall mitigation might be needed as a result of the project, and not for determining storm gate operations – an assumption was used in the modeling that the storm gates would be closed for 36 hours. This was based on a simulation time of a 24-hour rainfall event, with an additional 12 hours to simulate time for the rainfall to runoff/drain from higher elevation, inland areas. This simulation time is a reasonable assumption, but does not indicate that this is a protocol for how long the storm gates would be closed. The simulation also assumed that the storm gates were already closed at low tide prior to the coastal storm arriving, so that could add an additional 12 hours of closed storm gate time (although not incorporated in this model), for a total assumption of 48 hours for this scenario.

In reality, a storm surge event may come and go in less time than the 36-hours used in the modeling, but this simulation allowed for a more conservative estimate that assumed the pump stations would be the only source of interior drainage relief due to rainfall while storm surge/elevated exterior water levels were present. In other words, the pumps are designed to mitigate for all interior rainfall flooding without having to rely on the operation of storm gates to assist in the drainage after water levels recede, nor does it account for the volume of rainfall that is drained through the municipal subsurface drainage system, which is the majority. In reality, having the ability to open storm gates after the water levels recede can be critical to removing rainfall faster but the tide must recede to a mean tide level that is low enough not to pose further flooding issues. This is a complex scenario that will require additional engineering, data, modeling, and understanding of expert meteorological information that cannot occur until the PED phase.

2. Pumping operations, including when pumping would occur (during a storm, after a storm has passed, or both) and the amount of time required to fully pump out impounded water.
    - Operations of the hydraulic pump stations will be finalized during the PED phase of the project, once additional engineering analysis and design are done, more information is available (e.g., current depiction of the City's subsurface drainage system), and the interior drainage modeling is re-run and evaluated with this refined information. However, a preliminary (feasibility-level) understanding of the operations of the hydraulic pumps can be taken from the interior drainage modeling conducted during the feasibility study, which can be found in a subappendix if the Engineering Appendix of the Draft FR/EIS.

      Using USACE guidance (EM 1110-2-1413), the pump stations (in tandem with the storm gates) were assessed for non-storm surge conditions, meaning the future without-project geometry was computed using various rainfall frequencies while assuming constant high tide (MHHW). The future with-project geometries, both open system and closed system, were computed using various rainfall frequencies while assuming steady constant tide (MHHW) and the results were compared to assess the potential for elevated water levels that could induce flood damages to structures, if left unmitigated. During the storm gates

open condition (non-storm surge), all storm gates are open, and the planned pumps are assumed to not operate, and the City's existing pumps are assumed to operate. During the storm gates closed condition (storm surge conditions), the storm gates are assumed to be closed for the entire 36-hour rainfall model simulation described above in Question 1 response, and during this time, the planned pumps are operable, and the City's existing pumps are operable. The pumps are assumed to remain on throughout the remainder of the simulation (see more on duration below). However, the pumps could be set to deactivate once the rainfall has been appropriately evacuated.

In the current modeling, the planned permanent pump stations are assumed to be set to activate when the water surface elevation at the pump station inlet, as a result of interior rainfall, reaches 3.36 feet NAVD88. It is well understood that the storms that typically produce tidal surges (i.e., hurricanes and nor'easters) can also produce somewhat significant rainfall. Likewise, high rainfall events may be accompanied by some degree of storm surge. Historical accounts of these are provided in the H&H Subappendix of the Engineering Appendix of the Draft FR/EIS. Peak rainfall may occur many hours before and/or after a storm surge. Therefore, the pumps may activate due to the onset of rainfall prior to surge inundation arriving and could still be activated if rainfall is still occurring after storm surge has dissipated.

Pumping time will vary per pump station location and the size (watershed or service area) for which the pump station serves. The 36-hour model simulation (24-hour rainfall event) which assumes storm gates to be closed throughout the entire simulation illustrates that pumps (once activated) may generally pump for approximately 12-16 hours in larger drainage areas (permanent pump stations) such as Halsey Creek. Pumps may only be needed for a few hours in smaller drainage areas. In other words, pumping the rainfall runoff is assumed to occur until the interior water level draws down to a similar level to that of the future without-project for the same hydrometeorological event.

Please also clarify if heavy rainfall will require pumping at any of the mobile or permanent stations even when gates are kept open due to the wall and gates slowing runoff to the rivers.

- The primary objective of the planned pump stations is to pump interior rainfall that coincides with a storm surge event that would "trigger" storm gate closure (to be defined in the PED phase). The current interior drainage modeling illustrates that the future with-project generally does not increase (or insignificantly increases) interior water levels as compared to the future without-project for the more frequent rainstorms such as the 50% AEP (annual exceedance probability) (2-year) and 20% AEP (5-year) events. The future with-project condition has similar results (insignificant increases in interior water levels) for less frequent events such as the 10% AEP (10-year) rainfall. Areas such as Newmarket Creek and Vardells Creek show little to no difference in flooding for future-with versus future without-project for such an event (10% AEP). Based on the current modeling and assumptions (best available information), the planned pumps (both permanent and temporary) are only expected to operate when the gates are closed. However, there are some specific locations which need further evaluation during the PED phase with additional engineering and data. During the PED phase, a site-by-site assessment will be completed to continue to appropriately size each pump station and to further assess the need for pumps to operate during storm gates open and closed conditions for the larger, less frequent rainfall events. If modifications are needed, the proposed minimization measures for the pump stations would continue to be applied (e.g., water quality treatment for permanent pump stations).

3. Water quality treatment before discharging via open gates or pumps, including specifications on technologies used, water quality targets, and monitoring done before discharges to verify targets are met. At a minimum, the treatment and monitoring should focus on temperature, salinity, and the concentration of dissolved oxygen (DO).
    - All of the proposed permanent hydraulic pump stations will treat the existing condition stormwater runoff of the future without project. According to the City of Charleston's Department of Stormwater Management, during a storm, nutrient loads in the stormwater are not high because the study area is highly urbanized. Sediment can be an issue in local stormwater, though. The specific water quality treatment devices for the planned pumps will be identified in the PED phase when the pump stations are designed. The pumps will be designed to meet state water quality standards. USACE is not aware of any special water quality standards for the existing hydraulic pumps in the study area such as for temperature, salinity, or dissolved oxygen specifically, nor is any monitoring required in their Federal or state permits. These existing pump stations discharge into the Ashley and Cooper Rivers. The water quality treatment devices for the planned permanent pumps will be similar to those the used in the currently permitted hydraulic pump stations in the study area. For example, at the City's current pump station at Spring and Fishburne Streets, a sediment basin is used (since sediments are the primary concern) to remove solids and the pollutants that tend to bind to them, such as metals, phosphorous, BOD/COD, etc.

    - No water quality treatment is planned for the existing condition stormwater runoff that would be temporarily held when the storm gates are closed in the future with-project. While this may contribute to an additional decrease in the already degraded stormwater runoff, the runoff would also be mixed with direct rainfall while it is temporarily held during the storm event. This effect would be infrequent (see frequency response in question 1 above), and temporary until storm gates are re-opened (see scenarios referred to in question1 above). When storm gates are re-opened, the water behind the gates would be mixed and equilibrated with the water quality conditions outside of the gates, which is likely to be of equal or lower quality due to the storm event and in a much larger volume than the held water (see response to question 4 below). As such, any potential temporary treatment of water behind the gate would not likely provide any measurable benefit to aquatic resources. Aquatic resources behind the gates would already be reduced in abundance since the gates would be closed at low tide, and in some locations, habitats behind the gates are either not EFH or are already being compensated for impacts. In addition, during a coastal storm, aquatic resources seaward of the gates would also be experiencing storm-related reduced water quality conditions. Finally, the feasibility is also low of operating any kind of timely in-situ water quality treatment in a tidal creek system for such occasional and short-term events, when life safety and significant economic damages are at risk.

4. Estimates of the effects of all discharges on overall DO and other water quality parameters in adjacent tidal creeks and emergent wetlands, including the distance from each point-source that impacts will be detectable during the design flood event.
    - Based on the locations and functions of the hydraulic pumps, as described in Section 2.3 of the EFH Assessment and during a meeting between USACE and NMFS on February 8, 2022, the concentrations of dissolved oxygen and other water quality metrics in runoff that would be collected by the proposed pumps would be of the same

concentrations found in runoff in the study area without the project, as it would flow overland into surrounding waterbodies, or into the City's subsurface drainage system, or as it would be collected by the existing permitted hydraulic pumps in the study area. The planned permanent pump stations would collect/receive the rainfall/stormwater runoff as it flows over land towards the new storm surge wall, in the same manner as the City's existing pump stations. When the storm gates are closed, the pumps are activated to mitigate for rainfall flooding by collecting and removing the water before it causes flood damages. USACE modified the locations of the pumps so that they are not below the high tide line, but rather on high ground in sloping areas. Since the project will have no effect on the quality of stormwater that is received by the pumps, a characterization of the concentrations of DO and other water quality parameters either currently found in stormwater runoff or in the future without the project, is beyond the scope of this study. Stormwater that is discharged from the planned pump stations would be similar to the discharges from the City's existing pump stations that are of similar size/capacity which are already permitted to discharge into saltmarsh wetlands and tidal rivers. Since monitoring of discharges is not required at the existing pump stations, the levels of specific water quality parameters in the discharges are not known. Since the planned permanent pump stations for this study would treat the runoff that is collected before discharging it, the pumps would improve the quality of stormwater runoff discharged into surrounding waterbodies compared to the stormwater runoff that enters surrounding waterbodies from overland flow without the project. It is unknown how far the treated water would extend through the creeks or rivers where it will be discharged, and USACE is not aware of such information being requested or required for other permitted hydraulic pump stations in the study area. If the treated water is improved from the without project condition, this would not be considered an adverse effect.

- For the storm gates, it should be noted that in some proposed locations, runoff is essentially already "held" by man-made water retention basins (e.g., Alberta Long Lake and Colonial Lake) and discharged/drained into saltmarshes and surrounding waterbodies, and that these locations are not required to be monitored to meet any water quality standards. The temporary and infrequent operation of storm gates in these locations is not expected to alter the existing water quality conditions behind or released from the proposed gates, based on the current design and functions of these man-made structures. Therefore, no further assessment for storm gate impacts on EFH or managed species is needed at these locations.

  Of the remaining five storm gate locations, Halsey Creek is the only location where the proposed storm gates would create discharge points that are not already present in the future without project. In the other four locations, current discharges are controlled by existing partial tidal restrictions (culverts or bridges that run under roads or embankments). The planned storm gates would influence the timing of release of water during their infrequent use, but the majority of the time, discharge of any runoff through these structures will be the same with and without the project, regardless of the quality of the discharge.

  Existing water quality in the planned gated location at Halsey Creek, at the gated location at Gadsen Creek, and at the drainage channel that connects the Citadel marsh to the Ashley River are not known. In the planned gated culvert location at New Market Creek, the mean summertime dissolved oxygen concentration was 4.3 mg/L in 2015,

while salinity was 22 ppt, specific conductivity was 35.75 mS/cm, and pH was 7.4 (data provided by SCDNR Tidal Creek Project). This data was collected in the lower part of the reach below two of the creek's partial tidal restrictions so may not be representative of water quality in all of the creek. In the last planned gate location at Vardell's Creek, the only water quality data that is available is from over 25 years ago. In 1994, mean summertime dissolved oxygen saturation was 59%, salinity was 17 ppt, specific conductivity was 30.14 mS/cm, and pH was 7.2 (data provided by SCDNR Tidal Creek Project). According to SCDNR, benthic data collected at both of these creeks are representative of communities indicative of stressed conditions of first order creeks in urbanized watersheds.

USACE is not aware of any water quality data available in any of these specific tidal creeks prior to, during, and after a major coastal storm event, which would be the future without project conditions for operation of the project. There is a growing body of literature on post-hurricane conditions in estuaries that indicate salinity, dissolved oxygen, total suspended solids, and other water quality parameters are dramatically altered and degraded, and that these changes can persist for one week to over a month before normalizing to pre-storm conditions, depending on such factors as location, storm track, storm surge, and rainfall amounts. USACE can make a subset of this literature available to NMFS for their reference, if necessary. An assessment of the future without project water quality conditions caused by coastal storms and an evaluation of how these conditions affect EFH, managed fish species, and threatened and endangered species and their critical habitat in the study area is beyond the scope of this study.

USACE has concluded that in the future with project conditions when the storm gates are closed at low tide for a storm surge event, stormwater runoff will collect in the five tidal creek/saltmarsh areas identified above. This stormwater is expected to be high in total suspended solids but not necessarily nutrients, similar to the without project conditions. During the time the storm gates are closed, which could be estimated to be 48 hours (see response to question 1 above) but could be more or less time depending on any given storm, the quality of the stormwater runoff could continue to degrade without the normal influx and mixing of tidal water, however the held water would be receiving direct rainfall. This could infrequently and temporarily contribute to an adverse effect on future without-project water quality behind the gate. USACE has further concluded that any degraded water quality in the small volumes of water held behind the storm gates relative to the volume of water found in the tidal creeks and connecting tidal rivers (Ashley and Cooper Rivers), when released into the already degraded post-storm tidal waters, would contribute a nominal cumulative or synergistic effect to the without project water quality conditions. It is unclear from NMFS what the effects of without project conditions on water quality caused by hurricanes or similar coastal storms are on EFH and managed species in the study area. Such an assessment by USACE would be beyond the scope of this study. With no available information on how without project conditions of altered water quality affects EFH to characterize the EFH effects of this study outside of the gates, USACE is unable to evaluate if the with-project water quality conditions when gates re-open would affect EFH.

Living shorelines

Please provide the following items (adapted from pages 15-25 of the *Guidance forConsidering*

the Use of Living Shorelines) including a description of the:

- Physical site conditions including wave energy and history of erosion.
  Existing information from Jackson, C. (2017) was used to understand shoreline stability conditions at the feasibility-level study, which identified erosional hotspots throughout the study area. This information was also used in conjunction with the South Carolina Office of Ocean and Coastal Resource Management's (SC OCRM) Hazard Vulnerability Assessment Tool in order to understand where eroding shorelines are vulnerable to various coastal hazards, including storms and sea level rise.

- Quality of habitats and characterization of fish utilization along the shoreline.
  While NOAA's guidance may recommend this information be characterized, it is not consistent with the site attributes recommended by the state of South Carolina as being the most important to consider prior to installing living shorelines in South Carolina (SCDNR 2019). Habitat quality and fish utilization information is also not required by anyone seeking a state permit who may want to install a living shoreline for erosion control, such as a private land owner, per sections R.30-1D(31) and R.30-12.Q of state regulations S.C. Code Sections 48-39-10 et seq. The attributes recommended for consideration in SCDNR (2019) include site access, oyster proximity or salinity, energy level, bank slope and width, sediment firmness and composition, escarpment, and vegetation characteristics – especially if planting is involved. USACE intends to evaluate these parameters during the site suitability surveys that will be conducted in the PED phase. Discussions with local experts during the feasibility study suggest there is a low risk that the sites will not be suitable for reef establishment, given the number of other living shoreline projects that have been installed in the area, including even farther up the Ashley River than the current study area, and the presence of natural reef patches.

- Sea level rise considerations incorporated into project design.
  As with all other measures and features of the proposed plan, the reef-based living shoreline sills will not be designed until the PED phase. However, SCDNR (2019) suggests that based on research conducted by others, oyster reefs are able to naturally adapt and keep pace with rising sea levels. It is not anticipated at this time that the design of the oyster reef-based living shoreline sills would incorporate any special considerations for sea level rise but this could be re-considered in the PED phase depending on the state of the science.

- Habitat considerations reflected in the design.
  As with all other measures and features of the proposed plan, the reef-based living shoreline sills will not be designed until the PED phase. The materials and design of the living shorelines will be based on the results of the site suitability surveys conducted in PED and are anticipated to be similar to the designs shown to be effective in similar living shorelines projects in the study area, or elsewhere in South Carolina with comparable site conditions.

- Compliance with local regulations, including verification that the size of the structure minimizes impacts to subtidal habitats while also protecting upland infrastructure. Please ensure that living shorelines will not encroach into subtidal habitat any more than necessary to protect threatened infrastructure as South Carolina regulations (R.30-12.Q. of state regulations S.C. Code Sections 48-39-10 et seq.) indicate that impacts to non- vegetated habitats should be minimal, and the size and extent of living shorelines shouldbe limited to what is reasonable.
  As with all other measures and features of the proposed plan, the reef-based living shoreline sills will not be designed until the PED phase. As indicated above and in the EFH Assessment,

the living shoreline sills would be compliant with the specific project standards in sections R.30-1D(31) and R.30-12.Q of state regulations S.C. Code Sections 48-39-10 et seq. SC OCRM is responsible for determining if a Federal action is consistent with state coastal zone regulations. SC OCRM has already concurred that the proposed plan of the current study is consistent, including for the said regulation.

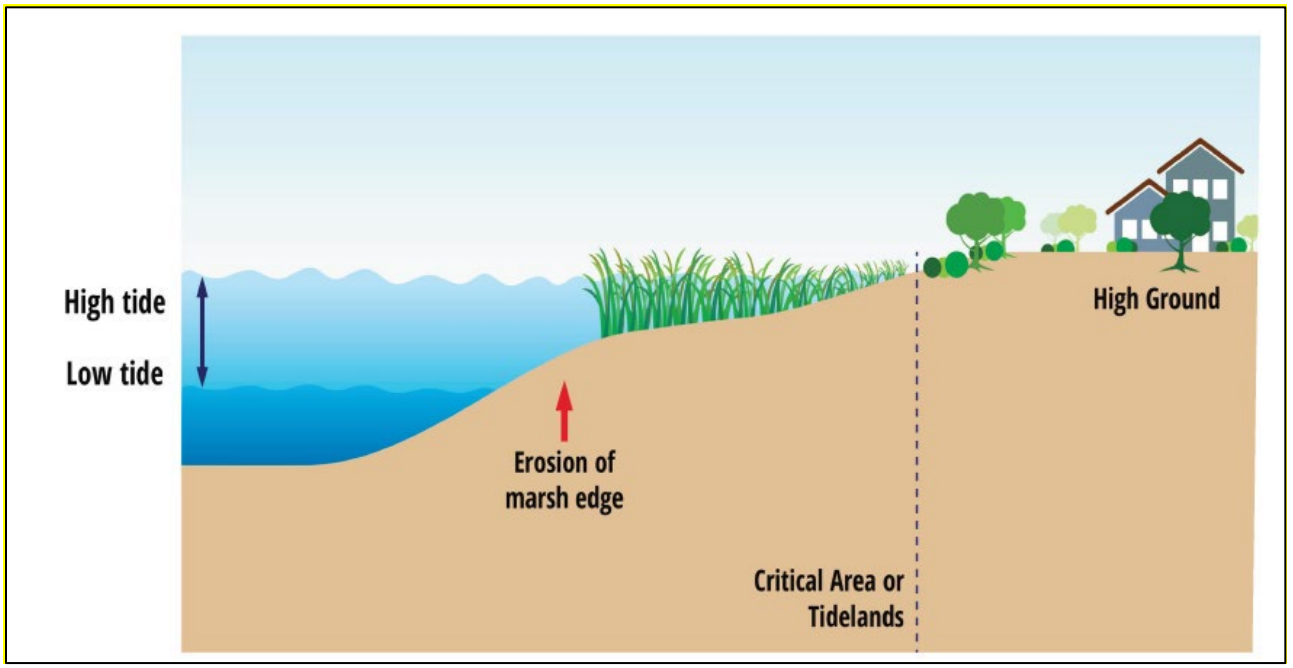
- Site suitability including the proximity of infrastructure to erosional habitat to justify altering the natural shoreline.

  Site suitability surveys for the living shoreline sills will be conducted during the PED phase. As discussed during the meeting between NMFS and USACE on February 8, 2022, if, as a result of the site suitability surveys, it is determined that the erosion and coastal hazard vulnerabilities would not exist in the future with-project condition to warrant erosion minimization measures, and that the use of NNBFs would not be overall beneficial to the environment, then the living shorelines would not be installed in those locations. It should be noted that SC OCRM determined, when proposing it's amendment to R.30-1 and R.30-12 of S.C. Code Sections 48-39-10 et seq., that "Living shorelines benefit the state's tideland ecosystems by maintaining, restoring, or enhancing natural estuarine processes that improve water quality, reduce shoreline erosion, protect property, and enhance aquatic habitats….There is no anticipated detrimental effect on the environment and/or public health associated with these proposed amendments."

- Public access considerations, e.g., addressing NMFS Protected Resources Division concerns about fishing line and entanglement.

  The reef-based living shoreline sills would be placed parallel to the shoreline in the intertidal zone, between the low and high tide (see red arrow in figure below from SCDNR 2019). They would not interfere with the navigation channel or most recreational boating. Once they are constructed, the sills may limit some non-motorized boats from accessing the shoreline in those locations. It is expected that signage will be used to identify the location of the sills. There is a public fishing pier located in Brittlebank Park where some of the living shoreline sills are planned. There are also existing small scale living shoreline projects in this area. USACE is not aware of issues with recreational fishing affecting the existing projects, but potential minimization measures could be considered if NMFS has recommendations. USACE is not aware of any issues of entrapment of aquatic resources with the existing living shoreline projects, which are intended to mimic and evolve into natural reef structures over time. USACE intends to use sill designs that would be similar to those used for other projects shown to be effective in the study area, or elsewhere in South Carolina with comparable site conditions.

  During construction of the living shoreline sills, all in-water work would occur at low tide for proper placement of the substrate in the intertidal zone, and would occur parallel and in close proximity to the shoreline. This may deter access to saltmarsh edge habitat by some managed species but would be temporary while construction is occurring. The living shoreline construction is not expected to block migratory pathways in the Ashley River for managed fish species, and USACE is not aware of this being a concern during construction of other living shoreline projects across the state.



Compensatory mitigation amounts and type

Please provide:

- A mitigation plan that includes measures to offset impacts at Vardell Creek
    - See supplemental information for the EFH Assessment provided on pages 1 and 2 of this document. USACE has concluded that the addition of the storm gate under Johnson Street at Vardell's Creek would not have any permanent adverse effect on tidal flow (not alter current hydrology) and therefore would not lead to any permanent indirect adverse effects on EFH or managed species. Therefore, compensatory mitigation is not appropriate, and no change is needed to the Draft Mitigation Plan. This is the same conclusion made for other storm gates in the EFH Assessment that will be installed at existing partial tidal restrictions.

- Mitigation that would improve ecological services in the Charleston Harbor watershed and in the same salinity regime as impacted areas.
    - 33 CFR Part 332 identifies requirements and regulates how USACE should achieve compensatory wetland mitigation. Compensatory wetland mitigation that is in-kind in the primary service area is preferred, and would be prioritized at the time a commitment is made to purchase credits from a specific wetland mitigation bank. That time will not come until much later in the PED phase after project engineering is near complete. However, wetland mitigation bank selection will be influenced by which banks are approved and permitted at that time, and the availability and cost of credits. An updated version of the Draft Mitigation Plan was sent to NMFS, along with other natural resource agencies, on January 26, 2022, that outlines a framework for achieving compensatory wetland mitigation that is attainable based on current information and compliant with 33 CFR Part 332. USACE will continue to coordinate with natural resource agencies throughout the process of finalizing the Draft Mitigation Plan.

- Re-initiation triggers if the plan is modified
    - NMFS has the authority to request that review be re-opened under the Magnuson-Stevens Act during the PED phase, in accordance with 50 C.F.R. 600.900(l) which states "Supplemental consultation. A Federal agency must reinitiate consultation with NMFS if the agency substantially revises its plans for an action in a manner that may adversely affect EFH or if new information becomes available that affects the basis for NMFS EFH Conservation Recommendations." USACE will continue to meet with and engage the Interagency Coordination Team (ICT) throughout the PED phase to keep them fully aware/informed of any modifications that would be made to the Mitigation Plan. The Charleston District has proven experience in engaging agencies during the PED phase of the Post 45 Project, and this study, if authorized and funded, would be no different.

References

Jackson, Chester W. 2017. "Mapping Coastal Erosion Hazards Along Sheltered Coastlines in South Carolina, 1849 – 2015." Summary Report submitted to South Carolina Office of Ocean and Coastal Resource Management and US Army Corps of Engineers Charleston District. Georgia Southern University, Applied Coastal Research Lab, 2017.

South Carolina Department of Natural Resources (SCDNR). 2019. Summary of Living Shoreline Research to Inform Regulatory Decision-Making in South Carolina. Charleston, SC: South Carolina Marine Resources Division. Technical Report No. 110. 49 p.

COASTAL ZONE MANAGEMENT ACT - FEDERAL CONSISTENCY REVIEW

Healthy People. Healthy Communities.

January 11, 2022

Ms. Bethney Ward
US Army Corps of Engineers
69A Hagood Ave
Charleston, SC 29403

RE: Charleston Peninsula Storm Risk Management Study - US Army Corps of Engineers, HPC-ZJRQ-WQH0B

Dear Ms. Ward:

This Coastal Zone Consistency Determination Conditional Concurrence is in response to the U. S. Department of Defense, US Army Corps of Engineers' Coastal Zone Consistency Determination submitted to South Carolina Department of Health and Environmental Control Office of Ocean and Coastal Resource Management (SCDHEC OCRM) on September 14, 2021. SCDHEC OCRM's review began on September 14, 2021. SCDHEC OCRM received notification of changes to the proposed activity on December 6, 2021, to include changes in proposed wall alignment, additional living shorelines, and study name change.

The proposed activity consists of draft integrated Feasibility Report and Environmental Impact Statement (FR/EIS) related to the planning process of the Charleston Peninsula Coastal Storm Risk Management Study (Study). The Study was initiated in October 2018 to evaluate actions that would reduce risk to the Charleston Peninsula from coastal storm surge inundation in conjunction with the City of Charleston, non-federal sponsor. The tentatively selected plan (TSP) formulated from this study includes the construction of a storm surge wall along the perimeter of the peninsula. The storm surge wall would be constructed along the perimeter of the peninsula to reduce damages from storm surge inundation. On land, the storm surge wall would be a T-wall with traditional concrete stem walls and pile supported bases. In the marsh, the storm surge wall would be a combination wall (combo-wall), which consists of continuous vertical piles on the storm surge side and battered piles on the other side, connected by a concrete cap. It would be strategically aligned to minimize impacts to existing wetland habitat, cultural and aesthetic resources, and private property while allowing continued operation of all ports, marinas, and the Coast Guard Station. The wall would tie into high ground as appropriate, including the shoreline at the Citadel and the existing Battery Wall. Due to its age and uncertainty about the integrity of the structure, the High Battery would be reconstructed to meet USACE construction standards and raised to provide a consistent level of performance. The proposed elevation of the storm surge wall is 12 feet North American Vertical Datum of 1988 (NAVD88).

The alignment of the wall proposed within the FR/EIS has been optimized to minimize costs and impacts to the study area. Changes to the alignment may occur during the Pre- construction Engineering and Design (PED) phase as appropriate. Drivers of the potential changes include, but

are not limited to, new developments in technology or construction methodologies, results of additional engineering analyses, unforeseen cultural and historic resources, the presence of buried utilities not discovered during feasibility, and real estate acquisition challenges. Also, during the PED phase, changes will occur for the purpose of aesthetic and cultural mitigation that could not be identified during the feasibility study because they inherently relate to detailed designs.

The approximately 7.1 non-continuous mile storm surge wall would include multiple pedestrian, vehicle, railroad, and storm (tidal flow) gates. Typically, the gates would remain open, and gate closure procedures would be initiated based on storm surge predictions from the National Weather Service. When major flooding is expected from storm surge, storm gates would be closed at low tide, to keep the rising tide levels from taking storage needed for associated rainfall. For the vehicular, pedestrian, and railroad gate closings, timing of the closure would be dependent on evacuation needs and the anticipated arrival of rising water levels that close transportation arteries. Specific gate operation procedures would be developed during the PED phase. Specific responsibilities of the non-Federal sponsor regarding execution of work will be described in the Project Partnership Agreement, a legally binding document between the Federal Government and the non-Federal sponsor, as well as the operations, maintenance, repair, replacement, and rehabilitation (OMRR&R) manual.

Five permanent and five temporary pump stations of low to moderate size, ranging from 20 to 90 cubic feet per second (cfs), would be installed. The purpose of the hydraulic pumps is to mitigate for rainfall flooding that may occur in the interior of the proposed wall. These pumps would be consistent in size with the smaller pumps currently permitted and operated by the City of Charleston.

Additionally, nonstructural measures are included in the FR/EIS in residential areas where construction of the storm surge wall would not be practical due to topography of the peninsula or other existing constraints. The nonstructural measures would include increasing the elevations or floodproofing structures. Neighborhoods that are largely equal to or higher than the proposed wall elevation, or separated from high-risk areas by high ground, have been identified for nonstructural measures. Those neighborhoods include Lowndes Point on the north-western edge of the peninsula, Bridgeview Village on the north-east edge of the peninsula, and the Rosemont community in the Neck Area of the peninsula. Wet floodproofing measures, such as elevation of utilities, would be applied in the Lowndes Point area because residential structures are already elevated above 12 feet NAVD88. Dry floodproofing measures would be applied to Bridgeview Village and elevation measures would be applied to the Rosemont neighborhood due to the nature of the construction materials and techniques used in these communities.

In association with the storm surge wall, oyster reef-based living shoreline sills would be constructed in some locations to reduce coastal storm impacts to natural shorelines and other resources seaward of the wall. The living shoreline sills would reduce erosion of existing wetland marsh, while reducing scour at the proposed storm surge wall. The living shorelines would also provide other environmental benefits. The reef-based living shoreline method/design would be determined during the PED phase.

Pursuant to 15 C.F.R. § 930.4 SCDHEC OCRM ***conditionally concurs*** with the determination that the project is consistent to the maximum extent practicable with the following conditions below

to ensure consistency with the enforceable policies contained within the S. C. Coastal Zone Management Program (SCCZMP) pursuant to 15 C.F.R. § 930.55. This concurrence is based upon the review of the Guidelines for Evaluation of All Projects as well as the Wildlife and Fisheries Management, Activities in Areas of Special Resource Significance *(Navigational Channels, Public Open Spaces and Wetlands)*, Stormwater Management *(Runoff)*, Beach and Shoreline Access, Geographic Areas of Particular Concern *(Areas of Special Historic, Archeological, or Cultural Significance)* policies contained in the SCCZMP.

1. As this project is a Federal Agency Development Project (15 CFR 930.31(b)), this concurrence is only for the planning and study phase under the FR/EIS. When the project moves to the PED and construction phases of the development project, a consistency determination is required for each of these major phases to ensure a continued consistency with the enforceable policies of the SC Coastal Zone Management Program.

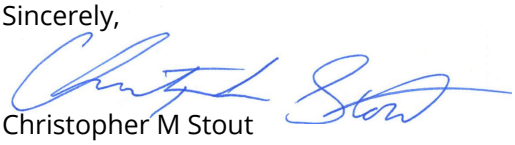
2. This concurrence is only applicable should the project continue as a direct federal agency activity to be carried out by the US Army Corps of Engineers. If at any time, the project will be conducted by the identified non-federal sponsor, or another non-federal agency entity, all review and work will require a SCDHEC OCRM Critical Area Permit.

3. Coastal resource effects to the salt marsh, species habitats, and cultural resources must be adequately mitigated for. SCDHEC OCRM must be included in the review of those mitigative measures during the future phases of the development project.

Please contact me if you have any questions about this concurrence or the conditions within it. It is our intention to work with the US Army Corps of Engineers to address any concerns that you may have as to how this project can be consistent with the enforceable policies of the SCCZMP.

Please contact me if you have any questions about this concurrence.

Sincerely,



Christopher M Stout
South Carolina Department of Health and Environmental Control
OCRM - Coastal Zone Consistency
stoutcm@dhec.sc.gov

Coastal Zone Consistency (Federal Consistency) Review for USACE's Charleston Peninsula Coastal Flood Risk Management Study, Charleston, South Carolina September 2021

Background

The South Carolina Coastal Management Program was authorized in the South Carolina Coastal Tidelands and Wetlands Act of 1977 (Statutory Code Ann. Section 48-39-10 et seq.). The South Carolina Department of Health and Environmental Control Division of Ocean and Coastal Resource Management (SCDHEC OCRM) is responsible for the implementation of the state's program. The goals of the South Carolina Coastal Management Program are attained by enforcement of the policies of the State as codified within the South Carolina Code of Regulations (SC Code of Regulations Chapter 30).

The national Coastal Zone Management Act of 1972, as amended, requires that each Federal agency activity performed within or outside the coastal zone that affects land or water use, or natural resources of the coastal zone, be carried out in a manner which is consistent to the maximum extent practicable, i.e. fully consistent, with the enforceable policies of approved state management programs.

The U.S. Army Corps of Engineers, Charleston District (USACE) is currently conducting the Charleston Peninsula Coastal Flood Risk Management Study to investigate and recommend potential structural, nonstructural, and natural or nature-based solutions to reduce damages and life safety impacts from coastal storms. The authority to study coastal South Carolina, including the Charleston Peninsula, was provided in the Rivers and Harbors Act of 1962, P.L. 87- 874, Section 110, and a subsequent Senate Committee Resolution dated 22 April 1988. Funding for the study was appropriated by the Bipartisan Budget Act of 2018 (Public Law 115-123), Division B, Subdivision 1, Title IV. The City of Charleston requested this study and is the non-Federal sponsor. As a result of the study, USACE has identified a Tentatively Selected Plan, also considered the proposed Federal action. This Tentatively Selected Plan was determined to be the National Economic Development Plan (meaning it maximizes the storm risk reduction benefits for the cost) and to have the least environmental impacts of the action alternatives considered. In compliance with the National Environmental Policy Act (NEPA), a draft integrated Feasibility Report/Environmental Impact Statement (FR/EIS) has been prepared for the study and accompanies this Federal Consistency review. It is available on USACE's website at: https://www.sac.usace.army.mil/Missions/Civil-Works/Supplemental-Funding/Charleston-Peninsula-Study/.

According to 15 CFR 930.37, a Federal agency may use its NEPA documents as a vehicle for its consistency determination with the Coastal Zone Management Act. Therefore, in compliance with the Coastal Zone Management Act of 1972, USACE has reviewed the proposed Federal action for consistency with the enforceable policies of the 1979 South Carolina Coastal Zone Management Program of SCDHEC OCRM, and prepared this consistency determination, supported by detailed information within the draft FR/EIS. Below is a summary of the proposed Federal action, the Federal Consistency review, and USACE's conclusion. The draft FR/EIS should be referred to for more information.

Description of Federal Action

The location of the proposed Federal action is the Charleston Peninsula study area (approximately 8 square miles of the lower Charleston Peninsula within the City's jurisdiction, see Figure 1). The region of influence for environmental effects includes the study area and the adjacent waterways of the Charleston Harbor, lower Ashley River, and lower Cooper River, as well as communities and historical resources outside of the study area that align those waterways. Notable areas that are not in the region of influence of the proposed Federal action are the Atlantic Intracoastal Waterway and barrier islands flanking the Charleston Harbor.

The following objectives have been identified for the Charleston Peninsula Coastal Flood Risk Management Study:

- Reduce risk to human health, safety, and emergency access from coastal storm surge inundation on the Charleston Peninsula through the 50-year life of the project, estimated to be 2032 to 2082.
- Reduce economic damages resulting from, and increase resilience to, coastal storm surge inundation on the Charleston Peninsula through the 50-year life of the project, estimated to be 2032 to 2082

The proposed Federal action to meet the study objectives includes construction of a storm surge wall of 12 ft elevation NAVD88 along portions of the perimeter of the Charleston Peninsula, nonstructural measures in the form of elevating and flood proofing for a limited number of structures, and natural and nature-based features in the form of large-scale oyster reef-based living shoreline sills. The approximate locations of these measures are shown in Figure 1 and are described in much more detail in the draft FR/EIS. Conceptual drawing and examples of the structural measures can be found in the Engineering Appendix. A summary of some key features of the measures are provided here.

Figure 1. Map showing the study area and approximate locations of the measures in the proposed Federal action.

Approximately 7.1 non-continuous miles of the perimeter storm surge wall would be constructed on land; approximately 1.5 non-continuous miles would be constructed through saltmarsh wetlands. The wall would be constructed of concrete, and on land it would be a T-wall design and in the marsh, it would be a combination design. For the combination wall, 12x12 ft prestressed concrete sheet piles would be battered at an inclination from vertical, using a hammer. The actual height of the wall at any given location will vary depending on the existing ground elevation, so that in total the height of the land and the wall reaches 12 ft NAVD88 to reduce the impacts of storm surges up to this height.

In relation to the storm surge wall, a number of features are being proposed. A series of gates would be needed in the wall to allow for daily access by pedestrians and transportation where the wall would intersect with existing infrastructure. The preliminary number and conceptual locations of the upland gates are discussed in the draft FR/EIS. Storm gates in the form of sluice gates are also needed to allow for daily tidal exchange in areas that intersect with the proposed wall. Five storm gates would be installed in the combination wall at Halsey Creek, and five storm gates would be installed at existing culverts that traverse several creeks or channels. These are also described in more detail in the draft FR/EIS. Gates would be closed during a storm surge event, and otherwise remain open.

A walking path for pedestrian transportation is planned on top of portions of the storm surge wall where it is located on land in the place of current sidewalks, similar to the promenade on the current Battery seawalls. The wall would also include aesthetic design features that are consistent with the current character of the Charleston Peninsula, which will be determined in a later design phase, if the project is authorized for funding.

Five permanent and five temporary pump stations of low to moderate size, ranging from 20 to 90 cubic feet per second (cfs), would be installed. The purpose of the hydraulic pumps is to mitigate for rainfall flooding that may occur in the interior of the proposed wall. These pumps would be consistent in size with the smaller pumps currently permitted and operated by the City of Charleston. The pumps are described in the draft FR/EIS, including their preliminary locations. The final number and locations of the hydraulic pumps will be verified in a later phase of the project, if it is authorized for funding. However, they are not expected to change considerably.

For nonstructural measures, elevating and floodproofing of structures have been proposed in residential areas where construction of the storm surge wall would not be practicable due to topography and other constructability constraints. For example, dry

floodproofing measures would be applied to the Bridgeview Village neighborhood and elevation measures would be applied to the Rosemont neighborhood due to the nature of the construction materials and techniques used in these communities. Wet floodproofing measures, such as elevating utilities, would be applied in the Lowndes Point neighborhood because residential structures are already elevated above 12 feet NAVD88.

Finally, in association with the storm surge wall, approximately 9,3000 linear feet of oyster reef-based living shoreline sills would be constructed in strategic locations to reduce coastal storm impacts to natural shorelines and other resources seaward of the wall. The living shoreline sills would reduce erosion of existing wetland marsh, while reducing scour at the base of the proposed storm surge wall. The living shorelines would also provide other environmental benefits, such as habitat for fish and wildlife. The exact locations would be verified in a later phase of the project, if it is funded, but they have been proposed in areas where small scale living shoreline projects have already shown success.

Coastal Zone Consistency Review

USACE reviewed the policy groups of the South Carolina Coastal Zone Management Program to determine Federal Consistency, based on their relevancy or applicability to the proposed Federal action. The policy groups that were considered for determining if the proposed Federal action is consistent with the enforceable policies of the South Carolina Coastal Zone Management Program included: Fish and Wildlife Management, Geographic Areas of Particular Concern, Areas of Special Resource Significance, Erosion Control, Shoreline Access, and Stormwater Management.

Additionally, the proposed Federal action would take place in "Critical Areas." Impacts on Critical Areas were taken into consideration while reviewing the policy groups. All of the tidelands and coastal waters in the study area and region of influence are within Critical Areas. Policies related to Areas of Special Resource Significance are focused on Navigation Channels and Public Open Spaces for consistency, and not tidelands because all of the tideland impacts are within Critical Areas. For clarification, there are no barrier islands or beach/dune systems in the study area nor the study's region of influence so policies related to these resources were not considered.

Action information and its consistency with the relevant policy groups is summarized here. Any policy groups not listed here were considered not applicable.

a) Wildlife and Fisheries Management – Consistent

i. Management

The proposed Federal action has the potential to affect approximately 35 acres of salt marsh wetland habitat and approximately 0.5 acres of sandy, intertidal flat habitat. This would result from approximately 1.5 miles of the proposed storm surge wall being constructed in seven different coastal wetland locations, including two associated with coastal waters around the perimeter of the Charleston Peninsula. USACE attempted to avoid impacts to wetlands by locating the proposed wall on land wherever possible. The majority of the storm surge wall (86%) would be constructed on land, but in some locations it would not be feasible due to the close proximity of existing built infrastructure and private property along shorelines of the study area.

One of the seven locations of the storm surge wall would intersect a salt marsh tidal creek system on the Charleston Peninsula, Halsey Creek off of the Ashley River. As described in more detail in the Draft Integrated FR/EIS, tidal flow in this tidal creek system is already restricted by two 24 inch diameter culverts which runs under 10th Street. The Creek is currently impaired by the surrounding dense residential development of the Wagener Terrace neighborhood. Under the proposed Federal action, ~0.1 mile of the storm surge wall would be constructed through Halsey Creek and its salt marsh system. To avoid fully impounding the area of creek and marsh behind the wall, which would result in a total loss of salt marsh tidal creek functions including habitat for fish and wildlife, USACE would install gates in the wall to allow for daily tidal flow. Approximately five gates of 15 ft-wide each (for a total opening of 75 feet in this part of the wall) are planned. While not fully restricted, tidal flow would still be altered because of the wall and gates. This in turn has the potential to degrade water quality and habitat value for aquatic resources that could commonly be found in Halsey Creek, such as white shrimp (*Litopenaeus setiferus*). Using a habitat suitability index model for white shrimp, USACE concluded that 90% of the habitat function could be lost in Halsey Creek as a result of the wall, even with the gates. This modeling is described in detail in Appendix F of the draft FR/EIS.

To mitigate for the adverse effects on salt marsh wetlands and coastal waters and the indirect effects on water quality and aquatic resources, USACE would compensate for ~0.6 acres of direct loss of salt marsh wetlands (in the footprint of the wall, which includes a 25 ft buffer on both sides of the wall) and ~7.1 acres of salt marsh wetlands behind the wall. This would be accomplished either through purchasing salt marsh wetland credits from an approved wetland mitigation bank or through Permittee Responsible Mitigation. The mitigation planning process is being closely coordinated with resource agencies and is currently ongoing. The process is described in more detail in the Draft Mitigation Plan for the study in Appendix F of the draft FR/EIS.

The gates would be open at all times except during a storm surge event, which is necessary to reduce storm surge flooding impacts to property and life safety. There is the potential for water quality to be dramatically altered in Halsey Creek during these occasional and temporary gate closures, which would have an adverse effect on aquatic resources behind the gates. This effect would be minimized by establishing gate protocol actions such as closing the gates during low tide when fewer aquatic resources would be present and by reducing the time that the gates are closed to the greatest extent that is practicable. Gate closure protocols will be finalized in a later phase of the project, if it is authorized for funding.

The proposed Federal action also has the potential to enhance habitat for fish and wildlife through the construction of reef-based living shoreline sills. Over 9,000 linear feet of living shorelines would be constructed. Since the primary purpose of the living shoreline sills would be to reduce erosion and wave attack related to coastal storms, this activity is described in more detail in the policy section related to Erosion Control. While the habitat value of the living shorelines has not been quantified for this study, it is widely recognized that reef-based living shorelines provide ecosystem services that benefit fish and wildlife including habitat for foraging and protection, improving water quality, and expansion of marsh vegetation.

ii. Impoundments

Five of the locations that would be adversely affected by the storm surge wall are areas of fringing salt marsh along the perimeter of the Charleston Peninsula. In these locations, tidal flow would become restricted between the wall and the upland shoreline, resulting in permanent impoundment of the salt marsh. Over time, water quality conditions would change and salt marsh functions, including salt marsh habitat for fish and wildlife, would be lost. Access by aquatic resources into these areas would also be lost.

The locations and acreage of the salt marsh wetland habitat lost would be:

- Along the Ashley River, roughly from north of Halsey Creek to Lowndes Point (~6.5 acres)
- Along the Ashley River, roughly from south of Halsey Creek to north of the Citadel boat channel (~4.5 acres)
- Citadel marsh behind Joe Riley Baseball Stadium (~11.5 acres)
- US Coast Guard marsh and coastal waters by Lockwood Blvd. and Tradd Street (3.5 acres)
- Along the interior shoreline of Diesel Creek (~1 acre)

Approximately 0.5 acres of sandy intertidal flat and coastal waters would also be impounded by the proposed storm surge wall at an area near the existing high Battery seawall and the Charleston Yacht Club, known locally as "Battery Beach." Due to dense infrastructure along the shoreline near this location, it was not feasible to construct the wall on land.

To minimize the extent of fringing marsh impounded, the storm surge wall would be located as close to the upland shoreline as possible, which is approximately 35 feet in most locations.

To further mitigate for this loss of the salt marsh wetlands and intertidal flat, USACE would compensate for the ~27 acres of salt marsh wetlands permanently lost or impounded (including a 25 ft buffer) at a 1:1 ratio, and the ~0.5 acre tidal flat impounded (and buffer) at the same ratio. This is consistent with mitigation requirements of the South Carolina Coastal Zone Management Program that indicate mitigation shall be performed at a ratio of 1:1 wetland created to wetland altered, for projects deemed in the public interest. The compensatory wetland mitigation would be accomplished either through purchasing salt marsh wetland credits from an approved wetland mitigation bank or through Permittee Responsible Mitigation of like habitat. The mitigation planning process is being closely coordinated with resource agencies and is currently ongoing. This process is described in more detail in the Draft Mitigation Plan in Appendix F of the draft FR/EIS.

b) Activities in Geographic Areas of Particular Concern – Consistent

i. Areas of Unique Natural Resource Value

There are no Heritage Trust Program Sites, State Wildlife Preserves, State Parks, or Marine and Estuarine Sanctuaries in the study area.

While a 24-mile stretch of the Ashley River from near Summerville to the Mark Clark Expressway (I-526 bridge) in North Charleston has been designated as a state Scenic River, this is out of the region of influence of the proposed Federal action.

Shellfish harvesting is already restricted in waters in and surrounding the study area.

The study area does fall within the Trident Capacity Use Area for groundwater; however, the proposed Federal action would not withdraw or use groundwater. The action would also not produce any waste that would be disposed of and impact groundwater.

There is no designated critical habitat for federally-listed threatened and endangered terrestrial wildlife species in the study area. There is designated critical habitat for Atlantic sturgeon within the region of influence of the Federal action, but the Federal action does not involve any in-water work near this area and any water quality changes are not expected to adversely modify their critical habitat.

Salt marsh-tidal creek habitat that is in the study area, while not designated critical habitat, could be used by listed species including manatees, wood storks, eastern black rails, sea turtles, and sturgeon. While it's possible for any of these species to be present in salt marsh areas potentially impacted by the Federal action, conditions are not ideal nor well documented so USACE is making a determination under Section 7 of the Endangered Species Act that these species "may be affected but are not likely to be adversely affected" by the proposed Federal action. This includes construction-related activities since USACE would employ best management practices to reduce temporary adverse water quality and noise impacts on protected species. The US Fish and Wildlife Service has already concurred with this determination; consultation with the National Marine Fisheries Service is ongoing. A similar conclusion is reasonably being made for state-listed species.

While the Federal action is proposed along coastal shorelines because this is where it is needed to be effective, it is not dependent on coastal shorelines for using or extracting any coastal resources.

ii. Areas of Special Historic, Archeological, or Cultural Significance

According to the South Carolina Department of Archives and History and the South Carolina Institute of Archaeology and Anthropology, who inventory data from the state's archaeological and built heritage, there are currently 373 known cultural resources within the study area. Of the 373 cultural resources identified within the study area, 79 are individually listed in the National Register of Historic Places, including 32 which are also designated as National Historic Landmarks. The largest concentration of historic properties is found in the Charleston Old and Historic District which spans the southern portion of the Peninsula and is also designated a National Historic Landmark. While USACE is taking steps to avoid impacts to these resources, this will not be feasible everywhere.

There is the potential for many of these resources, and resources yet to be identified, to be adversely affected by the Federal action. USACE is currently working with the South Carolina State Historic Preservation Office, the National Park Service, the Advisory Council on Historic Preservation, the City of Charleston, the Catawba Indian Nation, Historic Charleston Foundation, and the Preservation Society of Charleston to develop

a Programmatic Agreement (PA) pursuant to 36 CFR § 800.4(b)(2). The PA is a legally binding document that defines the surveys and other research needed during the design phase of the project, should it be funded, to fully identify cultural/historical resources that could be adversely affected, and proposes and ensures implementation of mitigation to reduce effects on cultural and historic resources to the greatest extent practicable. In accordance with the PA, the future project design would be modified where possible to avoid adverse effects to historic properties. A copy of the PA can be found in the draft FR/EIS.

c) Activities in Areas of Special Resource Significance – Consistent

i. Navigation

The majority of the proposed Federal action would occur on land. The activity will not harmfully obstruct the natural flow of navigable water at the expense of commercial navigation, shipping, or port development. Where it would be located in coastal waters or salt marsh wetlands, it would not be in close proximity to Federal navigation channels to restrict or adversely affect navigation, shipping, or port development. The wall in the marsh would not intersect with any established roads or bridges. It would intersect with the US Coast Guard Station's dock off Tradd Street; however an access gate would be included and is being closely coordinated with the U.S. Coast Guard to ensure continued operations and security of their facilities.

Effects on existing marine commerce operations or transportation from the proposed wall at Columbus Street Terminal and Union Pier have been minimized by placing the proposed wall on land rather than waterside, and in strategic locations with gates away from critical port operations. The proposed wall is also being closely coordinated with the South Carolina Ports Authority and the specific alignment within their property boundaries may be modified during a future phase of the project.

ii. Public Open Space

The proposed storm surge wall would align some known recreation areas/parks within the study area, most notably Waterfront Park and Brittlebank Park. While the wall may alter pedestrian or traffic flow into and out of the parks, public access to all parks and their associated recreational features such as public fishing piers, would not be restricted (except when gates are closed during a storm surge event). USACE has attempted to avoid intersecting parks by defaulting to aligning parks near roadways instead. Regardless, any landscaping, including trees, and other recreational features such as benches, trails, and playgrounds that may be in the footprint of the proposed wall would be redesigned and replaced in an alternate yet suitable location in the parks, if necessary.

Because the storm surge wall would be visible in public open spaces, the aesthetics of these spaces have the potential to be adversely affected, depending on the location and other factors. Adverse effects on aesthetics and the viewshed would be minimized through design elements of the storm surge wall and other engineering features in a later phase of the study if the proposed Federal action is selected for funding. Since this is a feasibility study, detailed design and engineering decisions that could inform mitigation for degraded aesthetics and viewshed effects cannot be made at this time. USACE has drafted a Memorandum of Understanding (MOU) with the City of Charleston that outlines a process for identifying and implementing practicable mitigation measures for potential adverse effects to visual resources. A copy of the MOU can be found in Appendix A of the draft FR/EIS.

d) Erosion Control – Consistent

The proposed Federal action includes installation of approximately 9,300 linear feet of reef-based living shoreline sills to be constructed in strategic locations of the study area to reduce wave attack and erosion from coastal storms. This natural or nature-based feature provides more benefits than hardened measures for shoreline stabilization. Site suitability surveys would be conducted in a later phase of the project if it is funded, but tentative locations are shown in Figure 1, which include areas along the Charleston Peninsula shoreline of the Ashley River near Lockwood Blvd, Brittlebank Park, and the Wagener Terrace neighborhood. These locations correspond with sites where other small scale living shorelines have already been constructed and shown success.

The specific design/technique of the reef-based living shoreline sills would also be determined in a later phase of the project if funded, but would be constructed with similar methods as those already used in South Carolina and that meet the definition and project standards for living shorelines in new sections R.30-1.D(31) and R.30-12.Q of S.C. Code Sections 48-39-10 et seq.

The Federal action, particularly the storm surge wall that would be constructed in portions of fringing salt marsh wetlands, have the potential to produce scouring of the marsh at the base of the wall. In these locations, it would not be feasible to construct the storm surge wall on land due to existing built infrastructure. The erosional impact to marshes in the immediate area would be offset through compensatory wetland mitigation that is planned for the larger action. In addition, the living shoreline sills would be placed in areas seaward of the storm surge wall to help reduce wave energy and trap sediments that would help minimize the scouring effect.

Modeling of wave action conducted by USACE supports that reflection and refraction of waves encountering the proposed wall on the Charleston Peninsula would have a nominal effect on shorelines outside of the study area. Under normal conditions, wave heights vary around the Charleston Peninsula depending on location, such as sheltered vs. exposed areas. Aside from these variations, the results did not show a difference in wave height in the surrounding areas with the wall present, when compared to without the wall. This is consistent with the understanding that local wind waves within the surrounding rivers and Charleston Harbor nearshore area would be limited in wave height and period during a storm surge event by the limited fetches. Waves would be dissipated by marshes and shallow foreshore areas before encountering the wall which would scatter the remaining waves, causing them to dissipate within a few wavelengths. Scattering would be due to directional/frequency spread of the short-period waves, irregularities in the wall, near-wall bathymetry, adverse wind (wind from the coastal storm blowing against the reflected waves), and complex bathymetry of the far-field (river channels/nearshore). Details and results of the modeling can be found in Appendix B, Coastal Sub-Appendix of the draft FR/EIS.

e) Beach and Shore Access – Consistent

To reduce impacts from storm surge on structures and life safety, the storm surge wall proposed in the Federal action, by design, creates a physical barrier between the upland and coastal waters. To the extent practicable, USACE has avoided implementation of this measure, including in areas that are already at a higher elevation or where nonstructural measures were more practicable. Several square miles of the upper Charleston Peninsula will not be affected by the storm surge wall.

In places where the storm surge wall would be constructed and there is currently designated access between the land and water, such as docks or marinas, gates would be installed in the wall to allow for continuous access. The gates would remain open except during a storm surge event.

In some places around the Charleston Peninsula, the storm surge wall would be constructed in public right-of-ways near the shoreline, where sidewalks for pedestrian transportation currently exist (e.g., along Lockwood Blvd). The loss of the sidewalk on the ground level would be offset with a walking path on top of the storm surge wall, similar to the current promenade on the Battery seawalls. The walkway, and access to it, would be compliant with the American Disabilities Act.

The function of the ~0.5 acre sandy intertidal flat near the current high Battery sea wall that is locally known as “Battery Beach” would be permanently affected by the proposed

Federal action. Once the proposed wall is built, tidal flow will no longer reach this area, and over time the tidal flat would no longer function (ecologically) as an intertidal flat. This impact is described in the Wildlife and Fisheries Management section above. With respect to public access, the existing high Battery seawall and cady-corner sea wall that runs along the yacht club serve as current barriers between the land and water interface here. There is currently no designated public access to the area known as "Battery Beach," although the public has been known to access it anyway. Although the proposed Federal Action may change the nature of the area, it would have no effect on the current lack of public access to the area.

f) Stormwater Management – Consistent

Construction activities related to the proposed nonstructural measures and the storm surge wall have the potential to disturb soils and sediments or create debris that could run off with stormwater into local waterways. This could result in increased turbidity and suspended solids in shallow waters that could degrade water quality, including temporary changes in salinity, pH and dissolved oxygen levels. To minimize these effects, typical construction best management practices (BMPs) would be used to reduce and contain the movement of soils and sediments. For example, silt curtains, settling basins, cofferdams, and other operational modifications would be applied.

The hydraulic pumps that are proposed as part of the Federal action would operate temporarily during a storm surge event for the purpose of minimizing rainfall and stormwater flooding impacts on the interior of the wall. The five proposed temporary pump stations would collect street-level stormwater that "ponds" because of the wall and exceeds the capacity of the current drainage system during a storm surge event, discharging it to the other side of the wall, as it would have with overland flow. The five permanent pump stations are intended to collect rainfall and stormwater runoff that is not collected by the subsurface drainage system as it naturally flows over land to low-lying marshes. The runoff would be pumped over/through the wall before water levels elevate to a level of inducing flooding to nearby structures. The pumps would not redirect the runoff; they would move the water where it would have drained without the wall.

When operating, the pumps would be a point source of stormwater discharge. The proposed pumps would be similar to the small- and medium-sized pumps that the City of Charleston already operates on a regular basis on the Charleston Peninsula, but would only be operated occasionally and temporarily. The proposed pumps would be expected to be compliant with state water quality standards. To minimize effects of the

pumped storm water on water quality, small manufactured treatment devices or sediment settling basins could be installed at the permanent pump stations if necessary.

Coastal Consistency Review Concluding Determination

The potential beneficial and adverse effects of the proposed Federal action on the human environment have been evaluated and documented in the draft FR/EIS. Based on the review provided here, USACE has determined that the proposed Federal action and the avoidance, minimization, and compensatory mitigation measures as proposed in the Charleston Peninsula Coastal Flood Risk Management Study, would be undertaken in a manner consistent to the maximum extent practicable with the enforceable policies of the South Carolina Coastal Zone Management Program.

CLEAN WATER ACT SECTION 401 COMPLIANCE

Healthy People. Healthy Communities.

January 26, 2022

VIA ELECTRONIC MAIL
Nancy Parrish
Department of the Army
Charleston District Corps of Engineers
69A Hagood Avenue
Charleston, SC 29201

Re: Charleston Peninsula Coastal Storm Risk Management Study

Dear Ms. Parrish,

The South Carolina Department of Health and Environmental Control (SCDHEC) is writing this letter in response to your correspondence dated January 18, 2022. SCDHEC confirms attending coordination meetings with the United States Army Corps of Engineers (USACE) on May 21, 2021 and on January 13, 2022.

In accordance with Section 401 of the Clean Water Act (33 USC §1341), the USACE must obtain a Section 401 Water Quality Certification from SCDHEC for the proposed activity. SCDHEC acknowledges at this time there are not sufficient design details to apply for and obtain a Section 401 Water Quality Certification.

SCDHEC confirms coordination between USACE and SCDHEC. Based on the current information discussed, SCDHEC does not have any preliminary findings, but does not object to USACE moving forward with further designs. SCDHEC looks forward to the continued coordination between both of our agencies as further details emerge.

If you have any questions please contact Mr. Chuck Hightower of the Water Quality Certification and Wetlands section at (803) 898-0369.

Sincerely,

Nathan Haber
Director, Water Quality Division

DEPARTMENT OF THE ARMY
CHARLESTON DISTRICT CORPS OF ENGINEERS
69A HAGOOD AVENUE
CHARLESTON, SOUTH CAROLINA 29403

January 18, 2022

Planning and Environmental Branch

Mr. Nathan Haber
Director, Water Quality Division
S.C. Dept. of Health & Environmental Control
2600 Bull Street
Columbia, SC 29201

Dear Mr. Haber:

The United States Army Corps of Engineers, Charleston District (USACE) has met with your agency on May 21, 2021 and January 13, 2022, to present the details and status updates on the Charleston Peninsula Coastal Storm Risk Management Study. In accordance with Section 401 of the Clean Water Act (33 USC § 1341), USACE must obtain certification from the South Carolina Department of Health and Environmental Control (DHEC), Bureau of Water office that any proposed discharges will comply with the applicable provisions of the Clean Water Act. However, as discussed at our most recent meeting, the design details of this feasibility level study do not provide a sufficient level of design detail to apply for and obtain a Section 401 Water Quality Certification from DHEC. USACE will seek water quality certification from your agency when sufficient detail is available, during the Pre-Construction Engineering and Design Phase. USACE seeks written confirmation acknowledging USACE's coordination on this project with your agency, your agency's potential preliminary findings, if available, and acknowledgement that USACE's plans to obtain a water quality certification at a later date, prior to implementation of the project.

We request your written confirmation within 15 days of the date of this letter. As this study progresses, we will continue to keep your agency apprised of any changes, as appropriate. Should you have any questions or comments, please contact Ms. Hannah Hadley at (208) 220-0961 or via email at hannah.f.hadley@usace.army.mil. Thank you for your cooperation.

Sincerely,

Nancy Parrish

Nancy Parrish
Chief, Planning and Environmental

CLEAN WATER ACT SECTION 404(b)(1) EVALUATION

Clean Water Act, Section 404(b) (1) Evaluation

Charleston Peninsula Coastal Storm Risk Management Study

City of Charleston, Charleston County, South Carolina

The U.S. Army Corps of Engineers, Charleston District (USACE) and the City of Charleston (non-Federal sponsor) are conducting the Charleston Peninsula Coastal Storm Risk Management Study to investigate and recommend potential structural and nonstructural solutions to reduce damages and life and safety impacts from coastal storms on the Charleston Peninsula within the City of Charleston, Charleston County, South Carolina. This document presents the Clean Water Act Section 404(b)(1) evaluation for the study.

I. PROJECT DESCRIPTION

a. Location and General Description. The study area is located in the City of Charleston, Charleston County, SC. It encompasses the Charleston Peninsula, an approximate eight square mile area known as "downtown Charleston" which is mostly urbanized. It is located between the Ashley and Cooper Rivers, which join off the southern end of the peninsula to form the Charleston Harbor before draining into the Atlantic Ocean. The Charleston Harbor is a natural tidal estuary sheltered by barrier islands, which are beyond the study area. The City of North Charleston lies to the north of the peninsula.

The peninsula is relatively flat, with nearly all areas below elevation 20 feet North American Vertical Datum of 1988 (NAVD88). The area has undergone dramatic shoreline changes since the first European settlers arrived in Charleston around 1670, predominantly by landfilling of the intertidal zone on the southern and western side of the peninsula. Tidal creeks that have not been filled and developed have all been altered to varying degrees. While most of the peninsula is developed, 2016 high-resolution landcover data shows that approximately 555 acres of estuarine emergent wetlands, or salt marsh, remain in the study area. There is no classified agriculture in the study area.

Charleston played an important role in Colonial, Revolutionary, antebellum, and Civil War America. Today, the Charleston Peninsula is the historic core and urban center of the City of Charleston. It is a popular tourist destination and home to approximately 40,000 people, a medical district, multiple colleges, and a port.

Figure 1. Map depicting the boundary of the Charleston Peninsula which is the study area.

b. **<u>Authority and Purpose</u>.** The Charleston Peninsula is vulnerable and at risk to coastal storms as evidenced by past events. The impacts of coastal storms are expected to increase in the future as a result of a combination of relative sea level rise and climate change. Without a plan to reduce damages from coastal storm surge inundation, the peninsula's vulnerability is expected to increase over time. The purpose of the Charleston Peninsula Coastal Storm Risk Management Feasibility Study is for USACE to investigate and recommend potential structural and nonstructural solutions to reduce damages and life and safety impacts from coastal storms on the Charleston Peninsula. The authority for USACE to study coastal South Carolina, including the Charleston Peninsula, was provided in the Rivers and Harbors Act of 1962, P.L. 87- 874, Section 110, and a subsequent Senate Committee Resolution dated 22 April 1988. Funding for the study was appropriated by the Bipartisan Budget Act of 2018 (Public Law 115-123), Division B, Subdivision 1, Title IV. The City of Charleston requested this study and is the non-Federal sponsor. The following objectives have been identified as part of the study:

- Reduce risk to human health, safety, and emergency access from coastal storm surge inundation on the Charleston Peninsula through the 50-year life of the project, estimated to be 2032 to 2082.
- Reduce economic damages resulting from, and increase resilience to, coastal storm surge inundation on the Charleston Peninsula through the 50-year life of the project, estimated to be 2032 to 2082.

Alternatives Considered: For reference, Section 404(b)(1) guidelines of the Clean Water Act require that "except as provided under section 404(b)(2), no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences." The 404(b)(1) guidelines consider an alternative practicable "if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes."

In accordance with the National Environmental Policy Act (NEPA) and USACE guidance, potential measures were identified through planning iterations (e.g., charettes), hosted by USACE or were submitted by stakeholders as part of the NEPA scoping and public review processes. The measures were evaluated based on each measure's effectiveness in meeting the study objectives, constructability (the degree of difficulty to construct or implement the measure), cost efficiency (the relative cost and outcomes of different measures), and USACE policy compliance. USACE policy compliance includes, among other requirements, compliance with environmental laws and regulations. Measures were either screened or retained based on these criteria, and formulated into alternative plans by USACE staff and the City of Charleston, with input from experts, stakeholders, and the public. An initial array of eight conceptual alternatives were formulated. Most of the alternatives were eliminated due to their ineffectiveness in meeting study objectives, feasibility, cost, and other factors. All of the measures and alternatives that were considered and evaluated as part of the NEPA process and USACE plan formulation process are described in the associated NEPA documents for this study (see below). The Final Array of Alternatives included the following three alternatives: a no action alternative (or a Future Without Project alternative), Alternative 2 (perimeter protection + nonstructural measures), and Alternative 3 (perimeter protection + nonstructural + wave attenuating structure). The measures and features in Alternative 3 are identical to Alternative 2, with the exception of the wave attenuating structure.

Following development and review of a draft integrated Feasibility Report and Environmental Assessment and additional engineering evaluation, Alternative 3 was eliminated due to lack of effectiveness of the wave attenuating structure in reducing storm surge, and low cost efficiency, , while also increasing the potential for adverse environmental effects with the breakwater. Therefore, continued environmental analysis was only conducted on the no action alternative and Alternative 2, for which a draft integrated Feasibility Report and Environmental Impact Statement (FR/EIS) was prepared.

Alternative 2 has been identified as the Tentatively Selected Plan, or proposed plan referred to in this evaluation (see Figure 2). The proposed plan is based on a preliminary level of design to meet the study objectives. Therefore, design elements may change during preconstruction engineering and design (PED) phase for the selected alternative. The proposed plan is also subject to refinement based on additional public and agency input through the NEPA process.

The majority of Alternative 2 will be constructed on land/uplands, in areas that are not categorized as waters of the United States. There is no dredging planned as part of Alternative 2, nor excavation of sediments. However, hardened structures in the form of a concrete storm surge wall would be placed in estuarine (salt marsh) wetlands around

portions of the perimeter of the study area. Alternative 2 (perimeter protection + nonstructural measures) includes the following measures and associated features:

Figure 2. Map showing the measures and some of the features of the Tentatively Selected Plan.

Structural Measure: Storm surge wall

To reduce damages and life safety risks from storm surge inundation, approximately 7.2 non-continuous miles of a storm surge wall would be constructed on land, and approximately 1.5 non-continuous miles would be constructed through estuarine wetlands, along the perimeter of parts of the Charleston Peninsula. On the east side of the Peninsula which aligns the Cooper River, the storm surge wall would be entirely on land. On the west side of the Peninsula that aligns the Ashley River, segments of the wall would be on land, while some segments would be sited just off the shoreline (approximately 35 ft) in salt marsh wetlands where it would not be feasible to construct the wall on land due to the proximity of existing infrastructure to the shoreline. The actual height of the wall at any given location will vary depending on the existing ground elevation, so that in total the height of the land and the wall reaches 12 ft NAVD88 to reduce the impacts of storm surges up to this height.

The storm surge wall would be constructed of concrete, and on land it would be a T-wall design with traditional concrete stem walls and pile supported bases. In the marsh, the storm surge wall would be a combination design (see Figure 3), which consists of sheet pile on the storm surge side and angled piles on the landward side, connected by a concrete cap. The supporting piles would be 12x12" prestressed concrete piles that would need to be battered at an inclination from vertical, using a hammer.

A walking path for pedestrian transportation is planned on top of portions of the storm surge wall where it is located on land in the place of current sidewalks. The walking path would be similar to the promenade on the current Battery seawalls found on the Charleston Peninsula. The wall would also include aesthetic design features that are consistent with the current character of the Charleston Peninsula, which will be determined in the PED phase.

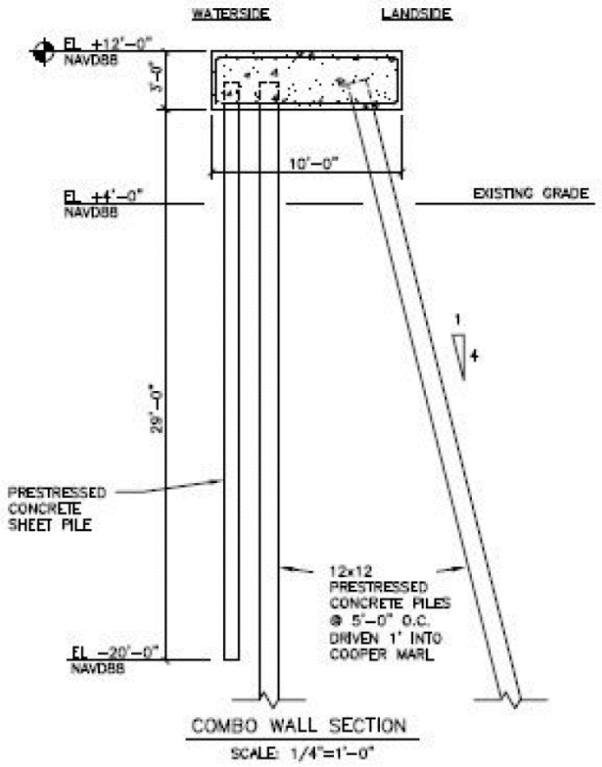


Figure 3. Schematic of combination storm surge wall to be constructed in marsh areas.

Nonstructural Measures: Elevating and floodproofing structures

Nonstructural measures of elevating structures and floodproofing structures have been proposed to reduce damages from storm surge inundation in residential areas where construction of the storm surge wall would not be practicable due to topography and other constructability constraints. For example, dry floodproofing measures would be applied to the Bridgeview Village neighborhood and elevation measures would be applied to the Rosemont neighborhood due to the nature of the construction materials and techniques used in these communities. Wet floodproofing measures, such as elevating utilities, would be applied in the Lowndes Point neighborhood because residential structures are already elevated above 12 feet NAVD88.

Natural and Nature-Based Feature: Oyster reef-based living shoreline sills

In association with the storm surge wall, approximately 9,300 linear feet of oyster reef-based living shoreline sills would be constructed in areas vulnerable to coastal erosion and future scouring from storms, including areas where the wall would be sited along the Charleston Peninsula shoreline of the Ashley River near Lockwood Blvd, Brittlebank Park, and the Wagener Terrace neighborhood (refer back to Figure 2). The reef-based living shoreline sills would be placed parallel to the vegetated shoreline in the intertidal zone for the purpose of reducing wave energy between the sill and the wall, leading to reduced shoreline erosion and marsh scour, while trapping sediments to stabilize and enhance marshes. They would also be constructed to compliment small scale reefs already in place in some locations around the Peninsula.

The specific design/technique of the reef-based living shoreline sills will be determined in the PED phase, but would be constructed with similar methods as those already used in South Carolina and that meet the definition and project standards for living shorelines in new sections R.30-1.D(31) and R.30-12.Q of S.C. Code Sections 48-39-10 et seq. This includes techniques that incorporate natural materials such as oyster shells, or materials that promote oyster growth such as oyster castles or manufactured wire reefs (Figure 4) to stabilize estuarine shorelines at the marsh-water interface, or more specifically between the low and high tide lines (Figure 5) and. Coir logs, while allowed by South Carolina regulations, would not be used for this project.

Figure 4. Typical bagged-shell oyster reef sill found in South Carolina. Source: SCDNR

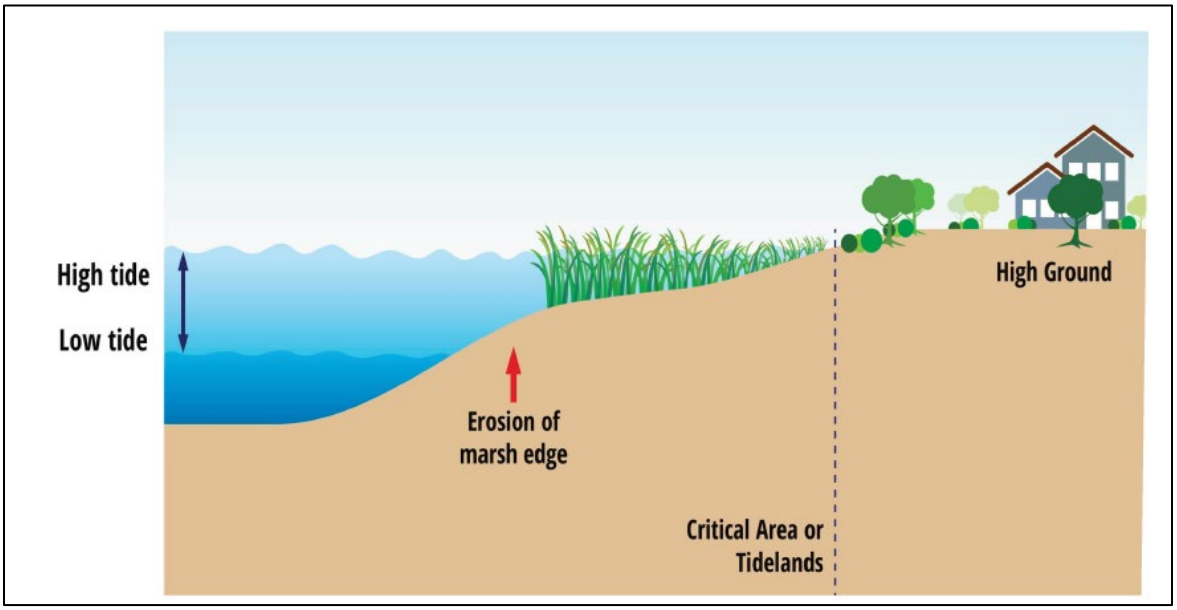


Figure 5. Profile of a typical South Carolina estuarine shoreline. The red arrow indicates the area of erosion concern where living shorelines sills would typically be placed in coastal South Carolina to reduce loss of the marsh edge. Source: SCDNR

Feature: Pedestrian, transportation, and tidal flow access gates

In association with the storm surge wall, a series of gates would be installed to allow for daily access by pedestrians and transportation where the wall would intersect with existing infrastructure. It is estimated that roughly 100 pedestrian and vehicle gates would be needed, and 2 railroad crossing gates. The gates would be designed in the PED phase, but will likely be various forms of swing and slide gates. Similar gates can already be found in the study area. Typically, the gates would remain open, and gate closure procedures would be initiated when major flooding is expected based on storm surge predictions from the National Weather Service. Timing of the closure of upland gates would be dependent on evacuation needs and the anticipated arrival of rising water levels that close transportation arteries. Details of the gate closure protocols would be finalized during the PED phase.

Storm gates in the form of sluice gates would be installed in the wall in one location to allow for daily tidal exchange. Figure 6 shows a typical sluice gate. Where the storm surge wall crosses Halsey Creek in the study area, five 15 ft-wide storm gates would be installed, for a total opening of 75 ft in that segment of the wall in estuarine wetlands. The gates would remain open except when major flooding from storm surge is predicted. Gates would be closed during low tide, and only be closed temporarily until the storm surge threat has passed. The details of the gate closure/opening procedures will be determined during the PED phase.

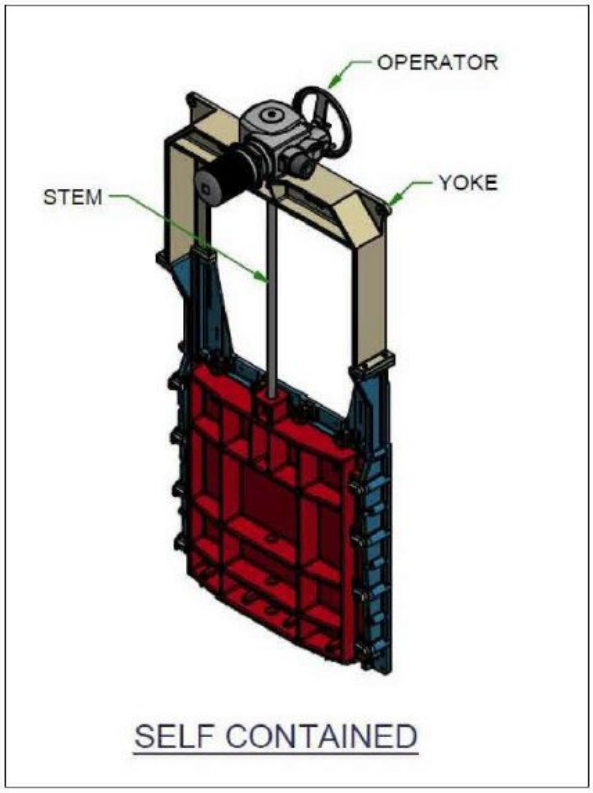


Figure 6. Graphic of a typical sluice gate.

Storm gates (sluice gates) would also need to be installed at six locations where existing roads cross several creeks or channels on the lower Peninsula to obstruct surge from entering and flooding the interior of the Charleston Peninsula. These gates would be installed on existing culverts at Morrison Drive and New Market Creek; at Lockwood Blvd and Colonial Lake; at Lockwood Blvd and Alberta Long Lake; at Lockwood Blvd and Gadsen Creek; and at the stormwater channel that runs behind the Joe Riley Baseball Stadium (that drains from the Citadel Marsh to the Ashley River), and at the bridge where Johnson Street crosses Vardell's Creek. The sites of the storm gates, including the five gates in the wall at Halsey Creek, are shown in Figure 7. These storm gates would be open on a daily basis and not alter current flow or drainage patterns. When major flooding from storm surge is predicted, the storm gates would temporarily close during low tide, as described above.

Figure 7. Planned locations for storm gates; six of the gates are under roads that intersect the creeks/channels.

Feature: Hydraulic Pumps

In association with the storm surge wall, five permanent and five temporary pump stations would need to be installed. The purpose of the hydraulic pumps is to mitigate for impacts from rainfall flooding that may occur in the interior of the proposed wall. All of the pumps would be of low to moderate size, ranging from 20 to 90 cubic feet per second (cfs). These pumps would be consistent in size with the smaller and medium pumps currently permitted and operated by the City of Charleston in the study area, but would only be operated during a storm event, which would be occasional and temporary.

The permanent pump stations would consist of a wet well installed in a low-lying area where water naturally runs off, such as near marshes and tidal creeks, but above the high tide line (not in estuarine wetlands). The wet well would consist of a concrete inlet box with mesh screens for debris and wildlife protection, and a hinged lid for pump removal for maintenance, etc. The outlet from the wet well would be routed to the wall and would either pass over the wall or through it with a check valve to prevent inflow of tidal waters. The wet well connects to a pump house, also in the upland. The pump house would be elevated and would hold the electrical infrastructure and other operating equipment, and a backup generator to minimize pump failure. Figure 8 shows a simple pump station as described here. Small manufactured treatment devices would be installed on all of the permanent pump stations, similar to water treatment methods used by the City's existing hydraulic pumps.

The tentative locations and capacity of the five permanent pump stations are as follows (also refer back to Figure 2):

- by Halsey Creek (3 pumps @ 30 cfs)
- behind Joe Riley Stadium (marsh side) (3 pumps @ 30 cfs)
- by Alberta Long Lake (3 pumps @ 20 cfs)
- next to the US Coast Guard Station (Tradd Street side) (3 pumps @ 20 cfs)
- by New Market Creek (3 pumps @ 30 cfs).

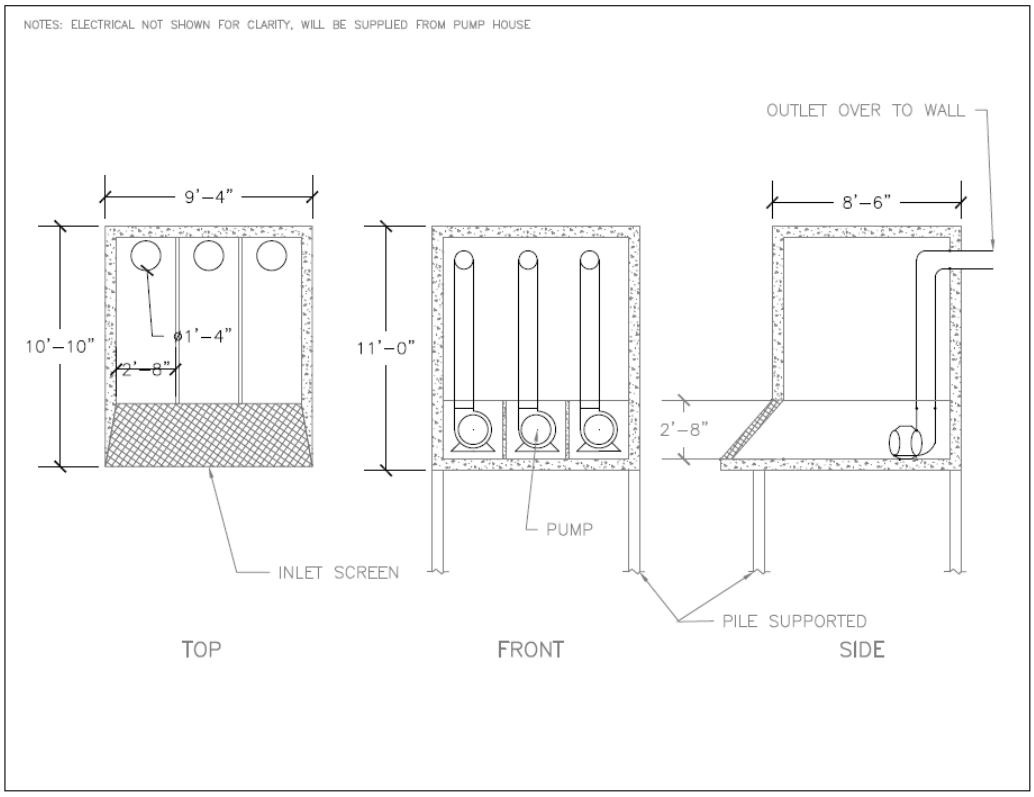


Figure 8. Schematic of pump station wet well.

The other five pump locations would require small pumps of 20 cfs, and would be temporary stations. These are needed in locations where there is not a low-lying natural feature, and where existing roads, houses, and other infrastructure are not conducive to installation of permanent stations (refer back to Figure 2). At these locations, an inlet pipe would be installed which would tap into the existing municipal subsurface storm drainage system, and an outlet pipe that goes over or through the wall. For storm events, a portable pump would be brought to the location and hooked up to the inlet and outlet pipes to efficiently move the rainfall in that area over the wall to avoid the "ponding" effect that the new wall would otherwise create. The temporary pumps would have built-in backup generators to allow them to function even if grid power fails, and would be trailer-mounted and portable to move and store off site when not in use.

The permanent and temporary pumps are not intended to redirect runoff; they would move it where it would have drained without the wall. When operating, the pumps would be a point source of stormwater discharge and would be compliant with state water quality standards.

Maintenance: During the life of the project, all measures and features will be routinely inspected, tested, maintained, and repaired. The procedures will be documented in an OMRRR manual by USACE, which the City of Charleston will be required to implement.

c. **General Description and Quantities of the Dredged or Fill Material.** The proposed plan does not involve dredging. Approximate 1.5 miles of the combination storm surge wall (pre-stressed concrete sheet pile and supporting pilings) would be placed in estuarine

wetlands, although this length is non-continuous. Short segments ranging from several hundred to thousands of feet of storm surge wall would be placed in six different locations of salt marsh of the study area, along the Ashley River and Halsey Creek, essentially filling estuarine wetlands. A short segment of storm surge wall would also be placed in a half-acre sandy intertidal flat along the Charleston Harbor. Five storm gates in the form of sluice gates would be constructed in the storm surge wall at Halsey Creek, and in six other locations of tidal creeks or drainage channels that are under roads where existing culverts or a bridge already exists.

A total of ~9,300 linear feet of oyster reef-based living shoreline sills of roughly 4 – 8 ft wide would be placed in the intertidal zone of three estuarine wetlands in the study area along the Ashley River. This is equivalent to 74,400 square feet, or ~1.07 acres total. The sills would be constructed to eventually create and promote natural oyster reef processes.

All other proposed measures and features would be constructed in the uplands.

d. **Description of the Proposed Discharge Site(s).** There are approximately 555 acres of estuarine emergent wetlands currently in the study area. Approximately 8.5 acres of waters of the United States (i.e., estuarine wetlands) would be permanently lost across six locations of salt marsh along the Ashley River from the placement of fill material to construct the proposed storm surge wall. Approximately half an acre of intertidal flat of sandy composition at the east end of the current Battery Seawall would also be permanently lost by the placement of fill associated with construction of the storm surge wall.[1]

Beyond the discharge sites, an additional 31.8 acres of estuarine wetlands would be affected as secondary impacts due to flooding of the wetlands located behind the wall. Of those, no gates are proposed at five locations, which will result in the permanent conversion of approximately 19.2 acres of tidal wetlands to freshwater wetlands. The remaining 12.6 acres at Halsey Creek would have five gates installed, which would remain open except during storm events when surge is anticipated to occur. During storm surge events, the gates at this location could be closed for 24 to 48 hours resulting in temporary flooding of tidal marsh areas behind the gates. In addition, approximately 1.07 acres of estuarine wetlands, in fringing marsh along the Ashley River, would be replaced with oyster reef-based living shoreline sills. The sills are intended to mimic and eventually form into self-sustaining oyster reefs, which are a natural component of healthy tidal creek systems.

e. **Description of Disposal Method.** No sediments will be dredged or excavated during construction of the planned measures or features.

The roughly 1.5 miles of storm surge wall that would be constructed in estuarine wetlands will be driven into the subsurface. A vibratory hammer would be used to install the pre-stressed concrete sheetpile, and the 12x12" concrete supporting piles would be battered at an angle down to the Cooper Marl Formation, as is required for all

[1] Intertidal flats are a subclassification of estuarine wetlands. For this Feasibility Study, estuarine wetland impact areas were identified from National Wetlands Inventory data, supplemented with Coastal Change Analysis Program landcover data and field observations. During the PED phase, USACE will conduct a formal jurisdictional delineation of the wetland areas.

development now in the study area to meet earthquake standards. Pre-augured holes will be drilled for the piles.

The oyster reef-based living shoreline sills will be placed directly on the marsh surface; no excavation or additional substrate is needed and no heavy equipment will be used. Materials will be transported to the sites by small shallow boats and constructed by hand during low tide for proper placement.

II. FACTUAL DETERMINATIONS.

a. Physical Substrate Determinations.

(1) Substrate Elevation and Slope. The combination storm surge wall would extend below the subsurface to the Cooper Marl formation, as required for major development projects to meet earthquake standards. The top elevation of the storm surge wall would be equivalent to 12 ft NAVD88. The storm surge wall does have the potential to alter sediment distribution patterns as a result of changes in flow, and thus marsh surface elevations, behind the wall (landward side). This effect would be offset through compensatory wetland mitigation. On the seaward side of the wall, wave action against the wall is likely to result in marsh scouring. The reef-based living shoreline sills are proposed to reduce wave action and trap sediments between the sill and the wall to minimize the marsh scour (see Determination 5 below). The reef-based sills would introduce oyster reef substrate at an approximate height of 12 inches in the estuarine wetlands. They are intended to mimic and form into natural oyster reefs over time. Since they will be in the intertidal zone where natural oyster reefs form in South Carolina, they would be regularly inundated upon high tide, and exposed at low tide.

(2) Sediment Type. The distinct soil types found in the study area include Galveston clay, Norfolk fine sand, Norfolk fine sandy loam, Portsmouth fine sandy loam, Galveston fine sand, and Norfolk sand. Most of the perimeter of the Charleston Peninsula is composed of artificial fill. The storm surge wall, where placed in estuarine wetlands, is not expected to alter the sediment type.

(3) Dredged/Fill Material Movement. Any sediments that are displaced during construction of storm surge wall in estuarine wetlands would be contained through the use of erosion or turbidity curtains, or other similar methods. No excavation or dredging of sediments is planned.

(4) Physical Effects on Benthos. Existing benthic organisms will be permanently lost in the immediate locations where the storm surge wall is constructed in estuarine wetlands and associated tidal flats. The quality and diversity of benthic communities behind (landward) of the storm surge wall are also likely to be impacted by changes in flow, sediment composition and water quality as a result of the wall. These effects would be offset through compensatory wetland mitigation .

(5) Actions Taken to Minimize Impacts. Adverse effects on sediment substrate seaward of the wall will be minimized by building oyster reef sills along

intertidal shorelines. Unintended movement of sediments during construction would be minimized with turbidity curtains or similar methods, and monitored.

b. <u>Water Circulation, Fluctuation and Salinity Determinations</u>.

(1) Water.

(a) Salinity. The storm surge wall in estuarine wetlands has the potential to alter salinity levels behind the wall by altering tidal flow. Permanent effects on salinity in the estuarine wetland water column would be offset as part of the compensatory wetland mitigation that is planned for wetlands permanently lost or degraded behind the wall. Temporary decreases in salinity would result when the storm gates are closed during a storm surge event. Salinity levels are expected to equalize when the gates re-open, but would be expected to reflect post-storm event water quality conditions irrespective of the proposed plan.

(b) Water Chemistry. The storm surge wall in estuarine wetlands has the potential to alter water chemistry, such as dissolved oxygen levels or pH, behind the wall by altering tidal flow. Permanent effects on water chemistry in the estuarine wetland water column would be offset as part of the compensatory wetland mitigation that is planned for wetlands permanently lost or degraded behind the wall. Temporary changes in water chemistry would result when the storm gates are closed during a storm surge event, as wetlands fill up with rainfall and stormwater runoff. Water chemistry is expected to equalize when the gates re-open, but would be expected to reflect post-storm water quality conditions irrespective of the proposed plan.

(c) Clarity and Color. The storm surge wall in estuarine wetlands has the potential to alter water clarity and color behind the wall by altering tidal flow. Permanent effects on clarity and color in the estuarine wetland water column would be offset as part of the compensatory wetland mitigation that is planned for wetlands permanently lost or degraded behind the wall. Additionally, the water may become temporarily clouded at the site of the wall during construction due to increased turbidity levels associated with disturbance of sediments. Silt curtains and other best management practice for reducing turbidity and suspended solids would be used during construction. Water clarity and color are expected to return to normal levels shortly after construction activities cease. While construction of the living shoreline sills may also result in sediment disturbance, effects on the water column are considered nominal; no special minimization measures have been required for any existing living shoreline projects in South Carolina constructed by others with the same methods.

(d) Odor. The storm surge wall and living shoreline sills are not expected to have any effects on odor in the estuarine wetlands.

(e) Taste. Not applicable. Water in the study area is not used as a drinking water resource.

(f) **Dissolved Gas Levels.** The storm surge wall in estuarine wetlands has the potential to alter dissolved oxygen levels behind the wall by altering tidal flow. Permanent effects on dissolved oxygen in the estuarine wetland water column would be offset as part of the compensatory wetland mitigation that is planned for wetlands permanently lost or degraded behind the wall. Temporary changes in dissolved oxygen levels may result when the storm gates are closed during a storm surge event, as wetlands fill up with rainfall and stormwater runoff. Dissolved oxygen levels expected to equalize when the gates re-open, but would be expected to reflect post-storm water quality conditions irrespective of the proposed plan.

(g) **Nutrients.** Stormwater from the study area currently discharges into surrounding waterbodies, primarily through the City of Charleston's subsurface drainage system. Nutrients loads are not high due to the urbanized nature of the study area. There are no areas classified as agricultural. The storm surge wall is not expected to increase nutrients in stormwater. Water quality treatment at proposed pump stations would actually reduce nutrient loading entering surrounding waterbodies. The reef-based living shoreline sills would not increase nutrients, and may actually improve the water quality conditions since oysters are filter feeders and naturally extract nutrients from the water column.

(i) **Eutrophication.** High nutrient loading causes eutrophication; however since nutrient loading is not high in the study area, eutrophication is not expected to be considerably altered, and may actually be improved for stormwater that is collected by the proposed pump stations.

(2) Current Patterns and Circulation.

(a) **Current Patterns and Flow.** Current and flow patterns in the Charleston Harbor, Cooper River and Ashley River, which are generally driven by strong currents and tidal influence, are not expected to be altered by the storm surge wall. The living shorelines would help to reduce wave attack and actually reduce the effects of refraction that could lead to marsh scouring seaward of the proposed wall. Modeling conducted by USACE showed that wave refraction off of the storm surge wall during coastal storm events would not extend impacts to areas outside of the study area. Changes in flow patterns are expected at Halsey Creek due to construction of the storm surge wall in this area, and would be offset through compensatory wetland mitigation.

(b) **Velocity.** Effects on water velocity would be similar to those described above in 2(a) for current patterns and flow. The purpose of the proposed project is to reduce high velocity coastal storm surge that contributes to flooding and erosion.

(c) **Stratification.** There is the potential for water to stratify temporarily in tidal creeks when storm gates are closed during a storm surge event, but this would be minimized by closing the gates at low tide. Any stratification is expected to equalize once gates are re-opened, but would

be reflective of post-storm water quality conditions irrespective of the proposed plan.

(d) **Hydrologic Regime.** The hydrologic regime would not be affected in the surrounding waterbodies of the Charleston Harbor, Cooper River or Ashley River. Within the study area, tidal exchange would be permanently restricted in some locations of estuarine wetlands due to the storm surge wall, resulting in a permanent impact to estuarine wetland functions. This impact will be offset with compensatory wetland mitigation. The hydrologic regime at Halsey Creek would be permanently altered due to the storm surge wall but the inclusion of storm gates will minimize some effects, resulting in secondary impacts on wetland functions. These secondary effects as a result of the altered hydrologic regime change will also be offset through compensatory wetland mitigation. In other locations where there are storm gates, hydrology would be temporarily restricted when storm gates are closed during storm surge events. The effects would be minimized to greatest extent practicable, and hydrologic regime is expected to equalize when the gates re-open, but would reflect post-storm tide levels irrespective of the proposed plan. The living shoreline sills would not alter the hydrologic regime; tidal waters would naturally inundate and recede during the tide cycle, as they would for natural oyster reefs.

(3) **Normal Water Level Fluctuations.** The study area currently experiences a diurnal tidal regime change of roughly six feet a day. Effects of the proposed plan on normal water level fluctuations would be similar as described in (2) above with no effects in the Charleston Harbor, Cooper and Ashley Rivers and as a result of the living shoreline sills; permanent effects in estuarine wetlands where the wall would restrict tidal flow; secondary effects at Halsey Creek with use of the storm gates; and temporary effects when storm gates are closed when no tidal exchange would occur for a short period during a storm event. Permanent effects on water level fluctuations would be mitigated.

(4) **Salinity Gradients.** The Charleston Harbor, and the Cooper River from the juncture of the east and west branches of the river to the confluence with the Ashley River are classified as a "Class Saltwater B" (SB) water body. For the lower Ashley River, it is classified as "Class Saltwater A" (SA), and SA with special site-specific conditions for some of the tributaries. Salinity in the Charleston Harbor is typically between 33 and 36 ppt, and in the Cooper and Ashley Rivers it can range from 5 to 18 ppt. Salinity gradients in these waterbodies are not expected to be affected by the storm surge wall. Where the storm surge wall would permanently restrict tidal flow to estuarine wetlands, the salinity region would be permanently affected. This impact will be offset through compensatory wetland mitigation. At Halsey Creek, the storm surge wall intersecting the creek could alter salinity as a result of restricting tidal flow, but the effects will be minimized through the use of storm gates, while secondary effects on wetland functions as a result of altered salinity regimes behind the wall in Halsey Creek will be offset through compensatory wetland mitigation. Temporary decreases in salinity would result when the storm gates are closed during a storm surge event. Salinity levels are expected to equalize when the gates re-open, but would be expected to reflect post-storm event water quality conditions

irrespective of the proposed plan. The living shoreline sills would not alter salinity gradients.

(5) Actions That Will Be Taken to Minimize Impacts. Activities in estuarine wetlands will be limited to the minimum necessary to implement the proposed plan. In addition, the following conservation measures/Best Management Practices will be followed:

- Storm gates would be installed at Halsey Creek to minimize full tidal restriction as a result of constructing the storm surge wall in this saltmarsh/tidal creek system.
- Time of closure of storm gates will be limited to the shortest time practicable during a storm event, and will be closed upon the last low tide before onset of storm impacts.
- Prior to the beginning of any construction activities, appropriate erosion control measures, such as turbidity curtains, silt barriers, or other suitable devices, will be installed, maintained, and monitored for proper functioning until the area is permanently stabilized upon project completion.
- Permanent adverse impacts to estuarine wetland functions as a result of constructing the storm surge wall in estuarine wetlands, including to the water column, will be offset through compensatory wetland mitigation. A Draft Mitigation Plan has been developed for the project, in coordination with natural resource agencies.
- Gates will be operated in accordance with an official Operations and Maintenance Plan that will be developed with input from discipline experts and will incorporate all required conservation measures for compliance with environmental laws and regulations.

c. <u>Suspended Particulate/Turbidity Determinations</u>.

(1) Expected Changes in Suspended Particulates and Turbidity Levels in the Vicinity of the Disposal Site. Turbidity and suspended solids may increase temporarily during construction of the storm surge wall in estuarine wetlands and of the living shorelines in the intertidal zone (although construction will occur during low tide and does not necessitate use of minimization measures or best management practices based on past projects). In most construction locations in estuarine wetlands, water depth is shallow, ranging from a few feet at high tide to less than a foot at low tide. Effects are expected to be minor or minimal, and turbidity would return to normal levels when construction is complete.

Reflective wave energy on the storm surge wall where it will be constructed in estuarine wetlands has the potential to create turbulence cable of suspending sediments in estuarine wetlands seaward of the proposed wall. To minimize this effect, oyster reef-based living shoreline sills would be installed at the shoreline edge. Reefs dissipate incident wave energy by causing waves to break on the reef, reducing exposure to resources in its lee. The reefs will also have the potential to trap and build up sediments, stabilizing and elevating the marsh between the reef and the wall, further offsetting erosional impacts.

(2) Effects (degree and duration) on Chemical and Physical Properties of the Water Column.

(a) Light Penetration. During construction of the proposed wall and living shoreline sills in estuarine wetlands, light penetration may diminish due to a temporary increase in turbidity levels as sediments are disturbed. Light penetration will return to normal or improve shortly after construction of the storm surge wall and of the living shorelines is complete. Effects from the proposed wall on suspended solids seaward of the wall in estuarine wetlands would be minimized by the living shorelines so that light penetration effects would be minimal.

(b) Dissolved Oxygen. As a result of increased turbidity during construction of the proposed wall and living shoreline sills in estuarine wetlands, dissolved oxygen (DO) levels may experience a minor decrease; however, DO levels would return to normal once construction activities cease. Effects from the proposed wall on suspended solids seaward of the wall in estuarine wetlands would be minimized by the living shorelines so that any effects on DO levels would be minimal.

(c) Toxic Metals and Organics. A temporary increase in organics could occur during construction in estuarine wetlands from suspended solids, but would be expected to return to normal levels following construction. Effects from the proposed wall on suspended solids seaward of the wall in estuarine wetlands would be minimized by the living shorelines so that any increases in organics would be minimal. There are no known areas metals or contaminants in the estuarine wetlands where construction of the storm surge wall or living shoreline sills is planned. If unexpected contamination is encountered during construction, the storm surge wall and sills would be realigned to avoid the contaminated area.

(d) Pathogens. While TMDLs have been set for the larger waterbodies of the Ashley and Cooper Rivers that extend well beyond the study area, nutrient loading from the Charleston Peninsula is low due to the highly urbanized nature of the peninsula. Any increases in bacteria from increased suspended solids during construction would be minimal and return to normal once construction activities cease.

(e) Aesthetics. During construction in estuarine wetlands, a short-term, minor degradation of visual aesthetics could occur due to turbidity from substrate disturbance. The visual aesthetics would be improved after construction in estuarine wetlands is complete.

(3) Effects on Biota.

(a) Primary Production & Photosynthesis. Primary production and photosynthesis may decrease temporarily during construction of the storm surge wall and living shoreline sills in estuarine wetlands due to turbidity increases; however, it would be minor and these factors should return to normal shortly after construction is complete. Effects from the proposed wall on suspended solids seaward of the wall in estuarine

wetlands would be minimized by the living shorelines so that any secondary effects on primary production and photosynthesis would be minimal, and potentially improved if the marshes stabilize over time.

(b) **Suspension/Filter Feeders.** Temporary effects during construction of the storm surge wall and living shoreline sills in estuarine wetlands could include reduced oxygen levels and impact food intake from increased suspended solids; however, conditions for existing filter feeders should return to normal once construction is complete. Effects from the proposed wall on suspended solids seaward of the wall in estuarine wetlands would be minimized by the living shorelines, which is composed of oysters who are filter feeders, so that any secondary effects on filter feeders would be minimal.

(c) **Sight Feeders.** A minimal, temporary disruption due to turbidity from construction of the storm surge wall and living shoreline sills is possible, for site feeders. The potential is reduced due to limited water depths and since most sight feeders are transient and can relocate until construction activities are complete. Effects from the proposed wall on suspended solids seaward of the wall in estuarine wetlands would be minimized by the living shorelines so that any indirect effects on sight feeders would be minimal.

(4) **Actions taken to Minimize Impacts.** The oyster reef-based living shorelines will be implemented to minimize permanent suspension of sediments seaward of the storm surge wall where it will be placed in estuarine wetlands. The sills are constructed during low tide, above the tide line in the intertidal zone, for proper placement so the extension of disturbance effects to existing biota would be nominal. For construction of the storm surge wall in estuarine wetlands, typical best management practices for sediment containment during construction will be used such as turbidity curtains and silt fencing, which will be monitored for effectiveness during construction. In addition, sediment disturbance will be reduced during wall construction in estuarine wetlands through the use of a worksite trestle over the marsh so that no heavy equipment will be operated on the marsh surface.

d. **Contaminant Determinations.**

There are no known areas of contamination in the estuarine wetlands where construction of the storm surge wall or living shorelines would occur. While a few upland CERCLA sites (in various stages of remediation) and RCRA sites are present in the study area, none are in close proximity to where the storm surge wall would be constructed in estuarine wetlands. There are no special water quality regulations in the study area related to protection of hazardous substances from stormwater runoff.

e. **Aquatic Ecosystem and Organism Determinations.**

(1) **Effects on Plankton.** Nutrient loading from the study area is low due to the highly urbanized nature of the Charleston Peninsula. Any increases in plankton, such as species of algae, from increased suspended solids during construction in estuarine wetlands would be minimal and return to normal once construction activities cease.

(2) Effects on Benthos. Existing benthic organisms will be permanently lost in the immediate locations where the storm surge wall is constructed in estuarine wetlands and associated tidal flats. The quality and diversity of benthic communities behind (landward) of the storm surge wall are also likely to be impacted by changes in flow, sediment composition and water quality as a result of the wall. These effects would be offset through compensatory wetland mitigation. The oyster reef-based living shoreline sills would have a nominal adverse effect on benthic communities and may have a beneficial effect through the creation of oyster reef habitat over time.

(3) Effects on Nekton. During construction in estuarine wetlands, mobile aquatic species are expected to move away from the area, and best management practices for in-water construction would be implemented, therefore reducing the potential for adverse effects. The proposed storm surge wall will have a permanent effect on aquatic species behind the wall (landward) where it is located in estuarine wetlands due to altered hydrologic and related conditions. The impacts on habitat function for aquatic resources, such as penaeid shrimp, in these locations will be offset through compensatory wetland mitigation. The proposed reef-based living shorelines have the potential to enhance estuarine wetland habitat for invertebrates and fish over time in those locations.

(4) Effects on Aquatic Food Web. Multiple levels of the aquatic food web could be affected by the proposed storm surge wall where it is located in estuarine wetlands. Adverse effects from the wall would be localized to those areas, and not widespread due to the limited extent of the proposed storm surge wall in wetlands (the majority of the wall structure will be constructed on land). For the areas of permanent impact or degradation, compensatory wetland mitigation is planned that will offset all levels of the food web that depend on the impacted wetlands. The living shoreline sills would have a nominal adverse effect on the aquatic food web, and may have a long term beneficial effect through the creation of oyster reef habitat, which supports several trophic levels.

(5) Effects on Special Aquatic Sites.

(a) Sanctuaries and Refuges. Not applicable; there are no special aquatic sites in the study area.

(b) Wetlands. Approximately 35 acres of estuarine wetlands and estuarine wetland function will be permanently and adversely affected by the proposed storm surge wall. These impacts will be offset through compensatory wetland mitigation. A Draft Mitigation Plan has been developed for the project, in coordination with natural resource agencies. Any impacts to estuarine wetlands as a result of the construction activities would be temporary and minor. Any estuarine emergent vegetation that is incidentally lost during construction (outside of the wall structure footprint which will be compensated for) would be replaced. The proposed reef-based living shorelines have the potential to enhance estuarine wetland functions through the creation of oyster reef habitat.

(c) **Mud Flats.** Intertidal mud flats are subclassification of estuarine wetlands and are part of the 35-acre estuarine wetland system that would be permanently and adversely affected by the storm surge wall. As such, the impacts would be offset through the compensatory wetland mitigation that is planned. In addition, there is one area of sandy intertidal flat of approximately half an acre that would be permanently impacted by the proposed storm surge wall along the Charleston Harbor. This small acreage loss would also be offset through the purchase of saltwater mitigation bank credits. The reef-based living shorelines will have nominal adverse effects on mud flats, and may actually help stabilize them. No subtidal flats will be affected by the proposed plan.

(d) **Vegetated Shallows.** Not applicable; there are no species of submerged aquatic vegetation in the study area.

(e) **Coral Reefs.** Not applicable; not found in the study area.

(f) **Riffle and Pool Complexes.** Not applicable; not found in the study area.

(6) **Threatened and Endangered Species.**

USACE has determined that the proposed plan (Alternative 2) may affect, but is not likely to adversely affect, the American wood stork, the Eastern black rail, and the West Indian Manatee. The proposed storm surge wall would limit potential foraging habitat for these listed species in approximately 35 acres of estuarine wetlands. According to the U.S. Fish & Wildlife Service (USFWS), there are no known wood stork roosting areas or rookeries in the study area, and utilization of marshes in the study area by the eastern black rail is questionable. For the manatee, South Carolina is the northern edge of the manatee's range and most of the estuarine wetlands that would be affected by the proposed plan lack sufficient depth to provide for manatee access. Additionally, all of these species would be able to migrate to other areas to forage, or to avoid construction activities. Construction activities could increase sedimentation and suspend solids that indirectly affect manatees, but such impacts would be minimized through implementation of the Standard Manatee Conditions for In Water Work. Therefore, the effect of the fill activity (the storm surge wall) on these species is deemed insignificant and discountable. The USFWS has concurred with these determinations.

USACE has determined that the proposed plan (Alternative 2) may affect, but is not likely to adversely affect, the shortnose sturgeon, Atlantic sturgeon, green sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, and loggerhead sea turtle. All of these listed species can be found in surrounding waterbodies of the study area, although this is not where they spend the majority of their time. Sturgeon and sea turtles use estuaries to feed, and for access to/from upstream tidal freshwater spawning habitat for sturgeon. Many of these species' food sources depend on estuaries for part of their life cycles. Salt marshes and tidal creek systems play an important role in the health of estuaries, therefore, they indirectly support sturgeon and sea turtles. The proposed storm surge wall has the potential to adversely affect approximately 35 acres of salt marsh wetland function in the study area. This fill activity would not block any migratory pathways, but will contribute to indirect effects on sturgeon and sea turtle species by limiting

foraging habitat in limited locations. Construction activities could increase sedimentation and suspend solids that indirectly affect sturgeon and sea turtles but such impacts would be minimized through the use of best management practices for in-water construction that adhere to the Protected Species Construction Conditions and the Measures for Reducing Entrapment Risk to Protected Species provided by the National Marine Fisheries (NMFS). Therefore, the effect of the fill activity on these species is deemed insignificant and negligible. USACE is currently seeking concurrence from NMFS for these determinations.

While there is designated Critical Habitat for Atlantic Sturgeon in the region of influence of the proposed plan, the fill activity in estuarine wetlands does not occur in the same waterbody as the designated Critical Habitat (i.e., it occurs in a different part of the study area).

(7) **Other Wildlife.** The proposed storm surge wall has the potential to adversely affect approximately 35 acres of estuarine wetland habitat that is considered essential for commercially and recreationally important fisheries (Essential Fish Habitat), such as for penaeid shrimp. The lost habitat function would be offset through compensatory wetland mitigation. Terrestrial wildlife in the study area is limited due the highly urbanized nature of the Charleston Peninsula, but impacts to other wildlife species, such non-listed wading birds who also use estuarine wetlands, could also result from the loss of the 35 acres of estuarine wetland habitat and from temporary construction activities of the storm surge wall in estuarine wetlands. Effects on these species would be considered minor and they would benefit from the same minimization and mitigation measures. The reef-based living shoreline sills have to potential to enhance estuarine wetland habitat for fish and wildlife species that utilize it.

(8) **Actions to Minimize Impacts:** The following minimization measures and mitigation would be implemented if the proposed plan is constructed to protect aquatic ecosystems. Construction-related measures will be included as requirements in plans and specifications for contractors.

- Prior to the beginning of any construction activities, appropriate erosion control measures, such as turbidity curtains, silt barriers, or other suitable devices, will be installed, maintained, and monitored for proper functioning until the area is permanently stabilized upon project completion.
- In-water construction would follow the Protected Species Construction Conditions, the Measures for Reducing Entrapment Risk to Protected Species, and the Standard Manatee Conditions for In Water Work.
- A worksite trestle will be used to minimize construction impacts by keeping heavy equipment off the surface of salt marshes. All equipment and materials will be mobilized and transported from land using the trestle, avoiding the use of waterborne vessels or transportation for the construction of the storm surge wall.
- Any inadvertent loss of estuarine wetland vegetation outside of the footprint of the storm surge wall that is disturbed during construction would be replaced.

- Closure of storm gates would occur during low tide to minimize aquatic resources behind the gates during temporary closures. Time of gate closure would be limited to the greatest degree practicable.
- Permanent adverse impacts to estuarine wetland habitat as a result of constructing the storm surge wall in estuarine wetlands will be offset through compensatory wetland mitigation. Credits from a saltwater mitigation bank will be purchased equivalent to the lost habitat function in accordance with the authorities and regulations governing the mitigation requirements of the project. A Draft Mitigation Plan further explaining the proposed mitigation methodology has been developed for the project, in coordination with natural resource agencies.

f. <u>Proposed Disposal Site Determinations</u>.

(1) Mixing Zone Determination. The discharge of fill material associated with this project is for the construction of a storm surge wall, and the disposal sites for the proposed discharges in waters of the United States are identified above in Section 1.d. A mixing zone is the portion of a waterbody where a permitted wastewater discharge undergoes initial dilution. Some of the existing stormwater outfalls for the City of Charleston's subsurface drainage system would be landward (inside) of where the proposed storm surge wall would be constructed, so the wall could potentially interfere with the existing mixing zones of those permitted outfalls. To avoid this effect, the existing outfalls would be extended through the storm surge wall, and discharge in the same waterbodies and in the same direction for which they were already discharging. Since the wall would be constructed approximately 35 feet from the shoreline and some of the existing pipes extend out past the shoreline already, the distances of piping that would be needed would be relatively minimal.

(2) Determination of Compliance with Applicable Water Quality Standards. Any temporary sediment disturbance that may result from constructing the storm surge wall in estuarine wetlands will be compliant with Section 401 of the Clean Water Act. Permanent impacts on water quality will be offset through compensatory wetland mitigation. A Water Quality Certification will be sought by USACE in the PED phase, for which the South Carolina Department of Health and Environmental Control (SC DHEC) has acknowledged by letter. Additionally, USACE has determined that the proposed plan is consistent with the laws and regulations of the South Carolina Coastal Zone Management Program, and SC DHEC has already concurred with this determination.

(3) Potential Effects on Human Use Characteristics.

(a) Municipal and Private Water Supply. Not applicable; municipal drinking water is not supplied from within the study area, and USACE is not aware of any private water supplies.

(b) Water Related Recreation. The storm surge wall does have the potential to alter recreational boating access at one location, but an alternate public access area will be made available in that location. Therefore the effect would be minimal.

(c) **Aesthetics.** The storm surge wall will have a permanent adverse effect on aesthetics in some areas in or near estuarine wetlands. Because aesthetics are inherently related to design, appropriate design features to minimize aesthetic impacts of the proposed storm surge wall will be identified during the PED phase.

g. **Determination of Secondary and Cumulative Effects on the Aquatic Ecosystem.** Secondary adverse effects related to the proposed plan include those associated with estuarine wetland habitat loss, altered hydrology, and minor water quality degradation related to turbidity and suspended solids for aquatic resources. Some effects will be permanent while others resulting from construction activities will be temporary. Most will be minor. These effects are necessary to effectively reduce coastal storm risks to life safety and property on the Charleston Peninsula by implementing the proposed plan (Alternative 2). Adverse effects on aquatic resources from permanent impacts to estuarine wetland habitat functions that cannot be avoided or minimized will be offset through compensatory wetland mitigation. The oyster reef-based living shoreline sills are likely to have a beneficial effect on aquatic resources.

III. FINDINGS OF COMPLIANCE OR NON-COMPLIANCE WITH THE RESTRICTIONS ON DISCHARGE.

a. No significant adaptation of the Section 404(b) guidelines were made relative to this evaluation.

b. Alternative 2 is the only action alternative that was carried forward for evaluation, as the others were eliminated prior to the final array of alternative or during the NEPA process. Therefore, Alternative 2 is the proposed plan that is the subject of this Section 404(b) evaluation. In this regard, the above evaluation further demonstrates that practicable alternatives that do not involve impacts to special aquatic sites do not exist, and that there are no practicable alternatives that would have less adverse impact on the aquatic ecosystem. On this basis, Alternative 2 is identified as the least environmentally damaging practicable alternative (i.e., the LEDPA) in light of the overall project purpose.

c. The proposed plan described in this evaluation would not cause or contribute to violations of any known applicable state water quality standards.

d. The proposed project will not violate the Endangered Species Act of 1973.

e. The proposed project will not result in significant adverse effects on human health and welfare, recreation, special aquatic sites, or overall ecosystem diversity, productivity and stability. Adverse effects on aesthetics will be minimized and mitigated, as to be determined during the PED phase.

f. The proposed plan will have permanent adverse impacts on estuarine wetlands, and secondary impacts on aquatic resources. Permanent effects that cannot be minimized would be offset through compensatory wetland mitigation.

g. Appropriate steps to minimize potential adverse impacts from the proposed plan will be implemented, such as reef-based living shorelines to reduce estuarine wetland erosion, storm gates to reduce hydrologic restrictions and related effects, and construction best management practices to reduce temporary turbidity and suspended solids impacts.

h. On the Basis of the Guidelines, the Proposed Disposal Site(s) for the Discharge of Fill Material is specified as complying with the requirements of the Clean Water Act Section 404(b)(1) guidelines, with the inclusion of appropriate and practical conditions to minimize adverse effects on the aquatic ecosystem.

Andrew C. Johannes, PhD PE PMP
Lieutenant Colonel, U.S. Army
Commander and District Engineer

STATE BASELINE ENVIRONMENTAL CONDTIONS DATA

THIS SECTION INCLUDES A SUBSET OF ENVIRONMENTAL CONDITIONS DATA FROM THE SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES (SCDNR) FOR SAMPLING SITES IN THE REGION OF INFLUENCE OF THIS STUDY. THE DATA COME FROM TWO STATE INITIATIVES: THE SOUTH CAROLINA ESTUARINE AND COASTAL ASSESSMENT PROGRAM AND THE SOUTH CAROLINA TIDAL CREEKS PROJECT. THESE DATA WERE PROVIDED DIRECTLY FROM SCDNR TO USACE FOR USE IN THIS STUDY, BUT ARE ALSO PUBLICLY AVAILABLE FROM SCDNR. ADDITIONAL DATA PROVIDED TO USACE FROM SCDNR CAN BE MADE AVAILABLE UPON REQUEST.

SOUTH CAROLINA ESTUARINE AND COASTAL ASSESSMENT PROGRAM

Sanger, D.M., S.P. Johnson, A.W. Tweel, D.E. Chestnut, B. Rabon, M.H. Fulton, and E. Wirth. 2020.
The Condition of South Carolina's Estuarine and Coastal Habitats During 2017-2018: Technical Report.
Charleston, SC: South Carolina Marine Resources Division. Technical Report No. 111. 52 p.

All of the SCECAP reports with information regarding the sampling methodologies can be found at:
https://www.dnr.sc.gov/marine/scecap/reports.html

Sites in the ROI (all open water)

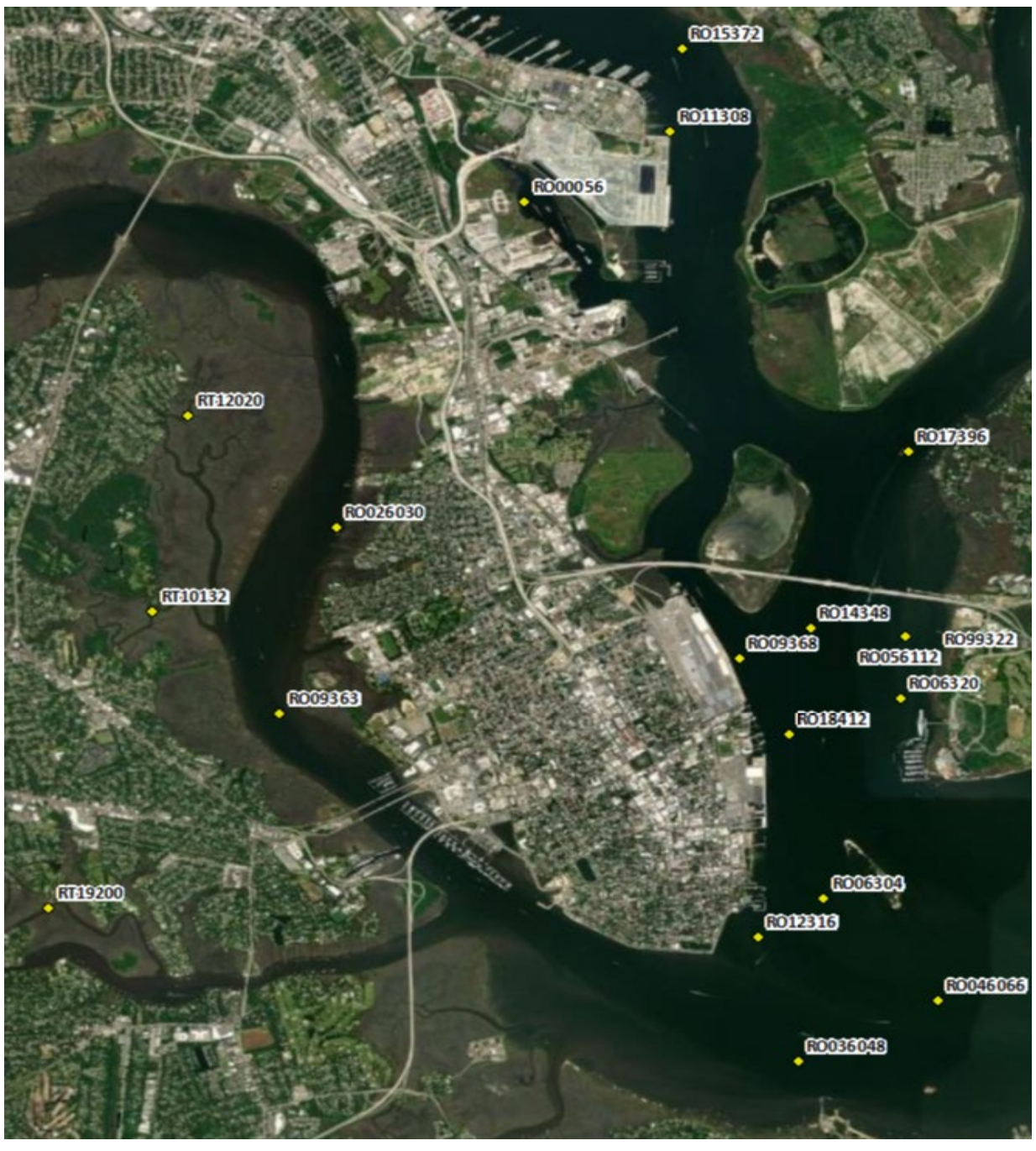
RO026030	Ashley River - by Waganer Terrace
RO09363	Ashley River - by Citadel
RO09368	Cooper River - by Columbus Terminal
RO12316	Charleston Harbor - by High Battery
RO18412	Cooper River - by Maritime Center

Tidal Creek site examples

RT10132	Oldetown Creek
RT12020	Orangegrove Creek

Character 1 = R (station location that was selected via a stratified random sampling approach);
Character 2 = station type; O/T (open water/tidal creek);
Characters 3-4 = sampling year (99 = 1999; 00 = 2000; … 20 = 2020);
the remaining characters = unique station number within sampling year

Source: Selected stations & parameters from "temp_ParamValues_Scores_byStation_20191121" table in SCECAP_Tables_spj front end DB



HABITAT QUALITY COMPONENT SCORE

Habitat quality assessments for selected SCECAP stations: Five open water stations ("RO") near the Charleston peninsula and two tidal creek stations ("RT") across the Ashley River from the Charleston peninsula. For scores, high values indicate better habitat quality than lower values (green is good, yellow is fair, red is poor).

		RO026030 Ashley R.	RO09363 Ashley R.	RO12316 CHS Harbor	RO09368 Cooper R.	RO18412 Cooper R.	RT10132 Oldtown Cr	RT12020 Orangegrove Cr
LOCATION/DATE	Latitude	32.80832	32.79151	32.77076	32.79369	32.79589	32.80049	32.81889
	Longitude	-79.96541	-79.97076	-79.92419	-79.92544	-79.92419	-79.98340	-79.97981
	Date Sampled	**07/31/02**	**08/11/09**	**07/24/12**	**08/11/09**	**08/21/18**	**07/14/10**	**07/24/12**
HABITAT QUALITY	Habitat Quality Score	2.7	2.7	4.3	5.0	5.0	3.0	2.0
WATER QUALITY	Temperature (°C)	30.9	30.0	29.9	29.3	28.9	30.4	31.9
	Salinity (ppt)	26.4	25.0	28.8	28.4	30.7	23.6	26.0
	pH	7.9	7.7	7.8	7.9	7.9	7.2	7.2
	DO (mg/L)	5.9	5.6	5.4	5.7	5.3	3.2	2.5
	Dissolved Oxygen Score	5	5	5	5	5	3	0
	Fecal Coliform (cfu/100 mL)	27	110	26	110	23	70	23
	Fecal Coliform Score	5	3	5	3	5	3	5
	Total Nitrogen (mg/L)	0.5	0.6	0.2	0.4	0.4	0.4	0.5
	Total Nitrogen Score	5	5	5	5	5	5	5
	Total Phosphorus (mg/L)	0.1	0.1	0.0	0.1	0.0	0.1	0.1
	Total Phosphorus Score	3	5	5	5	5	3	0
	Chlorophyll *a* (µg/L)	29.8	13.7	3.5	5.2	4.4	9.1	8.7
	Chlorophyll *a* Score	0	3	5	5	5	5	5
	Eutrophication Score	0	5	5	5	5	5	3
	Water Quality Score	3	5	5	5	5	3	0
SEDIMENT QUALITY	mERMq*	0.122	3.033	0.057	0.015	0.015	0.069	0.031
	mERMq Score	0	0	3	5	5	0	3
	Toxic? (Microtox bioassay)	Yes	Yes	Yes	No	No	No	No
	Total Organic Carbon (%)	3.2	3.2	4.2	0.5	2.6	1.2	3.2
	TOC Score	3	3	3	5	5	5	3
	Sediment Score	0	0	3	5	5	3	3
BENTHIC COMMUNITY	Benthic Index of Biotic Integrity**	3.5	2.0	3.5	4.5	4.5	2.0	2.0
	B-IBI Score	5	3	5	5	5	3	3

* mERMq stands for mean Effects Range Median quotient, and represents the overall relative toxicity of contaminants in the sediment (based on the subset of contaminants for which concentration-based relative toxicity data are available).

**The B-IBI is the benthic index of biotic integrity. Two sediment grabs are collected at each site and processed to identify and count the macrobenthic organisms.
The B-IBI value is a metric based on the mean abundance, mean number of taxa, 100% of the two most dominant taxa, and % of pollution sensitive taxa.
The B-IBI was developed by Bob Van Dolah back in 1999. You would expect in pristine areas to have a higher B-IBI and in degraded areas to have a lower B-IBI.
The B-IBI is then converted to the BQI score.

Trawl catches (number of individuals per hectare) for each replicate tow at each station.

Note that the tow distance vary across station types and can vary for replicate tows.

Station:	RO026030 Ashley R.		RO09363 Ashley R.		RO09368 Cooper R.		RO12316 CHSHarbor		RO18412 Cooper R.		RT10132		RT12020	
Replicate:	1	2	1	2	1	2	1	2	1	2	1	2	1	2
Tow Distance (m):	500	500	500	500	500	500	500	500	500	500	250	250	250	180
smooth butterfly ray			7				7							
bay whiff										7			43	
blackcheek tonguefish			14		7		14							
fringed flounder						7	22							
hogchoker		14					7	14				14		
ocellated flounder						7								
southern flounder											14		14	
American harvestfish			7											
Atlantic croaker	7	36					22	7			58	14	43	20
Atlantic menhaden	7		7	7										
Atlantic spadefish			7		29	22			7					
bay anchovy								7			29	29	58	
pigfish					7									
pinfish						29	7		29				101	181
silver perch									7	7	14	58	391	20
spot		22			7		7				14	29	14	
striped burrfish					7									
striped mullet													14	
weakfish	7	51				7	7						14	
Atlantic brief squid	7	65							14					
Atlantic blue crab								7			43	116	348	2,234
lesser blue crab	22	7					22	22						
brown shrimp		7			7						217	145	217	40
white shrimp	7	116	138	22			22	7			696	420	2,261	1,067

Sediment contaminant summary for selected SCECAP stations.

Sediment Contaminants	Units	ERM	RO026030	RO09363 Ashley R.	RO12316 CHSHarbor	RO09368 Cooper R.	RO18412 Cooper R.	RT10132	RT12020
Mean ERM Quotient (mERMq)	ratio		0.122	3.033	0.057	0.015	0.015	0.069	0.031
Total PBDEs	ng/g			0.53	0.00	0.00	0.00	0.00	0.05
Total DDTs	ng/g	46.1	0.0	66.3	0.3	0.1	0.0	4.0	0.6
Total PCBs	ng/g	180.0	0.1	30.5	1.6	1.9	0.4	10.3	1.3
Total PAHs	ng/g	44,792	1,640	213,261	1,132	223	740	1,747	382
Arsenic	µg/g	70.0	26.8	40.2	14.2	5.0	4.9	7.6	10.1
Cadmium	µg/g	9.6	0.3	0.6	0.2	0.1	0.0	0.1	0.0
Chromium	µg/g	370.0	63.6	110.9	61.6	23.5	13.3	33.2	43.4
Copper	µg/g	270.0	81.2	80.7	19.5	7.7	3.7	13.1	11.1
Lead	µg/g	218.0	67.0	109.1	26.0	11.0	3.2	20.2	15.9
Mercury	µg/g	0.7	0.5	0.4	0.0	0.0	0.0	0.0	0.0
Nickel	µg/g	51.6	29.9	22.2	21.3	3.8	6.1	10.2	12.1
Silver	µg/g	3.7	0.1	0.0	0.0	0.0	0.0	0.5	0.0
Zinc	µg/g	410.0	293.0	368.6	77.3	28.2	16.1	47.7	46.7
Antimony	µg/g			2.2	0.0	0.8	3.0	0.0	0.0
Barium	µg/g			196.6	227.9	222.4	8.8	137.4	149.1
Beryllium	µg/g			3.8	1.6	0.7	0.4	0.7	1.1
Cobalt	µg/g			21.6	10.6	3.1	2.7	4.2	5.9
Lithium	µg/g			149.7	62.7	13.3	4.6	28.6	36.5
Manganese	µg/g		316.0	658.9	358.7	146.1	116.3	148.5	155.6
Selenium	µg/g		0.7	1.9	0.9	0.6	0.0	0.5	0.6
Thallium	µg/g		0.6	1.1	0.4	0.2	0.0	0.2	0.3
Tin	µg/g		1.5	6.3	2.3	0.4	0.0	1.5	1.5
Uranium	µg/g			13.9	3.8	7.2	5.4	2.6	3.2
Vanadium	µg/g			157.7	83.9	28.1	9.0	34.6	49.5

mERMQ represents the overall relative toxicity of contaminants in the sediment, based on the subset of contaminants for which concentration-based relative toxicity levels are available (those with **ERM** values).
ERM = Effects Range Median

The Tidal Creek Project started in 1994 and has sampled several different years. The main objective has been to assess the impacts of coastal development on tidal creek environmental quality.
Vardell Creek: Only a first order creek, designated as urban for land classification.
New Market Creek: Only a first order creek, designated as urban for land classification.
Diesel Creek: Only a first order creek, designated as industrial for land classification.

Water quality collection data and parameter means for near-bottom logger deployments in tidal creeks near the peninsula.

										Mean	Mean	Mean	Mean	Mean	Mean	Mean
Creek	Creek Order	Order Nesting	Land Class	StartDate	EndDate	# DataPts	SampleID	Latitude	Longitude	Depth (m)	Temp (°C)	DO (mg/L)	DO (% sat.)	Salinity (ppt)	SpCond (mS/cm)	pH
Vardell	11	1	Urban	08/21/94	08/25/94	190	94025.006wq.00	32.80239	-79.93649	0.45	27.96		58.89	17.18	30.14	7.20
Vardell	11	1	Urban	02/17/00	02/28/00	524	00014.wq.00	32.80239	-79.93649	0.97	13.13	8.23	87.37	19.38	31.39	7.68
New Market	11	1	Urban	07/03/94	07/06/94	146	94002.006wq.00	32.80773	-79.94518	0.72	27.73		61.28	13.57	24.78	7.22
New Market	11	1	Urban	08/30/94	09/02/94	142	94026.006wq.00	32.80773	-79.94518	0.52	29.20		44.83	16.41	27.81	7.36
New Market	11	1	Urban	01/21/00	01/25/00	193	00013.wq.00	32.80773	-79.94518	2.27	10.13	8.77	91.26	23.46	37.36	7.74
New Market	11	1	Urban	03/09/05	03/10/05	100	20055763	32.80614	-79.94004	0.63	10.84	9.46	93.94	16.35	25.99	7.89
New Market	11	1	Urban	08/08/05	08/09/05	102	20056183	32.80614	-79.94004	0.56	28.76	3.26	46.62	15.41	25.10	7.40
New Market	11	1	Urban	07/24/06	07/25/06	84	20066283	32.80614	-79.94004	0.54	29.37	3.52	51.82	18.62	30.06	7.61
New Market	11	1	Urban	07/28/15	07/29/15	100	20154048	32.80659	-79.94152	1.07	30.75	4.23	64.59	22.47	35.75	7.39
Diesel	11	1	Industrial	07/16/94	07/20/94	188	94008.006wq.00	32.81962	-79.96320	1.83	30.17		47.58	17.83	28.92	7.37
Diesel	11	1	Industrial	07/13/95	07/17/95	197	95001.wq.00	32.81962	-79.96320	1.57	30.32		44.45	20.68	33.06	7.27
Diesel	11	1	Industrial	01/17/96	01/22/96	252	96001.wq.00	32.81962	-79.96320	0.92	10.06		93.64	19.65	32.27	7.89
Diesel	11	1	Industrial	05/09/96	05/14/96	237	96003.wq.00	32.81962	-79.96320	1.11	24.79		59.11	18.02	29.21	7.25
Diesel	11	1	Industrial	08/02/96	08/06/96	968	96006.wq.00	32.81962	-79.96320	0.97	29.55		50.03	21.76	34.60	7.31
Diesel	11	1	Industrial	08/29/96	09/03/96	747	96009.wq.00	32.81962	-79.96320	1.39	27.31		38.38	21.76	34.55	7.23
Diesel	11	1	Industrial	01/26/00	02/01/00	285	00021.wq.00	32.81962	-79.96320	0.88	7.01	9.48	85.82	14.56	24.00	7.78

Other data available:
Continuous water quality
Sediment contaminants
Nutrients, Chlorophyl a, Total Suspended Solids for New Market Creek only
Water pathagens
Benthic data
Seine and trawl biota for New Market Creek only

DRAFT MITIGATION PLAN

DRAFT MITIGATION PLAN

Charleston Peninsula Coastal Storm Risk Management Study

February 2022

This document describes the USACE and the non-Federal sponsor's (City of Charleston) strategy for mitigating adverse environmental effects that may result from implementation of the Recommended Plan for the Charleston Peninsula Coastal Storm Risk Management Study (see more on the Recommended Plan in Section 2.0). This document will be refined and ultimately finalized with input from the City of Charleston and in coordination with resource agencies during the Preconstruction Engineering and Design (PED) Phase of the project when the engineering designs are provided and final jurisdictional determinations can be made.

Previous coordination includes formation of an Interagency Coordination Team (ICT) made up of Federal, State, and local agencies (i.e., U.S. Fish & Wildlife Service, National Marine Fisheries Service, Environmental Protection Agency, National Park Service, Advisory Council on Historic Preservation, U.S. Coast Guard, South Carolina Department of Health and Environmental Control, South Carolina Department of Natural Resources, South Carolina Department of Archives and History, Charleston County) that provided early input during the scoping phase of the study and on the initial array of alternatives. Once the Tentatively Selected Plan (TSP) was identified and optimization was underway, USACE began meeting regularly with subsets of the ICT to discuss specific measures and features of the TSP, including how they could affect environmental resources for which they have jurisdiction or interest. The resources agencies have been primarily engaged in conversations with USACE about compensatory wetland mitigation requirements for this study and provided feedback on the habitat functional analysis performed (described later in Section 4). Several conservation measures have been incorporated that were informed by consultations with regulatory agencies. Similar meetings with a subset of the ICT agencies (e.g., the South Carolina State Historic Preservation Office) on the ICT have also occurred, with a focus on defining the extent of effects and the activities that would take place in PED to identify, minimize, and mitigate effects on cultural resources and historic properties. In September of 2021, an earlier draft of this current Draft Mitigation Plan was reviewed by the public and by agencies during a 60-day public review period of the integrated draft Feasibility Report/Environmental Impact Statement (FR/EIS). The TSP, with some minor modifications, has transitioned to be the Recommended Plan. This current version of the Draft Mitigation Plan incorporates information and input as it is known through the end of the feasibility study.

1.0 Mitigation Framework

For natural resources, the Water Resources Development Act (WRDA) of 1986 (Section 906), as amended in WRDA 2007 (Section 2036), and WRDA 2016 (Section 1163), the Water Resources Reform and Development Act (WRRDA) of 2014 (Section 1040), the National Environmental Policy Act (NEPA), and USACE Engineering Regulation (ER) 1105-2-100, Appendix C establish the mitigation framework for this Draft Mitigation Plan. These authorities and regulations require that adverse impacts to ecological resources from Federal actions are avoided or minimized to the extent practicable, and that remaining, unavoidable impacts are compensated for to the extent justified.

For adverse impacts to wetlands that cannot be avoided or minimized, options include compensatory mitigation in the form of restoration, establishment, enhancement, and/or preservation. South Carolina state regulations, specifically the Coastal Tidelands and Wetland Act of 1977 (Statutory Code Ann. Section 48-39-10 et seq.), must also be considered in the mitigation framework for this study. Section 4.1 of this Plan provides more information on compensatory mitigation regulations specifically for wetlands.

For historic properties and cultural resources, the Advisory Council on Historic Preservation's Part 800 regulations provide the framework for this Draft Mitigation Plan. Specifically, 36 CFR 800.6(a) provides for continued consultation "to develop and evaluate alternatives or modifications to the undertaking that could avoid, minimize, or mitigate adverse effects on historic properties." As part of that continued consultation, the parties have entered into a Programmatic Agreement (PA) in accordance with Sections 106 and 110(f) of the National Historic Preservation Act (NHPA) to provide for additional avoidance and minimization as more detailed project designs are developed and appropriate compensatory mitigation once project features are verified. A copy of the PA can be found in Appendix D – Cultural Resources of the FR/EIS. For visual resources, USACE's Visual Resource Assessment Procedure has been used to identify potential impacts of implementing the Recommended Plan, with steps outlined for the PED phase when project design considerations can inform appropriate mitigation.

This Draft Mitigation Plan identifies avoidance steps and minimization measures that either have or would be employed to lessen impacts to natural resources from implementation of the Recommended Plan. These are described in Section 3.0 below. While the primary focus of this Draft Mitigation Plan is on natural resources, given the parallel process for addressing mitigation to historic properties and cultural resources under the PA, this Plan also includes reference to mitigation for historic properties and cultural resources where specifically noted (e.g., under Avoidance and Minimization Measures, below). Among the natural resources, the unavoidable adverse impacts expected are direct and indirect impacts to salt marsh wetland systems. The framework for compensatory mitigation for these and other natural resources, including how it will be applied, is described in Section 4.0. Impacts to historic properties and cultural resources have the potential to be significant, but will be addressed in the parallel process under the PA.

2.0 Summary of Recommended Plan and Impacts

The Recommended Plan for the Charleston Peninsula Coastal Storm Risk Management Study is Alternative 2, which is also the National Economic Development plan. It includes structural and nonstructural measures for reducing damages on the Charleston Peninsula from storm surge flooding. The Recommended Plan also includes a number of associated features, including access gates, hydraulic pumps, and Natural and Nature Based Features (NNBFs) (see Figure 1).

Structural measures of Alternative 2 would consist of an 8.7-mile storm surge wall of 12 ft NAVD88 elevation along the perimeter of portions of the Charleston Peninsula. Most of the storm surge wall (~7.2 miles) would be on land in the form of a T-wall design, while ~1.5 miles would be in salt marsh wetlands in form of a combination wall design. The width of the combination wall that will be in the marsh is estimated to be 10 ft with an additional 25 ft on the landward side where piles would be

battered at an angle. These structural designs and dimensions are described in more detail and with schematics in the FR/EIS.

Figure 1. Map showing the structural and nonstructural measures and other features (pumps and living shorelines) of the Recommended Plan (Source: USACE)

Several features are also part of the Recommended Plan. The storm surge wall would include access gates in select locations for pedestrians and traffic flow (auto and rail), and for tidal flow in marshes and tidal creeks, referred to as storm gates. The number and size of upland gates is roughly 100, and will be finalized in the PED phase once engineering designs are further developed. For storm gates, these would be in the form of sluice gates and 11 are planned. In addition, five permanent and five temporary pump stations would be used to mitigate for interior flooding from rainfall that could be induced by the wall. The permanent pumps would be located on upland and housed in a structure of 60 ft x 50 ft. The small, temporary pumps would also be located on upland, and only mobilized during storm surge events. The gates and pumps are described in more detail and with graphics in Appendix B - Engineering, Structural Sub-Appendix of the FR/EIS. NNBFs in the form of reef-based living shoreline sills would be created in association with the storm surge wall. Roughly 9,300 feet of living shoreline sills would be implemented to minimize marsh erosion induced by the wall and coastal storms (see below and the Appendix B – Engineering in the FR/EIS).

Alternative 2 would also include implementation of nonstructural measures in two primary locations, the Rosemont and the Bridgeview neighborhoods of the Charleston Peninsula. The types of non-structural measures planned are home raising and flood proofing. These are described in more detail in the FR/EIS.

Direct and indirect effects from the Recommended Plan on environmental resources are described in detail in the FR/EIS. The National Environmental Policy Act defines direct effects as those which are caused by the action and occur at the same time and place. Indirect effects are defined as those which are caused by the action and are later in time or farther removed but still reasonably foreseeable. Many beneficial effects on the human environment would result through a reduction in storm surge flooding including for floodplain management, life safety, compound flooding, historical/cultural resources, transportation and some land uses. Features included in the Recommended Plan, including gates, hydraulic pumps and oyster reef-based living shoreline sills, are also evaluated for their adverse and beneficial effects.

Adverse effects are expected across of a number of environmental resources, but most would be temporary, such as from construction activities, and are generally considered to be minor.

For natural resources, no significant adverse effects would occur to threatened and endangered species. Water quality and aquatic resources are expected to be indirectly affected as a result of the storm surge wall and related features, which will be minimized. There is the potential for permanent direct and indirect adverse effects to wetlands. The Recommended Plan has the potential to affect up to 40 acres of salt marsh wetlands, for which their loss in wetland function would be offset with mitigation in accordance with Appendix C of ER 1105-2-100. The process for identifying the number of wetland acres based on habitat function that would be compensated for through mitigation, including the approach for how they would be compensated for, is described in the remaining sections of this document. Most of the losses would be to small areas of fringing salt marsh along the Ashley River along the footprint of the wall (direct impacts), and areas of marsh between the wall and the shoreline that would be permanently impounded, or blocked from tidal flow, resulting

in an indirect but permanent impact on wetland function that would be mitigated. One salt marsh tidal creek system in the study area (Halsey Creek) would be permanently directly and indirectly affected by the storm surge wall. Full loss of the tidal creek system and it's complexity habitats would be minimized through the use of storm gates to allow for tidal flow. Permanently altered direct and indirect habitat functions in Halsey Creek would be offset through compensatory mitigation. Finally, a small area of sandy tidal flat (~0.5 acre) (which is a subclassification of estuarine wetlands) near the current Battery seawall would also be permanently impacted as a result of implementing the Recommended Plan, and this habitat would offset with compensatory mitigation.

Historic and cultural resources, as well as visual resources, also have the potential to be adversely affected by the structural and nonstructural measures of the Recommended Plan. The extent of such impacts to these resources will vary by location and depends upon final designs in the PED phase of the project. As mentioned above, these resource areas are also addressed in separate appendices of the FR/EIS that outline processes for mitigation.

3.0 Avoidance and Minimization Measures

The first step in mitigation planning involves efforts to avoid, and then minimize, adverse effects on environmental resources. Resource agencies have been engaged in discussion about potential effects through technical meetings and site visits, and consultations under applicable environmental laws and regulations. Primary concerns were centered around cultural resources and historic properties, including viewshed impacts to historical sites from the storm surge wall, and on placement of the storm surge wall in salt marsh wetlands. USACE has taken the following planning actions to avoid and/or minimize effects of the Recommended Plan, and proposes additional steps that can be taken to further reduce the potential for adverse effects on environmental resources if the Recommended Plan is implemented.

Re-alignment of storm surge wall to avoid impacts. During earlier conceptualizations of the plan, USACE assessed the feasibility of moving portions of the storm surge wall from salt marsh wetlands to the land to avoid impacts to wetlands. This would avoid impacts to aquatic and benthic resources in those locations, and to localized water quality. Due to limited construction space in the urbanized landscape of the peninsula, this was not feasible everywhere. The following modifications were made to the earlier conceptualization of the storm surge wall:

- moved storm surge wall from marsh along Ashley River on to (alongside of) Lockwood Blvd, from Broad Street to Brittlebank Park
- reduced length of the storm surge wall through the Citadel marsh by tying into high ground along most of the Citadel shoreline

The change in alignment resulted in a considerable reduction in potential impact area of roughly 71 acres of salt marsh wetlands from the previous conceptualization of the plan (from 111 acres to 40 acres). The wetland effects were then further reduced to only 35 acres of lost wetland habitat function through minimization measures (described below). With the modified alignment, though, the number of upland gates that would be needed for traffic and pedestrian flow increased. USACE will continue to identify opportunities to minimize effects on transportation in the PED phase.

Design of storm surge wall to reduce indirect impacts. USACE and City of Charleston assessed whether the addition of a walking path, similar to the promenade on the current Battery wall, would be a justified feature of the proposed plan to offset some effects on transportation, visual resources and cultural/historic resources (but not as a recreation feature). A walking path on portions of the wall where it is on land has been added to the Recommended Plan, particularly to mitigate for lost walkways such as sidewalks where the wall would be. During the PED phase, USACE and City of Charleston will also consider design features for the storm surge wall that would maximize consistency with the history and culture of the peninsula to minimize adverse effects on historic and cultural resources and aesthetics.

Elimination of breakwater to avoid impacts. A large wave-attenuation structure, or breakwater, was originally considered as a cost-effective way to reduce damages from coastal storm surge inundation. In the draft FR/EA released in April 2020, this measure was included in one of the final array of alternatives under consideration. However, after additional assessment it was determined that the breakwater would not be effective, nor was it cost efficient, and this measure was eliminated from further consideration in the FR/EIS. While this decision was based on effectiveness and cost, it had the positive effect of avoiding fill impacts on aquatic and benthic resources in waters of the Charleston Harbor, as well as viewshed and other effects, and is illustrative of the continued effort to refine the plan to the optimal storm surge risk reduction while limiting the extent of structural measures.

Gate modifications to avoid and minimize impacts. The gates in the wall are a feature to minimize restrictions to access that would be created by the storm surge wall – access by people, transportation, daily tidal flow, fish passage, etc. The gates themselves can have unintended effects on the environment, which also need to be minimized. The miter gate that was originally proposed at the Citadel boat channel was removed from the plan which avoided some effects on aquatic resources and recreation. During the PED phase, USACE and the City of Charleston will continue to look for opportunities to reduce the number of upland gates and their effects on transportation.

Through engineering design and operational procedures of the gates, potential adverse effects on transportation, interior drainage, water quality, salt marsh wetlands, and aquatic resources can be minimized. For the storm gates, the gates would close on the last low tide prior to the onset of storm impacts to allow for the creeks to increase their storage capacity of rainfall and minimize the density of aquatic resources behind the wall. Gate operators will make visual inspections for special status species before closing the storm gates to avoid direct injury. USACE will continue to refine the protocols for the gate operations in PED once more engineering-level design has been done, to reduce the time of their closure to the greatest degree practicable while still providing the storm surge and life safety protection needed. The Charleston Weather Forecast Office of NOAA and other experts will be consulted on how storm surge forecasts and local meteorological information can be used to make the best-informed decisions about opening and closing gates. The gate protocols will be included in the Operations and Maintenance Plan that will be part of the legally-binding Project Partnership Agreement between USACE and City of Charleston, that the City will be required to implement. Regular maintenance would also be required on the gates to minimize the risk of failure, which would also be detailed in the Operations and Maintenance Plan.

Hydraulic pumps and water quantity and quality minimization. It is estimated that if the Recommended Plan is implemented, five permanent and five temporary hydraulic pump stations would be needed to mitigate for structural damages from rainfall flooding that could be induced on the interior of the storm surge wall, that would not occur without the wall. The intent is to capture rainfall runoff and efficiently move it to the outside of the wall so that flooding does not occur. USACE has modified the approximate locations of the pumps and the wet wells to collect and discharge runoff as it flows overland so that they can meet their intended purpose, while minimizing the potential for runoff to become concentrated before it is pumped. During the PED phase, additional modeling of the interior hydrology and engineering analysis will be performed to confirm or refine the number, size, and locations of pumps to the effective capacity needed to address flood mitigation needs. To further reduce any potential for water quality degradation discharged runoff, small manufactured treatment devices or sediment settling basins would be added to all of the permanent pump stations. Pumps would be expected to meet state water quality standards.

Living shorelines and erosion control. Shoreline erosion is caused primarily by winds and wave action, which are intensified during coastal storms. Erosion can leave upland bluffs exposed that slump into adjacent tidal creeks, leading to loss of vegetation, shoreline edge, and land. Sea level rise and human activities (e.g., boat wake) also contribute to shoreline erosion, but shoreline erosion may dramatically accelerate in the future due to increased intensity and frequency of future storm events, in combination with rising sea levels, if no action is taken to protect natural shorelines.

Currently, the largest extent of natural shoreline on the Charleston Peninsula is along the Ashley River. A statewide effort to evaluate shoreline change rates and identify erosional hotspots (Jackson 2017) shows that while some areas of the Charleston Peninsula are experiencing more gradual shoreline change, some higher erosional areas exist where the proposed storm surge wall is planned landward of the natural shoreline edge, including near the US Coast Guard Station, along Brittlebank Bank, and north of The Citadel along the Wagener Terrace neighborhood (see Figure 4-4 of the FR/EIS).

When hardened structures are placed along shorelines, like traditional seawalls, they reflect wave energy seaward. The reflection can create turbulence, capable of suspending sediments, leading to increased erosion or scouring. Scouring is a process by which water passes around an obstruction in the water column, causing it to change direction, accelerate, and suspend sediments. Portions of the storm surge wall along the Ashley River would be constructed in or extremely close to the marsh and come into contact with tides, storm surge, and waves. Scouring on the seaward side of the wall would degrade the marsh, as well as the water column through reduced water clarity. The impact on the outer edge of the marsh (the marsh shoreline) may be even greater.

To minimize erosion of salt marshes and natural shorelines in vulnerable areas associated with the storm surge wall, approximately 9,300 linear feet of oyster reef-based living shoreline sills would be constructed in the intertidal zone of these shorelines. Rip rap is the universal countermeasure for scouring, and is often more expensive than using NNBFs for erosion control, and doesn't provide environmental co-benefits. Reefs dissipate incident wave energy by causing waves to break on the reef, rather than the shoreline, and reduce exposure to resources in its lee. The rugosity and friction

created by reefs reduce wave height and energy that lead to wave run-up (Bridges et al., 2021). By considerably reducing the wave energy at the shoreline and base of the wall, erosion seaward of the storm surge wall would be minimized. Additionally, in systems where there is sufficient sediment supply, oyster reefs naturally trap and buildup sediments, which would gradually stabilize and elevate the marsh behind the sill, further offsetting potential scouring effects between the shoreline and the wall, without needing to add rip rap.

Construction best management practices and minimization. The NEPA process and consultations with regulatory agencies have helped to identify when adverse effects may result during construction of the Recommended Plan, and where minimization measures should be applied to reduce impacts to the environment. USACE would require that various construction best management practices (BMPs) and specific conservation measures be included in contractor construction plans and specifications, and that they be monitored for effectiveness.

For example, contractors would be required to have an erosion and sediment/soil control plan due to the potential for soil and sediment disturbance that could occur during construction of the wall (no dredging or excavation is planned). Typical BMPs would include use of turbidity curtains, silt fences or similar methods to contain sediments and soils and reduce the potential for impacts on water quality and aquatic resources from turbidity and suspended solids. In tidal waters or marsh areas, curtains would be placed within a 25-foot construction buffer zone from the wall, and parallel to the wall structure (which parallels the shoreline).

Minimization of noise effects would include limiting the times of days when pile driving would occur. Pile driving would be limited to 7:00AM to 7:00PM during the week, and from 9:00AM to 7:00PM on Saturdays due to the City of Charleston's current noise ordinance that pertains to loud repetitive sounds. Pile driving in shallow open water areas would be limited to low tide to reduce the potential for underwater sound impacts on marine mammals and fish (which would be further limited by the noise ordinance window). Since the majority of the construction will occur on land, the use of noise control techniques, such as mufflers and intake silencers, could also be used in construction areas closest to residential and commercial development if needed. Vibratory monitoring will be required during construction, particularly for historic structures within a conservative 200 ft buffer (100 ft is typical). A construction vibratory monitoring and/or protection plan would be developed during the PED phase, when more engineering and geotechnical information is available. Construction lighting, if used, would be down-shielded to minimize effects on migratory birds.

A special minimization feature that would be used to minimize construction impacts in marshes is a worksite trestle for keeping heavy equipment off the marsh during construction of the combination wall. It would be similar to a wood trestle currently being used by the City of Charleston for another construction project that allows for all of the construction, storage, and mobilization of construction equipment to occur from the land side. This would avoid boat strikes with marine mammals and any threatened and endangered aquatic species. Only the wood pilings from the temporary trestle would come into contact with the marsh, and the marsh would be restored to its former condition when the trestle is removed.

The "Standard Manatee Construction Conditions" recommended by the U.S. Fish and Wildlife Service would be required to reduce potential construction-related impacts to the manatee to discountable and insignificant levels (FWC, 2011). The "Protected Species Construction Conditions" (https://media.fisheries.noaa.gov/2021-06/Protected_Species_Construction_Conditions_1.pdf?null), "Vessel Strike Avoidance Measures" (https://media.fisheries.noaa.gov/2021-06/Vessel_Strike_Avoidance_Measures.pdf?null), and "Measures for Reducing Entrapment Risk to Protected Species" (https://media.fisheries.noaa.gov/dam-migration/entrapment_bmps_final.pdf) issued by the National Marine Fisheries Service Southeast Regional Office would also be followed to reduce potential construction-related impacts to sturgeon and sea turtle species. These measures would also generally reduce the potential for adverse effects on other aquatic resources.

4.0 Compensatory Wetland Mitigation

4.1 Wetland Mitigation Guidance

Section 2036(a) of the Water Resources Development Act (WRDA) of 2007 requires, among other things, that USACE Civil Works mitigation plans meet the applicable mitigation standards and policies of the Regulatory programs administered by the Secretary of the Army. On April 10, 2008, USACE and U.S. Environmental Protection Agency (USEPA) published regulations entitled, "Compensatory Mitigation for Losses of Aquatic Resources" ("Mitigation Rule"). The primary goal of these regulations was to improve the quality and success of compensatory mitigation plans that are designed and implemented to offset impacts to aquatic resources authorized by Department of the Army regulatory permits. Subsequent guidance issued 31 August 2009 by USACE (CECW-PC Memorandum, Implementation Guidance for Section 2036 (a) of the Water Resources Development Act of 2007 (WRDA 07) - Mitigation for Fish and Wildlife and Wetlands Losses) concluded that Civil Works guidance on mitigation planning is consistent with the applicable standards and policies of the Corps Regulatory Program for wetlands mitigation.

The Mitigation Rule emphasizes the strategic selection of mitigation sites on a watershed basis and establishes equivalent standards for all types of compensatory mitigation (i.e., mitigation banks, in-lieu fee programs, and permittee-responsible mitigation plans). Per regulations at 33 CFR Part 332, compensatory mitigation means the restoration (re-establishment or rehabilitation), establishment (creation), enhancement, and/or in certain circumstances preservation of wetlands for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and practicable avoidance and minimization have been achieved. The three mechanisms for providing compensatory mitigation listed in order of preference as stated in the Mitigation Rule are the following: mitigation banks, in-lieu fee programs, and permittee-responsible mitigation. Compensatory mitigation is necessary to offset these unavoidable impacts to aquatic resource functions and services and to meet the programmatic goal of "no overall net loss" of aquatic resource functions and services.

Likewise, the South Carolina Coastal Tidelands and Wetland Act of 1977 requires that impacts to wetland be mitigated. It states that avoidance is preferable to mitigation, and

that mitigation shall be performed at a ratio of 1:1 wetland created to wetland altered, for projects deemed in the public interest.

4.2 Mitigation Planning Objective

USACE and City of Charleston intend to compensate for permanent adverse effects on salt marsh wetlands through in-kind mitigation to the extent incrementally justified, and employing a watershed approach. The mitigation planning objective is to offset and replace non-negligible direct losses, and indirect losses in habitat function and quality, of salt marsh wetlands (measured in habitat units) as a result of implementing the Recommended Plan, as is required by USACE policy ER 1105-2-100, Appendix C. The action to be taken to achieve the mitigation objective for wetland impacts has been determined to be for the purchase of wetland mitigation credits from an approved Mitigation Bank, as described below. A Permittee-Responsible Mitigation option will continue to be considered per USACE policy, but no feasible and suitable opportunities have been identified to date. There were no In-Lieu Fee programs for consideration.

Since only one Federal action alternative was carried forward in the final array of alternatives in the FR/EIS, a cost comparison per habitat functional unit between action alternatives was not needed. An incremental cost-effective analysis to compare and select from the different mitigation options (Mitigation Bank or among multiple Permittee-Responsible Mitigation options) was not needed since no feasible and suitable opportunities for the Permittee-Responsible Mitigation option have been identified to date.

4.3 Areas of Potential Impact

Consistent with USACE policy for feasibility studies, this Draft Mitigation Plan considers the wetland losses reasonably expected to occur from implementation of the Recommended Plan. Careful consideration has already been taken during formulation and evaluation of Recommended Plan to avoid impacts to wetlands where feasible, reducing the number of wetlands potentially impacted in an earlier conceptualization of the alternative from approximately 111 acres to 40 acres. As explained below in more detail, USACE believes this is a realistic estimate. During the PED phase, when the measures and features of the plan will be designed, there may be opportunities to further minimize wetland impacts, resulting in a reduction of wetland impacts. Engineering analysis and design could also result in a slight increase or decrease in wetland impact. If either of these happens, resource agencies will be informed and this Mitigation Plan will be updated accordingly. Also during the PED phase, wetland delineations will be performed by USACE at each of the wetland impact areas to verify the actual acreage impacted and field validate other information. This will affirm the final acreage for the wetland mitigation requirement.

For this study, potential areas of wetland impact were identified based on geospatial data, site reconnaissance, and local understanding of the sites. The marshes and tidal creek systems that would be impacted are relatively small. Because the wetland areas are small, they were hand-digitized (leaving some room for inaccuracy) using current imagery, and spot-checked with 2017 NOAA Coastal Change Analysis Program (C-CAP) data. USFWS

National Wetland Inventory (NWI) data was only used as a general guide since it is the least current of the data sets. However, NWI data confirmed, for estimation purposes, that only one wetland type according to the Cowardin et al (1979) system is present at the potential impact locations: estuarine emergent wetlands (of which intertidal flats and oyster reefs are part of the estuarine wetland classification). The potential impact area was calculated based upon the intersection of the conceptual buffered footprint of the storm surge wall with the digitized wetlands, including the wetland areas landward (behind) the wall. The impact areas are predominantly on the Ashley River-side of the Charleston Peninsula. Since the storm surge wall would not be continuous in the marsh (i.e., coming onto land in some areas), the wetland areas impacted are also not continuous and can be isolated by location. Figure 2 shows the locations and labels of salt marsh wetland areas potentially affected by the Recommended Plan.

The approximate area of salt marsh wetlands that may be permanently affected by implementation of the Recommended Plan, **prior to accounting for minimization measures and the wetland functional analysis**, is 40.3 acres. The area of each impact site is shown in Table 1.

Table 1. Estimated salt marsh impact areas.

MARSH LOCATION	ESTIMATED IMPACT AREA (acres)
Ashley River along Wagener Terrace – North end	6.4
Halsey Creek	13.2
Ashley River along Wagener Terrace – South end	4.6
Citadel Marsh (behind Joe Riley Stadium)	11.5
Diesel Creek	1.2
USCG Marsh	3.4
TOTAL	**40.3**

Figure 2. Wetland areas potentially impacted by the Recommended Plan. (Source: USACE)

4.4 Wetland Functional Analysis

USACE Engineering Regulation (ER) 1105-2-100 states that "habitat-based evaluation methodologies shall be used to the extent possible to describe and evaluate ecological resources and impacts associated with alternative plans." In order to comply with this and to meet the mitigation planning objective, the lost function and quality of the wetlands were considered, not just the acreage. USACE identified the Habitat Suitability Index (HSI) Model for White Shrimp (Turner and Brody, 1983) to estimate the functional habitat loss of wetlands, and for the associated mitigation alternatives and quantities that would occur with implementation of the Recommended Plan. This model was selected because all of the salt marshes in the study area are designated as Essential Fish Habitat (EFH) for white shrimp (*Litopenaeus setiferus*) in the post-larvae to juvenile stage, as defined by the South Atlantic Fisheries Management Council in accordance with Magnuson-Stevens Act. This HSI Model is among the models approved for use by the USACE ECO-PCX; however, since the model was developed for the Gulf of Mexico region, single-use approval has been granted by the USACE ECO-PCX to apply it in South Carolina estuaries for this study. NOAA Fisheries and other regulatory agencies have agreed with the appropriateness and use of the White Shrimp HSI for determining functional losses of wetland habitat in this feasibility study.

The output of the White Shrimp HSI model is an index between 0.0 and 1.0, which reflects total shrimp production or carry capacity for an area. The authors suggest that "generalized statements about habitat requirements cannot be applied equally to all populations," and "each variable in the model should be evaluated and modified as necessary for best results in a local situation." There are four habitat variables: V1 - percentage of marsh cover; V2 - substrate composition (soft, muddy, course); V3 - salinity (summertime mean); and V4 - Temperature (summertime mean). The first two variables relate to post-larvae and juvenile white shrimp life requisites for food and cover, and the last two relate to water quality life requisites. The suitability index values are derived from graphical relationships with values for each habitat variable, and then are combined for the food/cover requisite component and for the water quality requisite component, respectively. The HSI is equivalent to the lowest value of either of the two life requisite values. The HSI also gives special consideration to physical structures, such as levees or roads, when evaluating habitat suitability for shrimp, which would apply to the storm surge wall in the Recommended Plan. If a physical structure would close off the hydrologic connection between estuarine shrimp habitat and the offshore habitat, a modifier is applied to the HSI calculation. The modifier states that if the hydrologic connection is ≤10% of the length of the confining boundary when considering the unconfined outline of the natural hydrologic unit, the site is assumed to be unsuitable for white shrimp habitat requirements, and the HSI score defaults to zero.

For this habitat functional analysis, each of the potential wetland impact areas was evaluated with respect to its suitability to provide habitat for white shrimp, both with the storm surge wall present, and without the wall (which represents the current habitat conditions). An HSI value, or score, was computed for each impact area using the White Shrimp HSI. The HSI score that resulted when computed with the wall present, was subtracted from the current condition HSI score, then multiplied by the number of acres at

each impacted area. The output was the number of acres of habitat function lost, not the size of the impact area. The outputs of the white shrimp HSI functional analysis are shown in the last column in Table 2.

Table 2. Estimated White Shrimp Habitat Function lost at each wetland impact area.

MARSH LOCATION	ESTIMATED IMPACT AREA (acres)	ESTIMATED FUNCTIONAL LOSS (acres)
Ashley River along Wagener Terrace – North end	6.4	5.1
Halsey Creek	13.2	7.7
Ashley River along Wagener Terrace – South end	4.6	3.5
Citadel Marsh (behind Joe Riley Stadium)	11.5	5.8
Diesel Creek	1.2	0.8
USCG Marsh	3.4	2.4
TOTAL	**40.3**	**25.3**

4.5 Determination of Required Mitigation

In order to determine the required amount of wetland mitigation, Federal and state regulations and USACE policy must be considered. South Carolina coastal zone regulations implementing the Coastal Tidelands and Wetlands Act (S.C. Code § 48–39–10 et seq), specifically R.30-4, would require that wetland mitigation be compensated at a 1:1 ratio for the Recommended Plan. This regulation does not take into account the habitat function of the impacted wetlands. The R.30-4 states as follows: "*Mitigation shall take the form of wetland creation and/or wetland enhancement and restoration. Wetland creation shall be performed at a ratio of 2:1, wetland created to wetland altered, for private projects and 1:1, wetland created to wetland altered, for projects deemed in the public interest*." As such, the mitigation requirement for this study has not been determined by using the White Shrimp HSI alone, because the amount of mitigation calculated by habitat function is less than wetland the mitigation otherwise required by the State based on acreage alone. USACE would be expected to mitigate for the wetland acreage impacted, not function, in order to be compliant with the Coastal Zone Management Act state regulations and to obtain Section 401 Water Quality Certification for estuarine emergent wetlands.

However, USACE believes the results of the functional analysis should be used for calculating the wetland mitigation requirement at Halsey Creek where most of the marsh habitat is only indirectly affected by the wall. Because storm gates would be installed in the wall at Halsey Creek as a minimization measure that allows for tidal exchange rather than creating a full restriction, the habitat function of the salt mash wetlands in Halsey Creek would not be completely lost, but some habitat functions would be degraded over time. Therefore, the HSI calculation for functional acres lost would be used to define the mitigation requirement here. The HSI and associated modifier was also used to determine the number of sluice gates that would be needed to maintain suitable habitat for white shrimp in Halsey Creek.

After considering all applicable regulations and policies, the feasibility-level estimation of wetland area required to be offset through compensatory mitigation is 34.8 acres (see Table 3).

Table 3. Required Compensatory Wetland Mitigation for Impacted Wetlands

MARSH LOCATION	ESTIMATED REQUIRED MITIGATION (acres)
Ashley River along Wagener Terrace – North end	6.4
Halsey Creek	7.7*
Ashley River along Wagener Terrace – South end	4.6
Citadel Marsh (behind Joe Riley Stadium)	11.5
Diesel Creek	1.2
USCG Marsh	3.4
TOTAL	**34.8**

*Includes estimation of habitat function lost, not total acreage impacted

4.6 Mitigation Options

For the Draft Mitigation Plan, two mitigation approaches were considered – the purchase of credits from a Salt Marsh Mitigation Bank and the identification of formulation of Permittee-Responsible Mitigation options.

Permittee-Responsible Mitigation requires acquisition of appropriate real estate interests, financial assurances for the mitigation site, a detailed restoration plan, and a monitoring and adaptive management plan. USACE sought input from natural resource agencies, local stakeholders, and the City of Charleston to identify potential opportunities for salt marsh restoration that could be suitable for the Permittee-Responsible Mitigation approach. USACE considered all ideas suggested by these entities, as well as some ideas of their own; however, they were not able to identify any that were feasible (i.e., could not be restored to salt marsh habitat) or suitable (e.g., not enough restored function to meet the mitigation requirement). USACE did cost out one restoration site idea, but it was too small to meet the mitigation requirement. Regardless, in accordance with the authorities and regulations provided in Section 1.0 above, feasible and suitable Permittee-Responsible Mitigation options could be considered prior to the Mitigation Plan being finalized in the PED phase.

When securing credits from a saltwater mitigation bank, many of the prerequisites for an acceptable mitigation plan have already been addressed by the approved and permitted banking entity. There are currently two permitted tidal salt marsh mitigation banks in South Carolina – Clydesdale Mitigation Bank and Murray Hill Mitigation Bank. Both of these banks are outside of the watershed of potential impacts. While there are currently no permitted saltwater banks in the watershed, the primary service area for a third bank, the Point Farm

Mitigation Bank, includes the watershed of potential impacts and has recently been approved, but the federal and state permits for this proposed bank are pending. There are at least two other saltwater mitigation banks currently going through the bank approval process, so additional banks could be available for consideration prior to the Mitigation Plan being finalized in the PED phase, and mitigation commitments need to be actualized.

The Clydesdale Mitigation Bank (Clydesdale) and the Murray Hill Mitigation Bank (Murray Hill) are both owned and operated by South Coast Mitigation Venture, LLC located in Jacksonville, Florida. The Clydesdale Mitigation Bank was approved in June 2013, and includes 487.6 acres of tidal restoration and 202.66 acres of tidal preservation. The Clydesdale bank is located in Jasper County, South Carolina. Only credits for tidal restoration would be considered for this study. The Murray Hill Mitigation Bank was approved in May 2018, and includes 452.9 acres of tidal preservation, 353.6 acres of tidal restoration, and 32 acres of upland preservation. The Murray Hill bank is also located in Jasper County, South Carolina, adjacent to the Clydesdale Mitigation Bank. Only credits for tidal restoration would be considered for this study. The Point Farm Mitigation Bank is located on the western end of Wadmalaw Island in Charleston County and is owned by Point Farm Investors, LLC located in Pawleys Island, South Carolina. The bank was approved by USACE in June 2021, and includes 35.31 acres of tidal restoration, 22.9 acres of tidal enhancement, and 1,107.57 acres of tidal preservation.

4.7 Mitigation Costs

Rough-order of magnitude (ROM) mitigation costs have been estimated for the wetland mitigation banks, based on present day values, which is appropriate for this feasibility-level study (see Tables 4a, 4b, 4c). The costs were developed from information provided by the banks. The price for a single credit from the Murray Hill and Clydesdale Mitigation Banks (regardless of the type of credit) is currently $65,000.00. The price of credits is driven by the market and therefore subject to change prior to construction. The Clydesdale Mitigation Bank was approved for use under the *Joint State and Federal Administrative Procedures for the Establishment and Operation of Mitigation Banks in South Carolina* (SC Guidelines) while the Murray Hill Mitigation Bank was approved under the *2010 Guidelines for Preparing a Compensatory Mitigation Plan* (2010 Guidelines). These two documents differ in their approach to determination of mitigation bank credits. The primary difference is in the range of values for the net improvement factor. The SC Guidelines provide a range of 0.1 to 4.0 while the 2010 Guidelines provides a range of 0.1 to 3.0. The methods also have minor differences in the values for other factors that can affect the overall value total. For each credit sale, both banks are required to provide a credit worksheet showing how many acres are consumed by the sale. When the total acres consumed equal the total acres in that bank, no more credits may be sold. For the Point Farm Mitigation Bank, it has been approved under the 2010 Guidelines, and the current market price of a single credit is understood to be approximately $60,000.00 if tidal restoration credits were being sold at this time.

USACE policy (ER 1105-2-100, Appendix C) requires that the same certified habitat assessment model used to determine the functional impacts of the proposed action also be used to assess the mitigation bank credits. To do this, USACE first conducted an assessment to determine the existing function based on acres and the remaining function once the project would be completed, as described in Section 4.4. The difference in these two numbers represents the functional loss that must be mitigated, unless 1:1 mitigation was required. This number was then multiplied by the total acreage of the area impacted. The final result was a total estimated mitigation requirement of 34.8 acres of salt marsh wetland restoration (inclusive of estuarine vegetation, intertidal oyster reefs, the estuarine water column, and intertidal flats that make up salt marsh systems). The next step required a review of the credit worksheets each bank used to determine the bank credits generated by their restoration activities. Selecting the marsh restoration areas, USACE adjusted the kind and location factors to match the project conditions (in kind and service area) and then calculated the total sum of all factors. Each bank has six factors to generate values. The banks consider net improvement, credit schedule, temporal lag, kind, and location in their credit determinations; however, Clydesdale also considers the type of site protection applied where Murray Hill allows credit for upland buffers that meet certain conditions. The sum of values was then multiplied by the acreage of each wetland impact site. As an example, for the Ashley River North site, the sum of values using the Murray Hill credit determination is 3.4. Using Clydesdale, the sum of values equals 4.76. When multiplied by the acreage (6.4), Murray Hill required credits would be 21.76 and Clydesdale required credits would be 26.88. Finally, the number of required credits was multiplied by the price for a single credit, which is currently either $65,000 or $60,000 depending on the bank.[1]

The ROM cost for mitigating significant adverse effects to wetlands from implementing the Recommended Plan, using wetland mitigation banking as the mitigation approach, would be roughly $7,600,000 - $9,600,000, depending on which bank is used.

[1] In accordance with the authorities and regulations provided in Section 1.0 above, the salt marsh mitigation credits summarized in Tables 4.a., b., and c. below (for Murray Hill, Clydesdale, and Point Farm, respectively) were calculated based on the same certified habitat assessment methodology (i.e., the HSI Model) that was used to determine the functional impacts of the proposed action. This approach ensures that that the identified impacts to the habitat functions of salt marsh wetlands are fully mitigated by the purchase of salt marsh credits, even where such impacts would not necessarily constitute a loss of waters of the United States at all. Therefore, the mitigation calculations summarized in Tables 4.a., b., and c. are not limited to the amount of compensatory mitigation that would otherwise be required merely to offset the loss of waters of the United States using the 2010 Guidelines.

Table 4a.

Proposed Mitigation Using Murray Hill Mitigation Bank			
Wetland Impact Site	Required Acres	Murray Hill Mitigation Bank Required Credits	Murray Hill Mitigation Bank Credit Cost
Ashley River North	6.4	21.76	$1,414,400.00
Ashley River South	4.2	14.28	$928,200.00
USCG	3.4	11.56	$751,400.00
Diesel Creek	1.2	4.08	$265,200.00
Halsey Creek	7.7	26.18	$1,701,700.00
Citadel Marsh	11.5	39.1	$2,541,500.00
Totals	34.4	116.96	$7,602,400.00

Table 4b.

Proposed Mitigation Using Clydesdale Mitigation Bank			
Wetland Impact Site	Required Acres	Clydesdale Mitigation Bank Required Credits	Clydesdale Mitigation Bank Credit Cost
Ashley River North	6.4	26.88	$1,747,200.00
Ashley River South	4.2	17.64	$1,146,600.00
USCG	3.4	14.28	$928,200.00
Diesel Creek	1.2	5.04	$327,600.00
Halsey Creek	7.7	32.34	$2,102,100.00
Citadel Marsh	11.5	48.3	$3,139,500.00
Totals	34.4	144.48	$9,391,200.00

Table 4c.

Proposed Mitigation Using Point Farm Mitigation Bank			
Wetland Impact Site	Required Acres	Point Farm Mitigation Bank Required Credits	Point Farm Mitigation Bank Credit Cost
Ashley River North	6.4	31.1	$1,866,000.00
Ashley River South	4.2	20.4	$1,224,000.00
USCG	3.4	15.3	$918,000.00
Diesel Creek	1.2	5.8	$348,000.00
Halsey Creek	7.7	32.7	$1,962,000.00
Citadel Marsh	11.5	55	$3,300,000.00
Totals	34.4	160.3	$9,618,000.00

4.8 Selecting a Mitigation Option

USACE policy is to compare different mitigation options and select the "best-buy" mitigation plan. To do this, a cost effective/incremental cost analysis (CE/ICA) would have been performed for Permittee-Responsible Mitigation options, as described in USACE ER 1105-2-100. The CE/ICA would identify the least cost mitigation option that provides full mitigation of losses identified in the mitigation plan, and that is unconstrained except for required legal and technical constraints. Since no feasible and suitable Permittee-Responsible Mitigation options have been identified to date, the CE/ICA is not necessary for purposes of this Draft Mitigation Plan. As such, saltwater mitigation banking is currently the preferred mitigation approach for meeting the compensatory wetland mitigation requirements for the Charleston Peninsula Coastal Storm Risk Management Study.

There are multiple wetland mitigation banks that can be used, subject to future credit availability and price. USACE's policy to select the "best buy" mitigation plan still applies and the bank with the least cost per credit for the acres needed to meet the mitigation requirement, and considering a watershed approach, shall be used. Identification of a particular bank (or a Permittee-Responsible Mitigation site) will be made later in the PED phase, in coordination with resource agencies, closer to when environmental commitments would be actualized. Credit availability and price could change in this time, and other banks are likely to emerge. For example, should mitigation credits from other approved saltwater mitigation banks become available prior to the Mitigation Plan being finalized in PED, those banks would be considered for meeting the mitigation requirement, subject to credit pricing and availability at the time credit purchase is required. Similarly, should a suitable and feasible Permittee-Responsible Mitigation site present itself during PED, that option would also be considered for meeting the mitigation requirement consistent with governing authorities and regulations.

4.9 Monitoring and Adaptive Management

When purchasing credits from a mitigation bank is selected as the mitigation option, the approved mitigation bank assumes monitoring and adaptive management (and long term management which would normally be included as an Operation & Maintenance cost) of the compensatory site in accordance with their bank approval requirements. USACE and City of Charleston will have met their mitigation requirement once the mitigation banking credits are purchased (prior to project construction) as demonstrated through appropriate documentation, and no further action is needed.

5.0 Consistency with the Mitigation Rule

The purchase of credits from an approved salt marsh mitigation bank is currently the preferred mitigation option. This approach is consistent with the requirements and intent of 33 CFR Part 332 (the Mitigation Rule). As described in this Draft Mitigation Plan, which will be finalized in PED, USACE has followed the mitigation sequence of 1) avoiding adverse impacts to aquatic resources, 2) identifying appropriate and practicable steps to be taken to minimize adverse impacts that cannot

be avoided, and 3) identifying appropriate and practicable compensatory mitigation for unavoidable adverse impacts which remain.

In accordance with the Mitigation Rule, USACE is responsible for determining the appropriate form and amount of compensatory mitigation required. This Draft Mitigation Plan summarizes the potential wetland impacts of the Recommended Plan, and identifies the mitigation objective. It discloses how the compensatory mitigation requirement was approached, and how it is consistent with USACE policy. In accordance with the Mitigation Rule, USACE considered Permittee-Responsible Mitigation and Mitigation Banking as options to meet the mitigation objective and requirement. The currently selected mitigation option to purchase salt marsh credits from a mitigation banking is consistent with state regulations for impacts to coastal tidelands (wetlands), and has been reviewed by state and federal resource agencies.

6.0 References

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ENVIRONMENTAL CORRESPONDENCE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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October 25, 2021

Ms. Nancy Parrish
U.S. Army Corps of Engineers, Charleston District
69A Hagood Avenue
Charleston, SC 29405

Re: EPA Comments on the Draft Integrated Feasibility Report (IFR) and Environmental Impact Statement (DEIS) for the Charleston Peninsula Coastal Flood Risk Management Study in Charleston County, South Carolina; CEQ No. 20210134

Dear Ms. Parrish:

The U.S. Environmental Protection Agency has reviewed the referenced document in accordance with Section 309 of the Clean Air Act and Section 102(2)(C) of the National Environmental Policy Act (NEPA). The U.S. Army Corps of Engineers, Charleston District, prepared this Draft IFR/EIS to identify and evaluate structural and non-structural solutions that will reduce risk to the Charleston Peninsula from coastal storm surge inundation. The purpose of the proposed action is to reduce risk to human health and safety, reduce economic damages, and increase resilience from coastal storm surge inundation.

The DEIS evaluates a No Action alternative and four build alternatives. Alternative 2, a combination of Alternatives 1 and 4 with an added natural/nature-based feature, was identified as the Tentatively Selected Plan (TSP) and includes: (1) construction of a storm surge wall along the perimeter of the Peninsula, approximately 8.5 miles; (2) non-structural measures (i.e., buyout, relocation, elevate, or floodproof) for structures outside of the wall alignment; and (3) construction of living shorelines. The TSP was the highest performing alternative when evaluated for effectiveness, efficiency, acceptability, and completeness.

As a cooperating agency on this project, the EPA participated in various interagency meetings and reviewed the preliminary DEIS on August 17, 2021. Our primary concerns during the preliminary review involved impacts to wetlands, mitigation and water quality. The EPA also acknowledged that issues such as climate change and environmental justice were appropriately addressed in the preliminary DEIS.

Based on our review of the DEIS, the EPA commends the USACE on the reduction in wetland impacts from approximately 111 acres in the April 2020 draft environmental assessment to approximately 35 acres in the DEIS by realigning the storm surge wall from saltmarsh wetlands to land and the installation of storm gates at Halsey Creek to allow for tidal exchange. The DEIS indicates that the remaining wetland impacts will be addressed through mitigation. In the enclosed detailed comments, we have

remaining recommendations pertaining to wetland mitigation and water quality for the USACE to address in the Final EIS to further protect human health and the environment.

The EPA appreciates the opportunity to review the Draft DEIS and earlier coordination efforts during project development. If you have questions regarding our comments, please contact Ms. Alya Singh-White at (404) 562-9339 or singh-white.alya@epa.gov.

Sincerely,

Mark J. Fite
Director
Strategic Programs Office

Enclosure

Enclosure
EPA Detailed Comments on the Charleston Peninsula Coastal Flood Risk Management Study
Draft Integrated Feasibility Report and Environmental Impact Statement
CEQ No. 20210134

Wetlands: According to the Draft Mitigation Plan (Appendix F), the USACE is considering compensatory mitigation through mitigation banking or Permittee-Responsible Mitigation (PMP) to offset wetland impacts.

Recommendation: The EPA recommends including a complete mitigation plan in the Final EIS that identifies the details of the compensatory mitigation strategy that will be used.

Water Quality: Potential impacts to water quality in tidal creeks, particularly Halsey Creek, are of concern. According to Section 6.4 of the DEIS, site specific studies have not been conducted to evaluate the impacts of the walls/gates on water quality, specifically salinity and dissolved oxygen. The EPA notes the following statement: "*Since dissolved oxygen levels are already impaired in the Ashley River (Sanger et al, 2020), which could be assumed to extend into small tributaries of the Ashley River like Halsey Creek, the proposed storm surge wall and gates could compound impairment of dissolved oxygen behind the wall*." With no water quality data for any of the tidal creeks, baseline conditions are unknown and future water quality trends cannot be established.

Recommendation: We recommend water quality monitoring for dissolved oxygen and salinity to establish baseline conditions in the tidal creeks (particularly Halsey Creek). Additionally, the EPA recommends an adaptive management plan be included in the Final EIS that outlines potential mitigation if water quality is negatively impacted post construction.

Environmental Justice and Community Impacts: There are three communities on the Charleston Peninsula with environmental justice concerns within the vicinity of the project area that should benefit from the proposed project. The Public Housing communities of Cooper River Court and Meeting Street Manor, which are located within the perimeter of the sea wall, will benefit from that protection, while non-structural measures (floodproofing and/or elevating) will be implemented at Rosemont Neighborhood and Bridgeview Village. The EPA also notes that the USACE collaborated with the City of Charleton during the feasibility study on potential seawall aesthetic impacts and mitigation measures. Section 6.13 of the document discusses potential impacts and mitigation measures and a draft Memorandum of Understanding between the two agencies can be found in Appendix A.

United States Department of the Interior

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ER 21/0385
9043.1

October 22, 2021

Nancy Parrish
US Corps of Engineers Charleston District
Planning and Environmental Branch
69A Hagood Avenue
Charleston SC, 29403

Re: Comments and Recommendations for the Draft Environmental Impact Statement (DEIS) for the Charleston Peninsula Coastal Flood Risk Management Study - Charleston County, South Carolina

Dear Ms. Parrish:

The US Department of the Interior (Department) has reviewed the DEIS for Charleston Peninsula Coastal Flood Risk Management Study in Charleston County, South Carolina. We offer the following comments.

The Charleston Peninsula Coastal Flood Risk Management Study is a federal study that is investigating coastal storm impacts on the Charleston peninsula and, in partnership with the City of Charleston and its stakeholders, is exploring effective, economically viable and environmentally-sound solutions to mitigate risks and build enduring coastal storm resiliency.

The Department has been a cooperating agency with the U.S. Army Corps of Engineers (USACE) in the development of the Environmental Impact Statement (EIS) for this study. Previous scoping comments from the Department raised concerns about potential viewshed impacts to and from nearby Fort Sumter and Fort Moultrie National Historical Park as well as historic properties within the surrounding National Historic Landmark district. Based on a review of the Draft EIS, the Department does not offer any specific comments as it appears that no National Park Service (NPS) lands or waters would be enclosed within the proposed Storm Surge Wall around the perimeter of the Charleston Peninsula. Therefore, there do not appear to be any direct impacts to NPS resources. However, there may be impacts to the views to and from historic properties that are being addressed through a Programmatic Agreement (PA) that is currently being developed in accordance with the National Historic Preservation Act (NHPA). As a consulting party under NHPA, comments on the draft PA have been provided separately to USACE.

Please contact Cynthia Walton, Branch Manager, Archeological and Historic Preservation Partnerships, NPS Interior Region 2, for additional information concerning the PA at cynthia_walton@nps.gov or (404) 354-6072. Questions regarding these comments should be directed to Anita Barnett, Environmental Protection Specialist, NPS Interior Region 2, at anita_barnett@nps.gov or 404-507-5706.

Moreover, we have received the draft Feasibility Report/Environmental Impact Statement for the proposed storm surge wall surrounding the peninsula of Charleston, South Carolina. The U.S. Army Corps of Engineers and Department of the Army in partnership with the City of Charleston (City), developed this draft Feasibility Report/Environmental Impact Statement in accordance with the National Environmental Policy Act (NEPA). The Department and the City are seeking comments on the proposed Tentatively Selected Plan (TSP) designed to reduce the risk of flooding and damage from storm generated surges. Comments will be incorporated into a final Feasibility Report and Environmental Impact Statement.

Our personnel from the South Carolina Ecological Services Field Office have been coordinating with the Department of the Army, City, and resource agencies since 2019 to evaluate the purpose and need of the project and potential measures that would address those needs while minimizing impacts. We have concluded section 7 consultation under the Endangered Species Act of 1973, provided technical correspondence, and a Fish and Wildlife Coordination Act Report has been developed for the TSP. Potential impacts to federally protected trust resources and supporting habitat are at the forefront of the project team's discussions. Through the various meetings and deliberations, a TSP was selected which significantly reduced the area of salt marsh impacts, eliminated an initially proposed large breakwater structure, utilization of storm gates and an active pump system to mimic tidal flows behind the wall, included the creation of nature based living shorelines, and use of non-structural measures such as flood proofing existing homes to reduce storm surge damage.

While we have worked with the Department of the Army and the City to reduce impacts, we find that further reduction of marsh habitat impacts could be accomplished by moving the proposed location of the wall closer to the existing shoreline. Long term adverse effects to the marsh habitat behind the proposed wall should be evaluated thoroughly. Although the planned surge gate will allow for some tidal flow it will not equal natural sheet flows experienced during diurnal tidal exchanges. As a result, over time the marsh habitat behind the wall is likely to degrade through loss of native vegetation. Construction of the surge wall is certainly a major undertaking and will require a significant monetary and personnel investment from the City to operate and maintain the gates and pumps planned along the wall as well as ensure the wall itself is maintained in good condition. The Department of the Army and the City must develop and finalize a detailed Operations and Maintenance Plan for the entire storm surge wall and commit to long term funding for its maintenance.

We remain committed to continued involvement throughout the review and development of the proposed project. We realize that the TSP design may change in scope as the project develops.

Other preliminary concerns are listed below:

- Noise during construction and its affect upon resident and transient wildlife.
- Long term loss of salt marsh habitat through tidal flow degradation.
- Trash collection behind wall resulting from upland storm drainage.
- The potential risk of development expansion into marsh behind the surge wall.
- Appropriate compensatory mitigation for resource losses must be conceived and approved.

We appreciate the opportunity to provide these comments early in this project's development phase. If clarification regarding these comments is needed, please contact Mr. Mark Caldwell at mark_caldwell@fws.gov or (843) 300-0426, and reference FWS Log No. 2019-CPA-0006. I can be reached on (404) 331-4524 or via email at joyce_stanley@ios.doi.gov.

Sincerely,

Joyce Stanley, MPA
Regional Environmental Officer

cc: Christine Willis - FWS
Jon Janowicz - USGS
Anita Barnett - NPS
OEPC – WASH

South Carolina Department of
Natural Resources

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Robert H. Boyles, Jr.
Director
Lorianne S. Riggin
Director, Office of
Environmental Programs

October 25,2021

Ms. Nancy Parrish
U.S. Army Corps of Engineers, Charleston District
69 A Hagood Avenue
Charleston, SC 29403-5107

REFERENCE: Charleston Peninsula, South Carolina: A Coastal Flood Risk Management Study Draft Feasibility Report/Environmental Impact Statement

Dear Ms. Parrish,

Personnel with the South Carolina Department of Natural Resources (SCDNR) have reviewed the Coastal Flood Risk Management Study Draft Feasibility Report/Environmental Impact Statement (FR/EIS) prepared by the Charleston District U.S. Army Corps of Engineers (Corps) and placed on notice September 10, 2021. The SCDNR offers the following comments for your consideration.

Project Description and NEPA Process

The Draft FR/EIS evaluates the No Action/Future Without Project Alternative and Alternative 2 as the final array of alternatives to address coastal storm risk for the Charleston Peninsula. The goal is to reduce risks to health, safety, and economic damages from coastal storm surge inundation on the peninsula. Alternative 2 is comprised of a storm surge wall along the perimeter of the Charleston Peninsula, permanent and temporary pump stations, nonstructural measures, and natural and nature-based features. Alternative 2 was identified as the plan that reasonably maximizes net National Economic Development (NED) benefits, consistent with protecting the Nation's environment. Therefore, Alternative 2 has been identified as both the NED plan and the Tentatively Selected Plan (TSP). The draft FR/EIS supersedes the previously issued 2020 Feasibility Report and Environmental Assessment and was prepared in accordance with the National Environmental Policy Act (NEPA).

The stated purpose of this proposed action for the Charleston Peninsula is to identify the optimal structural and non-structural solution set to reduce risk to human health and safety, reduce economic damages from coastal storm surge inundation and increase resilience to coastal storm

surge inundation. As stated in the Executive Summary, the objectives of the Draft FR/EIS are as follows:

1. Reduce risk to human health, safety, and emergency access from coastal storm surge inundation on the Charleston Peninsula through the year 2082.
2. Reduce economic damages resulting from and increase resilience to coastal storm surge inundation on the Charleston Peninsula through the year 2082.

General Comments on the Draft FR/EIS

As a cooperating agency in the development of an EIS for the Charleston Peninsula Flood Risk Management Study, the SCDNR has been involved in the environmental review of this project since its inception in 2018. SCDNR staff have participated in all Interagency Coordination Team (ICT) meetings and provided agency comment on the Draft Feasibility Report/Environmental Assessment and Mitigated Finding of No Significant Impact (FR/EA and FONSI) on June 17, 2020, and the Preliminary Draft Environment Impact Statement on August 9, 2021. The SCDNR has participated in a series of meetings to discuss key elements of an acceptable NEPA review of this project, including development of a clear and justifiable project purpose and need statement and a process to be used in developing a set of reasonable alternatives.

After a thorough review of the Draft FR/EIS, the SCDNR finds, with a few exceptions, the submitted report generally sufficient in addressing the potential environmental impacts associated with the proposed project. The SCDNR asks that the following comments and recommendations are taken into consideration in the development of a Final FR/EIS and in the selection of a final plan for this project.

In order to accommodate the expedited schedule for finalizing the report, our comments focus primarily on those sections of the Draft FR/EIS that address:

1. The potential direct and indirect impacts of the proposed project on our state's natural resources and
2. The proposed mitigation for those impacts.

Chapter 4 – Affected Environment

4.8 Aquatic Resources

As stated in the Draft FR/EIS, "SCDNR monitors biological communities throughout the state's coastal habitats." A narrative summary of the SCDNR monitoring data from the Tidal Creek Project (TCP) and South Carolina Estuarine and Coastal Assessment Program (SCECAP) should be included in the body of the FR/EIS and should refer to the associated raw data which is anticipated to be presented in the Environmental Appendix.

4.9 Benthic Resources

With respect to benthic resources, the Draft FR/EIS states, "In general, the biological condition of benthic communities and sediment quality tends to be lower in tidal creeks than in open waters across South Carolina's estuaries." This comment is somewhat misleading. According to the 2017-2018 SCECAP report[1], when tidal creek and open water habitats investigated in the study were considered separately, a greater percentage of tidal creek habitat was in fair to poor condition. However, in general, 90% South Carolina's coastal estuarine habitat (tidal creek and open water habitats combined) was considered to be in good condition. Lower biological condition values are often seen in tidal creek habitats, which likely reflect the fact that they are naturally more stressful environments than open water habitats. Tidal creeks also have a closer connection to the developed uplands, which can lead to higher levels of water quality and sediment quality measures such as fecal indicator bacteria and sediment chemical contamination. As noted above, SCDNR studies have investigated water quality and habitat quality near or within the study area and Region of Influence (ROI). An accurate summary of data from relevant studies, included as text in the FR/EIS, would create a more robust picture of baseline biological conditions for the proposed project. Please refer to appropriate data in the Environmental Appendix in the Final FR/EIS.

Chapter 6 – Environmental Consequences

6.4 *Water Quality*

The Draft FR/EIS acknowledges that the storm surge wall associated with Alternative 2 could have an adverse effect on creek and marsh water quality behind where the storm surge gates would be placed, and particularly in Halsey Creek. SCDNR has expressed concern regarding the potential for significant impacts on tidal creek and marsh hydrodynamics, as well as the ecological functions associated with tidal flows, as a result of the installation and operation of multiple gates. Overall hydrologic impacts are predicted to be temporary and minor based on normal conditions. The SCDNR believes the operation and maintenance of mechanical gates in a dynamic, saltwater environment will be difficult and the risk of gate failure or mismanagement is high. The potential for such failures and the associated impacts to creek and marsh hydrology and hydraulics should be acknowledged in the Final FR/EIS.

Mitigation

Compensatory Mitigation

The Draft Mitigation Plan considers two basic mitigation alternatives, purchase of mitigation banking credits and Permittee-Responsible Mitigation (PRM). No PRM sites have been identified nor has a specific mitigation bank been identified. The SCDNR recommends the following be considered in the formulation of a final compensatory mitigation plan for this project:

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[1] Sanger, D.M., S.P. Johnson, A.W. Tweel, D.E. Chestnut, B. Rabon, M.H. Fulton, and E. Wirth. 2020. The Condition of South Carolina's Estuarine and Coastal Habitats During 2017-2018: Technical Report. Charleston, SC: South Carolina Marine Resources Division. Technical Report No. 111. 52 p.

1. Compensatory mitigation should be used only after all adverse impacts of a project have been avoided and minimized to the greatest extent possible and no other feasible, less damaging alternatives exist. A detailed mitigation plan should be developed to compensate for all unavoidable impacts, both temporary and permanent, to natural resources.
2. Mitigation plans should be designed to replace wetland and other aquatic resource losses with those that are functionally similar. Mitigation sites should be located within the same watershed or ecosystem as the proposed impacts.
3. The restoration and enhancement of previously disturbed and degraded aquatic habitat is preferred over the creation of new habitat from uplands or the conversion of one type of functioning wetland/habitat to another. Creation or habitat conversion options result in the elimination or displacement of existing wetland/aquatic functions and result in no additional ecological benefits. Mitigation plans involving restoration or enhancement should include a monitoring plan, specific performance standards, and contingency measures to be implemented in the event of mitigation failure.
4. All mitigation proposals involving shellfish restoration will require careful upfront planning and should be coordinated with the SCDNR. SCDNR is generally not a consultant or contractor for hire to conduct shellfish restoration projects to meet the mitigation needs of permit applicants, particularly private entities. The SCDNR would not be able to accept funds or enter into a contract with a private entity to conduct work for shellfish restoration projects that would require monitoring, performance, and long-term success obligations. However, the SCDNR can accept the donation of funds with no additional obligations to support existing programs such as South Carolina Oyster Recycling and Enhancement (SCORE), but this type of mitigation would have to be reviewed and approved by the resource and regulatory agencies. Understand that the acceptance of the donated funds would not provide SCDNR's automatic approval of any project that this was proposed as mitigation.
5. The SCDNR does not consider the direct preservation of tidal saltmarsh under little to no threat as viable mitigation. Unless a Kings Grant can be documented, lands located below the mean high-water mark are in state ownership. Regardless of ownership, for mitigation in the form of preservation to be appropriate and provide compensatory mitigation value, the resources to be protected must be under threat of destruction or adverse modification. This is very difficult to demonstrate in the open tidal environment, given the protection afforded by existing regulations. Mitigation credit for marsh protection can be indirectly generated by the establishment of upland buffers placed immediately adjacent to tidal wetland areas.

Summary

While the SCDNR is not opposed to the planning and evaluation process used in developing the final array of alternatives and selecting the TSP, the SCDNR does not concur with the stated overall conclusion that, with minimization and mitigation measures, most of the environmental effects assessed are minor. The SCDNR considers the proposed project area to be worthy of the highest degree of environmental protection possible. The proposed project will involve significant impacts to important natural resources, requiring a thorough review under the

NEPA/EIS process, with careful consideration given to avoiding and minimizing impacts to important natural resources.

The SCDNR finds it important to consider alternatives with a greater emphasis on the use of non-structural and nature-based measures and strongly encourages the incorporation of these measures in the EIS process. Nature-based and layered resilience alternatives promote the establishment of tidal vegetation and other important natural resources, provide flood reduction benefits, and provide important ecological functions such as water purification and wildlife habitat.

The SCDNR appreciates the opportunity to comment on the Draft FR/EIS and looks forward to further assisting the Corps in the development of a plan that provides storm surge protection and meets the coastal resilience needs of the Charleston Peninsula with minimal impact to important natural resources. The SCDNR reserves the right to submit further comments on the proposed project, particularly with respect to the proposed mitigation, monitoring, and adaptive management plans, as the project evolves. Please contact me at crowes@dnr.sc.gov should you require any additional information.

Sincerely,

Stacie Crowe
Office of Environmental Programs

Cc: SCDHEC/Ress
OCRM/Stout
USEPA/Laycock
USFWS/Caldwell
NMFS/Cooksey
Lorianne Riggin