NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION - OFFICE OF MARINE AND AVIATION OPERATIONS

SOUTHEAST MARINE OPERATIONS HUB PROJECT

FINAL ENVIRONMENTAL ASSESSMENT

NORTH CHARLESTON, SOUTH CAROLINA

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Prepared for:
AHTNA ENVIRONMENTAL, INC.
900 SW 16th Street
Suite 330
Renton, WA 98057

Prepared by:
MOFFATT & NICHOL
4700 Falls of Neuse Rd
Suite 300
Raleigh, NC 27609

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF PHOTOS

LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	Definition
°C	Degrees Celsius
°F	Degrees Fahrenheit
ACM	Asbestos Containing Materials
ACS	American Community Survey
APE	Area Of Potential Effects
bls	Below Land Surface
BMPs	Best Management Practices
united	Brockington And Associates
CAA	Clean Air Act
Caltrans	California Department of Transportation
CAMA	Coastal Area Management Act
CDF	Confined Disposal Facility
CEQ	Council On Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, And Liability Act Of 1980
CESA	Cumulative Effects Study Area
CFR	Code Of Federal Regulations
CHATS	Charleston Area Transportation Study
cm	Centimeters
CO	Carbon Monoxide
CO2	Carbon Dioxide
CR	Census Reporter
CSC	Coastal Service Center
CTWA	Coastal Tidelands and Wetlands Act
CWA	Clean Water Act
CY	Cubic Yards
CZMA	Coastal Zone Management Act
dB	Decibels
dBA	A-Weighted Decibels
dBrms	Decibel Root Mean Square
DHEC	South Carolina Department of Health And Environmental Services
DO	Dissolved Oxygen
DPS	Distinct Population Segment
EA	Environmental Assessment
ECOS	Environmental Conservation Online System
EDR	Environmental Data Resources
EFH	Essential Fish Habitats
EIS	Environmental Impact Statement
EJ	Environmental Justice
EO	Executive Order
EPCRA	Emergency Planning and Community Right-to-Know Act
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FHWG	Fisheries Hydroacoustic Working Group
FIRM	Flood Insurance Rate Maps
FLETC	Federal Law Enforcement Training Center
FONSI	Finding Of No Significant Impacts
FWS	Fish And Wildlife Services
GHG	Greenhouse Gases
GIS	Geographic Information System
HTL	High Tide Line
HUD	Housing And Urban Development
I-26	Interstate 26
in.	Inches

Acronym	Definition
IPaC	Information And Planning and Consultation
kg	Kilogram
LRTP	Long Range Transportation Plan
m	Meters
MCL	Maximum Contaminant Level
MCP	Metals-Containing Paint
MCY	Million Cubic Yards
mg	Milligram
MLW	Mean Low Water
MLLW	Mean Lower Low Water
MMI	Modified Marcalli Intensity
MMPA	Marine Mammal Protection Act
MOC	Marine Operations Center
MOC-A	Marine Operations Center-Atlantic
MOC-P	Marine Operations Center-Pacific
MPSSZ	Middleton Place-Summerville Seismic Zone
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
N2O	Nitrous Oxide
NA	Not Applicable
NAAQS	National Ambient Air Quality Standards
NAO	NOAA Administrative Order
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHPA	National Historic Preservation Act
NLEB	Northern Long-Eared Bat
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTU	Nephelometric Turbidity Unit
NWI	National Wetland Inventory
O3	Ozone
OCM	Office for Coastal Management
OCRM	Office Of Ocean and Coastal Resource Management
OMAO	Office Of Marine and Aviation Operations
OPA	Oil Pollution Act
OSHA	Occupational Safety and Health Administration
PAH	Polynuclear Aromatic Hydrocarbons
Pb	Lead
PBDE	Polybrominated Diphenyl Ether
PCB	Polychlorinated Biphenyl
PIN	Parcel Identification Number
PM	Particulate Matter
PREC	Potential Recognized Environmental Conditions
Project	Proposed Action
QAPP	Quality Assurance Project Plan
QTR	Quarter
RCRA	Resource Conservation and Recovery Act Of 1976
RCW	Red-Cockaded Woodpecker
REC	Recognized Environmental Concern
RHA	River And Harbors Act
RSL	Regional Screening Levels
SCAAS	South Carolina Ambient Air Quality Standards
SCCZMP	South Carolina Coastal Zone Management Program

Acronym	Definition
SCDEQ	South Carolina Department of Environmental Quality
SCDHEC	South Carolina Department of Health & Environmental Control
SCDNR	South Carolina Department of Natural Resources
SCDOT	South Carolina Department of Transportation
SCE&G	South Carolina Electric and Gas
SCPA	South Carolina Port Authority
SCPSA	South Carolina Public Service Authority
SEL	Sound Exposure Level
SELcum	Cumulative Sound Exposure Levels
Services	FWS and NMFS
SF	Square Foot
SFHA	Special Flood Hazard Areas
SHPO	State Historic Preservation Officer
SIP	State Implementation Plans
SLR	Sea Level Rise
SO2	Sulfur Dioxide
STIP	Statewide Transportation Improvement Program
SWAP	State Wildlife Action Plan
TCLP	Toxicity Characteristics Leaching Procedure
TMDL	Total Daily Maximum Load
TNW	Traditional Navigable Waterways
U.S.	United States
U.S.C.	U.S. Code
USACE	U.S. Army Corps of Engineers
USDOT	U.S. Department of Transportation
USDSCRC	U.S. Department of State Charleston Regional Center
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
US-XX	U.S. Route XX
WETA	Water Emergency Transportation Authority
WOTUS	Waters Of the United States

EXECUTIVE SUMMARY

This Final Environmental Assessment (EA) was prepared for the National Oceanic and Atmospheric Administration (NOAA) in accordance with the National Environmental Policy Act (NEPA) of 1969 (42 U.S. Code §4321, et seq.), as implemented by the Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508); and Policy and Procedures for Compliance with the NEPA and Related Authorities, Companion Manual for NOAA Administrative Order 216-6A (Effective: January 13, 2017). NOAA is the lead federal agency responsible for the preparation and content of this document under the requirements of the NEPA as amended (42 U.S.C. 4321, et seq).

The NOAA Office of Marine and Aviation Operations (OMAO) proposes to recapitalize Pier Romeo (the Pier) through the replacement of the existing pier (the project), located on the southern bank of the Cooper River at the Federal Law Enforcement Training Center (FLETC), at 2234 South Hobson Avenue, North Charleston, South Carolina (NOAA site).

This EA analyzes the potential impacts of the project, which is to recapitalize the Pier to a fully functional berthing facility at the FLETC, and to support mission readiness by implementing measures that would increase adaptability and resiliency of the NOAA site to climate change and predicted sea level rise (SLR) during the 50-year life of the project. The project would improve long-term critical infrastructure at the NOAA site and support the agency's mission to safely deliver effective earth observations capabilities, integrate emerging technologies, and provide a specialized, flexible, and reliable team responsive to NOAA and the nation. The project requires the demolition and reconstruction of the existing mainframe pier to support the docking of NOAA vessels, the *Nancy Foster* and *Ronald H. Brown,* as well as other visiting government vessels. The project proposes adding a smaller floating dock (pontoon pier) adjacent to the main pier to accommodate smaller boats up to 50 feet in length.

Additionally, other project objectives were identified during early project scoping, including measures to protect the NOAA site from storm surge flooding and efforts to mitigate the deterioration occurring at the existing shoreline. The concept design proposed for the project takes into consideration these objectives and includes options aimed at increasing the functionality of the pier and the adaptability and resiliency of the NOAA site to climate change and projected SLR. Project options to meet these additional objectives include both non-structural and natural measures that would aid in the floodproofing of the NOAA site.

This environmental review considered action alternatives during early project scoping efforts that had the potential to meet the purpose and need of the project as well as the No-Action Alternative. Additionally, early project scoping considered various locations for the placement of the proposed vessel berthing facility. However, due to NOAA's mission to strategically berth their vessels at locations closer in proximity to their dedicated mission support areas, the NOAA site in Charleston was the only location considered to be viable from an operational standpoint. This EA carried forward from early scoping the Preferred Alternative and the No-Action Alternative at the NOAA site in northern Charleston, South Carolina.

NEPA requires analysis of the No-Action Alternative, which, in this instance, represents continuation of present-day activities on site. The No-Action Alternative would not fulfill the purpose of the project, which is to improve critical infrastructure and mission support capabilities at the NOAA site by recapitalizing the Pier and options to increase site resiliency to storm surges and flooding. The No-Action Alternative would, however, serve as the baseline against which the other alternatives were compared.

A Fixed Pier Alternative would have represented an action alternative consisting of replacement in kind. However, this option was removed from further analysis during early scoping because it would not have fully addressed the project's objectives to provide protection from storm surges and flooding or future site adaptivity to climate change and SLR. This alternative also would not have represented the least environmentally damaging option. The construction of this alternative would have required a larger number of in-water steel piles to stabilize the pier and trestle in comparison to the Preferred Alternative, which represents a floating pier option. The additional piles needed to construct the Fixed Pier Alternative would have added to the likelihood of associated environmental impacts to water quality and biological resources and notably added to the overall cost of project construction.

The Preferred Alternative (Floating Pier) meets the purpose and need for the project and is the least environmentally damaging of the build action alternatives.

Prior to the decommission of the Pier in 2006, scheduled maintenance dredging occurred for safe navigation to and from the Pier. The reinitiating of dredging would be required if this project is to be constructed to re-establish navigational pathways to the Pier. Periodic maintenance of dredging is also a part of operational functionality for the design life of the project. This is discussed in greater detail in the Geological Resources section of this report.

The Preferred Alternative and the No-Action Alternative are being further evaluated in this report by NOAA per Section 102 of the NEPA under 42 U.S. Code (U.S.C.) Section 4332, and Council on Environmental Quality Regulations for Implementing Procedural Provisions of NEPA at 40 Code of Federal Regulations (CFR) 1500-1508. This project complies with applicable laws, including NEPA, Clean Water Act (CWA), the Coastal Zone Management Act of 1972 (CZMA), the Endangered Species Act (ESA), the National Historic Preservation Act, the Magnuson-Stevens Fishery Management and Conservation Act, the Fish and Wildlife Coordination Act, the Clean Air Act, and Executive Order (EO) 12898: Federal Actions to Address Environmental Justice in Minority Population and Low-Income Populations.

The environmental document also provides analyses of the potential effects that would have an impact on the human environment. Specific metrics used for the determination of this analysis included the following:

- Identification of the presence or absence of receptors having the potential to be impacted by the project and to what degree those potential impacts would be expected to occur.
- Identification of a construction or operational activity associated with the project that would have the potential to affect receptors in a manner that would set a precedent for future actions, and determining whether a project-related impact would violate criteria set by federal, state, or local laws and regulations; and
- Determining whether the project would be related to other actions that individually are non-significant but cumulatively have the potential to be significant.

Due to the location of the project and existing surroundings development, environmental topics including land use, recreational resources, farmland, roadway and rail transportation, and socioeconomic conditions were considered but not carried forward in the environmental analysis. The NOAA site's land use category of light industrial would remain unchanged by the implementation of the project. There are no recreational resources or farmland at the NOAA site within a one-mile radius. The project would have no notable change on the regional transportation network or local traffic conditions.

Table ES-1 summarizes determinations of environmental consequences followed by the respective avoidance and minimization measures for the Preferred Alternative, and the No-Action Alternative.

In summary, this EA concludes that the proposed project would result in no significant effects to natural resources or NOAA managed lands that were analyzed in this report. Best Management Practices (BMPs) are recommended during short-term construction activities including project dredging, as well as long-term operational and maintenance activities.

The relevance of using available information to qualitatively describe the likelihood of anticipated environmental consequences are implied based on existing credible scientific evidence and research methodologies found to be acceptable in the scientific community. The affected environment descriptions use technical information from standardized sources that are readily available. Any assumptions considered to be significant (as defined by NEPA, 40 CFR. §1508.27) are documented in the EA.

Table ES-1: Environmental Consequences for the Preferred Alternative and the No-Action Alternative

Resource	No-Action Alternative*	Preferred Alternative – Floating Pier*	Phase	Recommended BMPs and Anticipated Regulatory Compliance
Air Quality	No Effect	Minor	Demolition & Construction	• Maintain construction equipment according to manufacturer specifications. • Minimize idling times. • Cover haul trucks that are transporting loose material. • Limit vehicle speeds on unpaved roads.
Noise	No Effect	Moderate	Demolition & Construction	• Consider both blasting and mechanical demolition and select the method that has the least acoustic impacts. • Conduct noise-generating work in a way that will minimize acoustic effects. • Use noise attenuation and minimization measures during pile driving. • Avoid or minimize activities with significant acoustic effects during sensitive life stages of ESA-listed species, federally managed species, or NOAA trust resources. • Locate stationary noise-generating equipment away from sensitive receptors. • Equip internal combustion engine-driven equipment with intake and exhaust mufflers. • Turn off equipment when not in use.
Geological Resources (including project dredging activities)	No Effect	Negligible (upland construction activities) Moderate (during riverbed dredging) Moderate (beneficial)	Demolition & Construction & Operations	• Prior to upland construction activities, conduct a site-specific geotechnical evaluation and assess any geologic hazards such as seismic hazards and hazards of coastal erosion. • Exposed soils should be stabilized quickly either through covering or capping in the form of either repaving or temporary measures to prevent soil erosion.

Resource	No-Action Alternative*	Preferred Alternative – Floating Pier*	Phase	Recommended BMPs and Anticipated Regulatory Compliance
Water Resources	No Effect	Moderate (Impacts related to temporary riverbed dredging and operational impacts of channel maintenance)	Demolition & Construction & Operation	• Maintain any vegetative buffer between the water and upland activities. • Make sure that raw concrete and grout does not contact the water. • Avoid the use of creosote or pressure treated piles and do not locate any treated piles in areas containing shellfish or sensitive habitats. • Incorporate stormwater controls to minimize pollutants in aquatic habitats. • Minimize the number of and size of piles used. • Dispose of dredge material in the appropriate way. • Prevent contaminants and sediments from entering aquatic habitats through discharge. • Implement applicable S.C. Department of Health and Environmental Control approved sediment control and erosion prevention practices.
Hazardous Materials / Waste Disposal	No Effect	Negligible	Demolition & Construction & Dredging	• Test leachability of lead-based painted materials; handle and dispose of such material in accordance with applicable regulations. • Develop a site-specific Health and Safety Plan in accordance with 29 CFR 1910.120. • Solid waste generated by construction of the project must be compliant with federal and South Carolina regulations and guidelines affecting the generation, transportation, treatment, storage and disposal of solid waste. • Further investigate disturbed upland soils during construction in areas where contaminant screening levels were exceeded prior to waste disposal.
Solid Waste Management	No Effect	Negligible	Demolition & Construction	• Further investigate disturbed upland soils during construction in areas where contaminant screening levels were exceeded prior to waste disposal.
Climate Change	No Effect	Moderate (beneficial)	Demolition & Construction & Operation	• Project should be designed and constructed in a manner that would increase site adaptability to SLR and minimize potential adverse effects on resources.
Coastal Resources	Moderate (adverse) Continued erosion of riverbank slopes	Moderate (beneficial)	Demolition & Construction & Operation	• Project design is intended to stabilize adjacent shoreline and reduce localized flood risk over the long-term.

Resource	No-Action Alternative*	Preferred Alternative – Floating Pier*	Phase	Recommended BMPs and Anticipated Regulatory Compliance
Biological Resources	No Effect	Minor	Demolition & Construction	• Conduct biological monitoring and assessments during multiple seasons to assess impacts as specified in regulatory permitting. • Ensure holes left by piles are filled with noncontaminated substrate. • Avoid dredging in sensitive aquatic habitat. • Avoid the temporary storage of dredged material in the water.
Utilities	No Effect	Moderate (beneficial)	Operation	None
Environmental Justice	Minimal	Minimal (beneficial)	Operations	Advance compliance with EO 14008
Cultural Resources	No Effect	No Effect	Demolition & Construction & Operation	None

1. PURPOSE AND NEED

1.1. Introduction

This chapter identifies the need for the project as well as its purpose and objectives to be achieved by its implementation.

1.1.1. Agency Mission

The NOAA - OMAO is a government agency charged with the mission of safely delivering effective earth observations capabilities, integrating emerging technologies, and providing a specialized, flexible, and reliable team responsive to NOAA and the nation. NOAA - OMAO administers the use, operation, maintenance, and upgrade of NOAA vessels and associated equipment, including the management of NOAA's fleet of research and survey ships.

NOAA - OMAO's research and survey ships comprise the largest fleet of federal research ships in the nation. Ranging from large oceanographic research vessels capable of exploring the world's deepest ocean to smaller ships responsible for charting the shallow bays and inlets of the United States (U.S.), the fleet supports a wide range of marine activities including fisheries research, nautical charting, and ocean and climate studies.

Administrative, engineering, maintenance, and logistical support for the NOAA fleet are based out of either the Marine Operations Center-Pacific (MOC-P) or the Marine Operations Center-Atlantic (MOC-A). The MOC-P is in Newport, Oregon and the MOC-A is in Norfolk, Virginia. Although a few NOAA ships are berthed at the MOC-P or MOC-A facilities for efficiency and continuance of operation, many NOAA ships are strategically berthed at locations closer in proximity to their dedicated or primary mission support areas.

1.1.2. Background

The South Carolina shoreline has a 79.7% average chance of being impacted by a tropical system each year, according to the South Carolina Hurricanes Comprehensive Summary (SCHCS, 2021). Strong winds associated with a hurricane or other tropical system disturbance are the primary cause of storm surges and localized flooding. These occurrences add to the continuing deterioration of the shoreline immediately southeast of the Pier.

The NOAA site was originally the Charleston Naval Shipyard and commonly referred to as "Facility 330". The Pier has previously served as a location for the berthing of naval vessels. The actual pier was built in 1947 and later improved in 1987. The Navy transferred ownership of the NOAA site to NOAA's Marine Operations Center (MOC) in 2004. NOAA's MOC previously docked one vessel at the Pier until the MOC transferred ownership to NOAA's Coastal Service Center (CSC) in 2005. The Pier was decommissioned in 2006, resulting in no further berthing operations. Today, the NOAA site consists of an office building, several support structures, and the decommissioned Pier, see Figure 1.

Figure 1: Project Location Map

Photo 1: View of Pier Romeo facing northeast. Photo taken May 2021.

Photo 2: View of Pier Romeo facing southwest. Photo taken May 2021.

1.2. PROPOSED PROJECT

NOAA - OMAO is proposing to recapitalize the Pier to re-establish homeport operations and maintenance functions for NOAA vessels, the *Nancy Foster* and *Ronald H. Brown,* and other visiting government vessels. For efficiency and continuance of operation, NOAA ships would be strategically berthed at a NOAA operated facility located closer in proximity to their dedicated or primary mission support area.

The project would replace the existing pier with a floating pier generally within the same environmental footprint. Additional project objectives include minimizing impacts associated with reoccurring storm surges and flood inundation and reducing future flood risks based on predicted climate change and SLR information derived from NOAA's Coastal Study Report (NOAA, 2022). See Appendix A.

1.3. PURPOSE AND NEED

The existing pier, its associated facilities, and utility network are in disrepair. The Pier and associated infrastructure has been closed to berthing or staging of vessels since 2006. The Pier's existing in-water piles and mooring structures are severely deteriorated. Shoreline erosion and overtopping of riverine waters due to wind, wave, and increasing tidal conditions is occurring near the Pier along the eastern shoreline. Existing rip rap installed to protect infrastructure has deteriorated over time. Occurrences of localized flooding due to rising sea levels that hinder operational efficiency at the NOAA site is occurring on a more frequent basis.

The need for the proposed project is as follows:

- Safe, modern pier facilities that are properly sized for the current agency mission.
- Increase storage area to support pier facility uses.
- Improved flood protection of infrastructure through non-structural and natural measures adjacent to the pier (to minimize overtopping, erosion, and reduction in wetland function).
- Improved adaptivity of existing NOAA site infrastructure on the banks of the Cooper River to SLR.

NOAA envisions the project implementation would be associated with the following benefits:

- The re-commissioning of the Pier to accommodate large vessel berthing, thus enhancing critical infrastructure and mission support capabilities.
- Implementation of upland site improvements intended to reduce flooding hazards that would be associated with operational inefficiency and property damage or loss.
- Stabilization of the site’s shorelines and improvement in its functionality to reduce flooding risks near the bank of the Cooper River.

The purpose of the project is to improve and protect critical infrastructure and mission support capabilities at the existing pier site for NOAA. An additional objective of the project is to combat the effects of storm surge and projected SLR within the NOAA site, which includes both NOAA operational headquarters and Pier operations.

2. ALTERNATIVES

An alternatives analysis was conducted as part of this EA to assess project options that would address the project need to recapitalize the Pier. Alternatives considered in this report consist of the Preferred Alternative and the No-Build Alternative.

2.1. Preferred Alternative

The Preferred Alternative (Floating Pier) would primarily consist of the recapitalization of the Pier with a floating pier for ship berthing operations. Conceptual design can be found in Appendix B.

Proposed actions upland of the high-tide line (HTL) elevation would include:

- Asphalt parking areas that may be disturbed during project-related construction activities or that require upgrading would be regraded, reconfigured, paved, and restriped.
- Resilient curbing would be added along the parcel boundaries adjacent to other land parcels.
- Buried remnant public utility infrastructure would be removed or replaced on site, including water, sewer, electrical, internet, and phone service.
- A new 5,000 SF warehouse facility would be constructed in the site parking lot that is located west of the NOAA facility.
- Fences and gates would be removed and replaced, if disturbed.
- An approximate 620-foot-long seawall (cantilever steel sheet pile wall) would be constructed upland and to the right of the pier. The seawall would fill a gap by connecting to the existing seawalls that are currently on either side of the pier.
- Construction of an approximate 100-foot concrete ramp with steel sheet pile cantilever walls along the length of the ramp leading to the pier.
- Construction of an 80-foot-long by 30-foot-wide steel truss trestle connecting with the pier.

Demolition and construction activities on land would include the use of heavy construction equipment, trucks, excavators, and cranes. Construction staging areas would be limited to the parking lot next to the pier. The primary materials used in building the vessel berthing facilities would be concrete, reinforced concrete, stone, and steel.

Proposed actions below the HTL elevation in-water activities would include:

- The demolition and removal of the existing pier and its associated buildings and structures, including the electrical substation located at the far end of the pier.
- Dredging would be required with reconstruction of the pier. Approximately 154,607 cubic yards (CY) of material would be dredged from areas around the pier to a depth of -27 feet mean lower low water (MLLW) (-25 feet dredge depth plus -2 feet overdredge allowance). The area of dredging would extend outward 180 feet from the centerline of the existing pier (150 feet for the edge of the proposed pier) and out to the navigational channel of the Cooper River. Figure 2 illustrates the project dredging footprint.
- Construction of a new 360-foot-long by 60-foot-wide floating pier with a 160-foot-long by 30-foot-wide gangway. To construct the replacement pier, up to 24, 48-inch diameter steel pipe piles, up to four, 36-inch diameter steel piles, and up to four 24-inch diameter steel piles will be installed using vibratory installation and then proofed with an impact hammer. Up to 32 piles in total would be installed in-water during project construction.
- Stabilization of the riverbank east of the pier.

Demolition and construction activities in-water would be performed using equipment based on a two-floating barge system from the shoreline. In-water concrete and timber piles would be removed and stockpiled for disposal at the regional landfill.

Additional design options that would address project objectives were included as part of this alternative to improve NOAA site resiliency to climate change and SLR. These options, consisting of a seawall, resilient curbing, and living shoreline, are intended to provide both non-structural and natural measures that would aid in the floodproofing of the NOAA site while improving the functionality of the site riverbank.

2.1.1. Seawall

A landward seawall would prevent coastal erosion and other damage due to wave action and storm surges on site. The proposed cantilever sheet pile seawall would be located several feet from the existing revetment. Additional geotechnical analysis would determine the final setting of the seawall; however, the seawall is expected to be placed at the same general location as the existing chain-link fence that borders the shoreline. The height of the wall would be approximately 5 to 6 feet above the average existing grade along its alignment or 10.5-feet North American Vertical Datum of 1988 (NAVD88). It would span the length of the shoreline approximately 620 feet eastward from the proposed steel trestle of the pier. An 8-foothigh chain-link fence would replace the existing one between the existing walking path behind the NOAA facility and the seawall.

2.1.2. Resilient Curbing

NOAA's Coastal Study Report (AECOM, 2022) states that the seawall was designed to meet high-frequency and low-frequency flood hazard mitigation goals, specifically for the Cooper River shoreline. The study included an evaluation of flood risks at the site, which indicated that additional components such as resilient flood curbs, would be needed to mitigate flooding and wave exposure Resilient curbing is proposed that would extend landward along the east and west site property lines that adjoin other land parcels. The curbing would provide added protection from lateral flooding onto the NOAA site from adjacent properties during and after storm events.

Resilient curbing would be constructed along the east property boundary that would tie into the seawall to the north, approximately 40 feet from the 90-degree turn of the seawall. The southern extent of the east resilient curb would end approximately 110 feet south of the end of the seawall, where the ground elevations are above 7.5-feet NAVD88 (AECOM, 2022). The height of the curbing would be approximately 1-2 feet above the average existing grade along its alignment.

The resilient curb along the west boundary would tie into the elevated bulkhead platform, approximately 40 feet from the shoreline where the concrete platforms ends. The southern extent of the west resilient curb would end approximately 50 feet of South Hobson Avenue, extending approximately 380 feet. The height of the curbing would be approximately 2-3 feet above the average existing grade of the terrain to match the 10.5-feet NAVD88 elevation of the proposed seawall.

2.1.3. Living Shoreline

A living shoreline is an option that would revitalize the deteriorating riverbank. A living shoreline would be expected to improve the overall ecological functionality of the river shoreline by adding high-quality aquatic habitat where it does not exist today. The living shoreline may also provide, to a marginal degree, added flood hazard risk protection as the in-water vegetation matures. The concept design width, or encroachment, would require approximately 20 feet of marsh to extend beyond the existing condition's shoreline, with additional marsh plantings incorporated into the bank between the marsh platform and the proposed seawall. The approximate height of the living shoreline sill and marsh base would range between 2- and 2.5-feet NAVD88. Additional concept design information on the shoreline option can be accessed in NOAA's Coastal Study Report, Coastal Investigation for the National Oceanic and Atmospheric Administration Office of Marine and Aviation Operations Southeast Marine Operations (AECOM, 2022) (see Appendix A).

Figure 2: Project Dredging Footprint

2.1.4. The No-Action Alternative

Analysis under NEPA requires review of a No-Action Alternative. Under the No-Action Alternative there would be no recapitalization of the pier, its supporting facilities, or efforts to enhance the resiliency of the NOAA site to storm surge flooding or SLR. Existing upland and in-water structures would remain, including the deteriorating timber piles and erosion of adjacent shoreline. The trestle and pier would continue to be non-operational. This alternative would not meet the purpose and need for the project.

2.1.5. Alternatives Considered But Eliminated From Further Consideration

Locations other than the NOAA site were not considered beyond the early scoping phase of project development due to NOAA's specific need for a NOAA-operated berthing facility for their vessels that would be located close in proximity to their dedicated mission support areas. There are no other NOAA facilities in proximity that would meet the location criteria having the capacity to berth the NOAA vessels the *Nancy Foster* and *Ronald H. Brown.* Both vessels had previously been berthed at this pier prior to it being decommissioned due to structural deficiencies.

A conceptual fixed pile-supported pier was considered in early project scoping to replace the existing pier at the NOAA site. The fixed pier would have similar dimensions as the existing pier design and would be located within the existing environmental footprint. The fixed pier and trestle, if reconstructed, would be secured, and stabilized by an estimated 155 concrete piles to accommodate the vessel berthing operation of the pier. This alternative was not carried forward into detailed environmental review based on the anticipated substantial increase in noise and water quality impacts to marine resources due to impact pile driving activities. In comparison to the Preferred Alternative, which is anticipated to only require 32 steel piles for construction, the fixed pile design concept did not represent the least damaging to the environment and thus was not carried forward for further environmental review.

Additionally, the fixed pile option would not address project objectives to increase the adaptability of the Pier to predicted SLR level over the 50-year design life of the project and, therefore, would not meet the purpose and need for the project.

Table 1 below provides a comparison of how alternatives that were carried forward for detailed environmental review met the stated need for the recapitalization of the Pier.

Table 1: Comparison of Proposed Project Alternatives Carried Forward for Detailed Environmental Review

Need for Action	No-Action	Floating Pier	Fixed Pile-Supported Pier (Not Carried Forward)
A need for safe, modern pier facilities that are the proper size for the current agency mission	No	Yes	Yes
A need to increase storage area to support pier facility uses	No	Yes	Yes
A need to reduce flood risk to property by improving shoreline stabilization adjacent to the Pier experiencing erosion, overtopping, and wetland function degradation	No	Yes	No
A need to adapt to SLR when constructing new facilities	No	Yes	No

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This section describes the affected resources and anticipated environmental consequences from implementation of the Preferred Alternative (Floating Pier) and the No-Action Alternative, including mitigation measures that would avoid or minimize potentially adverse effects related to the project. The affected resources described below were analyzed within the study area boundary, as illustrated in Figure 2. As used in NEPA, the term "significant," requires considerations of both context and intensity as defined below:

- *Context* means that the significance of an action must be analyzed in several contexts such as society (human, national), the affected region, interests, and the locality. Significance varies with the setting of the proposed project. Both short- and long-term effects are relevant (§1508.18[a]).
- *Intensity* refers to the severity of impact. Responsible federal officials must bear in mind that more than one agency may make decisions about partial aspects of a major action. (§1508.27[b]):

For this analysis, the intensity of an impact is assessed in terms of change or degree of change in a resource condition. Common characterizations used include the degree of change from existing conditions or effects to managed or scarce resources, often expressed as the relative area of impact, measured units of change, differences in levels of use, etc. Terminology used for depicting the overall magnitude of impact include:

- No Effect—The proposed project would not cause a detectable change.
- Negligible—The impact would be at the lowest level of detection; the impact would not be significant.
- Minor—The impact would be slight but detectable; the impact would not be significant.
- Moderate—The impact would be readily apparent; the impact would not be significant.
- Major—The impact would be clearly adverse or beneficial; the impact has the potential to be significant.

These levels of potential effects can consider duration, geographic extent, and the potential likelihood to occur, as indicated below:

- Duration—How long the impact would be expected to occur or last, measured in length of time. Common characterizations are short-term, long-term, permanent, etc.
- Geographic extent—Where the impact would be expected to occur geographically in the project area. Common characterizations for this project are largely local or regional in nature.
- Potential to occur (likelihood)—How probable the impact would be. Common characterizations include the likelihood of the impact if the project were to be permitted, or probability of occurrence based on the results of analysis. Common characterizations are unlikely, possible, probable, or certain to occur.

This EA concentrates on the issues that are applicable to the project regarding potential impacts to natural and human resources. Specific metrics used for the determination for more detailed analysis included the following:

- Identification of the presence or absence of receptors having the potential to be impacted by the project and to what degree those potential impacts would be expected to occur.
- Identification of a construction or operational activity associated with the project that would have the potential to affect receptors in a manner that would set a precedent for future actions.

- Determining whether a possible impact would violate criteria set by federal, state, or local laws and regulations; and
- Determining whether the action would be related to other actions that individually are non-significant but cumulatively have the potential to result in a significantly adverse impact.

Environmental topics considered but not carried forward into more detailed environmental analysis are listed in Table 2.

Table 2: Resources Not Carried Forward for Detailed Analysis

Resource	Rational for Elimination
Land Use	• The proposed project consists of replacing the existing Pier and will be completed in previously disturbed areas. No effects on land use plans or policies are anticipated because of the No-Action or proposed project Alternatives. • The proposed project will not result in changes to regional or local land use. • The existing light industrial use at the NOAA site would remain unchanged.
Recreational Resources	• The project site is located at the FLETC facility. There are no recreational resources at the facility, nor are there any recreational resources within 1 mile of the NOAA site.
Farmlands	• The project site is located at the FLETC facility and has no association with local or regional farmlands.
Transportation	• Implementation of the proposed project would not involve any activities that would be expected to result in a notable increase in recurring daily traffic generation. • The temporary vehicle trip generation during demolition and construction (comprising of worker commute and truck trips) would be lower than the volumes that would trigger a significant traffic impact. • Vessel traffic during construction and during future operations would be negligible. In-water construction activities would take place inside existing restricted navigation zone (Security Zone) that is outside the federal navigation channel and off-limits to civilian vessels, so there would be no significant impacts to vessel transportation.
Socioeconomic	• The project would not have any impact on communities or employ locations within the local or regional communities. • The project would have no impact to South Carolina Port operations or fishermen.
Aesthetics	• The project would not change visual resources at the project site or in the vicinity of the project. Additional lighting may increase illumination but will be compatible with the surrounding landscape and navigable waterway requirements, having no long- or short-term effect on visual quality. • The physical dimension of the Pier would be slightly modified to be shorter but slightly wider from its existing location but would not substantially change its visible conspicuity when viewed from surrounding areas.

3.1. AIR QUALITY

3.1.1. Regulatory Setting

Clean Air Act

The Clean Air Act (CAA) (42 U.S.C. 7401 et seq.) is the principal federal law that addresses air quality concerns. National air quality standards are set by the U.S. Environmental Protection Agency (USEPA) for six common pollutants (also referred to as “criteria” pollutants). These standards, known as National Ambient Air Quality Standards (NAAQS) consist of standards for carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO2), ozone (O3), sulfur dioxide (SO2), and fugitive dust or particulate matter (PM2.5 and PM10). The federal and state standards have been set, with an adequate margin of safety, at levels above which concentrations could be harmful to human health and welfare.

Greenhouse Gas Emissions

The South Carolina Department of Health and Environmental Services (DHEC) has authority to regulate conformity to the following air quality standards:

- South Carolina Air Pollution Control – Regulation No. 62.5 – Air Pollution Control Standard 2 Ambient Air Quality Standards.
- South Carolina Air Pollution Control – Regulation No. 62.6 – Control of Fugitive Particulate Matter.

Mobile Source Air Pollution Control Requirements

Mobile source air pollution requirements for motor vehicles' diesel fuel; non-road, locomotive, and marine diesel fuel; and U.S. Emissions Control Area Marine Fuel are contained in 40 CFR 80 Subpart 1. These provisions restrict diesel fuel sulfur content to prevent damage to the emission control systems. The proposed project would not have direct compliance responsibilities regarding vehicle and engine emission standards.

3.1.2. Affected Environment

Based on NAAQS and South Carolina Ambient Air Quality Standards (SCAAQS) (USEPA, 2021c), Charleston County is an attainment area for all federal air quality standards (USEPA, 2021a) and, thus, the project would be exempt from the CAA Conformity Determination Requirements.

Local air quality is primarily influenced by regional climate patterns and offshore winds. Air quality within the project boundary is likely to be influenced by exhaust from motor vehicles, naval vessels, and military machinery and vehicles, along with other regional activities. The large open area that is created by the Cooper River allows for the dilution of exhausts by strong breezes that blow through the subject site. These breezes can rapidly reduce and/or eliminate localized air quality concerns caused by airborne pollutants. The Appalachian Mountains and Blue Ridge Mountains are located to the northwest of the site, approximately 300 miles away. Regional air flow across these mountains towards to the piedmont region of South Carolina help to carry airborne pollutants offshore towards the Atlantic Ocean.

The State of South Carolina, Annual Ambient Air Monitoring Network Plan recorded air quality data from five monitoring sites in the North Charleston Metropolitan Statistical Area, including residential areas in the vicinity of the proposed project area. In each recording, air monitoring data was well below criteria thresholds for the regulated air pollutant. The monitoring occurred between July 1, 2020, through December 31, 2021 (SCDHEC, 2021).

Greenhouse Gas Emissions

Gases that trap heat in the atmosphere are often referred to as greenhouse gases (GHG). GHGs are emitted by natural processes and human activities. Examples of GHGs that are produced both by natural and industrial operations and processes include carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O). There are no federal or state standards for GHG emissions. The Council on Environmental Quality (CEQ) issued final guidance on the consideration of GHG emissions in 2016, entitled Final Guidance for Federal Departments on Consideration of Greenhouse Gas Emission and the Effects of Climate Change in National Environmental Policy Act Reviews. Project implementation would result in fuel consumption from the boats that will be berthed at the Pier, but the GHG emissions associated with these activities would be negligible because of the limited number of vessels anticipated to be berthed at the Pier that would be located close in proximity to their dedicated mission support areas. There are no potential stationary air source emissions associated with the Preferred Alternative.

3.1.3. Environmental Consequences

No Action Alternative

Under the No Action Alternative and due to the site being in an existing attainment area, impacts to air quality, both short-term and long-term, are not likely to occur. There are no stationary potential sources of air emissions present at this facility.

Preferred Alternative

The project is in an attainment area for regulated air toxins and follows the NAAQS and South Carolina Department of Health & Environmental Control's (SCDHEC's) State Implementation Plan. Potential effects of the project on ambient air quality under both normal and accident conditions is not anticipated.

Due to the negligible amount of vessel and equipment operation associated with project demolition and construction activities and day-to-day operations at the facility, temporary effects on air quality would be negligible and long-term effects would be unlikely to occur.

Construction Impacts

Fugitive Dust

Construction activities that would disturb upland soils could temporarily contribute to localized fugitive dust emissions, but at negligible levels not having the potential to exceed CAA air pollutant thresholds or result in adverse air quality effects. Particulates would be anticipated to increase in the project area as fugitive dust from construction activities collects in the air surrounding the project. The increase in fugitive dust emissions would be a short-term nuisance that would cease upon completion of construction activities.

Odors

Short-term, localized odors might be generated by exhaust emissions from construction equipment, paving, and pavement markings. The temporary odor emissions would not adversely impact human health but would be a temporary nuisance to those working on site.

Combustive Emissions from Construction Equipment

Typical activities during construction would include earth-moving vehicles, vehicular traffic, barge traffic, and vessel traffic associated with the construction of the Pier. Mobile construction equipment and portable stationary engines would likely emit combustive air pollutants including nitrogen oxides, CO2, PM, and toxic air pollutants. Due to their temporary and intermittent nature of operation, the ambient concentrations produced by these emissions within the project region would be negligible in consideration of the magnitude of consequences.

Operational Impacts

Operational impacts associated with the project, would be limited to the berthing of two large NOAA or other agency vessels and up to two supporting smaller vessels. Operational impacts on air quality over both the short term and long term are unlikely given the small number of vessels that will use the Pier on a regular basis.

3.1.4. Avoidance, Minimization, and Mitigation Measures

Implementation of the project would not result in significant long-term impacts to air quality or GHGs; therefore, no mitigation measures are proposed.

The implementation of minimization measures would be expected to address short-term air quality impacts such as construction-related impacts. Air quality impacts could be mitigated through the incorporation of BMPs, including those provided in Table 12, Environmental Consequences for the Preferred Alternative and the No-Action Alternative, and conformity to federal and state regulations.

3.2. NOISE

3.2.1. Regulatory Setting

The Noise Control Act of 1972 directs federal agencies to comply with applicable federal, state, and local noise requirements with respect to the control and mitigation of environmental noise. Applicable federal guidelines for noise regulation are derived from the U.S. Department of Transportation (USDOT).

Section 13-126 of the North Charleston Municipal Code prohibits unreasonably loud, disturbing, or unnecessary noise and establishes noise ordinances for residential areas (North Charleston, 2021b). This ordinance prohibits the operation of gas-powered lawn mowers, gas powered leaf blowers, and similar equipment within 300 feet of a residence between the hours of 11:00 pm and 7:00 am. Sensitive noise receptors include public areas such as schools, parks, residences, libraries, hospitals, and churches.

In 2008, the Fisheries Hydroacoustic Working Group (FHWG), which included NOAA National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (USFWS), the Departments of Transportation for California, Oregon, and Washington, and nation experts on sound propagation developed the interim injury criteria level threshold and a behavioral guideline for assessing potential noise impacts to fish (FHWG, 2008). These thresholds are shown in Table 3. The injury thresholds only apply to impulsive noise sources such as impact pile driving. Continuous noise sources, such as vibratory pile driving, would not be held to these thresholds. The behavioral guidelines apply to both continuous noise sources and impulsive noise sources. If noise levels exceed the interim injury criteria threshold, physical injury may occur. If noise levels exceed the behavioral guidelines, behavioral effects may occur. However, the potential for behavioral changes depends on site specific conditions, timing, and duration.

NOAA NMFS has identified Level A (potential injury) and Level B (potential behavioral disturbance) in-water noise thresholds for marine mammals (NMFS, 2020). Level A harassment is defined as “any act of pursuit, torment, or annoyance that has the potential to injure a protected marine mammal or marine mammal stock in the wild.” Level B harassment is defined as “any act of pursuit, torment, or annoyance that has the potential to disturb a protected marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering, but does not have the potential to injure a marine mammal or marine mammal stock in the wild.” The established noise thresholds are based on the hearing class of the marine mammal. Marine mammal hearing classes with established thresholds include phocids, otariids, high-frequency cetaceans, mid-frequency cetaceans, and low-frequency cetaceans. Marine mammals that could occur in the project area include West Indian manatee and bottlenose dolphins. Bottlenose dolphins are mid-frequency cetaceans. West Indian manatees are sirenians and noise thresholds have not been developed for this hearing class. Existing data suggests that manatee hearing capabilities may be similar to phocid pinnipeds (BOEM, 2014). The NMFS established thresholds for phocid pinnipeds and mid-frequency cetaceans are shown in Table 4.

A noise technical study was completed in July 2022 (see Appendix C). The conclusion of that study stated that due to the short-term nature of the Project, limited extent of potential noise impacts, and proposed avoidance and minimization measures, substantial adverse noise impacts to special-status species are not anticipated. Noise levels could exceed injury thresholds for special status species during the proposed pile installation activities within limited areas immediately around the pile driving activities. However, it is considered unlikely that special status species would occur within close proximity to the active construction areas and within these limited injury threshold areas. Therefore, impacts due to injury threshold exceedances are not anticipated.

Construction related noise could exceed behavioral thresholds; however, potential impacts due to exceedances over these thresholds would be minimized through the implementation of the proposed avoidance and minimization measures, such as the use of a soft-start, wood cushion block, and marine mammal monitoring.

Table 3. Noise Criteria Thresholds for Fish

	Interim Injury Criteria (impulsive)			Behavioral
	dB Peak	SELcum		dBrms
		Fish > 2 g	Fish < 2g	
Threshold	206 dB Peak	187 dB SELcum	183 dB SELcum	150 dBrms

dB=Decibels
SELcum=cumulative sound exposure levels
dBrms = Decibel Root Mean Square

Table 4. Noise Criteria Thresholds for Marine Mammals

Hearing Group	Impulsive			Non-impulsive	
	Injury (PTS)		Behavioral	Injury (PTS)	Behavioral
Mid Frequency Cetaceans	185 dB SEL	230 dB Peak	160 dBrms	198 dB SEL	120 dBrms
Phocid Pinnipeds	185 dB SEL	218 dB Peak	160 dBrms	201 dB	120 dB

3.2.2. Affected Environment

Sound In-air

Pier Romeo is in an industrial developed area and extends out into Cooper River, which experiences heavy vessel traffic. The CSX railroad is located approximately 0.9 mile from the pier; US-52, US-78, and I-26 are located approximately 1.4 miles from the pier (USACE, 2018a). Background noise levels would be anticipated to be impacted by motor vehicles, naval vessels, other marine traffic, military machinery, and the CSX railroad. Locomotive train horns are sounded in advance of all public crossings and must be at least 96 dBA at 100 feet (USACE, 2018a). At approximately 0.9 miles, train horns would be approximately 70 dBA and at approximately 2.6 miles, train horns would be 65 dBA. In 2018, existing in-air background noise levels were taken at 20 different locations within 1 to 2.5 miles of the pier (USACE, 2018a). Measurements were taken in 15-minute intervals during the day and then converted to hourly averages. In-air noise measurements ranged from 48.6 dBA to 62.8 dBA. The two nearest noise measurements were taken at 1801-1 English St. and at the cemetery next to K-Con, Inc. Noise measurements at these locations were 50.8 dBA and 60.6 dBA, respectively, and are anticipated to be representative of existing background noise levels within the vicinity of Pier Romeo.

Sensitive noise receptors include public areas such as schools, parks, residences, libraries, hospitals, and churches. The project would occur in an area zoned for commercial/retail services with the nearest residential area in North Charleston approximately 1 mile west of the Pier (North Charleston, 2020). Residential areas also occur 1 mile east of the Pier on Daniel Island. The nearest sensitive noise receptors include the residential area of Windsor Place approximately 1 mile west of the pier, the Evening of Prayer Fellowship Church approximately 1 mile west of the Pier, Cooper River County Park and Marina approximately 1 mile south of the Pier, and the Friends of the Hunley

Museum approximately 1 mile northwest of the pier. These identified locations are illustrated in Figure 3.

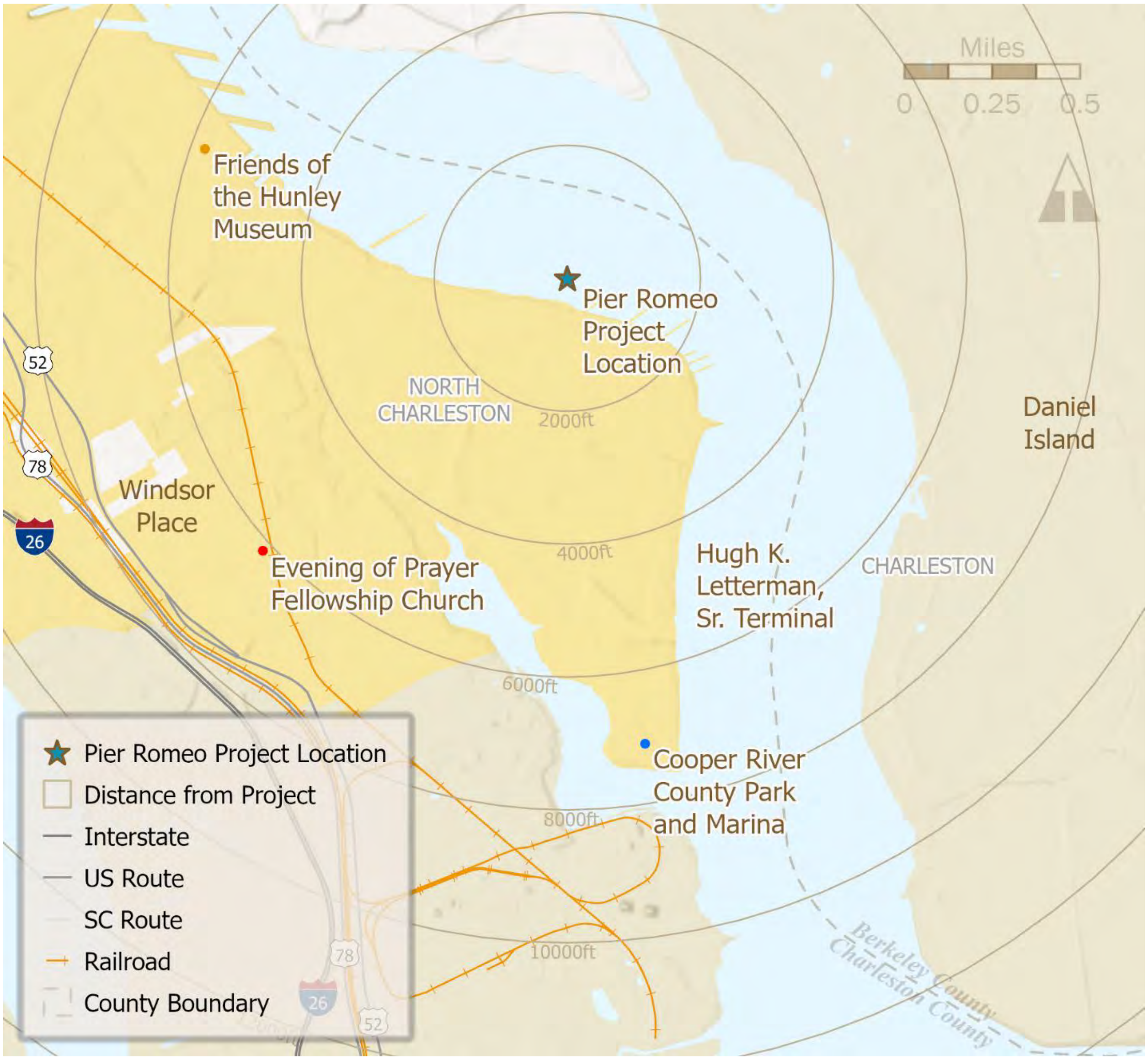

Figure 3: Noise Sensitive Receptors Map

Sound In-water

Underwater anthropogenic noise sources that could occur in the project area with regularity include naval vessels, fishing boats, recreational boats, and shipping traffic. In addition, dredging of the federal navigation channel would produce underwater noise.

Underwater sound measurements were not available for the project area. Background in-water sound levels in deep, slow-moving rivers are typically about 120 dBrms (Washington State Department of Transportation [WSDOT] 2020). Marine vessels produce noise levels ranging from 157 dB to 182 dB at the source (Kipple and Gabriele 2004). The federal navigation channel in Cooper River is routinely dredged (USACE, 2018b). The entrance channel is typically dredged by hopper dredge every two years, the lower harbor is typically dredged every 12 to 15 months with a clamshell dredge, and the upper harbor, where the pier is located, is typically dredged every 18 to 21 months via a hydraulic cutterhead pipeline dredge. The most recent dredging event in Cooper River occurred in April 2021 in the upper reach at the Port Terminal Reach (Waterway Guide, 2021). The largest class size cutterhead hydraulic dredges can produce source noise levels of up to 175 dBrms (Reine and Dickerson 2014a), while smaller, more typically sized cutterhead dredges, produce source noise levels of up to approximately 153 dBrms. The largest size class mechanical dredge in coarse sediment can produce source noise levels of up to 179.4 dB (Reine and Dickerson 2014a), while smaller dredges in soft sediments would typically produce far less noise.

3.2.3. Environmental Consequences

No Action Alternative

Under the No Action Alternative there would be no demolition or reconstruction activities at the Pier facility. No change in noise levels would be anticipated under the No Action Alternative.

Preferred Alternative

Construction Impacts (Sound In-air)

It is likely that the loudest pieces of equipment creating the greatest potential for in-air impacts would be pile drivers and a hydraulic dredge. Anticipated in-air construction related noise sources are summarized in Table 5.

Table 5. Anticipated In-air Equipment Noise

Equipment	Noise Level (dBA)	Measurement Distance
Impact pile driver[1]	101	50 feet
Vibratory pile driver[1]	101	50 feet
Hydraulic dredge[2]	80	50 feet

[1] Source: Federal Highway Administration noise prediction model (FHWA, 2006)
[2] Source: Noise Impacts Related to Lake Restoration Activities at Lake Kittamaqundi and Lake Elkhorn (Columbia Association, 2016)

Construction noise attenuates at a rate based on physical conditions between the source and receiver. Generally, sound levels for a point source decrease by 6 dBA for each doubling of distance (FHWA, 2017). The construction activity with the greatest potential to result in noise impacts is pile driving/removal activities at the Pier. Pile driving is anticipated to result in noise levels of up to 101 dBA at 50 feet from the source. There are no sensitive receptors within the immediate vicinity of the proposed construction activities. However, nearby sensitive noise receptors have the potential to be impacted by construction related noise. The nearest sensitive noise receptors are approximately 1 mile (~5,280 feet) away. Therefore, according to an anticipated 6 dBA reduction for each doubling distance, pile driving/removal activities could result in noise levels of up to 61 dBA at the nearest sensitive receptor. Compared to anticipated background noise levels, airborne noise levels from the proposed construction activities would be negligible at the nearest sensitive receptors.

Due to the existing noise levels experienced by birds and other wildlife that inhabit the project area, the proposed project, during construction and once in operation, would not pose a heightened level of noise. The ability of birds and other wildlife to communicate, feed and reproduce would not be negatively impacted.

Construction Impacts (Sound in Water)

Anticipated in-water construction related noise levels are summarized in Table 6. All available noise levels for the impact installation of 48-inch steel pipe piles include the implementation of a bubble curtain. However, given that impact pile driving is only proposed for proofing, a bubble curtain is not proposed for this Project. Bubble curtain effectiveness is variable, but typical noise reductions when deployed properly in favorable environments vary from approximately 5 to 10 dB (California Department of Transportation [Caltrans], 2020). Therefore, the unattenuated noise levels for the installation of 48-inch steel pipe piles may be up to approximately 10 dB louder than available attenuated noise levels.

Table 6. Anticipated In-water Equipment Noise (Unattenuated)

Equipment	Noise Level			Measurement Distance
	dB Peak	dBrms	dB SEL	
Impact pile driver (attenuated, 48-inch steel pipe)[1]	203	181	170	10 meters
Impact pile driver (unattenuated 48-inch steel pipe)*	213	191	180	10 meters
Impact pile driver (unattenuated, 36-inch stee pipel)[2]	210	193	183	10 meters
Impact pile driver (unattenuated, 24-inch steel pipe)[3]	203	189	178	10 meters
Vibratory pile driver (unattenuated, 48-inch steel pipe)[4]	--	159	--	10 meters
Vibratory pile driver (unattenuated, 36-inch steel pipe)[5]	191	159	159	10 meters
Vibratory pile driver (unattenuated, 24-inch steel pipe)[6]	181	153	153	10 meters
Vibratory pile driver (unattenuated, steel sheet)[7]	177	163	163	10 meters
Hydraulic dredge (100 ft length)[8]		153		1 meter

* Unattenuated value calculated by adding 10 dB to available attenuated noise data
[1] Source: Caltrans, 2020, Naval Base Kitsap, Bangor, WA
[2] Source: Caltrans 2020, Humboldt Bay Bridges, Eureka, CA
[3] Source: Caltrans 2020, Rodeo Dock Repair, San Francisco, CA
[4] Source: Illingworth & Rodkin, 2016
[5] Source: Caltrans 2020, Water Emergency Transportation Authority (WETA) Downtown Ferry, San Francisco, CA
[6] Source: Caltrans 2020, Prichard Lake Pumping Station, Sacramento, CA
[7] Source: Caltrans 2020, Port of Oakland, Oakland, CA
[8] Reine and Dickerson, 2014b

In-water noise produced during dredging activities would not be anticipated to result in noise threshold/guideline exceedances and, therefore, noise impacts from the proposed dredging activities are not anticipated. Noise produced during pile installation activities has the greatest potential to exceed noise thresholds and guidelines. To reduce potential noise impacts during pile installation activities, impact pile driving would be avoided to the extent feasible, a soft-start technique would be implemented, a wood cushion block would be used during impact proofing, and a marine mammal exclusion zone would be established to prevent harassment of marine mammals. Due to the short-term nature of the Project and proposed avoidance and minimization measures, substantial noise impacts are not anticipated. Potential noise threshold exceedances are analyzed in additional detail in the noise technical report prepared for this project (M&N, 2022).

Any potential noise exceedances over noise thresholds for fish (Table 3) or marine mammals (Table 4) will be coordinated with NMFS during the permitting process to ensure that major impacts to fish or marine mammals do not occur. Noise impacts to fish and marine mammals are discussed further in Section 3.7, Biological Resources of this document.

Operational Impacts

Noise would only occur during construction and would cease when project activities are completed. The project does not propose the construction of structures that could result in operational noise impacts.

3.2.4. Avoidance, Minimization, and Mitigation Measures

Implementation of the Preferred Alternative would not result in significant long-term impacts to noise change; therefore, no mitigation measures are proposed. Should protective recommendations or federal permit approvals be based on a need for time of year restrictions during construction for areas with critical habitat, the feasibility and methods to accommodate such request would be addressed on a case-by-case basis.

Noise abatement was considered for the construction phase of this project to minimize short-term impacts to levels not considered to be adverse. Pile-driving initiation utilizing the soft start procedure (ramping up) to reduce the potential for startle and annoyance of nearby receptors is an example of a practical minimization measure that is in keeping with NOAA's mission. Any potential noise exceedances over noise thresholds for fish or marine mammals will be coordinated with NMFS and appropriate steps will be taken to ensure that major impacts to fish and marine mammals do not occur. Additional minimization measures and BMPs are provided in Table 12, Environmental Consequences for the Preferred Alternative and the No-Action Alternative.

3.3. Geological Resources

The purpose of this section is to evaluate existing data and geology as well as soil conditions and associated hazards in the project area. The study area for geology and soils encompasses regional geology, soils, and known hazards that are near, underlie, or are located within the proposed footprint of project alternatives.

3.3.1. Regulatory Setting

Federal Land Policy and Management Act

The Federal Land Policy and Management Act of 1976 (PL 94-579) requires that the public lands be managed in a manner that protects the "quality of scientific" and other values, which includes paleontological resources such as fossils. Paleontological resources may also be protected by the Antiquities Act or the Archaeological Resource Protection Act.

3.3.2. Affected Environment

The NOAA site is in the Atlantic Coastal Plain Province in southeastern South Carolina on the eastern shoreline of the Charleston Peninsula. Geologic units in the area range in age from Late Cretaceous to Holocene and are composed of stratified gravel, sand, silt, clay, and limestone (see Figure 6). The geologic units in the South Carolina Coastal Plain underlying the Charleston area include several nearshore marine fluvial deposits of the Late Cretaceous and Tertiary age that overlie pre-Cretaceous crystalline rock. Geologic units are, from oldest to youngest, the Beech Hill, Clubhouse, Cape Fear, Middendorf, Shepherd Grove, and Caddin Formations; the Cane Acre, Coachman, Bladen, and Donoho Creek Formations of the Black Creek Group; the Peedee Formation; the Rhems and Williamsburg Formations of the Black Mingo Group; the Santee Limestone; and the Cross Formation (Campbell et al., 1996).

The topography of the area is flat coastal plain with no hills, mountains, or rock outcroppings. The NOAA site ranges in elevation from approximately four to nine feet (NAVD88). The area is subject to both riverine and tidal influence and is primarily a brackish to saline environment. Bathymetry data offshore of the site indicate a navigational channel of approximately -55 feet NAVD88 at the channel centerline. A shallower river bottom fronts the NOAA site for about 650 feet before reaching the previously dredged portion of the river channel. The fronting riverbed slopes down to the dredged channel beginning at about -10 feet and ending at 120 feet NAVD88 (AECOM, 2022).

The soil at the NOAA site is classified as soil type UR: Urban Land–Yauhannah–Yemassee–Ogeechee Association, which is considered poor for farming and is typically poor to moderately-well drained (North Charleston, 2020) with a parent material of loamy fluviomarine deposits (NRCS, 2021). Yauhannah and Yemassee soil types are found on nearly level ridges and in shallow depressions (SCDHEC, 2013).

The surface soil of the Charleston Naval Complex consists of recent and/or Pleistocene sand, silt, and clay, all with relatively high organic content. Where dredged material from the Cooper River and Shipyard Creek have been used as fill, the surface materials are poorly sorted mixtures of sand, silt, and clay. The subsurface geology consists of varying amounts of fill material to depths of approximately 5 feet below land surface (bls). The fill is underlain by undifferentiated Quaternary age (0 to 1.6 million years ago) sand, silt, and clay of the Wando Formation to approximately 20 to 25 feet bls. These deposits contain discontinuous clay layers and lensatic sand, with multiple interbeds of 1 foot or less in thickness. The Quaternary deposits are underlain by undifferentiated Tertiary marine silt. The marine silt is fossiliferous, with significant phosphatic content. This silt is variable in thickness, between approximately 10 and 20 feet. The Ashley Formation (Tertiary) underlies the marine silt, unconformably in some places. Beneath the Ashley Formation is the Eocene-age Santee Limestone of the Cooper Group (USACE, 2018b).

Seismicity

Seismicity describes the occurrence and frequency of earthquakes at a given location. The Charleston region is in the Middleton Place-Summerville Seismic Zone (MPSSZ), one of the most seismically active areas in the eastern U.S. The historic seismic record of the southeastern U.S. is dominated by the 1886 Charleston earthquake and its aftershocks. The 1886 event pre-dated instrumentation but estimates of the magnitude of the earthquake based on Modified Marcalli Intensity (MMI) observations made by Dutton in 1889 range from 6.6 to 6.9 in magnitude; however, others have estimated the 1886 earthquake to have had a magnitude of 6.5 to 7.5. Despite its moderate magnitude, evidence of MMI X ground motion was observed within the 1886 meisoseismal zone (approximately 2,000 square miles), and almost the entire state of South Carolina was subjected to MMI VII ground motion. The region continues to experience small-magnitude earthquakes (USACE, 2018b).

Instrumental seismic monitoring has been ongoing in Charleston since November 1974 and observed seismic data have indicated that a dense cluster of earthquake epicenters is in the MPSSZ. Currently the MPSSZ experiences between 10 to 15 magnitude 3 or less events every year (SCEMD, 2012). Paleoseismic studies conducted within the area suggest a recurrence rate for moderate-magnitude earthquakes such as the 1886 event every 500 to 600 years (USACE, 2018b).

The eastern coast of South Carolina, including North Charleston, was identified as an area with a high potential for liquefaction due to seismic activity in a report on the geologic hazards of the South Carolina Coastal Plain prepared by the South Carolina Department of Natural Resources (SCDNR, 2012).

Figure 4: Soil Series Map

Project Dredging

The project includes dredging to deepen the existing bathymetry at the Pier to achieve a navigational channel to be maintained for navigational safety throughout the life of the project. The existing bathymetry within the proposed dredge areas ranges from approximately -10 to -25 feet. Dredging at the Pier would be performed to achieve the approved -25 feet MLLW design depth (project depth) within the dredge area. The total planned volume of dredged material is approximately 154,607 CY (Table 7, Figure 5) (-25 feet dredge depth plus -2 feet overdredge allowance). Water was collected on January 24, 2022, and sediments were sampled on January 25, 2022, following methods and approaches defined in the approved Sampling and Analysis Plan (SAP, Moffatt & Nichol, December

2021, see Appendix D). Sediment was collected at six sampling locations to represent the dredged material (see Figure 5). The results provided in Appendix B characterized the proposed dredged material for placement at a designated Confined Disposal Facility (CDF) such as Clouter Creek and Daniel Island Diked Upland Disposal Area (Figure 6). The characterization of sample material was 67.7% silt, 29.0% clay, 0.6% medium sand, and 2.8% fine sand.

Table 7: Proposed Maintenance Dredge Volumes

Project Area	Project Depth (ft MLLW)	Total volume (cy)[2]
Pier Romeo Dredge Area	-25	125,087
Pier Romeo Dredge Area (-2 feet overdredge allowance)	-27	154,607

Notes:
[1] Volume includes 3:1 side slope due to size of the cut and location of project area
[2] Includes allowable overdepth (1 ft) for mechanical dredging

Sediment chemistry analysis and modified elutriate tests were completed on the samples collected from the site. The sediment was analysed for several parameters and analytes, including metals, pesticides, polychlorinated biphenyl (PCB) congeners, PCB aroclors, polynuclear aromatic hydrocarbons (PAHs), dioxins and furans, tributytin, and polybrominated diphenyl ethers (PBDEs).

The Sampling and Analysis Plan Results report indicated that all contaminants of potential concern measured were at non-detect or low concentrations and found below applicable criteria, except for arsenic and pyrene (SAR, Moffatt & Nichol, July 2022, see Appendix E). Arsenic was found at concentrations greater than the established criteria for sediment and water, but at or below the established background levels for the region. There may be temporary exceedance of the chronic criterium for total pyrene in the discharge effluent during dewatering activities. However, the total Polycyclic Aromatic Hydrocarbon concentrations were found to be at levels below those that are anticipated to generate narcotic-like impacts via Equilibrium Partitioning Sediment Benchmark Toxic Unit analysis. Since the total pyrene criteria were developed from the same equilibrium partitioning methods, impacts to water quality are not anticipated. Based on these findings, it is recommended the material at Pier Romeo be found suitable for hydraulic placement at Clouter Creek and/or Daniel Island sediment management areas.

Figure 5: Preliminary Dredge Layout Area

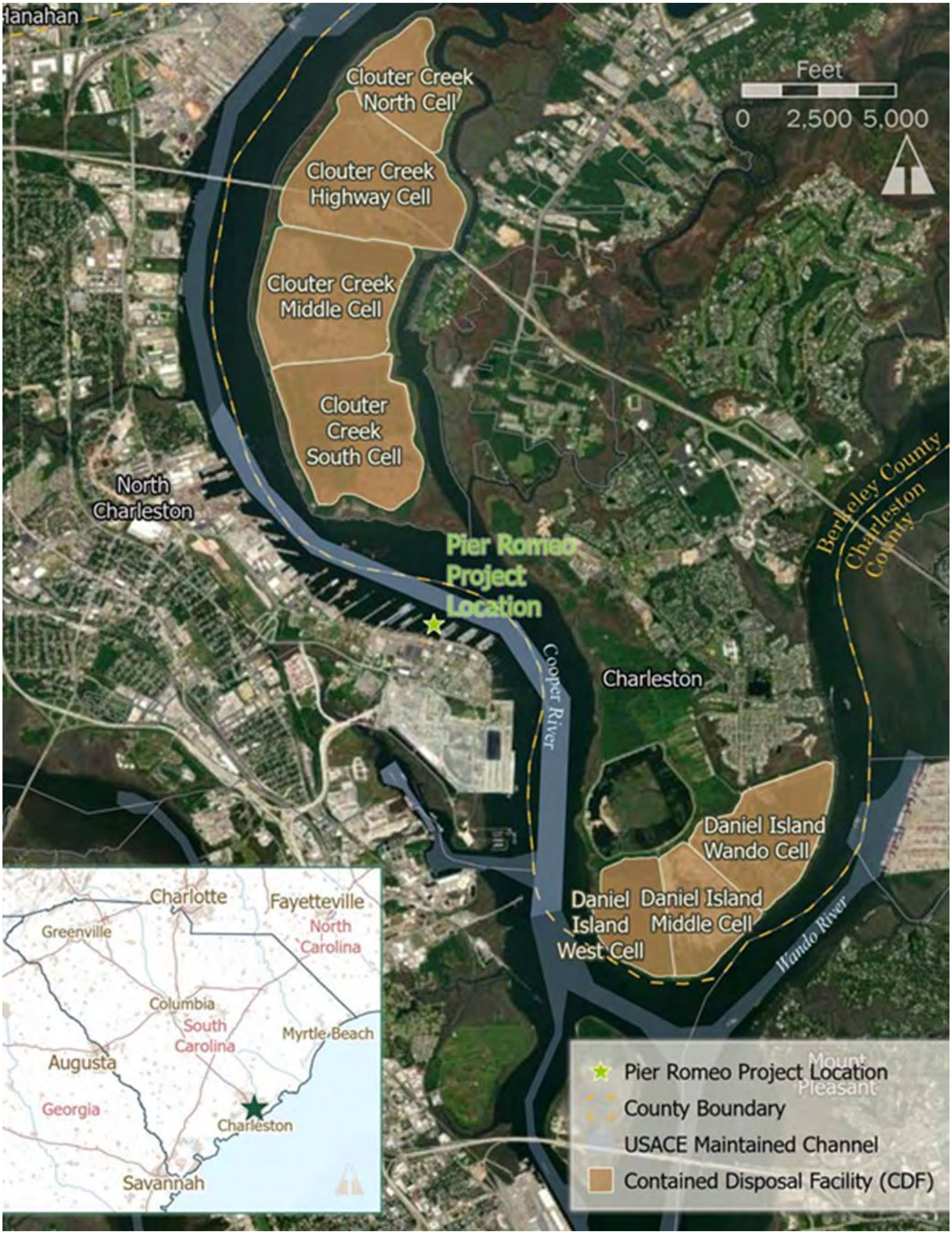

Figure 6: Contained Disposal Facilities in the Project Area

3.3.3. Environmental Consequences

No Action Alternative

Under the No-Action Alternative there would be no recapitalization of facilities at the Pier facility. Existing upland and in-water structures would remain, including the deteriorating timber piles. The trestle and pier would continue to be non-operational. In addition, no protective or mitigative actions would be taken to reduce flooding risk or shoreline erosion and localized flooding and shoreline erosion would continue to occur. Therefore, no effects would be expected on geological resources.

Preferred Alternative

Installation of upland improvements are expected to have a negligible effect on geological resources at the site since installation of the pier and associated infrastructure would occur primarily within the footprint of existing facilities. Approximately 95% of the upland NOAA site is covered with impervious surfaces and utilized for storage and vehicle parking. Modifications to the NOAA-OMAO facility parking area will occur within the footprint of the existing parking area. The exception being those areas immediately next to and below the high tide line (HTL) and parking lot islands with trees and ground cover.

Project related effects could occur because of installation of the proposed seawall, which would have a minimum embedment of 15 feet. The subsurface geology at that depth in the vicinity is sand, silt, and clay. The seawall is proposed at the approximate location of the existing fence, where soils have been previously disturbed by fence installation.

Project related effects to geological resources are likely to occur in the instance that riverbed disturbances are not mitigated using BMPs intended to minimize the dispersion of disturbed riverbed materials in the Cooper River. Unmitigated effects would be temporary with the potential to impact aquatic resources. The subsurface geology in the vicinity consists of fill material to a depth of 5 feet below ground surface and sand, silt, and clay to a depth of approximately 25 feet below that. As required by regulation and permit conditions, soils to be dredged were tested according to federal and state requirements.

The depth to the top of the Ashley formation, which is part of a substantial confining unit that separates the unconfined aquifer from underlying aquifers, is located at 35 to 50 feet below land surface. This depth is greater than the expected excavation depth required during dredging for the project; as a result, the confining layer would not be expected to be intercepted or breached.

Installation of the optional living shoreline is anticipated to have a positive effect on geological resources as it is expected to stabilize the shoreline and prevent erosion from continuing to occur.

Construction Impacts

Installation of the floating pier and associated infrastructure, modifications to the parking area, and installation of resilient curbing would occur within the footprint of existing facilities. Installation of the seawall would occur at the approximate location of the existing fence at the site. Soil to be dredged at the site would be tested according to federal and state requirements prior to dredging.

It is not expected that dredging activities at the site would intercept or breach the confining layer for the confined aquifer, or that construction activities would impact the frequency or magnitude of seismic events in the region.

Operational Impacts

While naturally occurring seismic events have the potential to produce unstable conditions that could directly affect the proposed facilities, it is not expected that operation of the floating pier, the seawall, or the resilient curbing would impact the frequency or magnitude of seismic events in the region.

3.3.4. Avoidance, Minimization, and Mitigation Measures

Implementation of the Preferred Alternative would not result in impacts to geological resources that require mitigative measures, but utilization of BMPs is recommended to minimize upland soil and in-water sediment dispersion during construction related activities.

Disturbance of upland soils and landscaping can be minimized during the construction phase by minimizing the amount of cut and fill required as part of the project's design phase. Exposed soils should be stabilized quickly, either through covering or capping in the form of either repaving or temporary measures to prevent soil erosion.

3.4. WATER RESOURCES

This section considers water resources that are associated with wetlands and other waters of the U.S. (WOTUS), hydrological processes, and floodplains. In addition to surface water resources, groundwater and riverine resources are a vital component of the aquatic ecosystem. This section discusses a detailed description of the aquatic features that are known to occur within the project.

3.4.1. Regulatory Setting

Clean Water Act

The CWA is a 1977 amendment to the Federal Water Pollution Control Act of 1972 (U.S.C. Title 33), which established the basic structure for regulating pollutant discharges to navigable WOTUS include surface water systems such as streams, lakes, ponds, and adjacent wetlands that have a significant nexus to traditionally navigable waters. Jurisdictional wetlands, regulated through permitting by the U.S. Army Corps of Engineers (USACE) under Section 404, must possess wetland indicators for hydrology, vegetation, and soils.

The CWA sets forth procedures for effluent limitations, water quality standards and implementation plans, national performance standards, and point source (e.g., municipal wastewater discharges) and nonpoint source programs (e.g., stormwater). The CWA also establishes permits for dredged or fill material under Section 404, certifications that activities meet water quality standards under Section 401, the National Pollutant Discharge Elimination System (NPDES) under Section 402 and allows for a list of impaired water bodies under Section 303(d) that can assist in improving water quality in impaired water bodies.

The NPDES permit program helps address water pollution by regulating point sources that discharge pollutants into WOTUS. NPDES program areas include stormwater discharges from construction activities, industrial activities, and municipal and transportation sources. Under the CWA, the USEPA authorizes the NPDES program to state, tribal, and territorial governments (USEPA, 2021b). In South Carolina, the program is administered by SCDHEC.

The CWA provides for the restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters. CWA Section 301(a) specifies that the discharge of any pollutant is unlawful unless it follows the Act.

The State of South Carolina has established water quality standards pursuant to the CWA Section 401 and state regulations. Relevant water quality standards for surface waters relevant to the project are provided in Table 8.

Table 8: South Carolina Water Quality Standards

Quality Standards for Freshwaters	
Items	Standards
a. Garbage, cinders, ashes, oils, sludge, or other refuse	None allowed.
b. Treated wastes, toxic wastes, deleterious substances, colored or other wastes except those given in a. above	None alone or in combination with other substances or wastes in sufficient amounts to make the waters unsafe or unsuitable for primary contact recreation or to impair the waters for any other best usage as determined for the specific waters that are assigned to this class.
d. Stormwater, and other nonpoint source runoff, including that from agricultural uses, or permitted discharge from aquatic farms, concentrated aquatic animal production facilities, and uncontaminated groundwater from mining	Allowed if water quality necessary for existing and classified uses shall be maintained and protected consistent with antidegradation rules.
e. Dissolved oxygen	Daily average not less than 5.0 mg/l with a low of 4.0 mg/1.
g. pH	Between 6.0 and 8.5.
h. Temperature	As prescribed in E.12. of this regulation.
10. Turbidity, except for lakes Lakes only	Not to exceed 50 nephelometric turbidity units (NTUs) provided existing uses are maintained. Not to exceed 25 NTUs provided existing uses are maintained.

Source: SCDHEC, 2014.

Section 10 of the Rivers and Harbors Act

Section 10 of the Rivers and Harbors Act (RHA) of 1899 (33 U.S.C. 403) establishes a program to regulate all work or structures in or affecting the course, condition, location, or capacity of jurisdictional wetlands. Jurisdictional wetlands include waters that are subject to the ebb and flow of the tide and/or are presently used or were used in the past or may be susceptible for use to transport interstate or foreign commerce.

Regulated activities under Section 10 include the placement or removal of structures, including piers, and work such as dredging or disposal of dredged material, or excavation, filling, or other modifications to the navigable WOTUS (NOAA, 2021e).

Executive Order 11990: Protection of Wetlands and Related USACE Regulations

EO 11990, Protection of Wetlands, requires federal agencies to avoid, to the extent practicable, the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative.

Wetlands are areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions (33 CFR 328.3[b]). Wetlands support hydrophytic vegetation, have wetland hydrology, and contain hydric soils.

Executive Order 11988 Floodplain Management

EO 11988, dated May 24, 1977, regulates new development within existing floodplains "to reduce the risk of flood loss; to minimize the impact of floods on human safety, health, and welfare; and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities." Specifically, the EO outlines an eight-step process to first determine if a proposed federal project is in an existing floodplain and subsequent exploration of alternatives and mitigation if so. If the project is not in an existing floodplain, no additional action is required.

Executive Order 13690, reinstated on May 20, 2021, established a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input, which is aimed at ensuring that federal investments located in or near floodplains will be resilient in the face of climate change.

3.4.2. Affected Environment

Watersheds

The project area is in the Cooper River/Charleston Harbor watershed (03050201-07) within the Cooper River Basin, see Figure 7. The watershed consists primarily of the Cooper River and its tributaries draining into the Charleston Harbor. The watershed occupies 206,457 acres of the Lower Coastal Plain and Coastal Zone regions of South Carolina. Land use/land cover in the watershed includes: 26.9% forested land, 25.9% urban land, 20.3% forested wetland (swamp), 10.5% non-forested wetland (marsh), 10.3% water, 4.6% agricultural land, and 1.5% barren land (SCDHEC, 2013).

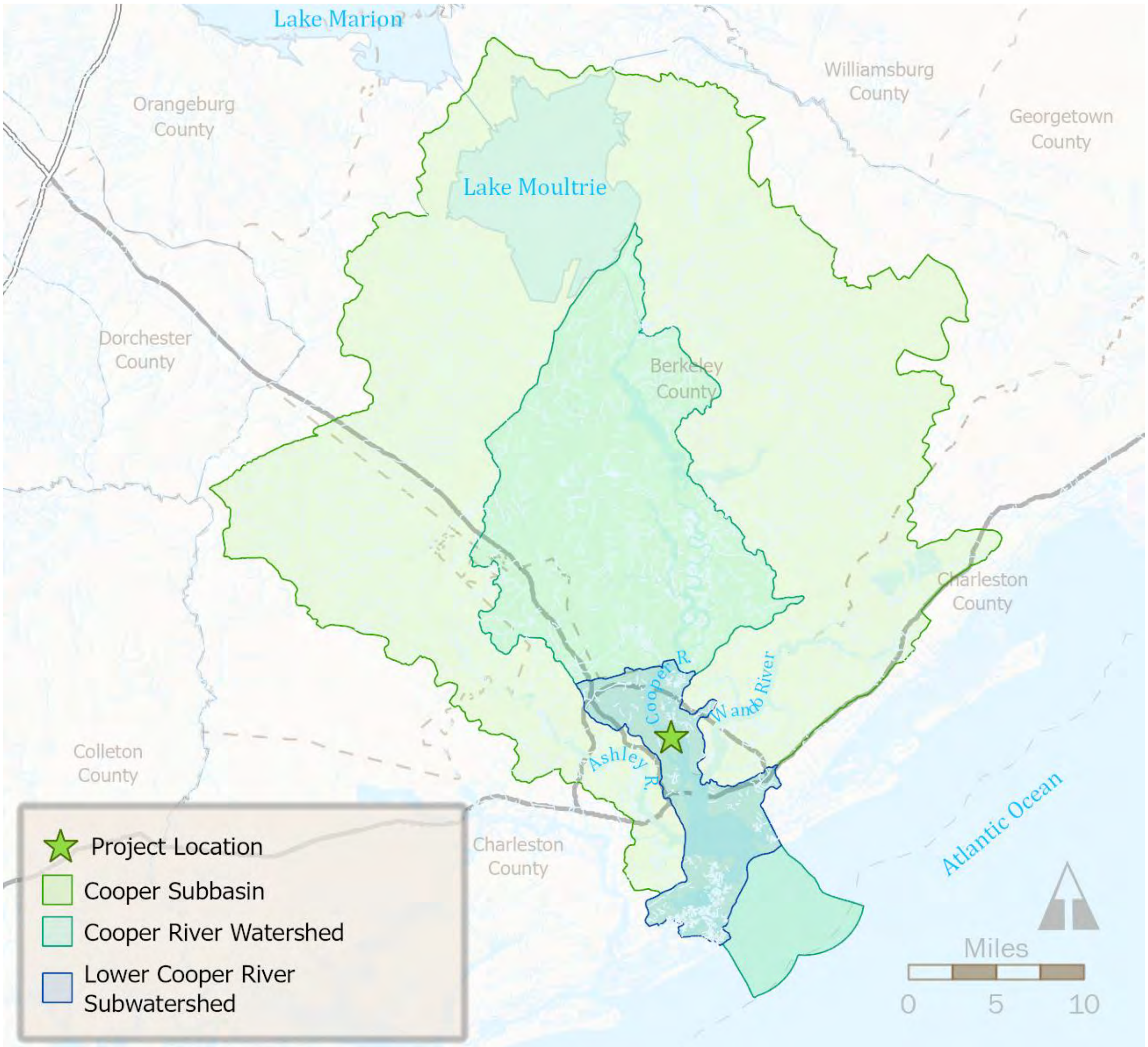

Figure 7: Watersheds in the Vicinity of the Proposed Project

Water Use

Water use in the Charleston area is primarily surface water sourced from the Bushy Park Reservoir and the Edisto River. The water requirements for the Trident Capacity Use Area, a 3,160 square mile area that includes the County of Charleston where the project is located and the counties of Berkeley and Dorchester, were 1,416,057.9 gallons of surface water and 4,503.5 gallons of groundwater for 2015 based on all reported water use (SCDHEC, 2017b).

Water Quality

Water Quality in the vicinity of the project site is monitored by SCDHEC. At the monitoring station nearest the project site, SCDHEC surface water quality monitoring station MD- 045, aquatic life and recreational uses are fully supported (SCDHEC, 2013 and 2021). The Cooper River is impaired for dissolved oxygen (DO) and is subject to the Charleston Harbor, Cooper, Ashley, and Wando Rivers DO total maximum daily load (TMDL), which has a target of 0.1 mg/L Delta DO for point sources and other activities that lower DO (Cantrell, 2013).

Groundwater and Surface Water

The oldest and deepest aquifers underlying the Trident Use Area are of Late Cretaceous Age and are comprised of sediments that have been subdivided into three aquifer systems (oldest to youngest): Gramling, McQueen Branch/Charleston, and Crouch Branch. These units are generally continental shelf to inner marine shelf and deltaic deposits and range from fine-to-medium grained sand, silts, and clays. Water bearing zones are typically beds of sands of varying thickness and extent separated by silty, clayey beds or lenses (SCDHEC, 2017a).

There are several major surface water sources within the use area. These are the Edisto River, the Santee River, the Ashley River, the Cooper River, the Wando River, and Lakes Marion, and Moultrie (SCDHEC, 2017a).

Precipitation

The average annual rate of precipitation reported at the Charleston Air Force Base Station between 2007-2019 is 51.03 inches (U.S. Climate Data, 2021). The wettest months based on the monthly averages are June through July, with the highest monthly average rainfall measured in July and the lowest monthly average rainfall measured in November (North Charleston, 2021c).

Stormwater Flows

The majority of stormwater flows east to the Cooper River, with a minor percentage flowing west to the Ashley River. Stormwater flows are further broken down into seven basins, with six of the basins leading to the Cooper River and one basin sloping toward the Ashley River. The majority of runoff in the vicinity of the study area finds its way to the Cooper River via overland flow and underground storm sewers. A portion of the runoff in the southernmost two stormwater basins is directed into Shipyard Creek, which then makes its way to the Cooper River (USACE, 2018b).

Tides and Currents

The project site is along the west bank of the Cooper River, which feeds into the Charleston Harbor Estuary. As such, the River is a tidally-influenced system. The Charleston, Cooper River Entrance SC tide gauge (Station 8665530), which is located approximately 5 miles from the project site on the Cooper River along East Bay Street and Broad Street, has recorded a mean tidal range of 5.22 feet, a diurnal range of 5.76 feet, and a water level maximum of 6.76 feet (NOAA, 2021a). On the Cooper River, tidal influence extends upstream as far as the Pinopolis Dam at Lake Moultrie. Attenuation of tidal influences begins at the confluence of the east and west branches of the Cooper River, approximately 20 river miles upstream from the study area (USACE, 2018b).

Wetlands

The USACE defines wetlands as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support and, under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Inland wetlands include marshes and wet meadows dominated by herbaceous plants, swamps dominated by shrubs, and wooded swamps dominated by trees. Coastal wetlands include saltwater and freshwater wetlands within coastal watersheds. Typical wetland types include fresh marshes, pocosins, Carolina bays, and bottomland hardwood forests/swamps. Elements of wetland function include water purification, flood protection, shoreline stabilization, groundwater recharge, streamflow maintenance, retention of particles, surface water storage, subsurface storage, nutrient cycling, biodiversity, values to society, and fish and wildlife habitat.

The Pier Romeo study area contains an Estuarine and Marine Deepwater wetlands, classified by the USFWS National Wetland Inventory (NWI) as Estuarine Subtidal, Unconsolidated Bottom, Subtidal (E1UBL).

The E1UBL Estuarine System consists of deep-water tidal habitats and adjacent tidal wetlands that are usually semi enclosed by land but have open, partly obstructed areas or sporadic access to the open ocean and in which ocean water is at least occasionally diluted by freshwater runoff from the land. The salinity of the sea water may be periodically increased above that of the open ocean by evaporation. Along some low-energy coastlines there is appreciable dilution of sea water. Offshore areas with typical estuarine plants and animals such as red mangroves (Rhizophora mangle) and eastern oysters (Crassostrea virginica) are also included in the Estuarine System.

The substrate in E1UBL habitats is continuously covered with tidal water (i.e., located below extreme low water). An unconsolidated bottom includes all wetlands and deep-water habitats with at least 25% cover of particles smaller than stones (less than 6-7 cm) and wetlands and deep-water habitats with at least 25% cover of particles smaller than stones (less than 6-7 cm) and a vegetative cover less than 30%. The unconsolidated material smaller than stones is predominantly organic soils of formerly vegetated wetlands, although coarser sediments or organic material may be intermixed. This wetland classification includes wetlands and deep-water habitats dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years. It typically includes a large array of vascular species in the Marine and Estuarine systems. They are commonly referred to as grass flats. In the Riverine, 'Saltwater Tidal' continuously covers the substrate. This Modifier is used to identify wetland basins or channels that were excavated by humans.

The map shown in Figure 8 was published by the U.S. Department of the Interior’s USFWS and depicts probable wetland areas based on stereoscopic analysis of high-altitude aerial photographs and analysis of infrared bands from remotely sensed imagery. This wetland area is located north along the banks of the Cooper River (USFWS, 2021). Additional site reconnaissance was conducted on April 12, 2021, to determine the extent of the wetlands. As referenced previously by the USFWS NWI Map, the Cooper River is located along the banks of the study area.

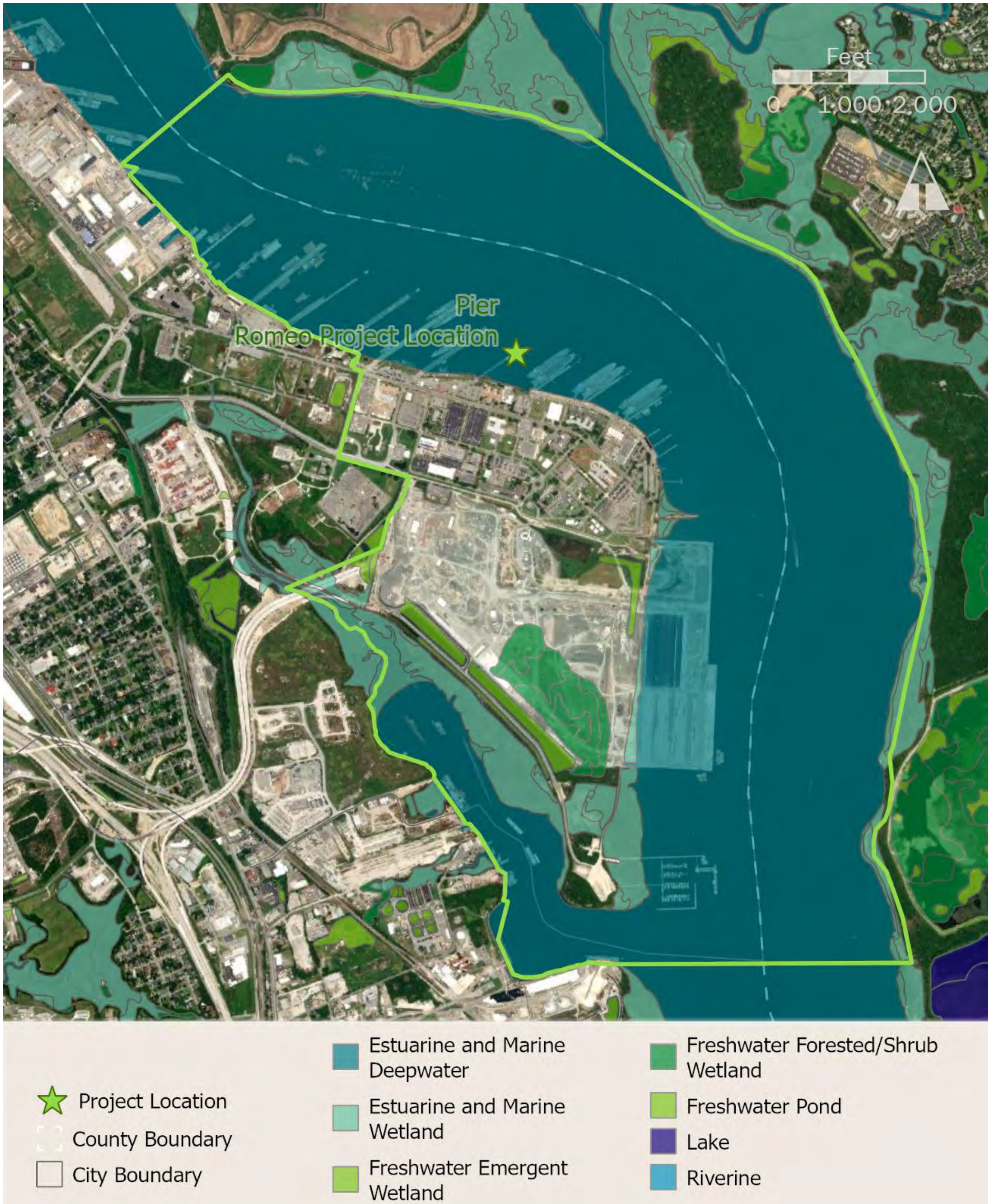

Figure 8: NWI Wetlands

Impacts to wetlands in the study area were evaluated using readily available literature, geographic information system (GIS) mapping and data resources, current USACE and state regulatory requirements, local land development and ordinance requirements, previous technical repots, and best professional judgment (see Figure 8).

With respect to wetlands, the analysis focused on the potential for federal (USACE) and SCDNR regulatory considerations with WOTUS that include traditional navigable waterways (TNWs), tributaries, surface waters, and wetlands, and potential impacts based on current construction impacts and the development of a new pier. Boundaries of WOTUS were delineated by GIS and a pedestrian site reconnaissance. For each alternative, WOTUS were evaluated for the two alternatives listed previously in Section 2. Impacts to WOTUS were evaluated in linear feet for streams/tributaries and acreage for wetlands and other WOTUS. Loss of wetlands or WOTUS would result in regulatory decisions on mitigation ratios and permit applications.

If impacts to WOTUS exceed the maximum allowable/limits for the 404 USACE Nationwide permits, an individual permit will be required. It is understood that dredging and bank stabilization efforts will be needed for the project, which will include both temporary and permanent impacts to WOTUS. Therefore, within this study, both temporary and permanent impacts have been evaluated because of the demolition and construction of the new pier.

For the purposes of this report, no impact equates to no indirect or direct impacts to WOTUS. Minor impacts would be considered permanent impacts, which include temporary impacts to WOTUS that are less than 0.5 acres of non-tidal wetlands, and less than 0.33 acres of tidal wetlands. Major impacts are defined as permanent and temporary impacts that equal or exceed 0.5 acres of non-tidal wetlands and greater than 0.33 acres of tidal wetlands.

The critical areas in South Carolina are coastal waters, tidelands, and beach/dune systems, which fall under the jurisdiction of the DHEC. The purpose of the critical line and jurisdictional freshwater wetland setback and buffer is to reduce and prevent new impervious surfaces near the DHEC-Office of Ocean and Coastal Resource Management (OCRM) delineated critical line and jurisdictional freshwater wetlands subject to review of the CWA; reduce stormwater runoff from properties within the NOAA and surrounding properties; reduce non-point source pollution contaminating the Cooper River, the Intracoastal Waterway, and other wetland areas in close proximity to the project; prevent the contamination of wildlife by pollution and, therefore, protect the aquatic resources within the Cooper River and in proximity to the project; protect the shrimp and seafood industry and recreational fishing of the town and surrounding area; and provide for the visual feel of a coastal forest while entering or leaving the town via waterways. The critical line for this project was determined by field biologists to be along the fence line of the existing river shoreline.

Floodplains

Floodplains are defined and regulated by the Federal Emergency Management Agency (FEMA) and mapped on Flood Insurance Rate Maps (FIRM) and the SCDNR's Flood Mitigation Program. Local municipalities' planning offices may also play a role in defining floodplains and regulating their use. Development occurring within floodplains must be consistent with EO 11988: Floodplain Management and related USACE policy. Guidance from NOAA recommends reviewing the FEMA databases and maps to determine if a particular site is in a floodplain. FEMA produces floodplain maps for communities participating in the National Flood Insurance Program (NFIP) that include both coastal and riverine floodplains. These maps display the 1% annual chance (100-year), and the 0.2% annual chance (500-year) flood events for participating communities. The City of Charleston, including the project's surrounding community, participates in the NFIP and there are preliminary flood maps for the community, see Figure 9.

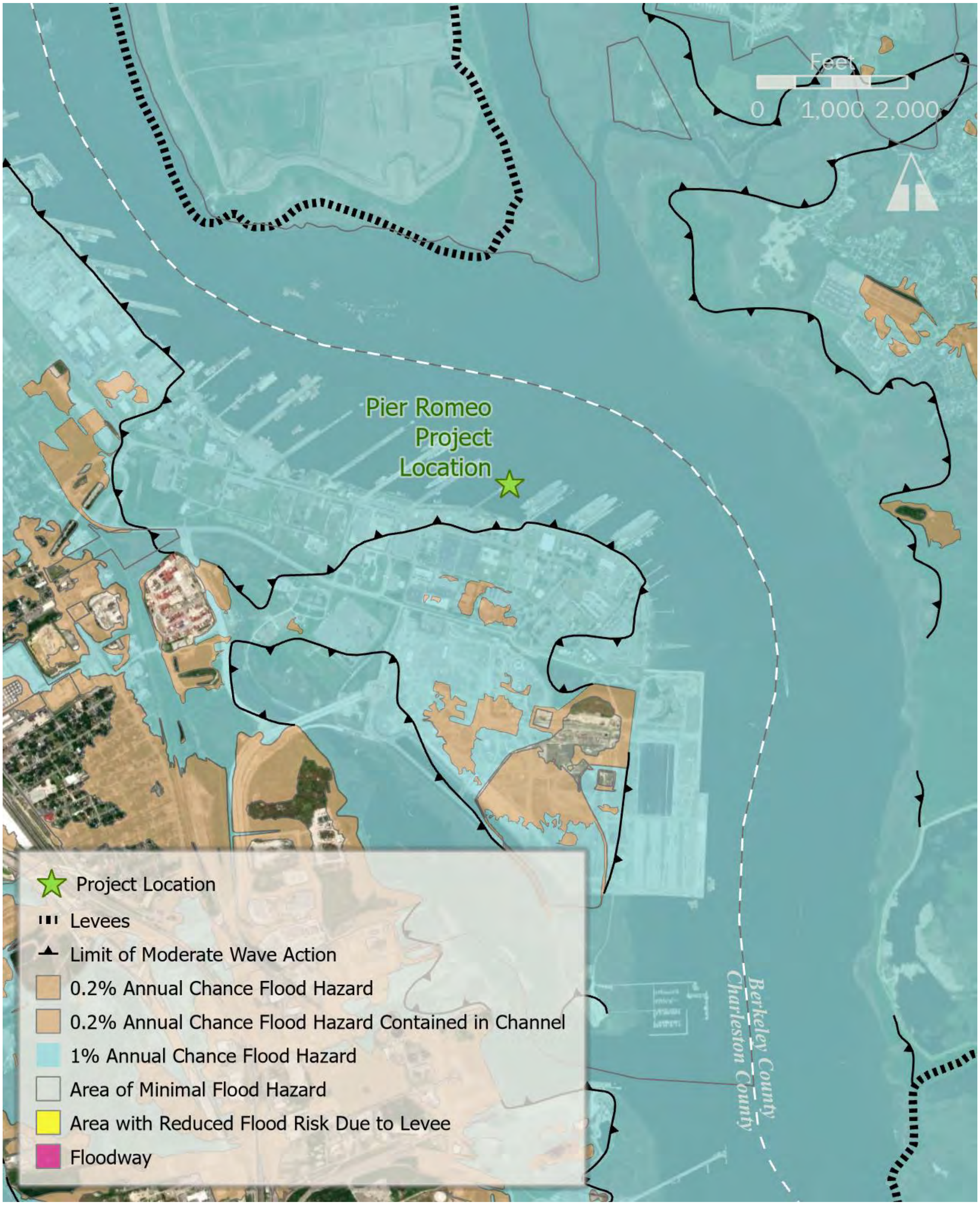

Figure 9: FEMA Floodplain Map

The project is situated along the Cooper River in North Charleston, South Carolina. Cooper River is tidally influenced and has several flood hazards located along its banks. As a result, the Pier Romeo site is mapped primarily as Zone AE and Zone VE, which are considered special flood hazard areas (SFHAs). These SFHAs are subject to inundation by the 1% annual chance flood. Zone AE has a 1% annual chance of flood (i.e., 100-year floodplain), also known as the base flood area, which has a 1% chance of being equaled or exceeded each year. The SFHA is subject to flow in the 1% annual chance of flood areas. Zone VE is the coastal flood zone with velocity hazard (wave action) with base flood elevations determined and areas in which flood hazards are undetermined, but possible (FEMA FIRM, 2021). Additionally, other areas are considered in Zone X, which are areas determined to be outside the 0.2% annual chance floodplain (i.e., 500-year floodplain) (FEMA FIRM, 2021). The flood zone elevations within the project boundary range from 10 to 14 feet. Floodplain classifications are referenced in Figure 9.

Photo 3: Photo of rip rap at shoreline adjacent to Pier Romeo

Other structures in the floodplain include shoreline stabilization features (i.e., rip rap revetment), bulkheads, and pier structures (pilings, see photo). These features were originally constructed primarily to protect the shoreline from erosion, reinforce the seawalls, and provide anchors for the pier. Although these features alter wave action along select portions of the shoreline, they are considered to have a major impact on floodwater conveyance as these features reduce flood events along the shoreline of the Cooper River.

3.4.3. Environmental Consequences

No Action Alternative

Analysis under NEPA requires review of a No-Action Alternative. Under the No-Action Alternative there would be no recapitalization of facilities at the Pier Romeo facility. Existing upland and in-water structures would remain, including the deteriorating timber piles. The trestle and pier would continue to be non-operational. No protective or mitigative actions would be taken to reduce flooding risk or shoreline erosion and localized flooding and shoreline erosion would continue to occur. This alternative would not meet the purpose and need for the project. Under this alternative, the USACE and SCDNR would not issue a Nationwide Permit, Individual Permit, or General Permit. No proposed project actions would trigger a requirement or approval from either above-mentioned agency as there would be no single, specific action that warrants approval. As a result, future impacts that could adversely affect WOTUS cannot be evaluated. In addition, the No-Action Alternative would not initiate consultation with FEMA or South Carolina Department of Environmental Quality (SCDEQ) as there would be no impacts to existing floodplain levels. No impacts are expected with this alternative; therefore, direct and indirect impacts to WOTUS and water resources overall would be negligible or have no impact. Additional assessment is not needed.

Preferred Alternative

The Preferred Alternative consists of an approximate 360-linear-foot-long and 60-foot-wide floating pier that would replace the existing pier. The floating pier would be connected to an approximate 80-foot steel access trestle banked by concrete wingwalls. The abutment for the access trestle will fan out into wingwalls. The proposed floating pier would be placed within the same environmental footprint of the existing pier. The floating pier would be secured and stabilized by approximately 32 steel piles.

The proposed alternative also includes installation of resilient curbing along the eastern and western limits of the parcel, construction of a seawall to close a gap between existing seawalls on either side of the pier within the project area, and a living shoreline to reduce flooding and wave hazard risk and shoreline erosion.

Construction Impacts

Under the proposed project, construction of the floating pier without considering potential dredging effects would result in minor impacts to WOTUS. These impacts would be considered temporary with the initial deconstruction and removal of the existing pier.

Construction of the seawall would have minor permanent impacts to WOTUS as the seawall is proposed to be constructed behind the existing revetment. Construction of the resilient curbing would occur within the footprint of existing developed area. Construction of the living shoreline would have permanent beneficial impacts to WOTUS since the proposed living shoreline will create additional wetland habitat.

Dredging in Cooper River would require notification to the USACE, SCDEQ, and Coastal Area Management Act (CAMA) for approval of this process. Dredging impacts may include temporary increases in turbidity and suspended solids levels along with the associated decreases in DO levels in the immediate vicinity of the dredging and dredged material placement operations. Increased turbidity would result in a decrease in light penetration and cause a general decline in aquatic primary productivity. Organisms capable of motion would be expected to evacuate areas of dredging and construction temporarily to reach areas of less disturbance. These changes in water quality would be temporary and would cease when construction is completed.

In this alternative, the long-term impacts to water-quality would be anticipated to be minor. Temporary water-quality impacts associated with dredging activities would be anticipated to be moderate. The use of BMPs for in-water work, including use of a turbidity curtain during demolition activities, would limit the extent of impacts to water quality. Effects to water quality because of construction would be temporary and limited to the time that construction would occur. Water quality would return to pre-project condition upon completion of the project. Impacts to water-quality would be beneficial over the long term since implementation of the proposed living shoreline could provide improved water quality and filtering capacity compared to existing shoreline features.

Demolition of the existing pier, complete removal of the contents of the pier, and installation of resilient curbing and a living shoreline would not affect or alter floodplain elevations. Impacts are considered negligible to floodplain impacts as an increase in surface waters would not be expected.

Potential effects to stormwater runoff water quality would occur as a result of regrading, reconfiguration, paving, and restriping of the upland parking area and installation of the resilient curbing. Regrading, repaving, and curb construction activities could result in temporarily exposing soils to the erosive forces of wind, rain, and stormwater runoff; this could cause the release of construction generated sediment to the adjacent river channel. Stormwater runoff could also be contaminated with chemicals used during construction such as fuels, oils, and solvents through the transportation, storage, and use of these materials. The reconfiguration and repaving of the parking area will occur within the footprint of the existing parking area and no additional paved surface is expected to be created that would result in increased stormwater runoff. These potential runoff related effects would be temporary and would cease when construction is completed. In addition, there is an existing stormwater retention basin onsite that is used to capture and retain runoff from the parking area.

Operational Impacts

Operations of the facility under the Preferred Alternative will result in short-term, minor direct effects to water quality in the vicinity of the project area due to increased turbidity and suspended sediment because of increased vessel traffic, increased potential for unintentional fuel spills from berthed vessels or maintenance or ship restocking activities, and release of incidental amounts of oil and grease because of use of vessel ballasts, engine cooling, and other vessel systems. The frequency and severity of the impact to water quality would be dependent on the usage of the piers and could range from negligible to moderate.

Operational impacts to stormwater runoff as a result of installation of the resilient curbing are unknown. Additional hydraulic modeling of stormwater flow at the site would provide further information on the change. Onsite stormwater structures may need to be evaluated as modeling occurs.

3.4.4. Avoidance, Minimization, and Mitigation Measures

Implementation of the Preferred Alternative would not result in significant long-term adverse impacts to water resources; therefore, no mitigation measures are proposed.

Standard erosion and turbidity controls would be used during construction activities, such as the installation and maintenance of silt fence, erosion control blankets, and turbidity curtains. Although short-term adverse effects would not be significant, these measures will minimize the potential for reductions in water quality during the construction period.

Minimization measures for water resources includes the implementation of BMPs as listed in Table 12.

3.5. Hazardous Materials and Solid Waste Management

3.5.1. Regulatory Setting

Hazardous materials are regulated by the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Oil Pollution Act (OPA), Toxic Substances Control Act, and related USEPA guidelines.

South Carolina regulations that are applicable include the South Carolina Hazardous Waste Management Act, the South Carolina Pollution Control Act, and the South Carolina Oil and Gas Act. Any change in the storage or use of hazardous materials must comply with these regulations. USEPA and SCDEHC are responsible for ensuring compliance with these regulations.

Resources Conservation and Recovery Act and Comprehensive Environmental Response, Compensation, and Liability Act

The USEPA is responsible for implementing and enforcing federal laws and regulations pertaining to hazardous materials. The primary legislation includes the RCRA and CERCLA, as amended by the Superfund Amendments and Reauthorization Act, and the Emergency Planning and Community Right-to-Know Act (EPCRA). Hazardous materials storage and reporting requirements, known as Tier II Requirements, have been delegated to the states by the USEPA. SCDEHC regulates state hazardous materials, clean-up, and remediation of known releases, spills, or hazardous materials, including any petroleum related contamination. This is found under Federal Register: Docket # EPA-R04-UST-2019-0582.

South Carolina Solid Waste Policy and Management Act

Solid waste is regulated by South Carolina through the South Carolina Solid Waste Policy and Management Act. The purpose of the Act is to protect the public health and safety, protect and preserve the environment of South Carolina, and recover resources that have the potential for further usefulness by providing for an environmentally safe, economically feasible, and cost-effective manner the storage collection, transport, separation, treatment, processing, recycling, and disposal of solid waste.

3.5.2. Affected Environment

Past surveys, including the *Draft Environmental Baseline Survey for Transfer facilities RTC-1, RTC-4, 200 1874, 330 Naval Base, Charleston, South Carolina* (1995), and the Phase I Environmental Site Assessment, Pier Romeo (2008) indicate that, historically, there have been numerous petroleum product spill incidents documented at Pier Romeo. Due to possible tidal fluctuations in groundwater flow, the potential exists for the migration of both soil and groundwater contaminants from nearby parcels on to the NOAA site. Additionally, several past incidents of sewage discharges were recorded near the NOAA Site from the mid-80s up to 1991. Underground storage tanks are reported to have been removed and associated monitoring wells abandon in 2005 by the Navy, but residual sediment from tank removals may still be present in site soils.

According to the EPA EnviroAtlas Database (EPA, 2021 and Environmental Data Resources (EDR, 2021) report, no hazardous waste sites or toxic release inventory sites are located within the study area. However, several facilities are located within a half-mile of the site that are listed as hazardous waste sites. Those facilities include the U.S. Department of State Charleston Regional Center (USDSCRC) (registry ID: 110021015426), the FLETC (Registry ID: 110012192260), the U.S. Coast Guard Vessel Support Facility (Registry ID: 110002258360), and the South Carolina Electric and Gas (SCE&G) Navy Base Crew Quarter (QTR) (Registry ID: 110007838643). According to the EPA EnviroAtlas Database (USEPA, 2021) and EDR Report (EDR, 2021), there are no brownfield sites or superfund sites located within 1,500 feet of the study area. Two facilities are located within approximately 1,500 feet of the study area. Those include the USDSCRC (Registry ID: 110021015426), which is located at 1969 Dyess Avenue in Charleston, Charleston County, South Carolina and the FLETC (Registry ID: 110012192260), which is located at 2000 Bainbridge Avenue in Charleston, Charleston County, South Carolina. The USDSCRC facility is approximately 650 feet south of the study area and the FLETC facility is located approximately 1,200 feet southwest of the study area (EPA, 2021 and EDR, 2021). The facilities have both been reported as small quantity generators. Both sites are still active and, according to the EDR Report, neither site has received violations (EDR, 2021). However, because of their proximity and topographic gradient, potential contamination could flow north towards the site if a release were to occur. A meeting was held on September 12, 2022 with representatives from the NOAA-OMOA, South Carolina Department of Health and Environmental Control, and the U.S. Navy to gather any input offered considering the property in the vicinity of the project site that is currently covered by a RCRA permit. Neither SCDHEC nor the U.S. Navy had any concerns about the infrastructure improvements that would be required in the construction of the project.

The parent property is identified by the Charleston County Online GIS Database as Parcel Identification Number (PIN) 4000000004 and is currently owned by FLETC and NOAA. The approximate 2-acre subject property is occupied by Pier Romeo, a NOAA administrative building, and parking lot and shoreline The subject site is in a commercial/militarized area of North Charleston, South Carolina. The subject site is bound on the north by the Cooper River and further north by a U.S. Naval Reservation, which consists of a spoil area; on the east by the Cooper River, Pier Sierra, and additional piers associated with FLETC; on the south by paved parking areas, multiple FLETC buildings and structures; and on the west by the Cooper River, Pier Quebec, and multiple FLETC properties. Based on a site reconnaissance conducted on April 10, 2021, no recognized environmental concerns (RECs) were determined to be on-site. The EDR Report did not identify the site as having known contaminants, spills, or releases. However, two nearby properties were identified that are considered potential recognized environmental conditions (PRECs) for the subject site. In addition, eight out of nine potential RECs (PRECs) are identified in the summary Phase I ESA and are located within 1 mile of the subject site. These sites represent potential RECS and are described in further detail within the *Summary Report of Hazardous Materials and Historical Information* (NOAA, 2021h).

A *Hazardous Materials Survey and Sampling Report* (NOAA, 2021g, see Appendix F) was also developed for the project. The report stated that eight suspect asbestos containing materials (ACM) samples, eight suspect metals-containing paint (MCP) samples, eight marine sediment samples, and three unsaturated soil samples were collected at the site. The report indicated that none of the eight potential ACM samples contained asbestos. Samples from the painted items that contained metals, including lead, will be tested with other representative demolition debris, per the Toxicity Characteristics Leaching Procedure (TCLP) test methodology, to determine if they would be characterized as a hazardous or solid (non-hazardous) waste prior to their removal and disposal. There were no detectable levels of metals in the marine sediment samples and the unsaturated soil samples, except for lead, which was found in one marine sediment sample in trace amounts and one unsaturated soil sample in which laboratory results indicated the presence of lead at a level that was below the USEPA Region 4 Regional Screening Levels (RSL) for an industrial setting. Following the initial hazardous materials survey and sampling event in April 2021, a supplemental visit and sample event was conducted to further assess the extended shoreline soil between Pier Romeo and Pier Sierra to the east and a supplemental report (GEAR, 2022) was developed for the project.

Eight additional unsaturated soil samples that were collected and tested contained levels of trace amounts of petroleum-related constituents between January 25th and 26th, 2022(see Appendix F) These levels are of minor concern but indicate past contamination associated with likely spills or stormwater run-off.

All eight unsaturated soil samples that were collected and tested contained levels of lead; the highest level of lead detected was 96200 *ug/kg*, or 96.2 *mg/kg* (96.2 ppm). There was no reported exceedances of USEPA Region 4 RSLs for lead amongst all samples taken. Though six of 11 soil samples contained lead exceeding USEPA regional screening maximum contaminant levels (MCLs) for lead in soil that may affect groundwater, the groundwater in this area is not used for potable purposes; therefore, regional screening exceedances are not practical since the groundwater is not potable without being treated.

3.5.3. Environmental Consequences

No Action Alternative

Under this scenario, hazardous materials, RECS, would not be affected. No additional assessment is advised.

Preferred Alternative

The alternative consists of demolition of the existing pier structure, utilities, and associated on-site land improvements such as a seawall located to the southeast of the pier and placement of a storage facility in the existing parking lot of the NOAA site. Construction of the new seawall option would occur upland of the riverbank but would likely require the displacement of the existing rock and soil riverbank.

No on-site features were documented as RECs. Several properties located off site could potentially impact the site with future contamination if a spill, release, or other environmental impact is found at the sites. Due to the pier being off-shore, impacts are considered minimal to negligible if an impact from land-based facilities are reported. Impacts from groundwater or surface waters are not expected to impact the pier.

In Water Demolition and Construction

Based on the data derived from the Sampling Analysis Plan (NOAA, 2022b), and the *Hazardous Materials Survey and Sampling Report* (NOAA, 2021g), the project is not expected to encounter hazardous, toxic, or radioactive waste. Neither the navigational channels to USACE approved disposal sites nor the disposal sites would be affected by hazardous, toxic, or radioactive wastes associated with this project. Additional information on dredge volumes and the chemical characterization of soils and sediment within the dredging limits of the project is provided in the Geological Resources section of this report and the geotechnical report (NOAA, 2022a).

Construction

The Preferred Alternative, if constructed, would generate solid waste during pier demolition and reconstruction of the pier and structural options to increase site resiliency. Solid waste management and disposal protocols for soil shall be in accordance with the South Carolina Solid Waste Policy and Management Act and an SCDHEC approved Quality Assurance Project Plan (QAPP). The QAPP should be reviewed to determine soil stockpile and/or disposal requirements. Solid waste generated by construction of the project must be compliant with federal and South Carolina regulations and guidelines affecting the generation, transportation treatment, storage, and disposal of solid waste. The management of dredged material is discussed in the Geotechnical Resources section of this report and the geotechnical report (NOAA, 2022a).

During construction it is imperative that Occupational Safety and Health Administration (OSHA) regulations be administered and enforced for workers' health and safety measures and guidelines during demolition of the pier. The findings of the NOAA (2021) report should be incorporated into demolition design/process, specifications, and cost estimates so that hazardous materials can be handled and removed appropriately to not only protect workers, but also the environment.

Construction methods for seawall installation may include excavation and removal of existing soil and other shoreline material; however, impacts from legacy trace material should be minimal assuming erosion and dust control BMPs are followed.

Typical construction activities would be implemented during the Action Alternative. Such activities include earthwork with heavy machinery, site preparation, and excavation from the existing pier and the inland parking lot that houses existing underground utility lines. The activities will also include removal of existing shoreline material and soils to construct the new seawall. Because the pier was built in 1947 and eventually improved in 1987, multiple utility lines still exist on and in the vicinity of the pier. Similar utilities exist along the shoreline including but are not limited to old piping and foundations (concrete) from old building foundations and/or roads. The Preferred Alternative would remove existing utility lines that consist of natural gas, electric, steam, and their residual products, as well as obstructions in the shoreline area. It was previously determined that petroleum gas lines do not exist on the pier or in the vicinity of the pier.

Hazardous waste from the demolition and removal of the pier would be classified and removed according to federal and state regulations. It is assumed that if contaminated material is found, the hazardous materials would be packaged and shipped to a recommended disposal site in accordance with Department of Transportation regulations. This material would be shipped to a Class I or Class II landfill for sorting and processing. If asbestos materials are discovered, it would be removed and transported in accordance with applicable federal, state, and local regulations, and disposed at a facility licensed and permitted to receive asbestos materials.

Safety and Health During Construction

There is a potential for unplanned encounters with contaminants during landward construction of the project. A Hazardous Material Survey and Sampling Report (GEAR, 2022) documented the existing hazardous materials at the pier. A supplemental soil sampling report (GEAR, 2022) documented trace amounts of lead and petroleum-related constituents in the soil along the eastern shoreline.

In-water and ground-disturbing activities would occur with the demolition and construction of the Preferred Alternative, which could potentially expose workers to hazardous materials from construction activities, disposal of contaminated materials, and transportation of materials off-site. Contaminated materials associated with the demolition and removal of the pier's materials could negatively impact construction workers and the public if contaminated materials are not properly handled, transported, and removed from the site. Therefore, site construction must adhere to federal, state, and local regulations regarding hazardous materials and current safety hazards and measures.

Upland and tidal range area site soils identified for excavation within a future design should be characterized to evaluate relevant risk associated with the presence of petroleum (including lead) impacted soils exceeding some USEPA Region 4 regional screening levels.

OSHA of the U.S. Department of Labor is responsible for implementing and enforcing federal laws and regulations that address worker health and safety. OSHA requires training for those using or otherwise handling hazardous materials or involved in the investigation and/or cleanup of contaminated sites. Training is to include procedures for personal safety, hazardous materials storage and handling, and emergency response.

Operational Impacts

Operations of the pier would include use of fuels (if necessary), oil, lubricants, typical paint, boat maintenance equipment, adhesives, and other cleaning chemicals. Vessel fueling would be completed by either barge or the vessel would travel to a nearby fuel depot. On-site fueling is not a part of the operational plan for vessels traveling to and from Pier Romeo. However, typical vessel maintenance is expected at the pier. This includes routine and emergency maintenance of mechanical instruments and machinery that require lubrication and chemicals to continue operational maintenance of the vessel. Proper usage, storage, and disposal of hazardous chemicals would be performed on site during each vessel's docking and departure. Major vessel maintenance is not expected at Pier Romeo. Hazardous substances are anticipated to be used during typical operations of the pier but are not anticipated to have an impact on resources under normal circumstances. In the instance of an accidental spill or release of hazardous material, all state and federal regulations will be complied with. The Preferred Alternative would have minimal to no adverse impacts relating to the handling and disposal of hazardous material.

Safety at the FLETC facility and naval operations facility (Pier Romeo & NOAA) is maintained through a variety of different health and safety plans that follow OSHA of the U.S. Department of Labor regulations.

3.5.4. Avoidance, Minimization, and Mitigation Measures

Implementation of the Preferred Alternative would not result in hazardous material related impacts; therefore, no mitigation measures are proposed. It is recommended that approved OSHA, state published guidelines and BMPs be used when working with soil to limit and prevent fugitive dust inhalation during construction activities.

3.6. Coastal Resources and Climate Change

This section considers the threats due to climate change on the coastal cities and coastal resources that are known to occur within the project area. Climate change refers to more than an increase in temperature, as it includes SLR, flooding, and much more (NOAA, 2021b). In the last decade, the speed at which sea level is rising in South Carolina has increased and is now rising by as much as 1 inch every 2 years (NOAA, 2021c). While North Charleston does not lie directly on the coast, major water bodies that surround it will be affected as the sea level rises. Accelerating SLR could especially present problems for North Charleston areas that are near the Ashley and Cooper Rivers, where the project area is located.

3.6.1. Regulatory Setting

The applicable regulations for coastal resources for this project include the Federal Coastal Zone Management Act (1972), South Carolina's Coastal Zone Management Program, and related Executive Orders, USACE Regulation, and guidance.

Federal Coastal Zone Management Act of 1972, As Amended

Under the CZMA, each federal agency activity performed within or outside the coastal zone (including development projects) that affects land or water use, or natural resources of the coastal zone is required to be carried out in a manner that is consistent to the maximum extent practicable, i.e., fully consistent, with the enforceable policies of approved state management programs unless full consistency is prohibited by existing law applicable to the federal agency. To implement the CZMA and to establish procedures for compliance with its federal consistency provisions, the U.S. Department of Commerce and NOAA promulgated regulations that are contained in 15 C.F.R. Part 930. As per 15 C.F.R. 930.37, a federal agency may use its NEPA documents as a vehicle for consistency determination. The project will comply with this Act. Mr. Christopher Stout of the South Carolina Department of Health and Environmental Control provided conditional concurrence 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 South Carolina Coastal Zone Management Program (SCCZMP) pursuant to 15 CFR. § 930.55 (see Appendix GAppendix G).

South Carolina's Coastal Zone Management Program

In accordance with 16 U.S.C. 1451-1465, the CZMA requires that federal actions that will have reasonably foreseeable effects on the land or water uses, or natural resources of a state's coastal zone must be consistent with federally approved State Coastal Management Programs. South Carolina's Coastal Management Program was established under the guidelines of the national CZMA (1972) as a state-federal partnership to comprehensively manage coastal resources. It was authorized in 1977 under South Carolina's Coastal Tidelands and Wetlands Act (CTWA) with the goal of achieving balance between the appropriate use, development, and conservation of coastal resources in the best interest of all citizens of the state. South Carolina's Coastal Zone Management Program Document and Final EIS (SCDHEC, 1979) identifies the following as significant coastal resources: (1) significant fish species and habitats; (2) threatened wildlife habitats; (3) public recreation areas; (4) drinking water supply; (5) historical, cultural, and archaeological sites; (6) barrier islands; and (7) wetlands. All these coastal resources, except for barrier islands, have the potential to exist within or adjacent to the project area.

Executive Order 13693: Planning for Federal Sustainability in the Next Decade

EO 13693, Planning for Federal Sustainability in the Next Decade, maintained federal leadership in sustainability and GHG emission reductions. The EO, revoked by EO 13834, required that agencies increase efficiency and improve their environmental performance by reducing agencies direct GHG emissions, fostering innovative energy solutions, reducing cost, and strengthening communities where federal facilities operate.

Executive Order 13834: Efficient Federal Operations

EO 13834, which revoked EO 13693, affirms that "agencies meet energy and environmental performance statutory requirements in a manner that increases efficiency, optimizes performance, eliminates unnecessary use of resources, and protects the environment." Specifically, the EO requires agencies to "prioritize actions that reduce waste, cut costs, enhance the resilience of federal infrastructure and operations, and enable more effective accomplishment of its mission."

Executive Order 14008: Tackling the Climate Crisis at Home and Abroad

EO 14008, dated January 27, 2021, enforces actions to tackle climate change and establishes the climate crisis at the forefront of foreign policy and national security planning. The EO has three overarching objectives, which include promoting safe global temperature, increasing climate resilience, and financially supporting a pathway toward low GHG emissions and climate-resilient development.

Related USACE Regulation

The purpose of USACE Regulation 1100-2-8162 (2013) is to provide guidance for incorporating the direct and indirect physical effects of projected future sea level change across the project life cycle in managing, planning, engineering, designing, constructing, operating, and maintaining USACE projects and systems of projects. This regulation is applicable because it applies to all USACE civil works activities incorporating sea level change.

Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews (2016)

This guidance provides federal agencies a common approach for assessing their project actions while recognizing each agency's unique circumstances and authorities. This guidance is intended to help federal agencies ensure their analysis of potential GHG emissions and effects of climate change in an EA or Environmental Impact Statement (EIS) is commensurate with the extent of the effects of the project. The guidance provides several recommendations, including quantifying a proposed agency action's projected direct and indirect GHG emissions considering available data and GHG quantification tools that are suitable for the proposed agency action, that agencies use projected GHG emissions as a proxy for assessing potential climate change effects, and discusses methods to appropriately analyze reasonably foreseeable direct, indirect, and cumulative GHG emissions and climate effects.

Affected Environment

North Charleston has a temperate to subtropical climate with the region averaging 230 days of sunshine each year. The average daily high is 75.7 degrees Fahrenheit (°F), and precipitation averages 50.14 inches each year. However, due to its proximity to the coast, the city is also impacted by tropical storms and hurricanes during hurricane season, which typically lasts from late summer to the end of November (North Charleston, 2020). The highest recorded temperature in South Carolina is 113°F (45 degrees Celsius [°C]) in Johnston and Columbia on June 29, 2012, while the lowest recorded temperature is -19°F (-28.3°C) at Caesars Head on January 21, 1985 (SCSCO, 2021).

Tropical storms and hurricanes have become more intense during the past 20 years, and hurricane wind speeds and rainfall rates are likely to increase as the climate continues to warm (USEPA, 2016b). North Charleston's proximity to open water, tidally influenced rivers, low-lying areas, and flat terrain makes it vulnerable to the threats or hazards that are associated with tropical storms and hurricanes including high winds, tornados, intense rainfall, storm surge, and severe flooding. Charleston is threaded by dozens of rivers and creeks, making flood drainage an important issue since its 1680 founding. Figure 9 illustrates the FEMA floodplain designations at the project area. In recent years, the combined challenges of SLR, heavier downpours, tidal flooding, and increased development have worsened conditions. Tidal flooding in the 1970s averaged twice per year. By the early 2010s, tidal flooding had risen to 11 times per year and is projected to strike up to 180 times per year by 2045 (NOAA, 2021b).

For additional information on significant fisheries resources and habitats that are known to occur within or adjacent to the project area, see Section 3.7.4, Environmental Consequences.

No Action Alternative

No Action Alternative would leave critical infrastructure more vulnerable to the impacts of storm surges and flooding during the 50-year design life of the project.

SLR intensifies the effects of high-frequency and extreme event flooding. Increased water levels can impact stormwater systems during rain events and increase shoreline erosion by extending the reach of waves and currents more inland. Moreover, future coastal storm events will produce larger and more damaging waves that will be able to reach even farther inland due to the influence of SLR (AECOM, 2022).

Preferred Alternative

The project would result in an improved and operational pier that is designed to enhance adaptability to predicted SLR. The alternative options provide measures to minimize future flood risk hazards to the NOAA facilities and protect and restore biological functionality to the shoreline within the study area.

3.6.2. Avoidance, Minimization, and Mitigation Measures

Implementation of the Preferred Alternative would not result in significant long-term adverse impacts to coastal resources; therefore, no mitigation measures are proposed. Initiatives to improve the City of Charleston's ability to withstand flooding and SLR are outlined in the City's Flooding and Sea Level Rise Strategy (NOAA, 2021b). The strategy sets a vision to protect the City of Charleston and provides a guiding framework for creating resiliency against threats of flooding and SLR. The strategy's 2015 recommendations were a 1.5- to 2.5-foot elevation increase for new facilities and infrastructure. However, considering the latest SLR projections, the strategy updated the City's recommendations for building elevations to 2 to 3 feet to account for SLR over 50 years.

3.7. BIOLOGICAL RESOURCES

Biological resources assessed in this section include amphibians, marine reptiles, birds, mammals, and flowering plants. Fisheries resources and essential fish habitats (EFH) are also assessed, including adjacent wetlands. For additional information on wetlands, see Section 3.4.2.

3.7.1. Threatened and Endangered Species

Within Charleston County, SC, 16 federally listed threatened and endangered species are known to exist. According to the USFWS Information and Planning and Consultation (IPaC) dated, December 2022 (see Table 9 and Appendix H), several species are listed for the county. However, a detailed survey of species was not conducted as part of this study.

Table 9: Threatened and Endangered Species in Charleston County, SC

Common Name	Scientific name	Federal Status	Survey Window
Mammals			
Bald Eagle	Haliaeetus leucocephalus	BGPA	October 1 – May 15
Northern Long-eared Bat	Myotis septentrionalis	T	Year-round
West Indian Manatee	Trichechus manatus	T	May 15 – October 15
Birds			
Piping Plover	Charadrius melodus	T, CH	July 15 – May 1
Red Knot	Calidris canutus rufa	T	July 15 – May 1
Red-cockaded Woodpecker	Picoides borealis	E	April 1 – July 31
Bachman's Warbler	Vermivora bachmanii	E	Year-round
Eastern Black Rail	Laterallus jamaicensis	T	March – September
Reptiles			
Green Sea Turtle	Chelonia mydas	T	May 1 – October 31
Kemp's Ridley Sea Turtle	Lepidochelys kempii	E	May 1 – October 31
Leatherback Sea Turtle	Dermochelys coriacea	E	May 1 – October 31
Loggerhead Sea Turtle	Caretta	T, CH	May 1 – October 31
Flowering Plants			
American Chaffseed	Schwalbea americana	E	May – August
Pondberry	Lindera melissifolia	E	February – March
Canbys Dropwort	Oxypolis canbyi	E	July – September
Amphibians			
Frosted Flatwood Salamander	Ambystoma cingulatum	T	October – January

Bald Eagle

Description: Distinguished by a white head and white tail feathers, Bald Eagles are powerful, brown birds that may weigh 14 pounds and have a wingspan of 8 feet. Male eagles are smaller, weighing as much as 10 pounds and have a wingspan of 6 feet. Sometimes confused with Golden Eagles, Bald Eagles are mostly dark brown until they are four to five years old and acquire their characteristic coloring.

Habitat: Bald Eagles live near rivers, lakes, and marshes where they can find fish, their staple food. Bald Eagles will also feed on waterfowl, turtles, rabbits, snakes, and other small animals and carrion. Bald Eagles require a good food base, perching areas, and nesting sites. Their habitat includes estuaries, large lakes, reservoirs, rivers, and some seacoasts. In winter, the birds congregate near open water in tall trees for spotting prey and night roosts for sheltering.

Northern Long-eared Bat

Description: The northern long-eared bat (NLEB) is a medium-sized bat with a body length of 3 to 3.7 inches but a wingspan of 9 to 10 inches. Their fur color can be medium to dark brown on the back and tawny to pale brown on the underside. As its name suggests, this bat is distinguished by its long ears, particularly as compared to other bats in its genus, *Myotis*.

Habitat: During summer, NLEBs roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. Males and non-reproductive females may also roost in cooler places, like caves and mines. This bat seems opportunistic in selecting roosts, using tree species based on suitability to retain bark or provide cavities or crevices. It has also been found, rarely, roosting in structures like barns and sheds. NLEBs spend winter hibernating in caves and mines, called hibernacula. They typically use large caves or mines with large passages and entrances, constant temperatures, and high humidity with no air currents. Specific areas where they hibernate have very high humidity, so much so that droplets of water are often seen on their fur. Within hibernacula, surveyors find them in small crevices or cracks, often with only the nose and ears visible.

The project area does not include suitable upland habitat for the Northern Long-eared Bat. Upland areas consist of a paved parking lot with ornamental trees in parking islands.

The project area includes suitable habitat for the West Indian Manatee, Bald Eagle, and Northern Long-eared Bat. Coordination with the USFWS and the NOAA NMFS was conducted to address potential impacts of aquatic and terrestrial species listed under Section 7 of the ESA of 1973, as amended (16 U.S.C. 1531 et seq.).

West Indian Manatee

Description: Most adult manatees are about 10-feet-long and weigh 800 to 1,200 pounds, although some larger than 12 feet and weighing as much as 3,500 pounds have been recorded. These “gentle giants” have tough, wrinkled brown-to-gray skin that is continuously being sloughed off. Hair is distributed sparsely over the body. With stiff whiskers around its mouth, the manatee’s face looks like a walrus without tusks.

Habitat: Manatees move between freshwater, brackish, and saltwater environments. They prefer large, slow-moving rivers, river mouths, and shallow coastal areas such as coves and bays. The animals may travel great distances as they migrate between winter and summer grounds. During the winter, manatees congregate around warm springs and around power plants that discharge warm water. During summer months, they have occasionally been seen as far north as Virginia and Maryland.

The project area includes suitable habitat for the West Indian Manatee. Coordination with the U.S. Fish and Wildlife Service and the NOAA National Marine Fisheries Service will be conducted to address potential impacts of aquatic and terrestrial species listed under Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.).

Piping Plover

Description: The Piping Plover is approximately 18 cm (7.25 inches) in length. The color during the breeding season is pale brown above/lighter below, black band across forehead, bill orange with black tip, legs orange, and white rump. The male has a complete or incomplete black band that encircles the body at the breast. The female has a paler head band and incomplete breast band. Piping Plover’s exhibit black bills during the winter; all birds lack breast band and head band during winter.

Habitat: Sandy upper beaches, especially where scattered grass tufts are present, and sparsely vegetated shores and islands of shallow lakes, ponds, rivers, and impoundments. Nests may also be built on sandy open flats among shells or cobble behind foredunes. The Piping Plover breeds mainly on gently sloping foredunes and blow-out areas behind primary dunes of sandy coastal beaches, and on suitable dredge oil deposits.

The project area does not include suitable upland habitat for the Piping Plover. Upland areas consist of landscaped areas with a paved parking lot with ornamental trees in parking islands.

Red Knot

Description: The Red Knot is 25-28 cm in length. Adults in spring are finely mottled with grays above, black, and light ochre, running into stripes on crown; throat, breast, and sides of head cinnamon-brown; dark gray line through eye; abdomen and undertail coverts white; and upper tail coverts white, barred with black. Adults in winter are pale ashy gray above, from crown to rump, with feathers on back narrowly edged with white; underparts white, the breast lightly streaked and speckled, and the flanks narrowly barred with gray. Adults in autumn the underparts of some individuals show traces of the "red" of spring.

Habitat: The Red Knot's unique and impressive life history depends on suitable habitat, food, and weather conditions at far-flung sites across the Western Hemisphere, from the extreme south of Tierra del Fuego to the far north of the central Canadian Arctic. Knots need to encounter these favorable habitats, food, and weather conditions within narrow seasonal windows as the birds hopscotch along migration stopovers between wintering and breeding areas. Red Knots breed in dry tundra areas such as extreme northern Alaska, Canada, northern Greenland, and Russia. They winter at intertidal marine habitats near coastal inlets, estuaries, and bays. Wintering grounds for the Red Knot include coastal sites from Massachusetts and California southward to southern South America. Red Knots also winter at coastlines in Europe, Africa, Asia, and Australia. For example, the knot population decline that occurred in the 2000s was caused primarily by reduced food availability from increased harvests of horseshoe crabs, exacerbated by small changes in the timing that knots arrived at the Delaware Bay. Horseshoe crab harvests are now managed with explicit goals to stabilize and recover knot populations.

The project area includes suitable habitat for the Red Knot. Coordination with the U.S. Fish and Wildlife Service and the NOAA National Marine Fisheries Service will be conducted to address potential impacts of aquatic and terrestrial species listed under Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.).

Red-cockaded Woodpecker

Description: The red-cockaded woodpecker (RCW) is a small bird measuring about 7 inches in length. Identifiable by its white cheek patch and black and white barred back, the males have a few red feathers, or "cockade." These red feathers usually remain hidden underneath black feathers between the black crown and white cheek patch unless the male is disturbed or excited. Female RCWs lack the red cockade. Juvenile males have a red 'patch' in the center of their black crown. This patch disappears during the fall of their first year, at which time their 'red-cockades' appear.

Habitat: RCW habitat includes forests with trees old enough for roosting, generally at least 30 to 120 years old, or greater than 10 inches in diameter at breast height, depending on species of pine. The most prominent adaptation of RCWs is their use of living pines for cavity excavation. For nesting and roosting habitat, RCWs prefer open stands of pine containing trees greater than 30 years old. RCWs need live, large older pines to excavate their cavities. Longleaf pines (*Pinus palustrus*) are preferred, but other species of southern pine are also acceptable. Dense stands with a thick hardwood under story are avoided. Foraging habitat is provided in pine and pine hardwood stands 30 years old or older with foraging preference for pine trees 10 inches or larger in diameter. An open under story with "meadow-like" characteristic is preferred by the RCW. In good, moderately stocked pine habitat, sufficient foraging substrate can be provided on 75 to 125 acres. Prescribed burning is the most efficient and ecologically beneficial method to accomplish hardwood mid-story control.

The project area does not include suitable upland habitat for the Red-cockaded Woodpecker. Upland areas consist of a paved parking lot with ornamental trees in parking islands.

Bachman's Warbler

Description: Bachman's warbler is one of the smallest warblers with a total length of 10-12 cm. It is a delicate warbler with a slender, decurved bill. Adult males have black forecrown, grey hind-crown and nape, yellow forehead, eye-ring, lores, supercilium, and throat; yellow underparts with black patch on upper breast, and white undertail; olive-green upperparts, grey wings with olive fringes and yellow lesser coverts, grey tail with white spots on inner webs of all but central rectrices. First-year males are duller with indistinct black breast patch and no black forecrown. Adult females are duller with whitish eye-ring, no black, and less well marked head. First year females are even duller and paler below. Juveniles are brownish, buffy-yellow below, whiter on throat, and have two buffy wing-bars.

Habitat: Historic records indicate the warblers typically nested in low, wet, forested areas containing variable amounts of water, but usually with some permanent water. Most areas are generally forested consisting mostly of sweet gum, oaks, hickories, black gum, and other hardwoods. Understory vegetation typically consists of dense ground cover including thickets of can, palmetto, blackberry, and gallberry. Nests are located near the ground. Migratory information is scattered and differ between winter and breeding habitat preferences because the warbler can tolerate a wide range of conditions and uses a large variety of vegetative associations.

The project area does not include suitable upland habitat for the Bachman's Warbler. Upland areas consist of a paved parking lot with ornamental trees in parking islands.

Eastern Black Rail

Description: The black rail is the smallest rail in North America. Adults range from 10 to 15 cm in length and have a wingspan of 22 to 28 cm. Easter black rails can weigh 35 grams on average and are larger but have less brightly colored plumage than California black rails. Males and females are similar in size and adults are generally pale to blackish gray, with a small blackish bill and bright red eyes. The underparts from chin to abdomen are uniformly colored but are lighter on the chin and throat. The nape and upper back are chestnut and the remaining back, upper tail feathers, and remiges (wing flight feathers) are dark gray to blackish with small white spots and sometimes washed with chestnut brown. The lower abdomen, undertail feathers, and flanks are blackish streaked with narrow white and dark gray barring, washed with chestnut. Overall, males are darker and have pale to medium gray throats, while females are lighter and have pale gray to white throats.

Habitat: Eastern black rails occupy relatively high elevations along heavily vegetated wetland gradients with soils moist or flooded to a shallow depth. Occupied habitats are reflective of the subspecies movement habits. Black rails require dense vegetative cover and, as a result, are found in a variety of salt, brackish, and freshwater marsh habitats that can be tidally or non-tidally influenced.

The project area does not include suitable upland habitat for the Eastern Black Rail. Upland areas consist of a paved parking lot with ornamental trees in parking islands.

Green Sea Turtle

Description: The green sea turtle grows to a maximum size of about 4 feet and a weight of 440 pounds. It has a heart-shaped shell, small head, and single-clawed flippers. Color is variable. Hatchlings generally have a black carapace, white plastron, and white margins on the shell and limbs. The adult carapace is smooth, keelless, and light to dark brown with dark mottling; the plastron is whitish to light yellow. Adult heads are light brown with yellow markings. Identifying characteristics include four pairs of costal scutes, none of which borders the nuchal scute, and only one pair of prefrontal scales between the eyes.

Habitat: Green turtles are generally found in shallow waters (except when migrating) inside reefs, bays, and inlets. The turtles are attracted to lagoons and shoals with an abundance of marine grass and algae. Open beaches with a sloping platform and minimal disturbance are required for nesting. Green turtles apparently have a strong nesting site fidelity and often make long distance migrations between feeding grounds and nesting beaches. Hatchlings have been observed to seek refuge and food in Sargassum rafts.

The project area includes suitable habitat for the Green Sea Turtle. Coordination with the U.S. Fish and Wildlife Service and the NOAA National Marine Fisheries Service will be conducted to address potential impacts of aquatic and terrestrial species listed under Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.).

Kemp's Ridley Sea Turtle

Description: The Kemp's Ridley turtle is the smallest of the sea turtles, with adults reaching about 2 feet in length and weighing up to 100 pounds. The adult Kemp's Ridley has an oval carapace that is almost as wide as it is long and is usually olive-gray in color. The carapace has five pairs of costal scutes. In each bridge adjoining the plastron to the carapace, there are four inframarginal scutes, each of which is perforated by a pore. The head has two pairs of prefrontal scales. Hatchlings are black on both sides. The Kemp's Ridley has a triangular-shaped head with a somewhat hooked beak with large crushing surfaces. This turtle is a shallow water benthic feeder with a diet consisting primarily of crabs.

Habitat: Kemp's Ridley sea turtles occur in the Atlantic Ocean and the Gulf of Mexico. The females come ashore only to lay eggs.

The project area includes suitable habitat for the Kemp's Ridley Sea Turtle. Coordination with the U.S. Fish and Wildlife Service and the NOAA National Marine Fisheries Service will be conducted to address potential impacts of aquatic and terrestrial species listed under Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.).

Leatherback Sea Turtle

Description: The leatherback is the largest, deepest diving, and most migratory and wide ranging of all sea turtles. The adult leatherback can reach 4 to 8 feet in length and 500 to 2,000 pounds in weight. Its shell is composed of a mosaic of small bones covered by firm, rubbery skin with seven longitudinal ridges or keels. The skin is predominantly black with varying degrees of pale spotting, including a notable pink spot on the dorsal surface of the head in adults. A toothlike cusp is located on each side of the gray upper jaw; the lower jaw is hooked anteriorly. The paddle-like clawless limbs are black with white margins and pale spotting.

Habitat: The leatherback is the most pelagic (open ocean dwelling) of the sea turtles. Adult females require sandy nesting beaches backed with vegetation and sloped sufficiently so the distance to dry sand is limited. Their preferred beaches have proximity to deep water and generally rough seas.

The project area includes suitable habitat for the Leatherback Sea Turtle. Coordination with the U.S. Fish and Wildlife Service and the NOAA National Marine Fisheries Service will be conducted to address potential impacts of aquatic and terrestrial species listed under Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.).

Loggerhead Sea Turtle

Description: Loggerheads were named for their relatively large heads, which support powerful jaws and enable them to feed on hard-shelled prey, such as whelks and conch. The carapace (top shell) is slightly heart-shaped and reddish-brown in adults and sub-adults, while the plastron (bottom shell) is generally a pale yellowish color. The neck and flippers are usually dull brown to reddish brown on top and medium to pale yellow on the sides and bottom. Mean straight carapace length of adults in the southeastern U.S. is approximately 36 inches (92 cm); corresponding weight is about 250 pounds (113 kg). On July 28, 1978, the Fish and Wildlife Service (FWS) and NMFS (the Services) issued a final rule listing the loggerhead sea turtle as threatened throughout its worldwide range. On September 22, 2011, the Services determined that the loggerhead sea turtle is composed of nine distinct population segments (DPSs) and listed four DPSs as threatened and five DPSs as endangered under the ESA. All but two of these DPSs are wholly foreign species.

Habitat: The loggerhead is widely distributed within its range. It may be found hundreds of miles out to sea, as well as in inshore areas such as bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers. Coral reefs, rocky places, and shipwrecks are often used as feeding areas. Nesting occurs mainly on open beaches or along narrow bays having suitable sand, and it is often in association with other species of sea turtles. Most loggerhead hatchlings originating from U.S. beaches are believed to lead a pelagic existence in the North Atlantic gyre for an extended period, as long as 7 to 12 years, and are best known from the eastern Atlantic near the Azores and Madeira. Post-hatchlings have been found floating at sea in association with *Sargassum* rafts. Once they reach a certain size, these juvenile loggerheads begin recruiting to coastal areas in the western Atlantic, where they become benthic feeders in lagoons, estuaries, bays, river mouths, and shallow coastal waters. These juveniles occupy coastal feeding grounds for about 13 to 20 years before maturing and making their first reproductive migration, the females returning to their natal beach to nest.

The project area includes suitable habitat for the Loggerhead Sea Turtle. Coordination with the U.S. Fish and Wildlife Service and the NOAA National Marine Fisheries Service will be conducted to address potential impacts of aquatic and terrestrial species listed under Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.).

American Chaffseed

Description: American Chaffseed is an erect perennial herb with unbranched stems (or stems branched only at the base) with large, purplish-yellow, tubular flowers that are borne singly on short stalks in the axils of the uppermost, reduced leaves (bracts). The leaves are alternate, lance-shaped to elliptic, stalkless and are 1 to 2 inches (2 to 5 cm) long. The plant is densely, but minutely, hairy throughout, including the flowers. Flowering occurs from April to June in the south, and from June to mid-July in the north. Chaffseed fruits are long, narrow capsules enclosed in a sac-like structure that provides the basis for the common name. Fruits mature from early summer in the south to October in the north. American Chaffseed is a hemiparasite (partially dependent upon another plant as host). Like most of the hemiparasitic Scrophulariaceae, it is not host-specific, so its rarity is not due to its preference for a specialized host.

Habitat: American Chaffseed occurs in sandy (sandy peat, sandy loam), acidic, seasonally moist to dry soils. It is generally found in habitats described as open, moist pine flatwoods, fire-maintained savannas, ecotonal areas between peaty wetlands and xeric sandy soils, and other open grass-sedge systems. Chaffseed is dependent on factors such as fire, mowing, or fluctuating water tables to maintain the crucial open to partly open conditions that it requires. Historically, the species probably existed on savannas and pinelands throughout the coastal plain and on sandstone knobs and plains inland where frequent, naturally occurring fires maintained these sub-climax communities. Under these conditions, herbaceous plants such as American Chaffseed were favored over trees and shrubs. Most of the surviving populations, and all the most vigorous populations, are in areas that are still subject to frequent fire. These fire-maintained habitats include plantations where prescribed fire is part of a management regime for quail and other game species, Army base impact zones that burn regularly because of artillery shelling, forest management areas that are burned to maintain habitat for wildlife, including the endangered RCW, and various other private lands that are burned to maintain open fields. Fire may be important to the species in ways that are not yet understood, such as for germination of seed, or in the formation of the connection to the host plant.

The project area does not include suitable upland habitat for the American Chaffseed. Upland areas consist of a paved parking lot with landscaping and ornamental trees in parking islands.

Pondberry

Description: Pondberry (*Lindera melissifolia*) is a deciduous shrub that grows to approximately 2 meters (6 feet) tall, and spreads vegetatively by stolons. Pale yellow flowers appear in the spring before the leaves emerge. The oval-shaped fruits are 0.5 inch (12 millimeter) long and turn from green during the summer to bright red in the fall. Pondberry is distinguished from the two other North American members of the genus (*Lindera benzoin* and *Lindera subcoriacea*) by its drooping foliage, obtuse or rounded leaf base, conspicuous venation, and the two lowest pairs of lateral nerves are not parallel to the ones above. Pondberry leaves have a distinct sassafras-like odor when crushed. Reproduction is primarily vegetative by means of stolons. The plants grow in clones of numerous stems that flower when little more than 2 to 3 years of age but appear to live for only a few years. The dead stems are replaced by new ones that emerge from the rootstock. The plants flower in late February or March and are dioecious (male and female flowers are produced on separate plants). Mature fruits can be found on the plants in October. Seeds are only viable for a short period of time.

Habitat: Pondberry, for the most part, is associated with wetland habitats such as bottomland and hardwoods in the interior areas, and the margins of sinks, ponds, and other depressions in the more coastal sites. The plants generally grow in shaded areas but may also be found in full sun.

The project area does not include suitable upland habitat for the Pondberry. Upland areas consist of a paved parking lot with landscaping and ornamental trees in parking islands.

Canby's Dropwort

Description: Canby's dropwort is a perennial herb that grows 2.6 to 3.9 feet (0.8 to 1.2 meters) tall. The stems are round in cross section, ascending, and stiff. They arise from scaly buds at the tips of the previous year's rhizomes or the first, second, or third nodes. The stems branch well above the mid-stem, with the branches arching-ascending and forking. The quill-like leaves are slender, round, hollow, and septate. The flowers consist of compound umbels of small five parted flowers, which appear from mid-July through September with white petals and pale green sepals, some of which are tinged with red or pink. The fruit is a schizocarp about 0.16 to 0.24 inch (4 to 6 millimeters) long, broadly obovoid or ellipsoidal and strongly compressed.

Habitat: Canby's dropwort has been found in a variety of coastal plain habitats, including natural ponds dominated by pond cypress, grass-sedge dominated Carolina bays, wet pine savannas, shallow pineland ponds, and cypress-pine swamps or sloughs. The largest and most vigorous populations have been found in open bays or ponds that are wet throughout most of the year, but which have little or no canopy cover. Soils are sandy loams or acidic peat mucks underlain by clay layers which, along with the slight gradient of the areas, result in the retention of water.

The project area does not include suitable upland habitat for the Canby's Dropwort. Upland areas consist of a paved parking lot with landscaping and ornamental trees in parking islands.

Rough-leaved Loosestrife

Description: Rough-leaved loosestrife is an erect perennial herb that can grow up to 6 cm tall and bears a terminal spike of showy, yellow, star-shaped flowers in the spring. The leaves are arranged in whorls of three around the stem.

Habitat: Rough-leaved loosestrife occurs most often in ecotones between longleaf pine upland and pond pine pocosin in moist, sandy, or peaty soils with low vegetation that allows for abundant sunlight to the herb layer. Fire is primarily responsible for maintaining low vegetation in these ecotones, which have been documented to occur between the following habitat types: longleaf pine savanna and pocosin; longleaf pine flatwood and pocosin; longleaf pine savanna and mixed herb; longleaf pine-pond pine and evergreen shrub; longleaf pine/wiregrass savanna and Carolina Bay pocosin; Streamhead Pocosin and Pine/Scrub Oak Sandhill; and Sandhill Seep and Pine/Scrub Oak Sandhill.

The project area does not include suitable upland habitat for the Rough-leaved Loosestrife. Upland areas consist of a paved parking lot with landscaping and ornamental trees in parking islands.

Seabeach Amaranthus

Description: Seabeach Amaranthus is an annual herb with reddish-colored, prostrate, highly branched stems that form clumps, often reaching 3 cm in diameter. Leaves are spinach-green, clustered towards the tips of the stems. Flowers and fruits are inconspicuous.

Habitat: Seabeach Amaranthus are found on barrier islands, mainly on coastal overwash flats at the accreting ends of the islands and lower foredunes and on ocean beaches above mean high tide (occasionally on sound-side beaches). Intolerant of competition; does not occur on well-vegetated sites. This species appears to need extensive, dynamic, natural areas of barrier island beaches and inlets.

The project area does not include suitable upland habitat for the Seabeach Amaranthus. Upland areas consist of a paved parking lot with landscaping and ornamental trees in parking islands.

Frosted Flatwood Salamander

Description: The Frosted Flatwoods salamander is a long and slender salamander that can reach a body length of 5.2 inches. It has a silvery-gray or black body with white spots that are less distinct than on the reticulated flatwoods salamander. These salamanders have a small head and a black belly. Adults are terrestrial and live underground most of the year. They breed in relatively small, isolated ephemeral ponds where the larvae develop until metamorphosis. Mature salamanders migrate out of the ponds and into uplands where they live until they move back to ponds to breed as adults.

Habitat: The Frosted Flatwoods salamander is endemic to the lower Gulf and Atlantic coastal plains where they occur in what were historically longleaf pine-wiregrass flatwoods and savannas and in scattered wetlands. Surviving populations of flatwoods salamanders are small, localized, and highly vulnerable to habitat destruction, deterioration, and fragmentation.

The project area does not include suitable upland habitat for the Frosted Flatwood Salamander. Upland areas consist of a paved parking lot with landscaping and ornamental trees in parking islands.

Based on the habitat descriptions of the above-listed species, it is expected that habitat could exist for the Bald Eagle, West Indian Manatee, Red Knot, Wood Stork, Green Sea Turtle, Kemp’s Ridley Sea Turtle, Leatherback Sea Turtle, and the Loggerhead Sea Turtle. Based on the current state of Pier Romeo, disturbance to threatened and endangered species may occur because of the pier demolition and rehabilitation efforts. Additional studies may be necessary to mitigate impacts to these threatened and endangered species.

According to the South Carolina Heritage Trust website, South Carolina lists one endangered species and two threatened species: Carolina Gopher Frog (E), Spotted Turtle (T), and Southern Hog-nosed Snake (T). Approximately 219 species are currently tracked in Charleston County, South Carolina (Heritage Trust, 2021). However, the above listings represent the current, threatened and endangered species for Charleston County, South Carolina. Table 10 references each species’ current species statis, rank, and State Wildlife Action Plan (SWAP) priority.

Table 10: South Carolina Federal and State Listed Threatened and Endangered Species

Species Name	Scientific Name	G-Rank/S-Rank	Federal Status	State Status	SWAP Priority
Spotted Turtle	Clemmys guttatta	G5/S3	At-Risk	Threatened	High
Southern Hog-nosed Snake	Heterodon simus	G2/S1S2	At-Risk	Threatened	Highest
Carolina Gopher Frog	Lithobates capito	G3/S1	At-Risk	Endangered	Highest

Rare, threatened, and endangered species are defined and protected under the federal and state/Commonwealth Endangered Species Acts. Additional protection is provided by specific legislation, such as the Bald Eagle Protection Act. These laws set limits on the types of actions that can occur within the habitat that support these species. The laws and regulations also define the permitting or mitigation process that must occur to offset impacts to rare, threatened, or endangered species. SCDNR and USFWS are responsible for implementing these laws and ensuring appropriate compliance.

Essential Fish Habitat

EFH is defined as "those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to maturity." Tidal streams and adjacent wetlands are all considered EFH within the Charleston Harbor, which includes habitats such as estuarine and marine vegetation, tidal freshwater wetlands, and the water column that are specific to the project area. These habitats foster growth, provide food, and offer protection from predators for many different fish and wildlife resources, including marine and estuarine species (USACE, 2015). Economically important species, such as white shrimp (*Penaeus setiferus*), brown shrimp (*P. aztecus*), and blue crabs (*Callinectee sapidue*) are found within the Cooper River and potentially the project area. In addition, fish species found within the river/project area include Atlantic menhaden (*Brevoortia tyrannus*), spot (*Leiostomus xanthurus*), southern flounder (*Paralichthys lethostigma*), bluefish (*Pomatomus saltatrix*), weakfish (*Cynoscion regalis*), blackcheek tonguefish (*Symphurus plagiusa*), silver perch (*Bairdiella chrysoura*), anchovies (*Anchoa mitchilli*), and American star drum (*Stellifer lanceolatus*) (USACE 2015; Wenner et al., 1984).

The estuarine water column, which is located between the sediment-water interface and the surface of the water, is considered EFH. It is characterized by a dynamic mix of adjacent riverine and marine systems. This habitat provides the resources for both migrating and residential species of varying life stages as it provides nutrients between the ocean and inland freshwater systems (USACE, 2015).

Atlantic Sturgeon

The Atlantic sturgeon (*Acipenser oxyrinchus*) is a member of the sturgeon family Acipenseridae. They are shaped like sharks, with deeply forked tails in which the upper lobe is longer than the lower. They have paired pectoral and pelvic fins, one single dorsal fin at the far back towards the tail, and a single anal fin. They are characterized by thick, tough skin with three rows of boney plates or scutes (SCDNR, 2014).

The Atlantic sturgeon is a long-lived species, with a lifespan approaching 50 years. Sexual maturity occurs between 8 to 20 years old. The species hatch in freshwater rivers, where they head out to the sea as juveniles. They return to their birthplace to spawn or lay eggs when they reach adulthood. It is the largest fish found along the Atlantic coast, and, specifically in South Carolina, females have been known to reach 2.5 m (8 feet) in length. They are benthic feeders and primarily consume invertebrates (SCDNR, 2014).

The status of the Atlantic sturgeon is "vulnerable" both globally and in South Carolina. It was considered for listing under the ESA in 1998, but NMFS determined that the listing was unwarranted.

However, the Cooper River is considered critical habitat under the ESA of 1973 and designated by NOAA Fisheries (see Figure 10). Several hundred adults are known to inhabit the Cooper River, but the status and viability of populations remains poorly understood (SCDNR, 2014; NOAA 2021d).

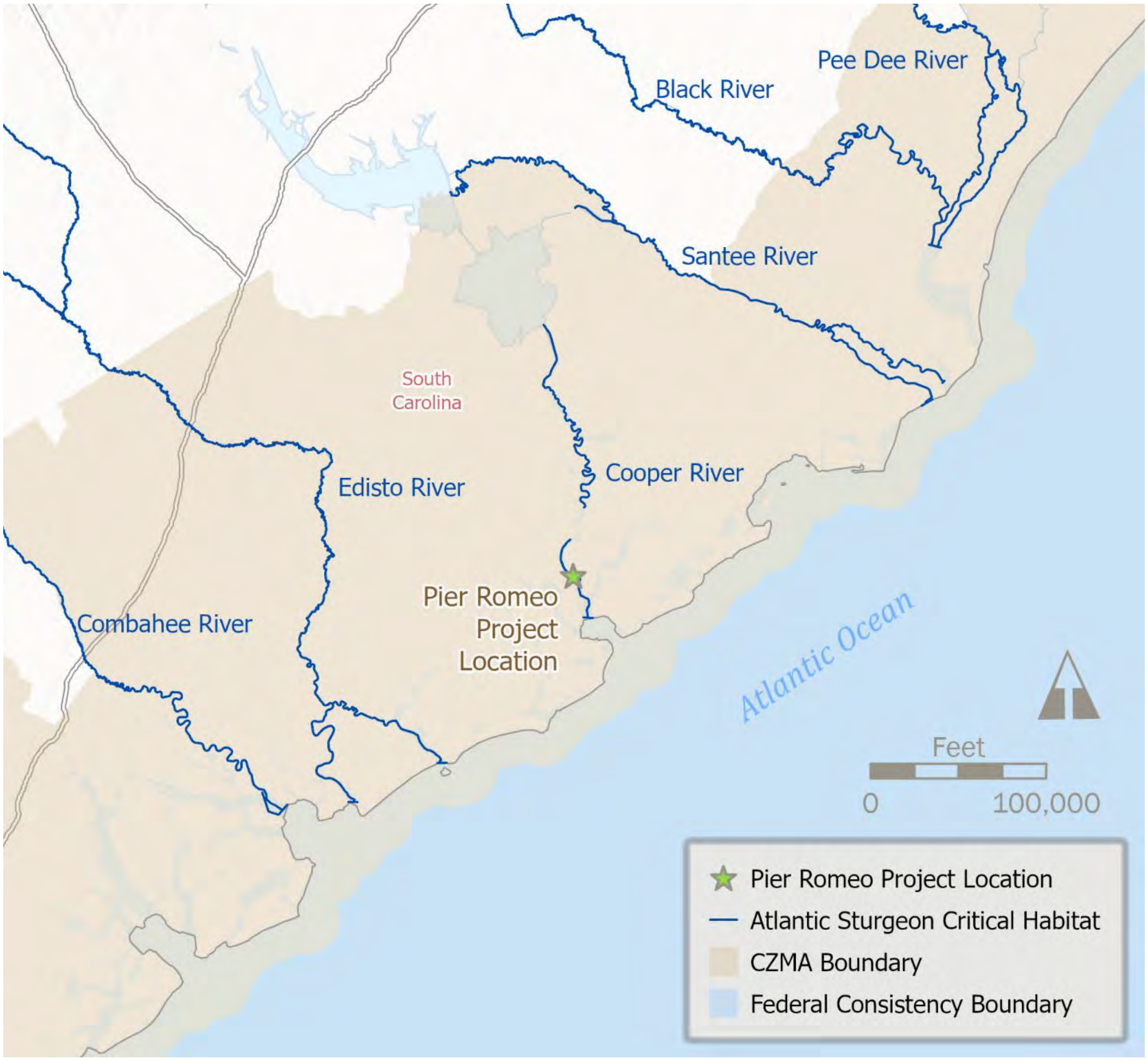

Figure 10: Atlantic Sturgeon Designated Critical Habitat Map (NOAA, 2021d)

3.7.2. Regulatory Setting

Endangered Species Act Section 7 & Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) governs protection of EFH. Under this act, federal agencies must consult with NMFS concerning any action that has the potential to adversely affect EFH. As stated above, EFH includes habitats necessary to a species for spawning, breeding, feeding, or growth to maturity, which by federal law includes marine and riverine migratory corridors and spawning grounds.

Coordination was initiated with the NMFS – Southeast Region Office – Habitat Conservation Division on September 13, 2022. The EFH information provided to NOAA for review can be found in Appendix J.

Endangered Species Act

The ESA provides for the conservation of any species of fish, wildlife, or plants that are classified as threatened or endangered. The ESA is implemented by the NMFS along with the USFWS; these organizations oversee and direct all federal agencies on threatened or endangered species. This act requires that federal agencies ensure that project actions do not jeopardize the continued existence of any endangered or threatened species or cause the destruction or adverse modification of their habitat. A biological assessment must be prepared to analyze potential effects on listed species and critical habitats in any case where they are present and could be affected by the project.

Coordination was initiated with the NMFS – Greater Atlantic Regional Fisheries Office. The request to initiate expedited informal consultation was submitted on September 13, 2022. The NOAA-OMAO is requesting concurrence that the proposed project may affect but is not likely to adversely affect any ESA-listed species and would have no effect on critical habitat. The USACE - Charleston District has indicated that the SARBO would be applicable in this instance since previous USACE permits had repeatedly approved dredging adjacent to Pier Romeo to -35 feet MLW with 2 feet allowable over depth since 1968, and this proposed reconstruction of Pier Romeo is proposing to dredge that previously disturbed area to only -25 feet MLW with 2 feet allowable over depth. Information provided to NOAA for review can be found in Appendix J.

Coordination was initiated with the U.S. Fish and Wildlife – South Carolina Ecological Services Field Office, Ecological Services. The only species included that the Service has jurisdiction for under the ESA is the West Indian manatee. Correspondence in response to NOAA-OMAO's request for concurrence on the determination of may affect, but not likely to adversely affect for West Indian manatee was received from the USFWS on October 7, 2022. Information provided to USFWS and their response can be found in Appendix J.

Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) of 1972 provides federal protection over all marine mammals. Like the ESA, this act is implemented by the NMFS and USFWS. The MMPA prohibits the "take" of any marine mammal - defining "take" as harassment, hunting, capturing, collecting, or killing - in U.S. waters or by U.S. citizens on the high seas. Incidental take, or unintentional take, of a marine mammal may be authorized through a permit application process for non-fishing activities, including construction projects.

3.7.3. Affected Environment

Impacts to threatened and endangered species and their resources were evaluated through field surveys of the site, available and current GIS data, and mapping provided by the USFWS and SCDEQ, along with other available GIS data. This evaluation considered construction and future operations of Pier Romeo that have potential negative impacts relating to the alteration, fragmentation, or habitat loss of threatened and endangered species. Severity of impacts is difficult to determine on a long-term basis; however, M&N considered short-term impacts more important due to the type of disturbance, duration of disturbance, and schedule of construction based on optimal breeding times for the previously mentioned threatened and endangered species. Changes to the existing conditions for each threatened and endangered species were identified and assessed both quantitatively and qualitatively based on available GIS data and previous USFWS research reporting.

Adverse effects on biological resources may occur when an activity directly or indirectly alters habitat or results in take of a species with special protections, such as marine mammals, endangered corals, or species of birds protected by the proposed pier. Examples of adverse effects include destruction and/or damaging all or part of the resource or habitat for the resource, altering any characteristics of the resource, interrupting breeding activities, or causing the death or wounding of a protected species. Impacts to habitats for threatened and endangered species and their resources also includes the removal of existing habitat and disturbance to in-water habitat.

3.7.4. Environmental Consequences

No Action Alternative

Analysis under NEPA requires review of a No-Action Alternative. Under the No-Action Alternative there would be no recapitalization of facilities at the Pier Romeo facility. Existing upland and in-water structures would remain, including the deteriorating timber piles. The trestle and pier would continue to be non-operational. This alternative would not meet the purpose and need for the project. In addition, No-Action would not initiate consultation with the USFWS or SEDEQ as there would be no impacts to existing habitat or threatened and endangered species within the study area. M&N would consider impacts to species and their critical habitat negligible, meaning no to very minimal impact to protected species and no to very minimal impacts/alterations to critical habitat.

Preferred Alternative

The Floating Pier alternative consists of an approximate 320-linear-foot-long and 62-foot-wide floating pier that would replace the existing pier. The floating pier would be connected to an approximate 200- to 300-foot steel access trestle banked by concrete wingwalls. The abutment for the access trestle will fan out into wingwalls. The proposed floating pier would be placed within the same environmental footprint of the existing pier. The floating pier would be secured and stabilized by approximately 8 concrete piles. The piles would be 60 to 70 feet in length and 24-inches-wide with 0.5-inch-thick steel rods.

Impacts to federally and state protected species were included within this analysis. Impacts to listed protected endangered and threatened species are considered detrimental to the project if it consists of a “take” of any species listed previously in the affected environment section. Other implications of the Action Alternative include both land-based and water-based impacts that would alter a species’ habitat and its survivability.

Based on land-based analysis, the take of a species or detrimental construction activity to land-based resources would not be affected. Based on in-water work, the removal of the pre-existing pier and habitat created by the pier would remove existing conditions that many fish and other mammals have utilized in the past. However, considering the construction timeframe, including demolition of the pier, it would be expected that over the longevity of the new pier, new habitat would form, which would result in displaced species of concern and threatened and endangered species would re-form around the pier. These potential impacts are anticipated to be minor. Minor impacts are defined in this report as minimal impact in the extent or quantity of damage resulting in habitat loss to protected species and their critical habitat.

3.7.5. Construction Impacts

Construction of the Preferred Alternative would have short-term effects on biological resources including EFH and species that are listed as threatened or endangered species. Impacts could occur due to increases in-water noise, decreased water quality, habitat disturbances, and/or displacement. Impacts would be considered minor to negligible.

Construction activities including pile driving and dredging would produce noise that could impact biological resources (See Section 3.2). Excessive noise has the potential to result in behavioral impacts and/or injury of species. As discussed in Section 3.2, thresholds have been established to assess potential noise impacts to fish and marine mammals. When these thresholds are exceeded, impacts could occur. The loudest construction related noise is anticipated to be pile driving. Noise produced during dredging activities would not be anticipated to result in noise threshold exceedances and, therefore, noise impacts from the proposed dredging activities are not anticipated. Pile driving has the potential to exceed noise thresholds and result in temporary noise impacts to biological resources. To reduce potential noise impacts during pile installation activities, impact pile driving would be avoided to the extent feasible, a soft-start technique would be implemented, a wood cushion block would be used during impact proofing, and a marine mammal exclusion zone would be established to prevent harassment of marine mammals. Due to the short-term nature of the Project and proposed avoidance and minimization measures, substantial noise impacts to biological resources are not anticipated.

General, localized, and temporary water quality/turbidity impacts could occur during in-water construction activities such as removal and replacement of the pier, construction of the shoreline protection feature, and dredging. Most sediment disturbances would occur during dredging activities. Typical small scale sediment plumes (such as those caused by dredging) would not be anticipated to cause substantial water quality impacts to biological resources. Any potential water quality impacts are anticipated to be minor and temporary. If necessary, turbidity barriers would be implemented to decrease potential water quality impacts.

Temporary and permanent benthic habitat disturbances could occur during construction. Pile installations would result in small amounts of permanent benthic habitat impacts. Dredging would result in temporary benthic habitat impacts within the dredge area adjacent to the pier. Temporarily disturbed benthic habitat is anticipated to be quickly recolonized by benthic species and in-benthic invertebrates. Potential benthic habitat impacts are anticipated to be minor.

Temporary displacement of biological resources could occur during construction. Mobile species would be anticipated to avoid the active construction areas, including areas immediately adjacent to the pier and shoreline as well as the proposed dredge area. It is expected that species would temporarily migrate to similar habitats in the vicinity of the site. These species are expected to adapt and recolonize areas around the pier, shoreline, and dredge area after the construction activity terminates. Therefore, potential displacement impacts are anticipated to be minor and temporary. The project does propose project elements that would be anticipated to permanently displace biological resources.

3.7.6. Operational Impacts

During operations of the pier and use of the dredged area, the periodic increase in both vessel activity and human activity around the pier would cause an increase in disturbance of fish, aquatic resources, other marine mammals, and mammal populations. However, the project is already located in a developed, militarized, and industrialized area of Charleston, South Carolina. Additionally, the site is situated between multiple piers along the Cooper River and within commercial vessel traffic areas. Therefore, future impacts to aquatic species, including those that are listed as threatened and endangered species, and their habitat is minimal to negligible with future operations. The implementation of federal, state, and local standards for compliance with federally protected threatened and endangered species would be both adhered to and complied with during the lifespan on the pier. Guidance from the USFWS will be sought if accidental biological resources are affected.

3.7.7. Avoidance, Minimization, and Mitigation Measures

Implementation of the Preferred Alternative would not result in significant long-term impacts to biological resources; therefore, no mitigation measures are proposed.

3.8. Utilities

3.8.1. Regulatory Setting

Utilities in Charleston are handled by a variety of public and private sources. An impact to utilities would be considered significant based on the below criteria:

1. Would the utility alter the current infrastructure, current operating practices, or personnel requirements to operate the facility?
2. Does the change in demand from a decommissioned pier require implementation of action alternative?

Affected Environment

Utilities in Charleston County are provided by both public and private sources. Areas in the county that are not served by the utility systems must rely on private wells and septic systems for water and wastewater. According to CountyOffice.org, 11 utility companies service Charleston County. Electricity for Charleston County is provided by several companies including Berkeley Electric Cooperative, SCE&G, The Urban Electric Company, and Dominion Energy. Water utilities are provided by the Charleston Water System, Isle of Palms Water and Sewer Commission, Lowcountry Regional Water System, Mount Pleasant Waterworks, St. Johns Water Company Inc., and Sullivan's Island Water and Sewer Department. Water supply services, oil/gas services, electrical, and sewer services were discontinued from the pier in 2006. Prior knowledge to which companies service the pier are unknown currently.

Solid waste is handled by the Charleston County's Environmental Management Department, which operates the Bees Ferry Road Landfill located at 1344 Bees Ferry Road in Charleston, Charleston County, SC. Bees Ferry landfill is approximately 312 acres with designated areas for solid waste and debris brought in by local municipalities in the region. The landfill currently does not accept demolition or construction waste from either private or commercial haulers.

3.8.2. Environmental Consequences

No Action Alternative

Utilities on the existing pier are decommissioned and not in working order. Under this scenario, utilities and solid waste would not be affected. No additional assessment is advised.

Preferred Alternative

The alternative consists of an approximate 320-linear-foot-long and 62-foot-wide floating pier that would replace the existing pier. The floating pier would be connected to an approximate 200- to 300-foot steel access trestle banked by concrete wingwalls. The abutment for the access trestle will fan out into wingwalls. The proposed floating pier would be placed within the same environmental footprint of the existing pier. The floating pier would be secured and stabilized by approximately 8 concrete piles. The piles would be 60 to 70 feet in length and 24-inches-wide with 0.5-inch-thick steel rods.

Construction Impacts

The Preferred Alternative would remove utilities that are not currently working on the pier and replace them. The impacts on utilities would be short-term and temporary in the form of construction activities.

Operational Impacts

Under this alternative, the pier would use existing utility and waste management infrastructure to accommodate the pier alternative. An increase in utilities (power and water) is expected due to the increased boat/vessel traffic, existing conditions, and current infrastructure. Based on current infrastructure demands with the new pier, additional utility lines will need to be activated/constructed to accommodate the load of vessels entering and exiting the pier location. However, the impacts of the alternative would be considered minimal as compared to existing piers in the vicinity of Pier Romeo at the FLETC facility. Additional assessment is not recommended.

3.8.3. Avoidance, Minimization, and Mitigation Measures

Implementation of the Preferred Alternative would not result in significant long-term impacts to utilities; therefore, no mitigation measures are proposed.

3.9. ENVIRONMENTAL JUSTICE

3.9.1. Regulatory Setting

Executive Order 12898

EO 12898 was issued in 1994 to focus federal attention on the environmental and human health effects of federal actions on minority and low-income populations with the goal of achieving environmental protection for all communities. The order directs federal agencies to identify and address the disproportionately high and adverse human health or environmental effects of their actions on minority and low-income populations to the greatest extent practicable and permitted by law. It is intended to promote nondiscrimination in federal programs that affect human health and the environment, as well as provide minority and low-income communities access to public information and public participation.

Two documents provide guidance on how to implement this EO, Environmental Justice (EJ): Guidance under the National Environmental Policy Act (CEQ, 1997) and Promising Practices for EJ Methodologies in NEPA Reviews (USEPA, 2016a). These documents offer guidelines and methodologies to assist federal agencies with their NEPA procedures so that EJ concerns are effectively identified and addressed.

In the EJ and Title VI of the Civil Rights Act of 1964 analysis, minority persons are defined as Black, Hispanic, Asian American, American Indian, or Alaskan Native. Low-income populations are those, regardless of ethnicity, who are in households with annual incomes at or below the U.S. Department of Health and Human Services poverty level ($22,314 for a family of four in 2010). Whether or not they fit the definition of groups protected by the EJ regulations, all groups and individuals have the right to access and participate in the decision-making process as provided by Title VI of the Civil Rights Act.

3.9.2. Affected Environment

The main community in the project area is the City of North Charleston, the third largest city in South Carolina. The population of North Charleston is 122,400, with a median population age of 33.4, which is younger than the South Carolina median age of 39.9. African Americans make up the majority of the population, with Caucasians as the second largest group in North Charleston. As shown in Table

11, minority populations make up approximately 60% of North Charleston's population compared to 36% for Charleston County and 36% statewide (CR, 2021). North Charleston has a lower median family income and lower unemployment rate compared to Charleston County and the state of South Carolina (FRED, 2021). According to the guidance in the USEPA's Promising Practices for EJ Methodologies in NEPA Reviews, North Charleston should be considered a minority community since the percentage of minorities in the city exceeds 50% of the total population (USEPA, 2016a).

Table 11: Demographic and Socioeconomic Characteristics, 2019

Location	Population	Minority Population	Median Age	Unemployment Rate	Median Family Income	Poverty Rate
City of North Charleston	122,400	60%	33.4	5.0	53,470	15.10%
Charleston County	411,406	36%	38.4	5.1	71,531	11.20%
State of South Carolina	5,148,714	36%	39.9	5.3	56,227	13.90%

Sources: CR, 2021 and FRED, 2021

The demographics in the vicinity of the project Site were also assessed using the USEPA EJScreen website with the address of the FLETC facility as a location marker. A 1-mile buffer was applied, and demographics were reviewed based on a summary of data from the 2014-2018 American Community Survey 5-year estimates. According to the results of the summary report, the population within 1 mile of the project site is a 96% minority population, and 80% of households have an income below $50,000 compared to the median family income of $53,470 for the City of North Charleston (EJScreen, 2021). The U.S. Department of Housing and Urban Development defines low income as 80% of the median income for the county or metropolitan area. Based on this definition, low income for the City of North Charleston is $42,776. The American Community Survey (ACS) Five Year Estimates (2014-2018) provide household income in $25,000 increments. The Housing and Urban Development (HUD) low-income guideline ($42,776) is within the $25,000 to $50,000 increment. As a result, all households in this increment and below are considered low-income. According to the summary results, 81% of households within 1 mile of the project location is low-income.

3.9.3. Environmental Consequences

No Action Alternative

Under the No-Action Alternative, there would be no recapitalization of facilities at the Pier Romeo facility. Existing upland and in-water structures would remain, including the deteriorating timber piles. The trestle and pier would continue to be non-operational. Therefore, no effects would be expected on socioeconomics or EJ. No protective or mitigative actions would be taken to reduce flooding risk or shoreline erosion and localized flooding and shoreline erosion would continue to occur.

This alternative would not advance compliance with EO 14008, Tackling the Climate Crisis at Home and Abroad, Section 219 directing federal agencies to deliver EJ to disadvantage communities through mitigation of climate change effects on disadvantaged communities.

Preferred Alternative

Implementation of the action alternative would not result in the displacement of people or businesses and would not change the economic character or stability of the surrounding area. There would not be an increased demand on housing, schools, or other social services and accessibility to these resources would not be changed. The project would not be expected to notably increase operational traffic volumes on local roadways. The project site is in an industrial area and no residential areas are within the immediate area of the project. Also, the project would not be expected to result in disproportionate adverse impacts to minority and low-income populations. This alternative would support the advancement of EO 14008, Tackling the Climate Crisis at Home and Abroad, Section 219 directing federal agencies to deliver EJ to disadvantage communities through mitigation of climate change effects on disadvantaged communities. As such, the Preferred Alternative would have a beneficial effect on the assessment of environmental health and safety risks of EJ populations by considering climate change and its potential impacts on communities. The project site is in an industrial area and no residential areas are within the immediate area of the project. Also, the project would not be expected to result in disproportionate adverse impacts to minority and low-income populations. As such, the action alternative is expected to have a negligible impact on socioeconomics and EJ.

Construction Impacts

The Preferred Alternative would have no direct adverse impacts on socioeconomic conditions or EJ populations since project activities would not impact residential properties or specific socioeconomic groups. The impacts on socioeconomic resources would be short-term and temporary in the form of construction activities.

Operational Impacts

The Preferred Alternative would have no direct adverse impacts on EJ since project activities would not impact residential properties or specific socioeconomic groups.

3.9.4. Avoidance, Minimization, and Mitigation Measures

Implementation of the Preferred Alternative would not result in significant impacts to social or economic resources; therefore, no mitigation measures are proposed. No mitigation measures are warranted.

3.10. CULTURAL RESOURCES

Cultural resources surveys were conducted for the project in addition to federal and state agency coordination. No known archaeological or cultural resources sites at the project site were identified within the cultural resources survey areas of potential effect (see Cultural Resources Survey Report in Appendix J).

3.10.1. Regulatory Setting

National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) (16 U.S.C. Section 407) and its implementing regulations (36 CFR Part 800) require federal agencies to consider the effects of their actions on historic properties. Federal agencies must identify historic properties in an Area of Potential Effects (APE), determine if any undertaking will constitute an adverse effect to identified historic properties, and seek to resolve any adverse effects. Section 106 mandates that federal agencies consider the effects of their actions on properties listed or eligible for listing in the National Register and to consult with the State Historic Preservation Office (SHPO) and federally recognized Indian tribes a reasonable opportunity to comment. Consultation with the South Carolina Department of Archives & History was completed on September 13, 2022. The cultural resources survey identified no new archaeological sites or underwater anomalies, and two historic architectural above-ground resources (See Appendix J). No additional cultural resource work is needed. Based on the description of the undertaking's Area of Potential Effect (APE) and the identification of historic properties within the APE, our office concurs with the assessment that no properties listed in or eligible for listing in the National Register of Historic Places (NRHP) will be affected by this project.

A list of contacts for federally recognized tribes with interests in North Charleston, South Carolina was derived from the South Carolina SHPO and provided three tribal entities, the Catawba Indian Nation, the Muscogee Nation, and the Eastern Shawnee Tribe. Consultation with each federally recognized tribe was completed on November 11, 2022 (see Appendix K). The Eastern Shawnee responded on October 20, 2022 with a finding that the project would have "no adverse effect or endangerment to known sites of interest to the Eastern Shawnee Tribe".

American Indian Religious Freedom Act of 1978

The American Indian Religious Freedom Act of 1978 (42 U.S.C. Section 1996) requires that federal agencies consider the effects of their actions on cultural resources that are of religious significance to Native Americans.

3.10.2. Affected Environment

Architectural Resources

In April 2021, a cultural resources survey was conducted at the NOAA Site the project site. The purpose of the survey was to identify and evaluate all historic properties that may be affected by the project. The assessment of effect of the proposed development on historic properties is required by the SHPO and Section 106 of the NHPA. Pier Romeo (SHPO Site Number 8422).

The pier is located on the southern shore of the Cooper River adjacent to 2234 South Hobson Avenue, which is the address for the offices for NOAA, Office for Coastal Management (OCM), and the U.S. Department of Commerce. The pier itself is currently vacant and not in use. Due to a lack of significant architectural features, association with historical events, and potential to yield historical information, SHPO Project Number 22-JS0388, Site No. 8422 was not deemed eligible for listing in the NRHP.

2234 Hobson Avenue Office Building (SHPO Project Number 22-JS0388, Site Number 8423)

Site No. 8423 serves as an office space for NOAA, the OCM, and the U.S. Department of Commerce. Several exterior alterations and extensions have been performed since the building's original construction in 1944, thereby altering the historic integrity. Due to a lack of significant architectural features, association with historical events, and potential to yield historical information, SHPO Site No. 8423 was not deemed eligible for listing in the NRHP.

Support Structure (SHPO Project Number 22-JS0388, Site Number 8432.01)

The support structure is a one-story, concrete building that was constructed in 1944. The building was used for storage of paint, chemicals, and lawn maintenance supplies. Due to a lack of significant architectural features, association with historical events, and potential to yield historical information, SHPO Site No. 8423.01 was not deemed eligible for listing in the NRHP.

Transfer Station (SHPO Project Number 22-JS0388, Site Number 8423.02)

Site No. 8423.02 was built in 1944 and is located northwest of SHPO Site No. 8423. Its current use is unknown; however, in 1995 the building housed four transformers. Due to a lack of significant architectural features, association with historical events, and potential to yield historical information, SHPO Site No. 8423.02 was not deemed eligible for listing in the NRHP.

Archaeological Resources

An archaeological survey of the bottom of the Cooper River was conducted in April 2021. Analysis of the magnetic and acoustic data identified no potentially significant anomalies, sonar targets, or bottom sediment features in the project site. Based on the data generated by the remote-sensing survey, no NRHP eligible submerged cultural resources will be impacted by project activities and no additional investigation is recommended.

The Eastern Shawnee Tribe of Oklahoma, stated in their response to project consultation on October 20, 2022 that the project proposes no adverse effect or endangerment to known sites of interest to the Eastern Shawnee Tribe. Tribe database and files indicate that the Eastern Shawnee Tribe had occupied areas within proximity to the project site. In the instance that this project inadvertently discovers an archeological site or objects, the Eastern Shawnee Tribe should be contacted as well as the appropriate state agencies within twenty-four hours. (See Appendix K).

3.10.3. Environmental Consequences

No Action Alternative

Under the No-Action Alternative, there would be no recapitalization of facilities at the Pier Romeo facility. Existing upland and in-water structures would remain, including the deteriorating pier which is not operational. No known architectural or archaeological resources were deemed eligible for the NRHP, therefore the No-Action Alternative would have no effects on known cultural resources.

Preferred Alternative

No known architectural or archaeological resources were deemed eligible for the NRHP; therefore the Preferred Alternative would have no construction related or operation impacts on known cultural resources.

A letter from Mr. John D. Sylvest, Project Review Coordinator, SHPO, dated September 13, 2022, stated that not further cultural resource work would be needed (see Appendix G).

3.10.4. Avoidance, Minimization, and Mitigation Measures

Implementation of the Preferred Alternative would have no effect on cultural resources; therefore, no mitigation measures are proposed.

4. CUMULATIVE IMPACTS

4.1. CUMULATIVE EFFECTS

This section discusses potential cumulative impacts associated with the project and other past, present, and foreseeably future projects in the area. An analysis of cumulative impacts is required by NEPA, as defined in 40 CFR 1508.7. The NEPA analysis of cumulative impacts follows the guidance of the CEQ's 1997 document, Considering Cumulative Effects Under the National Environmental Policy Act. The CEQ regulations stipulate that a cumulative effects analysis within an EA should consider the potential environmental impacts resulting from the "incremental impacts of the action when added to other past, present and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions," commonly referred to as "cumulative effects."

The analysis of cumulative effects requires that both geographical (spatial), and temporal (timeframe) boundaries be established. These limits are collectively referred to as the cumulative effects study area (CESA). Past, present, and reasonably foreseeable actions, such as those generally considered to be water management undertakings, as well as port and navigational projects that occur or that may occur near the Pier Romeo project area are most likely to cumulatively contribute to beneficial or adverse effects on a resource.

Pier Romeo is located within the Charleston Marine Support Facility and extends into the Cooper River. The Cooper River is within the Santee Basin and drains into the Atlantic Ocean via the Charleston Harbor. Upstream of Pier Romeo is the Naval Weapons Station of Charleston. Pier Romeo is located on the former Charleston Naval Base and has, in the past, supported NOAA ships *Ronald H. Brown* and *Nancy Foster* (NOAA, 2021i).

The geographic limits of the CESA extend beyond the project study area limits used to evaluate the direct effects of the Pier Romeo project and are dependent on characteristics of the resources being analyzed. Figure 11 shows the geographical limits of the CESA for the resources assessed in this EA except for air quality, which is evaluated on a county basis by the USEPA. This boundary was defined such that it would encompass the resources having the potential to be influenced in a cumulative manner by this project and other past, present, and reasonably foreseeable actions presented by agencies.

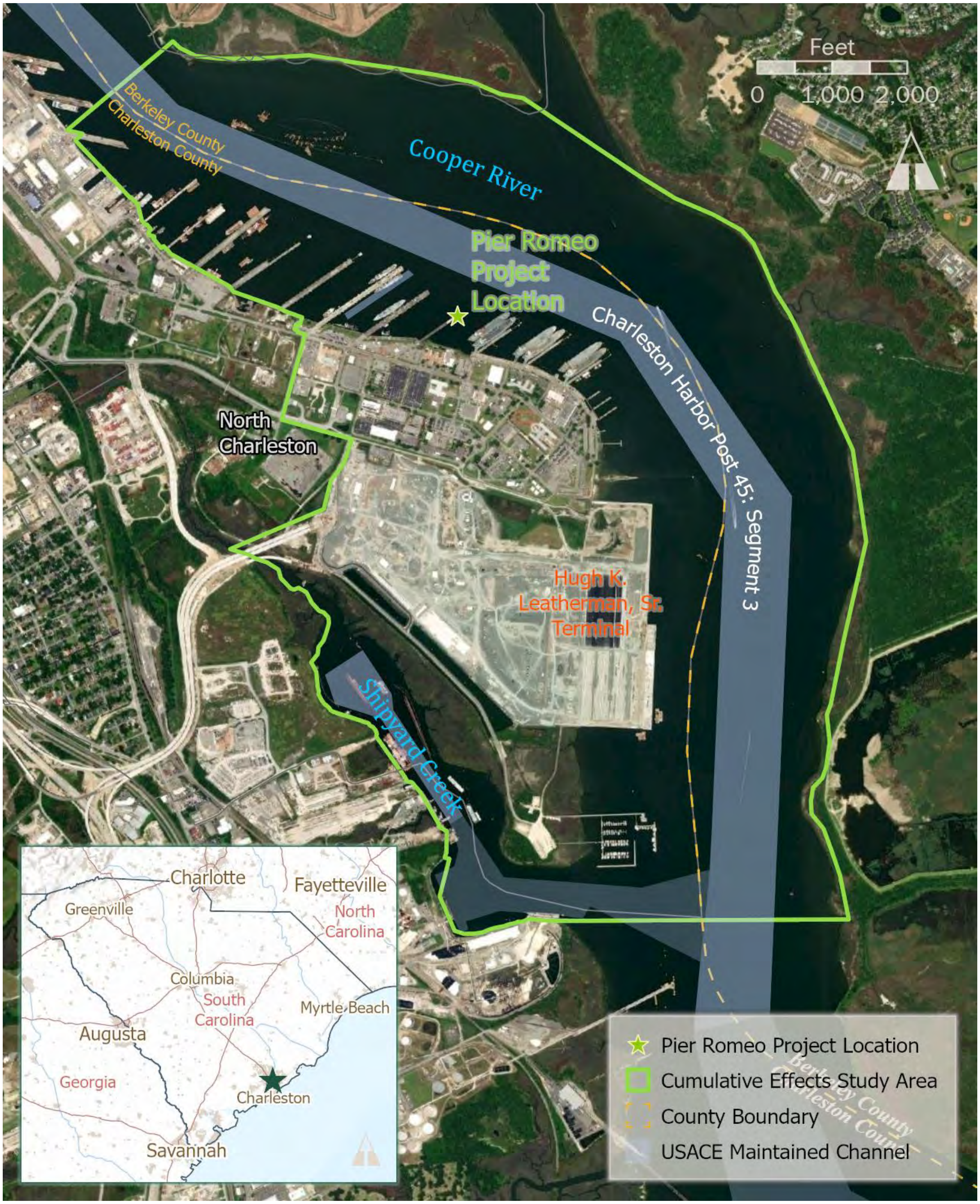

Figure 11: Geographical Limits of the CESA for Resources Assessed in this EA

In consideration of the natural boundaries of resources analyzed in this document, the temporal boundary to determine the likelihood of cumulative effects on natural resources is approximately 25 years prior to anticipated project implementation and 25 years from the anticipated completion of the project.

Past, Present, and Foreseeable Actions

Information in this section includes major initiatives and projects that have the potential to effect ecosystem resources when considered along with the project. This section does not include all past, present, or foreseeable actions within the CESA, but such actions that have had and will continue to notably influence resources in the ecosystem in a similar fashion as the project. Generally, the potential for a project under federal authorization to cumulatively effect resources is considered during the permit approval process. Projects that were granted permit approvals and did not result in more than minimal individual and cumulative adverse environmental effects were not included in this analysis. The regulatory entities that have jurisdiction over the majority of project permitting upstream and downstream of the project site include the USACE, Charleston District, South Carolina Ports Authority (SCPA), Federal Energy Regulatory Commission, and South Carolina Public Service Authority (SCPSA). The USACE and the SCPA have responsibilities for most dredging in the Charleston Harbor. The Federal Energy Regulatory Commission and SCPSA oversee most of the utility related permitting. The SCPSA also manages the large reservoirs upstream of Charleston Harbor.

Charleston Harbor Watershed

The dominant watershed features of the Charleston Harbor are formed by the confluence of the Ashley, Cooper, and Wando Rivers. Flooding in this watershed has historically been a concern, but in more recent times the watershed has experienced some of the most extensive flooding from both episodic and chronic events including rainfall events, king tides, Hurricane Matthews in 2016, and Hurricane Irma in 2017. These same events affected fish and wildlife habitat with extensive coastal and riparian erosion, submerged aquatic vegetation, lower salinity, degraded water quality, and extensive flood of upland areas (Crist et al., 2019).

Port and Navigational Projects

The Charleston Harbor is under the authority of the USACE. For more than 140 years the harbor has required dredging on an annual basis to maintain a navigational channel at the required federal project depth. This has required the dredging of approximately 2-3 million cubic yards (MCY) of material from the harbor floor each year. Construction to deepen the harbor to the now federally authorized 45-foot depth began in 1999 and was completed in 2004 (USACE, 2021a)

The marine container terminal at the Charleston Navel Complex (Hugh K. Leatherman Terminal) initiated its phased construction of a modernization plan in 2007. Construction continued through 2018 and consisted of a new port facility on the south end of the former Charleston Naval Base in North Charleston. The terminal was opened in April 2021. The purpose of the plan was to increase the Port of Charleston’s overall capacity. The project required dredging of approximately 900,000 CY of material from a 2.3-acre area in front of the wharf at the Kinder Morgan facility and to deepen and widen the adjacent federal navigation channel (Phase 1-A) (South Carolina Ports, 2021a and Homeland Security, 2021).

In 2020 Kinder Morgan summitted a permit application to the Department of the Army and the SCDHEC to preform maintenance dredging within 5.42 acres of Shipyard Creek at Berths 1 and 2 as part of a 10-year maintenance permit to dredge. The dredging would occur downstream from the project site. The applicant proposes to, in the future, dredge approximately 60,000 CY annually to a depth of -45 feet mean low water (MLW) with an allowable 1-foot over depth for the 10-year period of the permit (Charleston District Corps of Engineers & SCDHEC, 2020).

The Charleston Harbor Post 45 deepening project (also referred to as the Charleston Harbor Deepening Project) is scheduled to achieve a 52-foot depth in the future up from its current 47-foot depth (South Carolina Ports, 2021b). With the passage of the Water Infrastructure Improvements for the Nation Act of 2016, this project is anticipated to widen the navigational channel in Charleston Harbor and its various reaches including portions of the Cooper River.

The Charleston Harbor Post 45 project will encompass a 20-mile-long entrance channel. The entrance channel dredging work will be the most time-consuming construction requirement of the deepening project due to the high quantity of material and presence of limestone. USACE anticipates that construction activities associated with this project will occur concurrently with the deepening of various reaches remaining in the inner harbor areas of the Charleston Harbor federal channel. Construction of the entire project is anticipated to take somewhere between 40 to 76 months (USACE, 2021b).

Other Projects

Other projects associated with urban and industrial development and surface transportation having independent utility are not anticipated to have any direct or indirect impacts on natural resources; thus, they would not be expected to contribute in a cumulative manner to the beneficial or adverse impact on a resource.

4.1.1. Environmental Consequences

The potential for the project to impact an environmental resource in a cumulative manner was analyzed qualitatively by alternative. Resource areas that were assessed but not carried forward in detail review of their potential for cumulative impacts included:

- Socioeconomic and EJ
- Climate Change
- Human Health and Safety
- Land Use
- Recreational Resources
- Cultural Resources
- Transportation
- Utilities and Solid Waste
- Aesthetics
- Hazardous Materials
- Farmlands

Water Resources

Implementation of the Preferred Alternative will have short-term, localized and less than significant effects on water resources within the Cooper River. The Preferred Alternative and other actions as referenced above will not likely occur at the same time and locations, so potential effects would be negligible over the established temporal and geographic boundaries. Therefore, the Preferred Alternative in conjunction with other projects on or in the vicinity of the project would not result in significantly adverse cumulative effect to water quality or water resources.

Biological Resources

Implementation of the Preferred Alternative will have no long-term adverse effect to threatened or endangered species, no long-term adverse effect to EFH and associated Fishery Management Plan species, and only short-term, localized, and less than significant impacts to biological resources including, marine habitats, invertebrates, fish, and marine birds that occur in the project vicinity.

For EFH, the Preferred Alternative will result in minor impacts to river bottom and water column habitats, benthic communities and fishes from increased suspended sediments and turbidity and increased underwater noise levels from pier demolition and construction activities. The Preferred Alternative and reasonably foreseeable projects would not likely occur at the same time and location, so potential impacts would be moderated over space or time. Therefore, the Preferred Alternative in conjunction with other projects on or in the vicinity of project, would not result in significantly adverse cumulative impacts to biological resources.

Noise

Airborne noise effects from the Preferred Alternative are anticipated to be less than significant and below established limits and construction noise. Airborne noise will cease upon completion of demolition and construction activities. Underwater noise will not cause significant impacts to fish and will not affect marine mammals and sea turtles since these species are highly mobile and can avoid these short-term disturbances. The Preferred Alternative when combined with reasonably foreseeable projects would not likely occur at the same time and location, so potential impacts will be moderated over space or time. Therefore, the Preferred Alternative – Floating Pier, in conjunction with other projects on or in the vicinity of project, would not result in significant cumulative noise impacts.

Air Quality

Implementation of the Preferred Alternative will not significantly impact air quality. Proposed demolition and construction activities will generate short-term emissions from construction-associated vehicles and equipment. Due to the mobile nature of most construction emission sources and the relatively short duration of construction activities, these sources will not be expected to contribute to significant localized or regional impacts. The Preferred Alternative and reasonably foreseeable projects will not likely occur at the same time and location, so potential impacts will be negligible over space or time. Therefore, the Preferred Alternative in conjunction with other projects on or in the vicinity of project would not result in significant cumulative impacts to air quality.

5. PUBLIC SCOPING AND AGENCY CONSULTATION

Public scoping in advance of preparing an EA under NEPA is not required based on NOAA's NEPA implementing guidelines and is not customarily performed. While public scoping has not occurred, NOAA has conferred with key public officials and affected regulatory agencies to inform them of the project and its intention to prepare a Draft EA for public and agency review and comment.

As is customary, NOAA sought public and agency input regarding this Draft EA during a 30-day review period. A notice of availability for public access to and review of the Draft EA was published in The Post and Courier Marketplace classified filing notices on Sunday, October 9, 2022 (see Appendix K). No comments on the draft EA were received by NOAA. .

In addition, electronic copies of the Draft EA will be provided to potentially affected regulatory agencies and other stakeholders. These entities may include, but are not limited to, the following:

Federal Agencies:

- National Oceanic and Atmospheric Administration, National Marine Fisheries Service
- U.S. Army Corps of Engineers, Regulatory Branch
- U.S. Fish and Wildlife Service
- U.S. Coast Guard

State Agencies:

- S.C. Department of Health and Environmental Control
- S.C. Office of Ocean and Coastal Resource Management
- S.C. State Historic Preservation Office

As required under Section 401 of the CWA, a pre-filling meeting request was submitted to the SCDHEC on June 13, 2022. Response from Logan Ress received on June 14 2022, stated that a pre-filling meeting would not be required from this proposed project.

6. SUMMARY OF POTENTIAL IMPACTS, BMPS, AND MITIGATION MEASURES

No potentially significant impacts have been identified for the project. Table 12 provides a summary of potential impacts by environmental resources, as well as a summary of BMPs and mitigation measures to be considered, as necessary, to support a finding of no significant impact.

No anticipated environmental impacts were identified in relation to the No-Action Alternative.

Table 12: Environmental Consequences for the Preferred Alternative and the No-Action Alternative

Resource	No-Action Alternative*	Preferred Alternative – Floating Pier*	Phase	Recommended BMPs and Anticipated Regulatory Compliance
Air Quality	No Effect	Minor	Demolition & Construction	• Maintain construction equipment according to manufacturer specifications. • Minimize idling times. • Cover haul trucks that are transporting loose material. • Limit vehicle speeds on unpaved roads.
Noise	No Effect	Moderate	Demolition & Construction	• Consider both blasting and mechanical demolition and select the method that has the least acoustic impacts. • Conduct noise-generating work in a way that will minimize acoustic effects. • Use noise attenuation and minimization measures during pile driving. • Avoid or minimize activities with significant acoustic effects during sensitive life stages of ESA-listed species, federally managed species, or NOAA trust resources. • Locate stationary noise-generating equipment away from sensitive receptors. • Equip internal combustion engine-driven equipment with intake and exhaust mufflers. • Turn off equipment when not in use.
Geological Resources (including project dredging activities)	No Effect	Negligible (upland construction activities) Moderate (during riverbed dredging) Moderate (beneficial)	Demolition & Construction & Operations	• Prior to upland construction activities, conduct a site-specific geotechnical evaluation and assess any geologic hazards such as seismic hazards and hazards of coastal erosion. • Exposed soils should be stabilized quickly either through covering or capping in the form of either repaving or temporary measures to prevent soil erosion.

Resource	No-Action Alternative*	Preferred Alternative – Floating Pier*	Phase	Recommended BMPs and Anticipated Regulatory Compliance
Water Resources	No Effect	Moderate (Impacts related to temporary riverbed dredging and operational impacts of channel maintenance)	Demolition & Construction & Operation	• Maintain any vegetative buffer between the water and upland activities. • Make sure that raw concrete and grout does not contact the water. • Avoid the use of creosote or pressure treated piles and do not locate any treated piles in areas containing shellfish or sensitive habitats. • Incorporate stormwater controls to minimize pollutants in aquatic habitats. • Minimize the number of and size of piles used. • Dispose of dredge material in the appropriate way. • Prevent contaminants and sediments from entering aquatic habitats through discharge. • Implement applicable S.C. Department of Health and Environmental Control approved sediment control and erosion prevention practices.
Hazardous Materials / Waste Disposal	No Effect	Negligible	Demolition & Construction & Dredging	• Test leachability of lead-based painted materials; handle and dispose of such material in accordance with applicable regulations. • Develop a site-specific Health and Safety Plan in accordance with 29 CFR 1910.120. • Solid waste generated by construction of the project must be compliant with federal and South Carolina regulations and guidelines affecting the generation, transportation, treatment, storage and disposal of solid waste. • Further investigate disturbed upland soils during construction in areas where contaminant screening levels were exceeded prior to waste disposal.
Solid Waste Management	No Effect	Negligible	Demolition & Construction	• Further investigate disturbed upland soils during construction in areas where contaminant screening levels were exceeded prior to waste disposal.
Climate Change	No Effect	Moderate (beneficial)	Demolition & Construction & Operation	• Project should be designed and constructed in a manner that would increase site adaptability to SLR and minimize potential adverse effects on resources.

Resource	No-Action Alternative*	Preferred Alternative – Floating Pier*	Phase	Recommended BMPs and Anticipated Regulatory Compliance
Coastal Resources	Moderate (adverse) Continued erosion of riverbank slopes	Moderate (beneficial)	Demolition & Construction & Operation	• Project design is intended to stabilize adjacent shoreline and reduce localized flood risk over the long-term.
Biological Resources	No Effect	Minor	Demolition & Construction	• Conduct biological monitoring and assessments during multiple seasons to assess impacts as specified in regulatory permitting. • Ensure holes left by piles are filled with noncontaminated substrate. • Avoid dredging in sensitive aquatic habitat. • Avoid the temporary storage of dredged material in the water.
Utilities	No Effect	Moderate (beneficial)	Operation	None
Environmental Justice	Minimal	Minimal (beneficial)	Operations	Advance compliance with EO 14008
Cultural Resources	No Effect	No Effect	Demolition & Construction & Operation	None

7. CONCLUSIONS

The findings of this EA indicate that no significant effects would result from implementation of the project using the Preferred Alternative – Floating Pier, assuming standard BMPs and mitigation measures discussed in Section 6 and summarized in Table 12, Summary of Potential Impacts, BMPs, and Mitigation Measures, are implemented. As a result, preparation of an EIS is not required. A Finding of No Significant Impacts (FONSI) will be prepared for this project.

8. LIST OF PREPARERS

Name	Title	Organization
Julie Flesch-Pate	Project Manager	Moffatt & Nichol
Stephanie Oslick	NEPA EA Quality Control	Moffatt & Nichol
Dawn York	Section 7 Coordination	Moffatt & Nichol
Emily Beck	Environmental Engineering Specialist	Moffatt & Nichol
Amy Mindick	GIS Lead	Moffatt & Nichol
Doug Huggett	Scoping and Permit Lead	Moffatt & Nichol
Taylor Meyers	Noise Specialist	Moffatt & Nichol
Rachel Baker	Environmental Specialist	Moffatt & Nichol
Samantha Morrison	Environmental Specialist	Moffatt & Nichol

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Appendix A: NOAA Coastal Study Report

Coastal Study Report

Coastal Investigation for the National Oceanic and Atmospheric Administration Office of Marine and Aviation Operations Southeast Marine Operations Hub Project

National Oceanic and Atmospheric Administration
Office for Coastal Management
North Charleston Facility
2234 S Hobson Ave
North Charleston, SC 29405

Prepared by:

AECOM Technical Services
4026 Salt Pointe Parkway
North Charleston, SC 29405

Prepared for:

Associated Design Group, Inc.
3909 W. Congress Street #201
Lafayette, LA 70506

April 1, 2022

Contents

Figures

Tables

Acronyms

2-D	Two-dimensional
ACES	Automated Coastal Engineering System
ADCIRC	Advanced Circulation Model for Oceanic, Coastal, and Estuarine Waters
ADG	Associated Design Group, Inc.
AECOM	AECOM Technical Services
ASCE	American Society of Civil Engineers
BFE	Base Flood Elevation
Caro-COOPS	Carolinas Coastal Ocean Observing and Prediction System
CEM	Coastal Engineering Manual
CSC	Coastal Service Center
DEM	Digital Elevation Model
FEMA	Federal Emergency Management Agency
FFE	Finished Floor Elevation
FIS	Flood Insurance Study
FLETC	Federal Law Enforcement Training Center
Hc	Controlling Wave Height
HVAC	Heating, Ventilation and Air Conditioning
LiDAR	Light Detection and Ranging (System)
LiMWA	Limit of Moderate Wave Action
LMSL	Local Mean Sea Level
MHHW	Mean Higher High Water
MHW	Mean High Water
MLLW	Mean Lower Low Water
MLW	Mean Low Later
MOC-A	Marine Operations Center – Atlantic
mph	Miles Per Hour
MSL	Mean Sea Level
NAVD88	North American Vertical Datum of 1988
NBDC	National Buoy Data Center
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NTDE	National Tidal Datum Epoch
NWFSC	Northwest Fisheries Science Center
NWS	National Weather Service
OCM	Office of Coastal Management
OMAO	Office of Marine and Aviation Operations
RCP	Representative Concentration Pathway

RFP	Request for Proposal
SCDHEC	South Carolina Department of Health and Environmental Control
SCDNR	South Carolina Department of Natural Resources
SCSS	South Carolina Surge Study
SLR	Sea Level Rise
SOW	Scope of Work
SPM	Shore Protection Manual
SWAN	Simulating Waves Nearshore
SWEL	Stillwater Elevation
SWL	Still Water Level
TAW	Technical Advisory Committee for Water Retaining Structures
TNC	The Nature Conservancy
TWL	Total Water Level
USACE	US Army Corps of Engineers
WHAFIS	Wave Height Analysis for Flood Insurance Studies
WMO	World Meteorological Organization

1.0 Introduction

The National Oceanic and Atmospheric Administration (NOAA) Office of Marine and Aviation Operations (OMAO) proposes to demolish and replace the existing Pier Romeo located at the NOAA facility at 2234 S. Hobson Avenue, North Charleston, South Carolina (Southeast Marine Operations Hub Project). Once implemented, the project will improve critical infrastructure and mission support capabilities for OMAO by providing long-term berthing for two of NOAA's vessels, the *Nancy Foster* and *Ronald H. Brown*. NOAA expects to use the new pier for berthing of newer vessels as they become available.

A concept design package has been prepared for NOAA to use to solicit a Request for Proposals (RFP) for a Design-Build construction project. The design package includes site investigation, engineering support services, and a design and construction schedule. The existing Pier Romeo will be replaced by a floating pier with gangway access. A small craft pier is scoped to extend off of the main pier. A warehouse design will be provided with the deliverable to house OMAO equipment. Additionally, the project will include a seawall design to increase coastal hazard resilience of the facility. Based on discussion with NOAA, the seawall will be designed to be able to incorporate an additional cap elevation to account for increased hazards from sea level rise (SLR) over the 50-year design life of the project. An optional living shoreline concept design is also scoped.

AECOM developed this report as a sub to Associated Design Group, Inc. (ADG) to provide coastal engineering analyses to support the basis of design for this project. This report examines the site conditions, current and future flood risks, and design options for a floating pier system, primary seawall, 'resilient curbing' (intended for strategic flood and wave hazard reduction), and a living shoreline alternative.

1.1 Background

The Charleston Office for Coastal Management is a NOAA facility located along the shoreline of the Cooper River, approximately 5.5 miles north of the Charleston Battery (Figure 1). The property is located within the Federal Law Enforcement Training Center (FLETC).

Figure 1. The NOAA Office for Coastal Management site location

The NOAA property was originally developed by the US Navy as Facility 330 in 1947 and was improved in 1987. The former facility was previously used for berthing naval vessels. In 1996, the Navy transferred ownership of the pier to NOAA's Marine Operations Center – Atlantic (MOC-A). NOAA's MOC-A previously docked one vessel at the pier until the MOC-A transferred ownership of the pier to NOAA's Coastal Service Center (CSC) in 2005. The CSC allowed a partner agency, Carolinas Coastal Ocean Observing and Prediction System (Caro-COOPS), to dock vessels for loading and unloading. In 2006, the CSC discontinued electrical and water supply services to the pier, and the pier has not been utilized since.

The on-site NOAA office supports the administration of multiple programs, including the National Coastal Zone Management Program, National Estuarine Research Reserve, NOAA Coral Reef Conservation Program, and the Digital Coast Program.

1.2 Existing Site Conditions

The NOAA site currently consists of an office complex with attached technical facilities, two small warehouse/storage buildings near the shoreline, a mixed-use open-air pavilion, infrastructure installments (electrical and HVAC systems), and several parking lots that border the site along the S. Hobson Avenue and western sides of the complex. Figure 2 shows an aerial view (Source: Google Map) of the shoreline and layout of the existing facility. The angled view in this figure is oriented to face south, so that the northern shoreline of the property is in full view.

The site is subject to multiple flood hazards and currently has some minor stabilization/mitigation structures in place. The shoreline consists primarily of a riprap revetment that runs the length of the shoreline from the eastern property boundary west to the base of Pier Romeo, where it meets a concrete bulkhead. Some marsh development is active at the site where the pier creates favorable wave-sheltering conditions. There are two retention ponds on site, one adjacent to the base of the pier, and one adjacent to the eastern end of the open-air pavilion. Figure 3 shows some site photos of the NOAA facility collected during a site walk with NOAA officials.

Figure 2. Aerial view of existing conditions and facilities at the NOAA North Charleston site looking south from the Cooper River (courtesy of Google Maps)

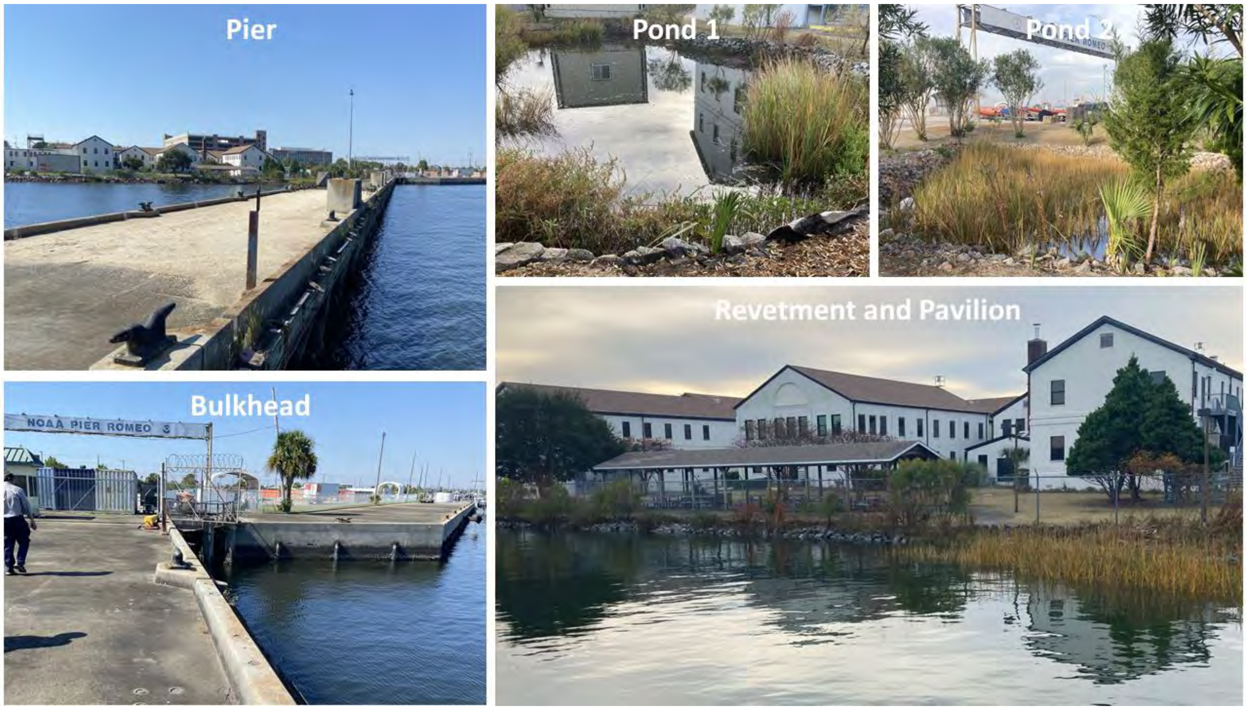

Figure 3. Site photos of the NOAA facility

1.2.1 Topographic and Bathymetric Setting

The NOAA facility sits on the eastern shoreline of the Charleston Peninsula, on the west bank of the Cooper River. The site ranges in elevation from approximately 4 to 9 feet North American Vertical Datum of 1988 (NAVD88). The area is composed primarily of coastal plain sediments (sands, clays, and silts), turning to interbedded sedimentary rock as depth increases, overlying basalts below approximately 2,300 feet of depth (Gohn, 1983). The area is subject to both riverine and tidal influence and is primarily a brackish to saline environment. Bathymetry data offshore of the site indicate a navigation channel of approximately -55 feet NAVD88 at the channel centerline. A shallower river bottom fronts the site for about 650 feet before reaching the dredged portion of the channel. The fronting riverbed slopes down to the dredged channel beginning at about -10 feet and ending at -20 feet NAVD88.

For analysis of the site surroundings, a seamless topographic and bathymetric Digital Elevation Model (DEM) was produced for the study area from topographic Light Detection and Ranging (LiDAR) and bathymetric survey sources (Figure). Topographic LiDAR data ranging from about -2.5 feet to 40 feet NAVD88 were pulled from the 2017 South Carolina Department of Natural Resources (SCDNR) LiDAR dataset for Charleston County. Bathymetric point survey data sources were used in the development of the bathymetric portion of the DEM, including National Ocean Service (NOS) hydrographic surveys (H11863 of 2009, H10858/63 of 1999, H09731/45 of 1978), United States Army Corps of Engineers (USACE) hydrographic surveys (2012 and 2020), and a 2021 survey from McKim & Creed. The 2020 USACE survey provided coverage for the dredged center channel, while the 1999, 2009 and 2012 surveys provided coverage for the remaining riverbed portions and shallower areas of the Cooper River. The 1978 survey data was used to supplement in nearshore areas where these more recent surveys did not have sufficient coverage. The 2021 survey data was provided by NOAA and contained detailed surveyed depths in the vicinity of the study area and pier.

All data sources were converted to a South Carolina State Plane horizontal projection in feet, and vertically to feet NAVD88. A terrain was built from the topographic and bathymetric sources, then converted to a 2.5 x 2.5-foot cell size raster DEM, with a transition from bathymetric to topographic data sources at -2.5 feet NAVD88. Appendix A contains the final seamless DEM produced, including additional supplemental spatial data.

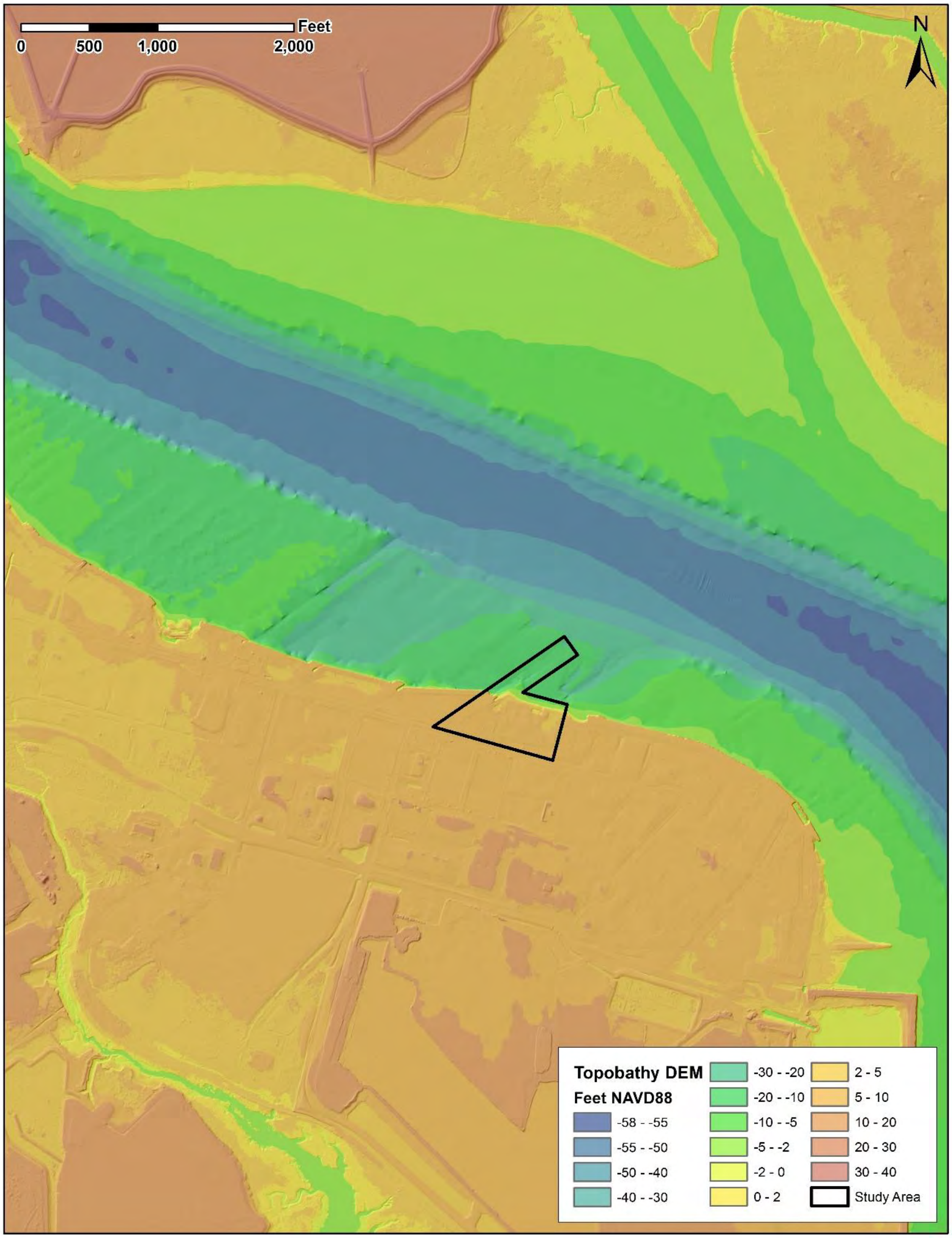

Figure 4. DEM of the NOAA project site

1.2.2 Tidal Conditions

The nearest NOAA tide gage station is located at the Cooper River entrance, approximately 4.7 miles downstream of the site at the Port of Charleston Union Pier complex. Values for this gage are reported in Mean Lower Low Water (MLLW) datum (-3.14 feet NAVD88). The mean tidal range is 5.22 feet with a Highest Observed Tide of 12.52 (9.46 NAVD88) feet recorded on September 21, 1989 during Hurricane Hugo. The Lowest Observed Tide of -4.09 (-7.23 NAVD88) feet was recorded on March 13, 1993 during the “Storm of the Century” 1993 blizzard. The range of tide elevations is provided in Table 1.

Table 1. Vertical Datums

Type:	Elevation (ft MLLW)	Elevation (ft NAVD88)
Highest Observed Tide	12.52 (9/21/1989)	9.46
Highest Astronomical Tide	7.26 (10/16/1993)	4.12
Mean Higher High Water	5.76	2.62
Mean High Water	5.40	2.26
Mean Sea Level	2.92	-0.22
Mean Low Water	0.18	-2.96
Mean Lower Low Water	0	-3.14
Lowest Astronomical Tide	-1.52 (2/09/2001)	-4.66
Lowest Observed Tide	-4.09 (3/13/1993)	-7.23

Note: Dates are included for the Highest Observed Tide, Highest Astronomical Tide, Lowest Astronomical Tide, and Lowest Observed Tide. All values were measured at the NOAA Cooper River Station 8665530 and are based on the National Tidal Datum Epoch (NTDE) of 1983–2001.

1.2.3 Flooding Hazards

High-Frequency Flood Events

Because of its location and topographic setting, the NOAA facility is subject to multiple types of flood hazards. The primary hazards to the site are coastal flooding from storm surge and severe tidal flooding, often referred to as ‘King Tides,’ ‘nuisance flooding,’ or ‘sunny-day flooding.’ King Tides and minor storm surge events are referred to as high-frequency events in this report. The coastal flooding hazard is most prevalent along the immediate shoreline threatening the inland portions of the site. Figure 5 shows how low-lying areas to the west of the site provide an avenue for coastal flooding to reach the area from a lateral direction, rather than just inundation from the shoreline closest to the facility.

Sources such as SCDNR and NOAA have differing definitions of flooding (as shown in Table 2); however, local King Tide flooding is generally noticeable when water levels are around 6.5 to 7 feet relative to MLLW (MyCoast, 2022). NOAA National Weather Service (NWS) defines 8 feet (MLLW) as Major Flooding for the Charleston area. These high-frequency flood events have become more common in the Charleston area. For example, between 1922 and 2014, there were 14 events recorded at the Charleston tide gage that were above 8 feet (MLLW). From 2015 to present, there have been 26 events that exceeded 8 feet MLLW (NOAA NWS, 2021). Two recent high-frequency events have been catalogued from November and December 2021 and show evidence of tidal flooding impacting areas of the site. Figure 5 shows the approximate flood extents of these events based on the peak measured water levels from the NOAA Cooper

River tide gage. Examples of site photos from the November event are shown in Figure 6. The images were collected by NOAA facility staff and showed that the flooding overtopped revetments and filled the retention pond east of the pavilion. The parking lot and loading area at the eastern portion of the property was also flooded. AECOM staff visited the site on December 6, 2021, to collect site photos for the December event. Figure 7 shows the December high-frequency event resulted in less severe flooding; however, impacts to the northeastern parking area and tidal connectivity of the ponds was noted due to water flooding out of the pond riser.

Table 2. Defined High Tide Flood Elevations for the Charleston Area

Type:	Elevation (ft MLLW)	Elevation (ft NAVD88)
Action Stage (NOAA NWS)	6.50	3.36
King Tide (SCDHEC)	6.60	3.46
Minor Flooding (NOAA NWS)	7.00	3.86
Moderate Flooding (NOAA NWS)	7.50	4.36
High Tide Flooding (NOAA NOS)	7.60	4.46
Major Flooding (NOAA NWS)	8.00	4.86
November 2021 King Tide	8.51	5.37
December 2021 King Tide	7.41	4.27

SCDHEC = South Carolina Department of Health and Environmental Control

Figure 5. Plan view approximation of site inundation from two recent high-frequency events

Figure 6. Site photos taken of the November 21, 2021, King Tide

Figure 7. Site photos taken of the December 6, 2021, King Tide

Low-Frequency Flood Events

According to the Federal Emergency Management Agency (FEMA) flood hazard study for Charleston County, SC (FEMA, 2021), the shoreline of the site is partially delineated in a high hazard Zone VE, which is characterized by waves greater than 3 feet. The majority of the NOAA facility falls within the Coastal A Zone, or an area with waves between 1.5 and 3 feet. The Limit of Moderate Wave Action (LiMWA) indicates the extent of the 1.5-foot wave, which has been confirmed to cause structural damage based on laboratory tests and field investigation (FEMA, 2019). Figure 8 shows the LiMWA, as well as the base flood elevations (BFEs) corresponding to the 1-percent-annual-chance flood event. Flooding during the 1-percent-annual-chance event may be inevitable at this site due to the low topography of the FLETC area. Mitigation of wave hazards on the NOAA property, particularly considering the effects of SLR, will be an important consideration for flood control at the site. Across the several sensitivity tests described in this report, particular attention is given to the location of the 1.5-foot controlling wave height (Hc) because it is considered a threshold value for reduced damages to buildings.

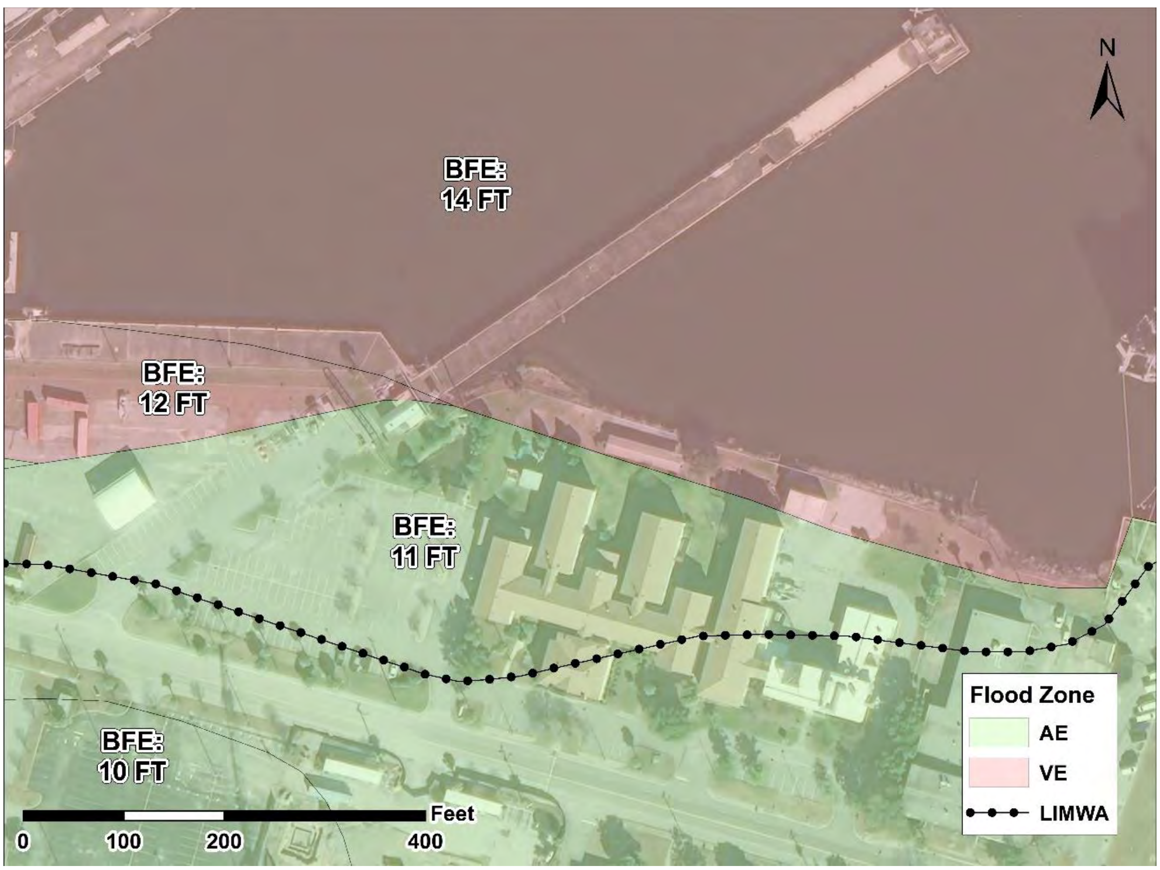

Figure 8. 1-percent-annual-chance FEMA flood hazard mapping relative to the NOAA facility (elevations in feet NAVD88)

Coincident Rain/Coastal Flood Events

While rain-based flooding was not identified by NOAA facility staff as a common problem on site, coastal flood events in the Charleston area are often accompanied by extreme rain events. The frequency and intensity of extreme rain events have increased in the Southeastern U.S. and are likely to continue to increase (USGCRP, 2018). The conditions caused by concurring extreme rain events and increased coastal flooding at the site could contribute to increased flooding, as stormwater systems would not have the necessary head to drain the water into the Cooper River system, causing the water to back up and spread laterally. The two stormwater ponds located on site both currently drain directly into the river and may not function properly if the river elevation at the stormwater outfall is too high (Figure 9). There are several recent local cases where coastal flooding was coincident with rain-based flooding; this scenario should be considered in the overall design of the project. For example, Figure 10, developed for the City of Charleston's Flooding and Sea Level Rise Strategy (City of Charleston, 2019), provides a summary of three recent cases where high gage elevations coincided with significant rainfall measurements.

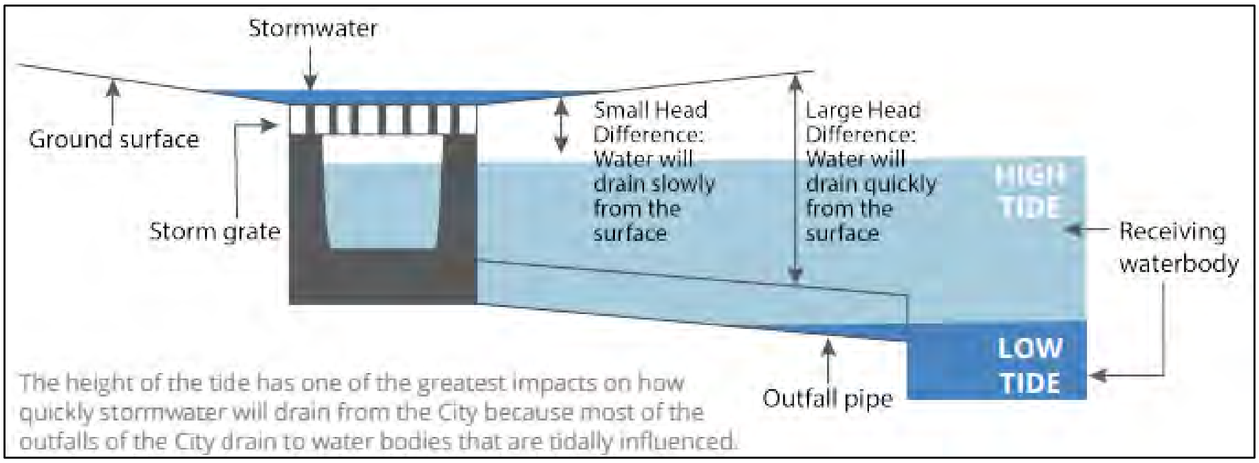

Figure 9. Effects of tide levels on coastal stormwater systems (City of Charleston, 2019)

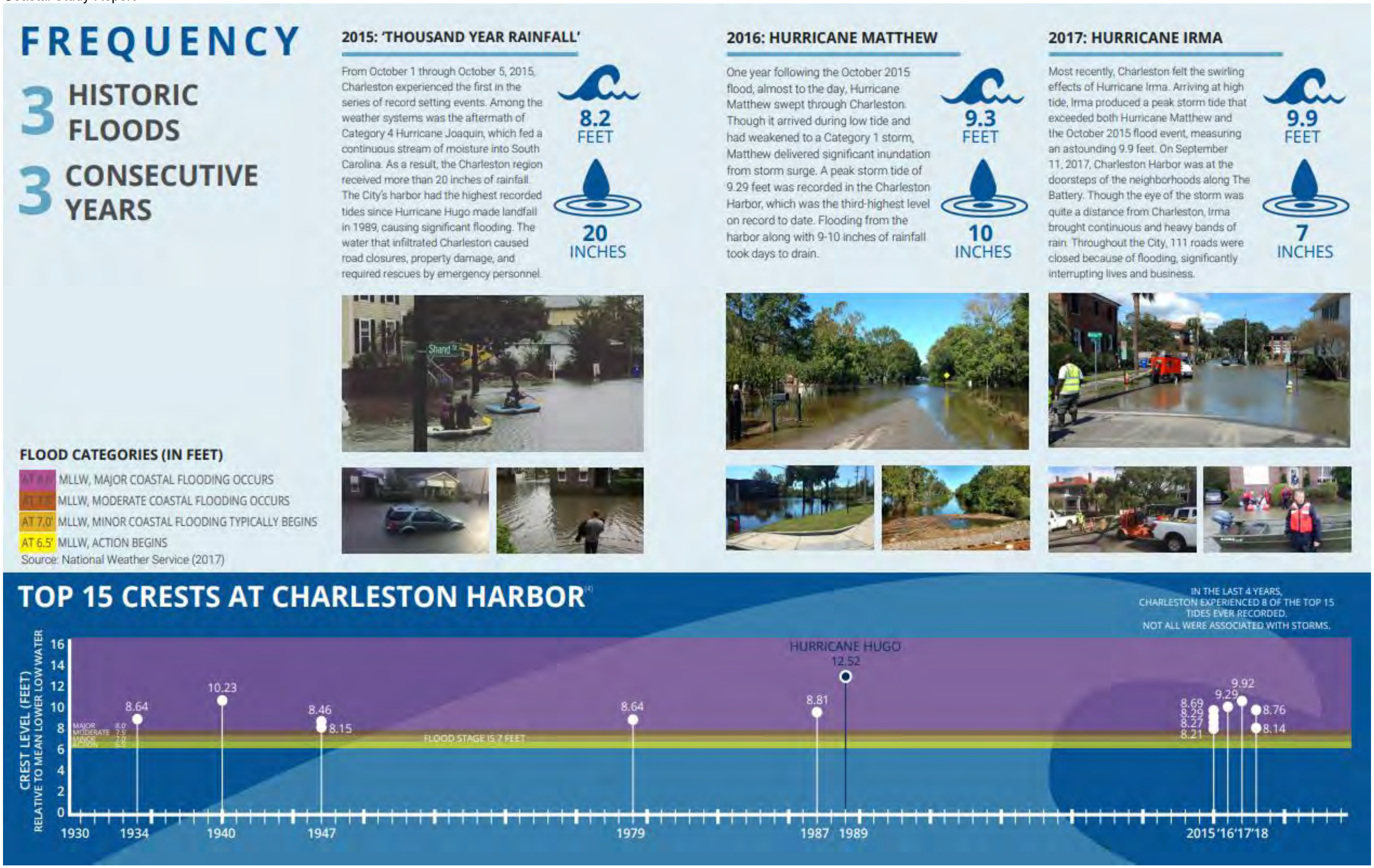

Figure 10. Excerpt from the City of Charleston Flooding and Sea Level Rise Strategy (2019)

2.0 Design Input Conditions

The concept design proposed for the NOAA OMAO, as described in the Basis of Design report, intends to mitigate the flood hazards described in Section 1. As noted in the Introduction of this report, the concept design proposes an adaptable solution to account for increasing future flood threats in order to provide flood protection at least until the end of the project's design life. Details of the design input water level (tides and surge), waves, and currents used to determine the loading and physical properties of the concept designs for this project are presented in the following subsections.

2.1 Sea Level Rise

SLR caused by the thermal expansion of ocean water and melting of land-based ice sheets exacerbates the effects of high-frequency and extreme event flooding. The higher coastal water levels also have an impact on stormwater systems during rain events. Furthermore, the increase in water levels can result in increases to shoreline erosion by elevating and extending the inland reach of waves and currents. The scope of the NOAA OMAO Southeast Marine Operations Hub Project includes consideration of SLR for the 50-year design life of the project.

The NOAA Cooper River tide station (8665530) has documented an increasing sea level trend of approximately 3.36 millimeters per year, which is equivalent to a change of 1.1 feet in the past 100 years (NOAA, 2022). Figure 11 displays regional SLR projections for the NOAA Cooper River tide gage relative to Local Mean Sea Level (LMSL) based on the 1983 – 2001 epoch by overlaying both the NOAA (2017) SLR probabilistic projections and the USACE Sea Level Curve Calculator (USACE, 2021) data points. Elevations corresponding to the NOAA (2017) SLR projections are also shown in Table 3.

The NOAA 50-year SLR projections vary from 1.22 feet to 5.75 feet for 2070 (Table 3). Upon discussion with NOAA, the NOAA Intermediate SLR projection was selected and a rounded value of 2.5 feet of SLR was chosen as the appropriate mid-range estimate for the 50-year design life. The selection of this value is supported by the uncertainty associated to each projection. For Charleston, the Intermediate NOAA 2070 projection has a 66 percent confidence interval that ranges from 2.11 feet to 2.79 feet to account for uncertainty (NOAA, 2017). This SLR estimate falls within the City of Charleston's Flooding and Sea Level Rise Strategy (City of Charleston, 2019), which recommends a 2- to 3-foot elevation increase for new facilities and infrastructure to account for SLR over 50 years based on the moderate Representative Concentration Pathway (RCP), which models greenhouse gas emissions stabilizing through 2050 and declining thereafter. The probability that Global Mean Sea Level (MSL) will exceed the NOAA Intermediate projections by 2100 is 3 percent (NOAA, 2017).

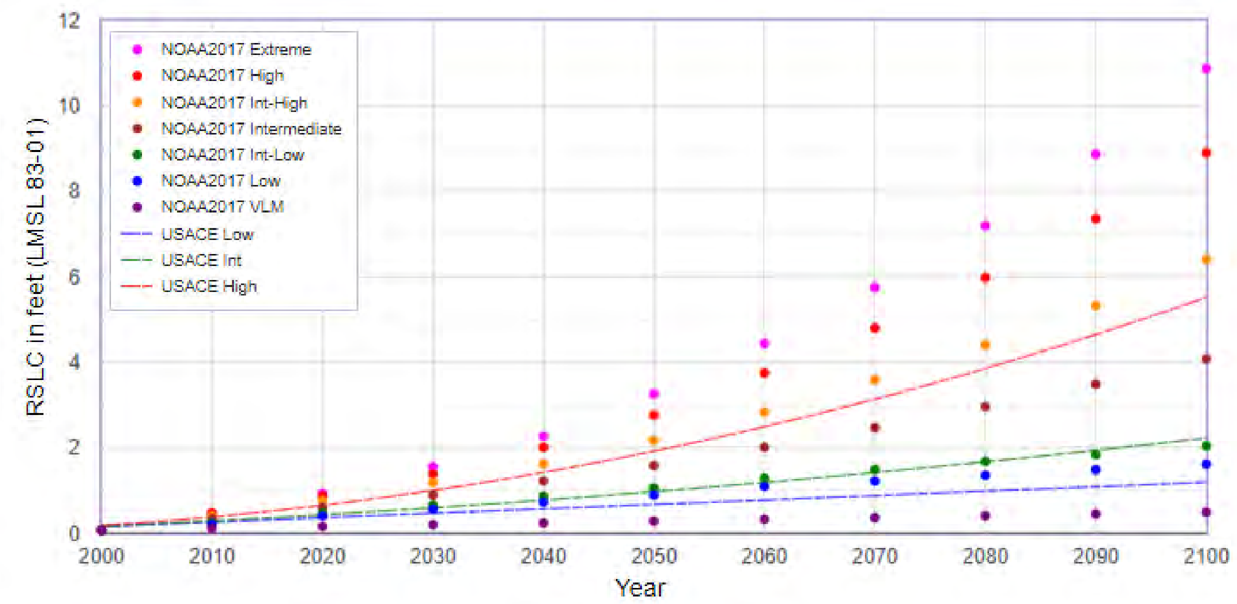

Figure 11. Regional SLR projections for Charleston, SC (Charleston I gage)

Table 3. SLR Projections for Charleston, SC

Year	Relative Sea Level Rise (feet MSL)					
	NOAA 2017 Low	NOAA 2017 Int-Low	NOAA 2017 Intermediate	NOAA 2017 Int-High	NOAA 2017 High	NOAA 2017 Extreme
2000	0.07	0.07	0.07	0.07	0.07	0.07
2010	0.2	0.24	0.33	0.4	0.47	0.47
2020	0.4	0.47	0.6	0.76	0.86	0.92
2030	0.56	0.66	0.89	1.19	1.38	1.55
2040	0.73	0.86	1.22	1.61	2.01	2.27
2050	0.89	1.06	1.58	2.17	2.76	3.25
2060	1.09	1.29	2.01	2.83	3.75	4.44
2070	1.22	1.48	2.47	3.58	4.8	5.75
2080	1.35	1.68	2.96	4.4	5.98	7.19
2090	1.48	1.84	3.48	5.32	7.36	8.86
2100	1.61	2.04	4.07	6.4	8.9	10.87

2.2 Coastal Flooding

As noted in Section 1.2.3, the primary flood hazards at the NOAA facility are coastal in nature, ranging from high-frequency events, such as King Tide flooding, to extreme flood events (including wave hazards), which are most often the result of tropical cyclones. The addition of SLR to these events not only increases the occurrence of on-site high-frequency flooding but also increases the severity and level of damage of high- and low-frequency flood events. With the influence of SLR, waves from future coastal storm events will be able to propagate farther inland and become larger and more damaging. Similarly, flooding from extreme tide events will become significantly more frequent and severe, eventually impacting the use of and access to portions of the NOAA facility. The impacts of high-frequency events, low-frequency flood events, and the influence of SLR at the NOAA OMAO facility based on the existing site conditions are described in this section.

High-Frequency Events

Analysis of high-frequency flood metrics for the Charleston area shows that increases in regular flooding due to SLR will cause a significant impact on the NOAA facility. Table 4 incorporates the high-frequency flood elevations shown in Table 2 and shows the increase to these values due to 2.5 feet of SLR in the rightmost column. For reference, LiDAR indicates the NOAA parking lot is generally 6 to 6.5 feet (NAVD88) and the pavilion is approximately 5.5 to 6 feet (NAVD88). Based on the 50-year Intermediate SLR projection, the NOAA-established Minor Flooding metric (6.36 feet NAVD88) would inundate the majority of the property. Major Flooding (7.36 feet NAVD88) would further inundate NOAA property and surrounding FLETC properties. Figure 12 shows FLETC areas inundated by flooding levels equal to 6.5 feet and 7.5 feet (NAVD88). Furthermore, topographic depressions, leading additional flooding to the NOAA facility are indicated by the yellow arrows. Figure 13 shows a closer visualization of these flood levels relative to the NOAA facility. Section 3.3 and Section 3.4 of this report provide an updated illustration of flood mitigation expected from the concept design.

Table 4. Defined High Tide Flood Elevations, with and without SLR

Type:	Elevation (ft MLLW)	Elevation (ft NAVD88)	Elevation + 2.5 feet SLR (ft NAVD88)
Action Stage (NOAA NWS)	6.50	3.36	5.86
King Tide (SCDHEC)	6.60	3.46	5.96
Minor Flooding (NOAA NWS)	7.00	3.86	6.36
Moderate Flooding (NOAA NWS)	7.50	4.36	6.86
High Tide Flooding (NOAA NOS)	7.60	4.46	6.96
Major Flooding (NOAA NWS)	8.00	4.86	7.36
November 2021 King Tide	8.51	5.37	7.87
December 2021 King Tide	7.41	4.27	6.77

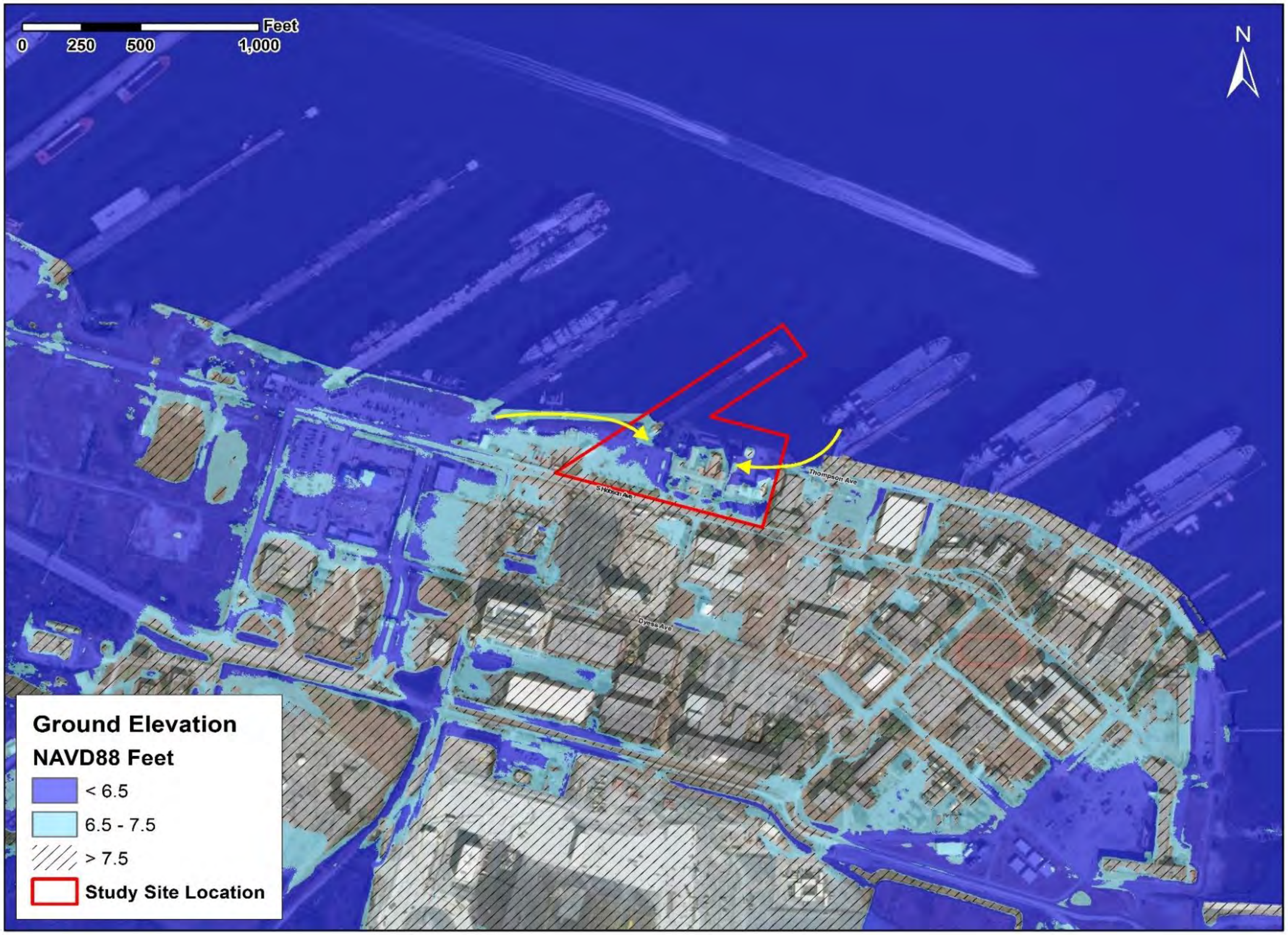

Figure 12. Illustration of site flooding based on water levels of 6.5 and 7.5 ft NAVD88. Additional flooding pathways to the NOAA Charleston site are schematized with yellow arrows.

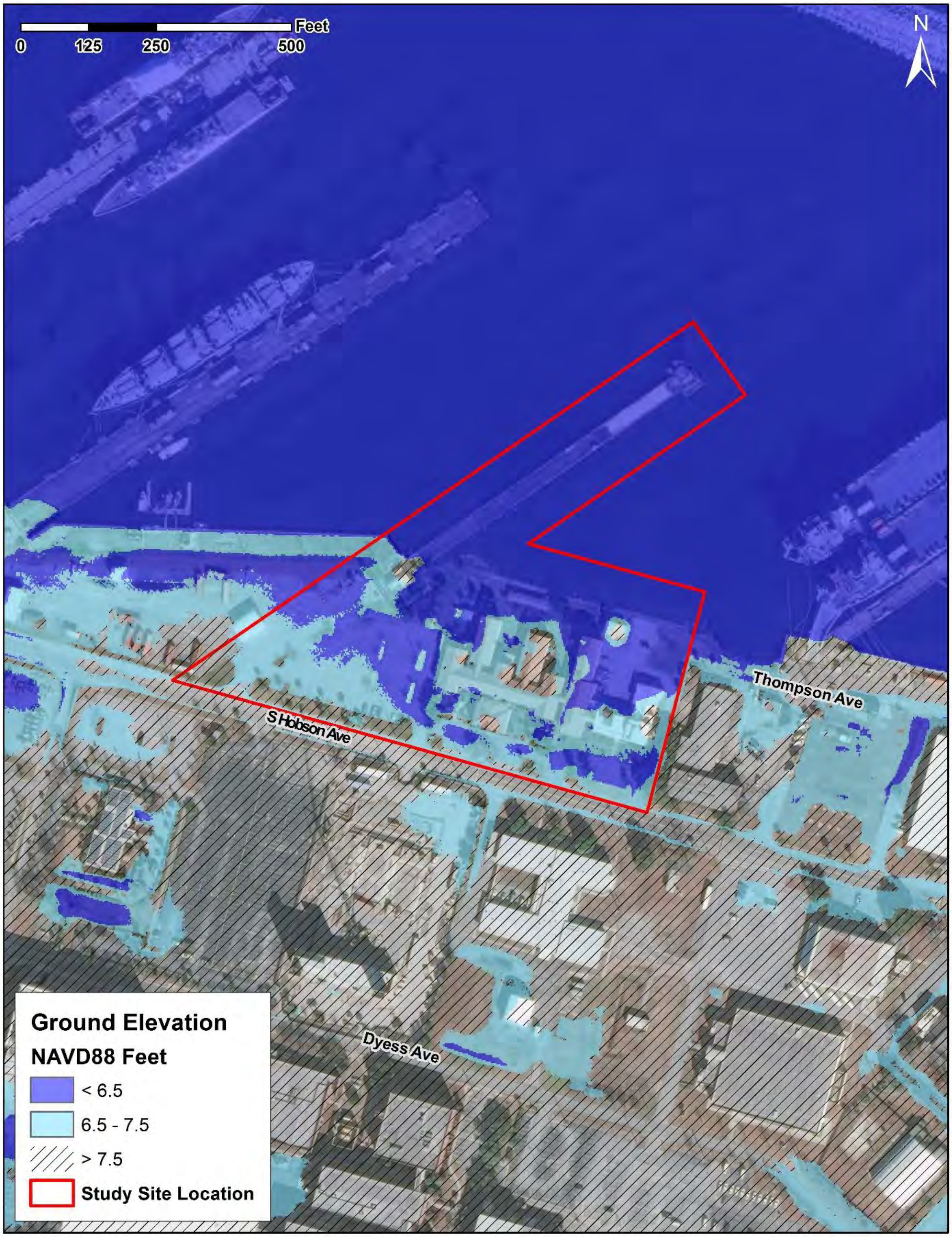

Figure 13. Detail of NOAA facility site flooding based on water levels of 6.5 and 7.5 ft NAVD88

The NOAA OMAO Southeast Marine Operations Hub Project is scoped to design and construct a seawall along the shoreline of the Cooper River to protect the facility from storms and future flood risk. A seawall could help mitigate the high-frequency flooding up to a certain point; however, low ground elevation areas surrounding the extent of the NOAA property would remain vulnerable, as Figure 13 illustrates. The construction of a shoreline-oriented seawall alone would not be able to completely prevent flooding of the property by events with water levels above 6.5 feet NAVD88, as properties to the east and west would provide lateral flood pathways to the NOAA facility. Section 3 of this report details the concept design of the seawall along the Cooper River as well as resilient curbs along the eastern and western limits of the parcel with respect to mitigation of high-frequency flooding. Due to the low elevation of the FLETC complex, the ability to mitigate inundation flooding is limited; resilient curb heights were developed primarily to mitigate wave hazards, though they will function to prevent coastal flood inundation up to approximately 7.5 feet NAVD88.

Low-Frequency Events

South Carolina has a 79.7 percent chance of being impacted by a tropical system each year, according to SCDNR. From 1851 to 2020, 43 tropical cyclones made landfall along the South Carolina coastline. Of these 43 systems that have directly hit the coast, only four made landfall as a major (Category 3+) hurricane (Mizzell et al., 2021).

For the purpose of informing design conditions, low-frequency events have been investigated through an analysis of 1-percent-annual-chance events at the NOAA site. The Charleston County FEMA Flood Insurance Study (FIS; FEMA, 2021) results show that the NOAA facility is currently at risk of damaging wave hazards during the 1-percent-annual-chance event, as previously shown in Figure 8. The flood and wave hazards for the 1-percent-annual-chance event will only continue to increase at this site due to the impacts of SLR. Although the design of a seawall can only limit flooding to a certain extent, the proposed concept design and wall crest elevation provides an opportunity to reduce the risk from wave hazards (which is exacerbated by SLR) in a way that will continue to add resilience at the site throughout the design life of the structure.

One way to restrict damaging waves is through the use of a ‘trip wall,’ which is a wall designed to be inundated by storm surge but limits the wave heights by inducing wave breaking and dissipating energy at the wall. This type of structure is commonly used because of its effectiveness at reducing wave risk with a relatively low cost and level of design. As NOAA concept designs may need to comply with National Flood Insurance Program (NFIP) standards and any resilience regulations required by Executive Orders, consideration of reducing the 1-percent-annual-chance flood hazards could provide added benefits for the final design.

To evaluate the benefits of the proposed structures, as described in the Basis of Design report, the FEMA-approved overland wave model, Wave Height Analysis for Flood Insurance Studies (WHAFIS), was used. WHAFIS was employed to confirm the existing conditions of the 1-percent-annual-chance event at the site and compare them to the impacts of the proposed structure elevations. WHAFIS, a one-dimensional model, simulates overland wave heights along a transect taking into account depth-limited wave calculations, contributions of drag from land use characteristics (e.g., marsh grass, rigid vegetation, and building obstructions), and wind-driven wave regeneration (FEMA, 1988). For this analysis, current conditions were modeled using the same methodology as applied for the Charleston County FEMA FIS, leveraging the same 1-percent-annual-chance stillwater elevation (SWEL) surface and input wave conditions.

For the site-specific analysis, three shore-normal transects were modeled with WHAFIS across the property. Figure 14 shows the transect layout for the site, including the approximate locations of the concept design wall and warehouse. The elevations along each transect were based on the seamless DEM described in Section 1.2.1 of this report. The elevations along Transect 1 were modified to represent the existing bulkhead more accurately. The structure was manually incorporated at the shoreline with an approximate cap elevation determined from site visit measurements relative to the tide level. For the proposed conditions modeling, the same elevation profiles were used, but were updated to include the proposed wall. Proposed wall elevations were adjusted to determine the minimum wall cap elevation needed to result in reducing the wave conditions to 1.5 feet at the wall.

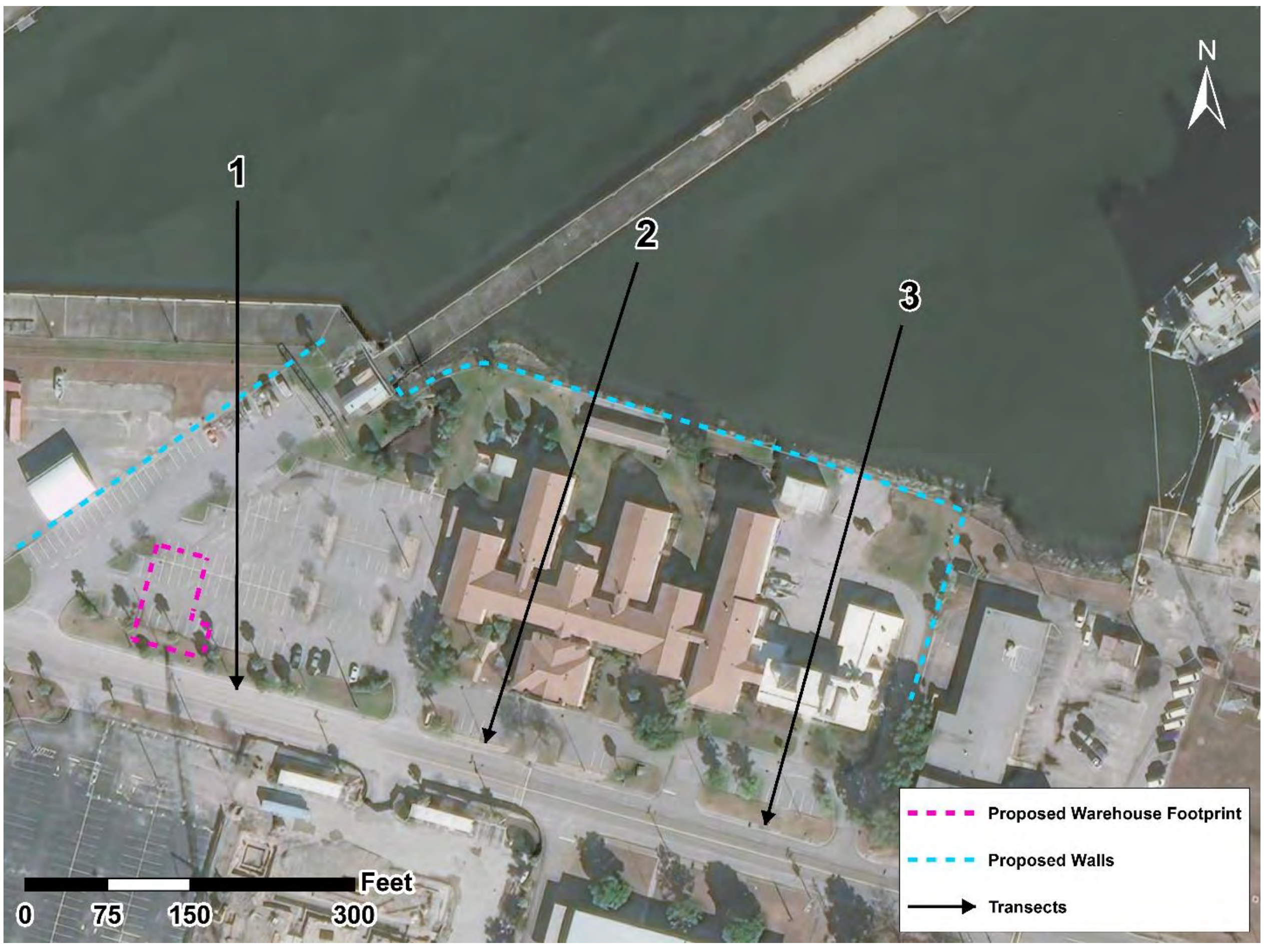

Figure 14. Transect layout for WHAFIS modeling of existing conditions and proposed wall conditions

Each transect was modeled to determine the impacts of the proposed modifications to the site for three water level scenarios. The water level scenarios were developed to evaluate existing vs. proposed conditions throughout the lifetime of the project:

- Current Condition: modeling the 1-percent-annual-chance SWEL using the input wave and water level conditions as in the Charleston County FIS (Figure 15).
- 20-year SLR Condition: modeling the 1-percent-annual-chance SWEL plus the 20-year SLR, approximated as a 1.25-foot increase based on Table 3. The static SLR value was added to the 1-percent-annual-chance SWEL elevations across the extent of each transect, and input wave conditions remained consistent with the Charleston County FIS (Figure 16).
- 50-year SLR Condition: modeling the 1-percent-annual-chance SWEL plus the 50-year SLR, approximated as a 2.5-foot increase based on Table 3. The static SLR value was added to the 1-percent-annual-chance SWEL elevations across the extent of each transect, and input wave conditions remained consistent with the Charleston County FIS (Figure 17).

Results of the WHAFIS modeling scenarios were used to produce the minimum wall design elevations shown in Table 5. The model scenarios indicate the wall elevation needed to reduce the wave heights to below 1.5 feet at the wall. The results showed that a 9.15-foot-high (NAVD88) wall would be required to reduce the wave risk for the next 20 years if SLR is considered. This elevation was rounded up to 9.2 feet and is considered the initial design wall elevation. A secondary design elevation for the wall was selected at 10.5 feet (NAVD88) to account for the full 50-year design life of the wall. Full design information for the wall is covered in Section 3.3 of this report.

Table 5. Minimum Wall Elevations and Recommended Concept Design Elevations to Reduce 1-percent-Annual-Chance Wave Heights to 1.5 Feet at the Proposed Wall

Modeling Scenario	Minimum Wall Elevation (ft NAVD88)	Design Wall Elevation (ft NAVD88)
Current Condition	8.00	9.20
20-year SLR Condition (2040)	9.15	9.20
50-year SLR Condition (2070)	10.35	10.50

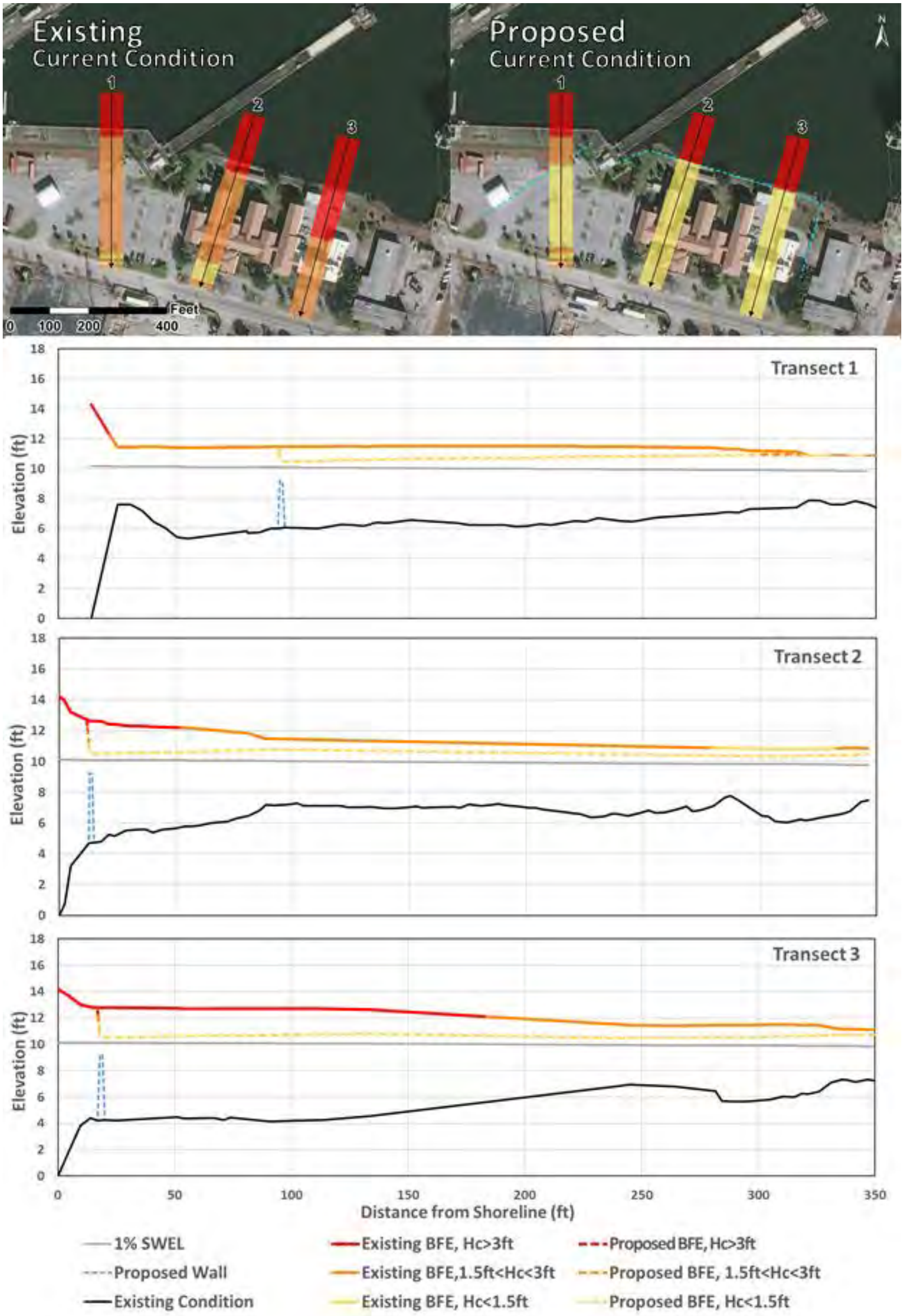

Figure 15. 1-percent-annual-chance event wave modeling based on current conditions (no SLR)

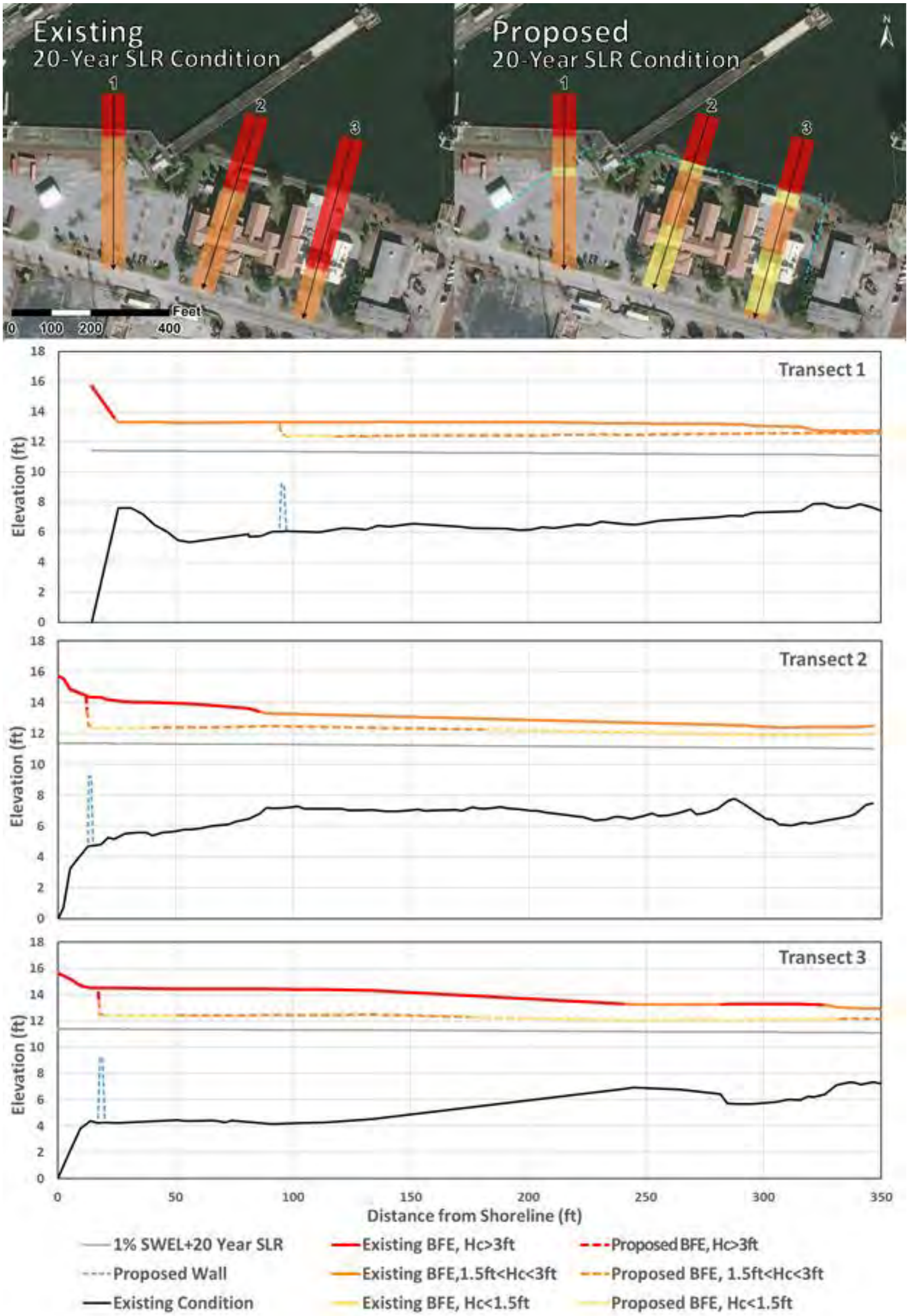

Figure 16. 1-percent-annual-chance event wave modeling based on 20-year SLR projections

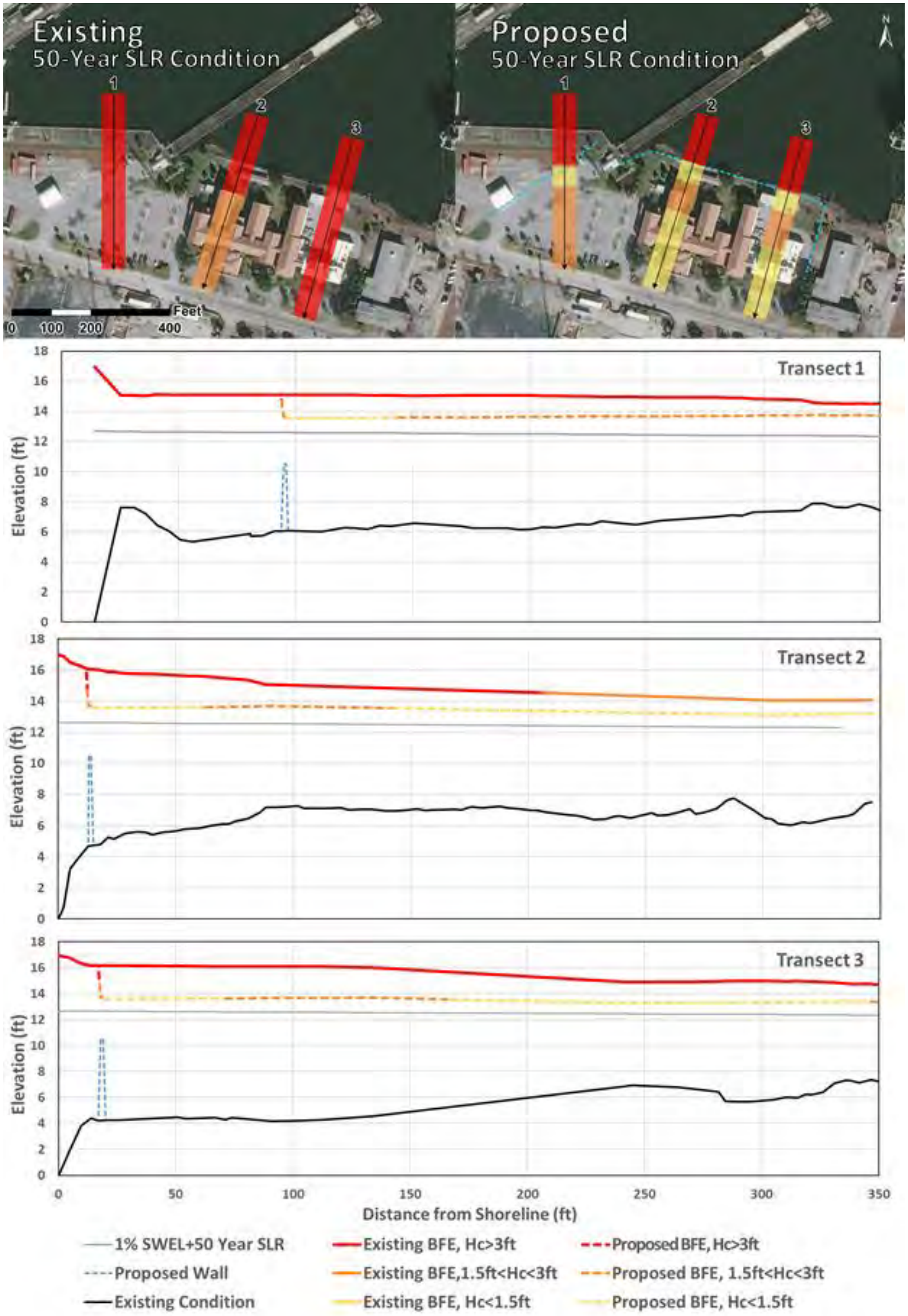

Figure 17. 1-percent-annual-chance event wave modeling based on 50-year SLR projections

Figure 15, Figure 16, and Figure 17 upper panels show the wave height dissipation along each modeling transect under existing and proposed site conditions, respectively. The wave results are shaded based on magnitude of the wave heights, with mild wave conditions (less than 1.5 feet) in yellow, moderate wave conditions (1.5 to 3 feet) in orange, and severe wave conditions (greater than 3 feet) shown in red. The three profiles, in the lower panels, show the topographic elevations, proposed wall location and elevation, and the existing and proposed BFE. The colors of the BFE lines match the wave height magnitude colors in the upper panels. The elevation of the BFE corresponds to the combined 1-percent-annual-chance SWEL including wave crest elevations.

In Figure 15, the proposed modeling shows that the 9.2-foot cap elevation reduces the wave risk to less than 1.5 feet across the site. When 20-year SLR projections are included in the 1-percent-annual-chance modeling (Figure 16), the extent of the severe wave conditions increases. The increase is particularly evident for Transect 3, which puts the existing facility at a risk of wave hazards greater than 3 feet. The proposed 9.2-foot wall produces a decrease in wave height below 1.5 feet at the location of the wall. Landward of the wall, some open areas allow for wave regeneration, which causes the waves to increase slightly above the 1.5-foot wave. According to research conducted for FEMA based on observed post-storm damage assessments, regenerated waves above 1.5 feet do not carry the same damage potential due to shortened wave periods and loss of energy within the water column (FEMA, 2019). Under a 50-year SLR scenario (Figure 17), current ground conditions expose the site to severe wave hazard. With the introduction of a 10.5-foot design wall elevation (the wall crest is increased in this scenario), the site resilience is augmented by continuing to limit wave heights to less than 1.5 feet at the location of the wall.

2.3 Local Fetch-Driven Waves

Wave conditions relative to the pier and shoreline were developed to provide design wave loading calculations for the project structures. AECOM conducted a fetch-limited wave analysis using the USACE Automated Coastal Engineering System (ACES, 1992), which has a module for windspeed adjustment and wave growth. NOAA specified that wind and wave design conditions should be based on Category 4 storm conditions. The maximum wind speed for a Category 4 storm condition is 156 miles per hour and was used as the input for fetch-limited shallow wave growth calculations for this analysis. Based on NOAA's Saffir-Simpson wind scale guidance, the 156-mph wind is assumed to be a peak 1-minute wind speed measured at the standard observation height of 10 meters (approximately 33 feet) (NOAA, 2021).

Fetch-limited wave analysis was conducted for a central point of the shoreline fronting the NOAA facility and a point near the end of the proposed pier (Figure 18, Figure 19).

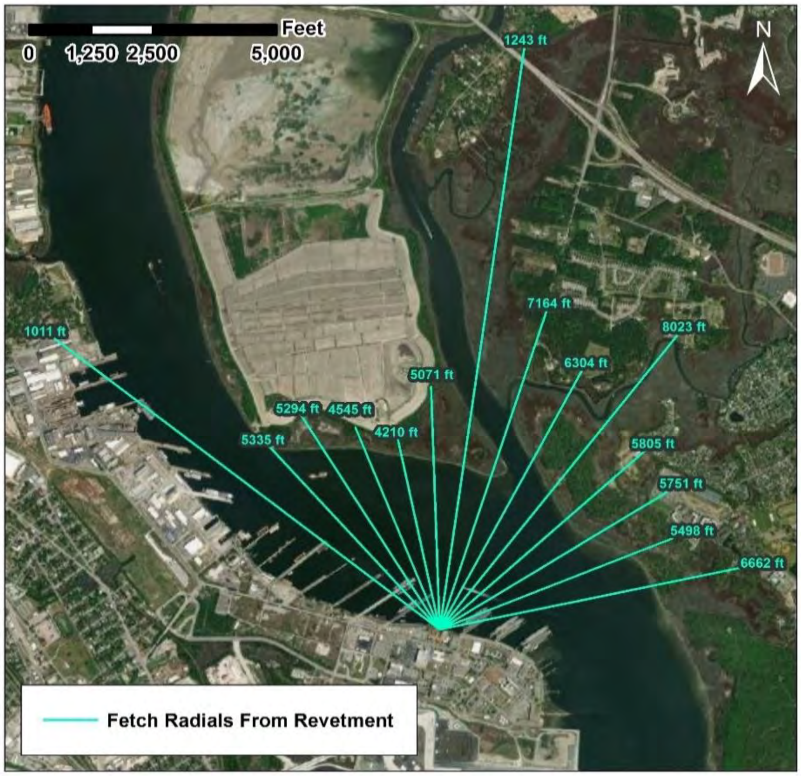

Figure 18. Fetch radials from existing revetment at shoreline

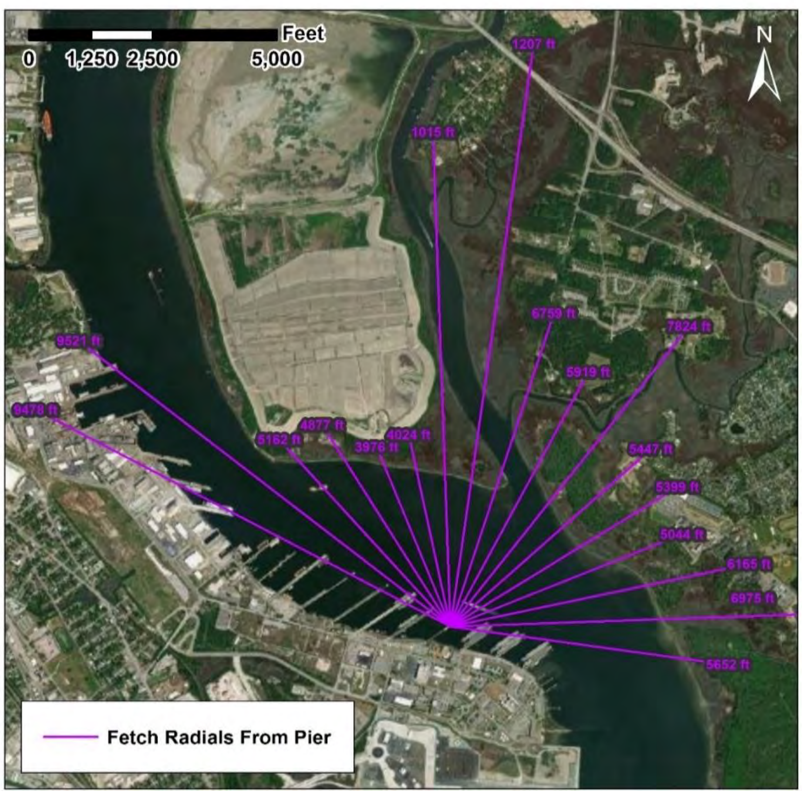

Figure 19. Fetch radials from the terminal end of Pier Romeo

Fetch radial lines were generated at 10-degree intervals extending across the Cooper River into neighboring tributaries and marsh areas. Table 6 provides the input and output conditions used for ACES wave growth. The average depth input for the fetch lengths was calculated with consideration of the 1-percent-annual-chance SWEL and 2.5 feet of SLR. The 1-percent-annual-chance SWEL and SLR elevations were also used to identify the initial extent of the fetch radials across the Cooper River. Once developed, the radial lines were reviewed and trimmed to ensure they captured true areas of fetch and were not crossing areas with dense vegetation or heavy development; the fetch-limited wave determinations only consider wind speed and water depth and do not account for land use, which produces a conservative result.

Initial results showed that the more conservative wave results originated generally from the north. Additional wind directions were evaluated for the pier, as it is more exposed, and wave force directions could be more impactful to the broadside of vessels and the longer edges of the floating pier. The direction of the maximum wave condition may not provide the maximum wave loading result. A second wave condition from the northwest direction was also provided to account for this condition in the concept design.

Table 6. Input and Output Conditions from ACES Wave Growth Modeling

Approximate Site Location	Average Fetch Elevation (ft NAVD88)	Additional Water Elevation (ft NAVD88)	Average Depth (ft)	Wind Direction (deg)	Wave Direction (deg)	Wave Height (ft)	Wave Period (sec)
Shoreline	-5.82	12.63	18.45	9	9	7.43	4.78
Pier (N)	-5.76	12.63	18.39	5	5	7.58	4.86
Pier (NW)	-5.76	12.63	18.39	305	305	7.22	4.68

2.4 Local Currents

The currents impacting the Cooper River near the study area will apply loading to the piles, floating pier, and vessels for both daily tidal conditions and storm conditions. The daily flood and ebb currents in the vicinity of the study area range from 1.0 to 2.75 feet per second for flood tides and 2.0 to 6.4 feet per second for ebb tides based on the NOAA tidal current prediction stations directly upriver and downriver of the Pier Romeo site (NOAA, 2022).

Less than 1 mile downstream of the NOAA facility, current profile measurements were collected along cross sections of the Cooper River in the vicinity of the Hugh K. Leatherman Sr. Port Terminal. The field measurements were collected by Applied Technology & Management, Inc. on two dates in 2017 that coincided with representative flood and ebb tide conditions and generally showed depth-averaged flow velocities of 2 to 3 feet per second (2017). Notably, the strongest currents occurred near the center of the shipping channel and decreased significantly in areas outside of the channel. For example, the maximum velocity in the channel was 2.3 feet per second, whereas values outside of the channel were approximately 60 percent lower. Some of this behavior could be influenced by the bend in the Cooper River to the north of the site, or a partial component of eddies caused by the terminal and contraction dikes along the western shoreline.

To analyze potential current impacts from an extreme tropical event, the most severe local storm in recorded history, Hurricane Hugo, was referenced (Figure 20). On September 22, 1989, Hurricane Hugo made landfall as a Category 4 storm on the Isle of Palms, 10 miles southeast of NOAA Pier Romeo, and was the highest observed water level on record for the NOAA Cooper River tide gage (as shown in Table 1). The storm surge was estimated to be approximately 8 feet on top of predicted tide level, with a measured level of 12.52 feet MLLW.

Due to the intensity and amount of recorded data associated with Hurricane Hugo, the storm was one of three storms selected to validate the coupled two-dimensional (2-D) Advanced Circulation Model and Simulating Waves Nearshore Model (ADCIRC+SWAN) built for the South Carolina Storm Surge (SCSS) study. The modeled wave results were plotted with the observed wave data from the National Buoy Data Center (NBDC) for review. The wave height and period data were in good agreement between the two datasets for Station 41002 (South Hatteras), which is approximately 250 nautical miles east of Charleston (URS, 2012). This validation storm was re-modeled in ADCIRC to produce output current velocities near the offshore extent of Pier Romeo.

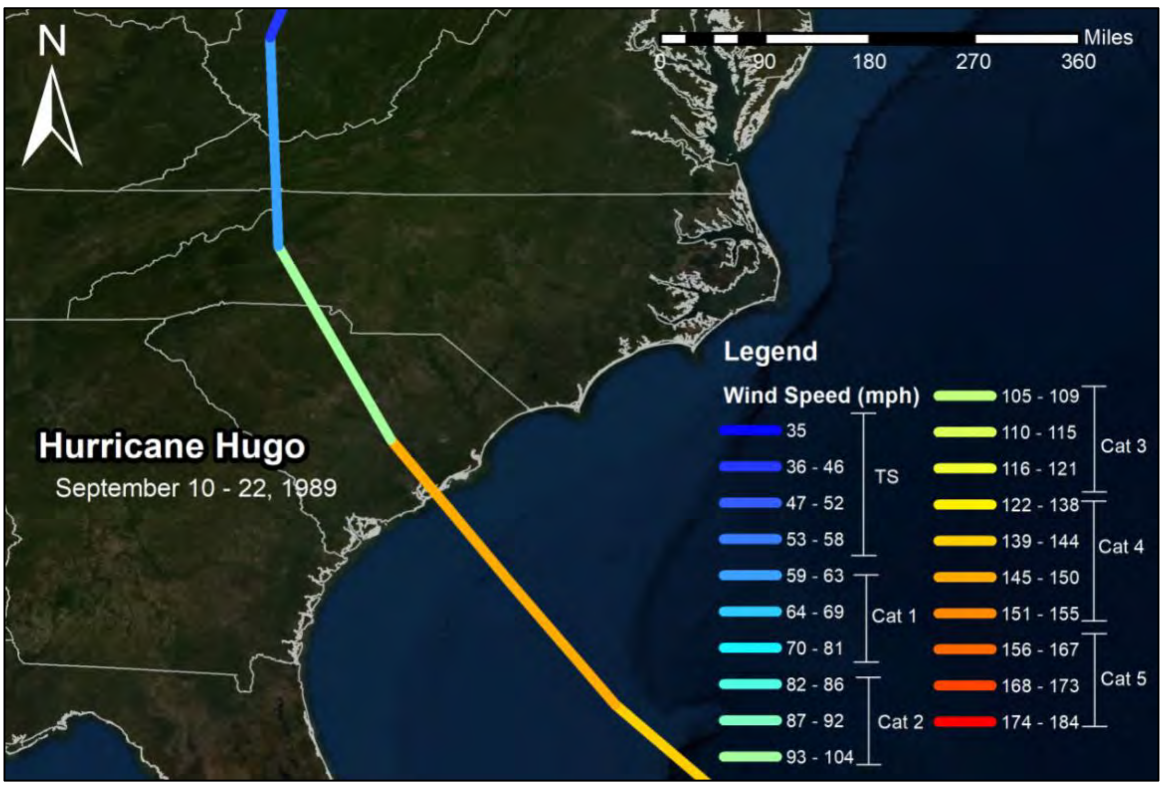

Figure 20. Hurricane Hugo track

Resulting maximum velocities from the Cooper River bend around the FLETC area are shown in Figure 21. A closer image of the Pier Romeo site shows the wave velocity results overlaying the unstructured model mesh in Figure 22. The node identified by a blue circle in Figure 22 produced a maximum velocity of 1.47 feet per second (0.45. m/s), directed downstream after the passing of the storm. For an initial design, the maximum NOAA tide current prediction velocity should be considered (approximately 4 knots). Modeling for the final design should consider the proposed dredging at the site as well as the “Post 45” dredging plan that will increase channel depths in the Cooper River (USACE, 2015).

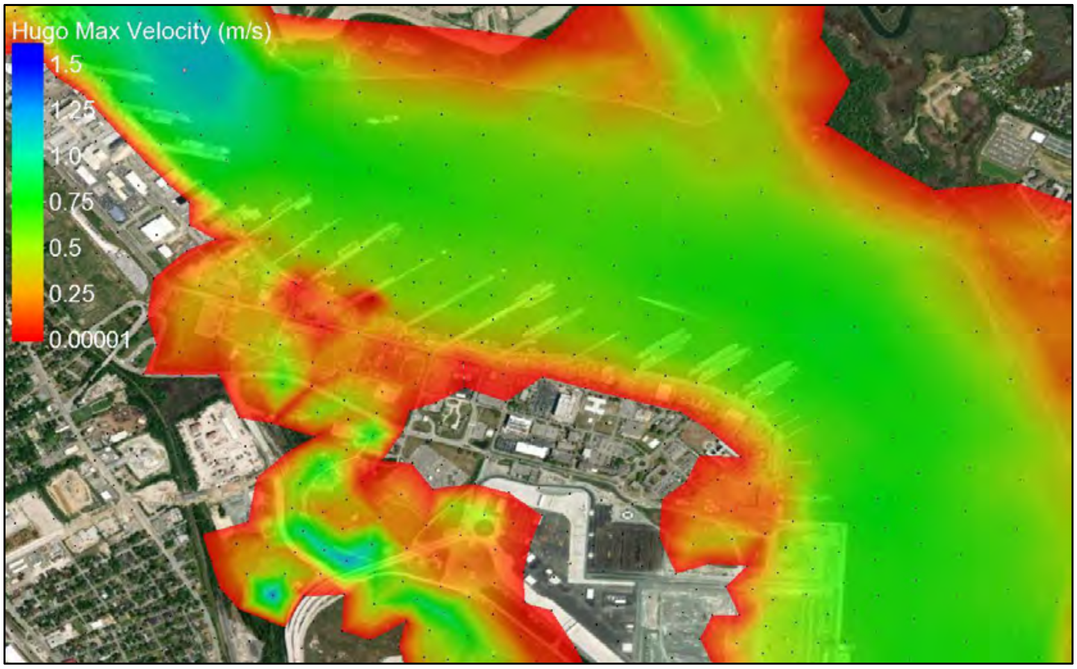

Figure 21. Maximum velocities for Hurricane Hugo ADCIRC model run in Cooper River

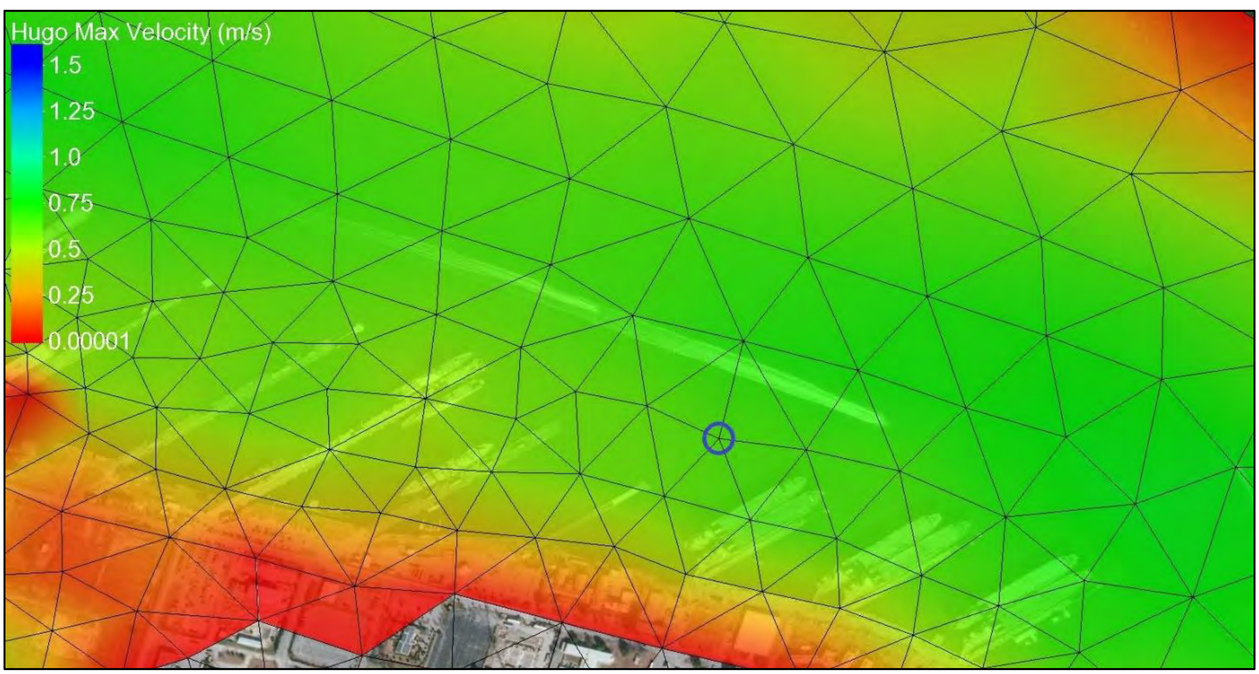

Figure 22. Maximum velocities for Hurricane Hugo ADCIRC model run near NOAA Pier Romeo

3.0 Evaluation of Flood Protection Designs

As described in the Scope of Work (SOW), AECOM created conceptual designs for several components of the NOAA facility to be included in the Basis of Design for this project. The SLR contributions, water levels, wave conditions, and current velocities detailed in Section 2 provided the input conditions for each design. Section 3 provides the loading calculations and other coastal engineering components of the following designs:

- Floating Pier
- Small Craft Pier
- Primary Shoreline
- Resilient Curbs
- Warehouse
- Optional Living Shoreline Alternative

Inputs, assumptions, and recommendations are provided for each design concept.

3.1 Floating Pier Romeo

The floating pier will be impacted by a number of forces. The following subsections describe wave loading for the cylindrical piles and floating pier. Wind loading information is also provided.

3.1.1 Wave Forces on Cylindrical Piles

Wave forces on vertical cylindrical piles were calculated using the Morison Equation, which applies inertial and drag forces per unit length of the pile (Morison et al., 1950). Recommendations from the *Coastal Engineering Manual* (CEM; USACE, 2011) were applied to calculate the total maximum forces and moments acting on the pile for design purposes. The force equations applied for this study are shown below.

$$F = F_i + F_D$$

$$F_i = C_M \rho g \frac{\pi D^2}{4} H K_i$$

$$F_D = C_D \frac{1}{2} \rho g D H^2 K_D$$

where:

F is the time varying force
F_i is the inertial force
F_D is the drag force
C_M is the inertia or mass hydrodynamic force coefficient
C_D is the drag hydrodynamic force coefficient
ρ is the bulk density
g is the gravitational acceleration
D is the pile
H is the wave height
K_i and K_D are dimensionless constants

The maximum drag force and the maximum inertia force occur at different time steps relative to the wave cycle; however, the CEM outlines that a conservative design approach assumes that the two maximum forces occur at the same time. Drag and inertia coefficients were 0.7 and 1.5 for most pile diameters and were calculated based on guidance in the *Shore Protection Manual* (USACE, 1984).

The maximum wave conditions calculated at the pier (Table 6) were used for the force calculations. The depth of the pile was assumed to be approximately 40.8 feet, accounting for the proposed dredge depth (-25 feet MLLW, or -28.1 feet NAVD88) and the 1-percent-annual-chance SWEL including the 50-year SLR projection (10.1 + 2.5 feet NAVD88). Wave force results are provided in Table 7 for 1-foot intervals of increasing pile diameters. The total inertia force and total drag force components were provided separately, as the total moments were used to identify the distance above the mudline that the total force is acting. A factor of safety was not incorporated in the Table 7 results; however, the CEM recommends a 1.5 factor of safety for low probability of occurrence force calculations in pile design. The final factor of safety will be considered by the designer depending on allowable stress design or load resistance factor design. Load factors and load combination will depend on the Unified Facilities Criteria (UFC).

Table 7. Wave Forces on Vertical Cylindrical Piles

Diameter	Total Inertia Force (lb)	Total Drag Force (lb)	Combined Total Force (lb)
1	305.7	199.9	505.6
2	1,069.1	318.0	1,387.1
3	2,405.4	477.0	2,882.4
4	4,276.2	636.0	4,912.2
5	6,681.6	795.0	7,476.6

3.1.2 Wave Loading on Floating Pier

Wave loading on the floating pier was calculated using two methodologies: Kriebel et al. (1998) and Nagai (1969). Both methodologies account for wave forces on a vertical wave barrier. The Kriebel equations applied to this study are:

$$F_o = \rho g H_{mo} \frac{\sinh k_p h}{k_p \cosh k_p h}$$

$$F_{mo} = F_o (\frac{w}{h})^{0.386(h/L_p)^{-0.7}}$$

where:

F_o is the significant force per unit width of vertical wall
H_{mo} is the incident significant wave height
k_p is the wave number associated with the spectral peak period Tp
w is the barrier penetration depth
F_{mo} is the significant force per unit width of barrier
h is the water depth at the barrier
L_p is the local wavelength associated with the peak spectral period Tp

ρ is the bulk density
g is the gravitational acceleration

The Nagai equation accounts for the pressure distribution along the vertical extent of the wall. Areas of the wall above the water level are assumed to have a linear distribution of pressure, with maximum pressure at the water level decreasing to zero for areas above the wave height. Pressure distribution below the water level is provided by the following equation:

$$\frac{P_{max}}{w_0} = H \frac{\cosh m\,(h+Z)}{\cosh mh}$$

where:

P_{max} is the maximum pressure
m is the wave number
H is the wave height
h is the depth
Z is the elevation along the wall, relative to water level
w_0 is the unit weight of water

The resulting pressure for the Nagai methodology conservatively assumes shallow wave conditions. Integrating the pressure distribution along the vertical extent of the floating pier produces the total force per unit length.

For both wave loading methodologies, the input wave conditions (Table 6) for the pier were calculated for both wave directions to determine the dominant loading forces on the structure (Table 8). As with the cylindrical pile calculations detailed in Section 3.1.1, the depth was assumed to be approximately 40.8 feet. The pier wall was assumed to have an 8-foot draft and 4 feet of freeboard.

Table 8. Wave Loading on Floating Pier

Design Condition	Kriebel Wave Loading (lb/ft)	Nagai Wave Loading (lb/ft)
Pier – Wave 305 deg from North	4,059	4,323
Pier – Wave 5 deg from North	4,260	4,612

3.1.3 Wind Loading

As noted in Section 2.4, wind loading for this project is based on a Category 4 storm condition. American Society of Civil Engineers (ASCE) 7-16, chapter 26 design criteria for wind loads was used, which assumes a 3-second gust. The 60-second gust data, which were based on the Category 4 storm conditions, were converted using methodology of the World Meteorological Organization (WMO) to a 3-second gust (Harper et al., 2010). Once converted, equation 26.10-1 from ASCE 7-16 was used to calculate the velocity pressure given the wind speed and several other factors applicable to the project site. Wind pressure against the dock was then calculated according to ASCE equation 29.4-1 using a combination of the projected wind area of the design vessel, the calculated velocity pressure, gust factor, and force coefficient. Wind direction was taken perpendicular to the vessel hull.

3.2 Small Craft Pier

The small craft pier was assumed to be vulnerable to the same wave loading as the floating pier. As with previous wave loading calculations on the piles and floating pier, the water depth and input wave conditions were assumed to be the same. The Morison Equation cylindrical pile wave force calculations in Section 3.1.1 would also apply to the small craft pier. Kriebel and Nagai methodologies (detailed in Section 3.1.2) were used to calculate the wave force, with a 2-foot draft and 1.5 feet of freeboard. Results for wave loading on the small craft pier are shown in Table 9.

Table 9. Wave Loading on Small Craft Pier

Design Condition	Kriebel Wave Loading (lb/ft)	Nagai Wave Loading (lb/ft)
Small Craft Pier – Wave 305 deg from North	1,389	1,496
Small Craft Pier – Wave 5 deg from North	1,383	1,578

3.3 Cooper River Seawall Concept

The shoreline design accounts for approximately 550 to 600 feet of steel sheet pile wall with a concrete cap. The conceptual location of the wall is proposed to be at the approximate location of the chain-link fence, a few feet landward of the existing revetment, as shown in Figure 23. Existing conditions and a concept design typical section are shown in Figure 24. The cap elevation of the wall is intended to be able to support a future secondary cap. The design elevations and wave loading components are detailed in this section. Additional stone size recommendations are provided for stabilization of the shoreline fronting the wall.

Figure 23. Approximate seawall and "resilient curb" concept design locations

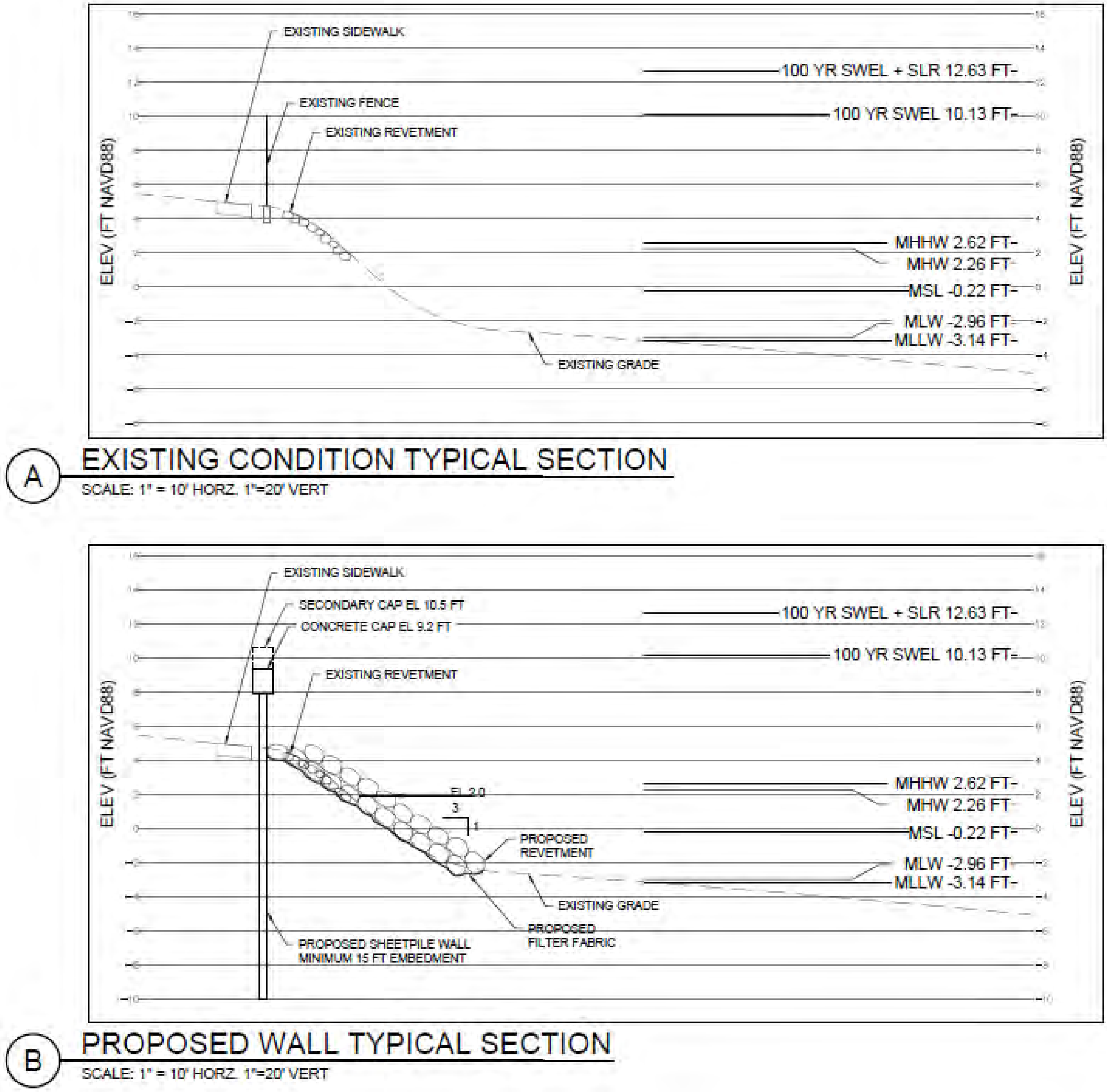

Figure 24. Existing and proposed conditions for the sheet pile seawall fronting the NOAA facility

3.3.1 Wall Cap Elevation Design

The sheet pile seawall concept design will have a primary construction elevation that suits project needs for the beginning of the 50-year design life. A secondary cap elevation was also designed to continue to support the resilience goals of project throughout the later duration of the 50-year design life. This design aspect follows USACE recommendations of a “When, Not If” approach to ensuring that appropriate hazard mitigation is addressed to meet the needs of SLR as it occurs (Veatch, 2021). Generally, this approach acknowledges that there is uncertainty in SLR projection timelines and focuses on thresholds of SLR that would trigger the need for additional mitigation. Locally, a similar design component exists for the Low Battery Seawall Project in Charleston, SC. The Low Battery seawall is a 9-foot (NAVD88) seawall, designed to support an additional 3 feet of wall elevation should SLR trigger a need for additional protection (USACE, 2021).

For this project, three aspects were considered in the development of the conceptual primary and secondary cap elevations:

- High-frequency flood mitigation throughout the design life: ensuring that the wall elevations will protect from NOAA NWS-predicted levels of coastal flooding (Table 4) throughout the 50-year design life of the project. The elevation does not consider pluvial flooding or coastal flooding that could impact the property via low-elevation pathways within FLETC property.
- Low-frequency wave hazard mitigation throughout the design life: ensuring that the wall elevations will reduce 1-percent-annual-chance wave hazards to less than 1.5 feet at the location of the wall.
- Reasonable line of sight for NOAA facility staff: consideration of the wall elevation relative to grade elevations of the site.

Analysis of the high-frequency and low-frequency flood and wave conditions and justification for the primary and secondary design elevations are detailed in Section 2.2. Table 10 provides a basic summary of how the primary and secondary designs can meet the needs of the project. Section 3.4 provides additional information regarding the lateral flood protection needs of the project.

Table 10. Seawall Design Aspects

		20-year Condition			50-year Condition		
Modeling Scenario	**Design Cap Elevation (ft NAVD88)**	**Site Protection from High-Frequency Coastal Events**	**Site Reduction of 1-Percent-Annual-Chance Wave Hazards**	**Design Accounts for Line of Sight**	**Site Protection from High-Frequency Events**	**Site Reduction of 1-Percent-Annual-Chance Wave Hazards**	**Design Accounts for Line of Sight**
Primary Seawall Cap	9.2	✓	✓	✓	✓		
Secondary Seawall Cap	10.5	✓	✓	✓	✓	✓	

The top priority of the seawall design concept is to mitigate flooding and wave hazards. The elevation of the primary seawall cap will also reduce the initial cost of construction, pushing the cost of the secondary cap into a future project. Additionally, the elevation of the primary seawall cap will offer a more open line of sight, improving the aesthetic of the proposed structure. Using the open-air pavilion as a benchmark (generally 5.75 feet NAVD88 based on LiDAR), the 9.2-foot (NAVD88) primary seawall cap would appear to be approximately 3.45 feet above the bare-earth elevation at the pavilion. This cap elevation would therefore appear lower than the average seated eye-level of 3.66 feet. The installation of the secondary 10.5-foot wall cap would likely exceed the seated line of sight for staff but is necessary to ensure continuing flood hazard mitigation.

In the future, the relative sea level trend will increase to nearly 1.25 feet above MSL (based on the 1983–2001 epoch), and the 9.2-foot (NAVD88) primary seawall cap elevation will no longer provide maximum functionality based on design. Although lateral flooding could still be a significant issue, the primary seawall would still prohibit high-frequency coastal flooding from overtopping the wall. Similarly, the risk of low-frequency wave hazards would increase, and 1.5-foot wave heights will no longer be limited to the wall. At this threshold, the incorporation of the secondary seawall cap would be necessary for continuing resilience of the NOAA facility, and would ensure operation of the structure at optimum design for hazard mitigation.

3.3.2 Wave Loading on Sheet Pile Wall

Although the scope of this project is for a design cap elevation of 9.2 feet (NAVD88), the wall should be designed to support the loading of the 10.5-foot (NAVD88) secondary cap that could be incorporated at a later date. The wave loading calculations for the sheet pile wall consider both the primary design elevation and additional forces for the secondary cap elevation. The wave loading for the wall was conducted using the Goda formula, modified for breaking wave conditions (Goda, 1974; Takahashi et al., 1994). Goda provides a linear trend of pressures that varies about the maximum pressure at the water level. The equations for this analysis are summarized in the CEM (USACE, 2011).

The following four scenarios were evaluated to ensure that a conservative wave loading result was considered in the concept design (all elevations relative to NAVD88):

- Scenario 1: 9.2-foot wall elevation assuming a 9.2-foot water level, including hydrostatic pressure.
- Scenario 2: 9.2-foot wall elevation assuming a water level of 1-percent-annual-chance SWEL + 50-year SLR, not including hydrostatic pressure.
- Scenario 3: 10.5-foot wall elevation assuming a 10.5-foot water level, including hydrostatic pressure.
- Scenario 4: 10.5-foot wall elevation assuming a water level of 1-percent-annual-chance SWEL + 50-year SLR, not including hydrostatic pressure.

For the primary and secondary wall elevations, there is a scenario that models the water level equal to the wall cap elevation, with no standing water on the landward side of the wall (Scenarios 1 and 3). This scenario would only occur if there was no ponding of water on the interior side of the wall, which would only be realistic if the surrounding facilities prevent flooding and pluvial flooding does not occur. This calculation was conducted assuming that neighboring FLETC shoreline facilities take flood mitigation steps that would further prohibit flooding from reaching the NOAA site laterally. Scenarios 2 and 4 model a scenario where the wall is fully inundated on both sides. All cases assume a depth-limited wave at the toe of the wall.

Table 11 provides the wave loading results for the four scenarios. The two most conservative values are associated with the secondary wall cap.

Table 11. Wave Loading Results for Seawall

Scenario	Wall Elev (ft NAVD88)	Water Elev (ft NAVD88)	Wave Loading (lb/ft)	Hydrostatic Loading (lb/ft)	Total Loading (lb/ft)
1	9.2	9.2	1,346	723	2,069
2	9.2	12.63	2,024	N/A	2,024
3	10.5	10.5	2,100	1,173	3,272
4	10.5	12.63	2,600	N/A	2,600

3.3.3 Stone Sizing

As shown in Figure 24, the seawall will be located near the existing chain-link fence. A revetment was designed for the stabilization of the shoreline fronting the seawall. The stone size of the armor layer was designed using the Rubble-Mound Revetment Design module of the ACES application, which applies the Van der Meer stability number for the slope stability coefficient (USACE, 1992). The nominal stone diameter of D50 was calculated using the Hudson equation (Hudson, 1958). The water depth was assumed to be approximately around -2.5 feet NAVD88, relative to the 1-percent-annual-chance SWEL (+2.5 feet SLR) and the structure slope is assumed to be 1:3, consistent with the existing condition shoreline slope. The resulting stone size gradations of the armor layer are provided in Table 12 and are based on gradation recommendations in ACES. The thickness of the armor layer is 4.25 feet.

Table 12. Stone Size Gradations of Armor Layer

% less Than by Weight	Weight (lb)	Dimension (ft)
0	199	1.1
15	635	1.6
50	1,588	2.1
85	3,113	2.7
100	6,352	3.4

The input wave conditions from Section 2.3 were used for the revetment design. These high wave conditions are important for the critical design aspects, such as the floating pier, piles, and seawall. With approval from NOAA, the final design could consider a less severe wave and storm condition for the revetment design, as this design aspect is a supplemental shore stabilization measure and not as critical as the other design components of this project.

3.4 Resilient Flood Curbs

Section 3.3 notes that the seawall was designed to meet high-frequency and low-frequency flood hazard mitigation goals, specifically for the Cooper River shoreline. An evaluation of flood risks at the site determined that additional components were needed to mitigate flooding and wave exposure from other directions. As shown in Section 2.2, the elevations to the west and east of the site are relatively low and could allow floodwater to encroach on the site (Figure 12). In this case, the seawall would be mitigating risks from flooding that occurs directly along the river but would not address the lateral inflow of floodwater from adjacent areas.

Concrete flood protection structures at some property boundaries are proposed to reduce flooding impacts from the east and west. These structures are referred to as 'resilient curbs' in this study to differentiate the east and west flood protection from the seawall along the Cooper River. Figure 23 shows the East Resilient Curb and West Resilient Curb concept design locations, generally situated along the east and west property boundaries. The East Resilient Curb would tie into the seawall to the north, approximately 40 feet from the 90 degree turn of the seawall. The southern extent of the East Resilient Curb would end approximately 110 feet south of the end of the seawall, where the ground elevations are above 7.5 feet NAVD88. The West Resilient Curb would tie into the elevated bulkhead platform, approximately 40 feet from the shoreline where the concrete platform ends. The southern extent of the West Resilient Curb would end approximately 50 feet of South Hobson Avenue. Figure 25 provides a visualization of high-frequency coastal flooding conditions at the NOAA facility and how the three concept design walls can function to prevent flooding of the interior site during a coastal event.

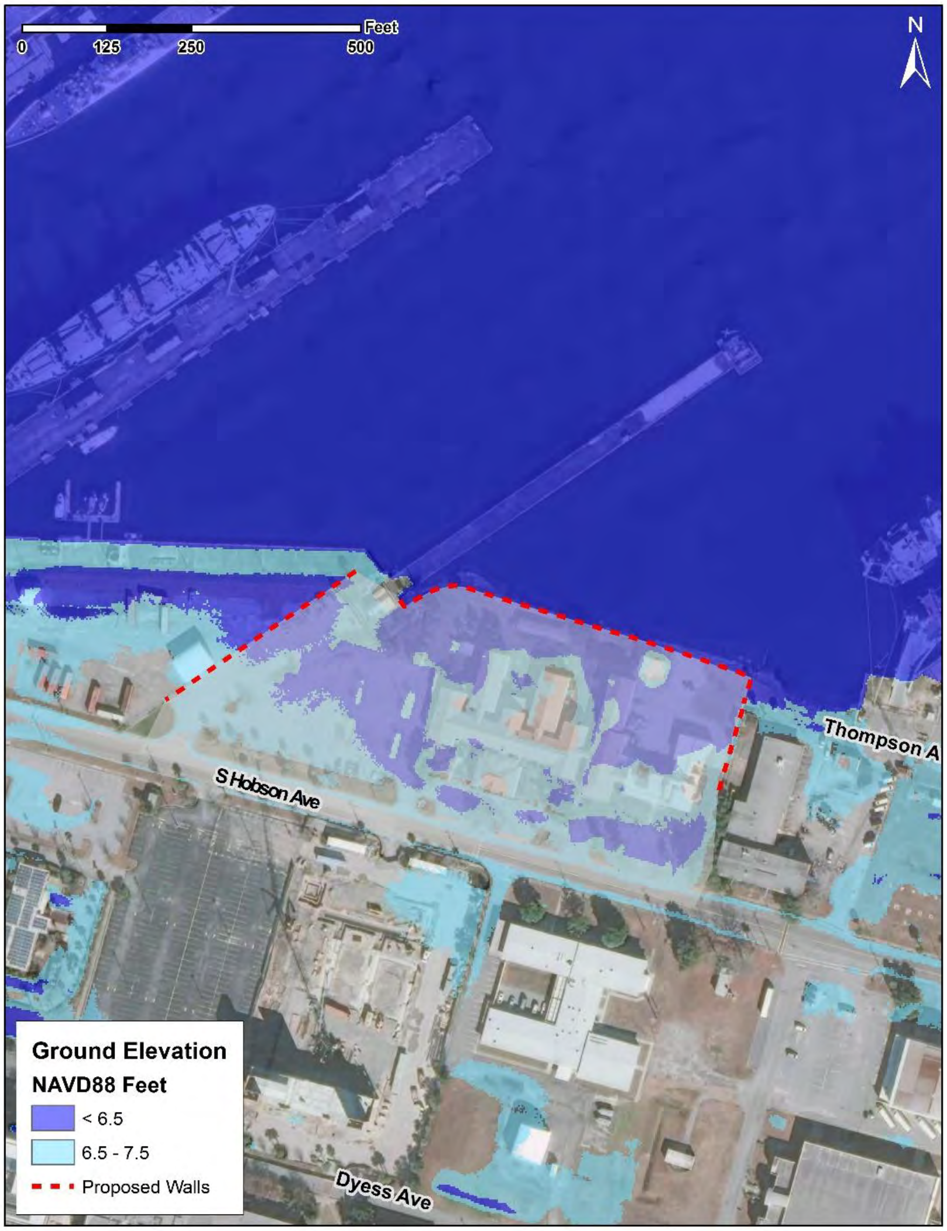

Figure 25. Visualization of seawall and resilient curb mitigation of high-frequency coastal flooding

3.4.1 Wall Cap Elevation Design

The design elevations of the resilient curbs consider similar goals to that of the seawall with respect to high-frequency flooding and low-frequency wave hazards. Risks from lateral flooding from adjacent areas are primarily due to inundation, but the eastern and western property boundaries differ in their orientation and exposure to wave risk.

The East Resilient Curb location is assumed to have a negligible risk of wave attack due to the angle of the shoreline and sheltering from buildings, bulkheads, and piers. The 40-foot inland extent of the seawall is assumed to provide a reasonable protection from low-frequency waves and diffraction of any waves that could reach the East Resilient Curb. The primary goal of the

East Resilient Curb is to protect the site from high-frequency flooding, including SLR. As noted in Figure 13, once water levels reach approximately 7.5 feet (NAVD88), inundation can begin to reach the site from South Hobson Avenue, the roadway immediately south of the NOAA facility. Assuming no hydraulic connectivity through stormwater, no contributions from rainfall, and no grade elevation changes to neighboring areas of FLETC, the maximum coastal inundation protection that could be provided by the seawall and resilient curbs is approximately 7.5 feet NAVD88. Consequently, the concept design elevation of the East Resilient Curb is 7.5 feet NAVD88, as shown in Table 13. This elevation would be relatively small compared to the terrain, which is approximately 6 feet (NAVD88) near the end of the seawall and increases to over 7.5 feet (NAVD88) at the southern extent of the East Resilient Curb. Because the primary hazard along the eastern property boundary is due to inundation rather than waves, a secondary cap elevation design is not recommended for the East Resilient Curb.

Table 13. Concept Design Elevations of Resilient Curbs

Design Scenario	Design Cap Elevation (ft NAVD88)
Primary East Resilient Curb Cap	7.5
Secondary East Resilient Curb Cap	N/A
Primary West Resilient Curb Cap	9.2
Secondary West Resilient Curb Cap	10.5

The West Resilient Curb location is exposed to low elevation pathways for high-frequency flooding that would allow water levels above 6.5 feet (NAVD88) to extend into the NOAA facility. Unlike the East Resilient Curb, the West Resilient Curb location is exposed to wave attack due to its orientation relative to the Cooper River and lack of sheltering from vegetation or development. Overland wave modeling in Section 2.2 showed that the low-frequency wave hazard across the west property boundary could impact a significant portion of the NOAA property including the area of the proposed warehouse.

The modeling results showed that the West Resilient Curb concept design should have a similar cap elevation as the seawall concept design to mitigate high-frequency flood risk and provide similar levels of low-frequency wave hazard resilience. Like the seawall, the West Resilient Curb design would benefit from a secondary cap elevation that would be triggered for construction when 20-year NOAA Intermediate SLR projections are nearly met. The elevation of the West Resilient Curb will appear approximately 2 to 3 feet high relative to the 6- to 7.5-foot (NAVD88) grade elevations along the western property boundary.

The addition of the East Resilient Curb and West Resilient curb with the Seawall will create a barrier across 3 of 4 borders of the property. This change could impact the rain-based runoff for the NOAA facility or for neighboring areas. For example, the asphalt loading area near the northeastern extent of the property appears to run slightly downhill towards the Cooper River, indicating that some pluvial runoff may drain directly into the Cooper River without entering the stormwater system. In this case, the Seawall could restrict site drainage or produce ponding of water in some low-elevation areas. The final design should consider the impacts of the design to site drainage and stormwater function, including the impacts of coastal flooding coincident with a rainfall event. As noted in Section 1.2.3 and Figure 9, the impacts of rain events with high coastal water levels can limit the function of gravity-driven stormwater outfalls due to the reduction of head difference. Figure 10 identified three recent storm events that were characterized by high coastal water levels and heavy rain, suggesting that this type of combined flood risk could occur within the design life of this project.

3.4.2 Wave Loading

Wave loading for the West Resilient Curb is provided to account for depth-limited waves that could impact the wall. Wave loading for the East Resilient Curb is not necessary. The modified Goda formula was applied to calculate wave loads. As the more conservative wave loading occurs from modeling the secondary cap elevation, the following two scenarios were evaluated:

- Scenario 5: 10.5-foot wall elevation assuming a 10.5-foot water level, including hydrostatic pressure.
- Scenario 6: 10.5-foot wall elevation assuming a water level of 1-percent-annual-chance SWEL + 50-year SLR, not including hydrostatic pressure.

Table 14. Wave Loading Results for West Resilient Curb

Scenario	Water Elev (ft NAVD88)	Wall Elev (ft NAVD88)	Wave Loading (lb/ft)	Hydrostatic Loading (lb/ft)	Total Loading (lb/ft)
5	10.5	10.5	1,220	649	1,869
6	12.63	10.5	1,667	N/A	1,667

3.5 Warehouse

NOAA scoped an additional warehouse facility at the site that will be located in the southwestern parking area. Based on the FEMA flood zone designation (Figure 8), the lower floor of the warehouse will be subject to flooding during the 1-percent-annual-chance event. Although the flood hazard structures will lower the risk of wave damage for the warehouse, it will not prevent the structure from being inundated. Under NFIP regulations, the warehouse will be required to include floodproofing in the structure design.

3.6 Living Shoreline Alternatives

An optional living shoreline alternative was evaluated for feasibility and design. Living shorelines are a method of mitigating both shoreline erosion and flood hazard risks by using natural components of the estuarine environment, sometimes in combination with engineered components, as a planned defense system. Studies consistently show that living shorelines outperform “gray” erosion control methods (e.g., bulkheads, revetments, etc.) in mitigating shoreline erosion and limiting wave hazards (Polk and Eulie, 2018). In a study conducted by AECOM (AECOM, 2020) for SCDNR, it was observed that living shoreline installations of oyster bags offshore of vulnerable estuarine shorelines not only lessened the magnitude of coastal storm surge but decreased the wave height and duration of wave attack along the shoreline.

Research following Hurricane Matthew suggests that living shorelines are more beneficial and resilient compared to traditional structures such as bulkheads. This research concluded that homes with natural shorelines sustained less damage from the storm event than homes with bulkheads, possibly because homes with bulkheads were closer to the shoreline on average (Smith and Scyphers, 2019). In addition to providing the substantial benefits of shoreline erosion mitigation, living shorelines benefit the nearby environment through improved water quality, habitat enhancement and rehabilitation, and reduced long-term project cost (installation and maintenance).

3.6.1 Suitability of the Site

An evaluation of the suitability of the site was conducted to ensure appropriate survival conditions for a living shoreline project. SCDHEC, in partnership with TNC, provided modeling results that evaluated the suitability of local shorelines for living shorelines use-based wind-wave energy, boat wake energy, and maximum fetch conditions (https://maps.coastalresilience.org/southcarolina/living-shorelines/). According to this tool, the NOAA site features the following energy conditions deemed suitable for successful living shoreline conditions:

- Low relative wind-generated wave energy (less than 200 Joules per meter), consistent with the threshold for intertidal oyster reefs.
- Low-level boat wake energy, determined as a function of potential boat wake energy, waterway width, and wake travel distance.
- Low relative maximum fetch, indicating that sites with a maximum fetch distance of less than 2.75 miles in length is at a lower level of wind-generated wave energy potential.

In addition to the wave energy levels at the site, the proximity of oysters at an existing site is a useful consideration for the implementation of a living shoreline (SCDNR, 2019). Site visits indicate that there is already an established, healthy oyster population on the hardened structures (piles, bulkheads, and utilities) along the site shoreline, as shown in Figure 26. This suggests that oyster colonization of a designed sill is likely, and that oyster survival is good.

Figure 26. Evidence of oyster growth at Pier Romeo

Further, aerial imagery and visual inspection from the site visit shows that a small tidal flat has developed in the sheltered area between the existing pier and shoreline. This confirms a low wave energy environment and suggests that sediment deposition is sufficient to sustain a wetland environment at this portion of shoreline.

3.6.2 Living Shoreline Design

Common living shoreline systems integrate nature-based hardened elements like oyster reefs and sills with “soft” components like sediment fill and planted vegetation (Figure 27). The configurations of living shorelines are highly dependent on site conditions, primarily with regard to fetch and wave climate (USACE, 2021). Areas exposed to longer fetches or subject to higher wave climates generally require “gray” or hardened nature-based elements (revetments, sills, reefs, etc.) to reduce the wave energy affecting the softer components. Living shorelines can, under some circumstances, be self-sustaining, as oysters will continue to repopulate and build the reef upward to keep pace with the tidal regime, and sediment will continue to accrete landward of the reef and sustain a steadily rising marsh platform. Additionally, more landward components, such as maritime forests, can be included to support a more natural ecological progression and enhance the effectiveness of the overall system (Bridges et al., 2021).

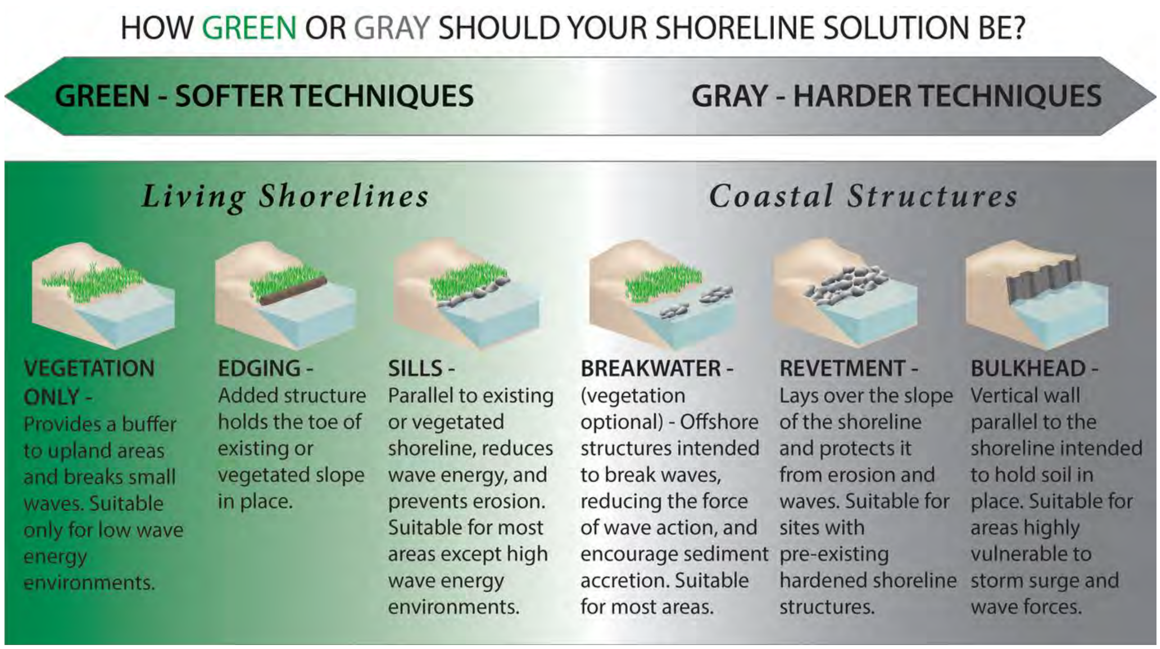

Figure 27. Living shoreline components versus hardened structures (NOAA, 2017)

The concept design for the living shoreline is a hybrid solution, combining a marsh platform protected by a rock sill. A hybrid approach was proposed at the site for the following reasons:

- The existing condition shoreline is relatively steep (1:3) and already stabilized by a rock revetment. Steep shorelines are less suitable for purely green solutions (SCDNR, 2019).
- Fetch lengths surrounding the property are approximately 1 mile. Many regional guidelines, including those for North Carolina, Virginia, Delaware, and the Gulf Coast, recommend hybrid living shorelines under these fetch conditions (Creighton, 2021).
- Dredging proposed at the pier could increase shoreline erosion risk. A rock sill will help stabilize the shoreline and reduce long-term maintenance of the living shoreline project.

Figure 28 shows the conceptual living shoreline consisting of a riprap sill located within the tide range, fronting a sloped fill area with marsh grass plantings. The marsh sill or breakwater is a type of edging that has been constructed in several Atlantic Coast states, including North

Carolina (Myszewski and Alber, 2016). Several comparable marsh sill living shoreline designs were referenced for this concept design, such as the Webster Field Annex living shoreline in Maryland (Hardaway and Duhring, 2010). The Harkers Island living shoreline and Sneads Ferry living shoreline projects in North Carolina are two additional examples of marsh living shorelines protected by armor stone (NC Coastal Federation, 2018).

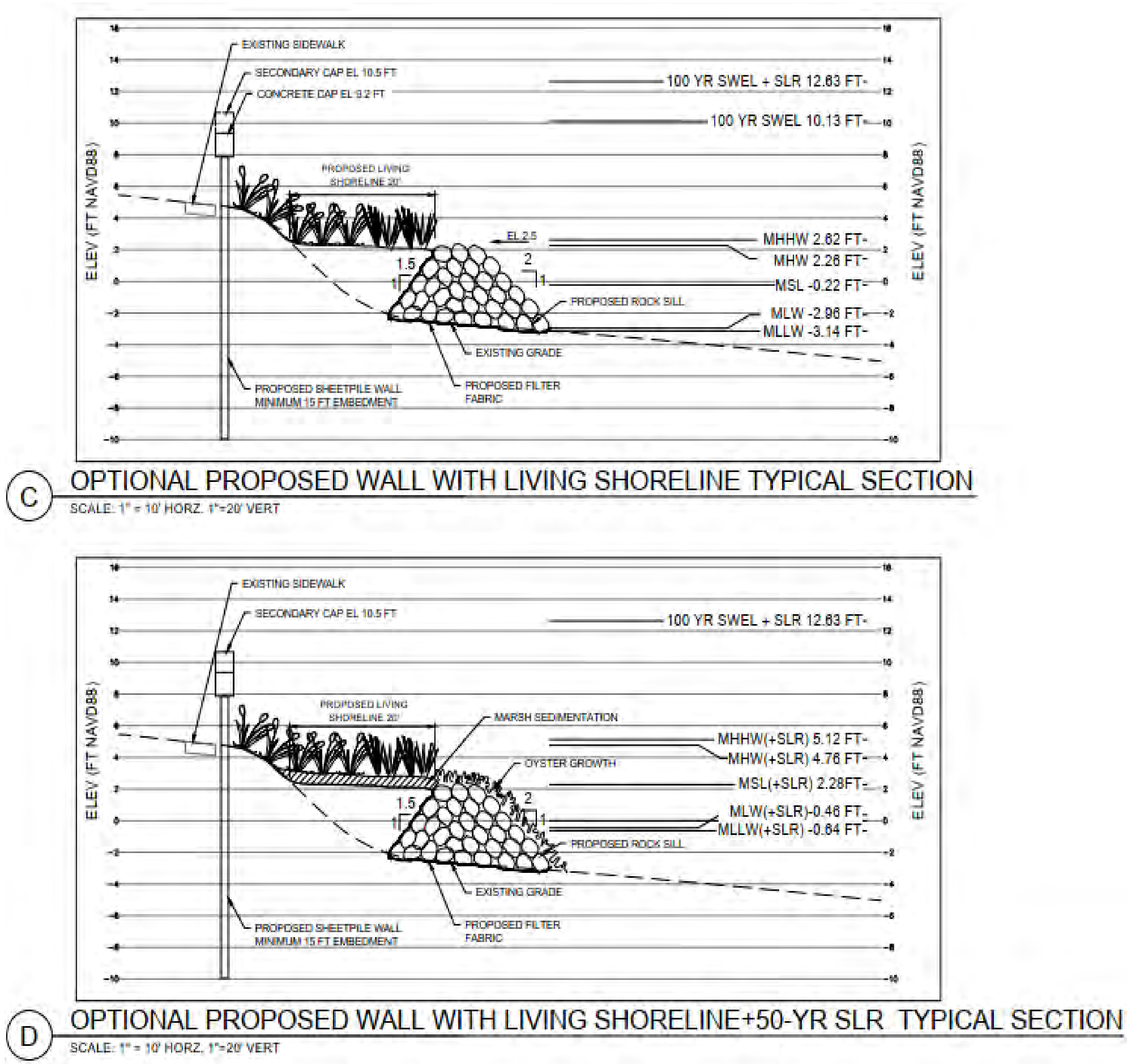

Figure 28. Conceptual design of living shoreline at construction (top) and an illustration of a healthy living shoreline condition under the influence of SLR

Concept Design Elevation and Width

The height of the living shoreline sill and marsh platform range between 2 and 2.5 feet NAVD88. An elevation at the upper range of local tide conditions was chosen because higher living shoreline system elevations often correspond to higher levels of protection (Hardaway and Duhring, 2010). The inland portion of the living shoreline would be composed of a marsh platform. The seaward extent of the marsh platform would be at approximately 2 feet (NAVD88) increasing landward to approximately 2.5 feet (NAVD88) where the platform meets the existing shoreline. These elevations correspond to elevations of healthy marsh systems in neighboring areas. One such example located in Charleston Harbor is a 2- to 3-foot elevation (NAVD88) marsh area protected by armor stone, shown in Figure 29 at various levels of tidal inundation. Based on these elevations of the concept design, Mean High Water (MHW) and Mean Higher High Water (MHHW) tide conditions would permeate through the rock sill and flood portions of the marsh, similar to this example. The design would allow tidal flow to deliver sediment into the fringe marsh to replenish nutrients and allow the marsh to maintain elevation during periods of SLR.

Figure 29. Charleston Harbor marsh system example at various tide levels, protected by armor stone (images courtesy of Google Earth and Bing Maps)

The concept design width, or encroachment, would call for 20 feet of marsh to extend past the existing conditions shoreline, with additional marsh plantings incorporated into the bank between the marsh platform and the proposed seawall. The width of the marsh platform could be adjusted in the final design with the understanding that a wider extent of marsh plantings would correspond to an increase in wave attenuation from the vegetation. One study reported that in the first 8 feet of marsh vegetation, 50 percent of wave energy is dissipated, and 100 percent of wave energy is dissipated in 100 feet of marsh (Walker et al., 2011). Additionally, inland banks can erode if the marsh is too narrow. The *Virginia Living Shorelines Guidelines* notes that protective marsh fringe is typically 10 to 20 feet from the marsh edge to upland banks (Hardaway and Duhring, 2010).

In the final design, modeling should examine the wave climate and currents in proximity to the NOAA facility shoreline to ensure that the combined impacts of dredging and living shoreline encroachment do not significantly change the energy potential at the shoreline. Consideration should also be given to adverse impacts on neighboring shorelines, as these factors may influence the location and width of the final living shoreline footprint.

Marsh Platform Sediment and Vegetation

The marsh platform would ideally be constructed with sediment that resembles the composition of the area marshes. Fill with sediment consisting of lower clay/silt composition up to clean sand can be used. The contractor will need to determine the soil characteristics of the existing fringe marsh and availability of fill material for the area to ensure a sediment source with an appropriate fine-particle fraction is available. Sediments with a lower mud fraction tend to be easier to work with in the construction phase and can allow faster vegetation establishment. The cost of fill will vary based on the sediment being placed for both the quantity of needed fill material and construction cost.

The vegetation planting for the site will include native low and high marsh species for the area, spaced approximately 1 to 1.5 feet apart, with fertilizer applied during installation. Common, easy to purchase species that would be ideal for the site include smooth cordgrass (*Sporobolus alterniflorus*), saltmeadow cordgrass (*Sporobolus pumilus*), and black needlerush (*Juncus roemerianus*). These species are commonly found intermixed in southeastern U.S. saltmarsh environments with the succession from lower to high marsh environments generally occurring as *S. alterniflorus, J. roemerianus,* and *S. pumilus*. These plants represent core marsh grass species and would provide the basis for a healthy marsh environment with the possibility of natural seeding of additional species occurring in the future. Approximately 60 to 66 percent of the grass plantings should be *S. alterniflorus*, 20 to 25 percent *S. pumilus*, and 14 to 15 percent *J. roemerianus*. *J. roemerianus* is not available in all areas, though local nurseries do stock it for this purpose, but exclusion of this species is acceptable if necessary.

As shown in the 50-year SLR illustration of the typical section in Figure 28 the vegetation is expected to further stabilize the shoreline through sediment trapping. In a North Carolina study, sediment accretion rates in restored marshes landward of a stone sill have been 1.5 to 2 times greater than accretion rates recorded in natural marshes (Myszewski and Alber, 2016). The plant roots are also expected to slow erosion and stabilize the soil (Feagin et al., 2009).

Rock Sill

The rock sill or breakwater would be a mounded structure of approximately 2.5 feet in crest elevation (NAVD88) underlain by geotextile fabric to mitigate loss of sediment to the Cooper River. The seaward slope of 1:2 and landward slope of 1:1.5 were supported by similar rock sill designs. The stone size calculations used the same methodology as stone calculations for Section 3.3.3 utilizing a steeper slope and a deeper toe based on the design. Results in Table 15 show a D50 of 2.6 feet is recommended for the rock sill design. Armor rock is recommended to be a minimum of 800 to 2,000 pounds for a medium wave climate (Hardaway and Duhring, 2010).

Table 15. Stone Size Gradations for Living Shoreline Armor Layer

% less than by weight	Weight (lb)	Dimension (ft)
0	365	1.3
15	1,167	1.9
50	2,917	2.6
85	5,718	3.3
100	11,670	4.1

Pre-population of the sill with oysters is an option if faster colonization is desired, but a bare sill would eventually become populated naturally. Evidence from the site indicates that the area is amenable to oyster reef development based on the substantial encrustation of the existing dock and piers with living oyster colonies. Figure 28 shows that the oyster growth is expected to increase the sill height as SLR continues to increase the tide range. If settlement or a slow oyster growth rate occurs during the lifetime of the project, an additional layer of armor stone could be used to continue to stabilize and increase sedimentation of the marsh platform.

Maritime Forest

In addition to the living shorelines component along the water, an optional living shoreline component of a planted maritime forest area landward of the proposed seawall is recommended. The design would replace approximately 0.3 acres (approximately 13,200 square feet) of the site area landward of the wall, currently covered by invasive turfgrass, with native, salt-tolerant flora commonly found in the salt marshes of the Southeastern U.S. Figure 30 shows possible locations for native plantings at the NOAA facility. The addition of the maritime forest plantings will enhance the effectiveness of the lower components of the living shoreline and will further reduce wave hazards. Rainfall infiltration rates are also expected to be higher for maritime forest areas, compared to turf grass. Maritime forests in South Carolina contain species such as oaks, pines, palms, magnolia, and sweetgrass.

Figure 30. Conceptual maritime forest footprint for the NOAA facility

3.6.3 Added Benefits of Project

Living shorelines provide a wide variety of benefits for the site, both in hazard mitigation and environmental rehabilitation. North Carolina studies have documented that marshes constructed with sills had no damage due to previous hurricane events, whereas numerous surveyed bulkheads were damaged (Myszewski and Alber, 2016). The reduction in wave effects and overall stormwater levels due to the presence of a living shoreline has the direct impact of mitigating a level of storm-induced wave damage, but also indirectly benefits flood control structures inland of the shoreline by reducing stress on the structure and lengthening design life. The fringe marsh and sill will reduce incoming wave energy on the wall by increasing drag in the water column. The maritime forest plantings would play a similar role by lessening wave regeneration inland of the seawall, thus lowering the wave risk for the buildings at the site. Additionally, the root mass of both the maritime forest and marsh vegetation will contribute to soil stabilization, which will reduce the risk of shoreline erosion.

Living shorelines also have the ability to migrate naturally in response to SLR. The presence of vegetation can trap more sediment that can, over time, rebuild low-lying portions of eroded shorelines (NOAA, 2017). Oyster reef growth rates have also been shown to outpace the rate of SLR (Rodriguez et al., 2014).

In addition to the hazard mitigation value provided by a living shoreline system, benefits to local estuarine and marine systems are also associated with living shorelines. Oyster reefs are a well-known water quality improvement mechanism in the coastal environment. A single adult Eastern oyster (*Crassostrea virginica*), the primary species of oyster along the Eastern and Gulf Coast shorelines, can filter up to 50 gallons of water per day (Chesapeake Bay Foundation, 2022). Furthermore, marsh flora and the marsh platform itself are important filter mechanisms for pollutants and silt from coastal areas, which would reduce the dredging frequency necessary for the adjacent pier. Marsh platforms and oyster reefs provide important habitat for dozens of species of fish and invertebrates for breeding, feeding, and nesting.

Implementation of living shoreline projects can provide economic benefits in the form of improved aesthetics, increased recreation opportunities, and ecotourism. Marine recreation is a highly valuable industry to coastal communities, and improved water quality and filtering capacity provided by living shorelines can reduce the risk of beach closures due to poor water quality (Arkema, Scyphers, and Shepard, 2017).

Salt marshes and oyster reefs also function as important carbon sinks. Carbon sequestration in coastal wetlands is known as “coastal blue carbon,” and has a long-term potential of storing approximately 75 grams of carbon per meter per year (NOAA, 2015).

Establishing a maritime forest-type area on the site would serve a similar role in increasing habitat health and availability and encouraging faunal diversity at the site while decreasing the footprint of the site requiring landscaping. The altered landscape would increase carbon sequestration at the site, offsetting carbon emissions for the facility. More directly, maritime forest landscaping would reduce the footprint that requires landscaping care, which is generally completed using fossil fuel-powered equipment. This landscaping update would also provide expanded habitat that would work in concert with the living shoreline, as multiple species use areas such as these as shelter during storm events. Recommended plantings would include wax myrtle (*Morella cerifera)*, yaupon holly (*Ilex vomitoria*), marsh elder (*Iva frutescens*), wild olive (*Osmanthus americanus*), groundseltree (*Baccharis halimifolia*), and seaside goldenrod (*Solidago sempervirens*).

Importantly, the incorporation of a living shoreline component to the project would contribute to compliance with Executive Order 14057 *Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability* (2021). A majority of the project materials can be sourced locally, specifically the fill and planting materials, and local businesses could provide or support the installation as the local industry has an array of resources that specialize in these projects. Cost savings may also be obtained by partnership with local non-profits or academic institutions that could provide contributions to the project through installation and monitoring.

4.0 Summary of Findings and Recommendations

This Coastal Study Report provides technical documentation to support the Basis of Design for the NOAA OMAO Southeast Marine Operations Hub Project. The report is intended to explain the site conditions and existing and future flood risks to support several components of the concept design. A current analysis was conducted to document the storm current velocity in proximity of the pier. A fetch-limited wave analysis was performed to provide wave conditions for the site, which were used to produce wave loading calculations for the piers, piles, and walls.

Key AECOM findings and recommendations are summarized below:

4.1 Design Input Conditions

- **Design Water Levels:** High-frequency and low-frequency water levels were provided with and without a 2.5-foot SLR contribution (NOAA projection). Additional elevations and consideration to the 20-year SLR condition is provided in Section 2.2.

Approximate Site Location	Existing Condition (no SLR) (ft, NAVD88)	50-Year Condition (ft, NAVD88)
High-frequency: Moderate Flooding (NOAA NWS)	4.36	6.86
High-frequency: Major Flooding (NOAA NWS)	4.86	7.36
Low-frequency: 1-percent-annual-chance SWEL (FEMA)	10.13	12.63

- **Fetch-Limited Wave Conditions:** ACES modeling including low-frequency design water levels and radial fetch lengths. The final design should incorporate 2-D wave modeling with consideration to roughness of marsh areas and influence of surrounding pier and wharf structures.

Approximate Site Location	Wave Direction (deg)	Wave Height (ft)	Wave Period (sec)
Cooper River Shoreline	9	7.43	4.78
Pier (N)	5	7.58	4.86
Pier (NW)	305	7.22	4.68

- **Current Velocities:** Current loads for purposes of computation of mooring loads and forces on marine structures should be assumed to be a maximum of 6.75 feet per second (4 knots). The final design should incorporate 2-D current modeling to include the proposed dredged elevations of the site and surrounding areas.

Condition	Current Velocity (ft/s)
NOAA Predicted Velocity for Cooper River	6.40
Modeled Velocity for Hurricane Hugo, relative to NOAA Pier Romeo	1.45

4.2 Floating Pier and Small Craft Pier

- **Design Elevation:** Based on the design water levels provided, the trestle and pier design elevations should account for approximately 12.6 feet (NAVD88) water levels and should consider additional freeboard due to wave risk.
- **Wave Loading for Pier:** Wave loading on the floating pier and small craft pier is computed as:

Design Condition	Kriebel Wave Loading (lb/ft)	Nagai Wave Loading (lb/ft)
Floating Pier Romeo – *Wave 305 deg from North*	4,059	4,323
Floating Pier Romeo – *Wave 5 deg from North*	4,260	4,612
Small Craft Pier – *Wave 305 deg from North*	1,389	1,496
Small Craft Pier – *Wave 5 deg from North*	1,383	1,578

- **Wave Loading for Piles:** Wave loading for cylindrical piles are shown as (additional design diameters included in Section 3.1.1):

Diameter	Total Inertia Force (lb)	Total Drag Force (lb)	Combined Total Force (lb)
2	1,069.1	318.0	1,387.1
4	4,276.2	636.0	4,912.2

4.3 Cooper River Seawall and Resilient Curb Concepts

- **Concept design cap elevation and horizontal load components:** Primary and secondary wall conditions for each concept design section with wave and hydrostatic loading considering the secondary cap elevation. Maximum total loading results shown, with intermediate results provided in Section 3.3.2 and Section 3.4.2:

Design Scenario	Primary Design Cap Elevation (ft NAVD88)	Secondary Design Cap Elevation (ft NAVD88)	Wave Loading (lb/ft)	Hydrostatic Loading (lb/ft)	Total Loading (lb/ft)
Cooper River Seawall	9.2	10.5	2100	1173	3272
East Resilient Curb	7.5	N/A	N/A	N/A	N/A
West Resilient Curb	9.2	10.5	1220	649	1869

- **Flood and wave hazard mitigation:** The elevations of for the seawall and curbs are intended to prevent high-frequency flooding and decrease low-frequency wave hazards as detailed in Sections 2.2 and Section 3.3.1.
- **Wall Locations:** The extent of the wall location shown in Figure 23 were intended to meet the flood and wave hazard mitigation goals and tie into elevations above 7.5 feet NAVD88.
- **Cooper River Riprap Armoring:** The D50 armor stone recommended is approximately 2.1 ft. Two layers of stone and a 1:3 slope is recommended. Note, this design is based on 1-percent-annual-chance SWEL + SLR with conservative wave conditions. A stone sizing for a less-extreme event could be a way to find cost savings from the project.

- **Stormwater Recommendations:** Flooding from pluvial hazards have not been accounted for in this analysis. The concept design of the East Resilient Curb, Seawall, and West Resilient Curb could impact the hydrology of the site, eliminating sheet flow water from draining directly from the parcel into the Cooper River. The final design should consider impacts of the design to site drainage and stormwater function, including the impacts of coastal flooding coincident with a rainfall event.

4.4 Warehouse Concept

- **Flood Considerations:** Warehouse design should consider flood protection to meet minimum NFIP standards.

4.5 Living Shoreline Concept

- **General Living Shoreline Geometry:** The concept design is recommended to be a hybrid marsh with rock sill as a full green infrastructure solution would likely require more maintenance. The 2- to 2.5-foot elevation (NAVD88) marsh platform would allow for high tide flooding and sedimentation of the marsh. The 20-foot marsh width of the living shoreline could be adjusted based on cost, and proximity to dredge footprint. A larger corridor of marsh platform would result in increased wave attenuation between the Cooper river and the Seawall.
- **Vegetation:** *Sporobolus alterniflorus* (S. alterniflora, Smooth Cordgrass), *Sporobolus pumilus* (S. patens, Saltmeadow Cordgrass), and *Juncus roemerianus* (Black Needlerush) are recommended for the marsh portion. Black Needlerush is an optional vegetation species if unavailable. No specific recommendations are stated for maritime forest vegetation, but local salt tolerant species are listed in Section 3.6.3.
- **Rock Sill:** Rock sill elevation with 2.5-foot (NAVD88) crest elevation is recommended with a stone size D50 of 2.6 feet. Filter fabric is recommended to prevent loss of backfill.
- **Oyster Implantation:** Oyster seeding along the rock sill is recommended, but not required. Colonization is likely to occur naturally but seeding after installation would speed reef development.
- **Adverse Impact Recommendation:** Analysis of adverse impacts to NOAA site and neighboring shorelines would be needed to ensure that the living shoreline encroachment combined with the dredging footprint of the pier do not result in significant changes to the wave and current climate of the area.

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Appendix A

This appendix is a digital component. See the ‘Appendix_A_NOAA_PierRomeo.gdb’ for supplemental spatial files and topographic data associated with this study.

Appendix B

See ‘Appendix_B_NOAA_OMAO_SE_MarineOp_Hub_Project.pdf’ for design inputs, equations, and calculations associated with this study.

aecom.com

Appendix B: Conceptual Design

UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION (NOAA)

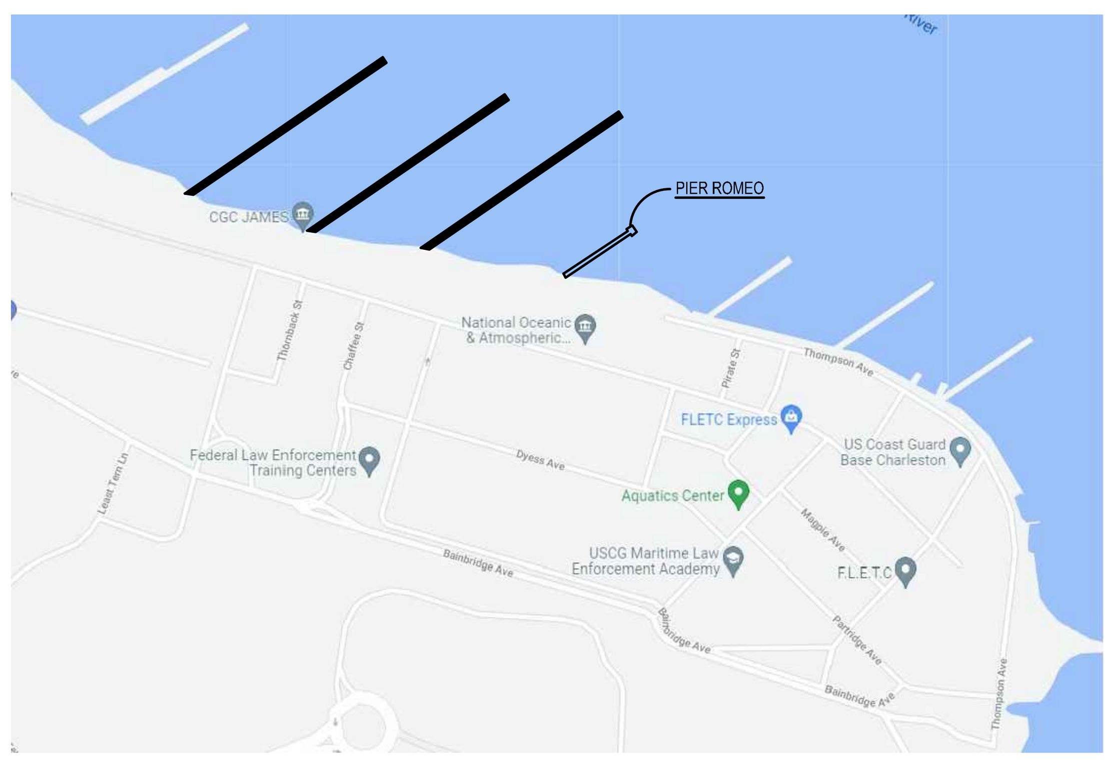
OFFICE OF MARINE AND AVIATION OPERATIONS (OMAO)
SOUTHEAST MARINE OPERATIONS HUB PROJECT
FINAL CONCEPT DRAWINGS

MAY 6, 2022
CONTRACT NO: 1305M421DNAAJ0007
TASK ORDER NO: 1305M422FNAAJ0005

ASSOCIATED DESIGN GROUP, INC.
3909 West Congress Street, Suite 201
Lafayette, Louisiana 70506
Phone: (337) 234-5710
Email: adginc@adginc.org

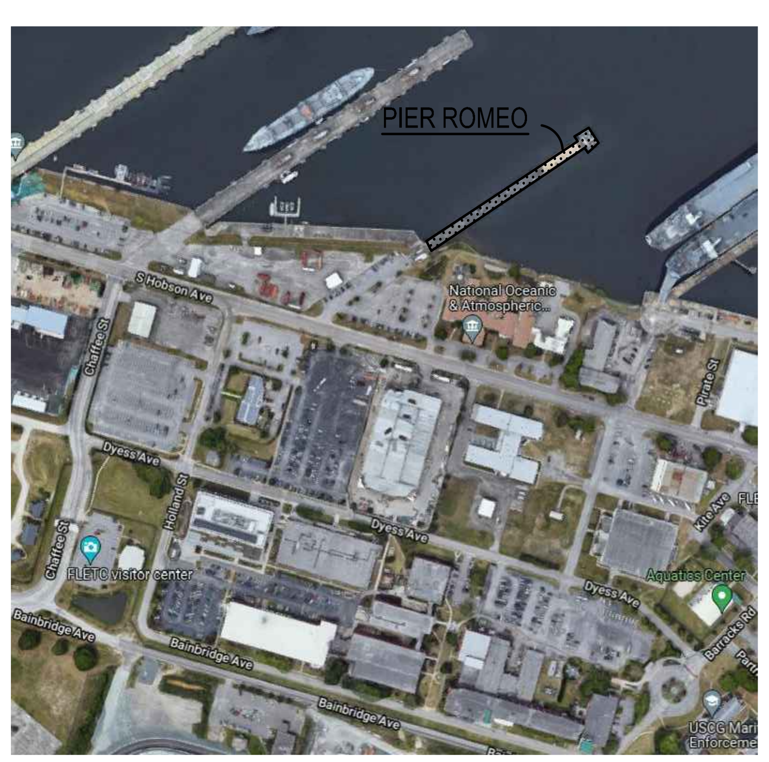
Lawrence W. Blanchette - License No. 22463
R. Craig Campbell II - License No. 29380
David B. Stelly - License No. 26070

Project No. 21260-D



(IMAGES COURTESY OF GOOGLE MAPS)

VICINITY MAP
NO SCALE
NORTH



(IMAGES COURTESY OF GOOGLE MAPS)

PROJECT LOCATION MAP
NO SCALE
NORTH

BUILDING INFORMATION

PROJECT ADDRESS
UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION
OMAO SOUTHEAST MARINE OPERATIONS HUB PROJECT
2234 S. HOBSON AVE.
NORTH CHARLESTON, SC 29405

BUILDING CODES
INCLUDING BUT NOT LIMITED TO THE FOLLOWING:

2018 SOUTH CAROLINA ICC CODES
(INCLUDING BUT NOT LIMITED TO: INTERNATIONAL BUILDING CODE, MECHANICAL CODE, FIRE CODE,)

2018 NFPA 10
2016 NFPA 13
2017 NFPA 70: NATIONAL ELECTRICAL CODE
2016 ASHRAE 90.1
2016 ASHRAE 62.1

TYPICAL ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR
CFCI	CONTRACTOR FURNISHED/CONTRACTOR INSTALLED
EL	ELEVATION
FE	FIRE EXTINGUISHER
NIC	NOT IN CONTRACT
VOJ	VERIFY ON JOB
CB	CATCH BASIN
SQF	SQUARE FEET

DRAWING NOMENCLATURE LEGEND

A - # # #

DISCIPLINE DESIGNATOR

G - GENERAL
C - CIVIL
A - ARCHITECTURAL

GENERAL NOTES

1. THE DRAWINGS AND DOCUMENTS INCLUDED ARE CONCEPT DOCUMENTS FOR USE BY NOAA. THESE DOCUMENTS ARE NOT TO BE USED FOR CONSTRUCTION, RECORDATION, CONVEYANCE, SALES OR A BASIS OF BUILDING PERMITS.
2. ALL WORK PERFORMED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS, AND ORDINANCES FROM LOCAL, STATE & FEDERAL AUTHORITIES. ALL WORK INCLUDES FURNISHING LABOR, MATERIALS, EQUIPMENT, TOOLS, SUPERVISION, START-UP SERVICES, & APPLICABLE PERMITS FOR THE PROJECT.
3. INSTALL MANUFACTURED ITEMS, MATERIALS, AND EQUIPMENT IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDED SPECIFICATIONS, EXCEPT THE SPECIFICATIONS HEREIN, WHERE MORE STRINGENT, SHALL BE COMPLIED WITH.
4. CONTRACTOR IS RESPONSIBLE FOR CHECKING ALL CONCEPT DOCUMENTS, FIELD CONDITIONS, DIMENSIONS FOR ACCURACY AND CONFIRMING THAT WORK IS BUILDABLE AS SHOWN BEFORE PROCEEDING WITH CONSTRUCTION. IF THERE ARE ANY QUESTIONS REGARDING THESE OR OTHER ITEMS, THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING CLARIFICATION FROM THE GOVERNMENT PM/COR BEFORE PROCEEDING WITH THE WORK IN QUESTION OR RELATED WORK.
5. THE PRIME PROFESSIONAL SHALL BE THE PRIMARY SOURCE FOR INFORMATION REGARDING THAT DISCIPLINE (CIVIL, MECH, ELEC, ETC.), HOWEVER IT WILL NOT BE THE ONLY SOURCE FOR COORDINATION OF DIMENSIONS, FIRE RESISTANCE, DESIGN, DETAILING AND FINISH APPEARANCE, COLOR OR TRIM FEATURES. THE CONTRACTOR IS RESPONSIBLE FOR REVIEW OF RELATED DESIGN DISCIPLINES AS THEY AFFECT COORDINATION. THE CONTRACTOR SHALL EXAMINE DRAWINGS AND SPECIFICATIONS OF ALL TRADES. NOTIFY DISCREPANCIES TO GOVERNMENT PM/COR.
6. DO NOT SCALE DRAWINGS, USE FIGURED DIMENSIONS ONLY, GOVT PM/COR WITH ANY CONFLICTS FOR RESOLUTION.
7. ALL WORK SHALL BE CONSTRUCTED IN ACCORDANCE WITH GOVERNING APPLICABLE LOCAL, STATE & FEDERAL CODES.
8. THE CONTRACTOR WILL PROVIDE ALL NECESSARY BARRICADES, SIGNAGE, REFLECTORS, LIGHTS, ETC DURING CONSTRUCTION. PROPERLY IDENTIFY AREAS CLOSED TO THE PUBLIC. VERIFY AND COORDINATE WITH GOVERNMENT PM/COR.
9. THE CONTRACTOR SHALL KEEP THE PREMISES FREE OF RUBISH AND CLEAN DAILY. DISPOSAL OF CONSTRUCTION DEBRIS/RUBISH SHALL MEET APPLICABLE GOVERNING CODES/REGULATIONS.
10. THE CONTRACTOR SHALL LOCATE ALL EXISTING SERVICES & UTILITIES WITHIN AND ADJACENT TO THE CONSTRUCTION AREA (WHERE AFFECTED) PRIOR TO COMMENCING CONSTRUCTION ACTIVITIES.
11. ALL CONDITIONS AND DIMENSIONS SHOWN ARE FOR REFERENCE ONLY AND MUST BE VERIFIED AT THE SITE. EXISTING BUILDINGS, PIERS, ROADWAYS, ARE BASED ON EXISTING DRAWINGS. UPON COMPLETION OF DEMOLITION, ALL CONDITIONS AND DIMENSIONS ARE TO BE CHECKED FOR VARIANCES. ANY UNNOTED EXISTING CONDITIONS WHICH MAY CONFLICT WITH THE PROPOSED NEW WORK AND MAY REQUIRE MODIFICATION, RELOCATION AND/OR REMOVAL, SHALL BE IDENTIFIED AND REPORTED TO THE GOVERNMENT (C.O./C.O.R.), IN WRITING, AT ONCE.
12. THE USE OF MANUFACTURER NAMES OR PROPRIETARY PRODUCT NAMES SHALL NOT BE CONSTRUED TO IMPLY THAT ONLY THE NAMED PRODUCT MAY BE USED TO THE EXCLUSION OF EQUIVALENT PRODUCTS BY OTHER MANUFACTURERS. EQUIVALENT PRODUCTS SHALL BE DEFINED AS PRODUCTS THAT HAVE BEEN APPROVED BY THE GOVERNMENT THROUGH THE SUBMITTAL PROCESS AND HAVE BEEN DETERMINED TO HAVE THE QUALITIES (TYPE, FUNCTION, DIMENSION, APPEARANCE, IN-SERVICE PERFORMANCE) AND PHYSICAL PROPERTIES THAT ARE EQUAL TO OR EXCEED THOSE OF THE SPECIFIED PRODUCT.

INDEX TO DRAWINGS

ASSOCIATED DESIGN GROUP, INC.
3909 West Congress Street, Suite 201
Lafayette, Louisiana 70506

ADG PROJECT NO: 21260-D

SEAL: CONCEPT DOCUMENTS NOT FOR CONSTRUCTION

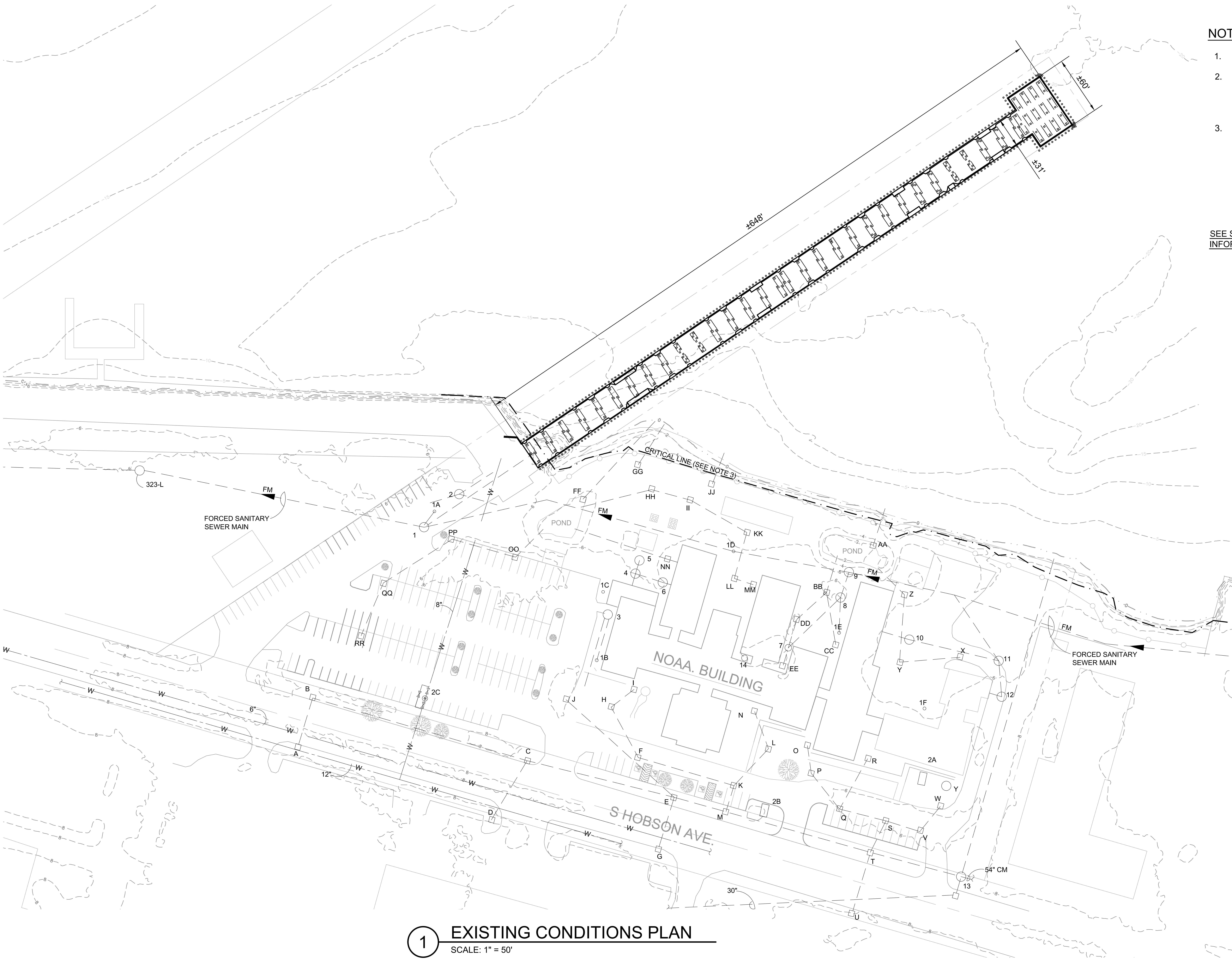
ENGINEER:
P.E. NO:
DATE:

AECOM
Axias BUILDING VALUE

UNITED STATES DEPARTMENT OF COMMERCE NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION
OFFICE OF MARINE AND AVIATION OPERATIONS (OMAO)
SOUTHEAST MARINE OPERATIONS HUB PROJECT
FINAL CONCEPT DRAWINGS
2234 S. HOBSON AVE. NORTH CHARLESTON, SC 29405

REV	DATE	DESCRIPTION

DATE ISSUED: MAY 6, 2022
DRAWN BY: SPC
CHECKED BY: LWB/LM
FILE NAME: 21260-D_G-001_Cover.dwg
DRAWING TITLE: COVER SHEET & INDEX TO DRAWINGS
REV NO. X
SHEET NO. G-001



EXISTING CONDITIONS PLAN

SCALE: 1" = 50'

NOTES:

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SEE SHEET C-101 FOR UTILITY STRUCTURE INFORMATION

N

0 25' 50' 100'

SCALE 1" = 50'-0"

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3909 West Congress Street, Suite 201
Lafayette, Louisiana 70506
Phone: (337) 234-5710
Email: adginc@adginc.org

Lawrence W. Blanchette - License No. 22463
R. Craig Campbell II - License No. 29380
David B. Stelly - License No. 26070

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OFFICE OF MARINE AND AVIATION OPERATIONS (OMAO) SOUTHEAST MARINE OPERATIONS HUB PROJECT FINAL CONCEPT DRAWINGS

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REV	DATE	DESCRIPTION

DATE ISSUED: MAY 6, 2022

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FILE NAME: 21260-D_C-100 -Ex conditions.dwg

DRAWING TITLE: EXISTING CONDITIONS PLAN

REV NO. X

SHEET NO. C-100

SANITARY SEWER STRUCTURE DATA

		Structure				Pipe			
ID	Utility	Dia (in)	Material	Depth (ft)	Depth to Standing Water (ft)	Dia (in)	Invert (ft. Below Rim)	Material	Notes
1	Sanitary	48	Conc	4.56	4.03	4	2.10 E	PVC	
						8	4.5 N	DI	
						12	4.83 SW	Clay	
						12	4.92 N	Clay	
1A	Valve Box	6		1.72					Depth of structure is to Top of Nut
1B	Valve Box	6		0.6					Depth of structure is to Top of Nut
1C	Valve Box	6		0.28					Depth of structure is to Top of Nut
1D	Valve Box	6		N/A					Top of nut above grade
3	Sanitary	48	Conc	4.37		8	4.43 N	Clay	
						4	3.41 S	DI	
						8	4.29 S	Clay	
4	Sanitary	48	Conc	4.40		8	4.16 N	Clay	
						8	4.40 E	Clay	
						8	4.16 S	Clay	
5	Sanitary	48	Conc	4.57	4.17				Structure appears to be abandoned
6	San LS	48	Conc	9.97	8.03				No pipes Visible
7	Sanitary	48	Conc & Brick	4.44					All pipes are capped
8	Sanitary	48	Conc	4.75	3.72	8	4.65 NE		
						8	4.55 SW		
9	Sanitary	48	Conc	3.82	2.92	8	3.82 SW		
10	Sanitary	48	Conc	3.72	2.04	8	3.72 E		
						8	3.72 W		
11	Sanitary	48	Conc	4.32	2.12	8	4.32 NW		
						8	4.32 SE		
12	Sanitary	48	Conc	6.54	4.54	8	5.02 W		
13	Sanitary	48	Conc	7.30	4.94				No pipes visible

WATER UTILITY STRUCTURE DATA

		Structure			Pipe			
ID	Utility	Dimensions	Material	Depth (ft)	Dia (in)	Depth to top of Pipe (ft.)	Material	Notes
2A	Water Vault	3' x 3'	Conc	4.45	4	4	DI	Depth is to top of existing 4" pipe
2B	Water Vault	4' x 4'	Conc					Cover bolted shut. No Access
2C	Water Vault	5' x 10'	Conc	5.84		3.33		Depth is to top of valve nut. Pipe not visible
						3.33		Depth is to top of valve nut. Pipe not visible

MISC./ UNKNOWN UTILITY STRUCTURE DATA

		Structure				Pipe			
ID	Utility	Dia (in)	Material	Depth (ft)	Depth to Standing Water (ft)	Dia (in)	Invert (ft. Below Rim)	Material	Notes
2	Telephone	6' x 8'	Conc	7.42	4.93		N		Unable to measure to Pipe Invert
							E		Unable to measure to Pipe Invert
							SW		Unable to measure to Pipe Invert
14	Unknown	48	Conc	4.70		4	2.41 S	DI	
						4	4.45 SE	Clay	
						8	4.70 E	Clay	

STORM SEWER STRUCTURE DATA

		Structure			Pipe			
ID	Utility	Dimensions	Material	Depth (ft)	Dia (in)	Invert (ft. Below Rim)	Material	Notes
A	Storm	3' x 4'	Conc & Brick	2.31	10	2.31 N	CMP	
B	Storm	3' x 4'	Conc & Brick	2.99	10	2.35 S	CMP	
					12	2.99 E	CMP	
C	Storm	3' x 4'	Conc & Brick	3.70	12	3.45 W	CMP	
					12	3.70 E	CMP	
					12	2.70 S	CMP	
D	Storm	3' x 4'	Conc & Brick	2.5	12	2.70 N	CMP	
E	Storm	3' x 4'	Conc & brick	4.91	12	4.11 W	CMP	
					15	4.41 NW	RCP	
					8	4.89 NE	Clay	
					15	4.91 E	RCP	
					12	3.06 S	CMP	
F	Storm	2' x 3'	Conc	3.89	12	2.53 NW	RCP	
					12	2.72 E	RCP	
G	Storm	3' x 4'	Conc & Brick	2.74	12	2.74 N	CMP	
H	Storm	2' x 3'	Conc	2.17	12	2.17 SE	RCP	
					12	2.02 NE	RCP	
I	Storm	3' x 3'	Conc	2.16	12	2.16 SW	RCP	
J	Storm	2' x 2'	Conc	2.28	15	2.28 SE	RCP	

STORM SEWER STRUCTURE DATA

K	Storm	2' x 3'	Conc	3.52	12	3.46 W	RCP	
					15	3.52 S	RCP	
					12	3.39 NE	RCP	
L	Storm	2' x 3'	Conc	3.55	12	2.93 SW	RCP	
					10	3.37 SE	PVC	
M	Storm	3' x 3'	Conc	5.11	15	5.09 W	RCP	
					15	4.95 N	RCP	
					15	5.11 E	CMP	
N	Storm	4' x 4'	Conc	2.90	10	2.90 SE	PVC	
O	Storm	2.5' x 2.5'	Conc	2.13	12	2.13 SE	RCP	
P	Storm	3.5' x 3.5'	Conc	2.60	12	2.50 NW	RCP	
					12	2.60 SE	RCP	
Q	Storm	3.5' x 3.5'	Conc	2.48	12	2.43 NW	RCP	
					12	2.38 NE	RCP	
					12	2.45 E	RCP	
R	Storm	3.5' x 3.5'	Conc	2.47	12	2.47 SW	RCP	
S	Storm	3.5' x 3.5'	Conc	2.91	12	2.73 W	RCP	
					18	2.90 S	RCP	
					10	2.90 E	PVC	
T	Storm	4' x 4'	Conc	5.60	18	5.21 N	RCP	
					15	5.60 E	CMP	
					12	2.58 S	CMP	
					15	5.46 W	CMP	
U	Storm	3' x 4'	Conc	2.35	12	2.35 N	CMP	
V	Storm	3' x 3'	Conc	2.22	10	2.22 W	PVC	
					10	2.02 NE	PVC	
W	Storm	3' Dia	Conc	1.51	10	1.51 SW	PVC	
X	Storm	2' x 2'	Conc	1.90	12	1.90 W	RCP	
Y	Storm	3' x 3'	Conc	2.4	12	2.40 E	RCP	
					15	2.05 NW	RCP	
Z	Storm	3.5' x 3.5'	Conc	3.85	15	3.85 SE	RCP	
					15	3.95 NW	RCP	
AA	Storm	3.5' x 3.5'	Conc	1.91	12	1.88 N	RCP	
BB	Storm	2' x 2'	Conc	2.32	12	2.32 NE	RCP	
					10	2.26 SW	RCP	
					12	2.12 SE	RCP	
CC	Storm	3' x 3'	Conc	2.73	12	2.73 NW	RCP	
DD	Storm	2' x 2'	Conc	1.85	10	1.85 NE	RCP	
					10	1.70 S	RCP	
EE	Storm	2' x 2'	Conc	1.45	10	1.45 NE	RCP	
FF	Storm	3.5' x 3.5'	Conc	2.28	6	2.19 W	RCP	
					12	2.28 NE	RCP	
GG	Storm	2.5' x 2'	Conc	1.9	10	1.90 NW	DI	
HH	Storm	4' x 4'	Conc	2.55	15	2.55 NW	RCP	
					15	2.45 E	RCP	
II	Storm	3' x 3'	Conc	1.95	15	1.95 W	RCP	
					15	1.70 E	RCP	
JJ	Storm	3' x 3'	Conc	4.29	12	4.29 N	RCP	
KK	Storm	5' x 5'	Conc	2.19	15	2.19 W	RCP	
					15	1.98 S	RCP	
LL	Storm	3.5' x 3.5'	Conc	2.35	15	2.35 N	RCP	
					15	2.33 E	RCP	
MM	Storm	3.5' x 2.5'	Conc	2.54	15	2.54 W	RCP	
NN	Storm	3' x 3'	Conc	2.49	18	2.49 NW	RCP	
					15	2.47 SE	RCP	
OO	Storm	3' x 4'	Conc	2.87	18	2.87 N	RCP	
					15	2.79 E	RCP	
PP	Storm	3' x 3.5'	Conc	3.00	15	2.57 E	RCP	
					15	2.68 S	RCP	
QQ	Storm	3' x 3.5'	Conc	2.91	15	2.74 N	RCP	
					15	2.75 SW	RCP	
RR	Storm	3' x 3'	Conc	3.07	15	2.96 NE	RCP	

ADG ENGINEERING

Associated Design Group, Inc.
3909 West Congress Street, Suite 201
Lafayette, Louisiana 70506
Phone: (337) 234-5710
Email: adginc@adginc.org

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R. Craig Campbell II - License No. 29380
David B. Stelly - License No. 26070

ADG PROJECT NO: 21260-D

SEAL:

CONCEPT DOCUMENTS

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ENGINEER: ______________________

P.E. NO: ______________________

DATE: ______________________

AECOM

Axias
BUILDING VALUE

NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

UNITED STATES DEPARTMENT OF COMMERCE NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION

OFFICE OF MARINE AND AVIATION OPERATIONS (OMAO)
SOUTHEAST MARINE OPERATIONS HUB PROJECT
FINAL CONCEPT DRAWINGS

2234 S. HOBSON AVE. NORTH CHARLESTON, SC 29405

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DATE ISSUED: MAY 6, 2022

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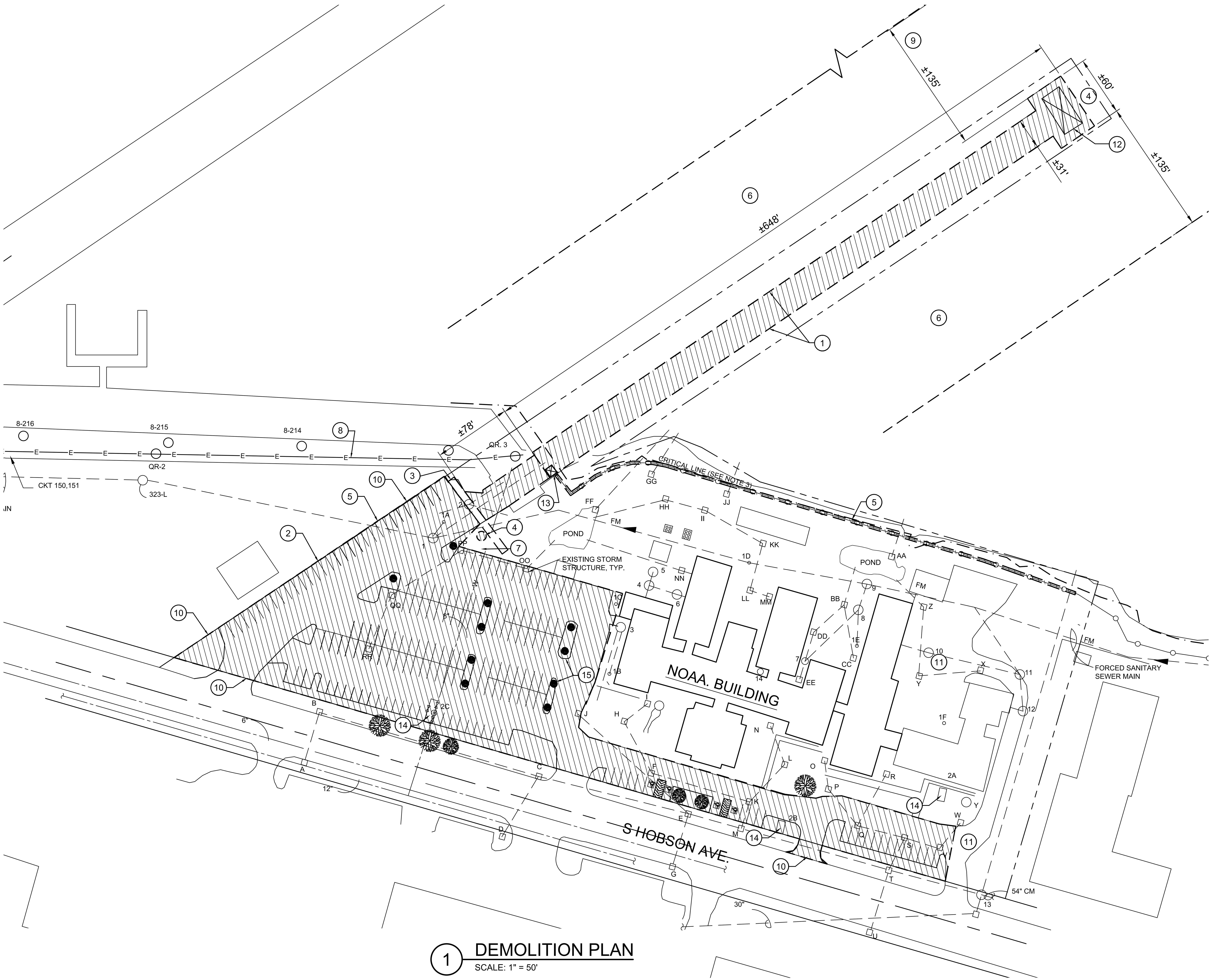
FILE NAME: 21260-D_C-101 Ex Utility Data.dwg

DRAWING TITLE: EXISTING UTILITY STRUCTURE DATA

REV NO. X

SHEET NO. C-101



1 DEMOLITION PLAN
SCALE: 1" = 50'

NOTES:

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2. THESE DRAWINGS ARE SUBJECT TO CHANGE BASED UPON INFORMATION PROVIDED WITHIN THE DRAFT ENVIRONMENTAL ASSESSMENT REPORT.
3. THE CRITICAL LINE LOCATION SHOWN ON DRAWING HAS PROVIDED BY OTHERS TO REPRESENT THE CRITICAL LINE APPROXIMATE LOCATION. THE GRAPHICAL REPRESENTATION OF CRITICAL LINE LOCATION ON DRAWINGS IS PROVIDED FOR REFERENCE ONLY AND SHOULD NOT BE RELIED ON FOR ANY FUTURE DESIGN, PERMITTING, OR CONSTRUCTION.

DEMOLITION KEY NOTES

1. EXISTING PIER STRUCTURE TO BE DEMOLISHED, REMOVED AND DISPOSED. ALL PILES, INCLUDING FENDER PILES SHALL BE REMOVED TO 3 FEET BELOW FINISHED DREDGE DEPTH BASED ON THE DREDGING REPORT. REMOVE ALL PIER UTILITIES AND APPURTENANCES TO SERVICE POINTS OR CONNECTIONS LOCATED ONSHORE.
2. DEMOLISH, REMOVE AND DISPOSE OF EXISTING CONCRETE CURB, ASPHALT PAVEMENT, LANDSCAPING, PLANTER AREAS AND IRRIGATION SYSTEM WITHIN THE PARKING LOT TO ACCOMMODATE NEW PARKING SPACES AND THE PROPOSED WAREHOUSE BUILDING.
3. EXISTING SIGN TO REMAIN. REFURBISH SIGN.
4. REMOVE HIGH MAST LIGHTING FIXTURE.
5. DEMOLISH EXISTING FENCE.
6. TENTATIVE DREDGE ZONE DOWN -25 MEAN LOW WATER. REFER TO DREDGING REPORT.
7. EXISTING ELECTRICAL BREAKERS HOUSED IN CONCRETE STRUCTURE. VERIFY IF ELECTRICAL IS ACTIVE AND CURRENTLY SUPPLYING EQUIPMENT ON SITE. REMOVE IF NO LONGER REQUIRED FOR SITE. REPLACE AND RE-FEED EQUIPMENT IF REQUIRED FOLLOWING FIELD DETERMINATION OF ELECTRICAL CONNECTIONS.
8. REMOVE EXISTING ELECTRICAL FEEDER TO SOURCE
9. DREDGE LIMITS TO EXTENT TO THE EXISTING CHANNEL.
10. CONTRACTOR SHALL PROVIDE FOR THE PROJECT SITE SECURITY AT ALL TIMES TO INCLUDE TEMPORARY PERIMETER SECURITY FENCING. CONTRACTOR SHALL COORDINATE WITH NOAA/FLETC TO ENSURE SITE SECURITY FOR DURATION OF CONSTRUCTION AND UNTIL INSTALLATION OF PERMANENT FENCING HAS BEEN COMPLETED.
11. NOAA REQUIRES CONTINUOUS ACCESS TO AND FROM SHIPPING AND RECEIVING AREAS.
12. REMOVE AND DISPOSED OF IN ITS ENTIRETY, EXISTING ELECTRICAL BUILDING, INCLUDING EQUIPMENT AND ASSOCIATED FEEDER CONDUIT TO TO SOURCE.
13. REMOVE AND DISPOSED OF IN ITS ENTIRETY EXISTING PIER GUARD SHACK AND ASSOCIATED ELECTRICAL CONDUITS TO SOURCE.
14. EXISTING WATER METER/ VALVE VAULT. CONTRACTOR TO PROTECT THE EXISTING VAULTS DURING DEMOLITION AND MAINTAIN ACCESS AT ALL TIMES.
15. PROTECT IN PLACE EXISTING ISLAND CONCRETE CONCRETE CURB. REMOVE AND DISPOSE OF EXISTING LANDSCAPING AND IRRIGATION SYSTEM.

N

0 25' 50' 100'
SCALE 1" = 50'-0"

ADG ENGINEERING
Associated Design Group, Inc.

ADG PROJECT NO: 21260-D

SEAL: CONCEPT DOCUMENTS NOT FOR CONSTRUCTION

ENGINEER: ______
P.E. NO: ______
DATE: ______

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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE NOAA

UNITED STATES DEPARTMENT OF COMMERCE NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION
OFFICE OF MARINE AND AVIATION OPERATIONS (OMAO) SOUTHEAST MARINE OPERATIONS HUB PROJECT FINAL CONCEPT DRAWINGS
2234 S. HOBSON AVE. NORTH CHARLESTON, SC 29405

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DATE ISSUED: MAY 6, 2022
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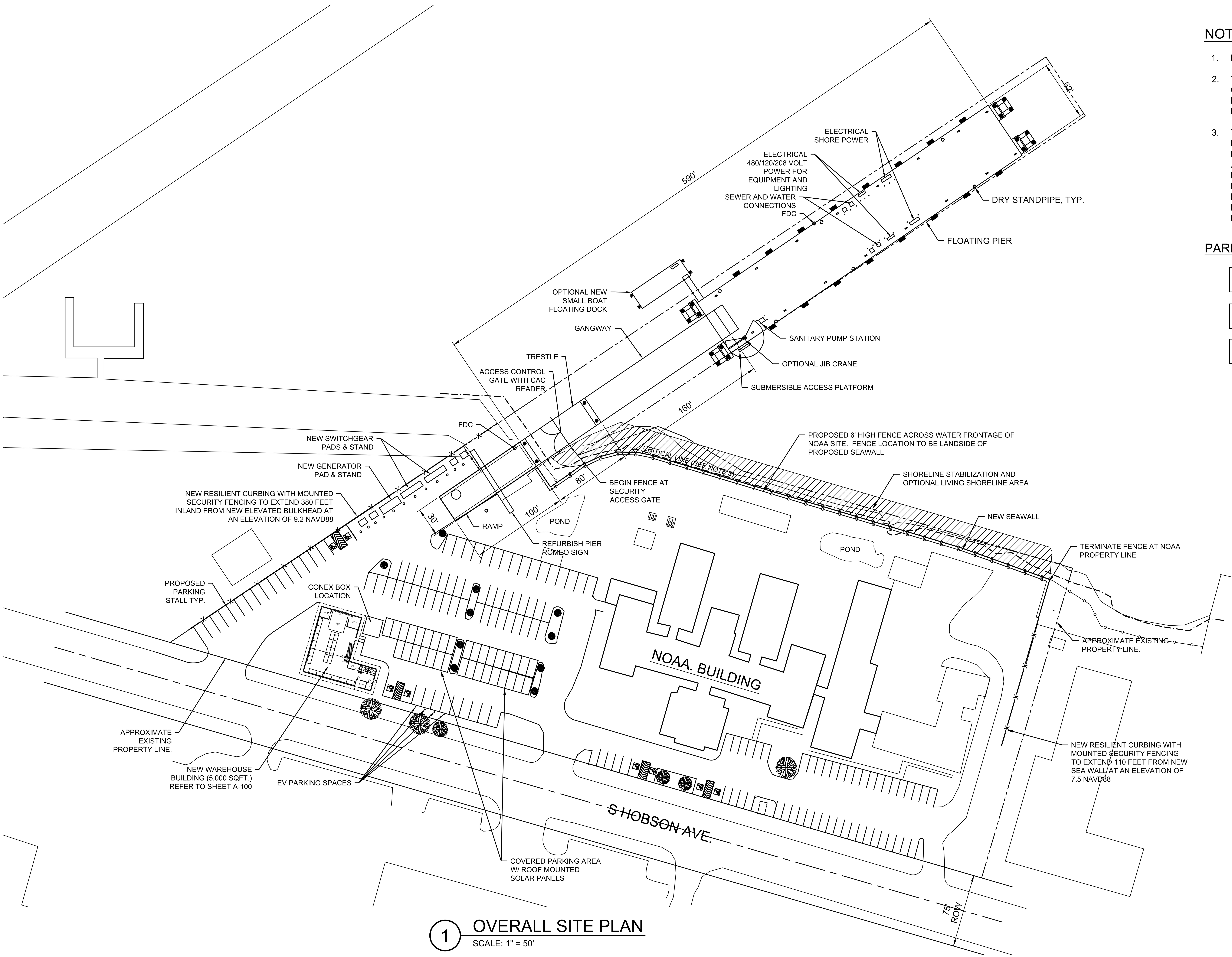
DRAWING TITLE: DEMOLITION PLAN
REV NO.: X
SHEET NO.: C-102



1 OVERALL SITE PLAN

SCALE: 1" = 50'

N

0 25' 50' 100'

SCALE 1" = 50'-0"

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PARKING COUNT:

EXISTING PARKING SPOTS:
178 + 4 HANDICAP

TOTAL PARKING SPOTS:
234 + 8 HANDICAP

NEW PARKING SPOTS:
56 + 4 HANDICAP

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3909 West Congress Street, Suite 201
Lafayette, Louisiana 70506
Phone: (337) 234-5710
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REV	DATE	DESCRIPTION

DATE ISSUED: MAY 6, 2022
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FILE NAME: 21260-D_C-110_Overall Site.dwg
DRAWING TITLE: OVERALL SITE PLAN
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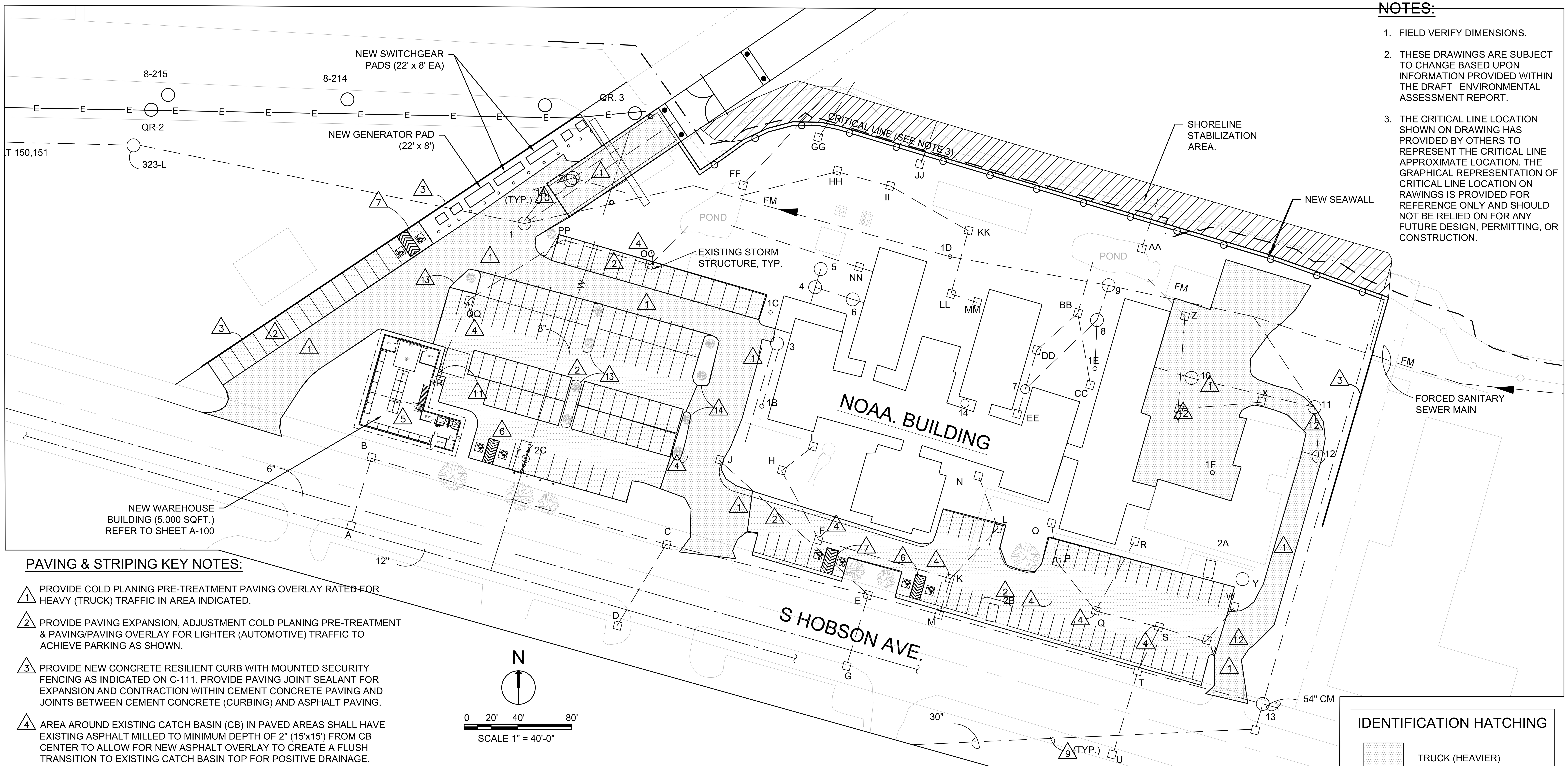
SHEET NO. C-110



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1 PARKING AREA PAVING & STRIPING CONCEPT PLAN

SCALE: 1" = 40'

PAVING & STRIPING KEY NOTES:

1. PROVIDE COLD PLANING PRE-TREATMENT PAVING OVERLAY RATED FOR HEAVY (TRUCK) TRAFFIC IN AREA INDICATED.
2. PROVIDE PAVING EXPANSION, ADJUSTMENT COLD PLANING PRE-TREATMENT & PAVING/PAVING OVERLAY FOR LIGHTER (AUTOMOTIVE) TRAFFIC TO ACHIEVE PARKING AS SHOWN.
3. PROVIDE NEW CONCRETE RESILIENT CURB WITH MOUNTED SECURITY FENCING AS INDICATED ON C-111. PROVIDE PAVING JOINT SEALANT FOR EXPANSION AND CONTRACTION WITHIN CEMENT CONCRETE PAVING AND JOINTS BETWEEN CEMENT CONCRETE (CURBING) AND ASPHALT PAVING.
4. AREA AROUND EXISTING CATCH BASIN (CB) IN PAVED AREAS SHALL HAVE EXISTING ASPHALT MILLED TO MINIMUM DEPTH OF 2" (15'x15') FROM CB CENTER TO ALLOW FOR NEW ASPHALT OVERLAY TO CREATE A FLUSH TRANSITION TO EXISTING CATCH BASIN TOP FOR POSITIVE DRAINAGE.
5. NEW WAREHOUSE BUILDING PROPOSED LOCATION AND CONFIGURATION - SEE SHEET C-111.
6. PROVIDE VAN ACCESSIBLE H.C. STRIPING (SAFETY BLUE) WITH 4" WIDE DIAGONAL STRIPING IN THIS VICINITY (TWO H.C. SPOTS - THIS LOCATION).
7. PROVIDE ACCESSIBLE H.C. STRIPING (SAFETY BLUE) WITH 4" WIDE DIAGONAL STRIPING IN THIS VICINITY (TWO H.C. SPOTS - THIS LOCATION)
8. PROTECT UNAFFECTED LAWN, TREES & VEGETATION WITHIN AND AROUND EXISTING PARKING AREA. RESTORE ANY DAMAGE CAUSED BY WORK OF THIS PROJECT.
9. EXISTING PIPING/MATERIALS TO REMAIN AND BE REWORKED.
10. REWORK EXISTING SEWER MANHOLE COVERS, VALVE BOXES, CATCH BASINS, ETC. FLUSH WITH FINAL GRADE, TO ACCOMMODATE REVISED PAVING. (TYPICAL)
11. EXISTING CATCH BASIN TO BE RELOCATED.
12. CONTRACTOR TO MAINTAIN ACCESS TO DRIVE AND LOADING DOCK OF EXISTING BUILDING AT ALL TIMES DURING CONSTRUCTION. CONTRACTOR TO COORDINATE WORK IN THIS AREA WITH GOVERNMENT PERSONNEL.

PAVING & STRIPING KEY NOTES-CONT.:

13. REMOVE AND REPLACE EXISTING ISLAND CONCRETE CURB, LANDSCAPING AND IRRIGATION.
14. PROTECT IN PLACE EXISTING ISLAND CONCRETE CONCRETE CURB. REMOVE AND REPLACE LANDSCAPING AND IRRIGATION.

GENERAL NOTES:

1. ASPHALT PATCHING, REMOVAL, REPLACEMENT, OVERLAY AND STRIPING IS REQUIRED AS PART OF THIS CONTRACT.
2. REFURBISH/RESURFACE EXISTING PARKING AREAS TO PROVIDE PARKING SPACES (H.C. & NON-H.C.) APPROXIMATELY AS SHOWN.
3. RE-STRIP LOT TO ACHIEVE CLEAR DESIGNATION OF 4 VAN ACCESSIBLE H.C. SPOTS & 4 (NON-VAN) H.C. SPOTS & CLEARLY IDENTIFIED RECTANGULAR AUTO PARKING SPOTS FOR 210 VEHICLES (202 PARKING SPOTS PLUS 8 H.C. PARKING SPOTS TOTAL)
4. VERIFY ALL GRADES AND SLOPE NEW ASPHALT TOPPING AS SHOWN AND TO DRAIN INLETS AS REQUIRED.
5. ADJUST ANY CATCH BASIN, MANHOLE, VALVE COVERS AS NEEDED TO FLUSH OUT WITH NEW SURFACE ELEVATION OF COMPLETED WORK.
6. CONTRACTOR SHALL PROVIDE ALL NECESSARY BARRICADES, SIGNAGE, REFLECTORS, SAFETY DEVISES AND WARNING LIGHTING AS NEEDED TO PROPERLY DEMARCATE CONSTRUCTION AREAS CLOSED TO STAFF OF PUBLIC. COORDINATE ANY/ALL DRIVE & ACCESS WAY CLOSURES WITH GOVERNMENT REPRESENTATIVE PRIOR TO CLOSURE.

PARKING COUNT:

TOTAL PARKING SPOTS:

182 + 8 HANDICAP SPACES

IDENTIFICATION HATCHING

- TRUCK (HEAVIER) TRAFFIC PAVING
- AUTOMOTIVE (LIGHTER) PARKING PAVING
- PROPOSED NEW WAREHOUSE BUILDING
- VAN ACCESSIBLE HANDICAPPED PARKING
- HANDICAPPED PARKING

ADG ENGINEERING
ASSOCIATED DESIGN GROUP, INC.

ADG PROJECT NO: 21260-D

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DATE:

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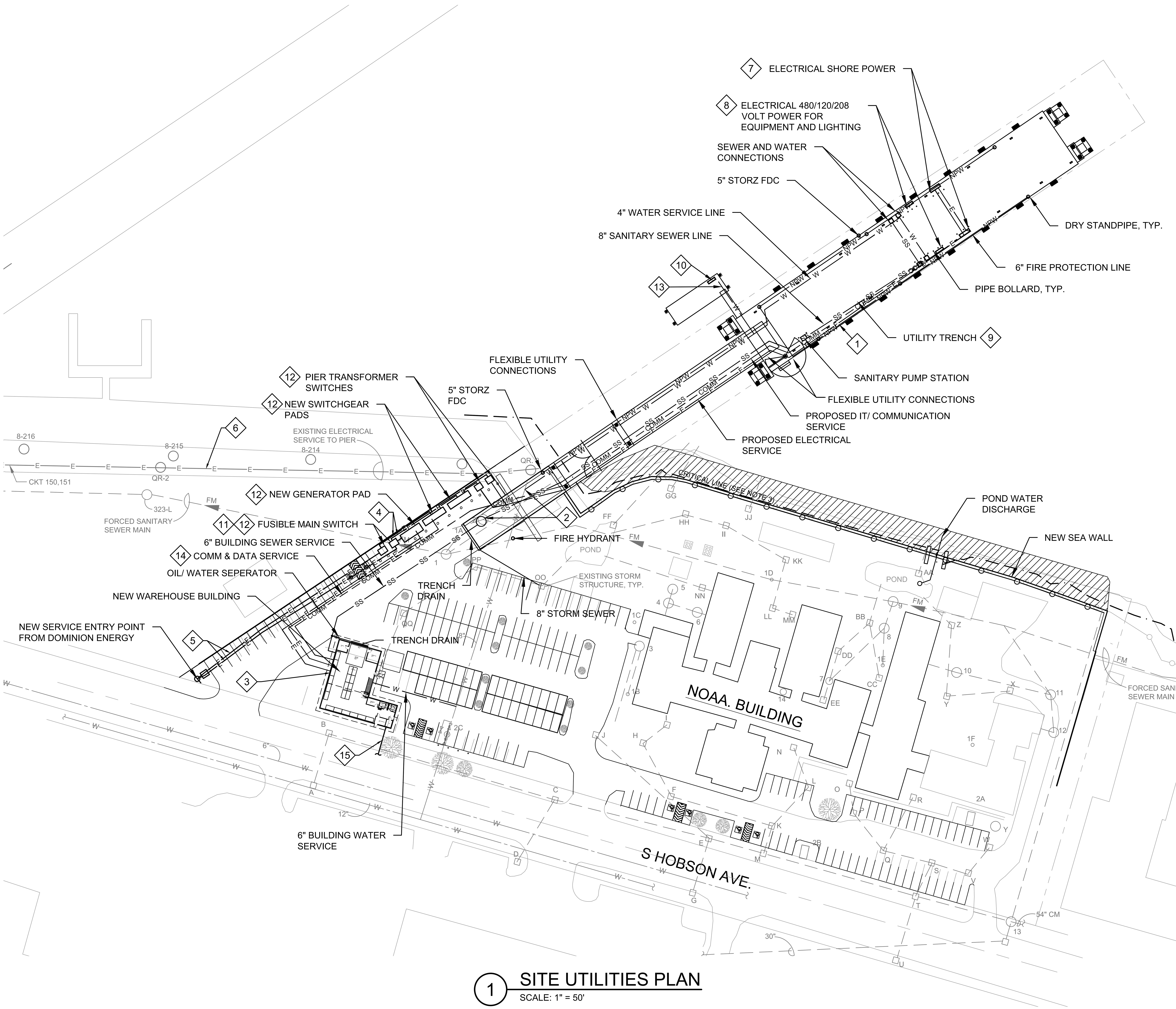
UNITED STATES DEPARTMENT OF COMMERCE NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION

OFFICE OF MARINE AND AVIATION OPERATIONS (OMAO) SOUTHEAST MARINE OPERATIONS HUB PROJECT FINAL CONCEPT DRAWINGS

2234 S. HOBSON AVE. NORTH CHARLESTON, SC 29405

REV	DATE	DESCRIPTION

DATE ISSUED: MAY 6, 2022
DRAWN BY: SPC
CHECKED BY: LWB/LM
FILE NAME: 21260-D_C-111-Paving striping.dwg
DRAWING TITLE: PARKING AREA PAVING & STRIPING CONCEPT PLAN
REV NO. X
SHEET NO. C-111



1 SITE UTILITIES PLAN
SCALE: 1" = 50'

PLAN KEYNOTES:

1. UTILITIES TO BE ROUTED IN UTILITY TRENCH ON PIER. PROVIDE ACCESS HATCHES EVERY 50 FEET ALONG TRENCH TO ALLOW FOR MAINTENANCE ACCESS.
2. PROVIDE CONNECTIONS TO EXISTING SANITARY SEWER, AND DOMESTIC WATER LINE AT NEW PIER LOCATION. EXTEND UTILITIES TO NEW PIER PER UFC'S REQUIREMENTS.
3. PROVIDE WATER AND SANITARY SEWER SERVICE TO WAREHOUSE BUILDING.
4. PROVIDE CONNECTIONS TO NEW ELECTRICAL SERVICE. EXTEND ELECTRICAL SERVICE TO NEW PIER AND WAREHOUSE BUILDING. MAKE ALL CONNECTIONS AND SERVICES PER UFC REQUIREMENTS.
5. EXTEND 2 - 24KV CIRCUITS TO NEW UNIT SUBSTATION FOR PIER ROMEO. COORDINATE EXACT ROUTING AND INSTALLATION REQUIREMENTS IN FIELD.
6. REMOVE EXISTING 13.2 KV FEEDERS AND ASSOCIATED CONDUIT TO SOURCE.
7. 1600 AMP PEDESTAL WITH 4 - 400AMP, 3 PHASE, 480V SHIP CONNECTIONS. SEE SECTION 10.1 FOR MORE SPECIFIC PEDESTAL REQUIREMENTS.
8. 400AMP SMALL EQUIPMENT 277/480V, 3 PHASE, 4 WIRE PANEL WITH STEP DOWN TRANSFORMER FOR A MINIMUM 200AMP 120/208V PANEL
9. UTILITY TRENCH WITH TRAFFIC RATED REMOVABLE COVER FOR UTILITIES. PROVIDE ACCESS EVERY 50FT FOR FUTURE MAINTENANCE.
10. 60AMP, 120/208V, 3 PHASE, 4 WIRE SERVICE TO SMALL BOAT DOCK.
11. 23.9KV FUSIBLE SWITCHGEAR PER DOMINION ENERGY REQUIREMENTS AND EQUIPMENT
12. ELECTRICAL SWITCHGEAR TO BE ON PLATFORM SIZED TO BE ABOVE 100 YEAR FLOOD PLAIN. PROVIDE STAIRS TO ACCESS EQUIPMENT.
13. PROVIDE ¾" DOMESTIC WATER LINE SERVICE TO NEW PIER.
14. EXTEND CONDUITS FROM INFORMATION TECHNOLOGY ROOM IN WAREHOUSE TO PIER FOR COMMUNICATIONS AND DATA CONNECTIONS TO VESSELS.
15. COMPLETE CONNECTIONS TO VOICE AND DATA SERVICE FROM LOCAL UTILITY COMPANY. COORDINATE WITH LOCAL UTILITY PROVIDERS FOR CONNECTION REQUIREMENTS.

NOTES:

1. FIELD VERIFY DIMENSIONS.
2. THESE DRAWINGS ARE SUBJECT TO CHANGE BASED UPON INFORMATION PROVIDED WITHIN THE DRAFT ENVIRONMENTAL ASSESSMENT REPORT.
3. THE CRITICAL LINE LOCATION SHOWN ON DRAWING HAS PROVIDED BY OTHERS TO REPRESENT THE CRITICAL LINE APPROXIMATE LOCATION. THE GRAPHICAL REPRESENTATION OF CRITICAL LINE LOCATION ON DRAWINGS IS PROVIDED FOR REFERENCE ONLY AND SHOULD NOT BE RELIED ON FOR ANY FUTURE DESIGN, PERMITTING, OR CONSTRUCTION.

N

0 20' 40' 80'
SCALE 1" = 50'-0"

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ADG PROJECT NO: 21260-D

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SOUTHEAST MARINE OPERATIONS HUB PROJECT
FINAL CONCEPT DRAWINGS

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REV	DATE	DESCRIPTION

DATE ISSUED: MAY 6, 2022
DRAWN BY: SPC
CHECKED BY: LWB/LM
FILE NAME: 21260-D_C-112- Utility plan.dwg
DRAWING TITLE: SITE UTILITIES PLAN
REV NO. X
SHEET NO. C-112

KEY NOTES:

1. APPROXIMATELY 380FT CURB/WALL TO PREVENT SITE FLOODING. TOP OF WALL ELEV = +9.2 NAVD88 USE CAST-IN-PLACE SCDOT TYPICAL CANTILEVER CONCRETE RETAINING WALL
2. 30FT X 100FT RAMP TO TRESTLE FROM +6.5 NAVD88 TO +14.5 NAVD88 (8% SLOPE) RETAIN RAMP SOIL WITH STEEL SHEET PILE WALL ASTM A328 AZ18-800 OR EQUIVALENT WITH 2FT X 2FT CONCRETE CAP AND RAILINGS.
   RAMP FILLED WITH QUARRY RUN/ ENGINEERED FILL/CONCRETE PAVEMENT
   TIP OF STEEL SHEET PILE = -2.5 NAVD88
   STEEL SHEET PILE RETAINING UPTO 4FT OF SOIL SHALL BE CANTILEVER WALL.
   STEEL SHEET PILE RETAINING MORE THAN 4FT OF SOIL UPTO 8.5FT SHALL BE HAVE TIE BACK SYSTEM AT 3FT BELOW TOP OF WALL.
3. 30FT X 80FT STEEL TRUSS TRESTLE USING W-SECTIONS. SEE MEMBER SIZES ON DRAWINGS.
   TRUSS HEIGHT = 16FT
   W/ STEEL GRATED DECK (4" X 1/4" WITH 5FT SPAN) RATED FOR HS-20 VEHICULAR TRAFFIC.
4. 2 - 48" DIA ASTM (5/8" THICK) A252 GRADE 50 STEEL PIPE PILE WITH 6FT X 6FT CONCRETE PILE CAP
   PILE CAP TOP ELEV = +13.0 NAVD88
   PILE TIP ELEV = -100.0 NAVD88
   ASSUMING GROUND ELEV = -5.0 NAVD88
5. 2 - 36" DIA (1/2" THICK) ASTM A252 GRADE 50 STEEL PIPE PILE WITH 5FT X 5FT CONCRETE PILE CAP
   PILE CAP TOP ELEV = +13.0 NAVD88
   PILE TIP ELEV = -80.0 NAVD88
   ASSUMING GROUND ELEV = -5.0 NAVD88
6. 30FT X 160FT STEEL TRUSS GANGWAY USING W-SECTIONS.
   TRUSS HEIGHT = 16FT
   W/ STEEL GRATED DECK (4" X 1/4" WITH 5FT SPAN) RATED FOR HS-20 VEHICULAR TRAFFIC
   MAX 10% SLOPE AT LOWEST TIDE
7. 60FT X 20FT SMALL VESSEL FLOATING DOCK (CONCRETE DOCK WITH 2FT FREEBOARD)
8. 24" DIA STEEL PIPE ASTM A252 GRADE 50 PILES (1" WALL THICKNESS) (4 TOTAL)
   PILE TOP ELEV = +18 NAVD88
   MUDLINE = -27.96 NAVD88
   PILE TIP ELEV = -85 NAVD88
9. 5FT X 24FT PEDESTRIAN ALUMINUM GANGWAY

KEY NOTES-CONTINUED:

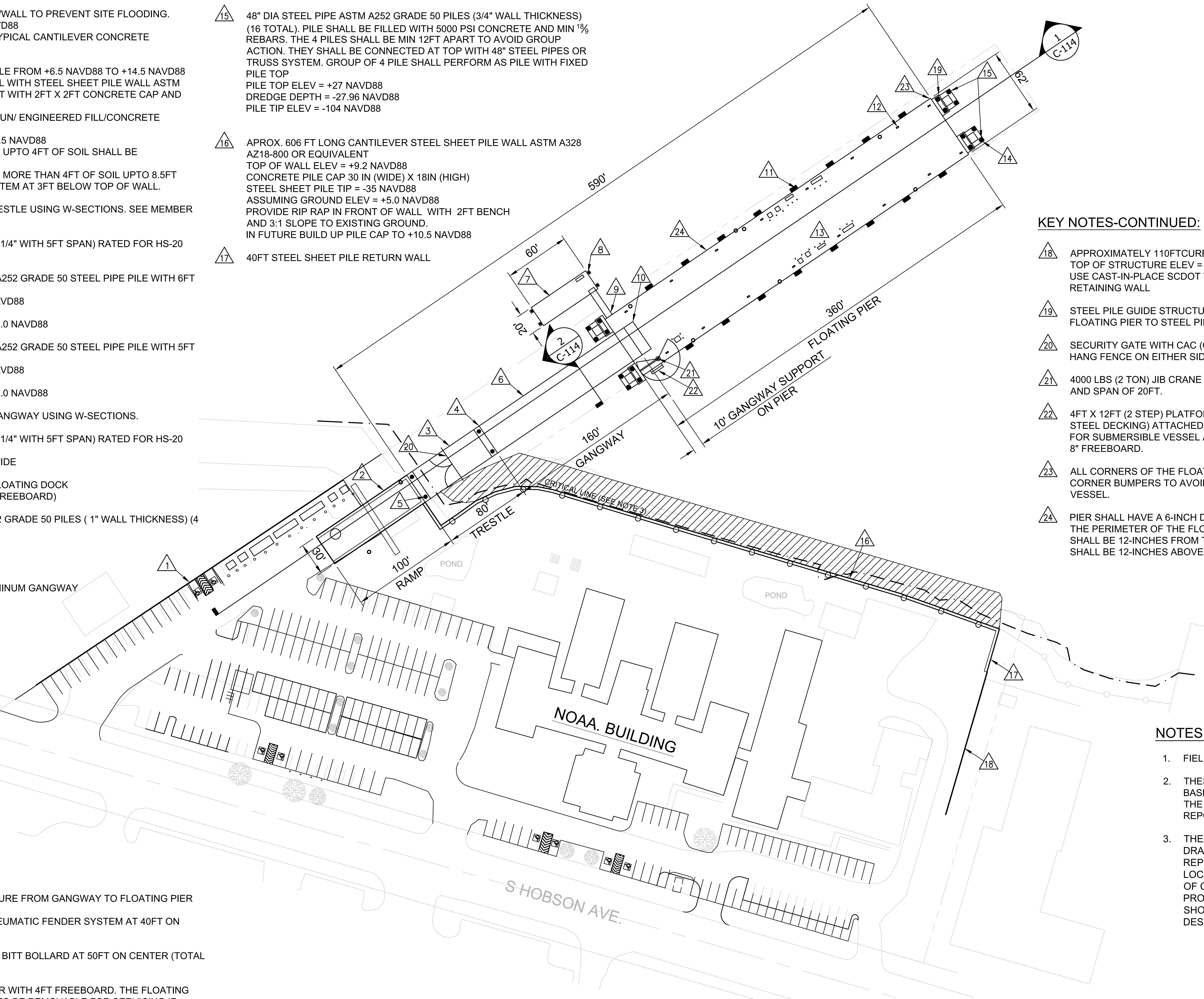
15. 48" DIA STEEL PIPE ASTM A252 GRADE 50 PILES (3/4" WALL THICKNESS) (16 TOTAL). PILE SHALL BE FILLED WITH 5000 PSI CONCRETE AND MIN 1% REBARS. THE 4 PILES SHALL BE MIN 12FT APART TO AVOID GROUP ACTION. THEY SHALL BE CONNECTED AT TOP WITH 48" STEEL PIPES OR TRUSS SYSTEM. GROUP OF 4 PILE SHALL PERFORM AS PILE WITH FIXED PILE TOP
    PILE TOP ELEV = +27 NAVD88
    DREDGE DEPTH = -27.96 NAVD88
    PILE TIP ELEV = -104 NAVD88
16. APROX. 606 FT LONG CANTILEVER STEEL SHEET PILE WALL ASTM A328 AZ18-800 OR EQUIVALENT
    TOP OF WALL ELEV = +9.2 NAVD88
    CONCRETE PILE CAP 30 IN (WIDE) X 18IN (HIGH)
    STEEL SHEET PILE TIP = -35 NAVD88
    ASSUMING GROUND ELEV = +5.0 NAVD88
    PROVIDE RIP RAP IN FRONT OF WALL WITH 2FT BENCH AND 3:1 SLOPE TO EXISTING GROUND.
    IN FUTURE BUILD UP PILE CAP TO +10.5 NAVD88
17. 40FT STEEL SHEET PILE RETURN WALL

KEY NOTES-CONTINUED:

10. TRANSITION RAMP STRUCTURE FROM GANGWAY TO FLOATING PIER
11. YOKOHAMA 4FT X 6.5FT PNEUMATIC FENDER SYSTEM AT 40FT ON CENTER (TOTAL 16)
12. TRELLEBORG 100T DOUBLE BITT BOLLARD AT 50FT ON CENTER (TOTAL 16)
13. 62FT X 360FT FLOATING PIER WITH 4FT FREEBOARD. THE FLOATING PIER SHALL BE DESIGNED TO BE REMOVABLE FOR SERVICING IF NEEDED
14. NAVIGATION LIGHTING AT END OF PIER ON TOP OF STEEL PILE

KEY NOTES-CONTINUED:

18. APPROXIMATELY 110FTCURB/ WALL TO PREVENT SITE FLOODING. TOP OF STRUCTURE ELEV = +7.5 NAVD88 USE CAST-IN-PLACE SCDOT TYPICAL CANTILEVER CONCRETE RETAINING WALL
19. STEEL PILE GUIDE STRUCTURE TO TRANSFER LATERAL LOAD FROM FLOATING PIER TO STEEL PIPE PILES
20. SECURITY GATE WITH CAC (COMMON ACCESS CARD) AND 3FT OVER HANG FENCE ON EITHER SIDE OF TRESTLE STRUCTURE.
21. 4000 LBS (2 TON) JIB CRANE WITH 8FT MIN CLEAR HEIGHT UNDER BOOM AND SPAN OF 20FT.
22. 4FT X 12FT (2 STEP) PLATFORM (WITH SS316 FRAME AND GRATED STEEL DECKING) ATTACHED TO FACE OF CONCRETE DOCK SIDE WALL FOR SUBMERSIBLE VESSEL ACCESS. SECOND STEP SHALL HAVE 6" TO 8" FREEBOARD.
23. ALL CORNERS OF THE FLOATING PIER AND PILE GUIDE SHALL HAVE CORNER BUMPERS TO AVOID DAMAGE TO PIER, PILE GUIDE, OR VESSEL.
24. PIER SHALL HAVE A 6-INCH DIAMETER STEEL PIPE BULL RAIL ALONG THE PERIMETER OF THE FLOATING PIER. BULL RAIL CENTER LINE SHALL BE 12-INCHES FROM THE EDGE OF THE PIER. TOP OF BULL RAIL SHALL BE 12-INCHES ABOVE THE DECK SURFACE.



NOTES:

1. FIELD VERIFY DIMENSIONS.
2. THESE DRAWINGS ARE SUBJECT TO CHANGE BASED UPON INFORMATION PROVIDED WITHIN THE DRAFT ENVIRONMENTAL ASSESSMENT REPORT.
3. THE CRITICAL LINE LOCATION SHOWN ON DRAWING HAS PROVIDED BY OTHERS TO REPRESENT THE CRITICAL LINE APPROXIMATE LOCATION. THE GRAPHICAL REPRESENTATION OF CRITICAL LINE LOCATION ON DRAWINGS IS PROVIDED FOR REFERENCE ONLY AND SHOULD NOT BE RELIED ON FOR ANY FUTURE DESIGN, PERMITTING, OR CONSTRUCTION.

N

0 25' 50' 100'
SCALE 1" = 50'-0"

1 PIER AND SEAWALL LAYOUT
SCALE: 1" = 50'

ASSOCIATED DESIGN GROUP, INC.
3909 West Congress Street, Suite 201
Lafayette, Louisiana 70506
Phone: (337) 234-5710
Email: adginc@adginc.org

Lawrence W. Blanchette - License No. 22463
R. Craig Campbell II - License No. 29380
David B. Stelly - License No. 26070

ADG PROJECT NO: 21260-D

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ENGINEER: ________________
P.E. NO: ________________
DATE: ________________

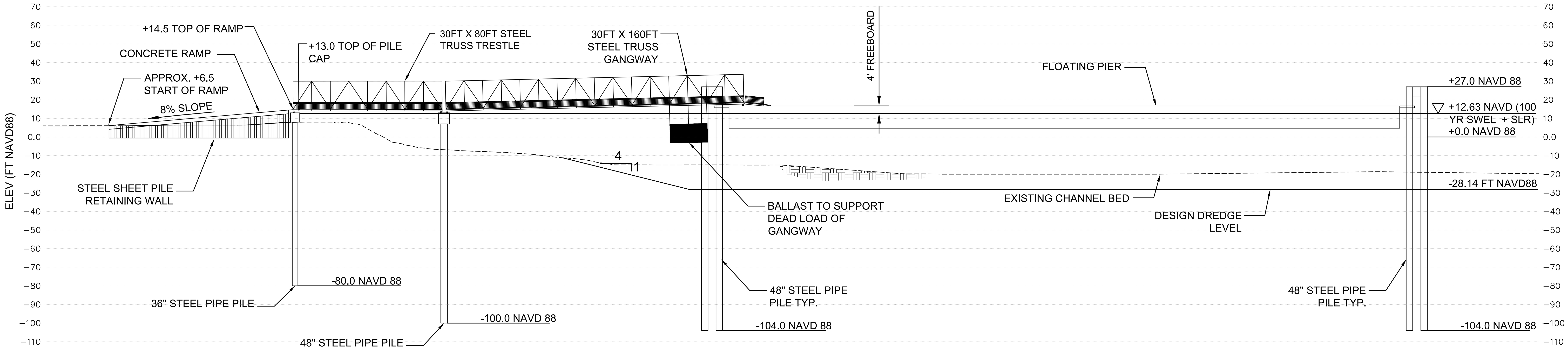
UNITED STATES DEPARTMENT OF COMMERCE NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION

OFFICE OF MARINE AND AVIATION OPERATIONS (OMAO)
SOUTHEAST MARINE OPERATIONS HUB PROJECT
FINAL CONCEPT DRAWINGS

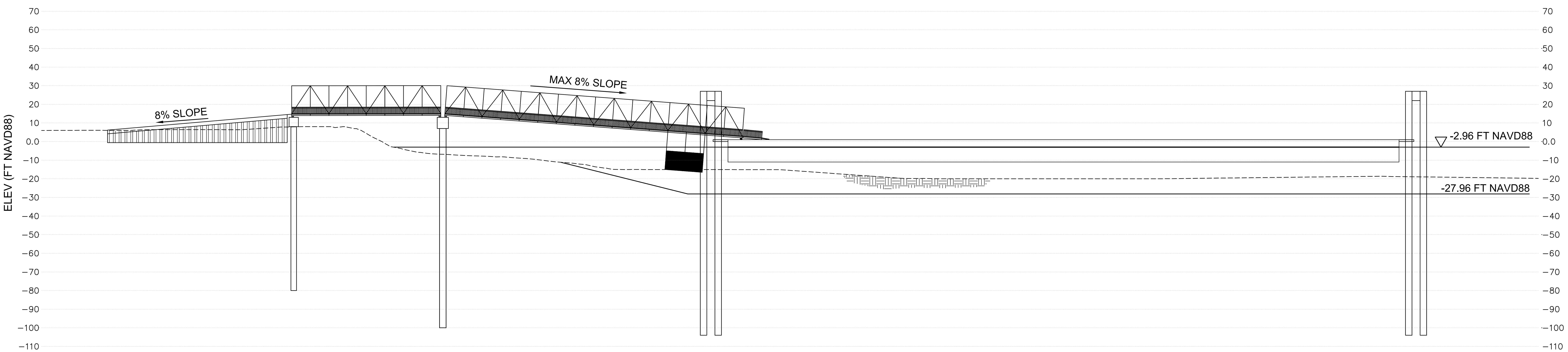
2234 S. HOBSON AVE. NORTH CHARLESTON, SC 29405

REV	DATE	DESCRIPTION

DATE ISSUED: MAY 6, 2022
DRAWN BY: SPC
CHECKED BY: LWB/LM
FILE NAME: 21260-D_C-113 Pier and Seawall Layout.dwg
DRAWING TITLE: PIER AND SEAWALL LAYOUT
REV NO.: X
SHEET NO.: C-113

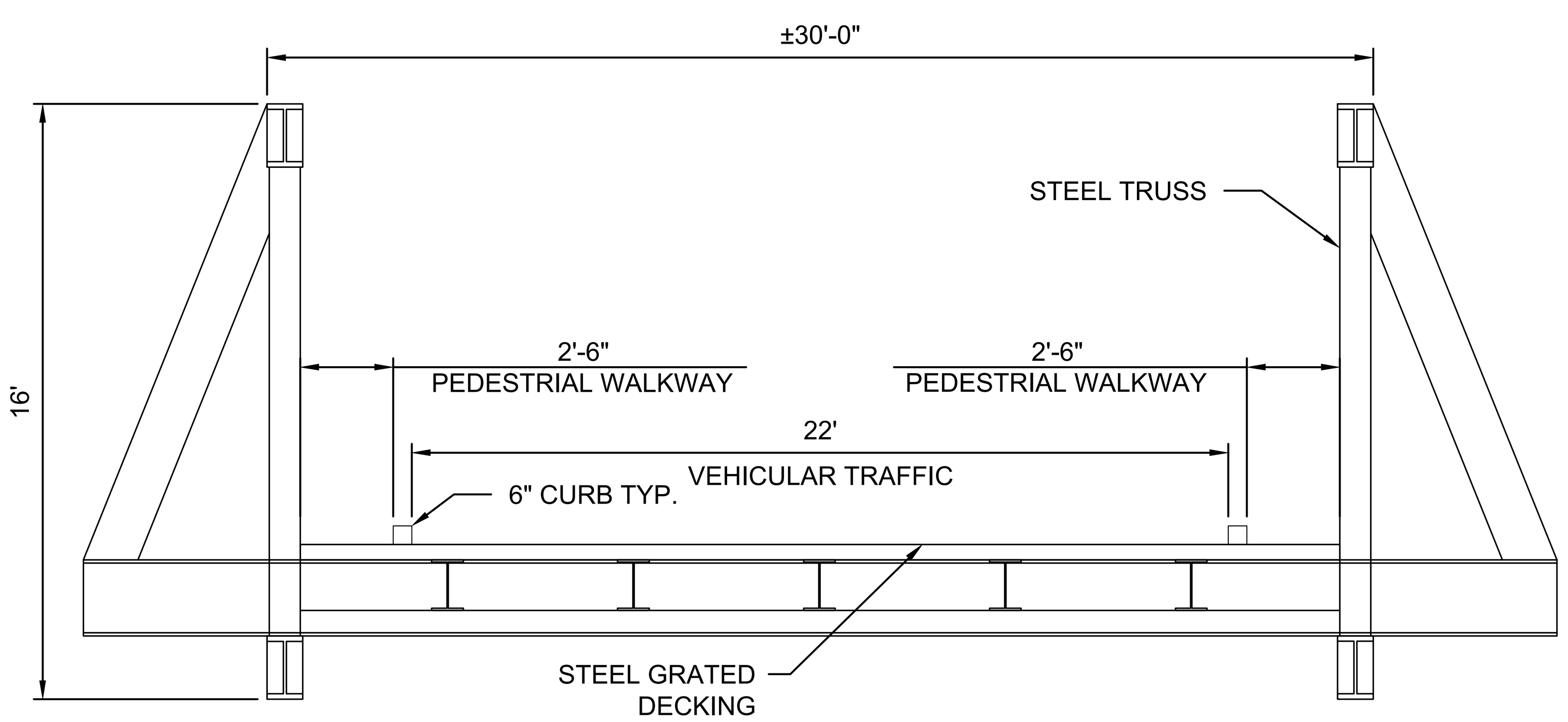


DESIGN HIGH WATER CONDITION



DESIGN LOW WATER CONDITION

1 PIER ELEVATIONS
SCALE: 1" = 30'



2 TYPICAL GANGWAY/TRESTLE SECTION
SCALE: 1" = 4'

NOTES:

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0 2' 4' 8'
SCALE 1" = 4'-0"
0 15' 30' 60'
SCALE 1" = 30'-0"

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3909 West Congress Street, Suite 201
Lafayette, Louisiana 70506
Phone: (337) 234-5710
Email: adginc@adginc.org

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R. Craig Campbell II - License No. 29380
David B. Stelly - License No. 26070

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REV	DATE	DESCRIPTION

DATE ISSUED: MAY 6, 2022
DRAWN BY: SPC
CHECKED BY: LWB/LM
FILE NAME: 21260-D_C-114 Pier_Elevation.dwg
DRAWING TITLE: PIER ELEVATIONS
REV NO. X
SHEET NO. C-114

NOTES:

1. FIELD VERIFY DIMENSIONS.
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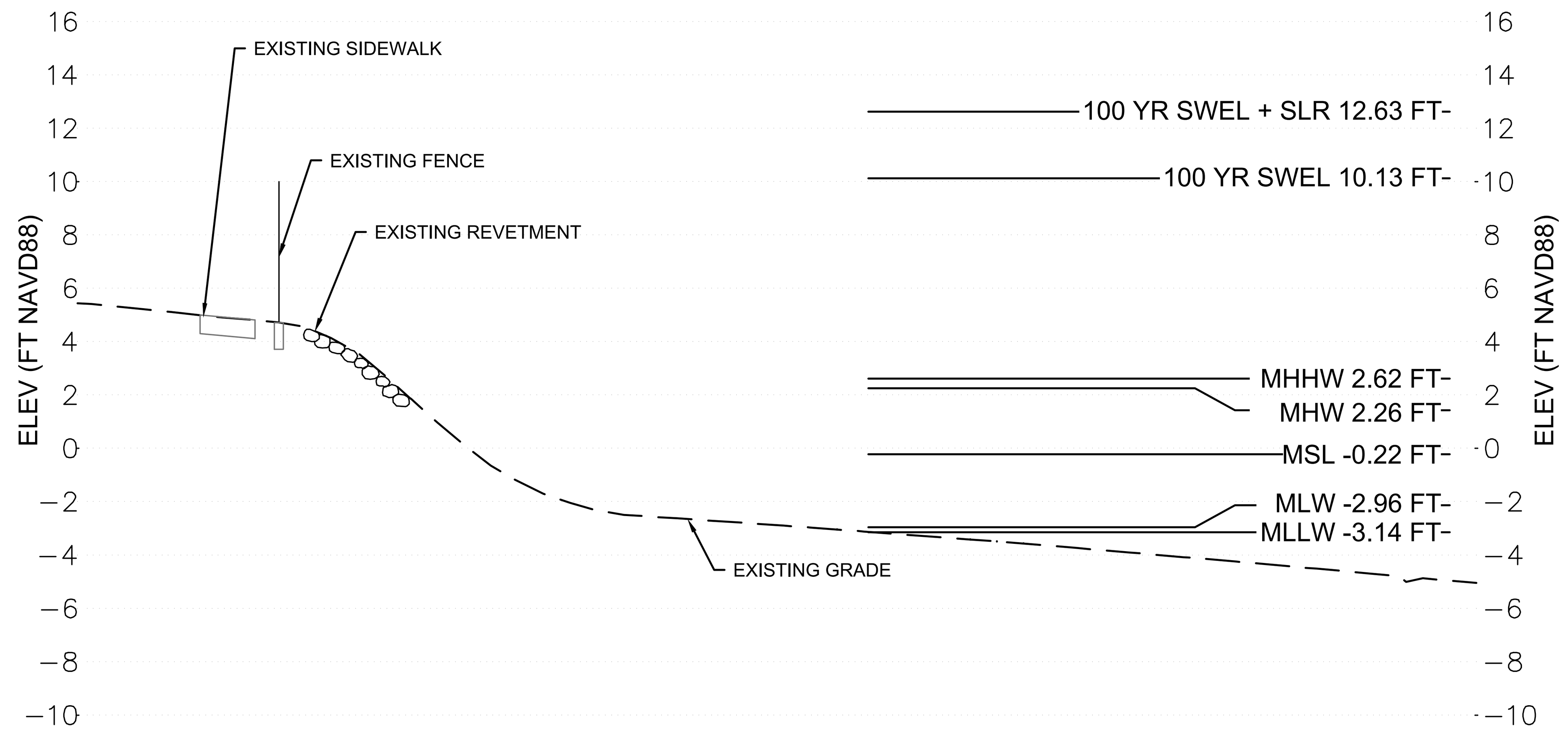
0 2.5' 5' 10'

VERTICAL SCALE: 1" = 5'-0"

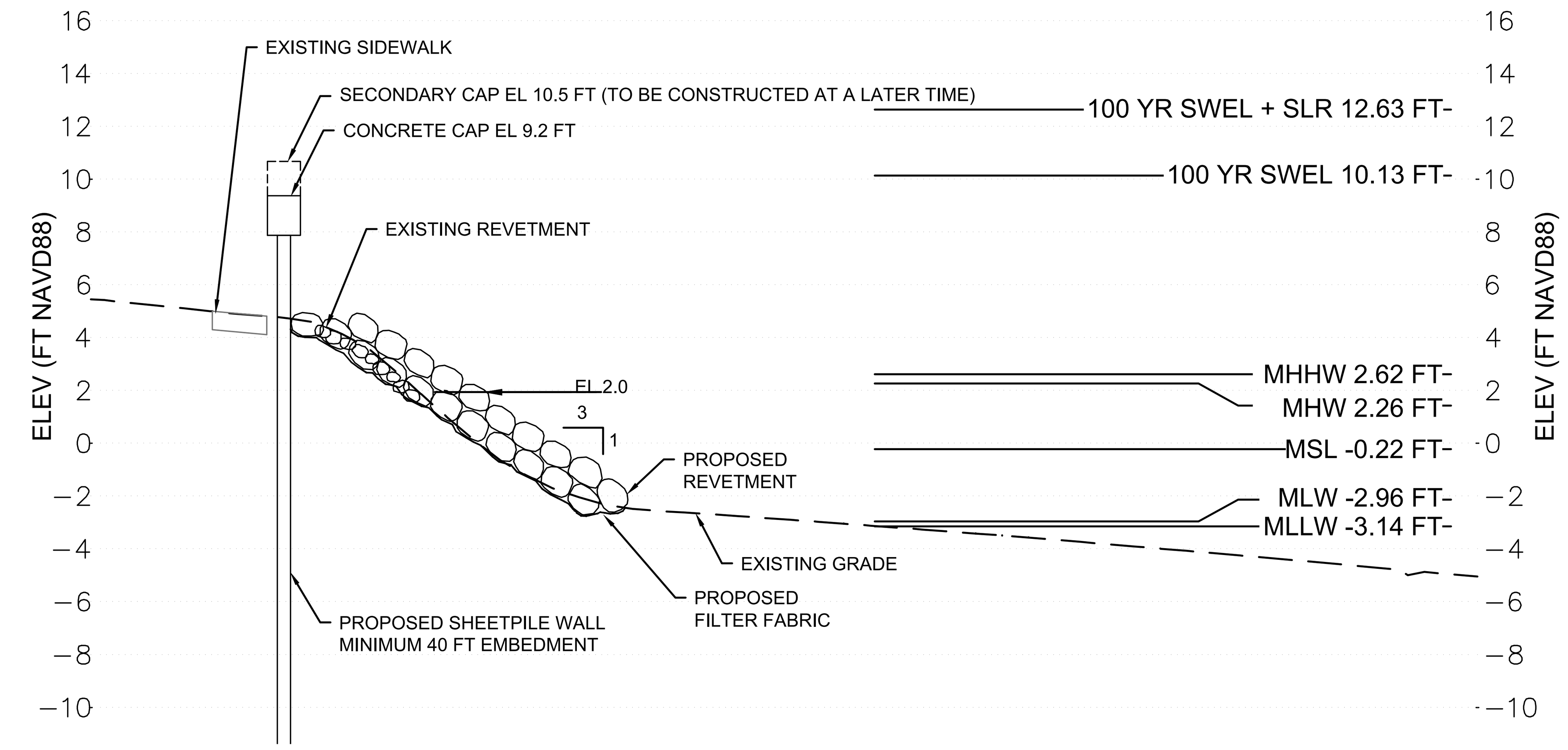
0 5' 10' 20'

HORIZONTAL SCALE: 1" = 10'-0"



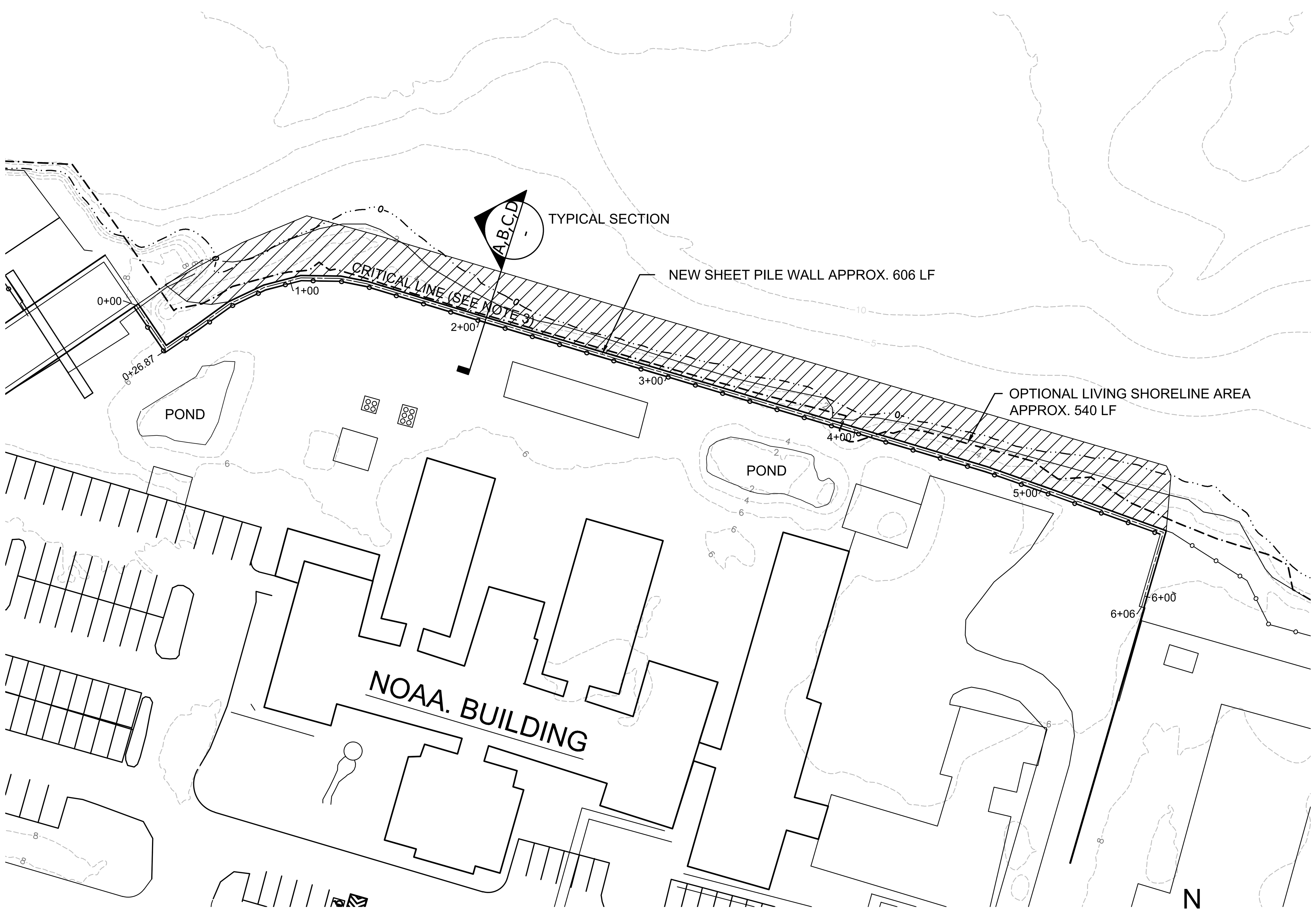
A EXISTING CONDITION TYPICAL SECTION

SCALE: 1" = 10' HORZ. / 1" = 5' VERT



B PROPOSED WALL TYPICAL SECTION

SCALE: 1" = 10' HORZ. / 1" = 5' VERT

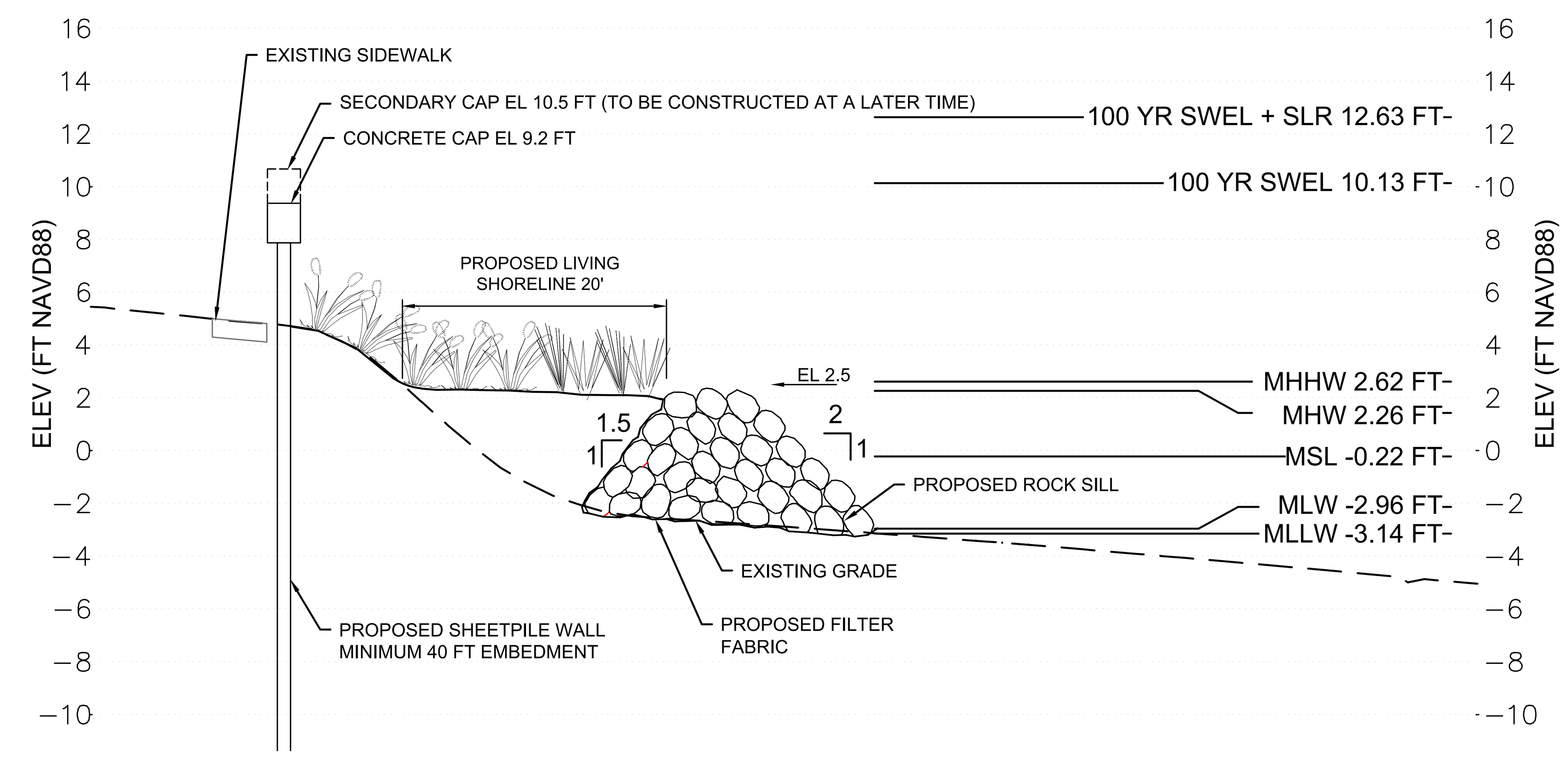


1 SITE PLAN WITH TYPICAL CROSS SECTION LOCATION

SCALE: 1" = 40'

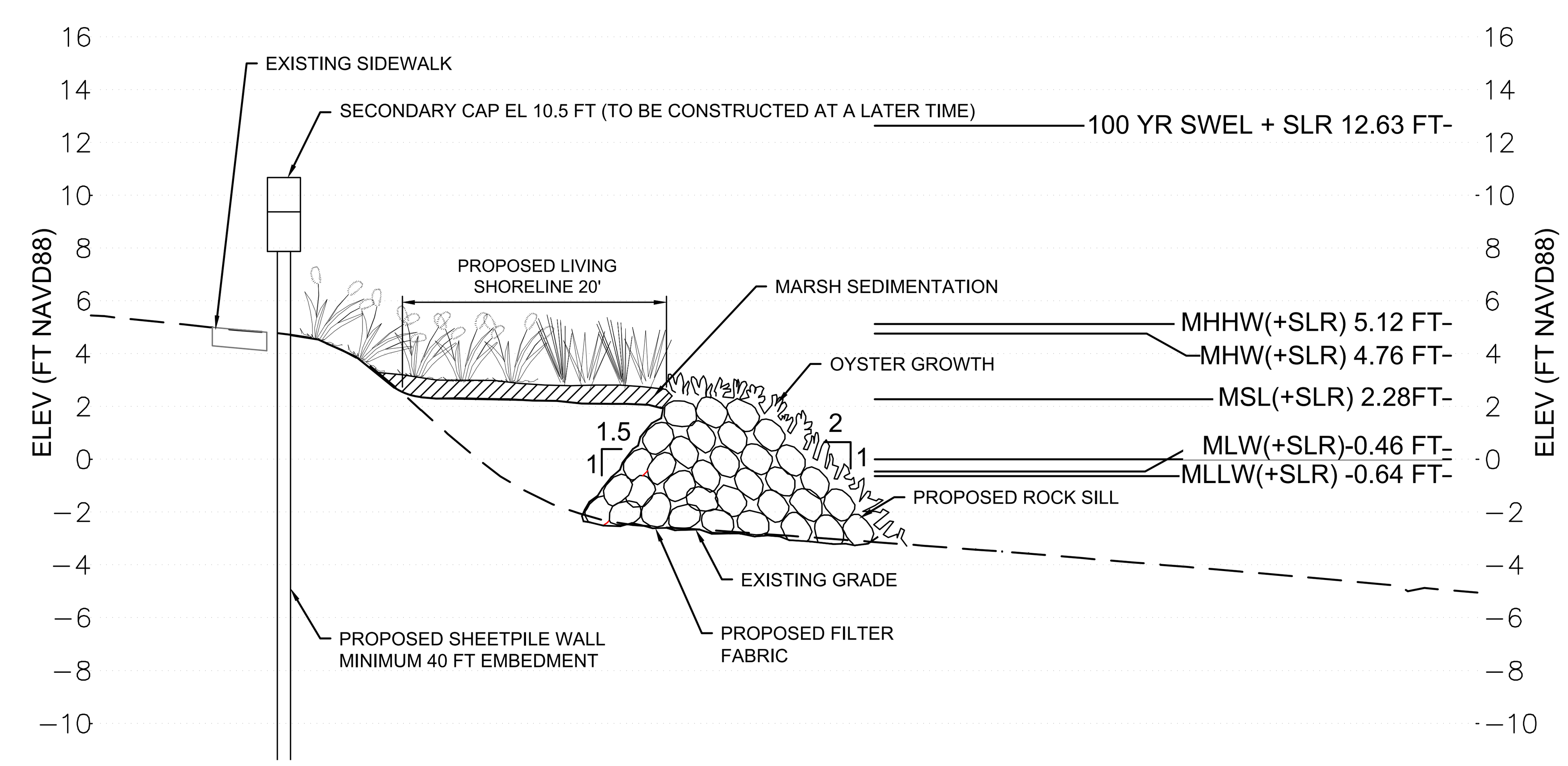
0 20' 40' 80'

SCALE 1" = 40'-0"



C OPTIONAL PROPOSED WALL WITH LIVING SHORELINE TYPICAL SECTION

SCALE: 1" = 10' HORZ. / 1" = 5' VERT



D OPTIONAL PROPOSED WALL WITH LIVING SHORELINE+50-YR SLR TYPICAL SECTION

SCALE: 1" = 10' HORZ. / 1" = 5' VERT

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2234 S. HOBSON AVE. NORTH CHARLESTON, SC 29405

REV	DATE	DESCRIPTION

DATE ISSUED: MAY 6, 2022

DRAWN BY: SPC

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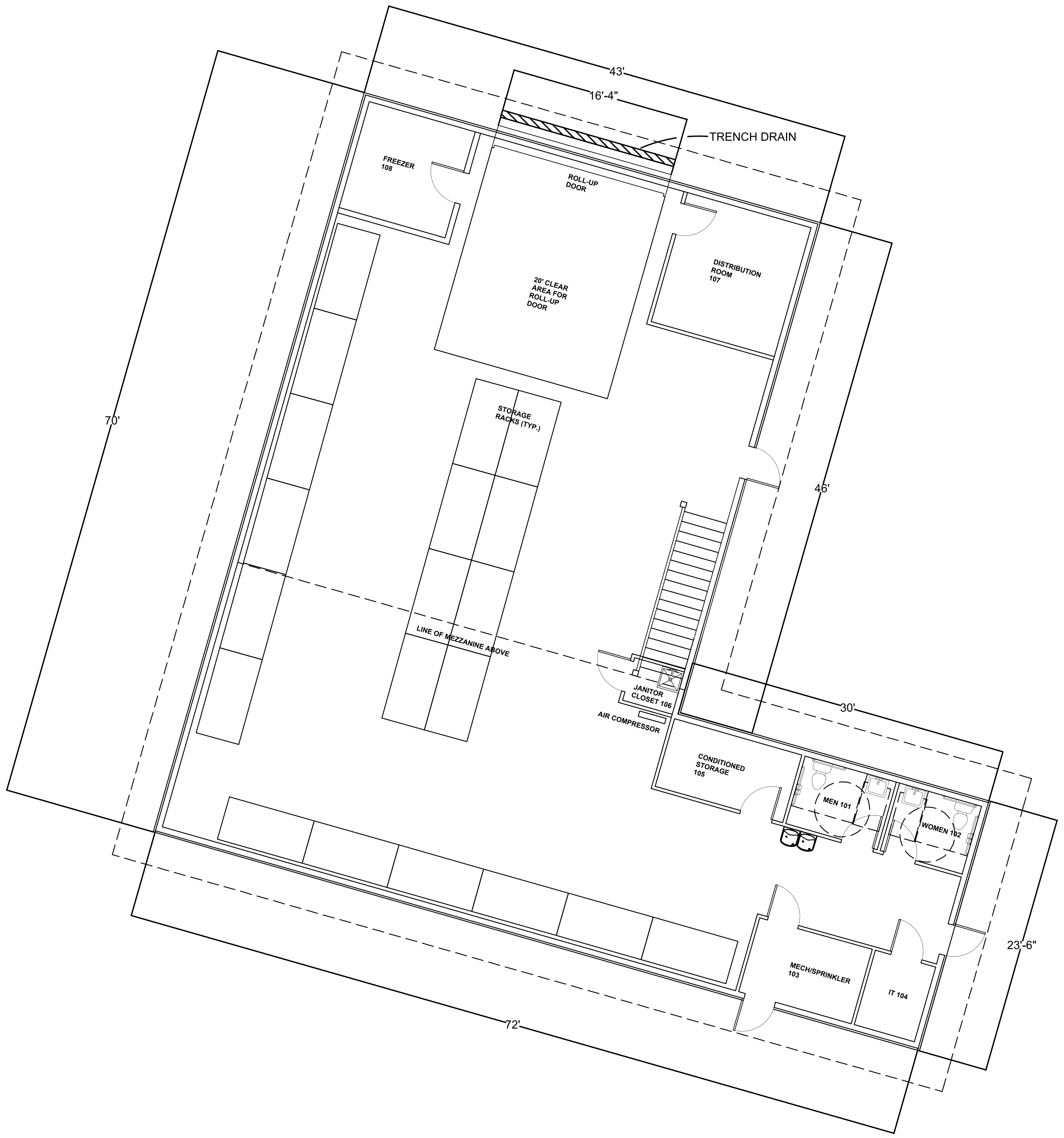
FILE NAME: 21260-D_C-115 Rvmt Xections.dwg

DRAWING TITLE: REVETMENT CROSS SECTIONS

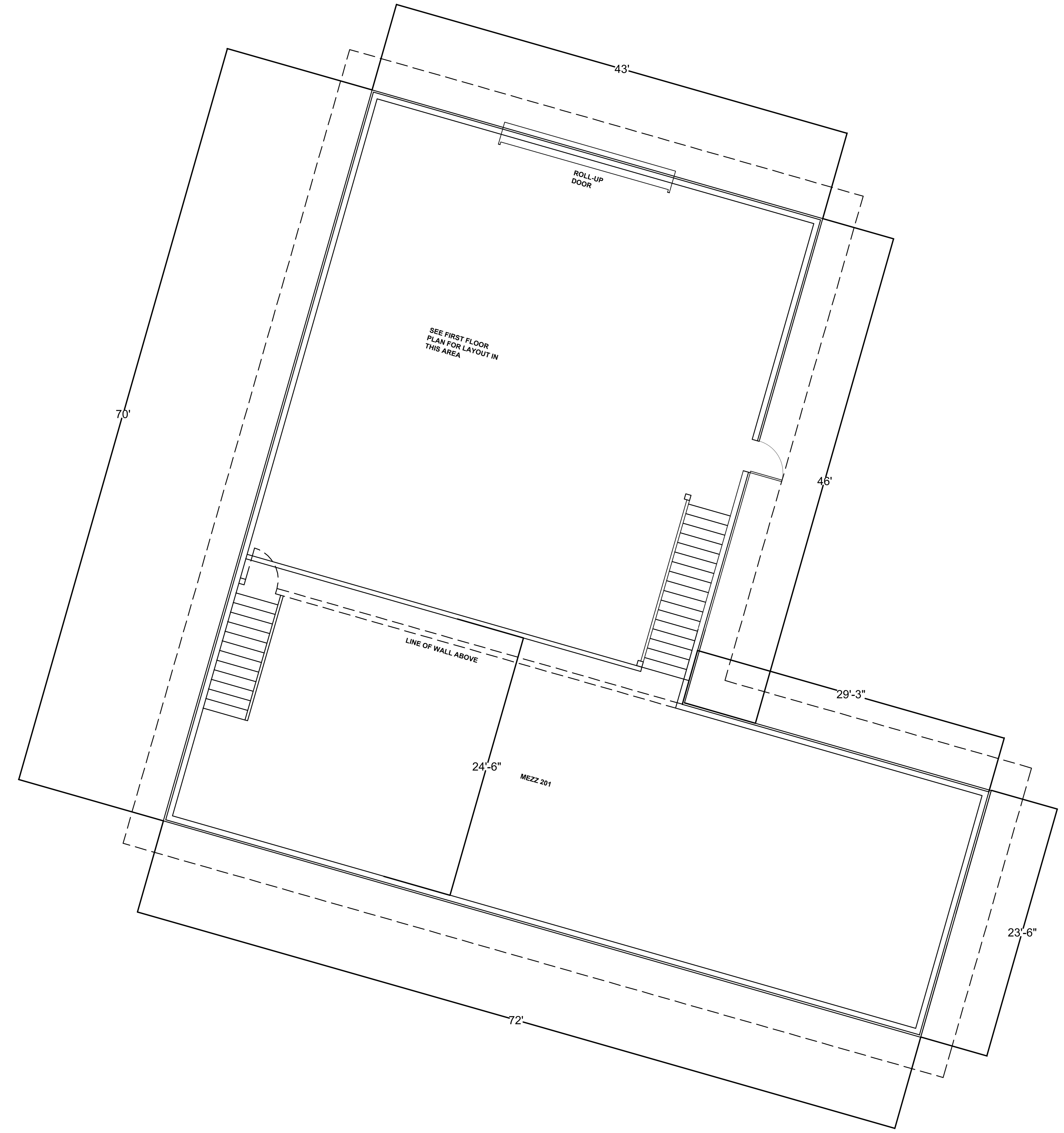
REV NO. X

SHEET NO. C-115



1 WAREHOUSE BUILDING - 1ST FLOOR
SCALE: 1/8" = 1'-0"

0 4' 8' 16'
SCALE: 1/8" = 1'-0"



2 WAREHOUSE BUILDING - MEZZANINE LEVEL
SCALE: 1/8" = 1'-0"

0 4' 8' 16'
SCALE: 1/8" = 1'-0"

GROUND FLOOR SQUARE FOOTAGE:
3,525 SQ.FT.

MEZZANINE LEVEL SQUARE FOOTAGE:
1,676 SQ.FT.

TOTAL: 5,201 SQ.FT.

NOTE:

THESE DRAWINGS WERE PREPARED WITHOUT THE DRAFT ENVIRONMENTAL ASSESSMENT INFORMATION. SUBJECT TO CHAGNED BASED UPON INFORMATION PROVIDED WITHIN THE DRAFT ENVIRONMENTAL ASSESSMENT REPORT.

NOTE:

FIELD VERIFY DIMENSIONS.

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Lafayette, Louisiana 70506
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FINAL CONCEPT DRAWINGS

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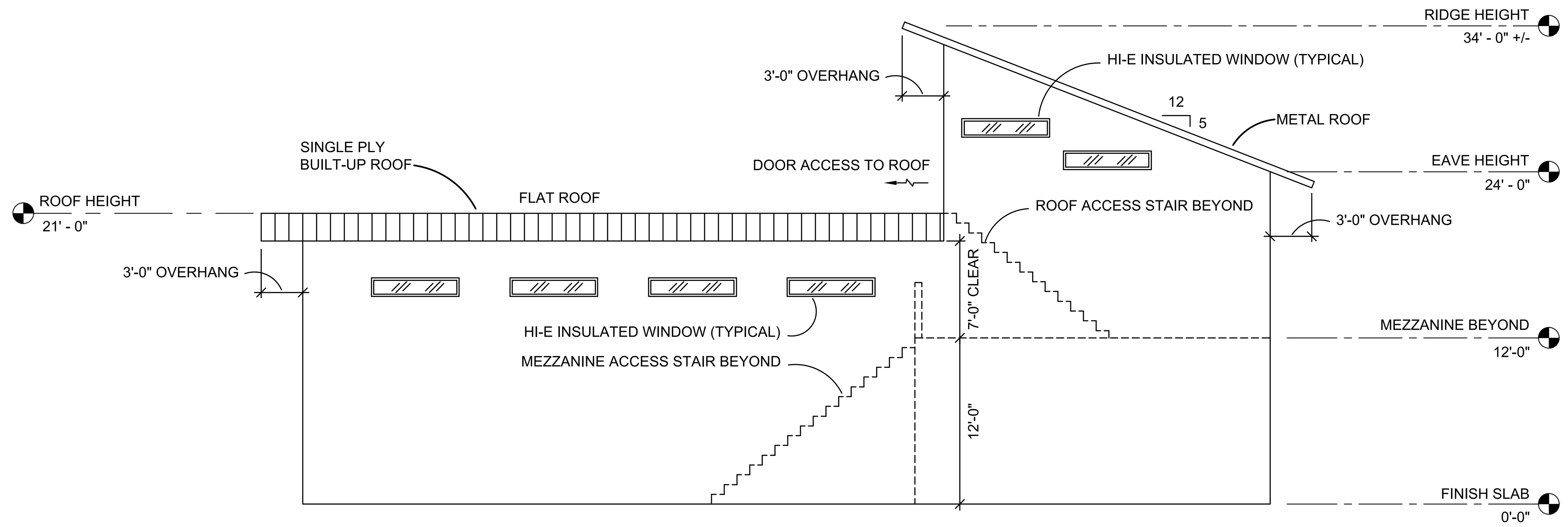
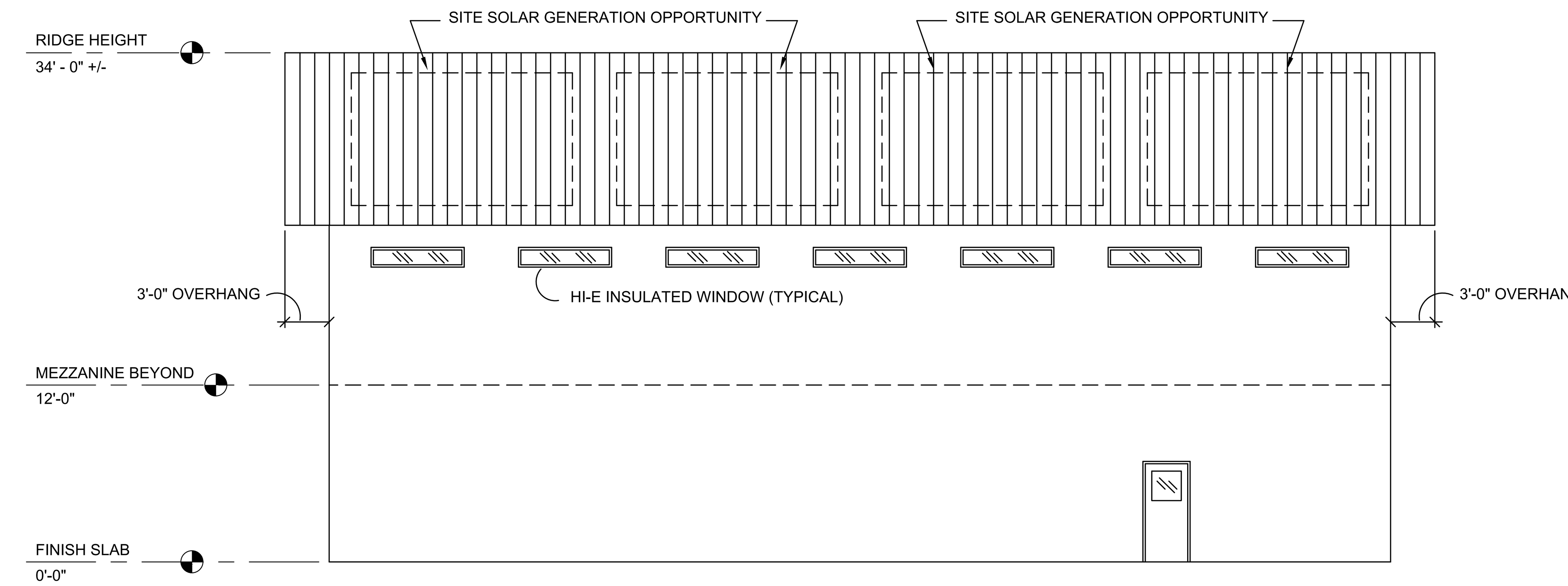
REV	DATE	DESCRIPTION

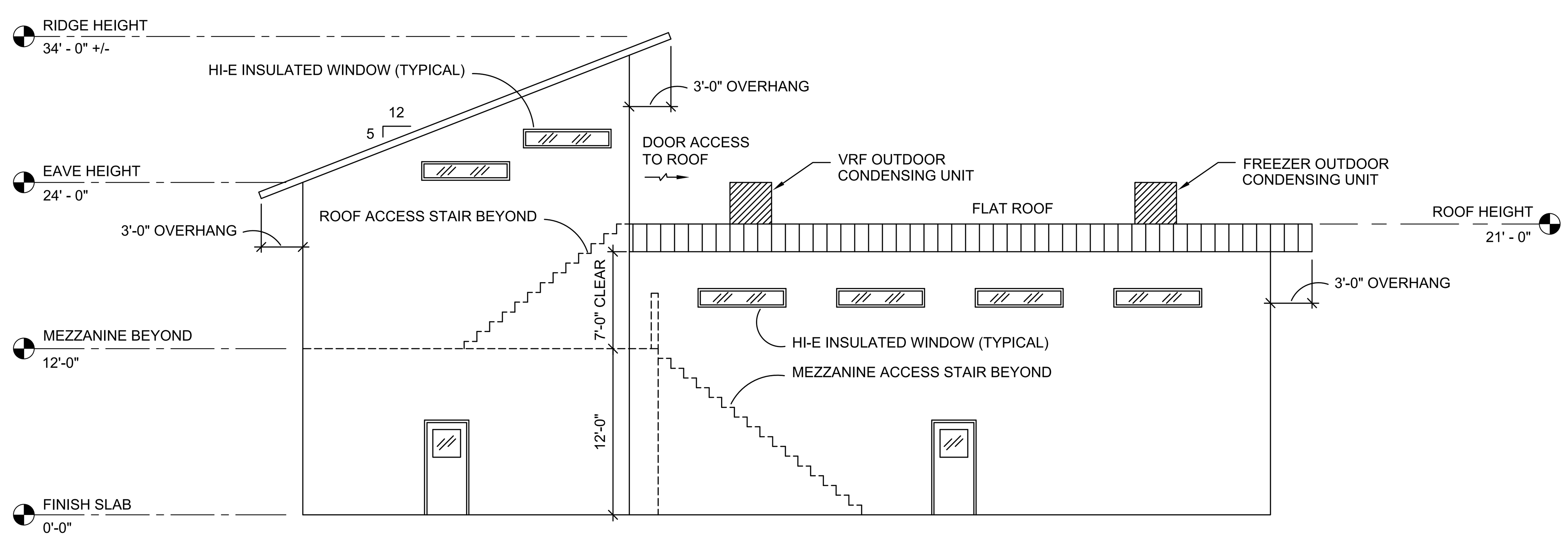
DATE ISSUED: MAY 6, 2022
DRAWN BY: SPC
CHECKED BY: LWB/LM
FILE NAME: 21260-D_A-100.dwg
DRAWING TITLE: WAREHOUSE BUILDING FLOOR PLANS
REV NO.: X
SHEET NO.: A-100



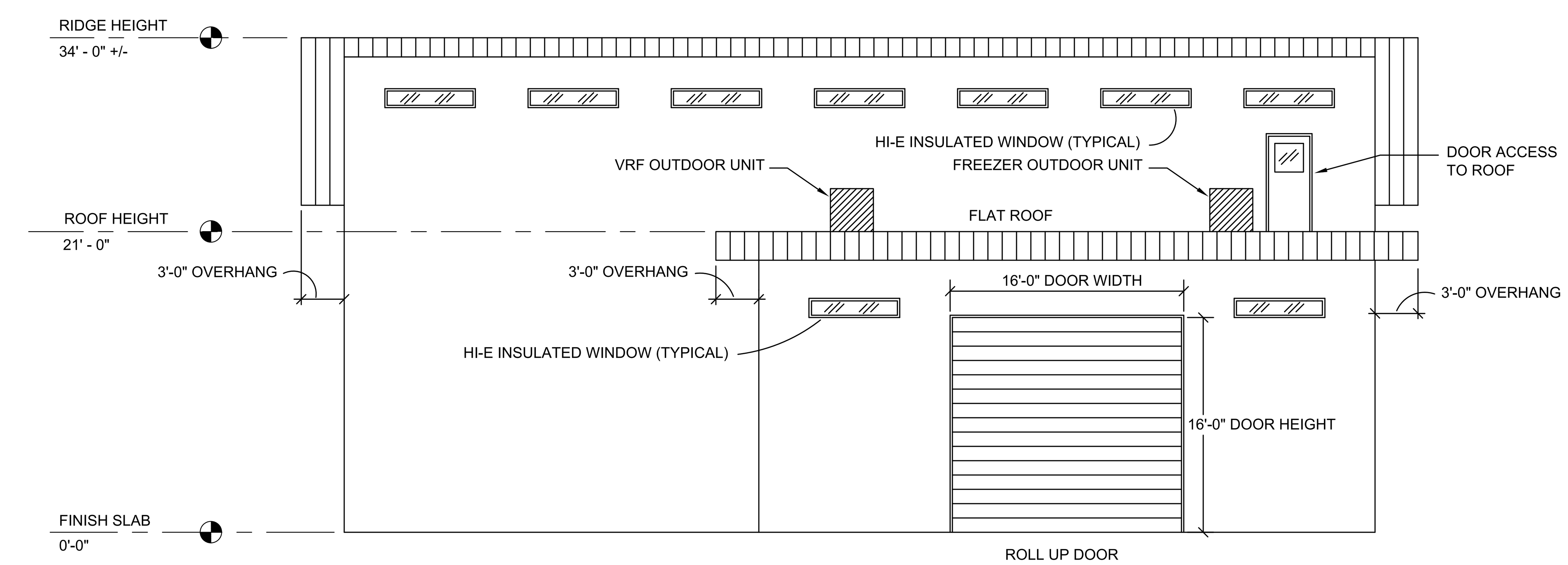
1 ■ WAREHOUSE BUILDING - WEST ELEVATION
SCALE: 1/8" = 1'-0"



3 ■ WAREHOUSE BUILDING - SOUTH ELEVATION
SCALE: 1/8" = 1'-0"



2 ■ WAREHOUSE BUILDING - EAST ELEVATION
SCALE: 1/8" = 1'-0"



4 ■ WAREHOUSE BUILDING - NORTH ELEVATION
SCALE: 1/8" = 1'-0"

0 4' 8' 16'
SCALE: 1/8" = 1'-0"

GROUND FLOOR SQUARE FOOTAGE:
3,525 SQ.FT.

MEZZANINE LEVEL SQUARE FOOTAGE:
1,676 SQ.FT.

TOTAL: 5,201 SQ.FT.

NOTE:
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NOTE:
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3909 West Congress Street, Suite 201
Lafayette, Louisiana 70506
Phone: (337) 234-5710
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R. Craig Campbell II - License No. 29380
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ADG PROJECT NO: 21260-D

SEAL:
CONCEPT DOCUMENTS
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ENGINEER:
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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NOAA
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UNITED STATES DEPARTMENT OF COMMERCE NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION

OFFICE OF MARINE AND AVIATION OPERATIONS (OMAO)
SOUTHEAST MARINE OPERATIONS HUB PROJECT
FINAL CONCEPT DRAWINGS

2234 S. HOBSON AVE. NORTH CHARLESTON, SC 29405

REV	DATE	DESCRIPTION

DATE ISSUED:	MAY 6, 2022
DRAWN BY:	SPC
CHECKED BY:	LWB/LM
FILE NAME:	21260-D_A-101.dwg

DRAWING TITLE:
WAREHOUSE BUILDING ELEVATIONS

REV NO.	SHEET NO.
X	A-101

Appendix C: Noise

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION - OFFICE OF MARINE AND AVIATION OPERATIONS

SOUTHEAST MARINE OPERATIONS HUB PROJECT

POTENTIAL NOISE IMPACTS TO PROTECTED SPECIES

TECHNICAL REPORT

NORTH CHARLESTON, SOUTH CAROLINA

JULY 2022

Prepared for:
AHTNA ENVIRONMENTAL, INC.
900 SW 16th Street
Suite 330
Renton, WA 98057

Prepared by:
MOFFATT & NICHOL
4700 Falls of Neuse Rd
Suite 300
Raleigh, NC 27609

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	Definition
BOEM	**Bureau Ocean Energy Management**
Caltrans	California Department of Transportation
CY	Cubic yards
dB	Decibels
dBA	A-weighted decibels
dBpeak	Peak sound pressure level
dBrms	Decibel root mean square
ESA	Endangered Species Act
FHWA	Federal Highway Administration
FHWG	Fisheries Hydroacoustic Working Group
Hz	Hertz
MLLW	Mean lower low water
MMPA	Marine Mammal Protection Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OMAO	Office of Marine and Aviation Operations
Project	Charleston Pier Romeo Recapitalization Project
PTS	Permanent threshold shift
SEL	Sound exposure level
SELcum	Cumulative sound exposure level
SERO	Southeast Regional Office
SLR	Sea level rise
TTS	Temporary threshold shift
USACE	U.S Army Corps of Engineers
USDOT	U.S Department of Transportation
USFWS	U.S. Fish and Wildlife Service
WETA	Water Emergency Transportation Authority
WSDOT	Washington State Department of Transportation

EXECUTIVE SUMMARY

The National Oceanic and Atmospheric Administration (NOAA) is proposing to remove and replace an existing deteriorated pier and install a seawall on the southern bank of the Cooper River, in the City of North Charleston, South Carolina. The proposed construction activities have the potential to result in temporary elevated in-water and terrestrial noise levels, with the most substantial construction activity-related noise being pile installation activities. Due to the location of the project on the southern bank of the Cooper River, in the City of North Charleston, South Carolina, the following protected species have the potential of occurring in the project vicinity: Atlantic sturgeon (*Acipenser oxyrinchus*), shortnose sturgeon (*Acipenser brevirostrum*), green sea turtle (*Chelonia mydas*), Kemp's Ridley sea turtle (*Lepidochelys kempii*), leatherback sea turtle (*Dermochelys coriacea*), loggerhead sea turtle (*Caretta*), hawksbill (*Eretmochelys imbricata*), Indian manatee (*Trichechus manatus*), and bottlenose dolphin (T*ursiops truncatus*).

This report evaluates the potential in-water noise impacts to these protected species by comparing anticipated in-water construction-related noise levels to established noise thresholds for these species. This report also identifies measures to avoid or minimize potential noise impacts as necessary. Based on the analysis presented in this report, noise levels could exceed injury thresholds for special status species during the proposed pile installation activities within limited areas immediately around the pile driving activities. Construction related noise could also exceed behavioral thresholds. Potential impacts due to exceedances over these thresholds would be minimized through the use of noise and vibration reduction measures. There measures would include a soft-start, where lower hammer energy levels are used to start the pile driving process, and then the force of pile driving is gradually increased, a wood cushion block between the pile and the helmet to minimize vibration during strikes, and marine mammal monitoring. Due to the short-term nature of in-water construction related activities, limited extent of potential noise impacts, and proposed avoidance and minimization measures, substantial adverse noise impacts to special-status species are not anticipated.

1. INTRODUCTION

The National Oceanic and Atmospheric Administration (NOAA) is proposing to remove and replace an existing deteriorated pier and install a seawall on the southern bank of the Cooper River, in the City of North Charleston, South Carolina (Figure 1). The proposed NOAA Office of Marine and Aviation Operations (OMAO) Charleston Pier Romeo Recapitalization Project (Project) includes elements that have the potential to result in temporary elevated underwater and terrestrial noise levels, with the most substantial construction activity-related noise being those related to pile installation activities. Elevated in-air and in-water noise levels have the potential to impact protected species. Several special status fish, sea turtle, and marine mammal species have been identified as having the potential to occur in the Project vicinity and could be impacted by Project related noise. The purpose of this Noise Technical Report is to evaluate potential construction related noise impacts to special status species. This report also includes avoidance and minimization measures that can be implemented to avoid or minimize potential noise impacts to protected species.

Figure 1. Project Location Map

1.1. PROJECT DESCRIPTION

NOAA - OMAO is proposing to recapitalize the pier to re-establish homeport operations and maintenance functions for NOAA vessels, the Nancy Foster and Ronald H. Brown, and other visiting government vessels. For efficiency and continuance of operation, NOAA ships would be strategically berthed at a NOAA operated facility located closer in proximity to their dedicated or primary mission support area.

The Project would rehabilitate Pier Romeo to a fully viable berthing facility, enabling the agency to support sustainable, safe navigation along the east coast for NOAA vessels and other visiting government vessels. The Project would consist of the demolition of the existing pier, construction of a replacement pier in the original pier footprint, placement of a 620-foot-long seawall located due east of the pier and above the critical area line, placement of shoreline revetment curbing along portions of the east and west property boundaries, and construction of an optional living shoreline.

The new facility would include a floating pier, access trestle, new utility systems and lighting, and modifications to the existing parking lot to support the new berthing area. Modification to existing concrete pier abutments is also proposed. Construction would involve replacing the pier structure including ship support/operational utilities, lighting upgrades, upgraded utility network, paving, fencing, and other associated site improvements required to support the new OMAO Pier Romeo structure. To construct the replacement pier, up to 24, 48-inch diameter steel pipe piles, up to four, 36-inch diameter steel pipe piles, and up to four, 24-inch diameter steel pipe piles would be installed using vibratory installation and then proofed with an impact hammer. The seawall would consist of a steel sheet pile wall installed with a vibratory hammer.

Dredging would be required with reconstruction of the pier. Approximately 142,000 cubic yards (CY) of material would be dredged from areas around the pier to a depth of -26 feet mean lower low water (MLLW) (-25 feet dredge depth plus -1 feet overdredge allowance). The area of dredging would extend outward 180 feet from the centerline of the existing pier (150 feet for the edge of the proposed pier) and out to the navigational channel of the Cooper River. The floating pier and trestle would be secured and stabilized by approximately 32 steel piles to construct the vessel berthing portion of the pier.

1.2. PURPOSE AND NEED

Infrastructure have been closed to berthing or staging of vessels since 2006. The pier's existing in-water piles and mooring structures are severely deteriorated. Shoreline erosion and overtopping of riverine waters due to wind, wave, and increasing tidal conditions is occurring near the pier along the eastern shoreline. Existing rip rap installed to protect infrastructure has deteriorated over time. Occurrences of localized flooding due to rising sea levels that hinders operational efficiency at the NOAA site is occurring on a more frequent basis.

The need for the proposed Project is as follows:

- Safe, modern pier facilities that are properly sized for the current agency mission.
- Increased storage area to support pier facility uses.
- Improved flood protection of infrastructure through non-structural and natural measures adjacent to the pier (to minimize overtopping, erosion, and reduction in wetland function).

- Improved adaptivity of existing NOAA site infrastructure on the banks of the Cooper River to sea level rise (SLR).
- NOAA envisions the Project implementation would be associated with the following benefits:
    - o The re-commissioning of the pier to accommodate large vessel berthing, thus enhancing critical infrastructure and mission support capabilities.
    - o Implementation of upland site improvements intended to reduce flooding hazards that would be associated with operational inefficiency and property damage or loss.
    - o Stabilization of the site's shorelines and improvement in its functionality to reduce flooding risks near the bank of the Cooper River.

The purpose of the Project is to improve and protect critical infrastructure and mission support capabilities at the existing pier site for NOAA. An additional objective of the Project is to combat the effects of storm surge and projected SLR within the NOAA site, which includes both NOAA operational headquarters and pier operations.

The Project would include the following:

- The re-commissioning of the pier to accommodate large vessel berthing, thus enhancing critical infrastructure and mission support capabilities.
- Implementation of upland site improvements intended to reduce flooding hazards that would be associated with operational inefficiency and property damage or loss.
- Stabilization of the site's shorelines and improvement in its functionality to reduce flooding risks near the bank of the Cooper River.

2. NOISE FUNADMENTALS

2.1. In-air Noise

Noise is defined as unwanted sound that is unexpected and can disrupt normal activities and reduce the quality of the environment (Federal Highway Administration [FHWA] Noise Handbook 2006. Noise is transmitted through air when an object moves and causes air waves. When the air waves reach a human's or animal's ear, they are perceived as sound. Sound is measured in decibels (dB) and the standard reference distance for noise levels is 50 feet. Airborne noise is typically reported in A-weighted decibels (dBA), which corresponds to the limits of human hearing.

A-weighting emphasizes the parts of the frequency spectrum that occur within the limits of human hearing and de-emphasizes frequencies below or above human hearing (i.e., below 500 hertz (Hz) and above 10,000 Hz). Many animals can hear sounds above or below frequencies heard by humans. Animal response to noise is dependent upon the noise level, frequency, hearing sensitivity, time of day, location relative to the noise source, and reproductive status. When assessing potential noise impacts to animals, the unweighted dB is typically used.

Noise attenuation is the reduction in the decibel level at each doubling distance from the source. Generally, in-air sound levels for a point source decrease by 6 dBA for each doubling of distance (FHWA 2017). However, factors such as topography, vegetation, and temperature can result in additional noise reductions. Hard flat sites, such as water or concrete, typically provide less attenuation than soft sites, such as unpacked earth. Dense vegetation can provide an additional 5 dB reduction for every 100 feet with a maximum reduction of 10 dB over 200 feet (USDOT 1995). Atmospheric conditions such a temperature, humidity, and wind can also impact noise attenuation rates. Generally, noise travels farther in colder temperatures and in areas with higher humidity, whereas wind can reduce noise levels.

2.2. In-water Noise

In-water noise behaves similarly to in-air noise. In-water noise is typically measured in dB and measured at 10 meters from the source. Unlike in-air noise, in-water noise is not weighted to correspond to the frequencies that humans hear. In-water noise is typically reported as the root mean square (dBrms) pressure level, peak sound pressure level (dBpeak), or sound exposure level (SEL). dBrms refers to the square root of the energy divided by the impulse duration, dBpeak refers to the instantaneous maximum observed, and dB SEL is used to indicate the energy dose. dBrms is typically used by NOAA's National Marine Fisheries Service (NMFS) to determine the potential harassment impacts to federally protected marine mammals, and dBpeak is often used to evaluate potential injury to federally protected fish species.

Transmission loss is the decrease in acoustic energy as the pressure wave moves away from the source. Bottom topography, sediment types, temperature gradients, currents, tidal flux, and river sinuosity can determine noise attenuation in an underwater environment. In-water structures can also block, reflect, or diffract noise waves. In-water noise propagation is typically defined using an accepted practical spreading model (NMFS 2012). The practical spreading model assumes that noise energy decreases at a rate of 4.5 dB per doubling distance.

3. EXISTING NOISE CONDITIONS

The ambient sound level is the total of all sound sources excluding anthropogenic sources. The background noise level is the total of all sound sources including anthropogenic sources. Ambient or background sound levels can vary greatly depending on site-specific factors.

3.1. IN-AIR

Pier Romeo is in an industrial developed area and extends out into Cooper River, which experiences heavy vessel traffic. The CSX railroad is located approximately 0.9 mile from the pier; US-52, US-78, and I-26 are located approximately 1.4 miles from the pier (USACE 2018a). Background noise levels would be anticipated to be impacted by motor vehicles, naval vessels, other marine traffic, military machinery, and the CSX railroad. Locomotive train horns are sounded in advance of all public crossings and must be at least 96 dBA at 100 feet (USACE 2018a). At approximately 0.9 miles, train horns would be approximately 70 dBA and at approximately 2.6 miles, train horns would be 65 dBA. In 2018, existing in-air background noise levels were taken at 20 different locations within 1 to 2.5 miles of the pier (USACE 2018a). Measurements were taken in 15-minute intervals during the day and then converted to hourly averages. In-air noise measurements ranged from 48.6 dBA to 62.8 dBA. The two nearest noise measurements were taken at 1801-1 English St. and at the cemetery next to K-Con, Inc. Noise measurements at these locations were 50.8 dBA and 60.6 dBA, respectively, and are anticipated to be representative of existing background noise levels within the vicinity of Pier Romeo.

3.2. IN-WATER

In-water anthropogenic noise sources that could occur in the Project area with regularity include naval vessels, fishing boats, recreational boats, and shipping traffic. Regular maintenance dredging of the federal navigation channel would also produce underwater noise.

Underwater sound measurements were not available for the Project area. Background in-water sound levels in deep slow-moving rivers are typically about 120 dBrms (Washington State Department of Transportation [WSDOT] 2020). Marine vessels produce noise levels ranging from 157 dB to 182 dB at the source (Kipple and Gabriele 2004). The federal navigation channel in Cooper River is routinely dredged (USACE 2018b). The entrance channel is typically dredged by hopper dredge every two years, the lower harbor is typically dredged every 12 to 15 months with a clamshell dredge, and the upper harbor, where the pier is located, is typically dredged every 18 to 21 months via a hydraulic cutterhead pipeline dredge. The most recent dredging event in Cooper River occurred in April 2021 in the upper reach at the Port Terminal Reach (Waterway Guide 2021). The largest class size cutterhead hydraulic dredges can produce source noise levels of up to 175 dBrms (Reine and Dickerson 2014a), while smaller, more typically sized cutterhead dredges, produce source noise levels of up to approximately 153 dBrms. The largest size class mechanical dredge in coarse sediment can produce source noise levels of up to 179.4 dB (Reine and Dickerson 2014a), while smaller dredges in soft sediments would typically produce far less noise.

4. EXPECTED CONSTRUCTION RELATED NOISE

The proposed construction activities have the potential to result in temporary elevated in-water and terrestrial noise levels, with the most substantial construction activity-related noise being dredging and pile installation activities.

As discussed in Section 1, the Project proposes to install the following pile types and diameters:

- Up to approximately 24, 48-inch diameter steel pipe piles;
- Up to approximately four, 36-inch diameter steel pipe piles;
- Up to approximately four, 24-inch diameter steel pipe piles; and
- Up to 140 steel sheet pile pairs.

Steel pipe piles would first be installed with a vibratory hammer and then proofed with an impact hammer. It is anticipated that up to one pile could be installed each day. Up to 730 blows per pile could be required for proofing and up to 8 hours of vibratory installation could be required for each pile. Steel sheet piles would be installed with a vibratory hammer and vibratory installation of the steel sheet piles could occur for up to 8 hours per day.

Up to approximately 142,000 CY of sediment would be hydraulically dredged as part of the proposed Project. The width of the dredging footprint would only extend approximately 150 feet to either side of the existing pier; therefore, it is anticipated that a small to typically sized hydraulic dredge would be used. Major processes contributing to noise production during hydraulic dredging include the noise produced during dredge material collection and intake of sediment-water slurry, sounds produced by pumps driving suction of material through pipes, movement of sediment through pipes, and sounds associated with vessels and machinery operating dredge equipment (Reine and Dickerson 2014a). Sounds produced by hydraulic dredging are continuous except during transitional activities (e.g., system flushing, repositioning, etc.).

4.1. IN-AIR CONSTRUCTION

Anticipated in-air construction related noise sources are summarized in Table 1.

Table 1. Anticipated In-air Equipment Noise

Equipment	Noise Level (dBA)	Measurement Distance
Impact pile driver[1]	101	50 feet
Vibratory pile driver[1]	101	50 feet
Hydraulic dredge[2]	80	50 feet

[1] Source: Federal Highway Administration noise prediction model (FHWA 2006)
[2] Source: Noise Impacts Related to Lake Restoration Activities at Lake Kittamaqundi and Lake Elkhorn (Columbia Association 2016)

4.2. IN-WATER CONSTRUCTION

Anticipated in-water construction related noise levels are summarized in Table 2. All available noise levels for the impact installation of 48-inch steel pipe piles include the implementation of a bubble curtain. However, given that impact pile driving is only proposed for proofing, a bubble curtain is not proposed for this Project. Bubble curtain effectiveness is variable, but typical noise reductions when deployed properly in favorable environments vary from approximately 5 to 10 dB (California Department of Transportation [Caltrans] 2020). Therefore, the unattenuated noise levels for the installation of 48-inch steel pipe piles may be up to approximately 10 dB louder than available attenuated noise levels.

Table 2. Anticipated In-water Equipment Noise (Unattenuated)

Equipment	Noise Level			Measurement Distance
	dB Peak	dBrms	dB SEL	
Impact pile driver (attenuated, 48-inch steel pipe)[1]	203	181	170	10 meters
Impact pile driver (unattenuated 48-inch steel pipe)*	213	191	180	10 meters
Impact pile driver (unattenuated, 36-inch stee pipel)[2]	210	193	183	10 meters
Impact pile driver (unattenuated, 24-inch steel pipe)[3]	203	189	178	10 meters
Vibratory pile driver (unattenuated, 48-inch steel pipe)[4]	--	159	--	10 meters
Vibratory pile driver (unattenuated, 36-inch steel pipe)[5]	191	159	159	10 meters
Vibratory pile driver (unattenuated, 24-inch steel pipe)[6]	181	153	153	10 meters
Vibratory pile driver (unattenuated, steel sheet)[7]	177	163	163	10 meters
Hydraulic dredge (100 ft length)[8]		153		1 meter

* Unattenuated value calculated by adding 10 dB to available attenuated noise data
[1] Source: Caltrans, 2020, Naval Base Kitsap, Bangor, WA
[2] Source: Caltrans 2020, Humboldt Bay Bridges, Eureka, CA
[3] Source: Caltrans 2020, Rodeo Dock Repair, San Francisco, CA
[4] Source: Illingworth & Rodkin 2016
[5] Source: Caltrans 2020, Water Emergency Transportation Authority (WETA) Downtown Ferry, San Francisco, CA
[6] Source: Caltrans 2020, Prichard Lake Pumping Station, Sacramento, CA
[7] Source: Caltrans 2020, Port of Oakland, Oakland, CA
[8] Reine and Dickerson 2014b

5. NOISE IMPACTS

5.1. FISH

The Project involves in-water work that could result in noise impacts to protected fish species. The Atlantic sturgeon (*Acipenser oxyrinchus*) and shortnose sturgeon (*Acipenser brevirostrum*) are Endangered Species Act (ESA)-listed as endangered and have the potential to occur in the Project vicinity (M&N 2022). This section describes potential noise impacts to fish including Atlantic sturgeon and shortnose sturgeon.

5.1.1. Thresholds and Guidelines for Potential Noise Impacts

The main hearing organ in fish is the lateral line system, which is sensitive to particle motion. Pressure waves can cause changes in the swim bladder that may cause damage or reduced hearing sensitivity. In 2008 the Fisheries Hydroacoustic Working Group (FHWG), which included NMFS, U.S. Fish and Wildlife Service (USFWS), the Departments of Transportation for California, Oregon, and Washington, and nation experts on sound propagation developed the interim injury criteria level threshold and a behavioral guideline for assessing potential noise impacts to fish (FHWG 2008). Excessive in-water noise has the potential to directly impact fish species by causing physical injury or altering behavior when thresholds/guidelines are exceeded. The NMFS Southeast Regional Office (SERO) has developed a model to estimate the levels of underwater sound received by fish during in-water construction activities (NMFS SERO 2021). This model calculates the distance in which the loudest anticipated noise levels would attenuate to federal threshold/guideline levels. These anticipated noise levels, as well as the anticipated attenuation distances, are summarized in Table 3.

Table 3. Noise Criteria Thresholds (or Guidelines) and Distances to Thresholds/Guidelines for Fish

	Interim Injury Criteria (impulsive)			**Behavioral**
	dB Peak	**SELcum**		**dBrms**
		Fish > 2 g	**Fish < 2g**	
Threshold	**206 dB Peak**	**187 dB SELcum**	**183 dB SELcum**	**150 dBrms**
Distance to Threshold (Impact 48-inch Steel)	30 meters (0.019 miles)	277 meters (0.17 miles)	512 meters (0.32 miles)*	5,412 meters (3.36 miles)
Distance to Threshold (Impact 36-inch Steel)	19 meters (0.012 miles)	439 meters (0.27 miles)	811 meters (0.50 miles)*	7,357 meters (4.57 miles)
Distance to Threshold (Impact 24-inch Steel)	7 meters (0.005 miles)	204 meters (0.13 miles)	377 meters (0.24 miles)*	3,982 meters (2.48 miles)
Distance to Threshold (Vibratory 48-inch Steel)	--	--	--	40 meters (0.03 miles)
Distance to Threshold (Vibratory 36-inch Steel)	--	--	--	40 meters (0.03 miles)
Distance to Threshold (Vibratory 24-inch Steel)	--	--	--	16 meters (0.01 miles)
Distance to Threshold (Vibratory Steel Sheet)	--	--	--	74 meters (0.05 miles)

* Threshold not applicable for installation method

In-water noise produced during dredging activities would not be anticipated to result in noise threshold/guideline exceedances and, therefore, noise impacts to fish from the proposed dredging activities are not anticipated. Noise produced during pile installation activities has the greatest potential to exceed noise thresholds and guidelines. The injury thresholds only apply to impulsive noise sources such as impact pile driving. Continuous noise sources such as vibratory pile driving would not be held to these thresholds. The behavioral guidelines apply to both continuous noise sources and impulsive noise sources. If noise levels exceed the interim injury criteria threshold, physical injury may occur. If noise levels exceed the behavioral guidelines, behavioral effects may occur. However, the potential for behavioral changes depends on site specific conditions, timing, and duration.

5.1.2. Noise Impact Analysis

As discussed in Section 4, the Project proposes to install 48-inch diameter steel pipe piles, 36-inch diameter steel pipe piles, 24-inch diameter steel pipe piles, and steel sheet piles. Distances to thresholds were calculated using the anticipated in-water construction related noise levels discussed in Section 4 (Table 2).

Injury Threshold Exceedances (Level A)

The injury threshold is 206 dB peak for fish of all sizes, 183 dB SEL cumulative (SELcum) for fish less than 2 grams, and 187 dB SELcum for fish greater than 2 grams. Both Atlantic sturgeon and shortnose sturgeon would be anticipated to be greater than 2 grams. Therefore, the injury threshold that is applicable to these species and Project site is 187 dB SELcum (Table 3).

Steel Pipe Piles Threshold Distance

According to the NMFS Multi-Species Pile Driving Calculator (NMFS SERO 2021), the loudest anticipated sound levels from proofing steel pipe piles could exceeded thresholds in which physical injury may occur within an area no larger than 439 meters (0.27 miles) around each pile (Table 3). Injury thresholds only apply to impulsive noise sources; therefore, vibratory installation of the steel pipe piles would not result in injury threshold exceedances.

Steel Sheet Piles Threshold Distance

Injury thresholds only apply to impulsive noise sources; therefore, vibratory installation of the steel sheet piles would not result in injury threshold exceedances and impacts are not anticipated.

Potential Impacts

Impact pile driving has been avoided to the extent feasible and would only be used to proof piles. This is being proposed to minimize potential impacts to ESA-listed species including Atlantic sturgeon and shortnose sturgeon. Instead, vibratory installation would be used, which emits a sound wave not known to result in injury to fish species. Impact proofs would be the minimum necessary to ensure structural integrity of the installed piles. For this noise analysis, it has been conservatively assumed that up to 730 blows per pile could be required for proofing, but far less are likely. Additionally, distances to thresholds were conservatively calculated using the greatest in-water noise from available applicable noise sources. Typical Project-related noise would be anticipated to be less than the maximum used for this impact analysis. Therefore, potential threshold exceedances would likely be less than those presented in this noise analysis. Furthermore, pile installation would be a short-term activity. Impact proofing would only occur during the installation of up to 32 total steel pipe piles and the installation of these steel pipe piles is anticipated to take less than 35 total days.

It is unlikely that Atlantic sturgeon and shortnose sturgeon will occur within close proximity to the active construction area and within the 439-meter (0.27 mile) injury threshold area during the limited extent of steel pipe pile driving activities. Cooper River is also an industrial area that receives heavy vessel traffic with an anticipated higher background noise level. Marine vessels produce noise levels ranging from 157 dB to 182 dB at the source (Kipple and Gabriele 2004). Construction related noise impacts compared to these high background noise levels would be minor. To reduce the potential for noise impacts, a soft start technique (pile driving at a reduced energy) will be implemented to alert any nearby Atlantic sturgeon and shortnose sturgeon, allowing them to move out of the area before full force pile driving begins. A wood cushion block would also be used during impact pile proofing. With the implementation of the proposed avoidance and minimization measures, noise impacts to Atlantic sturgeon and shortnose sturgeon due to exceedances over the injury threshold are considered unlikely.

Figure 2. Fish Injury Threshold Exceedance Distance

Level B Guideline Exceedances

The behavioral guideline, although not a formal regulatory standard, is 150 dBrms (FHWG 2008). The behavioral guideline applies to both continuous and impulsive noise sources.

Steel Pipe Piles Guideline Distance

The behavioral guideline could be exceeded within 7,357 meters (4.57 miles) during impact proofing of steel pipe piles and within 40 meters (0.03 miles) during vibratory installation of steel pipe piles. This exceedance area would be anticipated to be confined by adjacent land masses.

Steel Sheet Pile Guideline Distance

The behavioral guideline could be exceeded within 74 meters (0.05 miles) during vibratory installation of steel sheet piles.

Potential Impacts

Behavioral impacts could include fleeing of the area and/or ceasing of feeding or spawning in the area. Whether or not substantial impacts occur at noise levels exceeding this threshold relies heavily on project timing, project duration, species life history, and other site-specific factors (WSDOT 2020). The activity with the greatest potential to cause behavioral threshold exceedances is proofing of steel pipe piles. Impact proofing has been avoided to the extent feasible and would only be used to drive the last 10 feet of each steel pipe pile to ensure the structural integrity of the pile. Pile installation activities would be short-term. Steel pipe pile installation is anticipated to take approximately 35 days and steel sheet pile installation is anticipated to take up to approximately 60 days. Any potential impacts associated with exceedances over the behavioral guideline would be avoided or minimized through the implementation of minimization measures such as the implementation of a soft start technique and use of a wood cushion block during impact pile driving. Potential noise impacts are anticipated to be minor and temporary.

5.2. SEA TURTLES

Several turtle species including green sea turtle (*Chelonia mydas*), Kemp's Ridley sea turtle (*Lepidochelys kempii*), leatherback sea turtle (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), and loggerhead sea turtle (*Caretta*) have been identified as having potential to occur in Charleston County (M&N 2022). Green sea turtles are listed as threatened under the ESA, Kemp's Ridley sea turtle are endangered, leatherback are endangered, hawksbill are endangered, and loggerhead are threatened. This section describes potential in-water noise impacts to sea turtles.

5.2.1. Thresholds and Guidelines for Potential Noise Impacts

In-water noise impacts to sea turtles have not been thoroughly studied. Sea turtles are not known to use sound for communication (NOAA 2016) and it is thought that they likely have poor auditory sensitivity (U.S. Navy 2017). Electrophysiological and behavioral studies have indicated that sea turtles detect low frequency acoustics, and it is anticipated that they may use sound for navigation, finding prey, and avoiding predators (NOAA 2016).

NMFS SERO has established guidance for assessing noise impacts to sea turtles (NMFS SERO 2021). In-water noise produced during dredging activities would not be anticipated to result in noise threshold exceedances; therefore, noise impacts to sea turtles from the proposed dredging activities are not anticipated. Noise produced during pile installation activities has the greatest potential to exceed noise thresholds. The established thresholds and anticipated attenuation distances to these thresholds are summarized below in Table 4.

Table 4. NMFS SERO Noise Guidelines and Distances to Guidelines for Sea Turtles

	Injury PTS (impulsive)		Injury PTS (vibratory)	Behavioral Guideline
	dB SELcum	dB peak	dB SELcum	dBrms
Threshold	**204 dB SEL**	**232 dB peak**	**220 dB SEL**	**175 dBrms**
Distance to Threshold (Impact 48-inch Steel)	20.4 meters (0.01 miles)	0.5 meters (0.0003 miles)	--	117 meters (0.07 miles)
Distance to Threshold (Impact 36-inch Steel)	32.3 meters (0.02 miles)	0.3 meters (0.0002)	--	159 meters (0.1 miles)
Distance to Threshold (Impact 24-inch Steel)	15 meters (0.01 miles)	0.1 meters (0.0001)	--	86 meters (0.06 miles)
Distance to Threshold (Vibratory 48-inch Steel)	--	--	0.8 meters (0.0005 miles)	0.9 meters (0.0005 miles)
Distance to Threshold (Vibratory 36-inch Steel)	--	--	0.8 meters (0.0005 miles)	0.9 meters (0.000 miles)
Distance to Threshold (Vibratory 24-inch Steel)	--	--	0.3 meters (0.0002 miles)	0.3 meters (0.0002 miles)
Distance to Threshold (Vibratory Steel Sheet)	--	--	1.5 meters (0.001 miles)	1.6 meters (0.001 miles)

-- Threshold not applicable to installation method

5.2.2. Noise Impact Analysis

Threshold distances were calculated using the anticipated in-water construction related noise levels and installation methods discussed in Section 4 (Table 2).

Injury Threshold Exceedances

Steel Pipe Piles Threshold Distance

According to the NMFS Multi-Species Pile Driving Calculator (NMFS SERO 2021), the sound levels from proofing steel pipe piles could exceeded thresholds in which physical injury may occur within an area no larger than 32.3 meters (0.02 miles) around each pile (Table 4, Figure 3). The sound levels from vibratory installation of steel pipe piles could exceeded thresholds in which physical injury may occur within an area no larger than 0.8 meters (0.0005 miles) around each pile (Table 4, Figure 3).

Steel Sheet Piles Threshold Distance

According to the NMFS Multi-Species Pile Driving Calculator (NMFS SERO 2021), the sound levels from vibratory installation of steel sheet piles could exceeded thresholds in which physical injury may occur within an area no larger than 1.5 meters (0.001 miles) around each pile (Table 4, Figure 3).

Potential Impacts

Distances to thresholds were conservatively calculated using the greatest in-water noise from available sources. Typical Project-related noise would be anticipated to be less than the maximum used for this impact analysis. Only 32 total steel pipe piles would be installed. Installation of the steel pipe piles is anticipated to take less than 35 total days. Installation of the steel sheet piles could take up to approximately 60 days. The largest injury threshold area is 32.3 meters (0.02 miles). Sea turtles would not be anticipated to occur within close proximity to the active construction area and within the 32.3-meter (0.02 mile) injury threshold area. Therefore, potential impacts associated with exceedances over the injury threshold are not anticipated. To further reduce the potential for noise impacts, a soft start technique would be implemented to alert nearby sea turtles, allowing them to move out of the area before full force pile driving begins. A wood cushion block would also be used during impact pile proofing. With the implementation of the proposed avoidance and minimization measures noise impacts to sea turtles due to exceedances over the injury threshold are not anticipated.

Behavioral Threshold Exceedances

Steel Pipe Piles Guideline Distance

The behavioral guideline could be exceeded within 159 meters (0.1 miles) during impact proofing of steel pipe piles and within 0.9 meters (0.0005 miles) during vibratory installation of steel pipe piles (Table 4).

Steel Sheet Piles Guideline Distance

The behavioral guideline could be exceeded within 1.6 meters (0.001 miles) during vibratory installation of steel sheet piles (Table 4).

Potential Impacts

The largest behavioral guideline area is 159 meters (0.1 miles). Sea turtles would not be anticipated to occur within close proximity to the active construction area and within the 159-meter (0.01 mile) behavioral guideline area. Therefore, potential impacts associated with exceedances over the behavioral guideline are not anticipated. To further reduce the potential for noise impacts, a soft start technique will be implemented to alert nearby wildlife, allowing them to move out of the area before full force pile driving begins. A wood cushion block would also be used during impact pile proofing. With the implementation of the proposed avoidance and minimization measures noise impacts to sea turtles due to exceedances over the behavioral guideline are not anticipated.

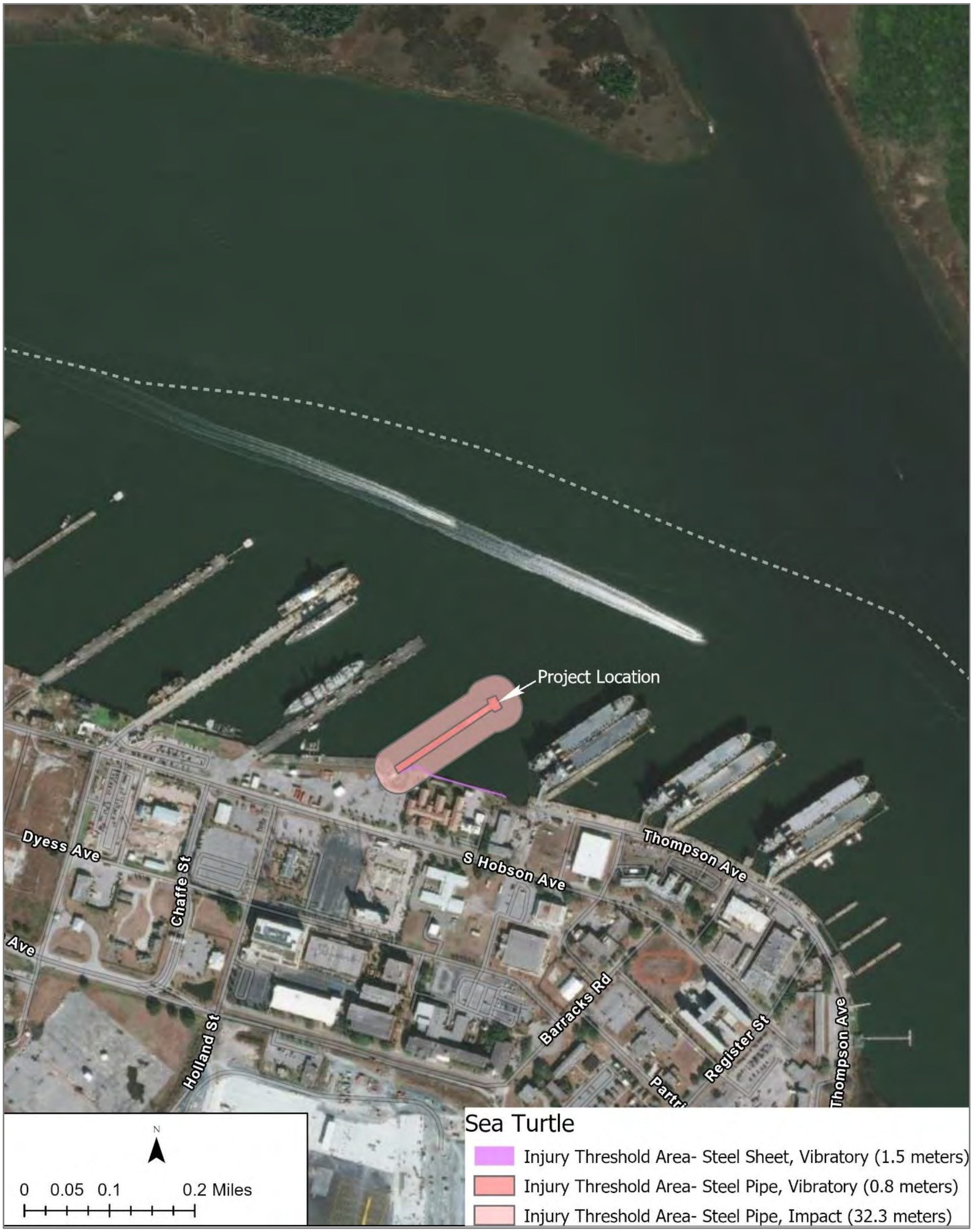

Figure 3. Sea Turtle Injury Threshold Exceedance Distances

5.3. ESA-LISTED MARINE MAMMALS

ESA-listed marine mammals with potential to occur within the Project vicinity include the West Indian manatee (*Trichechus manatus*) (M&N 2022). The West Indian manatee is threatened under the ESA. This section describes potential in-water noise impacts to West Indian manatees.

5.3.1. Threshold for Potential Noise Impacts

Exposure to substantial in-water noise can result in elevated hearing thresholds in marine mammals. If the hearing threshold returns to normal after the exposure, this is considered a temporary threshold shift (TTS). If the hearing threshold does not return to normal for some extended period of time after the exposure, this is considered a permanent threshold shift (PTS). Both PTS and TTS data have been used to determine safe noise exposure levels for marine mammals.

Using PTS and TTS data, NMFS has identified Level A (potential injury) and Level B (potential behavioral disturbance) in-water noise thresholds for marine mammals (NMFS 2020). Level A harassment is defined as "*any act of pursuit, torment, or annoyance that has the potential to injure a protected marine mammal or marine mammal stock in the wild*". Level B harassment is defined as "*any act of pursuit, torment, or annoyance that has the potential to disturb a protected marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering, but does not have the potential to injure a marine mammal or marine mammal stock in the wild*".

Noise has the potential to directly impact marine mammals by causing physical injury or altering behavior when these noise thresholds are exceeded. The established in-water thresholds are based on the hearing class of the marine mammal. Marine mammal hearing classes with established thresholds include phocids, otariids, high-frequency cetaceans, mid-frequency cetaceans, and low-frequency cetaceans. West Indian manatees are sirenians and NMFS has not developed noise thresholds for this hearing class.

Little data exists regarding manatee's sensitivity to noise. However, existing data suggests that manatees hearing capabilities may be similar to phocid pinnipeds (BOEM 2014). The NMFS established thresholds for phocid pinnipeds are shown in Table 5. Noise thresholds have also been estimated using available auditory data for sirenians and available auditory data for other species groups (Southall et al. 2019, Table 5). Given the available data, it is anticipated that the NMFS established in-water thresholds for phocid pinnipeds would provide conservative guidelines for any potential noise impacts to manatees. In-water noise produced during pile installation activities has the greatest potential to exceed noise thresholds; therefore, it is used as the basis for the analysis presented in this section. Dredging would not be anticipated to result in injury threshold exceedances or substantial behavioral threshold exceedances. Therefore, dredging noise impacts are not anticipated. The established thresholds for phocid pinnipeds and the anticipated attenuation distances to these thresholds are summarized in Table 5. These distances to thresholds are anticipated to be conservative of any potential impacts to West Indian manatees.

Table 5. Sirenians Noise Thresholds and Distances to Thresholds for West Indian Manatees

Hearing Group	Impulsive			Non-impulsive	
	Injury (PTS)		Behavioral	Injury (PTS)	Behavioral
	dB SEL	dB Peak			
Sirenians[1]	**190 dB**	**226 dB**	**--**	**206 dB**	**--**
Phocid Pinnipeds[2]	**185 dB**	**218 dB**	**160 dB**	**201 dB**	**120 dB**
Distance to Pinniped Threshold (Impact 48-inch Steel)	274 meters (0.17 miles)	4.6 meters (0.003 miles)	1,166 meters (0.72 miles)	--	--
Distance to Pinniped Threshold (Impact 36-inch Steel)	434 meters (0.27 miles)	2.9 meters (0.002 miles)	1,585 meters (0.99 miles)	--	--
Distance to Pinniped Threshold (Impact 24-inch Steel)	201 meters (0.13 miles)	1.0 meters (0.0007 miles)	858 meters (0.54 miles)	--	--
Distance to Pinniped Threshold (Vibratory 48-inch Steel)	--	--	--	12.2 meters (0.008 miles)	3,981 meters (2.48 miles)
Distance to Pinniped Threshold (Vibratory 36-inch Steel)	--	--	--	12.2 meters (0.008 miles)	3,981 meters (2.48 miles)
Distance to Pinniped Threshold (Vibratory 24-inch Steel)	--	--	--	4.9 meters (0.003 miles)	1,585 meters (0.99 miles)
Distance to Pinniped Threshold (Vibratory Steel Sheet)	--	--	--	22.6 meters (0.014 miles)	7,356 meters (4.57 miles)

[1] Source: Southall et al. 2019
[2] Source: NMFS 2020

5.3.2. Noise Impact Analysis

Injury (Level A) Threshold Exceedances

Steel Pipe Piles Threshold Distance

According to the NMFS Multi-Species Pile Driving Calculator (NMFS SERO 2021), the sound levels from proofing steel pipe piles could exceeded thresholds in which physical injury may occur within an area no larger than 434 meters (0.27 miles) around each pile (Table 5, Figure 4). The sound levels from vibratory installation of steel pipe piles could exceeded thresholds in which physical injury may occur within an area no larger than 12.2 meters (0.008 miles) around each pile (Table 5, Figure 4).

Steel Sheet Piles Threshold Distance

According to the NMFS Multi-Species Pile Driving Calculator (NMFS SERO 2021) the sound levels from vibratory installation of steel sheet piles could exceeded thresholds in which physical injury may occur within an area no larger than 22.6 meters (0.014 miles) around each pile (Table 5, Figure 5).

Potential Impacts

Cooper River is an industrial area that receives heavy vessel traffic and would be anticipated to have a high background noise level. Marine vessels produce noise levels ranging from 157 dB to 182 dB at the source (Kipple and Gabriele 2004). Construction related noise impacts compared to these high background noise levels would be minor. Impact proofing has the greatest potential to result in injury threshold exceedances. Therefore, impact proofing has been avoided to the extent feasible. Impact driving would only be used to proof the last 10 feet of the steel pipe piles. According to the calculated threshold distances (Table 5), vibratory pile driving would be unlikely to result in substantial injury threshold exceedances. Therefore, impacts due to injury threshold exceedances during vibratory installation are not anticipated.

Impact proofing could exceed the injury threshold within a small area no larger than 434 meters (0.27 miles) during steel pipe pile installation. Impact proofing would be the minimum necessary to ensure the structural integrity of the piles. For the purpose of this noise analysis, it has been conservatively assumed that up to 730 blows per pile could be required for proofing, but far less are likely. In addition, distances to thresholds were conservatively calculated using the greatest in-water noise from available applicable sources. Typical Project-related noise would be anticipated to be less than the maximum used for this impact analysis and, therefore, potential threshold exceedances would likely be less than those presented in this noise analysis. Furthermore, pile installation would be a short-term activity. Impact proofing would only occur during the installation of up to 32 total steel pipe piles and the installation of these steel pipe piles is anticipated to take less than 35 total days.

It is considered unlikely that manatees would occur within close proximity to the active construction and within the 434-meter (0.27 mile) impact injury threshold area during the limited extent of pile installation activities. However, to ensure that impacts do not occur, an exclusion (i.e., shut-down) zone will be established prior to in-water pile driving activities. The proposed exclusion zones are as follows:

- Steel pipe pile proofing: 1,585 meters (1 mile)
- Steel pipe pile vibratory installation: 3,981 meters (2.5 miles)
- Steel sheet pile vibratory installation: 7,356 meters (4.6 miles)

The proposed exclusion zones would prevent all possible Level A or Level B harassment of manatees (distances to Level B thresholds are discussed in the following section. The proposed exclusion zones may be confined by adjacent land masses (Figure 4). Figure 5 Additionally, a soft start technique will be implemented to alert nearby manatees, allowing them to move out of the area before full force pile driving begins. A wood cushion block would also be used during impact pile proofing. With the implementation of the proposed avoidance and minimization measures, including an exclusion zone, soft start, and wood cushion block, noise impacts to manatees due to exceedances over the Level A threshold are not anticipated.

Behavioral (Level B) Threshold Exceedances

Steel Pipe Piles Threshold Distance

The behavioral threshold could be exceeded within 1,585 meters (0.99 miles) during impact proofing of steel pipe piles and within 3,981 meters (2.48 miles) during vibratory installation of steel pipe piles (Table 5, Figure 4). The potential threshold exceedance distances would be confined by adjacent land masses.

Steel Sheet Piles Threshold Distance

The behavioral threshold could be exceeded within 7,356 meters (4.57 miles) during vibratory installation of steel sheet piles (Table 5, Figure 5). The potential behavioral threshold exceedance distances would also be confined by adjacent land masses.

Potential Impacts

To prevent potential noise impacts from Level B threshold exceedances, exclusion zones would be implemented prior to in-water pile driving activities (Table 5, Figure 4, Figure 5). The proposed exclusion zones will prevent all possible Level A or Level B harassment of manatees. With the implementation of the proposed avoidance and minimization measures, including an exclusion zone, soft start, and wood cushion block, noise impacts to manatees due to exceedances over the Level B threshold is not anticipated.

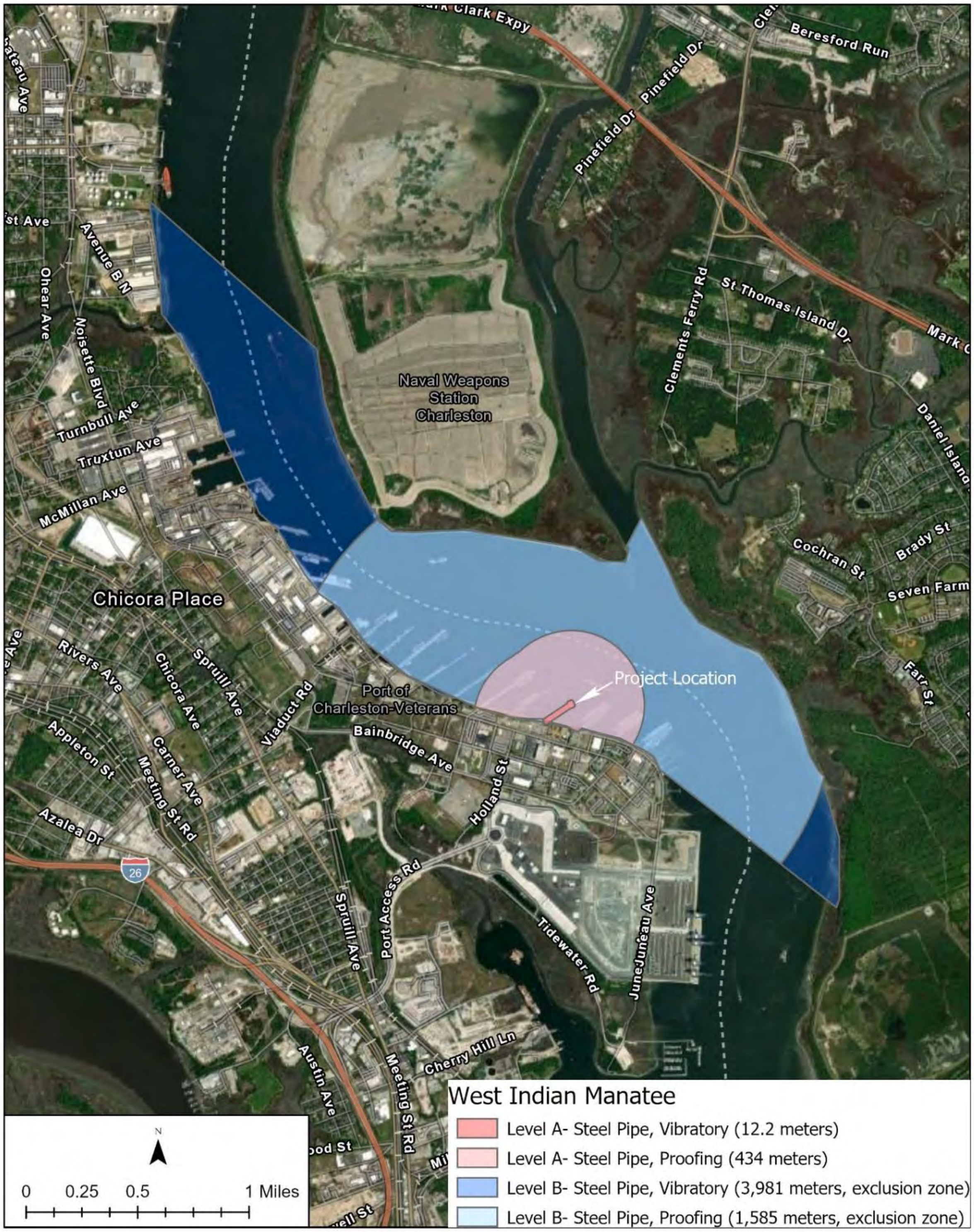

Figure 4. Manatee Behavioral and Injury Threshold Exceedance Distances, Steel Pipe Piles

Figure 5. Manatee Behavioral and Injury Threshold Exceedances, Steel Sheet Piles

5.4. Non-ESA-listed Marine Mammals

Non-ESA-listed marine mammals with potential to occur in the Project vicinity include the bottlenose dolphin (*Tursiops truncatus*) (M&N 2022). Bottlenose dolphins are not ESA-listed but are protected under the Marine Mammal Protection Act (MMPA). This section describes potential noise impacts to bottlenose dolphins.

5.4.1. Threshold for Potential Noise Impacts

In-water noise has the potential to directly impact marine mammals by causing physical injury or altering behavior when noise threshold levels are exceeded. As discussed in Section 5.3, NMFS has identified Level A (potential injury) and Level B (potential disturbance) noise thresholds for marine mammals based on their hearing class (NMFS 2020). Bottlenose dolphins are mid-frequency cetaceans. The NMFS noise thresholds for mid-frequency cetaceans and anticipated attenuation distances are shown in Table 6. In-water noise produced during pile installation activities has the greatest potential to exceed noise thresholds; therefore, it is used as the basis for the analysis presented in this section. Dredging would not be anticipated to result in injury threshold exceedances or substantial behavioral threshold exceedances.

Table 6. Mid-frequency Cetaceans Noise Thresholds

Hearing Group	Impulsive			Non-impulsive	
	Injury (PTS)		Behavioral	Injury (PTS)	Behavioral
	dB SEL	dB Peak		dB SEL	
Mid Frequency Cetaceans	185	230	160	198	120
Distance to Threshold (Impact 48-inch Steel)	18.2 meters (0.011 miles)	0.7 meters (0.004 miles)	1,166 meters (0.72 miles)	--	--
Distance to Threshold (Impact 36-inch Steel)	28.8 meters (0.018 miles)	0.5 meters (0.0003 miles)	1,585 meters (0.99 miles)	--	--
Distance to Threshold (Impact 24-inch Steel)	13.4 meters (0.009 miles)	0.2 meters (0.0001 miles)	857 meters (0.54 miles)	--	--
Distance to Threshold (Vibratory 48-inch Steel)	--	--	--	1.8 meters (0.001 miles)	3,981 meters (2.48 miles)
Distance to Threshold (Vibratory 36-inch Steel)	--	--	--	1.8 meters (0.001 miles)	3,981 meters (2.48 miles)
Distance to Threshold (Vibratory 36-inch Steel)	--	--	--	0.7 meters (0.0004 miles)	1,585 meters (0.99 miles)
Distance to Threshold (Vibratory Steel Sheet)	--	--	--	3.3 meters (0.002 miles)	7,356 meters (4.57 miles)

Source: NMFS 2020

5.4.2. Noise Impact Analysis

Injury (Level A) Threshold Exceedances

Steel Pipe Piles Threshold Distance

According to the NMFS Multi-Species Pile Driving Calculator (NMFS SERO 2021), the sound levels from proofing steel pipe piles could exceeded thresholds in which physical injury may occur within an area no larger than 28.8 meters (0.018 miles) around each pile (Table 6, Figure 6). The sound levels from vibratory installation of steel pipe piles could exceeded thresholds in which physical injury may occur within an area no larger than 1.8 meters (0.001 miles) around each pile (Table 6, Figure 6).

Steel Sheet Piles Threshold Distance

According to the NMFS Multi-Species Pile Driving Calculator (NMFS SERO 2021) the sound levels from vibratory installation of steel sheet piles could exceeded thresholds in which physical injury may occur within an area no larger than 3.3 meters (0.002 miles) around each pile (Table 6, Figure 7).

Potential Impacts

According to the calculated threshold distances (Table 6), pile driving would be unlikely to result in substantial injury threshold exceedances. Therefore, impacts due to injury threshold exceedances during pile installation are not anticipated. However, to ensure that impacts do not occur, an exclusion (i.e., shut-down) zone will be established prior to in-water pile driving activities. The proposed exclusion zones would prevent all possible Level A or Level B harassment of manatees. The proposed exclusion zones are as follow:

- Steel pipe pile proofing: 1,585 meters (1 mile)
- Steel pipe pile vibratory installation: 3,981 meters (2.5 miles)
- Steel sheet pile vibratory installation: 7,356 meters (4.6 miles)

The proposed exclusion zones would be confined by adjacent land masses. Additionally, a soft start technique will be implemented to alert nearby bottlenose dolphins, allowing them to move out of the area before full force pile driving begins. A wood cushion block would also be used during impact pile proofing. With the implementation of the proposed avoidance and minimization measures, including an exclusion zone, soft start, and wood cushion block, noise impacts to bottlenose dolphins due to exceedances over the Level A threshold are not anticipated.

Behavioral (Level B) Threshold Exceedances

Steel Pipe Piles Threshold Distance

The behavioral threshold could be exceeded within 1,585 meters (0.99 miles) during impact proofing of steel pipe piles and within 3,981 meters (2.48 miles) during vibratory installation of steel pipe piles (Table 6, Figure 6). The potential threshold exceedance distances would be confined by adjacent land masses.

Steel Sheet Piles Threshold Distance

The behavioral threshold could be exceeded within 7,356 meters (4.57 miles) during vibratory installation of steel sheet piles (Table 6, Figure 7). The potential behavioral threshold exceedance distances would be confined by adjacent land masses.

Potential Impacts

To prevent potential noise impacts from Level B threshold exceedances, exclusion zones would be implemented prior to in-water pile driving activities (Figure 6, Figure 7). The proposed exclusion zones will prevent all possible Level A or Level B harassment of bottlenose dolphins. With the implementation of the proposed avoidance and minimization measures, including an exclusion zone, soft start, and wood cushion block, noise impacts to bottlenose dolphins due to exceedances over the Level B threshold are not anticipated.

Figure 6. Bottlenose Dolphin Behavioral and Injury Threshold Exceedance Distances, Steel Pipe Piles

Figure 7. Bottlenose Dolphin Behavioral and Injury Threshold Exceedance Distances, Steel Sheet Piles

6. AVOIDANCE AND MINIMIZATION MEASURES

The following avoidance and minimization measures are proposed to avoid and/or minimize potential noise impacts on protected species.

- Impact pile driving will be avoided to the extent feasible and will only be used to proof piles.
- Pile-driving will commence with a soft start procedure (ramping up) in order to alert nearby wildlife, allowing them to move out of the area prior to construction activities. Ramping up is defined differently depending on the pile driving methods. For impact pile driving, contractors will be required to provide an initial set of strikes from the hammer at reduced percent energy, each strike followed by no less than a 30-second waiting period. This procedure will be conducted a total of two times before impact pile driving begins. If a vibratory hammer is used, contractors shall initiate sound from vibratory hammers for 15 seconds at reduced energy followed by a 1-minute waiting period. This procedure shall be repeated two additional times before full energy may be achieved.
- Use of a wood cushion block or other sound-reducing method shall be implemented if impact pile driving is to be employed. The use of wood cushion blocks during construction will result in a reduction in underwater noise.
- To avoid impacts to marine mammals, an exclusion zone will be monitored during and immediately before pile driving activity. The following in-water shutdown zones are anticipated to avoid Level A and Level B harassment of marine mammals, including manatees and bottlenose dolphins during in-water pile driving activities:
    - Steel pipe pile proofing: 1 mile
    - Steel pipe pile vibratory installation: 2.5 miles
    - Steel sheet pile vibratory installation: 4.6 miles

7. CONCLUSION

Due to the short-term nature of the Project, limited extent of potential noise impacts, and proposed avoidance and minimization measures, substantial adverse noise impacts to special-status species are not anticipated. Noise levels could exceed injury thresholds for special status species during the proposed pile installation activities within limited areas immediately around the pile driving activities. However, it is considered unlikely that special status species would occur within close proximity to the active construction areas and within these limited injury threshold areas. Therefore, impacts due to injury threshold exceedances are not anticipated. Construction related noise could exceed behavioral thresholds; however, potential impacts due to exceedances over these thresholds would be minimized through the implementation of the proposed avoidance and minimization measures, such as the use of a soft-start, wood cushion block, and marine mammal monitoring.

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Appendix D: Sampling Analysis Plan

From:	Fannin, Chelsea B CIV USARMY CESAC (USA)
To:	Anghera, Shelly; Flesch-Pate, Julie; Huggett, Douglas
Subject:	SAC-2021-00965 NOAA OMAO Pier Romeo SAP Approval
Date:	Wednesday, January 12, 2022 2:53:05 PM
Attachments:	Pier Romeo SAP.pdf

Good afternoon,

This is in response to your Sampling and Analysis Plan for a Department of the Army (DA) permit (SAC-2021-00965). The work affecting waters of the United States is part of an overall project known as NOAA OMAO Charleston Pier Romeo Recapitalization Project, to dredge Pier Romeo. In detail, you are requesting to mechanically dredge to a depth of -25' MLLW with 1' allowable overdepth for a total of approximately 125,000 cubic yards of material. The material will be placed in disposal facilities at either Clouter Creek or Daniel Island Dredge Material Placement Facility (DMPF). The area to be dredged is approximately 12.36 acres. The project is located on the Cooper River at Pier Romeo of the Charleston Marine Support Facility (at the former Naval Weapons Station Charleston), Charleston County, South Carolina (Latitude: 32.8493 °, Longitude: -79.9429 °).

Please be advised the proposed sediment testing outlined in the attached document entitled, "NOAA OMAO Charleston Pier Romeo Recapitalization Project Charleston, South Carolina Draft Sampling and Analysis Plan" dated December 14, 2021, has been approved and you may proceed with testing accordingly. Upon completion of the testing, the results should be provided to this office in the format outlined in the plan. This office will utilize the provided results to evaluate your project and/or the need for additional testing.

Chelsea B. Fannin
Project Manager
U.S. Army Corps of Engineers
Phone: 843-329-8038

moffatt & nichol

NOAA OMAO Charleston Pier Romeo Recapitalization Project Charleston, South Carolina

Sampling and Analysis Plan

Prepared for:

NOAA Office of Marine & Aviation Operations

8403 Colesville Road, Suite 500

Silver Spring, MD 20910

Prepared by:

Moffatt & Nichol

555 Anton Blvd, Ste. 400

Costa Mesa, CA 92626

Last modified: 14 December 2021

Table of Contents

List of Tables

List of Figures

NOAA OMAO Pier Romeo Charleston, South Carolina

Final Sampling and Analysis Plan

NOAA Office of Marine & Aviation Operations
8403 Colesville Road, Suite 500
Silver Spring, MD 20910

Shelly Anghera, PhD	**Julie Flesch-Pate, CPM, LEED AP**
Sediment Characterization Lead	QA Manager
	
Approval Date: December 14, 2021	Approval Date: December 14, 2021

Distribution List

Agency/Firm	Contact Name	Contact Information
US EPA Wetlands and Marine Regulatory Section	Kelly Laycock	laycock.kelly@epa.gov
US Fish & Wildlife	Mark Caldwell	mark_caldwell@fws.gov
US National Marine Fisheries Service	Pace Wilber	pace.wilber@noaa.gov
US National Marine Fisheries Service	Cindy Cooksey	cynthia.cooksey@noaa.gov
South Carolina Dept. of Health and Environmental Control	Chuck Hightower	wqcwetlands@dhec.sc.gov
South Carolina Dept of Health and Environmental Control	Blair Williams	ocrmpermitting@dhec.sc.gov
South Carolina Dept. of Natural Resources	Stacie Crowe	crowes@dnr.sc.gov
South Carolina Dept. of Health and Environmental Control	Josh Hoke	hokejd@dhec.sc.gov

All methods, language, guidance, and tables included in this Sampling and Analysis Plan are identical to the SAP Template for Dredging revised November 17, 2017.

1 Introduction

The laboratory responsible for sample analysis and any persons involved in the collection of the samples will be responsible for initiating and maintaining a safety and health program which will comply with OSHA standards. The U.S. Army Corps of Engineers ("Corps") will not be liable for accidents resulting from implementation related to this sampling and analysis plan.

In addition, the laboratory conducting the analysis and collecting the samples will be a South Carolina Department of Health and Environmental Control currently certified lab and certified to analyze all constituents required. A copy of the lab's certification will be attached to the final report.

2 Sampling Collection Procedures

2.1 Project Summary

The project includes dredging to deepen the existing bathymetry at Pier Romeo to achieve maintenance depth. Dredging at Pier Romeo will be performed using mechanical dredging methods to achieve the approved -25 ft MLLW design depth within the dredge footprint (Figure 1). The dredge design for hydraulic dredging includes 1 ft of allowable overdepth for the dredge area. The objective of the sampling program described in this SAP is to characterize the proposed dredged material for placement the designated contained disposal facilities (CDF) at Clouter Creek Diked Upland Disposal Area and Daniel Island (Figure 2). Table 1 summarizes the proposed maintenance dredging volumes for Pier Romeo. Dredged material volume estimates are based on condition surveys completed by McKim & Creed in April 2021. There are 6 proposed sampling locations to represent the dredged material as shown in Figure 1.

Table 1
Proposed D44 Maintenance Dredge Volumes

Project Area	Project Depth (ft MLLW)	Estimated Volume to Project Depth (cy)[1]	Additional 1-ft Overdepth Volume (cy)	Total Volume (cy)[2]
Pier Romeo Dredge Area	-25	112,104	12,983	125,087

Notes:
1 Volume includes 3:1 side slope due to size of the cut and location of project area
2 Includes allowable overdepth (1 ft) for mechanical dredging

2.2 Site Description

The site consists of the NOAA OMAO Pier Romeo at Charleston Marine Support Facility. The dredge area is located adjacent to the National Ocean and Atmospheric Administration station in Charleston, SC (Latitude 32°51'2.85"N, Longitude 79°56'31.31"W). The site is currently non-operable but is the responsibility of NOAA. The existing bathymetry within the proposed dredge areas ranges from approximately -10 to -25 ft.

2.3 Roles and Responsibilities

The project roles and responsibilities are identified below:

- Applicant: NOAA Office of Marine & Aviation Operations, 8403 Colesville Road, Suite 500, Silver Spring, MD 20910
- Authorized representative/Project Manager: Julie Flesch-Pate
- Authorized Sediment Sampling Lead: Shelly Anghera (Moffatt & Nichol) – PH: (657) 261-2675, email: sanghera@moffattnichol.com
- Field Sampling Crew: Athena
- Analytical Testing:
    - SME, Inc. – PH: (843) 884-0005
        - Chemical Analysis
    - GEL Laboratories, LLC – PH: (843) 556-8171
        - Column Settlement Testing

2.4 Site History

Charleston Marine Support Facility is located on the west bank of the Cooper River, at former Naval Weapon Station Charleston. Pier Romeo has been non-operational since 2006. There are no records available of previous dredging events. The pier facilities adjacent to Pier Romeo are operable pier facilities in use by the federal agencies at Charleston Marine Support Facility.

2.5 Sampling Design

Table 2 and Table 3 summarize the sediment core sampling and compositing scheme for the project, including subsample identification, compositing scheme and identification, core sample location, and lengths and volume represented by each sample. Based on site use and location to sediment inputs, it is believed the area is homogenous. However, if stratification is observed, additional discrete samples will be collected and analyzed. The six proposed sampling locations are shown in Figure 1.

Table 2 Estimated Dredge Quantities and Compositing Scheme

Composite ID	Approximate Area (acres)	Dredge Depth (feet) MLLW	Cut Volume (cy)	1-ft Overdredge Volume (cy)	Total Export Volume (cy)	Composite area borings
Dredge Area	12.36	- 25	112,104	12,983	125,087	6 Borings (PR-01 through PR-06)

Notes:
cy = cubic yards

Table 3 Target Coordinates, Estimated Mudline Elevations, and Target Core Lengths for Proposed Sampling Locations

Station ID	Latitude	Longitude	Estimated Mudline Elevation	Project Depth Plus 1 ft of Overdepth	Depth of Z-Layer	Target Core Length [2]
	(Degrees, Decimal Minutes[1])		(ft MLLW)		(ft)	
PR-01	32°51.06265'	-079°56.56749'	-13	-26	0.5	14

Station ID	Latitude	Longitude	Estimated Mudline Elevation	Project Depth Plus 1 ft of Overdepth	Depth of Z-Layer	Target Core Length [2]
	(Degrees, Decimal Minutes[1])		(ft MLLW)		(ft)	
PR-02	32°51.05777'	-079°56.52657'	-14	-26	0.5	13
PR-03	32°51.09792'	-079°56.49585'	-17	-26	0.5	10
PR-04	32°51.08889'	-079°56.43012'	-20	-26	0.5	7
PR-05	32°51.05837'	-079°56.46751'	-13	-26	0.5	14
PR-06	32°51.02234'	-079°56.49706'	-18	-26	0.5	9

Notes:
1. Based on North American Datum 1983
2. Target core length includes the depth to achieve project depth and 1 ft overdepth plus Z-layer

DA = Dredge Area

2.6 *Sample Transport and Chain-of-Custody Procedures*

A chain-of-custody (COC) record for each sample will be maintained throughout sampling activities and will accompany samples and shipment to the laboratory. Information tracked by the COC records in the laboratory include sample identification number, date and time of sample receipt, analytical parameters required, location and conditions of storage, date and time of removal from and return to storage, signature of person removing and returning the sample, reason for removing from storage, and final disposition of the sample. A sample COC form is provided in Attachment A.

2.7 *Equipment Decontamination*

The purpose of this section is to define decontamination procedures for field equipment used for collecting soil, sediment, and water samples. Techniques for ridding equipment of both metals and organic contaminants are discussed. Sampling equipment is decontaminated between each sampling event to avoid cross contamination of samples and to help maintain a healthy working environment.

It is the responsibility of the field sampling coordinator to assure that proper decontamination procedures are followed and that all waste materials produced by decontamination are properly managed. It is the responsibility of the applicant and/or the applicant's representative to enforce safety measures that provide the best protection for all persons involved directly with sampling and decontamination. Individuals involved in sampling and/or decontamination are responsible for maintaining a clean working environment and ensuring that contaminants are not introduced to the environment

All equipment will be decontaminated using a series of washes and rinses designed to remove materials of interest without leaving residues that will in any way interfere with analysis of the samples taken with that equipment. In addition, the decontamination site will be set up at a location separate from the sampling area in order to isolate these two activities.

Field equipment blanks will be taken at a frequency of 5% of samples and sent to the laboratory(s) for analysis along with the regular samples. These blanks will serve as a quality assurance indicator of possible cross contamination of samples. When feasible, samples to be taken with the same equipment will be taken in order from the lowest to highest suspected contaminant levels to minimize the chances of cross contamination.

The following is a list of materials that are required on site to support decontamination. The quantity and actual use of each item will be dependent on the overall size and nature of the sampling effort.

- Cleaning liquids and dispensers: soap and/or phosphate-free detergent Isolations, tap water, methanol, 10 % nitric acid, distilled/deionized water
- Appropriate safety gear
- Chemical free paper towels and/or tissues
- Powder free disposable latex gloves
- Waste storage containers: drums, boxes, plastic boxes
- Plastic ground cloths on which to lay clean equipment
- Cleaning containers: plastic and/or galvanized steel tubs and buckets
- Cleaning brushes with non-contamination stiff bristles Steam cleaning apparatus (when appropriate)

Materials used in decontamination activities are to be located a minimum of 15 to 30 feet downwind of the sampling site as designated by the task leader. Decontamination will be carried out before moving to the next sampling site to avoid transporting contaminants.

The following is a list of steps to be used for decontamination of equipment intended for collection of samples that will be analyzed for both organic and inorganic contaminants.

1. Wash and scrub equipment with a non-phosphoric, laboratory grade detergent and water,
2. Rinse with tap water
3. Rinse with distilled or deionized water
4. Rinse with 10% nitric acid
5. Rinse with distilled or deionized water
6. Use an appropriate solvent rinse (to be specified by the certified analytical laboratory)
7. Rinse with distilled or deionized water
8. Allow to air dry in an area not adjacent to decontamination area
9. Wrap sampling equipment with aluminum foil after decontamination, to remain wrapped until next sample collection

Regardless of the type of contamination that requires removal, the basic steps involved are the same. Procedures unique to organic, metal, and organic/metal combined contamination are discussed in their respective sections that follow.

Step 1: Gross Removal of Material

- Steam Cleaning
    - Depending on the availability of apparatus (e.g., drilling operations), steam cleaning combined with brushing is the preferred method of initial material removal. Using steam alone introduces little further contamination and is a very efficient way of removing materials. Equipment such as spatulas, split spoons, and drill flights are placed in and/or suspended over tubs that catch contaminated wash waters for proper disposal.

- Detergent Wash
    - In cases where steam apparatus is not available, a phosphate free detergent wash and tap water rinse may be used. A detergent bath is formulated in a tub large enough to hold the equipment to be washed leaving enough volume to hold the tap water rinses. All material is brushed from the equipment into the tub. The equipment is rinsed with tap water while suspended over the wash tub. Because detergents can contain low levels of interfering contaminants for both organic and metals analysis, the thoroughness of the final rinse in this step is of utmost importance. When the analyte levels in the samples to be taken by the decontaminated equipment are suspected to be very low (e.g., background level), it is recommended that the detergent wash be replaced by a distilled water wash or steam cleaning when available, followed by a decontamination equipment blank as described below.

Step 2: Specific Contaminant Removal

- Organic Contaminants
    - For removal of general organic contaminants, the solvent of choice is methanol because, a) it dissolves all contaminants of concern and b) it is miscible with water which means it can be removed with a water rinse. The equipment is suspended over a tub and rinsed from the top down with high purity methanol with a squirt bottle or similar device. Rinse wastes are disposed of according to project specific guidelines.
- Metal/Inorganic Contaminants
    - Metals/Inorganics require acid solvents for efficient removal. Nitric acid is the acid of choice because of its ability to dissolve all metals/inorganics of concern. The equipment is suspended over a tub and rinsed from the top down with 10% nitric acid delivered with a squirt bottle or similar device. Rinse wastes are disposed of according to project specific guidelines.

Step 3: Final Distilled/Deionized Water Rinse

A final rinse with distilled/deionized water is carried out last to remove the contaminant specific solvents (i.e., nitric acid and/or methanol). Because the solvents may themselves interfere with sample analyses, this step is very important and must be carried out thoroughly. The equipment is suspended over a waste tub and rinsed from the top down with distilled/deionized water delivered by pump or squirt bottle, depending on equipment size. In the case of metals decontamination, a simple pH monitoring technique (e.g., pH paper) may be used to monitor rinse water in determining rinse completion.

Step 4. Air Dry

Before an equipment blank is taken, the equipment is laid out on a clean plastic ground cloth and allowed to dry. The equipment should be protected from gross contamination during the drying process.

- Equipment Blanks
    - Equipment blanks are taken between selected samples as described below. As mentioned earlier, the equipment blank collection frequency is to be 5% that of sample number, or a minimum of 1 if the number of samples to be collected is less than 5. It is

advised that the applicant/applicant's representative address the issue of equipment blanks in the project specific Sampling and Analysis Plan.

- Equipment is rinsed with distilled water that is subsequently collected in a sample container. The rinsate sample is then labeled and shipped as a blind sample to the laboratory(s) with regular samples. One blank is created in this way for each analysis to be performed on samples taken with this equipment unless otherwise stated in the quality assurance plan. The equipment should be protected from contamination between the time the blank is taken and the time the next sample is collected.

2.8 Sample Collection

All proposed sampling locations will be shown on a site map attached to the Sampling and Analysis Plan and must be approved by the Charleston District, Corps of Engineers. Sample locations will be coordinated with the resource agencies, as needed. The Corps will be contacted at least 48 hours prior to commencing the collection of the samples. A representative of the Corps may be present during the sampling activity.

Sufficient material will be collected at each sampling site in sufficient volume to perform all of the required tests. Measures will be taken to assure that samples are not contaminated by collection or handling. A detailed sampling protocol will be included in the final report.

2.9 Preservation and Chain of Custody

The requirements of Table 1 entitled, "Recommended Procedures for Sample Collection, Preservation, and Storage" will be strictly followed.

Immediately after collection, each sediment sample to be analyzed will be placed in a pre-labeled, pre-cleaned, air-tight jar of the appropriate material as indicated in Table 1. Jars will be obtained from the laboratory that will be performing the tests, and a certificate of analysis for glassware will be submitted. After sealing the lid, a tamper-proof, field labeled seal will be placed on each of the jars.

All sediment and water containers will be labeled accurately and completely. The label information will be consistent with that provided on the chain of custody form. Sample labels will include the following information:

1. Project
2. Sample Identification number and station number
3. Sample matrix
4. Date and time of sample collection
5. Depth of sample
6. Name of collector
7. Sample preservation method
8. Type of analysis
9. Lab number

Immediately following the collection, the samples will be refrigerated or kept in coolers packed with ice or cold packs at a temperature at or below 4° C until released to the testing laboratory. The chain of custody of all samples will be documented beginning in the field and will accompany the samples at all times. Field logs and a brief report of the sampling process will be submitted to the Corps. All EPA prescribed holding times will be used (see attached table).

3 Quality Assurance/Quality Control

The laboratory performing this analysis will have a written and approved quality assurance/quality control (QA/QC) manual which will be provided to the Corps upon request. The laboratory will conform to EPA and SCDHEC quality control requirements. Along with the sediment and rinsate analysis, a matrix spike sample, a matrix spike duplicate sample, a laboratory control sample, a laboratory control duplicate sample and a sample blank will be provided with the final results.

4 Laboratory Analysis

4.1 Sediment Chemistry

Sediment from each sampling site will be analyzed for each of the parameters found in Table 2. The listed method and detection limit will be used. All results and detection limits will be reported on a dry weight basis.

4.2 Physical Analysis

Sediment from each sampling site shall be tested in accordance with the parameters and requirements listed in Table 4.

4.3 Modified Elutriate Tests/Chemical Analysis

Elutriate samples will be prepared using sediment and water from the proposed dredge site. The modified elutriate test will be conducted in accordance with the following document, also known as "The Upland Testing Manual":

USACE. 2003. Evaluation of Dredged Material Proposed for Disposal at Island, Nearshore, or Upland Confined Disposal Facilities — Testing Manual. ERDC/EL TR-03-1, Appendix B: Column Settling Test and Effluent Elutriate Procedures. http://acwc.sdp.sirsi.net/client/en_US/search/asset/1003067

Quantities of sediment and water needed for the analyses shall be determined by the laboratory. Both dissolved and total concentrations of the contaminants of concern and Total Suspended Solids (TSS) in the elutriates will be determined. The required list of analytes to be tested, including methods and detection limits, are shown in Table 3.

4.4 Column Settling Tests

Sufficient site water to create the appropriate slurry, shall be collected for the test. The settling test will be conducted in accordance with the following document, also known as "The Upland Testing Manual":

USACE. 2003. Evaluation of Dredged Material Proposed for Disposal at Island, Nearshore, or Upland Confined Disposal Facilities — Testing Manual. ERDC/EL TR 03 1, Appendix B: Column Settling Test and Effluent Elutriate Procedures. http://acwc.sdp.sirsi.net/client/en_US/search/asset/1003067

4.5 Background Water Sample(s)

Prior to dredging, a water sample will be taken from the proposed dredge site at the location shown on the attached site map. The sample will be collected in laboratory bottles and analyzed for the parameters listed in Table 3. In addition, the background water sample will be analyzed for Total Suspended Solids (TSS). (Note: If the results of modified elutriate testing indicate that the effluent from the proposed CDF might exceed State Water Quality Standards, the collection and analysis of a background water sample from the receiving waterbody at the proposed discharge site might also be required).

5 Results

The test results will be reported in the following format.

A. Abstract

B. Location of Sampling Areas

C. Material and Methods

1. Field sampling and sample handling procedures.

2. References for laboratory protocols including EPA method number and detection limit.

D. Final Results

1. Data Summary tables including a table showing the test results, as well as relevant sediment quality guidelines, South Carolina State Water Quality Standards[1], and/or other appropriate benchmarks based on human health or ecological risks. At a minimum, sediment quality guidelines should include the following:

- USEPA Region 4 Ecological Screening Values (ESVs)[2]
- Effects Range Low (ER-L) Values[3]
- Effects Range Median (ER-M) Values[3]
- Other appropriate guidelines as shown in Buchman, 2008[4]

[1] http://www.scdhec.gov/Agency/docs/water-regs/R.61-68.pdf

[2] https://www.epa.gov/sites/production/files/2015-09/documents/r4_era_guidance_document_draft_final_8-25-2015.pdf

[3] Long ER, MacDonald DD, Smith SL, Calder FD. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environ. Management 19:81-97

[4] Buchman, M.F. 2008. NOAA Screening Quick Reference Tables. http://response.restoration.noaa.gov/sites/default/files/SQuiRTs.pdf

Toxicity Equivalent Quotients (TEQs) for all 17 congeners of dioxin and furans (individually and combined).[5] This step may be deleted if the Corps has indicated dioxin testing is not necessary.

2. Copies of the final raw data sheets that have been certified accurate.

E. Discussion and Analysis of Data

F. References

G. Detailed Quality Assurance/Quality Control Plans and Information including the following:

1. Personnel Qualification
2. Facilities layout, equipment, and supplies
3. Sample collection, handling, and tracking
4. Test protocols and standard operating procedures for sediment analysis
5. Documentation, record keeping, data validation, and archiving.
6. Chemical quality control and reference toxicant testing
7. Certificate of Analysis for glassware
8. Copy of lab's DHEC certification

H. Chain of Custody

6 Report

The field sampling and laboratory analytical report will consist of logs of individual borings, a brief discussion of field and laboratory methods, and a summary of the results of the testing program. Results from statistical analyses may also be reported for this project. These analyses would consist of appropriate F - or t-statistics to compare chemical contamination at the test site sediment and reference site. Statistical significance will be reported at the 95% confidence level (e.g., a=0.05). Any chemical concentrations reported for the source site that are significantly different from the reference site will be compared with recognized guidelines for sediment quality. Appendices of the laboratory analyses, including final results and quality control and assurance data, will be provided.

[5] https://www.cerc.usgs.gov/pubs/center/pdfdocs/90970.pdf

7 Test Parameters and Methods

Table 4 Sediment Analysis

Test Parameter	Test Method	Detection Limit
Metals/Others		
Antimony	6010	0.50 ppm
Arsenic	6010	0.50 ppm
Cadmium	6010	0.10 ppm
Chromium	6010	0.10 ppm
Copper	6010	0.10 ppm
Lead	6010	0.10 ppm
Mercury	7471	0.05 ppm
Nickel	6010	0.10 ppm
Selenium	6010	0.20 ppm
Silver	6010	0.062 ppm
Zinc	6010	0.50 ppm
Total Organic Carbon (TOC)	9060(mod)	24.1 ppm
Grain Size	ASTM-D422	1.0%
% Solids	ASTM-D2216-80	1.0% solids
Pesticides		
Aldrin	8081	1.7 ppb
Chlordane & derivatives		
Technical Chlordane	8081	1.7 ppb
α (cis)-Chlordane	8081	1.7 ppb
γ (trans)-Chlordane	8081	1.7 ppb
Oxychlordane	8081	1.7 ppb
Cis-Nonachlor	8081	1.7 ppb
Trans-Nonachlor	8081	1.7 ppb
DDD & derivatives		
o,p′ (2,4′)-DDD	8081	3.3 ppb
p,p′ (4,4′)-DDD	8081	3.3 ppb
o,p′ (2,4′)-DDE	8081	3.3 ppb
p,p′ (4,4′)-DDE	8081	3.3 ppb
o,p′ (2,4′)-DDT	8081	3.3 ppb
p,p′ (4,4′)-DDT	8081	3.3 ppb
Dieldrin	8081	3.3 ppb
Endosulfan & derivatives		
Endosulfan I	8081	2 ppb
Endosulfan II	8081	2 ppb
Endrin & derivatives		
Endrin	8081	3.3 ppb
Endrin Aldehyde	8081	3.3 ppb

Test Parameter	Test Method	Detection Limit
Endrin Ketone	8081	3.3 ppb
Heptachlor and derivatives		
Heptachlor	8081	1.7 ppb
Heptachlor Epoxide	8081	1.7 ppb
Hexachlorocyclohexane (BHC)		
α-BHC	8081	2 ppb
β-BHC	8081	2 ppb
δ-BHC	8081	2 ppb
γ-BHC (Lindane)	8081	1.7 ppb
Methoxychlor	8081	10 ppb
Mirex®	8081	33 ppb
Toxaphene	8081	3.3 ppb
Total Chlorinated Pesticides	8081	10 ppb
PCB CONGENERS		
IUPAC-8	NOAA 1989	1 ppb
IUPAC-18	NOAA 1989	1 ppb
IUPAC-28	NOAA 1989	1 ppb
IUPAC-44	NOAA 1989	1 ppb
IUPAC-49	NOAA 1989	1 ppb
IUPAC-52	NOAA 1989	1 ppb
IUPAC-66	NOAA 1989	1 ppb
IUPAC-77	NOAA 1989	1 ppb
IUPAC-87	NOAA 1989	1ppb
IUPAC-101	NOAA 1989	1 ppb
IUPAC-105	NOAA 1989	1 ppb
IUPAC-118	NOAA 1989	1 ppb
IUPAC-126	NOAA 1989	1 ppb
IUPAC-128	NOAA 1989	1 ppb
IUPAC-138	NOAA 1989	1 ppb
IUPAC-153	NOAA 1989	1 ppb
IUPAC-156	NOAA 1989	1 ppb
IUPAC-169	NOAA 1989	1 ppb
IUPAC-170	NOAA 1989	1 ppb
IUPAC-180	NOAA 1989	1 ppb
IUPAC-183	NOAA 1989	1 ppb
IUPAC-184	NOAA 1989	1 ppb
IUPAC-187	NOAA 1989	1 ppb
IUPAC-195	NOAA 1989	1 ppb
IUPAC-206	NOAA 1989	1 ppb
IUPAC-209	NOAA 1989	1 ppb
PCB AROCLORS		

Test Parameter	Test Method	Detection Limit
PCB-1016	8080	3.3 ppb
PCB-1221	8080	3.3 ppb
PCB-1232	8080	3.3 ppb
PCB-1242	8080	3.3 ppb
PCB-1248	8080	3.3 ppb
PCB-1254	8080	3.3 ppb
PCB-1260	8080	3.3 ppb
Polynuclear Aromatic Hydrocarbons		
Acenapthene	8310	3.3 ppb
Acenapthylene	8310	3.3 ppb
Anthracene	8310	3.3 ppb
Benzo(a)anthracene	8310	3.3 ppb
Benzo(b)fluoranthene	8310	3.3 ppb
Benzo(k)flouranthene	8310	3.3 ppb
Benzo(a)pyrene	8310	3.3 ppb
Benzo(g,h,i)perylene	8310	3.3 ppb
Chrysene	8310	3.3 ppb
Dibenzo(a,h)anthracene	8310	3.3 ppb
Flourene	8310	3.3 ppb
Flouranthene	8310	3.3 ppb
Indeno(1,2,3-cd)pyrene	8310	3.3 ppb
1-Methylnaphthalene	8310	3.3 ppb
2-Methylnaphthalene	8310	3.3 ppb
Napthalene	8310	3.3 ppb
Phenanthrene	8310	3.3 ppb
Pyrene	8310	3.3 ppb
Dioxins and Furans (17 congeners)	1613	1 ng/kg
Tributytin	Uhler and Durrel	5 ppb

Table 4 Sediment Analysis Continued

Polybrominated Diphenyl Ethers (PBDE)	Prep Method	Recommended Test Method	Target Detection Limit (dry weight)	Laboratory Reporting Limit (dry weight)
PBDE (total of each level of bromination [i.e., mono-BDE. di-BDE, tri-BDE, tetra-BDE, penta-BDE, hexa-BDE, hepta-BDE, octa-BDE, nona-BDE, and deca-BDE]	3541	8270D SIM	Not specified by USACE or EPA	0.1 ug/kg for all congeners except PBDE 206 and 209, 1.0 ug/ kg for PBDE 206 and 209
PBDE 17				
PBDE 28				
PBDE 47				
PBDE 66				
PBDE 71				
PBDE 85				
PBDE 99				
PBDE 100				
PBDE 128				
PBDE 138				
PBDE 153				
PBDE 154				
PBDE 183				
PBDE 190				
PBDE 203				
PBDE 206				
PBDE 209				

References for Table 4

ASTM. 2014. Standard Guide for Collection, Storage, Characterization, and Manipulation of Sediments for Toxicological Testing and for Selection of Samplers Used to Collect Benthic Invertebrates. ASTM E1391 - 03(2014).

NOAA. 1989. Standard Analytical Procedures of the NOAA National Analytical Facility. 2nd ed. NOAA Tech. Mem. NMFS F/NWC-92, 1985-86. Contact: National Status and Trends Program, National Oceanic and Atmospheric Administration, NOAA N/OMA32, 11400 Rockville Pike, Rockville, MD 20852.

Uhler, A.D. & G.S. Durrel. 1989. Measurement of tributyltin species in sediments by n-pentyl derivation with gas chromatography/flame photometric detection (GC/FPD).

USEPA. 1986. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods Compendium (SW-846) Third Edition. (and all revisions). https://www.epa.gov/hw-sw846/sw-846-compendium

USEPA. 1983. Methods of Chemical Analysis of Water and Waste (MCAWW), Section 9.3, EPA/600/4-79/020, Cincinnati OH, (and all revisions) https://www.epa.gov/homeland-security-research/reference-document-methods-chemical-analysis-water-and-waste-epa6004-0

Table 5 Background Water and Elutriate

Test Parameter	Test Method	Detection Limit
Metals/Others		
Antimony	6010	3 ppb
Arsenic	6010	1 ppb
Cadmium	6010	1 ppb
Chromium	6010	1 ppb
Copper	6010	1 ppb
Lead	6010	1 ppb
Mercury	7471	0.2 ppb
Nickel	6010	1 ppb
Selenium	6010	2 ppb
Silver	6010	1 ppb
Zinc	6010	1 ppb
Total Organic Carbon (TOC)	9060(mod)	24.1 ppm
% Solids	ASTM-D2216-80	1.0% solids
Pesticides		
Aldrin	8081	0.04 ppb
Chlordane & derivatives		
Technical Chlordane	8081	0.14 ppb
α (cis)-Chlordane	8081	0.14 ppb
γ (trans)-Chlordane	8081	0.14 ppb
Oxychlordane	8081	0.14 ppb
Cis-Nonachlor	8081	0.14 ppb
Trans-Nonachlor	8081	0.14 ppb
DDD & derivatives		
o,p′ (2,4′)-DDD	8081	0.1 ppb
p,p′ (4,4′)-DDD	8081	0.1 ppb
o,p′ (2,4′)-DDE	8081	0.1 ppb
p,p′ (4,4′)-DDE	8081	0.1 ppb
o,p′ (2,4′)-DDT	8081	0.1 ppb
p,p′ (4,4′)-DDT	8081	0.1 ppb
Dieldrin	8081	0.02 ppb
Endosulfan & derivatives		
Endosulfan I	8081	0.1 ppb
Endosulfan II	8081	0.1 ppb
Endrin & derivatives		
Endrin	8081	0.1 ppb
Endrin Aldehyde	8081	0.1 ppb
Endrin Ketone	8081	0.1 ppb
Heptachlor and derivatives		
Heptachlor	8081	0.1 ppb

Test Parameter	Test Method	Detection Limit
Heptachlor Epoxide	8081	0.1 ppb
Hexachlorocyclohexane (BHC)		
α-BHC	8081	0.1 ppb
β-BHC	8081	0.1 ppb
δ-BHC	8081	0.1 ppb
γ-BHC (Lindane)	8081	0.1 ppb
Methoxychlor	8081	0.5 ppb
Mirex®	8081	0.1 ppb*
Toxaphene	8081	0.5 ppb
Total Chlorinated Pesticides	8081	0.02 ppb
PCB CONGENERS		
IUPAC-8	NOAA 1989	0.1 ppb
IUPAC-18	NOAA 1989	0.1 ppb
IUPAC-28	NOAA 1989	0.1 ppb
IUPAC-44	NOAA 1989	0.1 ppb
IUPAC-49	NOAA 1989	0.1 ppb
IUPAC-52	NOAA 1989	0.1 ppb
IUPAC-66	NOAA 1989	0.1 ppb
IUPAC-77	NOAA 1989	0.1 ppb
IUPAC-87	NOAA 1989	0.1 ppb
IUPAC-101	NOAA 1989	0.1 ppb
IUPAC-105	NOAA 1989	0.1 ppb
IUPAC-118	NOAA 1989	0.1 ppb
IUPAC-126	NOAA 1989	0.1 ppb
IUPAC-128	NOAA 1989	0.1 ppb
IUPAC-138	NOAA 1989	0.1 ppb
IUPAC-153	NOAA 1989	0.1 ppb
IUPAC-156	NOAA 1989	0.1 ppb
IUPAC-169	NOAA 1989	0.1 ppb
IUPAC-170	NOAA 1989	0.1 ppb
IUPAC-180	NOAA 1989	0.1 ppb
IUPAC-183	NOAA 1989	0.1 ppb
IUPAC-184	NOAA 1989	0.1 ppb
IUPAC-187	NOAA 1989	0.1 ppb
IUPAC-195	NOAA 1989	0.1 ppb
IUPAC-206	NOAA 1989	0.1 ppb
IUPAC-209	NOAA 1989	0.1 ppb
PCB AROCLORS		
PCB-1016	8080	3.3 ppb
PCB-1221	8080	3.3 ppb
PCB-1232	8080	3.3 ppb

Test Parameter	Test Method	Detection Limit
PCB-1242	8080	3.3 ppb
PCB-1248	8080	3.3 ppb
PCB-1254	8080	3.3 ppb
PCB-1260	8080	3.3 ppb
Polynuclear Aromatic Hydrocarbons		
Acenapthene	8310	3.3 ppb
Acenapthylene	8310	3.3 ppb
Anthracene	8310	3.3 ppb
Benzo(a)anthracene	8310	3.3 ppb
Benzo(b)fluoranthene	8310	3.3 ppb
Benzo(k)flouranthene	8310	3.3 ppb
Benzo(a)pyrene	8310	3.3 ppb
Benzo(g,h,i)perylene	8310	3.3 ppb
Chrysene	8310	3.3 ppb
Dibenzo(a,h)anthracene	8310	3.3 ppb
Flourene	8310	3.3 ppb
Flouranthene	8310	3.3 ppb
Indeno(1,2,3-cd)pyrene	8310	3.3 ppb
1-Methylnaphthalene	8310	3.3 ppb
2-Methylnaphthalene	8310	3.3 ppb
Napthalene	8310	3.3 ppb
Phenanthrene	8310	3.3 ppb
Pyrene	8310	3.3 ppb
Dioxins and Furans (17 congeners)	1613	10 ppq*
Tributytin	Uhler and Durrel	0.01 ppb
Benzo(a)pyrene	8310	3.3 ppb
Benzo(g,h,i)perylene	8310	3.3 ppb

Table 5 Background Water and Elutriate Continued

Polybrominated Diphenyl Ethers (PBDE)	Prep Method	Recommended Test Method	Target Detection Limit	Laboratory Reporting Limit
PBDE (total of each level of bromination [i.e., mono-BDE. di-BDE, tri-BDE, tetra-BDE, penta-BDE, hexa-BDE, hepta-BDE, octa-BDE, nona-BDE, and deca-BDE]	3541	8270D SIM	Not specified by USACE or EPA	1.0 ng/L for all congeners except PBDE 206 and 209, 10.0 ng/L for PBDE 206 and 209
PBDE 17				
PBDE 28				
PBDE 47				
PBDE 66				
PBDE 71				
PBDE 85				
PBDE 99				
PBDE 100				
PBDE 128				
PBDE 138				
PBDE 153				
PBDE 154				
PBDE 183				
PBDE 190				
PBDE 203				
PBDE 206				
PBDE 209				

References for Table 5

ASTM. 2014. Standard Guide for Collection, Storage, Characterization, and Manipulation of Sediments for Toxicological Testing and for Selection of Samplers Used to Collect Benthic Invertebrates. ASTM E1391 - 03(2014).

NOAA. 1989. Standard Analytical Procedures of the NOAA National Analytical Facility. 2nd ed. NOAA Tech. Mem. NMFS F/NWC-92, 1985-86. Contact: National Status and Trends Program, National Oceanic and Atmospheric Administration, NOAA N/OMA32, 11400 Rockville Pike, Rockville, MD 20852.

Uhler, A.D. & G.S. Durrel. 1989. Measurement of tributyltin species in sediments by n-pentyl derivation with gas chromatography/flame photometric detection (GC/FPD).

USEPA. 1986. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods Compendium (SW-846) Third Edition. (and all revisions). https://www.epa.gov/hw-sw846/sw-846-compendium

USEPA. 1983. Methods of Chemical Analysis of Water and Waste (MCAWW), Section 9.3, EPA/600/4-79/020, Cincinnati OH, (and all revisions) https://www.epa.gov/homeland-security-research/reference-document-methods-chemical-analysis-water-and-waste-epa6004-0

Table 6 Physical Tests

Parameter	Test Method	Detection Limit
Grain Size	ASTM D422-63(2007)e2	0.1 %
Total Solids/Water Content	ASTM D2216-10 Plumb 1998	1.0% solids
Specific Gravity of soils	ASTM D854-14	NA
Atterburg Limits	ASTM D4318-17	NA

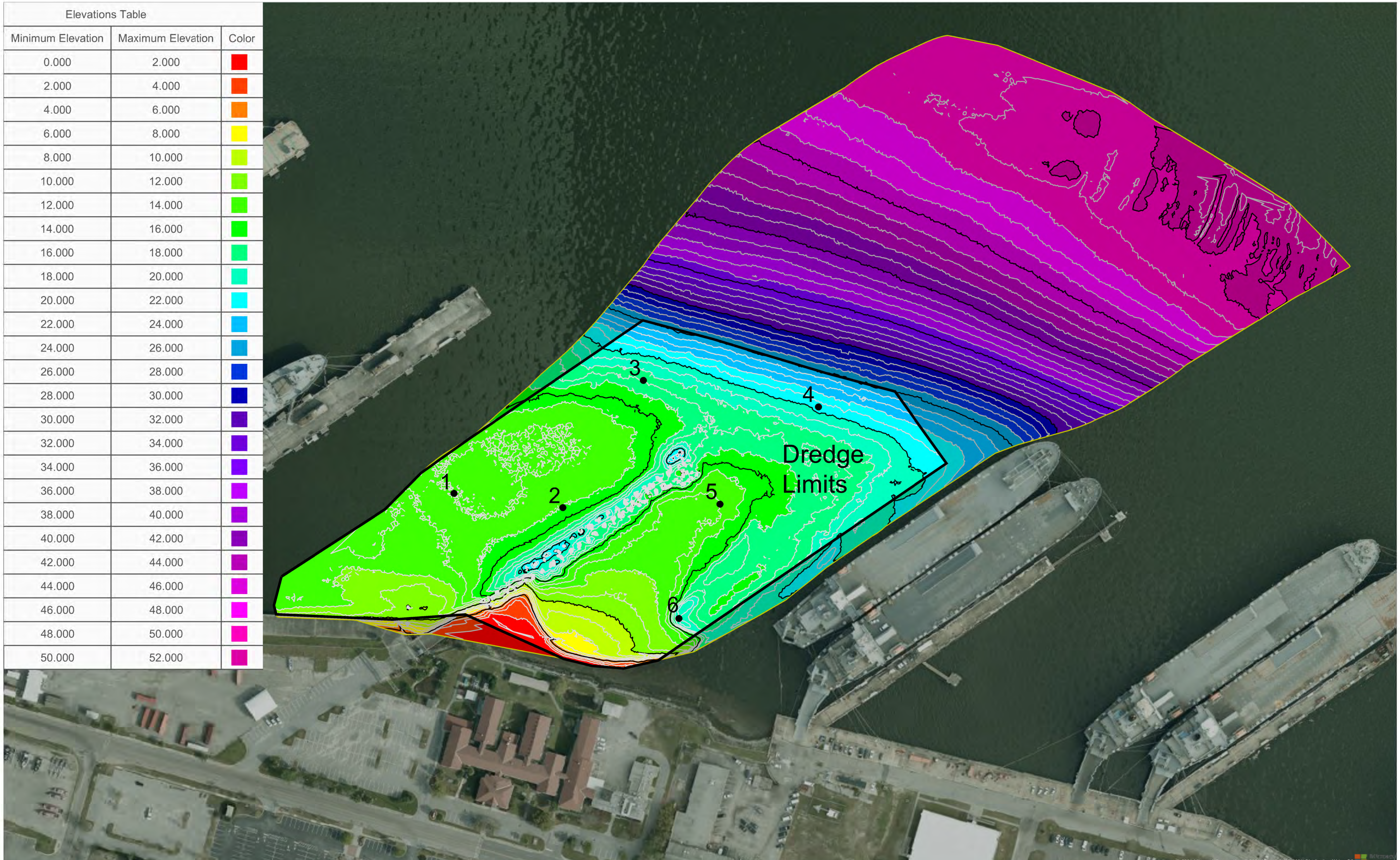
References for Table 6

ASTM D422-63(2007)e2. 2014. Standard Test Method for Particle-Size Analysis of Soils (Withdrawn 2016, no replacement).
ASTM D2216-10. 2010. Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
ASTM D854-14. 2014. Standard Test Methods for Specific Gravity of Soil Solids by Water Pycnometer.
ASTM D4318-17. 2017. Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

Figures

Figure 1 Pier Romeo Dredge Area

Elevations Table		
Minimum Elevation	Maximum Elevation	Color
0.000	2.000	
2.000	4.000	
4.000	6.000	
6.000	8.000	
8.000	10.000	
10.000	12.000	
12.000	14.000	
14.000	16.000	
16.000	18.000	
18.000	20.000	
20.000	22.000	
22.000	24.000	
24.000	26.000	
26.000	28.000	
28.000	30.000	
30.000	32.000	
32.000	34.000	
34.000	36.000	
36.000	38.000	
38.000	40.000	
40.000	42.000	
42.000	44.000	
44.000	46.000	
46.000	48.000	
48.000	50.000	
50.000	52.000	



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NOAA OMAO - Marine Support Facility Charleston
Pier Romeo
Preliminary Dredge Area Layout

moffatt & nichol
555 Anton Blvd Ste 400
Costa Mesa, CA 92626
Tel: (657) 261-2699

Figure 2 Regional Map with Locations of Potential Disposal Sites in Clouter Creek and Daniel Island


Hanahan
Clouter Creek North Cell
Clouter Creek Highway Cell
Clouter Creek Middle Cell
Clouter Creek South Cell
Feet
0 2,500 5,000
North Charleston
Pier Romeo Project Location
Berkeley County
Charleston County
Cooper River
Charleston
Daniel Island Wando Cell
Daniel Island West Cell
Daniel Island Middle Cell
Wando River
Charlotte
Fayetteville
Greenville
North Carolina
Columbia
South Carolina
Myrtle Beach
Augusta
Georgia
Charleston
Savannah
Mount Pleasant
Pier Romeo Project Location
County Boundary
USACE Maintained Channel
Contained Disposal Facility (CDF)

Appendix A:
Sample Chain of Custody Form

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Creative People, Practical Solutions.®

CHAIN OF CUSTODY RECORD

WO # / LAB USE ONLY

DATE: ____________________

PAGE: __________ OF __________

LABORATORY CLIENT:		CLIENT PROJECT NAME / NUMBER:	P.O. NO.:
ADDRESS:		PROJECT CONTACT: SHELLY ANGHERA	SAMPLER(S): (PRINT)
CITY:	STATE: ZIP:		
TEL:	E-MAIL:		

TURNAROUND TIME (Rush surcharges may apply to any TAT not "STANDARD"):

☐ SAME DAY ☐ 24 HR ☐ 48 HR ☐ 72 HR ☐ 5 DAYS ☐ STANDARD

☐ COELT EDF | GLOBAL ID: | LOG CODE:

SPECIAL INSTRUCTIONS:

REQUESTED ANALYSES

Please check box or fill in blank as needed.

LAB USE ONLY	SAMPLE ID	SAMPLING DATE	SAMPLING TIME	MATRIX	NO. OF CONT.	Unpreserved	Preserved	Field Filtered																		

Relinquished by: (Signature)	Received by: (Signature/Affiliation)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature/Affiliation)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature/Affiliation)	Date:	Time:

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Appendix E: Sampling Analysis Report

From:	Fannin, Chelsea B CIV USARMY CESAC (USA)
To:	Flesch-Pate, Julie
Cc:	Steve Wagner; Anghera, Shelly; Huggett, Douglas; Morrison, Samantha
Subject:	RE: SAC-2021-00965 NOAA OMAO Pier Romeo
Date:	Thursday, August 18, 2022 12:56:10 PM
Attachments:	image001.png image002.png image003.png image004.png

---

CAUTION: This email originated from outside of the organization.

Julie,

I wanted to let you know that it has been over 30 days since I sent your sediment testing results to the dredging committee. Only one agency commented (NMFS) and they had no comments regarding the results. The Corps also does not have any comments. You can move forward with submitting your application whenever you are ready.

Chelsea B. Fannin
Project Manager, South Branch
U.S. Army Corps of Engineers
Charleston District
69A Hagood Avenue
Charleston, SC 29403
Phone: 843-329-8038

From: Flesch-Pate, Julie <jfleschpate@moffattnichol.com>
Sent: Friday, July 1, 2022 4:21 PM
To: Fannin, Chelsea B CIV USARMY CESAC (USA) <Chelsea.B.Fannin@usace.army.mil>
Cc: Steve Wagner <swagner@ahtna.net>; Anghera, Shelly <sanghera@moffattnichol.com>; Huggett, Douglas <dhuggett@moffattnichol.com>; Morrison, Samantha <samantha.morrison@moffattnichol.com>
Subject: [URL Verdict: Neutral][Non-DoD Source] SAC-2021-00965 NOAA OMAO Pier Romeo

Chelsea,

Please see attached for your review the draft Sampling and Analysis Plan Results (SAR) for the Southeast Marine Operations Hub Project (formally referenced as NOAA OMAO Pier Romeo). We are submitting this report to you on behalf of Timothy Calohan of NOAA's Facilities Engineering Office. The NOAA facility is at 2234 S. Hobson Avenue, North Charleston, South Carolina. Please confirm upon your review if the information provided fulfills our requirements for coordination on the draft plan or if a call is needed to discuss next steps or to further discuss the proposed project.

The report appendices are too large to send via attachment to this message so we will be sending a file transfer message shortly with links to download both the draft report and its appendices in full. Please let us know if you do not receive the link or experience any issues with downloading the report files.

Your continued guidance regarding this project is greatly appreciated.

Thank you,

Julie Flesch-Pate CPM, LEED AP, MBA
Planning and Environmental Group Leader

4700 Falls of Neuse | Raleigh, NC 2609
P 919.781.4626 | M 919.532.9874

Click HERE to uploadfiles to my personal file box

REPORT
Produced For Ahtna Environmental, INC.
July 2022

FINAL SAMPLING AND ANALYSIS PLAN RESULTS

NOAA OMAO Pier Romeo North Charleston, South Carolina Southeast Marine Operations Hub Project

North Charleston, South Carolina

Document Verification

Client	Ahtna Environmental, INC.
Project name	NOAA OMAO - Southeast Marine Operations Hub Project
Document title	Sampling and Analysis Plan Result
Status	Draft Report
Date	July 2022
Project number	210495
File reference	Pier Romeo SAR_draft - 20220607

Revision	Description	Issued by	Date	Checked
00	Draft Report	SA	3/29/2022	JMFP
01	Updated Draft Report	SA	4/07/2022	JMFP
02	Update Draft Report	SA	7/21/2022	JMFP

Distribution List

Agency / Firm	Contact Name	Contact Information
US EPA Wetlands and Marine Regulatory Section	Kelly Laycock	laycock.kelly@epa.gov
US Fish & Wildlife	Mark Caldwell	mark_caldwell@fws.gov
US National Marine Fisheries Service	Pace Wilber	pace.wilber@noaa.gov
US National Marine Fisheries Service	Cindy Cooksey	cynthia.cooksey@noaa.gov
South Carolina Dept. of Health and Environmental Control	Chuck Hightower	wqcwetlands@dhec.sc.gov
South Carolina Dept. of Health and Environmental Control	Blair Williams	ocrmpermitting@dhec.sc.gov
South Carolina Dept. of Natural Resources	Stacie Crowe	crowes@dnr.sc.gov
South Carolina Dept. of Health and Environmental Control	Sarah Reed	reeds@dnr.sc.gov

Produced by:

Shelly Anghera, PhD

Sediment Characterization Lead, Moffatt & Nichol

Approval Date: March 24, 2022

Julie Flesch-Pate, CPM LEED AP, MBA

QA Manager, Moffatt & Nichol

March 28, 2022:

Moffatt & Nichol

555 Anton Blvd, Ste. 400

Costa Mesa, CA 922626

P 657.261.2675
www.moffattnichol.com

Table of Contents

List of Figures

List of Tables

Appendices

Glossary

CAGR	Compound Annual Growth Rate
CPI	Consumer Price Index
FCL	Full Container Load
ft	Feet
FY	Full Year
GDP	Gross Domestic Product
GFC	Global Financial Crisis
GT	Gross Tonnage
ha	Hectare (= 10,000 m^2)
KPI	Key Performance Indicator
LCMA	Least Cost Market Analysis
LCL	Less than Container Load
LOA	Length Overall
m	Meter
m^2	Square Meters
P&L	Profit and Loss Account
p.a.	Per annum
STS	Ship-to-Shore Crane (Quay Crane)
RTG	Rubber-Tyred Gantry
TEU	Twenty-Foot Equivalent Unit
THC	Terminal Handling Charge
Tonnes	Metric Tonnes
ULCS/s	Ultra Large Containership/s (10,000+TEU)
US$	United States Dollar(s)
YOY	Year on Year
YTD	Year to Date

1. Abstract

1.1. Project Summary

The National Oceanic and Atmospheric Administration (NOAA) Office of Marine and Aviation Operations (OMAO) proposes to recapitalize Pier Romeo to re-establish homeport operations for the NOAA vessels *Nancy Foster* and *Ronald H. Brown*. NOAA expects to use the new pier for the berthing of newer vessels as they become available. The project will include a seawall with living shoreline options aimed at reducing the risk of coastal storm surge and inundations at the project site.

The NOAA Charleston Marine Support Facility is located at Pier Romeo on the west bank of the Cooper River, within the Naval Weapons Station Charleston. Pier Romeo was decommissioned in 2006. The pier recapitalization project includes dredging to deepen the existing bathymetry at Pier Romeo to achieve maintenance depth. The existing bathymetry within the proposed dredge areas ranges from approximately -10 to -25 ft. Dredging at Pier Romeo will be performed to achieve the approved -25 ft MLLW design depth (project depth) within the dredge area. The total planned volume of dredged material is approximately 142,000 cy (Table 1) (plus a one-foot allowable overdepth). Water was collected on January 24 and sediments were sampled on January 25, 2022, following methods and approaches defined in the approved Sampling and Analysis Plan (SAP, Moffatt & Nichol, 2022). Sediment was collected at six sampling locations to represent the dredged material as shown in Figure 1. The results, provided here, characterize the proposed dredged material for placement at the designated Confined Disposal Facilities (CDF) at Clouter Creek and Daniel Island Diked Upland Disposal Area (Figure 2).

2. Location of Sampling Areas

2.1. Sediment Samples

Sediment was collected at six sampling locations to represent the dredged material as shown in Figure 1. Table 2 summarizes the sediment core sampling, including compositing scheme and identification, as well as core sample lengths.

2.2. Water Samples

Site water was collected from Pier Romeo for characterization and to create the elutriate sample. Site water was also collected in the Clouter Creek and Daniel Island creek near the anticipated outfall during dredged material placement. Table 3 summarizes the water sample locations. The two creek samples were evaluated to characterize background conditions during discharge. Figure 3 illustrates the locations where water samples were collected.

3. Material and Methods

NOAA submitted the SAP to U.S. Army Corps of Engineers (Corps) for their review and approval prior to project field activities. The SAP outlined procedures and quality assurance / quality control (QA/QC) requirements for the sampling and testing of proposed dredge sediments from the project. Appendix A provides a summary of the QA/QC measures implemented on this program.

Water was collected on January 24 and sediment was collected on January 25. Six cores were collected to characterize the project area. Cores extended to the project depth plus one-foot of allowable overdepth. Sample materials were collected by Athena Technologies, Inc and Moffatt & Nichol personnel in accordance with the SAP prior to being sent to the qualified laboratories for analysis. Ahtna Environmental Inc. personnel were onsite pre- and post-sampling. Sufficient material was collected to perform all the required tests. Project coordination occurred with the Corps prior to sampling event. Sediment and elutriate chemical characteristics were analysed at Eurofins. S&ME and GEL Laboratories evaluated physical features of the dredged material.

Field log sheets and chain-of-custody (COC) records were maintained throughout all sampling activities. COCs accompanied all samples and shipments to the laboratories. Copies of the COCs are provided in Appendix B.

All water and sediment sampling equipment used, including cores, liners, spoons, buckets, and containers were decontaminated prior to their use. All sampling crew donned new gloves between samples. All analytical containers were new and sourced from the laboratory. Engines were turned off during water sampling activities to avoid influence of local exhaust. All sediment was processed at Athena's geotechnical laboratory on elevated tables. Core logs and photos documented the sediment physical characteristics. Core logs and photos are provided in Appendix C.

Two field equipment blanks were collected: FB1 for water sampling pump and FB2 for sediment sampling core liners. Analyses were limited to metals (dissolved and total), pesticides, and polycyclic aromatic hydrocarbons (PAHs) as they are the most likely compounds to be encountered in the environment. These blanks will serve as a quality assurance indicator of possible cross-contamination of samples.

3.1. Laboratory Protocols

The approved SAP provides the analytical methods and target detection limits. Actual reporting limits (RLs), minimum detection limits (MDLs), and raw data for analysis are provided in Appendix D. All sediment, elutriate, and water samples were analysed as proposed in the SAP.

4. Final Results

4.1. Sediment Chemistry

A sediment composite sample (PR-S-20220125) from the proposed dredged area was analysed for all applicable parameters defined in Table 4 of the approved SAP. The SAP provides the analytical methods and target detection limits. Actual reporting limits RLs, MDLs, and raw data for analysis are provided in Appendix D. Table 4 provides a summary of the results compared to Region IV Ecological Screening Values (ESVs), effects range-low (ERL) and effects range-high (ERM) values by Long, et al., (1995). Table 5 provides a summary of the Toxicity Equivalent Quotients (TEQs) for all 17 congeners of dioxin and furans (individually and combined).

Analysis of sediment sample PR-S-20220125 resulted in arsenic concentrations in exceedance of the ESV and ERL values and total high molecular weight PAHs in excess of ESV.

4.1.1. Arsenic

Arsenic samples are naturally occurring in South Carolina. The NOAA report entitled "Chemical Contaminant Levels in Estuarine Sediment of the Ashepoo-Combahee-Edisto River Basin National Estuarine Research Reserve and Sanctuary Site", by Scott et al. (1998) found the level of sediment trace metal contamination in the ACE Basin National Estuarine Research Reserve (NERR) to be low. However, arsenic was found at concentrations that exceed the ERL level. Ten of the 34 sites had sediment arsenic concentrations exceeding the ERL level but not the ERM level. While arsenic levels found are believed to be natural there is a small potential for minimally higher levels, based on comparisons to the ERL benchmark. Several studies that have evaluated sediment quality in pristine systems have also found high arsenic concentrations in the southeastern United States (Scott et al. 1994, Long et al. 1998, Sanger 1998). "These naturally high levels are due to the high arsenic concentrations in the basement rock within the region. Therefore, these findings generally indicate that trace metal concentrations in the ACE Basin are indicative of that which one would expect from the natural weathering of basement rock within the region (Scott et al. 1998)." This study found that approximately 30% of the sediment samples exceeded the ERL value for arsenic with a maximum concentration of 21.22 ppm. The arsenic concentrations in the sediment composite sample are below naturally occurring concentrations in the region. Therefore, the dredging and settlement, when entrained in the dredge pond effluent, is not expected to result in unacceptable adverse impacts to aquatic, mammalian, and avian wildlife.

4.1.2. Polycyclic Aromatic Hydrocarbons

For screening of PAHs in sediment per USEPA (2018), the sum of low molecular weight PAHs (LMW-PAHs) or high molecular weight PAHs (HMW-PAHs) screening values are to be used, not individual compounds. Total HMW PAHs were found at concentrations greater than the ESVs for PR-S-20220125; therefore, further evaluation was conducted to evaluate the potential for PAHs to have a narcotic effect to sediment-dwelling organisms.

USEPA (2018) uses the equilibrium partitioning of the PAHs to estimate potential impacts (i.e., narcosis) to benthic organisms for a mixture of PAHs. To complete this, the concentration of each of the HMW-PAHs detected was normalized to total organic carbon (3.4%), then divided by its individual ESV found in Table 2c of USEPA (2018) guidance. The results for each equilibrium partitioning sediment benchmark toxic unit (ESBTU) are added together to obtain the ΣESBTU. Table 6 provides a summary of the analysis. The ΣESBTU is estimated to be 0.037 for the 10 HMW PAHs and when less than 1, does not have the potential for adverse impacts.

4.2. Modified Elutriate Tests/Chemical Analysis

An effluent elutriate test (EET) sample was created from site water (PR-W-20220125) and the sediment composite (PR-S-20220125) from the proposed dredged area. The elutriate was analysed for all applicable parameters defined in Table 5 of the approved SAP. The analytical methods, target detection limits, actual reporting limits (RLs), MDLs, and raw data for analysis are provided in Appendix D. Table 7 provides a summary of the results compared to Region IV ESVs.

The EET samples resulted in observance of arsenic in exceedance of the acute and chronic levels for both total and dissolved levels. Other occurrences of metals, PAHs, and additional analytes do not meet or exceed chronic or acute levels. Analysis of sample PR-W-20220125 for EET samples also resulted in an exceedance of the chronic guidelines, not acute, for total pyrene. The dissolved fraction for pyrene is not anticipated to exceed acute and chronic guidelines.

The evaluation of HMW PAHs in the sediments have demonstrated the mixture is not anticipated to generate adverse impacts for the whole sediment. Therefore, the total concentration portion of the elutriate that is generated during dewatering operations is not anticipated to have any greater impacts than the sediment itself. In addition, the estimated total pyrene concentrations will only be occurring temporarily, while the effluent is being discharged from the dredge ponds.

4.3. Physical Analysis

A sediment composite sample (PR-S-20220125) from the proposed dredged area was analysed for all physical tests defined in Table 6 of the approved SAP. The SAP provides the analytical methods and target detection limits. Actual reporting limits RLs, MDLs, and raw data for analysis are provided in Appendix D.

S&ME performed the geotechnical analysis tests for moisture content, Atterberg limits, grain size analysis, and specific gravity. The results of S&ME's analysis are included in Table 8. The characterization of sample material has been reported to be 67.7% silt, 29.0% clay, 20.5% colloids, 0.6% medium sand, and 2.8% fine sand.

GEL Laboratories was contracted to perform column settling tests on a single sample of water and sediment collected from the area adjacent to Pier Romeo and separated into nine samples for the purposes of analysis. Three sets of analyses were performed on the samples including testing to determine the particulate concentration and moisture content concentration of the sediment, total solids, water column sediment settling rates, and total suspended solids (TSS) and turbidity. Full analysis results are included in Appendix D.

The average specific gravity of the samples was determined to be 1.217 with the average total solids of 316.3 g/L and moisture content of 234.2 % by weight. Column settling results are based on sample set up on February 7, 2022, with measurements taken every hour for eight hours and then once per day thereafter for a total of fifteen days to test completion. Measurements taken during the first day of sample settlement uniformly represented 150.5 g/L of settled solids with 167.2 g/L of settled solids after seven days and 173.8 g/L of settled solids at fifteen days.

Results from the analysis of TSS versus turbidity began seven days into the column settling test and concluded at fifteen days with measurements taken once per day. At seven days, total suspended solids were reported at 229 mg/L and 57.8 NTU of turbidity in comparison to a reported 22 mg/L of TSS and 23.8 NTU of turbidity at fifteen days.

4.4. Background Water Samples

Site water (PR-W-20220125) from the proposed dredged area was analysed for all applicable parameters defined in Table 5 of the approved SAP. In addition, receiving water quality samples adjacent to Clouter Creek (CC-W-20220125) and Daniel Island (DI-W-20220125) CDF were collected and compared to applicable criteria. The SAP provides the analytical methods and target detection limits. Actual reporting limits RLs, MDLs, and raw data for analyses are provided in Appendix D. Table 9 provides a summary of the results compared to Region IV ESVs.

5. Discussion and Analysis of Data

Summary of primary findings:

- Sediments to be dredged appeared homogenous with regards to physical characteristics (i.e., grain size and organic content).
- The six composite cores generated a sample to represent the proposed dredged material. Sediments and elutriates were compared to applicable criteria.
- All contaminants of potential concern measured in the sediment and elutriate samples were at non-detect or at low concentrations and found below applicable criteria except for arsenic and pyrene.
  - Arsenic concentrations in the sediment and generated elutriate samples were at concentrations greater than established criteria for sediment and water. However, the concentrations are at or below established background levels in this region. Therefore, arsenic within the project sediments is not anticipated to impact water quality.
  - There may be temporary exceedance of the chronic criterium for total pyrene in the discharge effluent during dewatering activities. However, the total PAH concentrations were found to be at levels below those that are anticipated to generate narcotic-like impacts via ESBTU analysis. Since the total pyrene criteria were developed from the same equilibrium partitioning methods, impacts to water quality are not anticipated.
- Based on these findings, it is recommended the material at Pier Romeo be found suitable for hydraulic placement at Clouter Creek and/or Daniel Island sediment management areas.

6. References

Buchman, M.F. 2008. NOAA Screening Quick Reference Tables. http://response.restoration.noaa.gov/sites/default/files/SQuiRTs.pdf

Long ER, MacDonald DD, Smith SL, Calder FD. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environ. Management 19:81-97.

Sanger, D. M. 1998. Physical, chemical, and biological environmental quality of tidal creeks and salt marshes in South Carolina estuaries. Dissertation. University of South Carolina, Columbia, SC.

Scott, GI & Fulton, Michael & Dolah, RF & Key, Pete & Daugomah, James & Maier, PP & Wirth, Edward & Levison, M & Hadley, N & Layman, S. 1994. Ecotoxicological assessment of effluent and sediments from the Savannah Harbor dredged materials disposal areas in Wright River Estuary of South Carolina. US National Marine Fisheries Service and South Carolina Wildlife and Marine Resources Department, Charleston, SC. 244.

Scott, G.I., M.H. Fulton, D. Bearden, M. Sanders, A. Dias, L.A. Reed, S. Sivertsen, E.D. Strozier, P.B. Jenkins, J.W. Daugomah and others. 1998. Chemical contaminant levels in estuarine sediment of the Ashepoo-Combahee-Edisto River (ACE) Basin National Estuarine Research Reserve and Sanctuary Site. U.S. Department of Commerce, NOS, Charleston, SC.

U.S. Environmental Protection Agency (USEPA) 2018. Region 4 Ecological Risk Assessment Supplemental Guidance, Sediment Screening Values for Hazardous Waste Sites, Marine/Estuarine Sediment. Available at: http://www.scdhec.gov/Agency/docs/water-regs/R.61-68.pdf.

Tables

TABLE 1: PROPOSED D44 MAINENANCE DREDGE VOLUMES

Project Area	Project Depth (ft MLLW)	Estimated Volume to Project Depth (CY)[1]	Additional 1-ft Overdepth Volume (cy)	Total volume (cy)[2]
Pier Romeo Dredge Area	-25	129,000	13,000	142,000

Notes:

1 Volume includes 3:1 side slope due to size of the cut and location of the project area

TABLE 2: SEDIMENT SAMPLE COORDINATES, MUDLINE ELEVATIONS, AND CORE LENGTHS OF SAMPLES

Location ID	Coordinates[1]		Water Depth (ft)	Tide Elevation[2] (ft NAVD 88)	Tide Elevation[3] (ft MLLW)	Sediment Surface Elevation (ft MLLW)	Bottom of Boring Elevation (ft MLLW)	Penetration (ft)	Recovery (ft)
	Latitude	Longitude							
PR-01	32.85104	-79.942786	15.6	-0.8	2.3	-13.2	-26.0	12.8	11.7
								12.8	10.8
PR-02	32.85096	-79.942109	18.1	0.8	3.9	-14.2	-26.2	12.0[4]	10.9
PR-03	32.85163	-79.941584	22.3	1.1	4.2	-18.1	-27.1	9.0	8.7
PR-04	32.85149	-79.940505	26.4	1.5	4.6	-21.8	-27.8	6.0	5.5
PR-05	32.85098	-79.941122	18.3	1.7	4.8	-13.5	-26.0	12.5	12.1
PR-06	32.85037	-79.941617	16.7	1.9	5.0	-11.7	-26.2	14.5	12.8

Notes:

ft = feet

NAVD 88 = North American Vertical Datum of 1988

MLLW = Mean Lower Low Water

1 Coordinates were recorded in the field and were referenced to NAD Geographical Coordinates in Decimal Degrees.

2 Elevation data were collected in the field using a Spectra Precision SP80 Global Navigation Satellite System receiver interfaced with the South Carolina VRS Network, and referenced to NAVD 88.

3 MLLW elevation determined using vertical datum information from NOAA active tide station 8665530, Charleston, Cooper River Entrance SC. https://tidesandcurrents.noaa.gov/datums.html?id=8665530

4 Core collected using 4" stainless steel sample barrel to obtain sufficient sediment volume.

TABLE 3: WATER SAMPLE COORDINATES

Location ID	Time	Coordinates[1]		Water Depth (ft)	Notes
		Latitude	Longitude		
CC-W	10:39	32.87663	-79.9626	18.5	Clouter Creek
PR-W	11:42	32.85148	-79.9417	20.9	Pier Romeo
DI-W	12:32	32.82034	-79.9099	22	Daniel Island

Notes:

ft = feet

NAVD 88 = North American Vertical Datum of 1988

MLLW = Mean Lower Low Water

1 Coordinates were recorded in the field and were referenced to NAD Geographical Coordinates in Decimal Degrees.

TABLE 4: SEDIMENT SAMPLE RESULTS

	ESV	RSV	ERL	ERM	PR-S-20220125 01/25/2022 14:30
Conventional Parameters (mg/kg)					
Total Organic Carbon - Duplicates	-	-	-	-	**34000**
Metals (mg/kg)					
Antimony	2	25	-	-	**0.14 J**
Arsenic	7.2	42	8.2	70	**16**
Cadmium	0.68	4.2	1.2	9.6	**0.14 J**
Chromium	52	160	81	370	**39**
Chromium (III)	-	-	-	-	**39**
Chromium (VI)	-	-	-	-	0.72 U
Copper	19	110	34	270	**16**
Lead	30	110	47	220	**19**
Mercury	0.13	0.7	0.15	0.71	**0.084**
Nickel	16	43	21	52	**12**
Selenium	-	-	-	-	**0.64 J**
Silver	0.73	1.8	1	3.7	**0.084 J**
Zinc	120	270	150	410	**60**
PAHs (µg/kg)					
1-Methylnaphthalene	-	310	-	-	7.6 U
2-Methylnaphthalene	20	310	70	670	8 U
Acenaphthene	6.7	310	16	500	9.6 U
Acenaphthylene	5.9	310	44	640	**23 J**
Anthracene	47	310	85	1100	**33 J**
Fluorene	21	310	19	540	**6.9 J**
Naphthalene	35	310	160	2100	6.5 U
Phenanthrene	87	310	240	1500	**15 J**
Total LMW PAHs (ND = 0)	310	-	550	3200	**78**
Benzo(a)anthracene	75	660	260	1600	**88**
Benzo(a)pyrene	89	660	430	1600	**100**
Benzo(b)fluoranthene	-	660	-	-	**130**
Benzo(g,h,i)perylene	310	660	-	-	**57**
Benzo(k)fluoranthene	-	660	-	-	**65**
Chrysene	110	660	380	2800	**150**
Dibenz(a,h)anthracene	6.2	660	63	260	21 U
Fluoranthene	110	660	600	5100	**190**
Indeno(1,2,3-c,d)pyrene	340	660	-	-	**51**
Pyrene	150	660	670	2600	**220**
Total HMW PAHs (ND = 0)	660	-	1700	9600	**1050**

	ESV	RSV	ERL	ERM	PR-S-20220125 01/25/2022 14:30
Total PAHs (ND = 0)	1700	-	4000	45000	**1130**
Chlordanes (µg/kg)					
Alpha Chlordane	-	-	-	-	0.17 U
Cis-Nonachlor	-	-	-	-	0.22 U
Gamma Chlordane	-	-	-	-	0.16 U
Oxychlordane	-	-	-	-	0.29 U
Trans-Nonachlor	-	-	-	-	0.17 U
Technical Chlordane	-	-	0.5	6	3 U
DDTs (µg/kg)					
2,4'-DDD	-	-	-	-	0.12 U
2,4'-DDE	-	-	-	-	0.18 U
2,4'-DDT	-	-	-	-	0.27 U
4,4'-DDD	1.2	8	2	20	0.15 U
4,4'-DDE	2.1	370	2.2	27	0.14 U
4,4'-DDT	1.2	5	1	7	0.5 U
Total DDTs (ND = 0)	-	-	1.6	46	0.5 U
Organotins (µg/kg)					
Tributyltin	-	-	-	-	5 U
Tripentyltin	-	-	-	-	**26**
Organochlorine Pesticides (µg/kg)					
Aldrin	0.1	48	-	-	0.22 U
Dieldrin	0.1	4.3	0.02	8	0.17 U
Endosulfan I	-	-	-	-	0.19 U
Endosulfan II	0.14	-	-	-	0.15 U
Endrin	0.12	6	-	-	0.13 U
Endrin aldehyde	-	-	-	-	0.25 U
Endrin ketone	-	-	-	-	0.096 U
Heptachlor	1.5	71	-	-	0.22 U
Heptachlor epoxide	0.14	15	-	-	0.18 U
Methoxychlor	2.1	59	-	-	0.27 U
Mirex	3.6	120	-	-	0.13 U
Toxaphene	0.15	54	-	-	19 U
alpha-BHC	1.3	570	-	-	0.17 U
beta-BHC	-	570	-	-	0.19 U
delta-BHC	-	-	-	-	0.22 U
gamma-BHC (Lindane)	0.6	0.99	-	-	0.18 U
PCB Congeners (µg/kg)					
PCB008	-	-	-	-	0.59 U
PCB018	-	-	-	-	1 U

	ESV	RSV	ERL	ERM	PR-S-20220125 01/25/2022 14:30
PCB028	-	-	-	-	0.86 U
PCB044	-	-	-	-	0.64 U
PCB049	-	-	-	-	0.71 U
PCB052	-	-	-	-	0.65 U
PCB066	-	-	-	-	1.2 U
PCB077	-	-	-	-	1.4 U
PCB087	-	-	-	-	0.91 U
PCB101	-	-	-	-	0.45 U
PCB1016	-	-	-	-	0.44 U
PCB105	-	-	-	-	1.1 U
PCB118	-	-	-	-	1.1 U
PCB1221	-	-	-	-	0.49 U
PCB1232	-	-	-	-	0.34 U
PCB1242	-	-	-	-	0.2 U
PCB1248	-	-	-	-	0.33 U
PCB1254	-	-	-	-	0.41 U
PCB126	-	-	-	-	1 U
PCB1260	-	-	-	-	**2.9**
PCB128	-	-	-	-	0.61 U
PCB138	-	-	-	-	0.66 U
PCB153	-	-	-	-	1 U
PCB156	-	-	-	-	0.88 U
PCB169	-	-	-	-	1.1 U
PCB170	-	-	-	-	0.82 U
PCB180	-	-	-	-	0.77 U
PCB183	-	-	-	-	1.1 U
PCB184	-	-	-	-	0.9 U
PCB187	-	-	-	-	0.88 U
PCB195	-	-	-	-	0.85 U
PCB206	-	-	-	-	0.74 U
PCB209	-	-	-	-	1 U
Total PCB Congeners (ND = 0)	22	190	-	-	**2.9**
Dioxins/Furans (ng/kg)					
1,2,3,4,6,7,8-HpCDD	-	-	-	-	**140 J**
1,2,3,4,6,7,8-HpCDF	-	-	-	-	**11 J**
1,2,3,4,7,8,9-HpCDF	-	-	-	-	1.2 U
1,2,3,4,7,8-HxCDD	-	-	-	-	0.58 U
1,2,3,4,7,8-HxCDF	-	-	-	-	4.2 U
1,2,3,6,7,8-HxCDD	-	-	-	-	**7.1 J**

	ESV	RSV	ERL	ERM	PR-S-20220125 01/25/2022 14:30
1,2,3,6,7,8-HxCDF	-	-	-	-	4.3 U
1,2,3,7,8,9-HxCDD	-	-	-	-	**11 J**
1,2,3,7,8,9-HxCDF	-	-	-	-	4.3 U
1,2,3,7,8-PeCDD	-	-	-	-	**4.2 J**
1,2,3,7,8-PeCDF	-	-	-	-	0.16 U
2,3,4,6,7,8-HxCDF	-	-	-	-	4.2 U
2,3,4,7,8-PeCDF	-	-	-	-	0.12 U
2,3,7,8-TCDD	-	-	-	-	0.25 U
2,3,7,8-TCDF	-	-	-	-	**2.7 J**
OCDD	-	-	-	-	**1400**
OCDF	-	-	-	-	**23 J**
Ethers (PBDE) (ng/kg)					
BDE-7	-	-	-	-	0.63 U
BDE-8 + 11	-	-	-	-	0.48 U
BDE-10	-	-	-	-	**0.89 R J B**
BDE-12 + 13	-	-	-	-	**4.42 R J**
BDE-15	-	-	-	-	0.66 J
BDE-17 + 25	-	-	-	-	0.84 U
BDE-28 + 33	-	-	-	-	0.77 U
BDE-30	-	-	-	-	0.88 U
BDE-32	-	-	-	-	0.70 U
BDE-35	-	-	-	-	0.54 U
BDE-37	-	-	-	-	0.47 U
BDE-47	-	-	-	-	**3.18 R J B**
BDE-49	-	-	-	-	**0.78 R J**
BDE-51	-	-	-	-	0.32 U
BDE-66	-	-	-	-	0.49 U
BDE-71	-	-	-	-	0.46 U
BDE-75	-	-	-	-	0.37 U
BDE-77	-	-	-	-	0.30 U
BDE-79	-	-	-	-	0.28 U
BDE-85	-	-	-	-	0.33 U
BDE-99	-	-	-	-	**2.59 J B**
BDE-100	-	-	-	-	**0.71 J B**
BDE-105	-	-	-	-	0.41 U
BDE-116	-	-	-	-	0.52 U
BDE-119 + 120	-	-	-	-	0.38 U
BDE-126	-	-	-	-	0.20 U
BDE-128	-	-	-	-	0.42 U

	ESV	RSV	ERL	ERM	PR-S-20220125 01/25/2022 14:30
BDE-138 + 166	-	-	-	-	0.55 U
BDE-140	-	-	-	-	0.38 U
BDE-153	-	-	-	-	0.54 U
BDE-154	-	-	-	-	0.36 J
BDE-155	-	-	-	-	0.30 U
BDE-181	-	-	-	-	0.76 U
BDE-183	-	-	-	-	**0.87 R J**
BDE-190	-	-	-	-	1.32 U
BDE-203	-	-	-	-	**4.29 R J**
BDE-206	-	-	-	-	**75.1 MAX**
BDE-207	-	-	-	-	**79.1 MAX**
BDE-208	-	-	-	-	**53.1 MAX**
BDE-209	-	-	-	-	**3210**

Notes:

Bold Detected result

(yellow) Detected Concentration >= ESV

(orange) Detected Concentration >= ESV and ERL

\- No criteria

ESV Ecological Screening Value

RSV Refinement Screening Value

ERL Effects Range-Low

ERM Effects Range-Median

PAH Polycyclic Aromatic Hydrocarbon

PCB Polychlorinated Biphenyl

For totals, zeros were used for non-detect samples for summing. If all samples were non-detect, the highest MDL of all samples was used as the total result.

Total HMW [high molecular weight] PAHs are the sum of available HMW PAHs.

Total LMW [low molecular weight] PAHs are the sum of available LMW PAHs.

Total PAHs are the sum of available HMW and LMW PAHs.

For screening of ESV PAHs in sediment (Table 2b), the sum of low molecular weight PAHs (LMW-PAHs) or high molecular weight PAHs (HMW-PAHs) screening values are to be used, not individual compounds.

The U.S. EPA (1979) considers technical chlordane (CAS No. 12789-03-6) to be composed of 60% octachloro-4,7-methanotetrahydroindane (the cis and trans isomers) and 40% related compounds.

Total DDTs are the sum of: 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, 2,4'-DDD, 2,4'-DDE, and 2,4'-DDT.

Flags:

B Analyte was detected in the lab blank.

J Concentration is less than the limit of quantification.

R Peak detected but did not meet quantification criteria; result reported represents the maximum possible concentration.

U Analyte was not detected at the reporting limit; the minimum detection limit is provided.

MAX Concentration is an estimated maximum value.

TABLE 5: TOXICITY EQUIVALENT QUOTIENTS (TEQS) FOR ALL 17 CONGENERS OF DIOXIN AND FURANS (INDIVIDUALLY AND COMBINED)

	Toxicity Equivalence Factors (TEFs)			Reported results (ppt)	Estimated Conc. (ppb)	Toxicity Equivalence Factors (TEFs)		
PCDDs	fish[1]	humans[2]	birds[1]			fish[1]	humans[2]	birds[1]
2,3,7,8-TCDD	1	1	1	0.25 U	0.000125	1.25E-04	1.25E-04	1.25E-04
1,2,3,7,8-PeCDD	1	1	1	4.2 J	0.0042	4.20E-03	4.20E-03	4.20E-03
1,2,3,4,7,8-HxCDD	0.5	0.1	0.05	0.58 U	0.00029	1.45E-04	2.90E-05	1.45E-05

1,2,3,6,7,8-HxCDD	0.01	0.1	0.01	7.1 J	0.0071	7.10E-05	7.10E-04	7.10E-05
1,2,3,7,8,9-HxCDD	0.01	0.1	0.1	11 J	0.011	1.10E-04	1.10E-03	1.10E-03
1,2,3,4,6,7,8-HpCDD	0.001	0.01	0.001	140 J	0.14	1.40E-04	1.40E-03	1.40E-04
OCDD	0.0001	0.0003	0.0001	1400	1.4	1.40E-04	4.20E-04	1.40E-04
					TEQ	**4.93E-03**	**7.98E-03**	**5.79E-03**
PCDFs								
2,3,7,8-TCDF	0.05	0.1	1	2.7 J	0.0027	1.35E-04	2.70E-04	2.70E-03
1,2,3,7,8-PeCDF	0.05	0.03	0.1	0.16 U	0.00008	4.00E-06	2.40E-06	8.00E-06
2,3,4,7,8-PeCDF	0.5	0.3	1	0.12 U	0.00006	3.00E-05	1.80E-05	6.00E-05
1,2,3,4,7,8-HxCDF	0.1	0.1	0.1	4.2 U	0.0021	2.10E-04	2.10E-04	2.10E-04
1,2,3,6,7,8-HxCDF	0.1	0.1	0.1	4.3 U	0.00215	2.15E-04	2.15E-04	2.15E-04
1,2,3,7,8,9-HxCDF	0.1	0.1	0.1	4.3 U	0.00215	2.15E-04	2.15E-04	2.15E-04
2,3,4,6,7,8-HxCDF	0.1	0.1	0.1	4.2 U	0.0021	2.10E-04	2.10E-04	2.10E-04
1,2,3,4,6,7,8-HpCDF	0.01	0.01	0.01	11 J	0.011	1.10E-04	1.10E-04	1.10E-04
1,2,3,4,7,8,9-HpCDF	0.01	0.01	0.01	1.2 U	0.0006	6.00E-06	6.00E-06	6.00E-06
OCDF	0.0001	0.0003	0.0001	23 J	0.023	2.30E-06	6.90E-06	2.30E-06
					TEQ	**1.14E-03**	**1.26E-03**	**3.74E-03**

Notes:

1 Van den Berg et al. (1998) Toxic Equivalency Factors (TEFs) for PCBs, PCDDs, PCDFs for Humans and Wildlife. Environmental Health Perspectives 106: 12. pp. 775-792.

2 Human health TEFs updated to reflect latest guidance: EPA. (2010) Recommended Toxicity Equivalence Factors (TEFs) for Human Health Risk Assessments of 2,3,7,8-Tetrachlorodibenzo-p-dioxin and Dioxin-Like Compounds. Risk Assessment Forum, Washington, DC. EPA/100/R -10/005.

TABLE 6: REFINEMENT SCREENING OF PAHS AS CHEMICALS OF POTENTIAL CONCERN IN SEDIMENT USING SUM TOXIC UNIT APPROACH

Low Molecular Weight PAH	FCV	ug/kg	mg/kg	TOC normal[1]	ESBTU
Benz(a)anthracene	841	88	0.088	2.59	3.08E-03
Benzo(a)pyrene	965	100	0.1	2.94	3.05E-03
Benzo(b)fluoranthene	979	130	0.13	3.82	3.91E-03
Benzo(ghi)perylene	1090	57	0.057	1.68	1.54E-03
Benzo(k)fluoranthene	981	65	0.065	1.91	1.95E-03
Chrysene	844	150	0.15	4.41	5.23E-03
dibenz(a,h)anthracene	1120	21	0.021	0.62	5.51E-04
Fluoranthene	707	190	0.19	5.59	7.90E-03
Indeno(1,2,3-cd)pyrene	1115	51	0.051	1.50	1.35E-03
Pyrene	697	220	0.22	6.47	9.28E-03
				SUM ESBTU	3.78E-02

Notes:

FCV = Final Chronic Value standard for generating ESBTU

Total organic carbon = 3.4% (or fOC = 0.034)

TABLE 7: ELUTRIATE SAMPLE RESULTS

	Chronic	Acute	PR-W-20220125 10/2/2022 10:55 Dissolved Sample	Total Sample
Conventional Parameters (mg/l)				
Total Organic Carbon - Quad	-	-	**11**	**10**
Total Solids	-	-	-	**21000**
Total Suspended Solids	-	-	-	**82**
Metals (µg/l)				
Antimony	4300	-	**1.6 J**	**1.3 J**
Arsenic	36	69	**57**	**97**
Cadmium	-	-	0.22 U	0.22 U
Chromium	-	-	1.5 U	**3.7**
Copper	-	-	**0.89 J**	**1.6 J**
Lead	8.1	210	**0.19 J**	**0.65 J**
Mercury	0.94	1.8	0.13 U	0.13 U
Nickel	8.2	74	**1.3**	**2.8**
Selenium	71	290	1.5 U	1.5 U
Silver	-	-	0.18 U	0.18 U
Zinc	-	-	3.2 U	**4.4 J**
PAHs (µg/l)				
1-Methylnaphthalene	52	160	0.055 U	0.054 U
2-Methylnaphthalene	52	150	0.061 U	0.06 U
Acenaphthene	15	320	**0.095 J**	**0.12 J**
Acenaphthylene	28	290	0.064 U	0.063 U
Anthracene	0.43	1.8	0.049 U	**0.058 J**
Fluorene	24	82	0.068 U	0.066 U
Naphthalene	1.4	780	0.058 U	0.057 U
Phenanthrene	4.6	7.7	**0.12 J**	**0.092 J**
Total LMW PAHs (ND = 0)	-	-	**0.22**	**0.27**
Benzo(a)anthracene	0.35	4.6	0.074 U	0.072 U
Benzo(a)pyrene	0.02	0.64	0.052 U	0.051 U
Benzo(b)fluoranthene	0.06	1.4	0.096 U	0.093 U
Benzo(g,h,i)perylene	0.012	0.19	0.068 U	0.066 U
Benzo(k)fluoranthene	0.06	1.3	0.087 U	0.085 U
Chrysene	0.35	4.2	0.08 U	0.078 U
Dibenz(a,h)anthracene	0.01	0.28	0.071 U	0.069 U
Fluoranthene	0.82	3.4	**0.09 J**	**0.23**
Indeno(1,2,3-c,d)pyrene	0.012	0.27	0.084 U	0.082 U
Pyrene	0.11	0.45	**0.066 J**	**0.18**
Total HMW PAHs (ND = 0)	-	-	**0.16**	**0.41**
Total PAHs (ND = 0)	-	-	**0.37**	**0.68**
Chlordanes (µg/l)				
Alpha Chlordane	-	-	0.00035 U	0.00071 U
Cis-Nonachlor	-	-	0.00049 U	0.00098 U
Gamma Chlordane	-	-	0.00039 U	0.00079 U
Oxychlordane	-	-	0.0002 U	0.0004 U
Trans-Nonachlor	-	-	0.00018 U	0.00037 U
Technical Chlordane	-	-	0.007 U	0.014 U
DDTs (µg/l)				
2,4'-DDD	-	-	0.00079 U	0.0016 U
2,4'-DDE	-	-	0.00051 U	0.001 U
2,4'-DDT	-	-	0.00052 U	0.001 U
4,4'-DDD	0.084	0.35	0.00051 U	0.001 U
4,4'-DDE	0.14	0.7	0.00028 U	0.00057 U
4,4'-DDT	0.01	0.13	0.00066 U	0.0013 U
Total DDTs (ND = 0)	-	-	0.00079 U	0.0016 U
Organotins (µg/l)				
Tributyltin	0.0074	0.42	-	0.045 U
Tripentyltin (ug/L)	-	-	-	**0.19**
Organochlorine Pesticides (µg/l)				

	Chronic	Acute	PR-W-20220125 10/2/2022 10:55 Dissolved Sample	Total Sample
Aldrin	0.0001	1.3	0.00034 U	0.00068 U
Dieldrin	0.002	0.71	0.00026 U	0.00053 U
Endosulfan I	-	-	0.00066 U	0.0013 U
Endosulfan II	-	-	0.0003 U	0.00061 U
Endrin	0.002	0.04	0.00022 U	0.00044 U
Endrin aldehyde	-	-	0.0005 U	0.001 U
Endrin ketone	-	-	0.00038 U	0.00076 U
Heptachlor	0.004	0.05	0.00043 U	0.00087 U
Heptachlor epoxide	0.004	0.05	0.00033 U	0.00066 U
Methoxychlor	0.03	-	0.00075 U	0.0015 U
Mirex (ug/L)	0.001	0.001	0.00045 U	0.0009 U
Toxaphene	0.0002	0.21	0.047 U	0.094 U
alpha-BHC	-	-	0.00023 U	0.00046 U
beta-BHC	-	-	0.00035 U	0.0007 U
delta-BHC	-	-	0.00062 U	0.0012 U
gamma-BHC (Lindane)	0.02	0.16	0.00028 U	0.00056 U
PCB Congeners (µg/l)				
PCB008	-	-	0.00038 U	0.00039 U
PCB018	-	-	0.0006 U	0.0006 U
PCB028	-	-	0.00047 U	0.00047 U
PCB044	-	-	0.00069 U	0.0007 U
PCB049	-	-	0.00065 U	0.00066 U
PCB052	-	-	0.00044 U	0.00045 U
PCB066	-	-	0.00057 U	0.00057 U
PCB077	-	-	0.00067 U	0.00067 U
PCB087	-	-	0.00054 U	0.00054 U
PCB101	-	-	0.00056 U	0.00057 U
PCB1016	-	-	0.0046 U	0.0046 U
PCB105	-	-	0.00047 U	0.00048 U
PCB118	-	-	0.0007 U	0.00071 U
PCB1221	-	-	0.0055 U	0.0055 U
PCB1232	-	-	0.005 U	0.005 U
PCB1242	-	-	0.0034 U	0.0034 U
PCB1248	-	-	0.0077 U	0.0077 U
PCB1254	-	-	0.0044 U	0.0044 U
PCB126	-	-	0.00069 U	0.00069 U
PCB1260	-	-	0.0038 U	0.0038 U
PCB128	-	-	0.00052 U	0.00053 U
PCB138	-	-	0.00047 U	0.00048 U
PCB153	-	-	0.0005 U	0.00051 U
PCB156	-	-	0.00063 U	0.00064 U
PCB169	-	-	0.00066 U	0.00067 U
PCB170	-	-	0.00032 U	0.00032 U
PCB180	-	-	0.00066 U	0.00066 U
PCB183	-	-	0.00061 U	0.00062 U
PCB184	-	-	0.0006 U	0.00061 U
PCB187	-	-	0.00061 U	0.00061 U
PCB195	-	-	0.00075 U	0.00076 U
PCB206	-	-	0.00083 U	0.00084 U
PCB209	-	-	0.00079 U	0.00079 U
Total PCB Congeners (ND = 0)	0.03	0.03	0.0077 U	0.0077 U
Dioxins/Furans (pg/l)				
1,2,3,4,6,7,8-HpCDD	-	-	-	**190**
1,2,3,4,6,7,8-HpCDF	-	-	-	**11 J**
1,2,3,4,7,8,9-HpCDF	-	-	-	0.15 U
1,2,3,4,7,8-HxCDD	-	-	-	0.25 U
1,2,3,4,7,8-HxCDF	-	-	-	**1.4 J**
1,2,3,6,7,8-HxCDD	-	-	-	0.26 U
1,2,3,6,7,8-HxCDF	-	-	-	0.34 U

	Chronic	Acute	PR-W-20220125 10/2/2022 10:55 Dissolved Sample	Total Sample
1,2,3,7,8,9-HxCDD	-	-	-	**8 J**
1,2,3,7,8,9-HxCDF	-	-	-	0.45 U
1,2,3,7,8-PeCDD	-	-	-	**0.67 J**
1,2,3,7,8-PeCDF	-	-	-	**0.68 J**
2,3,4,6,7,8-HxCDF	-	-	-	**2 J**
2,3,4,7,8-PeCDF	-	-	-	0.11 U
2,3,7,8-TCDD	0	0	-	0.13 U
2,3,7,8-TCDF	-	-	-	0.12 U
OCDD	-	-	-	**2500**
OCDF	-	-	-	**23 J**
Ethers (PDBE) (pg/l)				
BDE-7	-	-	-	2.76 U
BDE-8 + 11	-	-	-	2.14 U
BDE-10	-	-	-	2.88 U
BDE-12 + 13	-	-	-	1.84 U
BDE-15	-	-	-	1.60 U
BDE-17 + 25	-	-	-	**1.70 R J**
BDE-28 + 33	-	-	-	**2.24 J B**
BDE-30	-	-	-	1.30 U
BDE-32	-	-	-	1.09 U
BDE-35	-	-	-	0.96 U
BDE-37	-	-	-	0.96 U
BDE-47	-	-	-	**33.3 J B**
BDE-49	-	-	-	1.91 U
BDE-51	-	-	-	1.32 U
BDE-66	-	-	-	2.28 U
BDE-71	-	-	-	1.87 U
BDE-75	-	-	-	1.55 U
BDE-77	-	-	-	1.35 U
BDE-79	-	-	-	1.55 U
BDE-85	-	-	-	2.23 U
BDE-99	-	-	-	**32.6 J B**
BDE-100	-	-	-	**7.09 J B**
BDE-105	-	-	-	2.83 U
BDE-116	-	-	-	3.62 U
BDE-119 + 120	-	-	-	2.43 U
BDE-126	-	-	-	1.37 U
BDE-128	-	-	-	3.13 U
BDE-138 + 166	-	-	-	2.82 U
BDE-140	-	-	-	1.91 U
BDE-153	-	-	-	**4.19 J**
BDE-154	-	-	-	**4.07 J B**
BDE-155	-	-	-	1.32 U B
BDE-181	-	-	-	2.66 U
BDE-183	-	-	-	**5.46 J B**
BDE-190	-	-	-	4.82 U
BDE-203	-	-	-	**10.9 R J B**
BDE-206	-	-	-	**58.9 MAX B**
BDE-207	-	-	-	**118 MAX B**
BDE-208	-	-	-	**83.9 MAX B**
BDE-209	-	-	-	**1140 R**

Notes:

Bold	Detected result
	Detected Concentration >= Chronic
	Detected Concentration >= Chronic and Acute
-	No criteria
Chronic	Chronic toxicity threshold specified in EPA (2018) Region 4 Ecological Risk Assessment Supplemental Guidance Table 1a: Surface Saltwater Screening Values for Hazardous Waste Sites.

Acute	Acute toxicity threshold specified in EPA (2018) Region 4 Ecological Risk Assessment Supplemental Guidance Table 1a: Surface Saltwater Screening Values for Hazardous Waste Sites.
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
Totals	Zeros were used for non-detect samples for summing. If all samples were non-detect, the highest MDL of all samples was used as the total result. Total HMW [high molecular weight] PAHs are the sum of available HMW PAHs. Total LMW [low molecular weight] PAHs are the sum of available LMW PAHs. Total PAHs are the sum of available HMW and LMW PAHs. The U.S. EPA (1979) considers technical chlordane (CAS No. 12789-03-6) to be composed of 60% octachloro-4,7-methanotetrahydroindane (the cis and trans isomers) and 40% related compounds. Total DDTs are the sum of: 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, 2,4'-DDD, 2,4'-DDE, and 2,4'-DDT.
Flags:	
B	Analyte was detected in the lab blank.
J	Concentration is less than the limit of quantification.
R	Peak detected but did not meet quantification criteria; result reported represents the maximum possible concentration.
U	Analyte was not detected at the reporting limit; the minimum detection limit is provided.
MAX	Concentration is an estimated maximum value.

TABLE 8: GEOTECHNICAL ANALYSIS RESULTS

ASTM Standard	Test Name	Unit of Measure	Observed Value
D2216-10	Moisture Content	%	226.8
D4318-17	Atterberg Limits – Liquid Limit	-	150
D4318-17	Atterberg Limits – Plastic Limit	-	51
D4318-17	Atterberg Limits – Plasticity Index	-	99
D422-63	Sieve Analysis - % Passing No. 200	%	96.7
D854-14	Specific Gravity	-	2.520

TABLE 9: WATER SAMPLE RESULTS

	Chronic	Acute	PR-W-20220125 01/24/2022 11:30	CC-W-20220125 01/24/2022 10:55	DI-W-20220125 01/24/2022 12:30
Conventional Parameters (mg/l)					
Total Organic Carbon - Quad	-	-	**1.3**	**1.5**	**0.98 J**
Total Solids	-	-	**18000**	**16000**	**27000**
Total Suspended Solids	-	-	**8.4**	**7.7**	**13**
Metals (µg/l)					
Antimony	4300	-	0.38 U	0.38 U	0.38 U
Arsenic	36	69	**1.4**	**1.4**	**2**
Cadmium	-	-	0.22 U	0.22 U	0.22 U
Chromium	-	-	1.5 U	1.5 U	**1.6 J**
Copper	-	-	**1.1 J**	**1.1 J**	**1 J**
Lead	8.1	210	0.13 U	0.13 U	**0.15 J**
Mercury	0.94	1.8	0.13 U	0.13 U	0.13 U
Nickel	8.2	74	**1.5**	**4.9**	**2**
Selenium	71	290	1.5 U	1.5 U	1.5 U
Silver	-	-	0.18 U	0.18 U	0.18 U
Zinc	-	-	3.2 U	3.2 U	3.2 U
PAHs (µg/l)					
1-Methylnaphthalene	52	160	0.056 U	0.056 U	0.056 U
2-Methylnaphthalene	52	150	0.062 U	0.062 U	0.062 U
Acenaphthene	15	320	0.065 U	0.065 U	0.065 U
Acenaphthylene	28	290	0.065 U	0.065 U	0.065 U
Anthracene	0.43	1.8	0.049 U	0.049 U	0.049 U
Fluorene	24	82	0.069 U	0.069 U	0.069 U
Naphthalene	1.4	780	0.059 U	0.059 U	0.059 U
Phenanthrene	4.6	7.7	**0.12 J**	**0.13 J**	**0.11 J**
Total LMW PAHs (ND = 0)	-	-	**0.12**	**0.13**	**0.11**
Benzo(a)anthracene	0.35	4.6	0.075 U	0.075 U	0.075 U
Benzo(a)pyrene	0.02	0.64	0.053 U	0.053 U	0.053 U
Benzo(b)fluoranthene	0.06	1.4	0.097 U	0.097 U	0.097 U
Benzo(g,h,i)perylene	0.012	0.19	0.069 U	0.069 U	0.069 U
Benzo(k)fluoranthene	0.06	1.3	0.088 U	0.088 U	0.088 U
Chrysene	0.35	4.2	0.081 U	0.081 U	0.081 U
Dibenz(a,h)anthracene	0.01	0.28	0.072 U	0.072 U	0.072 U
Fluoranthene	0.82	3.4	0.06 U	0.06 U	0.06 U
Indeno(1,2,3-c,d)pyrene	0.012	0.27	0.085 U	0.085 U	0.085 U
Pyrene	0.11	0.45	0.054 U	0.054 U	0.054 U
Total MHW PAHs (ND = 0)	-	-	0.097 U	0.097 U	0.097 U
Total PAHs (ND = 0)	-	-	**0.12**	**0.13**	**0.11**

	Chronic	Acute	PR-W-20220125 01/24/2022 11:30	CC-W-20220125 01/24/2022 10:55	DI-W-20220125 01/24/2022 12:30
Chlordanes (µg/l)					
Alpha Chlordane	-	-	0.00035 U	0.00035 U	0.00035 U
Cis-Nonachlor	-	-	0.00049 U	0.00048 U	0.00048 U
Gamma Chlordane	-	-	0.00039 U	0.00039 U	0.00039 U
Oxychlordane	-	-	0.0002 U	0.0002 U	0.0002 U
Trans-Nonachlor	-	-	0.00018 U	0.00018 U	0.00018 U
Technical Chlordane	-	-	0.007 U	0.0069 U	0.0069 U
DDTs (µg/l)					
2,4'-DDD	-	-	0.00079 U	0.00079 U	0.00079 U
2,4'-DDE	-	-	0.00051 U	0.00051 U	0.00051 U
2,4'-DDT	-	-	0.00052 U	0.00051 U	0.00051 U
4,4'-DDD	0.084	0.35	0.00051 U	0.00051 U	0.00051 U
4,4'-DDE	0.14	0.7	0.00028 U	0.00028 U	0.00028 U
4,4'-DDT	0.01	0.13	0.00066 U	0.00066 U	0.00066 U
Total DDTs (ND = 0)	-	-	0.00079 U	0.00079 U	0.00079 U
Organotins (µg/l)					
Tributyltin	0.0074	0.42	0.045 U	-	-
Tripentyltin	-	-	**0.22**	-	-
Organochlorine Pesticides (µg/l)					
Aldrin	0.0001	1.3	0.00034 U	0.00034 U	0.00034 U
Dieldrin	0.002	0.71	0.00026 U	0.00026 U	0.00026 U
Endosulfan I	-	-	0.00066 U	0.00065 U	0.00065 U
Endosulfan II	-	-	0.0003 U	0.0003 U	0.0003 U
Endrin	0.002	0.04	0.00022 U	0.00022 U	0.00022 U
Endrin aldehyde	-	-	0.0005 U	0.00049 U	0.00049 U
Endrin ketone	-	-	0.00038 U	0.00038 U	0.00038 U
Heptachlor	0.004	0.05	0.00043 U	0.00043 U	**0.00077 J**
Heptachlor epoxide	0.004	0.05	0.00033 U	0.00032 U	0.00032 U
Methoxychlor	0.03	-	0.00075 U	0.00074 U	0.00074 U
Mirex	0.001	0.001	0.00045 U	0.00044 U	0.00044 U
Toxaphene	0.0002	0.21	0.047 U	0.047 U	0.047 U
alpha-BHC	-	-	0.00023 U	0.00023 U	0.00023 U
beta-BHC	-	-	0.00035 U	0.00035 U	0.00035 U
delta-BHC	-	-	0.00062 U	0.00061 U	0.00061 U
gamma-BHC (Lindane)	0.02	0.16	0.00028 U	0.00028 U	0.00028 U
PCB Congeners (µg/l)					
PCB008	-	-	0.00039 U	0.00038 U	0.00038 U
PCB018	-	-	0.0006 U	0.0006 U	0.0006 U
PCB028	-	-	0.00047 U	0.00047 U	0.00047 U

	Chronic	Acute	PR-W-20220125 01/24/2022 11:30	CC-W-20220125 01/24/2022 10:55	DI-W-20220125 01/24/2022 12:30
PCB044	-	-	0.0007 U	0.00069 U	0.00069 U
PCB049	-	-	0.00066 U	0.00065 U	0.00065 U
PCB052	-	-	0.00045 U	0.00044 U	0.00044 U
PCB066	-	-	0.00057 U	0.00057 U	0.00057 U
PCB077	-	-	0.00067 U	0.00067 U	0.00067 U
PCB087	-	-	0.00054 U	0.00054 U	0.00054 U
PCB101	-	-	0.00057 U	0.00056 U	0.00056 U
PCB1016	-	-	0.0046 U	0.0045 U	0.0045 U
PCB105	-	-	0.00048 U	0.00047 U	0.00047 U
PCB118	-	-	0.00071 U	0.0007 U	0.0007 U
PCB1221	-	-	0.0055 U	0.0054 U	0.0054 U
PCB1232	-	-	0.005 U	0.005 U	0.005 U
PCB1242	-	-	0.0034 U	0.0034 U	0.0034 U
PCB1248	-	-	0.0077 U	0.0076 U	0.0076 U
PCB1254	-	-	0.0044 U	0.0043 U	0.0043 U
PCB126	-	-	0.00069 U	0.00069 U	0.00069 U
PCB1260	-	-	0.0038 U	0.0037 U	0.0037 U
PCB128	-	-	0.00053 U	0.00052 U	0.00052 U
PCB138	-	-	0.00048 U	0.00047 U	0.00047 U
PCB153	-	-	0.00051 U	0.0005 U	0.0005 U
PCB156	-	-	0.00064 U	0.00063 U	0.00063 U
PCB169	-	-	0.00067 U	0.00066 U	0.00066 U
PCB170	-	-	0.00032 U	0.00032 U	0.00032 U
PCB180	-	-	0.00066 U	0.00066 U	0.00066 U
PCB183	-	-	0.00062 U	0.00061 U	0.00061 U
PCB184	-	-	0.00061 U	0.0006 U	0.0006 U
PCB187	-	-	0.00061 U	0.00061 U	0.00061 U
PCB195	-	-	0.00076 U	0.00075 U	0.00075 U
PCB206	-	-	0.00084 U	0.00083 U	0.00083 U
PCB209	-	-	0.00079 U	0.00079 U	0.00079 U
Total PCB Congeners (ND = 0)	0.03	0.03	0.0077 U	0.0076 U	0.0076 U
Dioxins/Furans (pg/l)					
1,2,3,4,6,7,8-HpCDD	-	-	**1 J**	-	-
1,2,3,4,6,7,8-HpCDF	-	-	**0.31 J**	-	-
1,2,3,4,7,8,9-HpCDF	-	-	**0.15 J**	-	-
1,2,3,4,7,8-HxCDD	-	-	0.032 U	-	-
1,2,3,4,7,8-HxCDF	-	-	0.044 U	-	-
1,2,3,6,7,8-HxCDD	-	-	0.032 U	-	-
1,2,3,6,7,8-HxCDF	-	-	**0.13 J**	-	-

	Chronic	Acute	PR-W-20220125 01/24/2022 11:30	CC-W-20220125 01/24/2022 10:55	DI-W-20220125 01/24/2022 12:30
1,2,3,7,8,9-HxCDD	-	-	0.038 U	-	-
1,2,3,7,8,9-HxCDF	-	-	0.054 U	-	-
1,2,3,7,8-PeCDD	-	-	0.049 U	-	-
1,2,3,7,8-PeCDF	-	-	**0.23 J**	-	-
2,3,4,6,7,8-HxCDF	-	-	**0.34 J**	-	-
2,3,4,7,8-PeCDF	-	-	0.035 U	-	-
2,3,7,8-TCDD	0	0	0.036 U	-	-
2,3,7,8-TCDF	-	-	0.034 U	-	-
OCDD	-	-	**14 J**	-	-
OCDF	-	-	**0.32 J**	-	-
Ethers (PBDE) (pg/l)					
BDE-7	-	-	1.99 U	-	-
BDE-8 + 11	-	-	1.46 U	-	-
BDE-10	-	-	2.12 U	-	-
BDE-12 + 13	-	-	1.36 U	-	-
BDE-15	-	-	1.19 U	-	-
BDE-17 + 25	-	-	1.34 U	-	-
BDE-28 + 33	-	-	1.29 U	-	-
BDE-30	-	-	1.41 U	-	-
BDE-32	-	-	1.09 U	-	-
BDE-35	-	-	0.94 U	-	-
BDE-37	-	-	0.94 U	-	-
BDE-47	-	-	**8.90 R J B**	-	-
BDE-49	-	-	1.69 U	-	-
BDE-51	-	-	1.14 U	-	-
BDE-66	-	-	1.92 U	-	-
BDE-71	-	-	1.59 U	-	-
BDE-75	-	-	1.31 U	-	-
BDE-77	-	-	1.11 U	-	-
BDE-79	-	-	1.28 U	-	-
BDE-85	-	-	0.94 U	-	-
BDE-99	-	-	**7.55 R J B**	-	-
BDE-100	-	-	**1.78 J B**	-	-
BDE-105	-	-	1.05 U	-	-
BDE-116	-	-	1.29 U	-	-
BDE-119 + 120	-	-	0.95 U	-	-
BDE-126	-	-	0.94 U	-	-
BDE-128	-	-	0.94 U	-	-
BDE-138 + 166	-	-	1.77 U	-	-

	Chronic	Acute	PR-W-20220125 01/24/2022 11:30	CC-W-20220125 01/24/2022 10:55	DI-W-20220125 01/24/2022 12:30
BDE-140	-	-	1.18 U	-	-
BDE-153	-	-	1.62 U	-	-
BDE-154	-	-	0.94 U	-	-
BDE-155	-	-	0.94 U	-	-
BDE-181	-	-	1.54 U	-	-
BDE-183	-	-	**1.01 R J**	-	-
BDE-190	-	-	2.63 U	-	-
BDE-203	-	-	**4.82 R J B**	-	-
BDE-206	-	-	**17.6 R J B**	-	-
BDE-207	-	-	**23.8 R J B**	-	-
BDE-208	-	-	**21.5 R J**	-	-
BDE-209	-	-	**357 R J**	-	-

Notes:

Bold Detected result
- No criteria/Not measured

Chronic Chronic toxicity threshold specified in EPA (2018) Region 4 Ecological Risk Assessment Supplemental Guidance Table 1a: Surface Saltwater Screening Values for Hazardous Waste Sites.

Acute Acute toxicity threshold specified in EPA (2018) Region 4 Ecological Risk Assessment Supplemental Guidance Table 1a: Surface Saltwater Screening Values for Hazardous Waste Sites.

PAH Polycyclic Aromatic Hydrocarbon

PCB Polychlorinated Biphenyl

Totals Zeros were used for non-detect samples for summing. If all samples were non-detect, the highest MDL of all samples was used as the total result.
Total HMW [high molecular weight] PAHs are the sum of available HMW PAHs.
Total LMW [low molecular weight] PAHs are the sum of available LMW PAHs.
Total PAHs are the sum of available HMW and LMW PAHs.
The U.S. EPA (1979) considers technical chlordane (CAS No. 12789-03-6) to be composed of 60% octachloro-4,7-methanotetrahydroindane (the cis and trans isomers) and 40% related compounds.
Total DDTs are the sum of: 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, 2,4'-DDD, 2,4'-DDE, and 2,4'-DDT.

Flags:

B Analyte was detected in the lab blank.

J Concentration is less than the limit of quantification.

R Peak detected but did not meet quantification criteria; result reported represents the maximum possible concentration.

U Analyte was not detected at the reporting limit; the minimum detection limit is provided.

Figures

FIGURE 1: PIER ROMEO DREDGE AREA

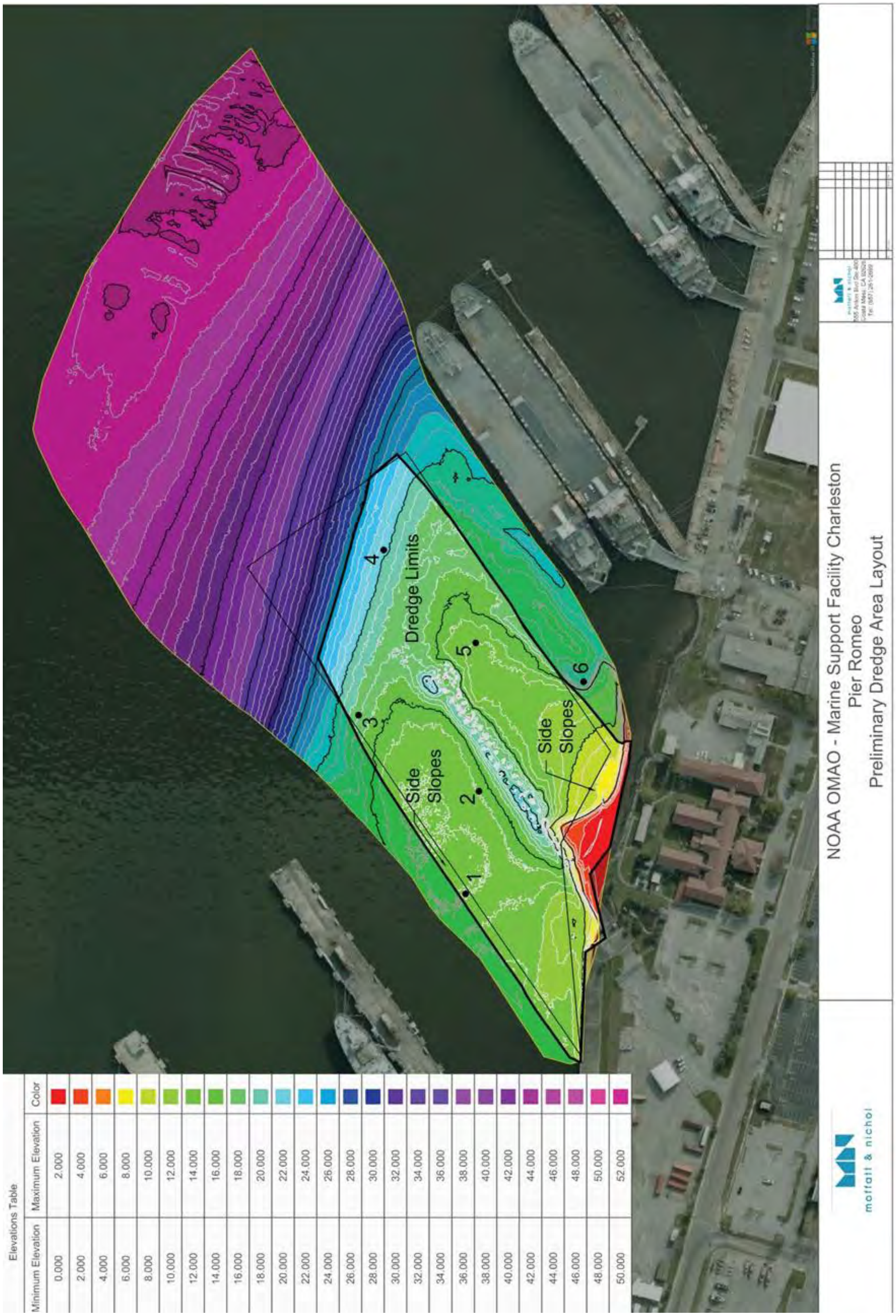

FIGURE 2: REGIONAL MAP WITH LOCATIONS OF POTENTIAL DISPOSAL SITES IN CLOUSTER CREEK AND DANIEL ISLAND WITH WATER SAMPLING LOCATIONS

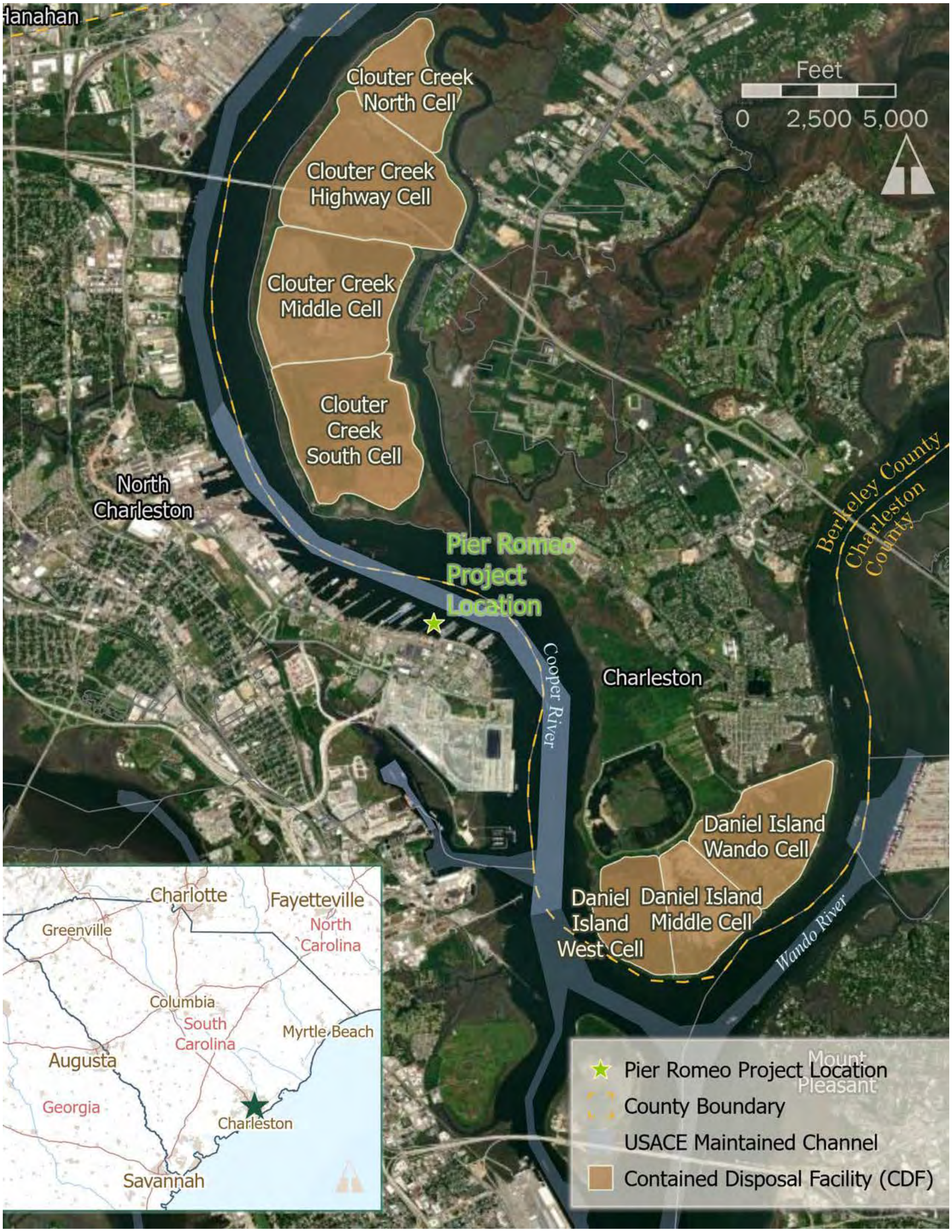

FIGURE 3: WATER QUALITY SAMPLING LOCATIONS

Appendix A:
Detailed Quality Assurance / Quality Control Plans

Detailed Quality Assurance/Quality Control Plans

Eurofins Calscience has provided written quality assurance/quality control (QA/QC) documentation as well as standard operating procedures (SOPs) for laboratory analysis of samples provided to the Pittsburgh laboratory. The laboratory will conform to EPA and SCDHEC quality control requirements. Along with the sediment and rinsate analysis, a matrix spike sample, a matrix spike duplicate sample, a laboratory control sample, a laboratory control duplicate sample and a sample blank will be provided with the final results

Eurofins provides a QA/QC summary in Section 4 of the laboratory report provided in Appendix B. Eurofins has also provided a Quality Assurance Manual as well as procedures for the following methods and test procedures:

- Records management, retention, and archive
- Preparation of standards and reagents; procurement of standards and materials, labelling, traceability
- Sample receipt and login
- Bottle order preparation and shipping
- DHEC certifications
- Chlorinated pesticide analysis SOP
- Percent moisture, solids, ash, and organic matter in soil samples SOP
- Preparation and analysis of mercury SOP
- Analysis of metals by inductively coupled plasma/mass spectrometry SOP
- Total organic carbon analysis for solid and sediment matrices SOP
- PCBs and PCBs as Congeners SOP
- Analysis for semi volatile organics SOP
- Hexavalent chromium analysis SOP

The Quality Assurance manual section 3.3.1.1 Dredged Material Evaluations includes the testing processes for trace level testing of water and sediment samples in support of in-water and upland material placement. Such testing includes the following sample evaluations:

- Organochlorine Pesticides
- Organophosphorus Pesticides
- PCBs
- Volatile Organics
- Metals
- Cyanide
- Total Sulfides
- Acid Volatile Sulfide
- Nitrogen, Ammonia
- Nitrogen, Nitrate + Nitrite
- Biochemical Oxygen Demand
- Chemical Oxygen Demand
- Total Organic Carbon
- Total Solids/Moisture Content
- Total Volatile Solids
- Lipids

The QA manual also includes laboratory personnel roles, laboratory objectives quality data analysis, document control, the purchasing of services and supplies, control of discrepancies, methods of corrective actions, preventative actions to mitigate possible non-conformances, control of records, laboratory environmental conditions, testing method validation, equipment and calibration techniques, sampling and the handling of samples, quality assurance of test results, and the reporting of results.

Deviations in QC protocols are not expected to alter the findings presented here.

Water sample FB2-W-20220125 indicated a chrysene concentration of 0.4 ug/l in exceedance of the chronic level of 0.35 ug/l as well as a dibernz(a,h)anthracene concentration of 0.4 ug/l in exceedance of the acute level of 0.28 ug/l.

Appendix B:
Chain of Custodies

Appendix C:
Core Logs and Photographs

Appendix D:
Laboratory Reports

To be provided electronically

Appendix F: Hazardous Material Assessment

moffatt & nichol

4700 Falls of Neuse Road, Suite 300
Raleigh, NC 27609

(919) 781-4626 Fax: (919) 781-4626
www.moffattnichol.com

MEMORANDUM

To: Steve Wagner

From: Julie Flesch-Pate

Date: July 18, 2022

Subject: Southeast Marine Operations Hub Project - Haz Mat Summary

This memorandum represents a broad description of findings to estimate the nature and extent of contamination at the subject site, located at 2234 South Hobson Avenue, North Charleston, South Carolina. An Environmental Site Assessment (ESA) was completed in June 2021 for NOAA's proposed Southeast Marine Operations Hub Project. Additionally, representative marine and upland samples were collected on-site. Soil sampling and analysis was key in detecting the presence of chemical constituents that may pose a hazard to humans, thus warranting special provisions regarding waste management activities as stipulated by state and federal agencies.

Project specific database searches indicated that multiple nearby properties are considered potential recognized environmental conditions (PRECs), which prompted early coordination with state and federal agencies. NOAA initiated early coordination with the South Carolina Department of Health and Environmental Control (SCDHEC) based on the proximity of the subject site to areas covered under an active Resource Conservation and Recovery Act (RCRA)permit issued to the U.S. Navy, and due to the site's historic industrial use as a berthing facility. NOAA initiated early agency coordination to inquire about any evolving area conditions or changes in applicable regulatory requirements pertaining to the RCRA permitted areas that may influence waste management activities or best management practices (BMPs) on the subject site. The subject site is not included in the current RCRA permit issued to the U.S. Navy.

The ESA included a site reconnaissance, which occurred on April 13, 2021 (see *Summary Report of Hazardous Materials and Historic Information*, June 2021). The ESA provides information pertaining to the following subject topics.

- Historic and present land uses at the subject site, and
- Records indicating presence of Recognized Environmental Conditions (RECs) defined as any hazardous substance or petroleum product on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the subject site.

The industrial setting of the subject site has not changed since the pier was originally developed by the U.S. Navy in 1947. Project construction would allow the site to be fully operational for industrial use, including government vessel berthing operations.

Soil sampling at the subject site occurred between April 12th through April 14, 2021. Sample types collected included:

- Eight (8) suspect asbestos containing materials (ACM) samples,
- Eight (8) suspect metals-containing paint (MCP) samples,
- Eight (8) marine sediment samples, and
- Three (3) unsaturated upland soil samples.

The *Hazardous Materials Survey and Sampling Report* (June 2021) provides detail on the sampling methodology and analysis findings of the twenty-seven (27) samples collected. No asbestos was detected in the eight (8) suspect asbestos samples taken. Sampling for asbestos included insulation on a six-inch (6 in) steam line that runs the length of the pier under the deck and insulation of pipe and valve coverings on the pier deck. Various metals were detected in the eight (8) suspect MCP samples. Painted items that contained metals, including lead, will be tested with other representative demolition debris by an accredited testing laboratory, per the Toxicity Characteristics Leaching Procedure (TCLP) test methodology, to determine if they would be characterized as a hazardous or solid (non-hazardous) waste prior to their removal and disposal. One sample taken at the mudline of the riverbank out of the eight (8) marine sediment samples collected contain only a trace amount of lead that was well below the USEPA Region 4 Regional Screening Level for industrial use sites.

A second series of upland and coastal soil samples were collected at the subject site between January 25 and 26, 2022. The purpose of the additional sampling was to investigate the possibility of chemical constituent contamination along the riverbank of the subject site south from Pier Romeo to Pier Sierra, where a seawall is proposed as part of the overall project. Of the eight (8) samples taken, five (5) samples were reported to have trace levels of lead at levels below the USEPA Industrial Regional Screening Limit. (see *Supplemental Report to the Hazardous Materials Survey and Sampling Report* (July, 2022).

Attachments

- *Summary Report of Hazardous Materials and Historic Information* (June, 2021) (without appendices)
- *Hazardous Materials Survey and Sampling Report* (June, 2021)
- *Supplemental Report to the Hazardous Materials Survey and Sampling Report (July, 2022)*

Summary Report of Hazardous Materials and Historical Information

Pier Romeo
South Hobson Avenue
Charleston, Charleston County, South Carolina
M&N Job No. 210495

Rev. #	Issue Date	Originated	Approved	Approval Date	Description
[1]	June 4, 2021			June 4, 2021	Final

DECLARATIONS

"I declare that, to the best of my professional knowledge and belief, I meet the definition of Environmental Professional as defined in Sec. 312.10 of 40 CFR Part 312."

"I have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject site. I performed and/or developed all the appropriate inquiries in conformance with the standards and practices set forth in 40 CFR Part 312."[1]

[1] A person who does not qualify as an Environmental Professional may assist in the conduct of all appropriate inquiries in accordance with ASTM E 1527-13, if such person is under the supervision or responsible charge of a person meeting the definition of an environmental professional when conducting such activities.

Table of Contents

1. Introduction

This report summarizes the results of our Summary Hazardous Materials and Historical Information of Pier Romeo located along South Hobson Avenue in Charleston, Charleston County, South Carolina (i.e., subject site). The parent property is identified by the Charleston County Online GIS Database as Parcel Identification Number (PIN) 4000000004 and is currently owned by FLETC (Federal Law Enforcement Training Center) and the National Oceanic and Atmospheric Administration (NOAA). The approximate 2-acre subject site is occupied by Pier Romeo, a NOAA Administrative Complex, and parking lot. Reference Figures 1 – 3 in Appendix A.

The subject site is in a commercial/militarized area of North Charleston, South Carolina. The subject site is bound on the north by the Cooper River and further north by a US Naval Reservation area; on the east by the Cooper River, Pier Sierra and additional piers associated with the FLETC; on the south by paved parking areas, multiple FLETC buildings and structures; and on the west by the Cooper River, Pier Quebec, and multiple FLETC properties.

No Recognized Environmental Conditions (RECs) were identified within the subject site. However, multiple nearby properties are considered potential recognized environmental conditions (PRECs) for the subject site. Potential RECs are described in further detail in Section 2.6.

ASTM E1527-13 defines a "recognized environmental condition (REC)" as the "presence or likely presence of any hazardous substances or petroleum products in, on or at a property: 1.) due to release to the environment, 2.) under conditions indicative of a release to the environment; or 3.) under conditions that pose a material threat of a future release to the environment."

The proposed action would improve critical infrastructure and mission support capabilities including the provision of operational and logistical support to NOAA vessels and other visiting government vessels. The proposed project is to stabilize the shoreline adjacent to the pier to reduce flood risk. Proposed actions at Pier Romeo would include shortening the Pier in length, widening the pier to support docking of two large vessels or four smaller vessels, providing a floating pier to combat the effects of sea level rise, and stabilizing adjacent shorelines to reduce flood risks.

1.1. Purpose and Scope of Services

The purpose of this Summary Hazardous Materials and Historical Information report was to identify potential RECs in connection with the subject site. Our services were completed in general accordance with our proposal, dated April 12, 2020, and authorized by the NOAA on January 5, 2021. The scope was refined on May 4, 2021, to just include a summary of the previous Phase I and the new 2021 EDR report. Our scope does not include full services that are developed in general accordance with the American Society for Testing and Materials (ASTM) Standard E 1527-13 for Summary Hazardous Materials and Historical Information and the Environmental Protection Agency's (EPA's) Federal Standard 40 Code of Federal Regulations (CFR) Part 312, "Standards and Practices for All Appropriate Inquiries (AAI)." Rather, this is a review of site conditions, historical information, and site reconnaissance of Pier Romeo. The scope of services described below was completed by an environmental professional as described in Federal Standard 40 CFR. Our scope of services for the Summary Hazardous Materials and Historical Information summary included the following:

1. Reviewing the results of a federal, state, local, and tribal environmental database search provided by an outside environmental data service for listings of sites with known or suspected environmental conditions on or near the subject site within the search distances specified by ASTM.
2. Conducting a visual reconnaissance of the subject site and adjacent properties to identify visible evidence of potential RECs.
3. Reviewing historical aerial photographs, fire insurance maps, city directories, land use, and tax assessor records, to identify past development history on and adjacent to the subject site relative to the possible use, generation, storage, release, or disposal of hazardous substances.
4. Identifying uses of the subject site from 1938 to the present.
5. Reviewing current and historic United States Geological Survey (USGS) topographic maps to identify the physiographic setting of the subject site and provide a statement on the local geologic, soil, and groundwater conditions based on our general experience and sources, such as geologic maps and soil surveys.
6. Identifying the source of potable water, heating and sewage disposal system(s) used at the subject site.
7. Providing a summary of the Summary Hazardous Materials and Historical Information results provided by EDR.

1.2. Special Considerations

Our scope of services did not include an environmental compliance audit or an evaluation for the presence of lead-based paint, toxic mold, polychlorinated biphenyls (PCBs), radon, lead in drinking water, asbestos-containing building materials, or urea-formaldehyde insulation. Soil, groundwater, and surface water sampling were not part of this Summary Hazardous Materials and Historical Information Report. Additionally, our scope of services did not include an assessment of vapor intrusion into future structures on the property per ASTM Standard E 2600-08.

2. Subject Site Condition

The ASTM standard includes disclosure and obligation of the user to help the Environmental Professional identify the potential for RECs associated with the subject site.

2.1. Involved Parties

Information provided by the Charleston County Tax Assessor's records indicates the subject site is currently owned by the United States of America. It is our understanding that the NOAA intends to purchase/acquire the property.

2.2. Location, Legal Description, and Setting

General site information, property use(s) and environmental setting of the subject site area are summarized in Table 1 below.

Table 1. Subject Site Information	
Topographic Map	Charleston Quadrangle, 2014
Section, Township and Range	North Charleston
Subject Site Address	South Hobson Avenue, Charleston, SC
Subject Site General Location	FLETC Property
Subject Site Legal Description	See Title Commitment Report in Appendix B
Tax Parcel Number	Charleston County: 4000000004
Subject Site Approximate Area	2 acres
Subject Site Existing Use	The Pier is currently decommissioned but was previously used for naval operation
Geologic Setting	Coastal Plain
Nearest Surface Water Bodies	Cooper River
Approximate Surface Elevation	1-3 feet above mean sea level
Soil and Geologic Conditions	Silt and silty sand
Inferred Direction of Shallow Groundwater Flow	To the north and east towards the Cooper River

Our knowledge of the general physiographic setting, geology, and groundwater occurrence in the vicinity of the subject site is based on our review of the topographic map listed above.

2.3. Subject Site Reconnaissance

A visual reconnaissance of the subject site occurred on April 12, 2021. The site reconnaissance was performed to observe site conditions and evaluate the current use, storage, generation, release or disposal of hazardous substances at the site. Photographs of the subject site are included in Appendix C. Table 2 summarizes conditions observed during our subject site reconnaissance.

Table 2. Site Reconnaissance

Features	Observation		Comment, Location and/or Description, etc.
	Yes	No	
Structures (existing)	X		The entrance of the Pier has several storage buildings. At the terminus of the Pier, an existing, decommissioned electrical substation is located. The substation did not have evidence of a release or staining.
Structures (evidence of former)	X		Same as above.
Heating/Cooling System		X	
Floor Drains, Sumps or Drywells		X	
Aboveground Storage Tanks (ASTs)	X		No ASTS were observed on site. However, one AST was located due east of the Pier on the NOAA property. The AST is a fuel tank that is approximately 500 gallons in size. The AST is situated on a concrete slab. No visible secondary containment was identified around the AST. Evidence of staining or a release from the AST was not observed. If the tank is to be decommissioned, proper ASTM protocols for removal and disposal should be followed. A storage structure is located immediately adjacent to the AST but access was not provided at the time of the reconnaissance.
Underground Storage Tanks (USTs) or Evidence of USTs		X	
Drums or Other Containers	X		6 unidentified, 50-gallon drums are located on Pier Romeo's entrance. Evidence of staining or a release from these drums were not identified. Based on a teleconference call on June 1, 2021 with NOAA, the drums do not contain hazardous materials. Current knowledge of the contents of the drums, other than that they are non-hazardous materials, has not been provided at this time.

Chemicals or Hazardous Materials (other than de minimis quantities of cleaning products)		X	
Evidence of Leaks, Spills or Releases Surrounding ASTs, USTs, and/or Chemical Storage Areas		X	
Stained or Corroded Floors, Walls or Drains (other than apparent water stains or minor oil stains on pavement from parked vehicles)		X	
Pipes of Unknown Origin or Use	X		Multiple decommissioned pipes were identified along the Pier. These pipes were originally used for steam, electrical, and fuel lines for the pier. Evidence of staining or a release from these pipes were not identified during the site reconnaissance. Further investigation into the pipes is to be documented in the Phase II Environmental Site Assessment report.
On-site Septic System		X	
Sewage Disposal System		X	
Potable Water Supply		X	
Solid Waste Refuse Dumpsters		X	
Hydraulic Hoists		X	
Oil/Water Separators		X	
Discolored or Stained Soil or Vegetation Potentially from Hazardous Substances		X	
Hazardous Waste Disposal Areas		X	
Uncontained Debris, Refuse or Unidentified Waste Materials		X	
Standing Water or Other Liquids		X	
Catch Basins and Stormwater Drainage		X	
Pits/Ponds/Lagoons	X		Pits/ponds/and lagoon were not observed on site. However, a stormwater catchment basin is located southeast of the Pier, adjacent to the parking lot and NOAA building. Evidence

			of a release was not identified on the surface waters.
Waste or Wastewater Discharges		X	
Unusual Odors		X	
Stressed Vegetation		X	
Fill Material		X	
Water Wells (agricultural, domestic, monitoring)		X	
Pad-Mounted Transformers		X	
Pole-Mounted Transformers		X	
Other Conditions of Environmental Concern		X	

2.4. Adjacent Property and Vicinity Observations

The properties located adjacent to and surrounding the subject site were viewed on 12 April 2021 from accessible public rights-of-way and the subject site. We did not enter adjacent properties or buildings. Table 3 outlines adjacent land uses and pertinent observations with respect to conditions that could pose a REC on the subject site.

Table 3. Adjacent Land Uses

Direction	Position Relative to Site[1]	Adjoining Street	Adjacent Property and Use(s)
North	Downgradient	South Hobson Avenue	Cooper River
East	Downgradient	South Hobson Avenue	NOAA Facility
South	Upgradient	South Hobson Avenue	FLETC Property
West	Upgradient	South Hobson Avenue	Parking Lot and FLETC Property

*Note: A US Naval Reservation area is located approximately 4,200 feet north from Pier Romeo. Due to the distance, this is not considered a REC of the site.

2.5. Previous Reports

A review was conducted on a previously completed Phase I ESA report (dated November 4, 2008). This report is attached in Appendix E. Based on the report, numerous spill incidents from the mid-1980s through 1998 were documented. Those spills occurred at the following properties: Building 200 Naval Station between Pier Q and R, Pier QR Quaywall, Pier R, and S Naval Station Charleston Cooper River, and Pier R Charleston Naval Base.

- Building 200 Naval Station between Pier Q and R was documented with a discharge of 5 gallons of diesel fuel into the Cooper River on October 18, 1990.
- Pier QR Quaywall was documented with a discharge of 20 gallons of miscellaneous lubricating oil into the Cooper River on November 15, 1990.
- Pier R and S Naval Station Charleston Cooper River was documented with an unknown quantity of oil into the Cooper River on July 10, 1991.
- Pier R Charleston Naval Base was documented with a discharge of 10 gallons of hydraulic oil into the Cooper River on September 9, 1991.

Numerous adjacent and surrounding piers were identified in the ERNS database for discharges of hazardous materials which likely impacted water and sediment quality in the Cooper River. However, the report noted that the discharges represent a REC to the river, but they are unlikely to have impacted the physical structure of Pier Romeo. The report stated that based on the age of Pier Romeo (developed in 1947), lead-based paint would likely be present on site and was considered an environmental concern.

The previous Phase I ESA identified interviews with the SCDHEC, specifically with Ms. Denise Place, with the SCDHEC's UST Management section. According to records, a release occurred at a nearby LUST site, 1969 Dyess Avenue. Ms. Place indicated that no records exist for remediation performed and believed the impacts were below the State of South Carolina cleanup levels. Additionally, the report reviewed NRC records that were available at the site after July 1995. According to the report, two incidents occurred, Incident Report #311442 and Incident Report # 461895. No fires, damages, or evacuations were reported from the releases and no remedial actions were reported. Lastly, the report did not identify unexploded ordinances (UXOs) in the vicinity of the site.

A review was completed on a Hazardous Materials Survey and Sampling Report dated May 19, 2021. The report stated that 8 suspect asbestos containing materials (ACM) samples, 8 suspect metals-containing paint (MCP) samples, 8 marine sediment samples, and 3 unsaturated soil samples were collected at the site. The report indicated that all paint samples contained some amounts of metals and in some cases were above residential and industrial cleanup target levels, especially lead. Only 1 mud-line sediment sample contained trace amounts of lead, and all 3 upland and coastal soil samples contained some amount of lead and Acetone. Other potential hazardous materials were noted to be present on the Pier. The report recommends these findings be incorporated into demolition designs/process, specifications, and cost estimates so that hazardous materials can be handled appropriately to protect workers and the environment. This report is provided in Appendix E.

A draft Side Scan Sonar Report (dated April 23, 2021) was also reviewed. Based on the report, collected data was obtained by using a Pos-MV Inertia Navigation System I2NS for positioning, a R2 Sonic 2022 Multibeam System, and an Edgetech 4125 side scan sonar. Side Scan and multibeam data were used to locate and measure targets in the vicinity of Pier Romeo. Based on the side scan sonar, 4 objects were identified. However, the report did not indicate that unexploded ordinances (UXOs) were identified or storage tanks that could represent a REC to the site. This report is provided in Appendix E.

2.6. Database Search

A review was conducted on the results of a search of pertinent environmental regulatory lists and databases for current or previous facilities listed at addresses located within ASTM-specified distances from the subject site. The information reviewed was provided by a subcontracted regulatory list search service, Environmental Data Resources, Inc. (EDR). The EDR report is presented in Appendix E. The report includes details regarding the listed facilities identified and maps showing the approximate locations of the listed facilities relative to the subject site.

The search results for listings pertaining to the subject site were reviewed as well as EDR's listing of database entries that could not be mapped because of insufficient addresses (orphans). Off-site facilities found within the specified distances from the site were evaluated for potential impact to the subject site.

A regulatory records search of ASTM standard and supplemental databases was conducted for the subject site and is included in Appendix B. The regulatory search report in the appendix includes additional details about the regulatory databases that were reviewed. The regulatory records search involves searching a series of databases for facilities that are located within a specified distance from the subject site. The ASTM standard specifies an approximate minimum search distance from the subject site for each database. Pursuant to ASTM, the approximate minimum search distance may be reduced for each standard environmental record except for Federal National Priority List (NPL) site list, and Federal Resource Conservation and Recovery Act (RCRA) Treatment, Storage, and Disposal (TSD) list. According to ASTM, government information obtained from nongovernmental sources may be considered current if the source updates the information at least every 90 days or, for information that is updated less frequently than quarterly by the government agency, within 90 days of the date the government agency makes the information available to the public. Table 4 indicates the standard environmental record sources and the approximate minimum search distances for each record.

Based on our knowledge of the subject site and the surrounding area, attempts to verify and interpret this data were conducted as part of this review. While this attempt at verification is made with due diligence, the accuracy of the record(s) search beyond that of information provided by the regulatory report(s) cannot be guaranteed. No warranty is included, regarding the accuracy of the database report information included within the regulatory report

The regulatory database search was performed by EDR, dated March 18, 2021. The minimum ASTM search distance was not reduced, as they are previously stipulated by the minimum ASTM standard. The regulatory databases reviewed include supplemental databases researched by EDR.

Table 4: SUMMARY OF ENVIRONMENTAL RECORDS AND AGENCY DATA			
Standard Environmental Record Sources from Agencies	**Minimum Search Distance Per ASTM (miles)**	**Site**	**Off-Site**
Federal NPL (National Priority List)	1	No	1

Federal Delisted NPL	0.5	No	0
Federal CERCLIS (Comprehensive Environmental Response, Compensation and Liability Information System)	0.5	No	0
Federal CERCLIS NFRAP (No Further Remedial Action Planned)	0.5	No	0
Federal RCRA (Resource Conservation and Recovery Act) CORRACTS (Corrective Active Report)	1	No	2
Federal RCRA non-CORRACTS TSD (Treatment, Storage, and Disposal Facilities)	0.5	No	0
Federal RCRA (Resource Conservation and Recovery Act) Generators	0.25 and Subject Site	No	2
Federal IC/EC (Institutional Controls/ Environmental Controls)	0.25 and Subject Site	No	0
Federal ERNS (Emergency Response Notification System)	0.25 and Subject Site	No	0
State and Tribal Hazardous Waste Sites (CERCLIS Equivalent)	0.5	No	6
State and Tribal Landfill and/or solid waste disposal sites	0.5	No	0
State and Tribal Leaking Tanks	0.5	No	1
State and Tribal Registered UST (Underground Storage Tanks) and AST (Above Ground Storage Tanks)	0.25 and Subject Site	No	1
State and Tribal IC/EC	0.25 and Subject Site	No	0
State and Tribal Voluntary Cleanup (VCP)	0.5	No	0
State and Tribal Brownfield Sites	0.5	No	0

The subject site was not identified on the EDR Report. However, two off-site properties were listed within ¼ mile of the site. Those sites include the US Department of State Charleston Regional Center, which is located at 1969 Dyess Avenue in Charleston, South Carolina and the FLETC located at 2000 Bainbridge Avenue in Charleston, South Carolina. Both facilities are listed as conditionally exempt small quantity generators. Further descriptions of each facility are provided in the EDR Report. Based on review, each site is listed as an exempt small quantity generator. A release, spill, or remediation action was not reported. Therefore, the incidents are considered potential RECs for the site.

Furthermore, nine off-site facilities are located within 1 mile of the subject site. Those sites include the Naval Shipyard - Charleston located at Viaduct Road, the South Carolina Department of Commerce -Division of Public Railways located at 1175 North Hobson Avenue, the Naval Shipyard - Charleston located On Shore of Cooper River and I-26 and Remount, the South Carolina Public Railways located at Bainbridge Avenue, Park South Tract located at Spruill Avenue, Family Dollar located at 2645 Spruill Avenue, MaCalloy Corporation located at 1800 Pittsburg Avenue, and the Charleston Naval Station (NS) Fleet and Industrial Supply Center located at between Juneau Avenue and Ozark Avenue. Further information regarding these facilities is described in detail in Section 4 of this summary report.

The 9 off-site facilities in the EDR report are located a significant distance from the subject site. Documentation of spills or a release were documented from multiple sites and further information is provided in the EDR report. In our opinion 8 of 9 of these sites may pose a potential environmental concern to the subject site due to the proximity and upgradient location to the subject site.

We were able to identify the general location of 1 orphan site listed in the EDR report. The site is named M/V Cape Douglas (Ship) Engine Room Pier P which was located at Hobson Avenue. This orphan site is unlikely to affect the project site based on the distance from the site and the transient nature of its presence.

3. Subject Site History

Pier Romeo or (subject site) is located along the southern banks of the Cooper River, situated approximately 320 feet north of South Hobson Avenue in Charleston, Charleston County, South Carolina. Reference Figures 1-3 in Appendix A for site location and further geographic details. According to the Charleston County Tax Assessors online GIS database, the Parcel Identification Number (PIN) is 4000000004 and is a reported 147.45 acres in size. However, the study area for Pier Romeo is approximately 2 acres in size. The current, decommissioned Pier is approximately 650 feet in length with an approximate 1,000 square-foot electrical substation at the terminus of the Pier.

Pier Romeo currently exists as a decommissioned, reinforced concrete pier with an electrical substation and lighting structure at the terminus of the Pier. The entrance of the pier consists of multiple storage units and associated containers.

The site was developed in 1947 and subsequently improved in 1987. The Charleston Naval Shipyard previously used the site for the docking of naval vessels. According to the previous Summary Hazardous Materials and Historical Information report, the US Navy transferred ownership of the Pier to NOAA Coastal Services Center (CSC) in 2005. Additionally, the CSC disconnected utilities of the Pier in 2006 and subsequently the utilization of the Pier was decommissioned.

3.1. Historical Resources

Our understanding of the history of the subject site is based on a review of the information from the historical resources listed in Table 5 and teleconference meetings with NOAA.

Table 5. Historical Resources Reviewed

Description	Provider or Interviewee	Dates of Coverage or Dates of Site Knowledge	Date Reviewed or Contacted	Comment
Historical Aerial Photographs[1]	EDR search of aerial photographs	1938, 1939, 1954, 1958, 1961, 1968, 1973, 1979, 1983, 1989, 1994, 1999, 2005,2013, 2017	3/18/2021	See Section 4.2 for findings. The aerial photos are provided in Appendix F.
Historical Topographic Maps	EDR search of topographic maps	1919, 1948, 1958,1971, 1979, 1983, 1988, 1994,2014	3/18/2021	There are no significant findings in the topographic maps with respect to hazardous materials.
Historical Fire Insurance Maps	EDR search of Sanborn maps	None	3/19/2021	Fire insurance maps were not available for the subject site
City Directories	EDR search of city directories	2000, 2005, 2010, 2014, 2017	3/24/2021	No significant findings in the City Directories

Note: The scale of the photographs reviewed allowed for an interpretation of general site development/configuration, such as identifying most structures, roadways, and clearings. However, the scale of the photographs did not allow for identification of specific site features, such as fuel pumps, wells, or chemical storage areas of the site, if any.

3.2. Historical Subject Site Ownership and Use Summary

Site Ownership

According to Charleston County Tax Assessor's records, the subject site is currently owned by the United States of America. NOAA intends to acquire this facility.

Historical Photographs Review

Review of the historical photographs of the site and surrounding area indicate the following:

- The 1939 historical aerial photograph shows the site is vegetated with multiple roads south of the site.
- The 1954, 1958, 1961, aerial photograph shows the site is developed with Pier Romeo and associated and associated NOAA facility. Areas to the east and west appear to be developed with multiple Piers, roads, and facilities.

- The 1968. 1973, 1979, 1983, 1989, 1994, 1999, 2005, 2013, and 2017 historical aerial photos indicates areas surrounding Pier Romeo have been developed with multiple roads, facilities, and infrastructure.

Adjacent Properties

Contiguous and nearby properties were documented during the site reconnaissance around the subject site and adjoining properties. Additionally, historical imagery was evaluated to determine what facilities were in vicinity of the subject site.

The historical aerial photographs indicate the areas adjacent to the west as a parking lot, South Hobson Road, multiple piers, and facilities. Areas to the south include South Hobson Avenue, parking lots, and FLETC facilities. Areas to the east include the NOAA facility, multiple Piers, and FLETC facilities. Areas to the north remain undisturbed due to the location of the Cooper River.

4. Conclusions

The Summary Hazardous Materials and Historical Information Report was conducted in general accordance with the scope and limitations of ASTM E 1527-13 and EPA's Federal Standard 40 CFR Part 312, "Standards and Practices for All Appropriate Inquiries (AAI)." Based on the results of our study, no RECs were identified in connection to the subject site. However, the following known or suspect environmental conditions identified by our study represent potential RECs for the site.

- Two off-site properties were listed within ¼ mile of the site. Those sites include the US Department of State Charleston Regional Center, which is located at 1969 Dyess Avenue in Charleston, South Carolina and the Federal Law Enforcement Training Center located at 2000 Bainbridge Avenue in Charleston, South Carolina. Both facilities are listed as conditionally exempt small quantity generators. Further descriptions of each facility are provided in the EDR Report. Based on the EDR report, incidents of a spill or release were not reported and therefore are not considered RECs to the subject site.
- Eight additional off-site facilities were identified within 1 mile of the subject site. Those sites include the Naval Shipyard - Charleston located at Viaduct Road, the South Carolina Department of Commerce - Division of Public Railways located at 1175 North Hobson Avenue, the Naval Shipyard - Charleston located On Shore of Cooper River and I-26 and Remount, the South Carolina Public Railways located at Bainbridge Avenue, Park South Tract located at Spruill Avenue, Family Dollar located at 2645 Spruill Avenue, MaCalloy Corporation located at 1800 Pittsburg Avenue, and the Charleston NS Fleet and Industrial Supply Center located at between Juneau Avenue and Ozark Avenue.
    - The Naval Shipyard - Charleston site located at Viaduct Road and the Naval Shipyard on Shore of Cooper River is listed on the following databases: DOD (Department of Defense), SC SHWS (Site Assessment Section Project List) (SC AUL (Land Use Controls), SC VCP (Voluntary Cleanup Sites), SC Brownfields, SC AllSITES (Site Assessment and Remediation Public Record Database), Superfund Enterprise Management System (SEMS)-Archive, CORRACTS (Corrective Action Report) , RCRA-TSDF (Treatment, Storage, and Disposal Facility), US Institutional (INST) Controls, RCRA NON-GEN/NLR (Non-

Generators/ No Longer Regulated), 2020 CO ACTION, RAA-TS (RCRA Administrative Action Tracking System), Potential Responsible Parties (PRP), PCB Activity Database System (Pads), SC Groundwater Contamination Inventory (GWCI) , Federal RCRA CORRACTS (Corrective Action Report), State and Tribal Hazardous Waste Sites (CERCLIS Equivalent), and the NY MANIFEST. Hazardous substances were reported in the EDR report, but incidents of spills or releases were not reported. Contamination may still be present on site due to the EDR report and current documentation. This site is considered a potential REC of the subject site due its distance and location upgradient of the subject site.

- The South Carolina Department of Commerce - Division of Public Railways site is listed on the following databases: SC Brownfields, SC SHWS, State and Tribal Hazardous Waste Sites (CERCLIS Equivalent), and SC VCP. A report of a release or spill was not identified in the EDR Report. However, due to the possible contamination still present, the distance, and location upgradient of the subject site, it is considered a potential REC of the site.
- The South Carolina Public Railways site is listed on the following databases: SC Brownfield, SC SHWS, SC VCP, and the SC ALLSITES. Incidents of spills or releases were not reported. However, due to the possible contamination still present, the distance, and location upgradient of the subject site, it is considered a potential REC of the site.
- The Park South Tract is listed on the following database: SC SHWS. However, this site is located downgradient of the subject site and a release or spill was not reported. This site is not considered a REC or potential REC of the subject site.
- The Family Dollar site is listed on the following databases: SC SHWS, SC VCP, SC Brownfields, State and Tribal Hazardous Waste Sites (CERCLIS Equivalent), and SC ALLSITES. Incidents of a spill or release were not reported in the EDR report. However, due to the possible contamination still present, the distance, and location upgradient of the subject site, it is considered a potential REC of the site.
- The MaCalloy Corporation is listed on the following databases: Federal NPL, Federal RCRA CORRACTS, State and Tribal Hazardous Waste Sites (CERCLIS Equivalent), SC SHWS, SC AUL, SC VCP, SC Brownfields, and the SC ALLSITES. This site has numerous reports of spills and releases as documented in the EDR report. However, due to the possible contamination still present, the distance, and location upgradient of the subject site, it is considered a potential REC of the site.
- The Charleston NS Fleet and Industrial Supply Center is listed on the following database: Unexploded Ordinance Site (UXO) Munitions and Ordinance Area. Based on the upgradient location and distance to the site, this site does not represent a REC to the subject site.

5. Limitations

This Draft Summary Hazardous Materials and Historical Information \ report has been prepared for use by NOAA. This Summary Hazardous Materials and Historical Information summary of the subject site in Charleston, South Carolina, is in general accordance with the scope and limitations of our proposal and subsequent meeting identified on May 4, 2021, to perform a summary Hazardous Materials and Historical Information services by others and the EDR report. This report is a summary review of site conditions, historical information, and site reconnaissance of Pier Romeo.

Environmental conditions described in this summary are based on site observations and historical research pertaining to the subject site.

Within the limitations of scope, schedule, and budget, this report has been prepared in accordance with generally accepted engineering and environmental practices in effect at the time the work was performed.

FINAL

NOAA Charleston Pier Romeo Recapitalization Project

Located At

FLETC

Charleston, South Carolina

SUPPLEMENTAL REPORT TO THE
Hazardous Materials Survey Sampling Report June 4, 2021

Prepared By

Gator Engineering & Aquifer Restoration, Inc.
1928 Boothe Circle, Longwood, FL 32750
Ph: 407-853-4555 Ext. 24 Fx:407-853-4556

July 8, 2022

FINAL

G.E.A.R.
1928 Boothe Circle STE 1000
Longwood, Florida 32750, USA
Tel: 407-853-4555

Supplemental Report for:

HAZARDOUS MATERIALS SURVEY SAMPLING REPORT of June 4, 2021

NOAA Charleston Pier Romeo Recapitalization Project
North Latitude: 32° 51’ 0.6”
West Longitude: 79° 56’ 34.9”
Pier Romeo Facility, including shoreline upland Soils to the east between Pier Romeo and Pier Sierra
Former Naval Base Charleston, FLETC Charleston
2000 Bainbridge Ave N. Charleston (Cooper River), South Carolina

Prepared For:

Julie Flesch-Pate
Moffatt & Nichol
4700 Falls of Neuse Road
Suite 300
Raleigh, NC 27609

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

EXECUTIVE SUMMARY

Gator Engineering & Aquifer Restoration, Inc. (GEAR) developed this Supplemental Hazardous Material (HazMat) survey and Sampling Report to further address the National Oceanic and Atmospheric Administration's (NOAA) Charleston Pier Romeo (PIER) Recapitalization Project facility located at the Federal Law Enforcement Training Center (FLETC) in North Charleston, South Carolina on the Cooper River (the Site). This report is a supplement to the HazMat Survey Report submitted in June 2021. The term HazMat/HazWastes encompasses a large body of regulated hazardous, non-hazardous, and universal wastes. The previous survey was accomplished in April and the HazMat Survey report was submitted in June 2021. Subsequent to that date, the recapitalization project determined to include design and construction of a new seawall along the eastern shoreline between Pier Romeo and Pier Sierra. This supplement report addresses eight (8) upland soil samples in the area where the seawall is planned.

The Site included the approximately 650 foot long by 30-foot-wide reinforced concrete pier and associated piping, a concrete building at the end of the pier, a small steel "guard shack" at the landside of the pier, limited area of adjacent quay wall pier and soil immediately west of the concrete pier, and submerged sediments below and adjacent to the pier. The Site was non-operational at the time of the survey and has been out of use since approximately 2006. The Pier has an approximate total area of 20,000 square feet. The Pier was developed by the US Navy as Facility 330 in 1947 and was improved in 1987. The former Charleston Naval Shipyard previously-used the subject property for berthing and repairing naval vessels in an industrial setting. The Navy transferred ownership of the pier to NOAA in 1996. All services to the pier were terminated in 2006.

The June 4, 2021, HazMat report's sampling event took place on April 12, 13, and 14, 2021. The scope included eight (8) samples of suspect Asbestos Containing Material (ACM), eight (8) samples of suspect Metal Containing Paint (MCP), eight (8) marine sediment samples, and three (3) unsaturated soil samples. Additionally, an inventory of other HazMat substances was taken. Results and findings indicated all 8 ACM samples were non-detect, all paint samples contained some amounts of metals and in some cases above residential and industrial cleanup target levels, especially lead. Only one (1) sediment sample from the mudline contained a trace amount of lead; note that only the top six inches of the mudline in 8 locations were sampled. All three upland and coastal soil samples contained some amount of lead and Acetone. Other potential HazMat materials were noted to be present on the pier. Tables 2 and 3 present data from the original three upland soil samples, and also from the additional 8 samples collected as part of this survey.

This Supplemental Report indicated that all of the additional eight (8) soil samples contain some levels of lead, and various constituents of petroleum-based contaminates indicative of the Site's past industrial setting. GEAR recommends these findings be incorporated into demolition designs/process, specifications, and cost estimates so any required soil movement and disposal can be handled appropriately.

1.0 INTRODUCTION & BACKGROUND

GEAR is submitting this Supplemental Hazardous Material (HazMat) Survey report which addresses additional soil sampling. This Supplemental report was conducted for the National Oceanic and Atmospheric Administration's (NOAA) Charleston Pier Romeo Recapitalization Project facility located at the Federal Law Enforcement Training Center (FLETC) in North Charleston, South Carolina on the Cooper River (the Site). GEAR was contracted by Moffatt & Nichol to support NOAA's desire and intent to design and construct a concrete "seawall" extending from Pier Romeo south to the next berthing pier (Sierra). GEAR previously completed three (3) soil borings as part of the HazMat Survey along the first approximately 50 feet south of Pier Romeo along the upland shoreline. The Supplemental Assessment scope of work continued further south to Pier Sierra by conducting additional upland soil sampling extending for approximately 600 feet. GEAR conducted eight (8) additional soil borings and collected (eight) 8 additional soil samples to analyze for Lead, Volatile Organic Compounds, and Semi-Volatile Organic Compounds.

The objective of this Supplemental HazMat Survey and sampling was to identify potential locations of contaminant impacts (presence/absence) along the shoreline for purposes of addressing environmental activities associated with the seawall construction. At the time of sample planning and execution GEAR was not aware of the seawall design plans. **Figure 1** presents the location of the facility; **Figure 2** presents Pier Romeo's location and the approximate limits of the June 4, 2021, HazMat Survey and upland soil sampling. **Figure 3** presents the area associated with the continuation of soil sampling along shoreline which is now included in the Recapitalization Project. **Figure 4** presents the approximate location of the Supplemental soil samples. The first three (3) soil samples (SB-1, SB-2, SB-3) were taken from upland and coastal (unsaturated) soils landside of the pier which may contain petroleum related material; results were reported in the June 2021 Hazardous Waste Survey Report.

The results of the supplemental soil evaluations are presented in this report. GEAR's supplemental soil sampling assessment and survey was conducted between January 25 and January 26, 2022, by GEAR' professional geologist and Environmental Technician. Copies of the professional license and OSHA certifications are provided in **Appendix A.** Access to the Site was provided by Mr. Steve Wagner, who was represented the prime contractor, Ahtna for this Project. A formal Kick-Off meeting with Ahtna and subcontractors was held on Site January 26, 2022, prior to beginning field activities.

1.1 Site Description

The Site includes upland and coastal (unsaturated) soils along the approximate 600 feet of shoreline south from Pier Romeo to Pier Sierra. Pier Romeo was non-operational at the time of the HazMat Survey and Supplemental HazMat Survey and has been out of use since approximately 2006. Pier Romeo was developed by the US Navy in 1947 and was improved in 1987. The shoreline to the south of the Pier Romeo has been an "industrial setting" since the 1940s. Historical aerials indicate that buildings may have existed along the waterfront which is now upland soils. The Navy transferred ownership of the Pier to NOAA in 1996. Pier operation and use by NOAA continued until 2005. Electrical and water supply services to the Pier were discontinued in 2006.

2.0 METHODOLOGY

2.1 Supplemental Soil Sampling and Assessment for Lead and Petroleum Products

GEAR mobilized to the Site on January 25, 2022 and attended the scope meeting with Ahtna and other subcontractors at the FLETC check-in facility. The scope included determining the location of soil borings for the expressed purpose of identifying where petroleum-impacted soils may be present along the shoreline from Pier Rome to Pier Sierra. GEAR used a walk down of the shoreline to identify areas of stained soil, exposed pipes, stressed vegetation, and outfalls from stormwater runoff to locate the proposed sample locations.

GEAR conducted the Supplemental HazMat Survey sampling protocol in accordance with GEAR's QAPP and H&S plan by collecting soil grab samples from the hand auger at 1-foot intervals to the water table (approximately 4-5 feet below land surface) and field screening for petroleum vapors. Using a decontaminated stainless-steel hand-auger soil grab samples where field screened for organic vapors using an Organic Vapor Analyzer with Photo-Ionization Detector (OVA-PID). Although organic vapors were detected in all soil borings none were greater than 1.0 part per million (ppm).

Soil Borings SB-6 and SB-7 were only extended to 2 feet below land surface due to encountering concrete remains of a building foundation that was not removed. Based on the industrial history of Pier Romeo, periodic flooding in these areas, and a visibly disposed 8-inch diameter steel pipe in the water along the shoreline near SB-6 and SB-7, GEAR determined it to be prudent to collect soil samples at the 2-foot interval above the concrete foundation in both SB-6 and SB-7.

Soil samples were collected based either on the highest OVA reading, or visual indications of potential impact and placed into sterile laboratory containers. These eight (8) samples were labeled from SB-4 through SB-11 to identify their locations (Figure 4). Each sample was collected, preserved, and transported to GEL laboratories in North Charleston. The soil laboratory analysis included US EPA Method SW846 3541/8270C semi-volatile organic compounds (SVOCs), Method 8260B Volatile Aromatic Compounds (VOCs), and EPA Methods 3050B, and 6010C for Total Lead. It should be noted that within the 8270C Semi-volatile compounds group there are 67 separate constituents (analytes) that are tested, and in the 8260B volatile aromatic compounds group there are 52 separate constituents that are tested. Some of these are hazardous waste and some are hazardous substances

3.0 FINDINGS

The findings of the Supplemental HazMat Survey soil sampling event are provided at the end of this report in **Table 1**, **Table 2, and Table 3**. Soil laboratory analytical reports are provided in **Appendix B**. Laboratory chain of custody and field notes are provided in **Appendix C**.

3.1 Petroleum Products Soil Sampling & Analysis

The stained areas along the shoreline indicated that periodic stormwater runoff possibly contained oils/greases and other substances. The sample locations were placed at control structures and the low points of the driveways and parking areas. The limited number of sample points only represent that specific point, which may not be indicative of the entire area. All samples were located within 5 feet of the fence line at the riprap, or approximately 10-15 feet from shoreline at high tide. Borings SB-8, SB-9, SB-10, and SB-11 were located along an enclave where heavy staining was observed in the littoral soil and riprap. Boring SB-11, located adjacent to a large diameter galvanized pipe, contained hard 1" diameter black glassy clumps that had an oily appearance and conchoidal fracturing. GEAR measured water table, recorded test OVA results, and described the soil appearance as tabulated in **Table 1** at the end of this report.

Except for the black oil clumps in SB-11, there was no visible evidence of past spills or petroleum related odors, or other orders associated with products such as solvents in or around the areas or sampling holes. For each sample, GEAR decontaminated the auger tools for OVA testing. The sample with the highest OVA reading was containerized, placed in a dedicated laboratory cooler with ice preservation, and chain-of-custody submittal sheets. The soil samples were delivered directly from the field to GEL Laboratories, Inc. in North Charleston, South Carolina, for client requested chemical analyses US EPA Method SW846 3541/8270C semi-volatile organic compounds (SVOCs) and Method 8260B Volatile Aromatic Compounds (VOCs) and 6010C for Total Lead. The complete laboratory results (93 pages) can be found in Appendix B. For ease in assessment, of the combined 120 constituents tested, only those for which the lab had a detection for are summarized and shown in the Reported Laboratory Analytical Results **Table 2** at the end of this report. Those constituents with results which equal or exceed Federal (EPA) screening levels are also highlighted and annotated in the fourth column. Those constituents which are marked with an asterisk (*) are petroleum related and do not appear on the EPA hazardous standards tables, but values for constituents of concern can be found in SCDHECs UST management programs QAPP.

GEAR has also provided **Table 3** which only compares the exceeded values of lead and those petroleum constituents which are listed on the USEPA Region 4 hazardous substance listings and appear at levels which exceed one or more of the listed USEPA Region 4 screening level values. The federal (USEPA) values are used since this area has been considered an industrial area since at least 1947, was originally part of the Federal Facilities assessment of the former Naval Shipyard and is the more conservative approach. It should be noted that regional screening levels (RSL) for comparison are typically used when appropriate to identify conditions that have little or no probability of needing additional treatment to address the specific resource concerns. Screening levels are also used when a potential site is initially investigated to determine if potentially significant levels of contamination are present to warrant further investigation. The USEPA Regional Screening Levels (RSL) can be described as risk-based concentrations derived from standardized equations combining various information variables such as exposure, site use, media, levels, intent, etc. which would be discussed with federal and state environmental project managers. RSLs are not “clean-up levels”. Although lead was present in all eleven (11) of the samples, they were all relatively minor with no exceedance of industrial screening levels or residential screening levels. However, 6 of 11 lead levels slightly exceeded Maximum Contaminant Levels (MCL) for soil to groundwater levels. Additionally, listed waste Benzo (a) anthracene, and Benzo(a)pyrene in SB-9 and SB-10 exceeded USEPA Residential RSLs as did Trichloroethylene. However, this is not a residential area. Trichloroethylene values in SB-8 exceeded MCLs for soil to groundwater and Risk to groundwater RSLs as did Methylene chloride on SB-11. Since this area has been and will remain industrial use, and groundwater is not a source for potable water / drinking, these minor exceedances are not considered to pose a health risk. Petroleum related constituents found in these samples are relatively less important than the listed hazardous values. Since both hazardous constituents and petroleum related constituents exist in the sample locations, the hazardous (federal) regulations take precedence. The SCDHEC UST QAPP lists risk-based screening levels of .066 mg/kg for Benzo(k)fluoranthene, and Dibenzo(a,h)anthracene. While these constituents were detected in lab samples, the values did not exceed the listed screening values.

4.0 CONCLUSIONS

The subject area and proposed site are located on a federal facility and in an industrial setting. This area was previously part of the Charleston Naval Shipyard where maintenance actions were practiced between approximately 1948 and 1985. As shown in **Table 2**, all unsaturated soil samples that were collected and tested contained levels of trace amounts of petroleum-related constituents. Some sample locations (SB-1, SB-4, SB-5, SB-8, SB-9, SB-10, and SB-11-contained trace amounts of listed hazardous constituents that slightly exceeded some of the federal screening levels shown in Table 3, but none exceeded the USEPA Industrial RSL. While these levels are of minor concern, they do indicate past contamination associated with likely spills or stormwater run-off over time. Past spills were documented in the 2008 URS Phase I ESA of the Pier area.

All unsaturated soil samples that were collected and tested contained levels of lead; the highest level of lead detected was 96200 *ug/kg*, or 96.2 *mg/kg* (96.2 ppm). Though six (6) of 11 soil samples contained lead exceeding USEPA regional screening MCL levels for lead in soil which may affect groundwater, the groundwater in this area is not used for potable water purposes, therefore regional screening exceedances are not practical since the groundwater is not potable without being treated. Any other petroleum (non-listed waste constituents) are also minor and not considered to be a concern.

5.0 RECOMMENDATIONS

5.1 General HazMat Recommendations

Based on the conclusions of this survey, GEAR recommends the following:

- Due to the documented presence of listed USEPA waste constituents in some soil boring samples, although minor in, it is recommended that the SCDHEC RCRA Federal Facilities Department be notified of these results (Contact person is Kent Krieg is 803-256-1234 - kriegkm@dhec.sc.gov). Although this is a known federal facility, SCDHEC may require implementation of their Document for Preparing Quality Assurance Project Plans (QAPP) process to further characterize and evaluate relevant risk associated with the presence of listed constituents and petroleum (including lead) impacted soils exceeding some USEPA Region 4 regional screening levels in soils identified for excavation within the future design footprint. The SCDHEC may also require groundwater samples to be collected and tested in this area.

- Disposal protocols for soil in accordance with a South Carolina Department of Health and Environmental Control (SCDHEC) approved Quality Assurance Project Plan (QAPPs), should be reviewed to determine soil stockpile and/or disposal requirements. As a minimum any soils requiring disposal will require sampling to determine where the waste may be disposed of.

- Use approved OSHA, state published guidelines and Best Management Practices (BMPs) when working with soil to limit and prevent fugitive dust inhalation during construction activities.

6.0 LIMITATIONS

GEAR's services were provided in accordance with generally accepted environmental science, industrial hygiene, and engineering practices at the time the work was performed. However, the number of soil samples collected was limited by a prescribed scope and budget. No expressed or intended representation of warranty is included or intended in this report, except those services were performed with the customary thoroughness and competence of our profession. This report is based on the limited specific locations data was collected from, site conditions and other limited information that is applicable as of the sample dates and date of this report. The conclusions and recommendations herein are therefore applicable only to that timeframe. The scope of services performed by GEAR may not be appropriate to satisfy the needs of other users, and any use or re-use of this document, or of the findings, conclusions or recommendations herein is at the sole risk of the user. Applicable Federal, State, and local regulations should be verified prior to work that will disturb potentially contaminated material.

REFERENCES

U.S. Environmental Protection Agency (EPA): Asbestos Hazard Emergency Response Act (AHERA), 40 CFR, Part 763.20, 1990.

FOSHA 29 CFR 1926.62 Lead in Construction Standard

OSHA 29 CFR 1926.1118 Inorganic Arsenic

OSHA 29 CFR 1926.1127 Cadmium

OSHA 29 CFR 1910.1000 Table Z-1 Limits for Air Contaminants; United States Department of Labor

South Carolina Department of Natural Resources Rules of Asbestos Removal and Encapsulation, Chapter 391-3-14.

SCDHEC Publications for lead in Soil Contamination (Quality Assurance Project Plans)

SCDHEC SECTION 280.65. Investigations for Soil and Groundwater Cleanup

SCDHEC UST Management Division QAPP Underground Storage Tank Management Division Revision Number: 4.0 Revision Date: July 2020

USEPA Region 4 Soil Screening Levels (Nov 2020)

https://www.epa.gov/risk/regional-screening-levels-rsls

TABLES

Table 1: Soil Sample Descriptions			
Soil Boring	**Soil Description**	**OVA Range (ppm)**	**Depth to Water**
SB-4	0’-3’ Dark Brown Slightly Clayey Silty fine sand	0.0 – 0.2	2.40 feet
SB-5	0’-3’ Brown Slightly Clayey to Silty fine sand	0.1 – 0.1	2.42 feet
SB-6	0’-2’ Brown Slightly Clayey to Silty fine sand	0.1 – 0.2	NA
SB-7	0’-2’ Brown Slightly Clayey to Silty fine sand	0.3 – 0.6	NA
SB-8	0’-4’ Brown Slightly Clayey to Silty fine sand	0.2 – 0.3	3.55 feet
SB-9	0’-4’ Brown Slightly Silty fine sand	0.1 – 0.2	3.95 feet
SB-10	0’-4’ Brown Silty fine sand with oil clumps	0.8 – 1.2	4.10 feet
SB-11	0’-4’ Gray Brown Silty fine sand with oil clumps	0.3 – 0.4	4.00 feet

Table 2: Soil Analytical Summary							
		Laboratory Analytical Result		USEPA Federal RSL mg/kg			
Soil Sample	Constituent	ug/kg	mg/kg	U.S. EPA Industrial RSL	U.S. EPA Residential RSL	U.S. EPA MCL Soil-to-Groundwater RSL	U.S. EPA Risk Soil-to-Groundwater RSL
SB-1	Lead	18,700	18.7	800	400	14	NE
	Dichlorodifluoromethane	.360	.000360	3700	87	NE	.3
	Acetone	12.76	.01276	1100000	70000	NE	3.7
SB-2	Lead	10,000	10	800	400	14	NE
	Dichlorodifluoromethane	.360	.000360	3700	87	NE	.3
	Acetone	28.4	.0284	1100000	70000	NE	3.7
SB-3	Lead	5,380	5.380	800	400	14	NE
	Dichlorodifluoromethane	.326	.000326	3700	87	NE	.3
	Acetone	3.20	.0320	1100000	70000	NE	3.7
SB-4	Lead	16,600	16.6	800	400	14	NE
	Di-n-octylphthalate	408	.408	*	*	*	*
	Acetone	269	.269	1100000	70000	NE	3.7
SB-5	Lead	23,300	23.3	800	400	14	NE
	Benzo(k)fluoranthene	20.3	.0203	*	*	*	*
	Di-n-octylphthalate	16.7	.016.7	*	*	*	*
	Fluoranthene	18.7	.0187	*	*	*	*
	Indeno(1,2,3-cd)pyrene	15	.015	*	*	*	*
	Pyrene	15.9	.0159	*	*	*	*
SB-6	Lead	11,300	11.3	800	400	14	NE
	Di-n-octylphthalate	321	.321	*	*	*	*
	2-Butanone	271	.271	*	*	*	*
SB-7	Lead	8,870	8.87	800	400	14	NE
	Dibenzo(a,h)anthracene	97.6	.0976	*	*	*	*
	2-Butanone	604	.604	*	*	*	*
	Acetone	624	.624	1100000	70000	NE	3.7
SB-8	Lead	19600	19.6	800	400	14	NE
	Di-n-octylphthalate	385	.385	*	*	*	*
	Trichloroethylene	3240	3.24	6.0	.94	.0018	.00018

SB-9	Lead	38700	38.7	800	400	14	NE
	Benzo(a)pyrene	475	.475	2.1	0.11	0.24	.029
	Benzo(ghi)perylene	506	.506	*	*	*	*
	Benzo(k)fluoranthene	1210	1.210	*	*	*	*
	Chrysene	732	.732	*	*	*	*
	Di-n-octyl phthalate	530	.530	*	*	*	*
	Fluoranthene	1070	1.070	*	*	*	*
	Indeno (1,2,3-(cd)pyrene	677	.677	*	*	*	*
	Phenanthrene	311	.311	*	*	*	*
	Pyrene	896	.896	*	*	*	*
	2-Butanone	221	.221	*	*	*	*
SB-10	Lead	7000	7.0	800	400	14	NE
	Acenaphthene	138	.138	*	*	*	*
	Anthracene	390	.390	*	*	*	*
	Benzo(a)anthracene	2189	2.189	21	1.1	NE	0.011
	Benzo(a)pyrene	2050	2.050	2.1	0.11	0.24	0.029
	Benzo(ghi)perylene	1350	1.350	*	*	*	*
	Benzo(k)fluoranthene	3950	3.950	*	*	*	*
	Carbazole	225	.225	*	*	*	*
	Chrysene	2250	2.250	*	*	*	*
	Di-n-octylphthalate	206	.206	*	*	*	*
	Dibenzo(a,h)anthracene	275	.275	*	*	*	*
	Fluoranthene	4300	4.3	*	*	*	*
	Indeno(1,2,3-cd)pyrene	1540	1.540	*	*	*	*
	Phenanthrene	2510	2.510	*	*	*	*
	Pyrene	3560	3.560	*	*	*	*
SB-11	Lead	96200	96.2	800	400	14	NE
	Methylene chloride	7.24	.007	1000	57	.0013	.0029

NOTES: Yellow Highlights indicates exceedances
ug/kg- microgram per kilogram (reported by laboratory)
mg/kg-milligram per kilogram (used by USEPA)
NE- Level not established by USEPA
- Levels not included in USEPA federal superfund listing

RSL – EPA Region (4) Screening Level

Table 3
USEPA Regional Soil Screening Levels
Pier ROMEO North Charleston

					Sample Name:	SB-1	SB-2	SB-3	SB-4	SB-5	SB-6	SB-7	SB-8	SB-9	SB-10	SB-11
					Sample Date:	4/13/2021	4/13/2021	4/13/2021	1/26/2022	1/26/2022	1/26/2022	1/26/2022	1/26/2022	1/26/2022	1/26/2022	1/26/2022
					Matrix:	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
					Collection Depth (feet below ground surface):	1.5	1.5	1.5	1.5	2	2	2	2	2	2	2
Analyte	**U.S. EPA Industrial RSL**	**U.S. EPA Residential RSL**	**U.S. EPA MCL Soil-to-Groundwater RSL**	**U.S. EPA Risk Soil-to-Groundwater RSL**	Units											
Metals (6010D)																
Lead	800	400	14	NA	mg/kg	18.7	10	5.38	16.6	23.3	11.3	8.8	19.6	38.7	7	96.2
(8270D)																
Benzo(a)anthracene	21	1.1	NE	0.011	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.189	ND
Benzo(a)pyrene	2.1	0.11	0.24	0.029	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	0.475	2.05	ND
Trichloroethylene	6	0.94	0.0018	0.00018	mg/kg	ND	ND	ND	ND	ND	ND	ND	3.24	ND	ND	ND
Methylene chloride	1000	57	0.0013	0.0029	mg/kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00724

Notes: NOTE: Laboratory reported sampling in ug/kg- This table presents the results in mg/kg to match USEPA units

U.S. EPA Industrial RSL = U.S. EPA Industrial Regional Screening Levels for Chemical Contaminants at Superfund Sites, using a Target Hazard Quotient of 1.0 (November 2020)
U.S. EPA Residential RSL = U.S. EPA Residential Regional Screening Levels for Chemical Contaminants at Superfund Sites, using a Target Hazard Quotient of 1.0 (November 2020)
U.S. EPA MCL Soil-to-Groundwater RSL = U.S. EPA MCL-Based Soil-to-Groundwater Regional Screening Levels for Chemical Contaminants at Superfund Sites, using a Target Hazard Quotient of 1.0 (November 2020)
U.S. EPA Risk Soil-to-Groundwater RSL = U.S. EPA Risk-Based Soil-to-Groundwater Regional Screening Levels for Chemical Contaminants at Superfund Sites, using a Target Hazard Quotient of 1.0 (November 2020)
Highlighted Cells = Indicate exceedance of application screening level
U.S. EPA = United States Environmental Protection Agency
MCL = Maximum C19 Level
mg/kg = Milligrams per kilogram
NE = Not Established
ND = Not detected

Figure No.	G.E.A.R. Gator Engineering & Aquifer Restoration, Inc.	PIER AND FACILITY LOCATION	Drawn by: MMC
1		**Supplemental to Hazardous Materials Survey Sampling Report** Pier Romeo N. Charleston, SC	Revised by: MMC Date: 02/14/2022 Scale: 1" = 2,000'

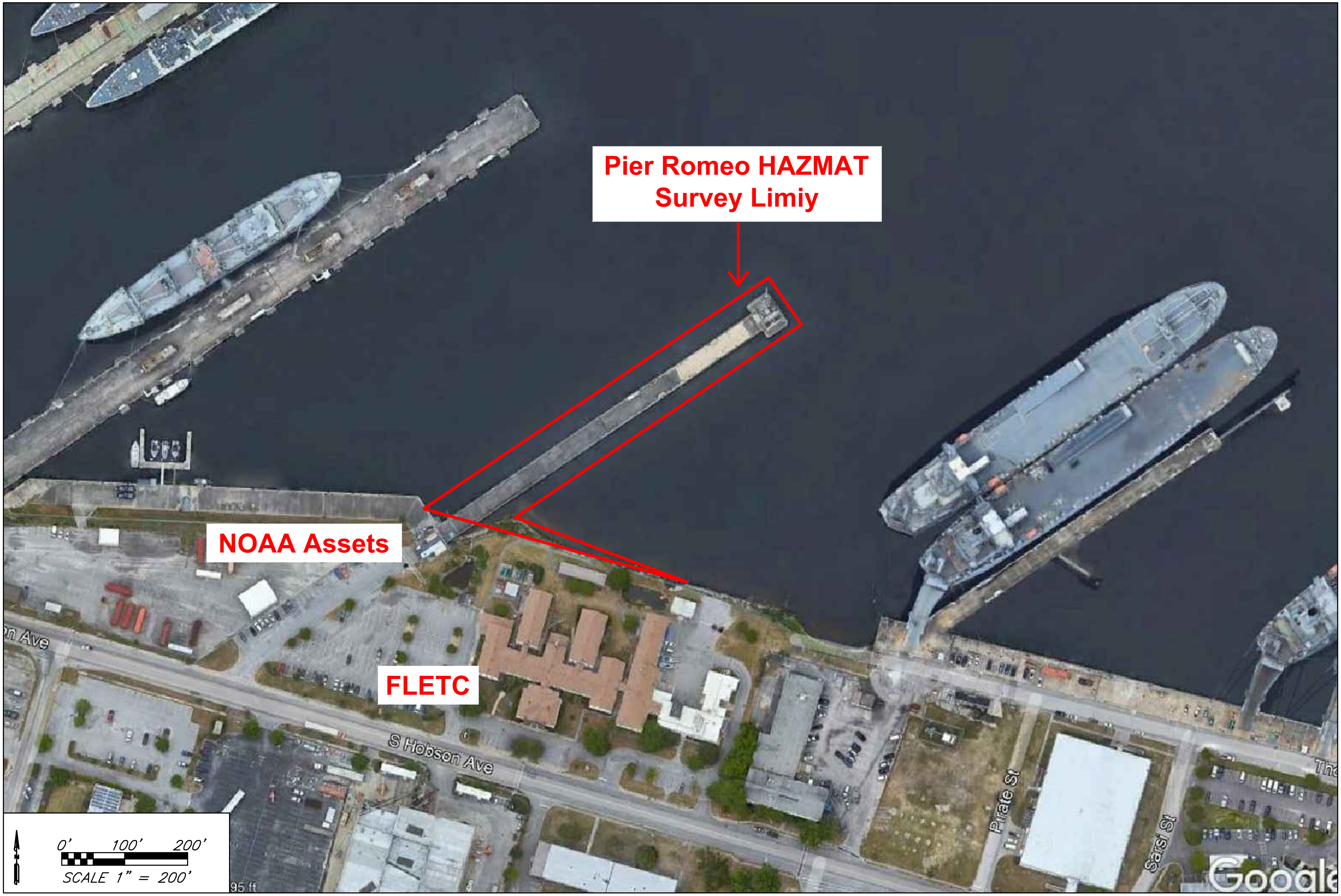

Figure No. 2	G.E.A.R. Gator Engineering & Aquifer Restoration, Inc.	**PIER ROMEO LOCATION & HAZMAT (INITIAL) SURVEY LIMIT** **Supplemental to** **Hazardous Materials Survey Sampling Report** Pier Romeo N. Charleston, SC	Drawn by: MMC Revised by: MMC Date: 02/14/2022 Scale: 1" = 200'

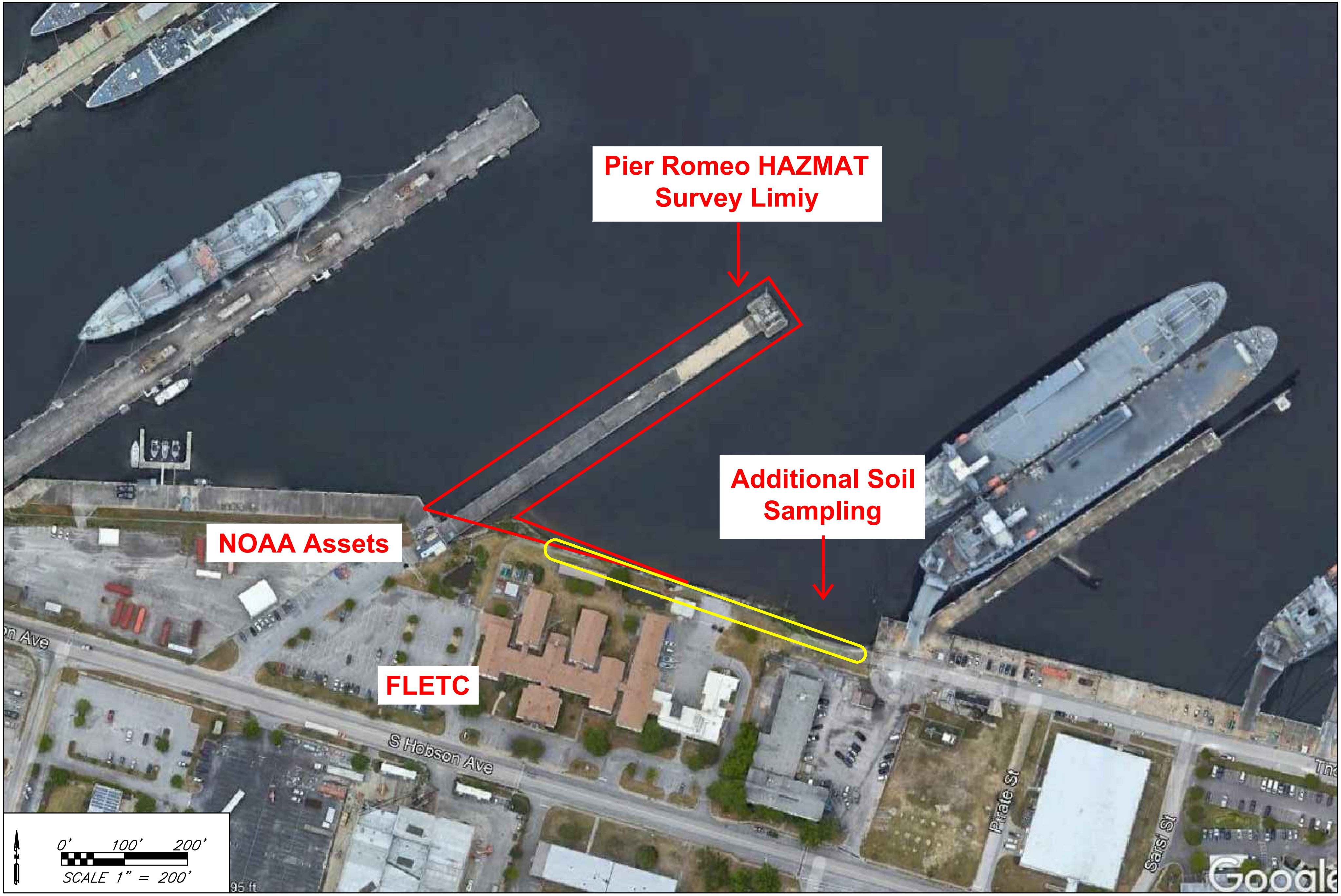

Figure No.		PIER ROMEO LOCATION & HAZMAT COMPLETE SURVEY LIMIT	
3	G.E.A.R. Gator Engineering & Aquifer Restoration, Inc.	**Supplemental to Hazardous Materials Survey Sampling Report** Pier Romeo N. Charleston, SC	Drawn by: MMC Revised by: MMC Date: 02/14/2022 Scale: 1" = 200'

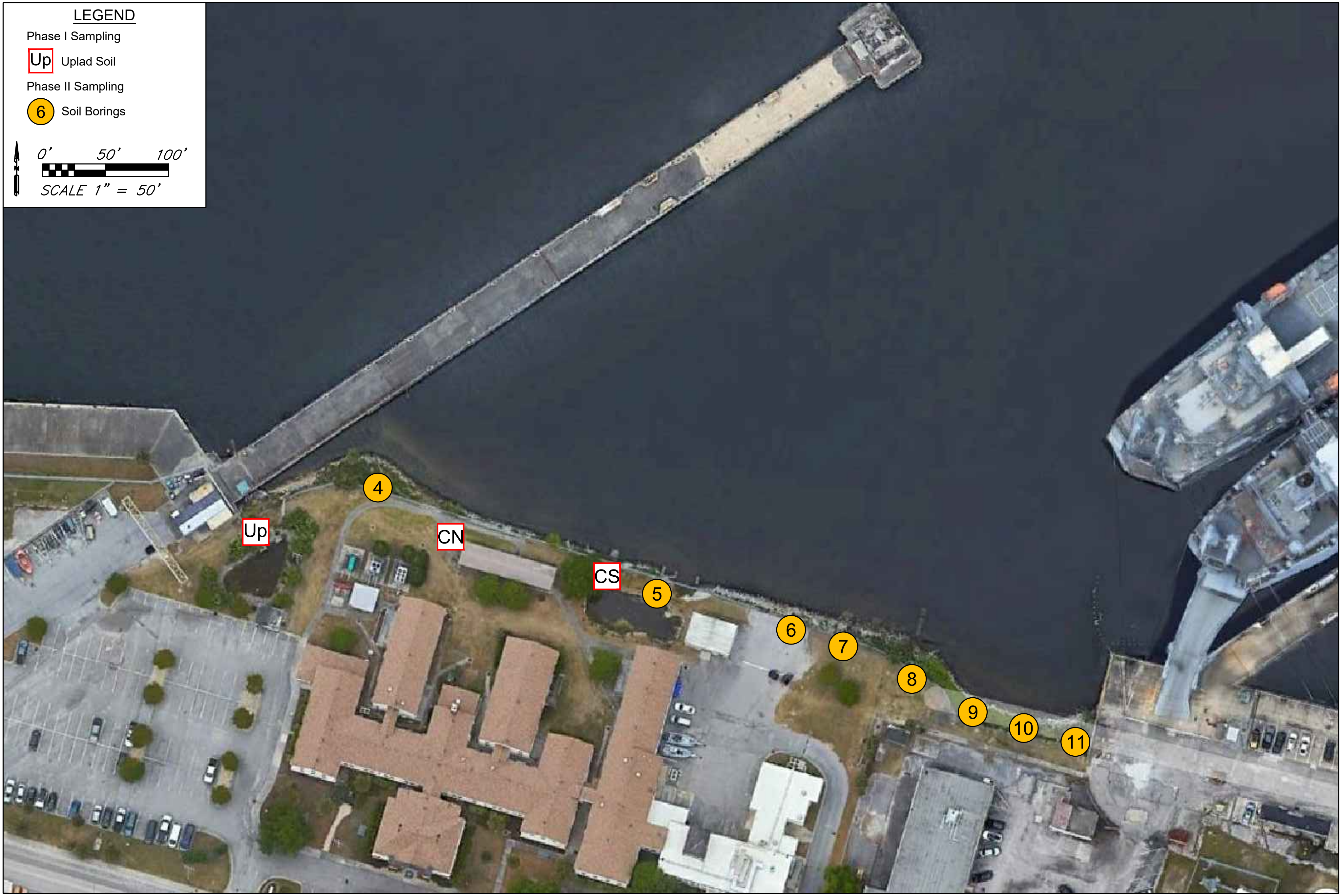

Figure No. 4	G.E.A.R. Gator Engineering & Aquifer Restoration, Inc.	SOIL SAMPLING LOCATIONS **Supplemental to** **Hazardous Materials Survey Sampling Report** Pier Romeo N. Charleston, SC	Drawn by: MMC Revised by: MMC Date: 02/14/2022 Scale: 1" = 100'

APPENDIX A
LICENSES, ACCREDITATION, & CERTIFICATES

Ron DeSantis, Governor

STATE OF FLORIDA

BOARD OF PROFESSIONAL ENGINEERS

THE PROFESSIONAL ENGINEER HEREIN IS LICENSED UNDER THE PROVISIONS OF CHAPTER 471, FLORIDA STATUTES

HATCH, NORMAN NELSON JR.

1411 TIGER LAKE DRIVE
GULF BREEZE FL 32563

LICENSE NUMBER: PE28390

EXPIRATION DATE: FEBRUARY 28, 2023

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Ron DeSantis, Governor

Halsey Beshears, Secretary

STATE OF FLORIDA
DEPARTMENT OF BUSINESS AND PROFESSIONAL REGULATION

BOARD OF PROFESSIONAL GEOLOGISTS

THE PROFESSIONAL GEOLOGIST HEREIN IS LICENSED UNDER THE PROVISIONS OF CHAPTER 492, FLORIDA STATUTES

WILSON, NELSON N

1620 REDWOOD GROVE TERRACE
LAKE MARY FL 32746

LICENSE NUMBER: PG1425

EXPIRATION DATE: JULY 31, 2022

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PLATINUM
Engineering and Safety, Inc.

Certificate of Attendance

Let it be known that

Neeld Wilson

has successfully completed the course and after passing the required examination, is hereby awarded this certificate

ON **FOR**

December 23, 2020

8 Hr HazWOper Refresher IAW 29CFR1910.120

Certificate Number: 8HZWP122320
Expires: December 23, 2021

Arthur J. Sodermark/Training Center Director

PLATINUM
Engineering and Safety, Inc.

Certificate of Attendance

Let it be known that

Kyle Wilson

has successfully completed the course and after passing the required examination, is hereby awarded this certificate

ON	**FOR**
November 8, 2021	8 Hr HazWOper Refresher IAW 29CFR1910.120

Certificate Number: 8HZWP110821
Expires: November 8, 2022

Arthur J. Sodermark/Training Center Director

APPENDIX B
LABORATORY ANALYTICAL REPORTS

GEL Laboratories LLC
a member of The GEL Group INC

PO Box 30712 Charleston, SC 29417
2040 Savage Road Charleston, SC 29407
P 843.556.8171
F 843.766.1178

gel.com

February 08, 2022

Neeld Wilson
GEAR - Gator Engineering & Aquifer Restoration, Inc
1928 Boothe Circle
Longwood, Florida 32750

Re: Gator Engineering & Aquifer Restoration, Inc
Work Order: 568586

Dear Neeld Wilson:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on January 26, 2022. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Test results for NELAP or ISO 17025 accredited tests are verified to meet the requirements of those standards, with any exceptions noted. The results reported relate only to the items tested and to the sample as received by the laboratory. These results may not be reproduced except as full reports without approval by the laboratory. Copies of GEL's accreditations and certifications can be found on our website at www.gel.com.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4523.

Sincerely,

Samuel Hogan
Project Manager

Enclosures

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 − (843) 556−8171 − www.gel.com

Certificate of Analysis Report
for

PPAY001 Industrial Prepay Accounts

Client SDG: 568586 GEL Work Order: 568586

The Qualifiers in this report are defined as follows:

- *   A quality control analyte recovery is outside of specified acceptance criteria
- **   Analyte is a Tracer compound
- **   Analyte is a surrogate compound
- J   See case narrative for an explanation
- J   Value is estimated
- U   Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the Certificate of Analysis.

The designation ND, if present, appears in the result column when the analyte concentration is not detected above the limit as defined in the ’U’ qualifier above.

This data report has been prepared and reviewed in accordance with GEL Laboratories LLC standard operating procedures. Please direct any questions to your Project Manager, Samuel Hogan.

Sam Hogan

Reviewed by ____

Certificate of Analysis

Report Date: February 8, 2022

Company : GEAR - Gator Engineering & Aquifer Restoration, Inc
Address : 1928 Boothe Circle

Longwood, Florida 32750
Contact: Neeld Wilson
Project: Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-4	Project:	PPAY00421
Sample ID:	568586001	Client ID:	PPAY001
Matrix:	Soil		
Collect Date:	26-JAN-22 09:45		
Receive Date:	26-JAN-22		
Collector:	Client		
Moisture:	29.4%		

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Metals Analysis-ICP												
SW846 3050B/6010D Lead Solid "Dry Weight Corrected"												
Lead		16600	433	2620	ug/Kg	92.6	1	TXT1	01/27/22	1847	2222991	1
Semi-Volatile-GC/MS												
SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"												
1,1'-Biphenyl	U	ND	2780	9280	ug/kg	0.0328	20	ND2	01/28/22	2135	2223119	2
1,2,4,5-Tetrachlorobenzene	U	ND	2780	9280	ug/kg	0.0328	20					
2,3,4,6-Tetrachlorophenol	U	ND	2780	9280	ug/kg	0.0328	20					
2,4,5-Trichlorophenol	U	ND	2780	9280	ug/kg	0.0328	20					
2,4,6-Trichlorophenol	U	ND	2780	9280	ug/kg	0.0328	20					
2,4-Dichlorophenol	U	ND	2780	9280	ug/kg	0.0328	20					
2,4-Dimethylphenol	U	ND	2780	9280	ug/kg	0.0328	20					
2,4-Dinitrophenol	U	ND	2780	18600	ug/kg	0.0328	20					
2,4-Dinitrotoluene	U	ND	2780	9280	ug/kg	0.0328	20					
2,6-Dinitrotoluene	U	ND	2780	9280	ug/kg	0.0328	20					
2-Chloronaphthalene	U	ND	278	928	ug/kg	0.0328	20					
2-Chlorophenol	U	ND	2780	9280	ug/kg	0.0328	20					
2-Methyl-4,6-dinitrophenol	U	ND	2780	9280	ug/kg	0.0328	20					
2-Methylnaphthalene	U	ND	278	928	ug/kg	0.0328	20					
2-Nitrophenol	U	ND	2780	9280	ug/kg	0.0328	20					
3,3'-Dichlorobenzidine	U	ND	2780	9280	ug/kg	0.0328	20					
4-Bromophenylphenylether	U	ND	2780	9280	ug/kg	0.0328	20					
4-Chloro-3-methylphenol	U	ND	3710	9280	ug/kg	0.0328	20					
4-Chloroaniline	U	ND	2780	9280	ug/kg	0.0328	20					
4-Chlorophenylphenylether	U	ND	2780	9280	ug/kg	0.0328	20					
4-Nitrophenol	U	ND	2780	9280	ug/kg	0.0328	20					
Acenaphthene	U	ND	278	928	ug/kg	0.0328	20					
Acenaphthylene	U	ND	278	928	ug/kg	0.0328	20					
Acetophenone	U	ND	2780	9280	ug/kg	0.0328	20					
Anthracene	U	ND	278	928	ug/kg	0.0328	20					
Atrazine	U	ND	3710	9280	ug/kg	0.0328	20					
Benzaldehyde	U	ND	2780	9280	ug/kg	0.0328	20					
Benzo(a)anthracene	U	ND	278	928	ug/kg	0.0328	20					
Benzo(a)pyrene	U	ND	278	928	ug/kg	0.0328	20					
Benzo(b)fluoranthene	U	ND	278	928	ug/kg	0.0328	20					
Benzo(ghi)perylene	U	ND	278	928	ug/kg	0.0328	20					
Benzo(k)fluoranthene	U	ND	278	928	ug/kg	0.0328	20					
Butylbenzylphthalate	U	ND	278	928	ug/kg	0.0328	20					

Certificate of Analysis

Report Date: February 8, 2022

Company : GEAR - Gator Engineering & Aquifer Restoration, Inc
Address : 1928 Boothe Circle

Longwood, Florida 32750
Contact: Neeld Wilson
Project: Gator Engineering & Aquifer Restoration, Inc

Client Sample ID: SB-4 Project: PPAY00421
Sample ID: 568586001 Client ID: PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Semi-Volatile-GC/MS												
SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"												
Caprolactam	U	ND	2780	9280	ug/kg	0.0328	20					
Carbazole	U	ND	278	928	ug/kg	0.0328	20					
Chrysene	U	ND	278	928	ug/kg	0.0328	20					
Di-n-butylphthalate	U	ND	278	928	ug/kg	0.0328	20					
Di-n-octylphthalate	J	408	278	928	ug/kg	0.0328	20					
Dibenzo(a,h)anthracene	U	ND	278	928	ug/kg	0.0328	20					
Dibenzofuran	U	ND	2780	9280	ug/kg	0.0328	20					
Diethylphthalate	U	ND	278	928	ug/kg	0.0328	20					
Dimethylphthalate	U	ND	278	928	ug/kg	0.0328	20					
Diphenylamine	U	ND	2780	9280	ug/kg	0.0328	20					
Fluoranthene	U	ND	278	928	ug/kg	0.0328	20					
Fluorene	U	ND	278	928	ug/kg	0.0328	20					
Hexachlorobenzene	U	ND	2780	9280	ug/kg	0.0328	20					
Hexachlorobutadiene	U	ND	2780	9280	ug/kg	0.0328	20					
Hexachlorocyclopentadiene	U	ND	2780	9280	ug/kg	0.0328	20					
Hexachloroethane	U	ND	2780	9280	ug/kg	0.0328	20					
Indeno(1,2,3-cd)pyrene	U	ND	278	928	ug/kg	0.0328	20					
Isophorone	U	ND	2780	9280	ug/kg	0.0328	20					
N-Nitrosodipropylamine	U	ND	2780	9280	ug/kg	0.0328	20					
Naphthalene	U	ND	278	928	ug/kg	0.0328	20					
Nitrobenzene	U	ND	2780	9280	ug/kg	0.0328	20					
Pentachlorophenol	U	ND	2780	9280	ug/kg	0.0328	20					
Phenanthrene	U	ND	278	928	ug/kg	0.0328	20					
Phenol	U	ND	2780	9280	ug/kg	0.0328	20					
Pyrene	U	ND	278	928	ug/kg	0.0328	20					
bis(2-Chloro-1-methylethyl)ether	U	ND	2780	9280	ug/kg	0.0328	20					
bis(2-Chloroethoxy)methane	U	ND	2780	9280	ug/kg	0.0328	20					
bis(2-Chloroethyl) ether	U	ND	2780	9280	ug/kg	0.0328	20					
bis(2-Ethylhexyl)phthalate	U	ND	278	928	ug/kg	0.0328	20					
m,p-Cresols	U	ND	2780	9280	ug/kg	0.0328	20					
m-Nitroaniline	U	ND	2780	9280	ug/kg	0.0328	20					
o-Cresol	U	ND	2780	9280	ug/kg	0.0328	20					
o-Nitroaniline	U	ND	3060	9280	ug/kg	0.0328	20					
p-Nitroaniline	U	ND	2780	9280	ug/kg	0.0328	20					
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												

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2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: February 8, 2022

Company :	GEAR - Gator Engineering & Aquifer Restoration, Inc
Address :	1928 Boothe Circle
	Longwood, Florida 32750
Contact:	Neeld Wilson
Project:	Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-4	Project:	PPAY00421
Sample ID:	568586001	Client ID:	PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												
1,1,1-Trichloroethane	U	ND	47.3	142	ug/kg	2.01	50	JM6	02/07/22	1322	2226063	3
1,1,2,2-Tetrachloroethane	U	ND	47.3	142	ug/kg	2.01	50					
1,1,2-Trichloroethane	U	ND	47.3	142	ug/kg	2.01	50					
1,1-Dichloroethane	U	ND	47.3	142	ug/kg	2.01	50					
1,1-Dichloroethylene	U	ND	47.3	142	ug/kg	2.01	50					
1,2,3-Trichlorobenzene	U	ND	47.3	142	ug/kg	2.01	50					
1,2,4-Trichlorobenzene	U	ND	47.3	142	ug/kg	2.01	50					
1,2-Dibromo-3-chloropropane	U	ND	71.1	142	ug/kg	2.01	50					
1,2-Dibromoethane	U	ND	47.3	142	ug/kg	2.01	50					
1,2-Dichlorobenzene	U	ND	47.3	142	ug/kg	2.01	50					
1,2-Dichloroethane	U	ND	47.3	142	ug/kg	2.01	50					
1,2-Dichloropropane	U	ND	47.3	142	ug/kg	2.01	50					
1,3-Dichlorobenzene	U	ND	47.3	142	ug/kg	2.01	50					
1,4-Dichlorobenzene	U	ND	47.3	142	ug/kg	2.01	50					
1,4-Dioxane	U	ND	2370	7110	ug/kg	2.01	50					
2-Butanone	U	ND	237	711	ug/kg	2.01	50					
2-Hexanone	U	ND	237	711	ug/kg	2.01	50					
4-Methyl-2-pentanone	U	ND	237	711	ug/kg	2.01	50					
Acetone	J	269	237	711	ug/kg	2.01	50					
Benzene	U	ND	47.3	142	ug/kg	2.01	50					
Bromochloromethane	U	ND	47.3	142	ug/kg	2.01	50					
Bromodichloromethane	U	ND	47.3	142	ug/kg	2.01	50					
Bromoform	U	ND	47.3	142	ug/kg	2.01	50					
Bromomethane	U	ND	47.3	142	ug/kg	2.01	50					
Carbon disulfide	U	ND	237	711	ug/kg	2.01	50					
Carbon tetrachloride	U	ND	47.3	142	ug/kg	2.01	50					
Chlorobenzene	U	ND	47.3	142	ug/kg	2.01	50					
Chloroethane	U	ND	47.3	142	ug/kg	2.01	50					
Chloroform	U	ND	47.3	142	ug/kg	2.01	50					
Chloromethane	U	ND	47.3	142	ug/kg	2.01	50					
Cyclohexane	U	ND	47.3	142	ug/kg	2.01	50					
Dibromochloromethane	U	ND	47.3	142	ug/kg	2.01	50					
Dichlorodifluoromethane	U	ND	47.3	142	ug/kg	2.01	50					
Ethylbenzene	U	ND	47.3	142	ug/kg	2.01	50					
Isopropylbenzene	U	ND	47.3	142	ug/kg	2.01	50					
Methyl acetate	U	ND	237	711	ug/kg	2.01	50					

Certificate of Analysis

Report Date: February 8, 2022

Company :	GEAR - Gator Engineering & Aquifer Restoration, Inc
Address :	1928 Boothe Circle Longwood, Florida 32750
Contact:	Neeld Wilson
Project:	Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-4	Project:	PPAY00421
Sample ID:	568586001	Client ID:	PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												
Methylcyclohexane	U	ND	47.3	142	ug/kg	2.01	50					
Methylene chloride	U	ND	237	711	ug/kg	2.01	50					
Styrene	U	ND	47.3	142	ug/kg	2.01	50					
Tetrachloroethylene	U	ND	47.3	142	ug/kg	2.01	50					
Toluene	U	ND	47.3	142	ug/kg	2.01	50					
Trichloroethylene	U	ND	47.3	142	ug/kg	2.01	50					
Trichlorofluoromethane	U	ND	47.3	142	ug/kg	2.01	50					
Trichlorotrifluoroethane	U	ND	237	711	ug/kg	2.01	50					
Vinyl chloride	U	ND	47.3	142	ug/kg	2.01	50					
cis-1,2-Dichloroethylene	U	ND	47.3	142	ug/kg	2.01	50					
cis-1,3-Dichloropropylene	U	ND	47.3	142	ug/kg	2.01	50					
m,p-Xylenes	U	ND	94.8	284	ug/kg	2.01	50					
o-Xylene	U	ND	47.3	142	ug/kg	2.01	50					
tert-Butyl methyl ether	U	ND	47.3	142	ug/kg	2.01	50					
trans-1,2-Dichloroethylene	U	ND	47.3	142	ug/kg	2.01	50					
trans-1,3-Dichloropropylene	U	ND	47.3	142	ug/kg	2.01	50					

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3050B	SW846 3050B Prep	CD3	01/27/22	1555	2222990
SW846 3541	Prep Method 3541 8270E BNA for Soil	JM3	01/28/22	1203	2223116
SW846 5035A	SW846 5035A Prep	JM6	02/07/22	1045	2226061

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	SW846 3050B/6010D	
2	SW846 3541/8270E	
3	SW846 8260D	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
2-Fluorobiphenyl	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	1980 ug/kg	2320	85	(26%-118%)
Nitrobenzene-d5	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	1750 ug/kg	2320	76	(28%-110%)
p-Terphenyl-d14	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	2240 ug/kg	2320	96	(26%-130%)
2,4,6-Tribromophenol	SW846 3541/8270E SVOA, Solid (Automated	2770 ug/kg	4640	60	(26%-128%)

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: February 8, 2022

Company :	GEAR - Gator Engineering & Aquifer Restoration, Inc
Address :	1928 Boothe Circle
	Longwood, Florida 32750
Contact:	Neeld Wilson
Project:	Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-4	Project:	PPAY00421
Sample ID:	568586001	Client ID:	PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
	Soxhlet) "Dry Weight Corrected"											
2-Fluorophenol	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"				3610 ug/kg		4640		78		(30%-108%)	
Phenol-d5	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"				3920 ug/kg		4640		84		(29%-116%)	
1,2-Dichloroethane-d4	SW846 8260D Volatiles, Solid "Dry Weight Corrected"				6820 ug/kg		50.0		96		(76%-127%)	
Bromofluorobenzene	SW846 8260D Volatiles, Solid "Dry Weight Corrected"				7270 ug/kg		50.0		102		(70%-130%)	
Toluene-d8	SW846 8260D Volatiles, Solid "Dry Weight Corrected"				6960 ug/kg		50.0		98		(81%-120%)	

Notes:

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: February 8, 2022

Company : GEAR - Gator Engineering & Aquifer Restoration, Inc
Address : 1928 Boothe Circle

Longwood, Florida 32750
Contact: Neeld Wilson
Project: Gator Engineering & Aquifer Restoration, Inc

Client Sample ID: SB-5   Project: PPAY00421
Sample ID: 568586002   Client ID: PPAY001
Matrix: Soil
Collect Date: 26-JAN-22 10:15
Receive Date: 26-JAN-22
Collector: Client
Moisture: 18.8%

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Metals Analysis-ICP												
SW846 3050B/6010D Lead Solid "Dry Weight Corrected"												
Lead		23300	403	2440	ug/Kg	99.2	1	TXT1	01/27/22	1904	2222991	1
Semi-Volatile-GC/MS												
SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"												
1,1'-Biphenyl	U	ND	122	407	ug/kg	0.0330	1	ND2	01/28/22	2203	2223119	2
1,2,4,5-Tetrachlorobenzene	U	ND	122	407	ug/kg	0.0330	1					
2,3,4,6-Tetrachlorophenol	U	ND	122	407	ug/kg	0.0330	1					
2,4,5-Trichlorophenol	U	ND	122	407	ug/kg	0.0330	1					
2,4,6-Trichlorophenol	U	ND	122	407	ug/kg	0.0330	1					
2,4-Dichlorophenol	U	ND	122	407	ug/kg	0.0330	1					
2,4-Dimethylphenol	U	ND	122	407	ug/kg	0.0330	1					
2,4-Dinitrophenol	U	ND	122	813	ug/kg	0.0330	1					
2,4-Dinitrotoluene	U	ND	122	407	ug/kg	0.0330	1					
2,6-Dinitrotoluene	U	ND	122	407	ug/kg	0.0330	1					
2-Chloronaphthalene	U	ND	12.2	40.7	ug/kg	0.0330	1					
2-Chlorophenol	U	ND	122	407	ug/kg	0.0330	1					
2-Methyl-4,6-dinitrophenol	U	ND	122	407	ug/kg	0.0330	1					
2-Methylnaphthalene	U	ND	12.2	40.7	ug/kg	0.0330	1					
2-Nitrophenol	U	ND	122	407	ug/kg	0.0330	1					
3,3'-Dichlorobenzidine	U	ND	122	407	ug/kg	0.0330	1					
4-Bromophenylphenylether	U	ND	122	407	ug/kg	0.0330	1					
4-Chloro-3-methylphenol	U	ND	163	407	ug/kg	0.0330	1					
4-Chloroaniline	U	ND	122	407	ug/kg	0.0330	1					
4-Chlorophenylphenylether	U	ND	122	407	ug/kg	0.0330	1					
4-Nitrophenol	U	ND	122	407	ug/kg	0.0330	1					
Acenaphthene	U	ND	12.2	40.7	ug/kg	0.0330	1					
Acenaphthylene	U	ND	12.2	40.7	ug/kg	0.0330	1					
Acetophenone	U	ND	122	407	ug/kg	0.0330	1					
Anthracene	U	ND	12.2	40.7	ug/kg	0.0330	1					
Atrazine	U	ND	163	407	ug/kg	0.0330	1					
Benzaldehyde	U	ND	122	407	ug/kg	0.0330	1					
Benzo(a)anthracene	U	ND	12.2	40.7	ug/kg	0.0330	1					
Benzo(a)pyrene	U	ND	12.2	40.7	ug/kg	0.0330	1					
Benzo(b)fluoranthene	U	ND	12.2	40.7	ug/kg	0.0330	1					
Benzo(ghi)perylene	U	ND	12.2	40.7	ug/kg	0.0330	1					
Benzo(k)fluoranthene	J	20.3	12.2	40.7	ug/kg	0.0330	1					
Butylbenzylphthalate	U	ND	12.2	40.7	ug/kg	0.0330	1					

Certificate of Analysis

Report Date: February 8, 2022

Company : GEAR - Gator Engineering & Aquifer Restoration, Inc
Address : 1928 Boothe Circle

Longwood, Florida 32750
Contact: Neeld Wilson
Project: Gator Engineering & Aquifer Restoration, Inc

Client Sample ID: SB-5 Project: PPAY00421
Sample ID: 568586002 Client ID: PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Semi-Volatile-GC/MS												
SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"												
Caprolactam	U	ND	122	407	ug/kg	0.0330	1					
Carbazole	U	ND	12.2	40.7	ug/kg	0.0330	1					
Chrysene	U	ND	12.2	40.7	ug/kg	0.0330	1					
Di-n-butylphthalate	U	ND	12.2	40.7	ug/kg	0.0330	1					
Di-n-octylphthalate	J	16.7	12.2	40.7	ug/kg	0.0330	1					
Dibenzo(a,h)anthracene	U	ND	12.2	40.7	ug/kg	0.0330	1					
Dibenzofuran	U	ND	122	407	ug/kg	0.0330	1					
Diethylphthalate	U	ND	12.2	40.7	ug/kg	0.0330	1					
Dimethylphthalate	U	ND	12.2	40.7	ug/kg	0.0330	1					
Diphenylamine	U	ND	122	407	ug/kg	0.0330	1					
Fluoranthene	J	18.7	12.2	40.7	ug/kg	0.0330	1					
Fluorene	U	ND	12.2	40.7	ug/kg	0.0330	1					
Hexachlorobenzene	U	ND	122	407	ug/kg	0.0330	1					
Hexachlorobutadiene	U	ND	122	407	ug/kg	0.0330	1					
Hexachlorocyclopentadiene	U	ND	122	407	ug/kg	0.0330	1					
Hexachloroethane	U	ND	122	407	ug/kg	0.0330	1					
Indeno(1,2,3-cd)pyrene	J	15.0	12.2	40.7	ug/kg	0.0330	1					
Isophorone	U	ND	122	407	ug/kg	0.0330	1					
N-Nitrosodipropylamine	U	ND	122	407	ug/kg	0.0330	1					
Naphthalene	U	ND	12.2	40.7	ug/kg	0.0330	1					
Nitrobenzene	U	ND	122	407	ug/kg	0.0330	1					
Pentachlorophenol	U	ND	122	407	ug/kg	0.0330	1					
Phenanthrene	U	ND	12.2	40.7	ug/kg	0.0330	1					
Phenol	U	ND	122	407	ug/kg	0.0330	1					
Pyrene	J	15.9	12.2	40.7	ug/kg	0.0330	1					
bis(2-Chloro-1-methylethyl)ether	U	ND	122	407	ug/kg	0.0330	1					
bis(2-Chloroethoxy)methane	U	ND	122	407	ug/kg	0.0330	1					
bis(2-Chloroethyl) ether	U	ND	122	407	ug/kg	0.0330	1					
bis(2-Ethylhexyl)phthalate	U	ND	12.2	40.7	ug/kg	0.0330	1					
m,p-Cresols	U	ND	122	407	ug/kg	0.0330	1					
m-Nitroaniline	U	ND	122	407	ug/kg	0.0330	1					
o-Cresol	U	ND	122	407	ug/kg	0.0330	1					
o-Nitroaniline	U	ND	134	407	ug/kg	0.0330	1					
p-Nitroaniline	U	ND	122	407	ug/kg	0.0330	1					
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												

Certificate of Analysis

Report Date: February 8, 2022

Company : GEAR - Gator Engineering & Aquifer Restoration, Inc
Address : 1928 Boothe Circle

Longwood, Florida 32750
Contact: Neeld Wilson
Project: Gator Engineering & Aquifer Restoration, Inc

Client Sample ID: SB-5 | Project: PPAY00421
Sample ID: 568586002 | Client ID: PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												
1,1,1-Trichloroethane	U	ND	0.317	0.951	ug/kg	0.772	1	JM6	02/04/22	1136	2226063	3
1,1,2,2-Tetrachloroethane	U	ND	0.317	0.951	ug/kg	0.772	1					
1,1,2-Trichloroethane	U	ND	0.317	0.951	ug/kg	0.772	1					
1,1-Dichloroethane	U	ND	0.317	0.951	ug/kg	0.772	1					
1,1-Dichloroethylene	U	ND	0.317	0.951	ug/kg	0.772	1					
1,2,3-Trichlorobenzene	U	ND	0.317	0.951	ug/kg	0.772	1					
1,2,4-Trichlorobenzene	U	ND	0.317	0.951	ug/kg	0.772	1					
1,2-Dibromo-3-chloropropane	U	ND	0.475	0.951	ug/kg	0.772	1					
1,2-Dibromoethane	U	ND	0.317	0.951	ug/kg	0.772	1					
1,2-Dichlorobenzene	U	ND	0.317	0.951	ug/kg	0.772	1					
1,2-Dichloroethane	U	ND	0.317	0.951	ug/kg	0.772	1					
1,2-Dichloropropane	U	ND	0.317	0.951	ug/kg	0.772	1					
1,3-Dichlorobenzene	U	ND	0.317	0.951	ug/kg	0.772	1					
1,4-Dichlorobenzene	U	ND	0.317	0.951	ug/kg	0.772	1					
1,4-Dioxane	U	ND	15.8	47.5	ug/kg	0.772	1					
2-Butanone	U	ND	1.58	4.75	ug/kg	0.772	1					
2-Hexanone	U	ND	1.58	4.75	ug/kg	0.772	1					
4-Methyl-2-pentanone	U	ND	1.58	4.75	ug/kg	0.772	1					
Acetone	U	ND	1.58	4.75	ug/kg	0.772	1					
Benzene	U	ND	0.317	0.951	ug/kg	0.772	1					
Bromochloromethane	U	ND	0.317	0.951	ug/kg	0.772	1					
Bromodichloromethane	U	ND	0.317	0.951	ug/kg	0.772	1					
Bromoform	U	ND	0.317	0.951	ug/kg	0.772	1					
Bromomethane	U	ND	0.317	0.951	ug/kg	0.772	1					
Carbon disulfide	U	ND	1.58	4.75	ug/kg	0.772	1					
Carbon tetrachloride	U	ND	0.317	0.951	ug/kg	0.772	1					
Chlorobenzene	U	ND	0.317	0.951	ug/kg	0.772	1					
Chloroethane	U	ND	0.317	0.951	ug/kg	0.772	1					
Chloroform	U	ND	0.317	0.951	ug/kg	0.772	1					
Chloromethane	U	ND	0.317	0.951	ug/kg	0.772	1					
Cyclohexane	U	ND	0.317	0.951	ug/kg	0.772	1					
Dibromochloromethane	U	ND	0.317	0.951	ug/kg	0.772	1					
Dichlorodifluoromethane	U	ND	0.317	0.951	ug/kg	0.772	1					
Ethylbenzene	U	ND	0.317	0.951	ug/kg	0.772	1					
Isopropylbenzene	U	ND	0.317	0.951	ug/kg	0.772	1					
Methyl acetate	U	ND	1.58	4.75	ug/kg	0.772	1					

Certificate of Analysis

Report Date: February 8, 2022

Company :	GEAR - Gator Engineering & Aquifer Restoration, Inc
Address :	1928 Boothe Circle Longwood, Florida 32750
Contact:	Neeld Wilson
Project:	Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-5	Project:	PPAY00421
Sample ID:	568586002	Client ID:	PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												
Methylcyclohexane	U	ND	0.317	0.951	ug/kg	0.772	1					
Methylene chloride		5.20	1.58	4.75	ug/kg	0.772	1					
Styrene	U	ND	0.317	0.951	ug/kg	0.772	1					
Tetrachloroethylene	U	ND	0.317	0.951	ug/kg	0.772	1					
Toluene	U	ND	0.317	0.951	ug/kg	0.772	1					
Trichloroethylene	U	ND	0.317	0.951	ug/kg	0.772	1					
Trichlorofluoromethane	U	ND	0.317	0.951	ug/kg	0.772	1					
Trichlorotrifluoroethane	U	ND	1.58	4.75	ug/kg	0.772	1					
Vinyl chloride	U	ND	0.317	0.951	ug/kg	0.772	1					
cis-1,2-Dichloroethylene	U	ND	0.317	0.951	ug/kg	0.772	1					
cis-1,3-Dichloropropylene	U	ND	0.317	0.951	ug/kg	0.772	1					
m,p-Xylenes	U	ND	0.634	1.90	ug/kg	0.772	1					
o-Xylene	U	ND	0.317	0.951	ug/kg	0.772	1					
tert-Butyl methyl ether	U	ND	0.317	0.951	ug/kg	0.772	1					
trans-1,2-Dichloroethylene	U	ND	0.317	0.951	ug/kg	0.772	1					
trans-1,3-Dichloropropylene	U	ND	0.317	0.951	ug/kg	0.772	1					

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3050B	SW846 3050B Prep	CD3	01/27/22	1555	2222990
SW846 3541	Prep Method 3541 8270E BNA for Soil	JM3	01/28/22	1203	2223116
SW846 5035A	SW846 5035A Prep	JM6	02/04/22	0930	2226061

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	SW846 3050B/6010D	
2	SW846 3541/8270E	
3	SW846 8260D	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
2-Fluorobiphenyl	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	1060 ug/kg	2030	52	(26%-118%)
Nitrobenzene-d5	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	993 ug/kg	2030	49	(28%-110%)
p-Terphenyl-d14	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	1240 ug/kg	2030	61	(26%-130%)
2,4,6-Tribromophenol	SW846 3541/8270E SVOA, Solid (Automated	1950 ug/kg	4070	48	(26%-128%)

Certificate of Analysis

Report Date: February 8, 2022

Company :	GEAR - Gator Engineering & Aquifer Restoration, Inc
Address :	1928 Boothe Circle
	Longwood, Florida 32750
Contact:	Neeld Wilson
Project:	Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-5	Project:	PPAY00421
Sample ID:	568586002	Client ID:	PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
		Soxhlet) "Dry Weight Corrected"										
2-Fluorophenol		SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"		2020	ug/kg	4070			50		(30%-108%)	
Phenol-d5		SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"		2230	ug/kg	4070			55		(29%-116%)	
1,2-Dichloroethane-d4		SW846 8260D Volatiles, Solid "Dry Weight Corrected"		46.8	ug/kg	50.0			99		(76%-127%)	
Bromofluorobenzene		SW846 8260D Volatiles, Solid "Dry Weight Corrected"		49.5	ug/kg	50.0			104		(70%-130%)	
Toluene-d8		SW846 8260D Volatiles, Solid "Dry Weight Corrected"		47.9	ug/kg	50.0			101		(81%-120%)	

Notes:

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: February 8, 2022

Company :	GEAR - Gator Engineering & Aquifer Restoration, Inc
Address :	1928 Boothe Circle
	Longwood, Florida 32750
Contact:	Neeld Wilson
Project:	Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-6	Project:	PPAY00421
Sample ID:	568586003	Client ID:	PPAY001
Matrix:	Soil		
Collect Date:	26-JAN-22 11:45		
Receive Date:	26-JAN-22		
Collector:	Client		
Moisture:	12.4%		

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Metals Analysis-ICP												
SW846 3050B/6010D Lead Solid "Dry Weight Corrected"												
Lead		11300	358	2170	ug/Kg	95.1	1	TXT1	01/27/22	1907	2222991	1
Semi-Volatile-GC/MS												
SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"												
1,1'-Biphenyl	U	ND	2240	7470	ug/kg	0.0327	20	ND2	01/28/22	2231	2223119	2
1,2,4,5-Tetrachlorobenzene	U	ND	2240	7470	ug/kg	0.0327	20					
2,3,4,6-Tetrachlorophenol	U	ND	2240	7470	ug/kg	0.0327	20					
2,4,5-Trichlorophenol	U	ND	2240	7470	ug/kg	0.0327	20					
2,4,6-Trichlorophenol	U	ND	2240	7470	ug/kg	0.0327	20					
2,4-Dichlorophenol	U	ND	2240	7470	ug/kg	0.0327	20					
2,4-Dimethylphenol	U	ND	2240	7470	ug/kg	0.0327	20					
2,4-Dinitrophenol	U	ND	2240	14900	ug/kg	0.0327	20					
2,4-Dinitrotoluene	U	ND	2240	7470	ug/kg	0.0327	20					
2,6-Dinitrotoluene	U	ND	2240	7470	ug/kg	0.0327	20					
2-Chloronaphthalene	U	ND	224	747	ug/kg	0.0327	20					
2-Chlorophenol	U	ND	2240	7470	ug/kg	0.0327	20					
2-Methyl-4,6-dinitrophenol	U	ND	2240	7470	ug/kg	0.0327	20					
2-Methylnaphthalene	U	ND	224	747	ug/kg	0.0327	20					
2-Nitrophenol	U	ND	2240	7470	ug/kg	0.0327	20					
3,3'-Dichlorobenzidine	U	ND	2240	7470	ug/kg	0.0327	20					
4-Bromophenylphenylether	U	ND	2240	7470	ug/kg	0.0327	20					
4-Chloro-3-methylphenol	U	ND	2990	7470	ug/kg	0.0327	20					
4-Chloroaniline	U	ND	2240	7470	ug/kg	0.0327	20					
4-Chlorophenylphenylether	U	ND	2240	7470	ug/kg	0.0327	20					
4-Nitrophenol	U	ND	2240	7470	ug/kg	0.0327	20					
Acenaphthene	U	ND	224	747	ug/kg	0.0327	20					
Acenaphthylene	U	ND	224	747	ug/kg	0.0327	20					
Acetophenone	U	ND	2240	7470	ug/kg	0.0327	20					
Anthracene	U	ND	224	747	ug/kg	0.0327	20					
Atrazine	U	ND	2990	7470	ug/kg	0.0327	20					
Benzaldehyde	U	ND	2240	7470	ug/kg	0.0327	20					
Benzo(a)anthracene	U	ND	224	747	ug/kg	0.0327	20					
Benzo(a)pyrene	U	ND	224	747	ug/kg	0.0327	20					
Benzo(b)fluoranthene	U	ND	224	747	ug/kg	0.0327	20					
Benzo(ghi)perylene	U	ND	224	747	ug/kg	0.0327	20					
Benzo(k)fluoranthene	U	ND	224	747	ug/kg	0.0327	20					
Butylbenzylphthalate	U	ND	224	747	ug/kg	0.0327	20					

Certificate of Analysis

Report Date: February 8, 2022

Company : GEAR - Gator Engineering & Aquifer Restoration, Inc
Address : 1928 Boothe Circle

Longwood, Florida 32750
Contact: Neeld Wilson
Project: Gator Engineering & Aquifer Restoration, Inc

Client Sample ID: SB-6 Project: PPAY00421
Sample ID: 568586003 Client ID: PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Semi-Volatile-GC/MS												
SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"												
Caprolactam	U	ND	2240	7470	ug/kg	0.0327	20					
Carbazole	U	ND	224	747	ug/kg	0.0327	20					
Chrysene	U	ND	224	747	ug/kg	0.0327	20					
Di-n-butylphthalate	U	ND	224	747	ug/kg	0.0327	20					
Di-n-octylphthalate	J	321	224	747	ug/kg	0.0327	20					
Dibenzo(a,h)anthracene	U	ND	224	747	ug/kg	0.0327	20					
Dibenzofuran	U	ND	2240	7470	ug/kg	0.0327	20					
Diethylphthalate	U	ND	224	747	ug/kg	0.0327	20					
Dimethylphthalate	U	ND	224	747	ug/kg	0.0327	20					
Diphenylamine	U	ND	2240	7470	ug/kg	0.0327	20					
Fluoranthene	U	ND	224	747	ug/kg	0.0327	20					
Fluorene	U	ND	224	747	ug/kg	0.0327	20					
Hexachlorobenzene	U	ND	2240	7470	ug/kg	0.0327	20					
Hexachlorobutadiene	U	ND	2240	7470	ug/kg	0.0327	20					
Hexachlorocyclopentadiene	U	ND	2240	7470	ug/kg	0.0327	20					
Hexachloroethane	U	ND	2240	7470	ug/kg	0.0327	20					
Indeno(1,2,3-cd)pyrene	U	ND	224	747	ug/kg	0.0327	20					
Isophorone	U	ND	2240	7470	ug/kg	0.0327	20					
N-Nitrosodipropylamine	U	ND	2240	7470	ug/kg	0.0327	20					
Naphthalene	U	ND	224	747	ug/kg	0.0327	20					
Nitrobenzene	U	ND	2240	7470	ug/kg	0.0327	20					
Pentachlorophenol	U	ND	2240	7470	ug/kg	0.0327	20					
Phenanthrene	U	ND	224	747	ug/kg	0.0327	20					
Phenol	U	ND	2240	7470	ug/kg	0.0327	20					
Pyrene	U	ND	224	747	ug/kg	0.0327	20					
bis(2-Chloro-1-methylethyl)ether	U	ND	2240	7470	ug/kg	0.0327	20					
bis(2-Chloroethoxy)methane	U	ND	2240	7470	ug/kg	0.0327	20					
bis(2-Chloroethyl) ether	U	ND	2240	7470	ug/kg	0.0327	20					
bis(2-Ethylhexyl)phthalate	U	ND	224	747	ug/kg	0.0327	20					
m,p-Cresols	U	ND	2240	7470	ug/kg	0.0327	20					
m-Nitroaniline	U	ND	2240	7470	ug/kg	0.0327	20					
o-Cresol	U	ND	2240	7470	ug/kg	0.0327	20					
o-Nitroaniline	U	ND	2470	7470	ug/kg	0.0327	20					
p-Nitroaniline	U	ND	2240	7470	ug/kg	0.0327	20					
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												

Certificate of Analysis

Report Date: February 8, 2022

Company : GEAR - Gator Engineering & Aquifer Restoration, Inc
Address : 1928 Boothe Circle

Longwood, Florida 32750
Contact: Neeld Wilson
Project: Gator Engineering & Aquifer Restoration, Inc

Client Sample ID: SB-6 Project: PPAY00421
Sample ID: 568586003 Client ID: PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												
1,1,1-Trichloroethane	U	ND	41.9	126	ug/kg	2.20	50	JM6	02/07/22	1348	2226063	3
1,1,2,2-Tetrachloroethane	U	ND	41.9	126	ug/kg	2.20	50					
1,1,2-Trichloroethane	U	ND	41.9	126	ug/kg	2.20	50					
1,1-Dichloroethane	U	ND	41.9	126	ug/kg	2.20	50					
1,1-Dichloroethylene	U	ND	41.9	126	ug/kg	2.20	50					
1,2,3-Trichlorobenzene	U	ND	41.9	126	ug/kg	2.20	50					
1,2,4-Trichlorobenzene	U	ND	41.9	126	ug/kg	2.20	50					
1,2-Dibromo-3-chloropropane	U	ND	62.8	126	ug/kg	2.20	50					
1,2-Dibromoethane	U	ND	41.9	126	ug/kg	2.20	50					
1,2-Dichlorobenzene	U	ND	41.9	126	ug/kg	2.20	50					
1,2-Dichloroethane	U	ND	41.9	126	ug/kg	2.20	50					
1,2-Dichloropropane	U	ND	41.9	126	ug/kg	2.20	50					
1,3-Dichlorobenzene	U	ND	41.9	126	ug/kg	2.20	50					
1,4-Dichlorobenzene	U	ND	41.9	126	ug/kg	2.20	50					
1,4-Dioxane	U	ND	2090	6280	ug/kg	2.20	50					
2-Butanone	J	271	210	628	ug/kg	2.20	50					
2-Hexanone	U	ND	210	628	ug/kg	2.20	50					
4-Methyl-2-pentanone	U	ND	210	628	ug/kg	2.20	50					
Acetone	U	ND	210	628	ug/kg	2.20	50					
Benzene	U	ND	41.9	126	ug/kg	2.20	50					
Bromochloromethane	U	ND	41.9	126	ug/kg	2.20	50					
Bromodichloromethane	U	ND	41.9	126	ug/kg	2.20	50					
Bromoform	U	ND	41.9	126	ug/kg	2.20	50					
Bromomethane	U	ND	41.9	126	ug/kg	2.20	50					
Carbon disulfide	U	ND	210	628	ug/kg	2.20	50					
Carbon tetrachloride	U	ND	41.9	126	ug/kg	2.20	50					
Chlorobenzene	U	ND	41.9	126	ug/kg	2.20	50					
Chloroethane	U	ND	41.9	126	ug/kg	2.20	50					
Chloroform	U	ND	41.9	126	ug/kg	2.20	50					
Chloromethane	U	ND	41.9	126	ug/kg	2.20	50					
Cyclohexane	U	ND	41.9	126	ug/kg	2.20	50					
Dibromochloromethane	U	ND	41.9	126	ug/kg	2.20	50					
Dichlorodifluoromethane	U	ND	41.9	126	ug/kg	2.20	50					
Ethylbenzene	U	ND	41.9	126	ug/kg	2.20	50					
Isopropylbenzene	U	ND	41.9	126	ug/kg	2.20	50					
Methyl acetate	U	ND	210	628	ug/kg	2.20	50					

Certificate of Analysis

Report Date: February 8, 2022

Company : GEAR - Gator Engineering & Aquifer Restoration, Inc
Address : 1928 Boothe Circle

Longwood, Florida 32750
Contact: Neeld Wilson
Project: Gator Engineering & Aquifer Restoration, Inc

Client Sample ID: SB-6 Project: PPAY00421
Sample ID: 568586003 Client ID: PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												
Methylcyclohexane	U	ND	41.9	126	ug/kg	2.20	50					
Methylene chloride	U	ND	210	628	ug/kg	2.20	50					
Styrene	U	ND	41.9	126	ug/kg	2.20	50					
Tetrachloroethylene	U	ND	41.9	126	ug/kg	2.20	50					
Toluene	U	ND	41.9	126	ug/kg	2.20	50					
Trichloroethylene	U	ND	41.9	126	ug/kg	2.20	50					
Trichlorofluoromethane	U	ND	41.9	126	ug/kg	2.20	50					
Trichlorotrifluoroethane	U	ND	210	628	ug/kg	2.20	50					
Vinyl chloride	U	ND	41.9	126	ug/kg	2.20	50					
cis-1,2-Dichloroethylene	U	ND	41.9	126	ug/kg	2.20	50					
cis-1,3-Dichloropropylene	U	ND	41.9	126	ug/kg	2.20	50					
m,p-Xylenes	U	ND	83.8	251	ug/kg	2.20	50					
o-Xylene	U	ND	41.9	126	ug/kg	2.20	50					
tert-Butyl methyl ether	U	ND	41.9	126	ug/kg	2.20	50					
trans-1,2-Dichloroethylene	U	ND	41.9	126	ug/kg	2.20	50					
trans-1,3-Dichloropropylene	U	ND	41.9	126	ug/kg	2.20	50					

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3050B	SW846 3050B Prep	CD3	01/27/22	1555	2222990
SW846 3541	Prep Method 3541 8270E BNA for Soil	JM3	01/28/22	1203	2223116
SW846 5035A	SW846 5035A Prep	JM6	02/07/22	1045	2226061

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	SW846 3050B/6010D	
2	SW846 3541/8270E	
3	SW846 8260D	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
2-Fluorobiphenyl	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	1520 ug/kg	1870	82	(26%-118%)
Nitrobenzene-d5	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	1340 ug/kg	1870	72	(28%-110%)
p-Terphenyl-d14	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	1730 ug/kg	1870	93	(26%-130%)
2,4,6-Tribromophenol	SW846 3541/8270E SVOA, Solid (Automated	2220 ug/kg	3740	59	(26%-128%)

Certificate of Analysis

Report Date: February 8, 2022

Company :	GEAR - Gator Engineering & Aquifer Restoration, Inc
Address :	1928 Boothe Circle
	Longwood, Florida 32750
Contact:	Neeld Wilson
Project:	Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-6	Project:	PPAY00421
Sample ID:	568586003	Client ID:	PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
	Soxhlet) "Dry Weight Corrected"											
2-Fluorophenol	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"			2790	ug/kg	3740		75		(30%-108%)		
Phenol-d5	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"			3070	ug/kg	3740		82		(29%-116%)		
1,2-Dichloroethane-d4	SW846 8260D Volatiles, Solid "Dry Weight Corrected"			5940	ug/kg	50.0		95		(76%-127%)		
Bromofluorobenzene	SW846 8260D Volatiles, Solid "Dry Weight Corrected"			6510	ug/kg	50.0		104		(70%-130%)		
Toluene-d8	SW846 8260D Volatiles, Solid "Dry Weight Corrected"			6260	ug/kg	50.0		100		(81%-120%)		

Notes:

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: February 8, 2022

Company :	GEAR - Gator Engineering & Aquifer Restoration, Inc
Address :	1928 Boothe Circle
	Longwood, Florida 32750
Contact:	Neeld Wilson
Project:	Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-7	Project:	PPAY00421
Sample ID:	568586004	Client ID:	PPAY001
Matrix:	Soil		
Collect Date:	26-JAN-22 11:00		
Receive Date:	26-JAN-22		
Collector:	Client		
Moisture:	12%		

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Metals Analysis-ICP												
SW846 3050B/6010D Lead Solid "Dry Weight Corrected"												
Lead		8870	343	2080	ug/Kg	91.6	1	TXT1	01/27/22	1910	2222991	1
Semi-Volatile-GC/MS												
SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"												
1,1'-Biphenyl	U	ND	563	1880	ug/kg	0.0330	5	ND2	01/28/22	2258	2223119	2
1,2,4,5-Tetrachlorobenzene	U	ND	563	1880	ug/kg	0.0330	5					
2,3,4,6-Tetrachlorophenol	U	ND	563	1880	ug/kg	0.0330	5					
2,4,5-Trichlorophenol	U	ND	563	1880	ug/kg	0.0330	5					
2,4,6-Trichlorophenol	U	ND	563	1880	ug/kg	0.0330	5					
2,4-Dichlorophenol	U	ND	563	1880	ug/kg	0.0330	5					
2,4-Dimethylphenol	U	ND	563	1880	ug/kg	0.0330	5					
2,4-Dinitrophenol	U	ND	563	3750	ug/kg	0.0330	5					
2,4-Dinitrotoluene	U	ND	563	1880	ug/kg	0.0330	5					
2,6-Dinitrotoluene	U	ND	563	1880	ug/kg	0.0330	5					
2-Chloronaphthalene	U	ND	56.3	188	ug/kg	0.0330	5					
2-Chlorophenol	U	ND	563	1880	ug/kg	0.0330	5					
2-Methyl-4,6-dinitrophenol	U	ND	563	1880	ug/kg	0.0330	5					
2-Methylnaphthalene	U	ND	56.3	188	ug/kg	0.0330	5					
2-Nitrophenol	U	ND	563	1880	ug/kg	0.0330	5					
3,3'-Dichlorobenzidine	U	ND	563	1880	ug/kg	0.0330	5					
4-Bromophenylphenylether	U	ND	563	1880	ug/kg	0.0330	5					
4-Chloro-3-methylphenol	U	ND	751	1880	ug/kg	0.0330	5					
4-Chloroaniline	U	ND	563	1880	ug/kg	0.0330	5					
4-Chlorophenylphenylether	U	ND	563	1880	ug/kg	0.0330	5					
4-Nitrophenol	U	ND	563	1880	ug/kg	0.0330	5					
Acenaphthene	U	ND	56.3	188	ug/kg	0.0330	5					
Acenaphthylene	U	ND	56.3	188	ug/kg	0.0330	5					
Acetophenone	U	ND	563	1880	ug/kg	0.0330	5					
Anthracene	U	ND	56.3	188	ug/kg	0.0330	5					
Atrazine	U	ND	751	1880	ug/kg	0.0330	5					
Benzaldehyde	U	ND	563	1880	ug/kg	0.0330	5					
Benzo(a)anthracene	U	ND	56.3	188	ug/kg	0.0330	5					
Benzo(a)pyrene	U	ND	56.3	188	ug/kg	0.0330	5					
Benzo(b)fluoranthene	U	ND	56.3	188	ug/kg	0.0330	5					
Benzo(ghi)perylene	U	ND	56.3	188	ug/kg	0.0330	5					
Benzo(k)fluoranthene	U	ND	56.3	188	ug/kg	0.0330	5					
Butylbenzylphthalate	U	ND	56.3	188	ug/kg	0.0330	5					

Certificate of Analysis

Report Date: February 8, 2022

Company :	GEAR - Gator Engineering & Aquifer Restoration, Inc
Address :	1928 Boothe Circle
	Longwood, Florida 32750
Contact:	Neeld Wilson
Project:	Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-7	Project:	PPAY00421
Sample ID:	568586004	Client ID:	PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Semi-Volatile-GC/MS												
SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"												
Caprolactam	U	ND	563	1880	ug/kg	0.0330	5					
Carbazole	U	ND	56.3	188	ug/kg	0.0330	5					
Chrysene	U	ND	56.3	188	ug/kg	0.0330	5					
Di-n-butylphthalate	U	ND	56.3	188	ug/kg	0.0330	5					
Di-n-octylphthalate	J	97.6	56.3	188	ug/kg	0.0330	5					
Dibenzo(a,h)anthracene	U	ND	56.3	188	ug/kg	0.0330	5					
Dibenzofuran	U	ND	563	1880	ug/kg	0.0330	5					
Diethylphthalate	U	ND	56.3	188	ug/kg	0.0330	5					
Dimethylphthalate	U	ND	56.3	188	ug/kg	0.0330	5					
Diphenylamine	U	ND	563	1880	ug/kg	0.0330	5					
Fluoranthene	U	ND	56.3	188	ug/kg	0.0330	5					
Fluorene	U	ND	56.3	188	ug/kg	0.0330	5					
Hexachlorobenzene	U	ND	563	1880	ug/kg	0.0330	5					
Hexachlorobutadiene	U	ND	563	1880	ug/kg	0.0330	5					
Hexachlorocyclopentadiene	U	ND	563	1880	ug/kg	0.0330	5					
Hexachloroethane	U	ND	563	1880	ug/kg	0.0330	5					
Indeno(1,2,3-cd)pyrene	U	ND	56.3	188	ug/kg	0.0330	5					
Isophorone	U	ND	563	1880	ug/kg	0.0330	5					
N-Nitrosodipropylamine	U	ND	563	1880	ug/kg	0.0330	5					
Naphthalene	U	ND	56.3	188	ug/kg	0.0330	5					
Nitrobenzene	U	ND	563	1880	ug/kg	0.0330	5					
Pentachlorophenol	U	ND	563	1880	ug/kg	0.0330	5					
Phenanthrene	U	ND	56.3	188	ug/kg	0.0330	5					
Phenol	U	ND	563	1880	ug/kg	0.0330	5					
Pyrene	U	ND	56.3	188	ug/kg	0.0330	5					
bis(2-Chloro-1-methylethyl)ether	U	ND	563	1880	ug/kg	0.0330	5					
bis(2-Chloroethoxy)methane	U	ND	563	1880	ug/kg	0.0330	5					
bis(2-Chloroethyl) ether	U	ND	563	1880	ug/kg	0.0330	5					
bis(2-Ethylhexyl)phthalate	U	ND	56.3	188	ug/kg	0.0330	5					
m,p-Cresols	U	ND	563	1880	ug/kg	0.0330	5					
m-Nitroaniline	U	ND	563	1880	ug/kg	0.0330	5					
o-Cresol	U	ND	563	1880	ug/kg	0.0330	5					
o-Nitroaniline	U	ND	619	1880	ug/kg	0.0330	5					
p-Nitroaniline	U	ND	563	1880	ug/kg	0.0330	5					
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												

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Certificate of Analysis

Report Date: February 8, 2022

Company : GEAR - Gator Engineering & Aquifer Restoration, Inc
Address : 1928 Boothe Circle

Longwood, Florida 32750
Contact: Neeld Wilson
Project: Gator Engineering & Aquifer Restoration, Inc

Client Sample ID: SB-7 Project: PPAY00421
Sample ID: 568586004 Client ID: PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												
1,1,1-Trichloroethane	U	ND	92.7	279	ug/kg	4.90	50	JM6	02/07/22	1415	2226063	3
1,1,2,2-Tetrachloroethane	U	ND	92.7	279	ug/kg	4.90	50					
1,1,2-Trichloroethane	U	ND	92.7	279	ug/kg	4.90	50					
1,1-Dichloroethane	U	ND	92.7	279	ug/kg	4.90	50					
1,1-Dichloroethylene	U	ND	92.7	279	ug/kg	4.90	50					
1,2,3-Trichlorobenzene	U	ND	92.7	279	ug/kg	4.90	50					
1,2,4-Trichlorobenzene	U	ND	92.7	279	ug/kg	4.90	50					
1,2-Dibromo-3-chloropropane	U	ND	139	279	ug/kg	4.90	50					
1,2-Dibromoethane	U	ND	92.7	279	ug/kg	4.90	50					
1,2-Dichlorobenzene	U	ND	92.7	279	ug/kg	4.90	50					
1,2-Dichloroethane	U	ND	92.7	279	ug/kg	4.90	50					
1,2-Dichloropropane	U	ND	92.7	279	ug/kg	4.90	50					
1,3-Dichlorobenzene	U	ND	92.7	279	ug/kg	4.90	50					
1,4-Dichlorobenzene	U	ND	92.7	279	ug/kg	4.90	50					
1,4-Dioxane	U	ND	4640	13900	ug/kg	4.90	50					
2-Butanone	J	604	464	1390	ug/kg	4.90	50					
2-Hexanone	U	ND	464	1390	ug/kg	4.90	50					
4-Methyl-2-pentanone	U	ND	464	1390	ug/kg	4.90	50					
Acetone	J	624	464	1390	ug/kg	4.90	50					
Benzene	U	ND	92.7	279	ug/kg	4.90	50					
Bromochloromethane	U	ND	92.7	279	ug/kg	4.90	50					
Bromodichloromethane	U	ND	92.7	279	ug/kg	4.90	50					
Bromoform	U	ND	92.7	279	ug/kg	4.90	50					
Bromomethane	U	ND	92.7	279	ug/kg	4.90	50					
Carbon disulfide	U	ND	464	1390	ug/kg	4.90	50					
Carbon tetrachloride	U	ND	92.7	279	ug/kg	4.90	50					
Chlorobenzene	U	ND	92.7	279	ug/kg	4.90	50					
Chloroethane	U	ND	92.7	279	ug/kg	4.90	50					
Chloroform	U	ND	92.7	279	ug/kg	4.90	50					
Chloromethane	U	ND	92.7	279	ug/kg	4.90	50					
Cyclohexane	U	ND	92.7	279	ug/kg	4.90	50					
Dibromochloromethane	U	ND	92.7	279	ug/kg	4.90	50					
Dichlorodifluoromethane	U	ND	92.7	279	ug/kg	4.90	50					
Ethylbenzene	U	ND	92.7	279	ug/kg	4.90	50					
Isopropylbenzene	U	ND	92.7	279	ug/kg	4.90	50					
Methyl acetate		1550	464	1390	ug/kg	4.90	50					

Certificate of Analysis

Report Date: February 8, 2022

Company :	GEAR - Gator Engineering & Aquifer Restoration, Inc
Address :	1928 Boothe Circle Longwood, Florida 32750
Contact:	Neeld Wilson
Project:	Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-7	Project:	PPAY00421
Sample ID:	568586004	Client ID:	PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												
Methylcyclohexane	U	ND	92.7	279	ug/kg	4.90	50					
Methylene chloride	J	888	464	1390	ug/kg	4.90	50					
Styrene	U	ND	92.7	279	ug/kg	4.90	50					
Tetrachloroethylene	U	ND	92.7	279	ug/kg	4.90	50					
Toluene	U	ND	92.7	279	ug/kg	4.90	50					
Trichloroethylene	U	ND	92.7	279	ug/kg	4.90	50					
Trichlorofluoromethane	U	ND	92.7	279	ug/kg	4.90	50					
Trichlorotrifluoroethane	U	ND	464	1390	ug/kg	4.90	50					
Vinyl chloride	U	ND	92.7	279	ug/kg	4.90	50					
cis-1,2-Dichloroethylene	U	ND	92.7	279	ug/kg	4.90	50					
cis-1,3-Dichloropropylene	U	ND	92.7	279	ug/kg	4.90	50					
m,p-Xylenes	U	ND	186	557	ug/kg	4.90	50					
o-Xylene	U	ND	92.7	279	ug/kg	4.90	50					
tert-Butyl methyl ether	U	ND	92.7	279	ug/kg	4.90	50					
trans-1,2-Dichloroethylene	U	ND	92.7	279	ug/kg	4.90	50					
trans-1,3-Dichloropropylene	U	ND	92.7	279	ug/kg	4.90	50					

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3050B	SW846 3050B Prep	CD3	01/27/22	1555	2222990
SW846 3541	Prep Method 3541 8270E BNA for Soil	JM3	01/28/22	1203	2223116
SW846 5035A	SW846 5035A Prep	JM6	02/07/22	1045	2226061

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	SW846 3050B/6010D	
2	SW846 3541/8270E	
3	SW846 8260D	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
2-Fluorobiphenyl	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	1070 ug/kg	1880	57	(26%-118%)
Nitrobenzene-d5	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	944 ug/kg	1880	50	(28%-110%)
p-Terphenyl-d14	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	1260 ug/kg	1880	67	(26%-130%)
2,4,6-Tribromophenol	SW846 3541/8270E SVOA, Solid (Automated	1900 ug/kg	3750	51	(26%-128%)

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Certificate of Analysis

Report Date: February 8, 2022

Company : GEAR - Gator Engineering & Aquifer Restoration, Inc
Address : 1928 Boothe Circle

Longwood, Florida 32750
Contact: Neeld Wilson
Project: Gator Engineering & Aquifer Restoration, Inc

Client Sample ID: SB-7 Project: PPAY00421
Sample ID: 568586004 Client ID: PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
	Soxhlet) "Dry Weight Corrected"											
2-Fluorophenol	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"			1870	ug/kg	3750			50		(30%-108%)	
Phenol-d5	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"			2080	ug/kg	3750			56		(29%-116%)	
1,2-Dichloroethane-d4	SW846 8260D Volatiles, Solid "Dry Weight Corrected"			13100	ug/kg	50.0			94		(76%-127%)	
Bromofluorobenzene	SW846 8260D Volatiles, Solid "Dry Weight Corrected"			14100	ug/kg	50.0			101		(70%-130%)	
Toluene-d8	SW846 8260D Volatiles, Solid "Dry Weight Corrected"			13600	ug/kg	50.0			97		(81%-120%)	

Notes:

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: February 8, 2022

Company :	GEAR - Gator Engineering & Aquifer Restoration, Inc
Address :	1928 Boothe Circle
	Longwood, Florida 32750
Contact:	Neeld Wilson
Project:	Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-8	Project:	PPAY00421
Sample ID:	568586005	Client ID:	PPAY001
Matrix:	Soil		
Collect Date:	26-JAN-22 11:15		
Receive Date:	26-JAN-22		
Collector:	Client		
Moisture:	13.7%		

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Metals Analysis-ICP												
SW846 3050B/6010D Lead Solid "Dry Weight Corrected"												
Lead		19600	348	2110	ug/Kg	90.9	1	TXT1	01/27/22	1913	2222991	1
Semi-Volatile-GC/MS												
SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"												
1,1'-Biphenyl	U	ND	2310	7710	ug/kg	0.0333	20	ND2	01/28/22	2326	2223119	2
1,2,4,5-Tetrachlorobenzene	U	ND	2310	7710	ug/kg	0.0333	20					
2,3,4,6-Tetrachlorophenol	U	ND	2310	7710	ug/kg	0.0333	20					
2,4,5-Trichlorophenol	U	ND	2310	7710	ug/kg	0.0333	20					
2,4,6-Trichlorophenol	U	ND	2310	7710	ug/kg	0.0333	20					
2,4-Dichlorophenol	U	ND	2310	7710	ug/kg	0.0333	20					
2,4-Dimethylphenol	U	ND	2310	7710	ug/kg	0.0333	20					
2,4-Dinitrophenol	U	ND	2310	15400	ug/kg	0.0333	20					
2,4-Dinitrotoluene	U	ND	2310	7710	ug/kg	0.0333	20					
2,6-Dinitrotoluene	U	ND	2310	7710	ug/kg	0.0333	20					
2-Chloronaphthalene	U	ND	231	771	ug/kg	0.0333	20					
2-Chlorophenol	U	ND	2310	7710	ug/kg	0.0333	20					
2-Methyl-4,6-dinitrophenol	U	ND	2310	7710	ug/kg	0.0333	20					
2-Methylnaphthalene	U	ND	231	771	ug/kg	0.0333	20					
2-Nitrophenol	U	ND	2310	7710	ug/kg	0.0333	20					
3,3'-Dichlorobenzidine	U	ND	2310	7710	ug/kg	0.0333	20					
4-Bromophenylphenylether	U	ND	2310	7710	ug/kg	0.0333	20					
4-Chloro-3-methylphenol	U	ND	3080	7710	ug/kg	0.0333	20					
4-Chloroaniline	U	ND	2310	7710	ug/kg	0.0333	20					
4-Chlorophenylphenylether	U	ND	2310	7710	ug/kg	0.0333	20					
4-Nitrophenol	U	ND	2310	7710	ug/kg	0.0333	20					
Acenaphthene	U	ND	231	771	ug/kg	0.0333	20					
Acenaphthylene	U	ND	231	771	ug/kg	0.0333	20					
Acetophenone	U	ND	2310	7710	ug/kg	0.0333	20					
Anthracene	U	ND	231	771	ug/kg	0.0333	20					
Atrazine	U	ND	3080	7710	ug/kg	0.0333	20					
Benzaldehyde	U	ND	2310	7710	ug/kg	0.0333	20					
Benzo(a)anthracene	U	ND	231	771	ug/kg	0.0333	20					
Benzo(a)pyrene	U	ND	231	771	ug/kg	0.0333	20					
Benzo(b)fluoranthene	U	ND	231	771	ug/kg	0.0333	20					
Benzo(ghi)perylene	U	ND	231	771	ug/kg	0.0333	20					
Benzo(k)fluoranthene	U	ND	231	771	ug/kg	0.0333	20					
Butylbenzylphthalate	U	ND	231	771	ug/kg	0.0333	20					

Certificate of Analysis

Report Date: February 8, 2022

Company : GEAR - Gator Engineering & Aquifer Restoration, Inc
Address : 1928 Boothe Circle

Longwood, Florida 32750
Contact: Neeld Wilson
Project: Gator Engineering & Aquifer Restoration, Inc

Client Sample ID: SB-8 Project: PPAY00421
Sample ID: 568586005 Client ID: PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Semi-Volatile-GC/MS												
SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"												
Caprolactam	U	ND	2310	7710	ug/kg	0.0333	20					
Carbazole	U	ND	231	771	ug/kg	0.0333	20					
Chrysene	U	ND	231	771	ug/kg	0.0333	20					
Di-n-butylphthalate	U	ND	231	771	ug/kg	0.0333	20					
Di-n-octylphthalate	J	385	231	771	ug/kg	0.0333	20					
Dibenzo(a,h)anthracene	U	ND	231	771	ug/kg	0.0333	20					
Dibenzofuran	U	ND	2310	7710	ug/kg	0.0333	20					
Diethylphthalate	U	ND	231	771	ug/kg	0.0333	20					
Dimethylphthalate	U	ND	231	771	ug/kg	0.0333	20					
Diphenylamine	U	ND	2310	7710	ug/kg	0.0333	20					
Fluoranthene	U	ND	231	771	ug/kg	0.0333	20					
Fluorene	U	ND	231	771	ug/kg	0.0333	20					
Hexachlorobenzene	U	ND	2310	7710	ug/kg	0.0333	20					
Hexachlorobutadiene	U	ND	2310	7710	ug/kg	0.0333	20					
Hexachlorocyclopentadiene	U	ND	2310	7710	ug/kg	0.0333	20					
Hexachloroethane	U	ND	2310	7710	ug/kg	0.0333	20					
Indeno(1,2,3-cd)pyrene	U	ND	231	771	ug/kg	0.0333	20					
Isophorone	U	ND	2310	7710	ug/kg	0.0333	20					
N-Nitrosodipropylamine	U	ND	2310	7710	ug/kg	0.0333	20					
Naphthalene	U	ND	231	771	ug/kg	0.0333	20					
Nitrobenzene	U	ND	2310	7710	ug/kg	0.0333	20					
Pentachlorophenol	U	ND	2310	7710	ug/kg	0.0333	20					
Phenanthrene	U	ND	231	771	ug/kg	0.0333	20					
Phenol	U	ND	2310	7710	ug/kg	0.0333	20					
Pyrene	U	ND	231	771	ug/kg	0.0333	20					
bis(2-Chloro-1-methylethyl)ether	U	ND	2310	7710	ug/kg	0.0333	20					
bis(2-Chloroethoxy)methane	U	ND	2310	7710	ug/kg	0.0333	20					
bis(2-Chloroethyl) ether	U	ND	2310	7710	ug/kg	0.0333	20					
bis(2-Ethylhexyl)phthalate	U	ND	231	771	ug/kg	0.0333	20					
m,p-Cresols	U	ND	2310	7710	ug/kg	0.0333	20					
m-Nitroaniline	U	ND	2310	7710	ug/kg	0.0333	20					
o-Cresol	U	ND	2310	7710	ug/kg	0.0333	20					
o-Nitroaniline	U	ND	2540	7710	ug/kg	0.0333	20					
p-Nitroaniline	U	ND	2310	7710	ug/kg	0.0333	20					
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												

GEL LABORATORIES LLC

2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: February 8, 2022

Company :	GEAR - Gator Engineering & Aquifer Restoration, Inc
Address :	1928 Boothe Circle
	Longwood, Florida 32750
Contact:	Neeld Wilson
Project:	Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-8	Project:	PPAY00421
Sample ID:	568586005	Client ID:	PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												
1,1,1-Trichloroethane	U	ND	43.1	129	ug/kg	2.23	50	JM6	02/07/22	1442	2226063	3
1,1,2,2-Tetrachloroethane	U	ND	43.1	129	ug/kg	2.23	50					
1,1,2-Trichloroethane	U	ND	43.1	129	ug/kg	2.23	50					
1,1-Dichloroethane	U	ND	43.1	129	ug/kg	2.23	50					
1,1-Dichloroethylene	U	ND	43.1	129	ug/kg	2.23	50					
1,2,3-Trichlorobenzene	U	ND	43.1	129	ug/kg	2.23	50					
1,2,4-Trichlorobenzene	U	ND	43.1	129	ug/kg	2.23	50					
1,2-Dibromo-3-chloropropane	U	ND	64.7	129	ug/kg	2.23	50					
1,2-Dibromoethane	U	ND	43.1	129	ug/kg	2.23	50					
1,2-Dichlorobenzene	U	ND	43.1	129	ug/kg	2.23	50					
1,2-Dichloroethane	U	ND	43.1	129	ug/kg	2.23	50					
1,2-Dichloropropane	U	ND	43.1	129	ug/kg	2.23	50					
1,3-Dichlorobenzene	U	ND	43.1	129	ug/kg	2.23	50					
1,4-Dichlorobenzene	U	ND	43.1	129	ug/kg	2.23	50					
1,4-Dioxane	U	ND	2160	6470	ug/kg	2.23	50					
2-Butanone	U	ND	216	647	ug/kg	2.23	50					
2-Hexanone	U	ND	216	647	ug/kg	2.23	50					
4-Methyl-2-pentanone	U	ND	216	647	ug/kg	2.23	50					
Acetone	U	ND	216	647	ug/kg	2.23	50					
Benzene	U	ND	43.1	129	ug/kg	2.23	50					
Bromochloromethane	U	ND	43.1	129	ug/kg	2.23	50					
Bromodichloromethane	U	ND	43.1	129	ug/kg	2.23	50					
Bromoform	U	ND	43.1	129	ug/kg	2.23	50					
Bromomethane	U	ND	43.1	129	ug/kg	2.23	50					
Carbon disulfide	U	ND	216	647	ug/kg	2.23	50					
Carbon tetrachloride	U	ND	43.1	129	ug/kg	2.23	50					
Chlorobenzene	U	ND	43.1	129	ug/kg	2.23	50					
Chloroethane	U	ND	43.1	129	ug/kg	2.23	50					
Chloroform	U	ND	43.1	129	ug/kg	2.23	50					
Chloromethane	U	ND	43.1	129	ug/kg	2.23	50					
Cyclohexane	U	ND	43.1	129	ug/kg	2.23	50					
Dibromochloromethane	U	ND	43.1	129	ug/kg	2.23	50					
Dichlorodifluoromethane	U	ND	43.1	129	ug/kg	2.23	50					
Ethylbenzene	U	ND	43.1	129	ug/kg	2.23	50					
Isopropylbenzene	U	ND	43.1	129	ug/kg	2.23	50					
Methyl acetate	U	ND	216	647	ug/kg	2.23	50					

Certificate of Analysis

Report Date: February 8, 2022

Company :	GEAR - Gator Engineering & Aquifer Restoration, Inc
Address :	1928 Boothe Circle
	Longwood, Florida 32750
Contact:	Neeld Wilson
Project:	Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-8	Project:	PPAY00421
Sample ID:	568586005	Client ID:	PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												
Methylcyclohexane	U	ND	43.1	129	ug/kg	2.23	50					
Methylene chloride	U	ND	216	647	ug/kg	2.23	50					
Styrene	U	ND	43.1	129	ug/kg	2.23	50					
Tetrachloroethylene	U	ND	43.1	129	ug/kg	2.23	50					
Toluene	U	ND	43.1	129	ug/kg	2.23	50					
Trichloroethylene		3240	43.1	129	ug/kg	2.23	50					
Trichlorofluoromethane	U	ND	43.1	129	ug/kg	2.23	50					
Trichlorotrifluoroethane	U	ND	216	647	ug/kg	2.23	50					
Vinyl chloride	U	ND	43.1	129	ug/kg	2.23	50					
cis-1,2-Dichloroethylene	U	ND	43.1	129	ug/kg	2.23	50					
cis-1,3-Dichloropropylene	U	ND	43.1	129	ug/kg	2.23	50					
m,p-Xylenes	U	ND	86.3	259	ug/kg	2.23	50					
o-Xylene	U	ND	43.1	129	ug/kg	2.23	50					
tert-Butyl methyl ether	U	ND	43.1	129	ug/kg	2.23	50					
trans-1,2-Dichloroethylene	U	ND	43.1	129	ug/kg	2.23	50					
trans-1,3-Dichloropropylene	U	ND	43.1	129	ug/kg	2.23	50					

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3050B	SW846 3050B Prep	CD3	01/27/22	1555	2222990
SW846 3541	Prep Method 3541 8270E BNA for Soil	JM3	01/28/22	1203	2223116
SW846 5035A	SW846 5035A Prep	JM6	02/07/22	1045	2226061

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	SW846 3050B/6010D	
2	SW846 3541/8270E	
3	SW846 8260D	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
2-Fluorobiphenyl	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	2040 ug/kg	1930	106	(26%-118%)
Nitrobenzene-d5	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	1830 ug/kg	1930	95	(28%-110%)
p-Terphenyl-d14	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	2420 ug/kg	1930	126	(26%-130%)
2,4,6-Tribromophenol	SW846 3541/8270E SVOA, Solid (Automated	3000 ug/kg	3850	78	(26%-128%)

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Certificate of Analysis

Report Date: February 8, 2022

Company :	GEAR - Gator Engineering & Aquifer Restoration, Inc
Address :	1928 Boothe Circle
	Longwood, Florida 32750
Contact:	Neeld Wilson
Project:	Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-8	Project:	PPAY00421
Sample ID:	568586005	Client ID:	PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
	Soxhlet) "Dry Weight Corrected"											
2-Fluorophenol	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"				3790 ug/kg		3850		98		(30%-108%)	
Phenol-d5	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"				4230 ug/kg		3850		110		(29%-116%)	
1,2-Dichloroethane-d4	SW846 8260D Volatiles, Solid "Dry Weight Corrected"				6110 ug/kg		50.0		94		(76%-127%)	
Bromofluorobenzene	SW846 8260D Volatiles, Solid "Dry Weight Corrected"				6620 ug/kg		50.0		102		(70%-130%)	
Toluene-d8	SW846 8260D Volatiles, Solid "Dry Weight Corrected"				6260 ug/kg		50.0		97		(81%-120%)	

Notes:

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: February 8, 2022

Company : GEAR - Gator Engineering & Aquifer Restoration, Inc
Address : 1928 Boothe Circle

Longwood, Florida 32750
Contact: Neeld Wilson
Project: Gator Engineering & Aquifer Restoration, Inc

Client Sample ID: SB-9 — Project: PPAY00421
Sample ID: 568586006 — Client ID: PPAY001
Matrix: Soil
Collect Date: 26-JAN-22 12:10
Receive Date: 26-JAN-22
Collector: Client
Moisture: 16.2%

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Metals Analysis-ICP												
SW846 3050B/6010D Lead Solid "Dry Weight Corrected"												
Lead		38700	375	2270	ug/Kg	95.2	1	TXT1	01/27/22	1915	2222991	1
Semi-Volatile-GC/MS												
SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"												
1,1'-Biphenyl	U	ND	2340	7790	ug/kg	0.0326	20	ND2	01/28/22	2354	2223119	2
1,2,4,5-Tetrachlorobenzene	U	ND	2340	7790	ug/kg	0.0326	20					
2,3,4,6-Tetrachlorophenol	U	ND	2340	7790	ug/kg	0.0326	20					
2,4,5-Trichlorophenol	U	ND	2340	7790	ug/kg	0.0326	20					
2,4,6-Trichlorophenol	U	ND	2340	7790	ug/kg	0.0326	20					
2,4-Dichlorophenol	U	ND	2340	7790	ug/kg	0.0326	20					
2,4-Dimethylphenol	U	ND	2340	7790	ug/kg	0.0326	20					
2,4-Dinitrophenol	U	ND	2340	15600	ug/kg	0.0326	20					
2,4-Dinitrotoluene	U	ND	2340	7790	ug/kg	0.0326	20					
2,6-Dinitrotoluene	U	ND	2340	7790	ug/kg	0.0326	20					
2-Chloronaphthalene	U	ND	234	779	ug/kg	0.0326	20					
2-Chlorophenol	U	ND	2340	7790	ug/kg	0.0326	20					
2-Methyl-4,6-dinitrophenol	U	ND	2340	7790	ug/kg	0.0326	20					
2-Methylnaphthalene	U	ND	234	779	ug/kg	0.0326	20					
2-Nitrophenol	U	ND	2340	7790	ug/kg	0.0326	20					
3,3'-Dichlorobenzidine	U	ND	2340	7790	ug/kg	0.0326	20					
4-Bromophenylphenylether	U	ND	2340	7790	ug/kg	0.0326	20					
4-Chloro-3-methylphenol	U	ND	3110	7790	ug/kg	0.0326	20					
4-Chloroaniline	U	ND	2340	7790	ug/kg	0.0326	20					
4-Chlorophenylphenylether	U	ND	2340	7790	ug/kg	0.0326	20					
4-Nitrophenol	U	ND	2340	7790	ug/kg	0.0326	20					
Acenaphthene	U	ND	234	779	ug/kg	0.0326	20					
Acenaphthylene	U	ND	234	779	ug/kg	0.0326	20					
Acetophenone	U	ND	2340	7790	ug/kg	0.0326	20					
Anthracene	U	ND	234	779	ug/kg	0.0326	20					
Atrazine	U	ND	3110	7790	ug/kg	0.0326	20					
Benzaldehyde	U	ND	2340	7790	ug/kg	0.0326	20					
Benzo(a)anthracene	U	ND	234	779	ug/kg	0.0326	20					
Benzo(a)pyrene	J	475	234	779	ug/kg	0.0326	20					
Benzo(b)fluoranthene	U	ND	234	779	ug/kg	0.0326	20					
Benzo(ghi)perylene	J	506	234	779	ug/kg	0.0326	20					
Benzo(k)fluoranthene		1210	234	779	ug/kg	0.0326	20					
Butylbenzylphthalate	U	ND	234	779	ug/kg	0.0326	20					

Certificate of Analysis

Report Date: February 8, 2022

Company : GEAR - Gator Engineering & Aquifer Restoration, Inc
Address : 1928 Boothe Circle

Longwood, Florida 32750
Contact: Neeld Wilson
Project: Gator Engineering & Aquifer Restoration, Inc

Client Sample ID: SB-9 Project: PPAY00421
Sample ID: 568586006 Client ID: PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Semi-Volatile-GC/MS												
SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"												
Caprolactam	U	ND	2340	7790	ug/kg	0.0326	20					
Carbazole	U	ND	234	779	ug/kg	0.0326	20					
Chrysene	J	732	234	779	ug/kg	0.0326	20					
Di-n-butylphthalate	U	ND	234	779	ug/kg	0.0326	20					
Di-n-octylphthalate	J	530	234	779	ug/kg	0.0326	20					
Dibenzo(a,h)anthracene	U	ND	234	779	ug/kg	0.0326	20					
Dibenzofuran	U	ND	2340	7790	ug/kg	0.0326	20					
Diethylphthalate	U	ND	234	779	ug/kg	0.0326	20					
Dimethylphthalate	U	ND	234	779	ug/kg	0.0326	20					
Diphenylamine	U	ND	2340	7790	ug/kg	0.0326	20					
Fluoranthene		1070	234	779	ug/kg	0.0326	20					
Fluorene	U	ND	234	779	ug/kg	0.0326	20					
Hexachlorobenzene	U	ND	2340	7790	ug/kg	0.0326	20					
Hexachlorobutadiene	U	ND	2340	7790	ug/kg	0.0326	20					
Hexachlorocyclopentadiene	U	ND	2340	7790	ug/kg	0.0326	20					
Hexachloroethane	U	ND	2340	7790	ug/kg	0.0326	20					
Indeno(1,2,3-cd)pyrene	J	677	234	779	ug/kg	0.0326	20					
Isophorone	U	ND	2340	7790	ug/kg	0.0326	20					
N-Nitrosodipropylamine	U	ND	2340	7790	ug/kg	0.0326	20					
Naphthalene	U	ND	234	779	ug/kg	0.0326	20					
Nitrobenzene	U	ND	2340	7790	ug/kg	0.0326	20					
Pentachlorophenol	U	ND	2340	7790	ug/kg	0.0326	20					
Phenanthrene	J	311	234	779	ug/kg	0.0326	20					
Phenol	U	ND	2340	7790	ug/kg	0.0326	20					
Pyrene		896	234	779	ug/kg	0.0326	20					
bis(2-Chloro-1-methylethyl)ether	U	ND	2340	7790	ug/kg	0.0326	20					
bis(2-Chloroethoxy)methane	U	ND	2340	7790	ug/kg	0.0326	20					
bis(2-Chloroethyl) ether	U	ND	2340	7790	ug/kg	0.0326	20					
bis(2-Ethylhexyl)phthalate	U	ND	234	779	ug/kg	0.0326	20					
m,p-Cresols	U	ND	2340	7790	ug/kg	0.0326	20					
m-Nitroaniline	U	ND	2340	7790	ug/kg	0.0326	20					
o-Cresol	U	ND	2340	7790	ug/kg	0.0326	20					
o-Nitroaniline	U	ND	2570	7790	ug/kg	0.0326	20					
p-Nitroaniline	U	ND	2340	7790	ug/kg	0.0326	20					
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												

Certificate of Analysis

Report Date: February 8, 2022

Company : GEAR - Gator Engineering & Aquifer Restoration, Inc
Address : 1928 Boothe Circle

Longwood, Florida 32750
Contact: Neeld Wilson
Project: Gator Engineering & Aquifer Restoration, Inc

Client Sample ID: SB-9 Project: PPAY00421
Sample ID: 568586006 Client ID: PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												
1,1,1-Trichloroethane	U	ND	34.4	103	ug/kg	1.73	50	JM6	02/07/22	1508	2226063	3
1,1,2,2-Tetrachloroethane	U	ND	34.4	103	ug/kg	1.73	50					
1,1,2-Trichloroethane	U	ND	34.4	103	ug/kg	1.73	50					
1,1-Dichloroethane	U	ND	34.4	103	ug/kg	1.73	50					
1,1-Dichloroethylene	U	ND	34.4	103	ug/kg	1.73	50					
1,2,3-Trichlorobenzene	U	ND	34.4	103	ug/kg	1.73	50					
1,2,4-Trichlorobenzene	U	ND	34.4	103	ug/kg	1.73	50					
1,2-Dibromo-3-chloropropane	U	ND	51.7	103	ug/kg	1.73	50					
1,2-Dibromoethane	U	ND	34.4	103	ug/kg	1.73	50					
1,2-Dichlorobenzene	U	ND	34.4	103	ug/kg	1.73	50					
1,2-Dichloroethane	U	ND	34.4	103	ug/kg	1.73	50					
1,2-Dichloropropane	U	ND	34.4	103	ug/kg	1.73	50					
1,3-Dichlorobenzene	U	ND	34.4	103	ug/kg	1.73	50					
1,4-Dichlorobenzene	U	ND	34.4	103	ug/kg	1.73	50					
1,4-Dioxane	U	ND	1720	5170	ug/kg	1.73	50					
2-Butanone	J	221	172	517	ug/kg	1.73	50					
2-Hexanone	U	ND	172	517	ug/kg	1.73	50					
4-Methyl-2-pentanone	U	ND	172	517	ug/kg	1.73	50					
Acetone	U	ND	172	517	ug/kg	1.73	50					
Benzene	U	ND	34.4	103	ug/kg	1.73	50					
Bromochloromethane	U	ND	34.4	103	ug/kg	1.73	50					
Bromodichloromethane	U	ND	34.4	103	ug/kg	1.73	50					
Bromoform	U	ND	34.4	103	ug/kg	1.73	50					
Bromomethane	U	ND	34.4	103	ug/kg	1.73	50					
Carbon disulfide	U	ND	172	517	ug/kg	1.73	50					
Carbon tetrachloride	U	ND	34.4	103	ug/kg	1.73	50					
Chlorobenzene	U	ND	34.4	103	ug/kg	1.73	50					
Chloroethane	U	ND	34.4	103	ug/kg	1.73	50					
Chloroform	U	ND	34.4	103	ug/kg	1.73	50					
Chloromethane	U	ND	34.4	103	ug/kg	1.73	50					
Cyclohexane	U	ND	34.4	103	ug/kg	1.73	50					
Dibromochloromethane	U	ND	34.4	103	ug/kg	1.73	50					
Dichlorodifluoromethane	U	ND	34.4	103	ug/kg	1.73	50					
Ethylbenzene	U	ND	34.4	103	ug/kg	1.73	50					
Isopropylbenzene	U	ND	34.4	103	ug/kg	1.73	50					
Methyl acetate	U	ND	172	517	ug/kg	1.73	50					

Certificate of Analysis

Report Date: February 8, 2022

Company :	GEAR - Gator Engineering & Aquifer Restoration, Inc
Address :	1928 Boothe Circle
	Longwood, Florida 32750
Contact:	Neeld Wilson
Project:	Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-9	Project:	PPAY00421
Sample ID:	568586006	Client ID:	PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												
Methylcyclohexane	J	60.0	34.4	103	ug/kg	1.73	50					
Methylene chloride	U	ND	172	517	ug/kg	1.73	50					
Styrene	U	ND	34.4	103	ug/kg	1.73	50					
Tetrachloroethylene	U	ND	34.4	103	ug/kg	1.73	50					
Toluene	U	ND	34.4	103	ug/kg	1.73	50					
Trichloroethylene	U	ND	34.4	103	ug/kg	1.73	50					
Trichlorofluoromethane	U	ND	34.4	103	ug/kg	1.73	50					
Trichlorotrifluoroethane	U	ND	172	517	ug/kg	1.73	50					
Vinyl chloride	U	ND	34.4	103	ug/kg	1.73	50					
cis-1,2-Dichloroethylene	U	ND	34.4	103	ug/kg	1.73	50					
cis-1,3-Dichloropropylene	U	ND	34.4	103	ug/kg	1.73	50					
m,p-Xylenes	U	ND	69.0	207	ug/kg	1.73	50					
o-Xylene	U	ND	34.4	103	ug/kg	1.73	50					
tert-Butyl methyl ether	U	ND	34.4	103	ug/kg	1.73	50					
trans-1,2-Dichloroethylene	U	ND	34.4	103	ug/kg	1.73	50					
trans-1,3-Dichloropropylene	U	ND	34.4	103	ug/kg	1.73	50					

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3050B	SW846 3050B Prep	CD3	01/27/22	1555	2222990
SW846 3541	Prep Method 3541 8270E BNA for Soil	JM3	01/28/22	1203	2223116
SW846 5035A	SW846 5035A Prep	JM6	02/07/22	1045	2226061

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	SW846 3050B/6010D	
2	SW846 3541/8270E	
3	SW846 8260D	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
2-Fluorobiphenyl	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	1720 ug/kg	1950	88	(26%-118%)
Nitrobenzene-d5	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	1590 ug/kg	1950	82	(28%-110%)
p-Terphenyl-d14	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	1870 ug/kg	1950	96	(26%-130%)
2,4,6-Tribromophenol	SW846 3541/8270E SVOA, Solid (Automated	2520 ug/kg	3890	65	(26%-128%)

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Certificate of Analysis

Report Date: February 8, 2022

Company :	GEAR - Gator Engineering & Aquifer Restoration, Inc
Address :	1928 Boothe Circle
	Longwood, Florida 32750
Contact:	Neeld Wilson
Project:	Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-9	Project:	PPAY00421
Sample ID:	568586006	Client ID:	PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method

	Soxhlet) "Dry Weight Corrected"				
2-Fluorophenol	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	3240 ug/kg	3890	83	(30%-108%)
Phenol-d5	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	3540 ug/kg	3890	91	(29%-116%)
1,2-Dichloroethane-d4	SW846 8260D Volatiles, Solid "Dry Weight Corrected"	4910 ug/kg	50.0	95	(76%-127%)
Bromofluorobenzene	SW846 8260D Volatiles, Solid "Dry Weight Corrected"	5250 ug/kg	50.0	102	(70%-130%)
Toluene-d8	SW846 8260D Volatiles, Solid "Dry Weight Corrected"	5250 ug/kg	50.0	102	(81%-120%)

Notes:

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: February 8, 2022

Company : GEAR - Gator Engineering & Aquifer Restoration, Inc
Address : 1928 Boothe Circle

Longwood, Florida 32750
Contact: Neeld Wilson
Project: Gator Engineering & Aquifer Restoration, Inc

Client Sample ID: SB-10 | Project: PPAY00421
Sample ID: 568586007 | Client ID: PPAY001
Matrix: Soil
Collect Date: 26-JAN-22 12:20
Receive Date: 26-JAN-22
Collector: Client
Moisture: 28.1%

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Metals Analysis-ICP												
SW846 3050B/6010D Lead Solid "Dry Weight Corrected"												
Lead		7000	386	2340	ug/Kg	84.0	1	TXT1	01/27/22	1918	2222991	1
Semi-Volatile-GC/MS												
SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"												
1,1'-Biphenyl	U	ND	1380	4590	ug/kg	0.0330	10	ND2	01/29/22	0022	2223119	2
1,2,4,5-Tetrachlorobenzene	U	ND	1380	4590	ug/kg	0.0330	10					
2,3,4,6-Tetrachlorophenol	U	ND	1380	4590	ug/kg	0.0330	10					
2,4,5-Trichlorophenol	U	ND	1380	4590	ug/kg	0.0330	10					
2,4,6-Trichlorophenol	U	ND	1380	4590	ug/kg	0.0330	10					
2,4-Dichlorophenol	U	ND	1380	4590	ug/kg	0.0330	10					
2,4-Dimethylphenol	U	ND	1380	4590	ug/kg	0.0330	10					
2,4-Dinitrophenol	U	ND	1380	9170	ug/kg	0.0330	10					
2,4-Dinitrotoluene	U	ND	1380	4590	ug/kg	0.0330	10					
2,6-Dinitrotoluene	U	ND	1380	4590	ug/kg	0.0330	10					
2-Chloronaphthalene	U	ND	138	459	ug/kg	0.0330	10					
2-Chlorophenol	U	ND	1380	4590	ug/kg	0.0330	10					
2-Methyl-4,6-dinitrophenol	U	ND	1380	4590	ug/kg	0.0330	10					
2-Methylnaphthalene	U	ND	138	459	ug/kg	0.0330	10					
2-Nitrophenol	U	ND	1380	4590	ug/kg	0.0330	10					
3,3'-Dichlorobenzidine	U	ND	1380	4590	ug/kg	0.0330	10					
4-Bromophenylphenylether	U	ND	1380	4590	ug/kg	0.0330	10					
4-Chloro-3-methylphenol	U	ND	1830	4590	ug/kg	0.0330	10					
4-Chloroaniline	U	ND	1380	4590	ug/kg	0.0330	10					
4-Chlorophenylphenylether	U	ND	1380	4590	ug/kg	0.0330	10					
4-Nitrophenol	U	ND	1380	4590	ug/kg	0.0330	10					
Acenaphthene	J	138	138	459	ug/kg	0.0330	10					
Acenaphthylene	U	ND	138	459	ug/kg	0.0330	10					
Acetophenone	U	ND	1380	4590	ug/kg	0.0330	10					
Anthracene	J	390	138	459	ug/kg	0.0330	10					
Atrazine	U	ND	1830	4590	ug/kg	0.0330	10					
Benzaldehyde	U	ND	1380	4590	ug/kg	0.0330	10					
Benzo(a)anthracene		2180	138	459	ug/kg	0.0330	10					
Benzo(a)pyrene		2050	138	459	ug/kg	0.0330	10					
Benzo(b)fluoranthene	U	ND	138	459	ug/kg	0.0330	10					
Benzo(ghi)perylene		1350	138	459	ug/kg	0.0330	10					
Benzo(k)fluoranthene		3950	138	459	ug/kg	0.0330	10					
Butylbenzylphthalate	U	ND	138	459	ug/kg	0.0330	10					

Certificate of Analysis

Report Date: February 8, 2022

Company : GEAR - Gator Engineering & Aquifer Restoration, Inc
Address : 1928 Boothe Circle

Longwood, Florida 32750
Contact: Neeld Wilson
Project: Gator Engineering & Aquifer Restoration, Inc

Client Sample ID: SB-10 Project: PPAY00421
Sample ID: 568586007 Client ID: PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Semi-Volatile-GC/MS												
SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"												
Caprolactam	U	ND	1380	4590	ug/kg	0.0330	10					
Carbazole	J	225	138	459	ug/kg	0.0330	10					
Chrysene		2250	138	459	ug/kg	0.0330	10					
Di-n-butylphthalate	U	ND	138	459	ug/kg	0.0330	10					
Di-n-octylphthalate	J	206	138	459	ug/kg	0.0330	10					
Dibenzo(a,h)anthracene	J	275	138	459	ug/kg	0.0330	10					
Dibenzofuran	U	ND	1380	4590	ug/kg	0.0330	10					
Diethylphthalate	U	ND	138	459	ug/kg	0.0330	10					
Dimethylphthalate	U	ND	138	459	ug/kg	0.0330	10					
Diphenylamine	U	ND	1380	4590	ug/kg	0.0330	10					
Fluoranthene		4300	138	459	ug/kg	0.0330	10					
Fluorene	U	ND	138	459	ug/kg	0.0330	10					
Hexachlorobenzene	U	ND	1380	4590	ug/kg	0.0330	10					
Hexachlorobutadiene	U	ND	1380	4590	ug/kg	0.0330	10					
Hexachlorocyclopentadiene	U	ND	1380	4590	ug/kg	0.0330	10					
Hexachloroethane	U	ND	1380	4590	ug/kg	0.0330	10					
Indeno(1,2,3-cd)pyrene		1540	138	459	ug/kg	0.0330	10					
Isophorone	U	ND	1380	4590	ug/kg	0.0330	10					
N-Nitrosodipropylamine	U	ND	1380	4590	ug/kg	0.0330	10					
Naphthalene	U	ND	138	459	ug/kg	0.0330	10					
Nitrobenzene	U	ND	1380	4590	ug/kg	0.0330	10					
Pentachlorophenol	U	ND	1380	4590	ug/kg	0.0330	10					
Phenanthrene		2510	138	459	ug/kg	0.0330	10					
Phenol	U	ND	1380	4590	ug/kg	0.0330	10					
Pyrene		3560	138	459	ug/kg	0.0330	10					
bis(2-Chloro-1-methylethyl)ether	U	ND	1380	4590	ug/kg	0.0330	10					
bis(2-Chloroethoxy)methane	U	ND	1380	4590	ug/kg	0.0330	10					
bis(2-Chloroethyl) ether	U	ND	1380	4590	ug/kg	0.0330	10					
bis(2-Ethylhexyl)phthalate	U	ND	138	459	ug/kg	0.0330	10					
m,p-Cresols	U	ND	1380	4590	ug/kg	0.0330	10					
m-Nitroaniline	U	ND	1380	4590	ug/kg	0.0330	10					
o-Cresol	U	ND	1380	4590	ug/kg	0.0330	10					
o-Nitroaniline	U	ND	1510	4590	ug/kg	0.0330	10					
p-Nitroaniline	U	ND	1380	4590	ug/kg	0.0330	10					
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												

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Certificate of Analysis

Report Date: February 8, 2022

Company : GEAR - Gator Engineering & Aquifer Restoration, Inc
Address : 1928 Boothe Circle

Longwood, Florida 32750
Contact: Neeld Wilson
Project: Gator Engineering & Aquifer Restoration, Inc

Client Sample ID: SB-10 Project: PPAY00421
Sample ID: 568586007 Client ID: PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												
1,1,1-Trichloroethane	U	ND	50.5	152	ug/kg	2.18	50	JM6	02/07/22	1535	2226063	3
1,1,2,2-Tetrachloroethane	U	ND	50.5	152	ug/kg	2.18	50					
1,1,2-Trichloroethane	U	ND	50.5	152	ug/kg	2.18	50					
1,1-Dichloroethane	U	ND	50.5	152	ug/kg	2.18	50					
1,1-Dichloroethylene	U	ND	50.5	152	ug/kg	2.18	50					
1,2,3-Trichlorobenzene	U	ND	50.5	152	ug/kg	2.18	50					
1,2,4-Trichlorobenzene	U	ND	50.5	152	ug/kg	2.18	50					
1,2-Dibromo-3-chloropropane	U	ND	75.8	152	ug/kg	2.18	50					
1,2-Dibromoethane	U	ND	50.5	152	ug/kg	2.18	50					
1,2-Dichlorobenzene	U	ND	50.5	152	ug/kg	2.18	50					
1,2-Dichloroethane	U	ND	50.5	152	ug/kg	2.18	50					
1,2-Dichloropropane	U	ND	50.5	152	ug/kg	2.18	50					
1,3-Dichlorobenzene	U	ND	50.5	152	ug/kg	2.18	50					
1,4-Dichlorobenzene	U	ND	50.5	152	ug/kg	2.18	50					
1,4-Dioxane	U	ND	2530	7580	ug/kg	2.18	50					
2-Butanone	U	ND	253	758	ug/kg	2.18	50					
2-Hexanone	U	ND	253	758	ug/kg	2.18	50					
4-Methyl-2-pentanone	U	ND	253	758	ug/kg	2.18	50					
Acetone	U	ND	253	758	ug/kg	2.18	50					
Benzene	U	ND	50.5	152	ug/kg	2.18	50					
Bromochloromethane	U	ND	50.5	152	ug/kg	2.18	50					
Bromodichloromethane	U	ND	50.5	152	ug/kg	2.18	50					
Bromoform	U	ND	50.5	152	ug/kg	2.18	50					
Bromomethane	U	ND	50.5	152	ug/kg	2.18	50					
Carbon disulfide	U	ND	253	758	ug/kg	2.18	50					
Carbon tetrachloride	U	ND	50.5	152	ug/kg	2.18	50					
Chlorobenzene	U	ND	50.5	152	ug/kg	2.18	50					
Chloroethane	U	ND	50.5	152	ug/kg	2.18	50					
Chloroform	U	ND	50.5	152	ug/kg	2.18	50					
Chloromethane	U	ND	50.5	152	ug/kg	2.18	50					
Cyclohexane	U	ND	50.5	152	ug/kg	2.18	50					
Dibromochloromethane	U	ND	50.5	152	ug/kg	2.18	50					
Dichlorodifluoromethane	U	ND	50.5	152	ug/kg	2.18	50					
Ethylbenzene	U	ND	50.5	152	ug/kg	2.18	50					
Isopropylbenzene	U	ND	50.5	152	ug/kg	2.18	50					
Methyl acetate	U	ND	253	758	ug/kg	2.18	50					

Certificate of Analysis

Report Date: February 8, 2022

Company :	GEAR - Gator Engineering & Aquifer Restoration, Inc
Address :	1928 Boothe Circle
	Longwood, Florida 32750
Contact:	Neeld Wilson
Project:	Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-10	Project:	PPAY00421
Sample ID:	568586007	Client ID:	PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												
Methylcyclohexane	U	ND	50.5	152	ug/kg	2.18	50					
Methylene chloride	U	ND	253	758	ug/kg	2.18	50					
Styrene	U	ND	50.5	152	ug/kg	2.18	50					
Tetrachloroethylene	U	ND	50.5	152	ug/kg	2.18	50					
Toluene	U	ND	50.5	152	ug/kg	2.18	50					
Trichloroethylene	U	ND	50.5	152	ug/kg	2.18	50					
Trichlorofluoromethane	U	ND	50.5	152	ug/kg	2.18	50					
Trichlorotrifluoroethane	U	ND	253	758	ug/kg	2.18	50					
Vinyl chloride	U	ND	50.5	152	ug/kg	2.18	50					
cis-1,2-Dichloroethylene	U	ND	50.5	152	ug/kg	2.18	50					
cis-1,3-Dichloropropylene	U	ND	50.5	152	ug/kg	2.18	50					
m,p-Xylenes	U	ND	101	303	ug/kg	2.18	50					
o-Xylene	U	ND	50.5	152	ug/kg	2.18	50					
tert-Butyl methyl ether	U	ND	50.5	152	ug/kg	2.18	50					
trans-1,2-Dichloroethylene	U	ND	50.5	152	ug/kg	2.18	50					
trans-1,3-Dichloropropylene	U	ND	50.5	152	ug/kg	2.18	50					

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3050B	SW846 3050B Prep	CD3	01/27/22	1555	2222990
SW846 3541	Prep Method 3541 8270E BNA for Soil	JM3	01/28/22	1203	2223116
SW846 5035A	SW846 5035A Prep	JM6	02/07/22	1045	2226061

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	SW846 3050B/6010D	
2	SW846 3541/8270E	
3	SW846 8260D	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
2-Fluorobiphenyl	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	1830 ug/kg	2290	80	(26%-118%)
Nitrobenzene-d5	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	1690 ug/kg	2290	74	(28%-110%)
p-Terphenyl-d14	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	1830 ug/kg	2290	80	(26%-130%)
2,4,6-Tribromophenol	SW846 3541/8270E SVOA, Solid (Automated	2700 ug/kg	4590	59	(26%-128%)

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Certificate of Analysis

Report Date: February 8, 2022

Company : GEAR - Gator Engineering & Aquifer Restoration, Inc
Address : 1928 Boothe Circle

Longwood, Florida 32750
Contact: Neeld Wilson
Project: Gator Engineering & Aquifer Restoration, Inc

Client Sample ID: SB-10 Project: PPAY00421
Sample ID: 568586007 Client ID: PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
		Soxhlet) "Dry Weight Corrected"										
2-Fluorophenol		SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"		3420	ug/kg	4590			75		(30%-108%)	
Phenol-d5		SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"		3690	ug/kg	4590			80		(29%-116%)	
1,2-Dichloroethane-d4		SW846 8260D Volatiles, Solid "Dry Weight Corrected"		7300	ug/kg	50.0			96		(76%-127%)	
Bromofluorobenzene		SW846 8260D Volatiles, Solid "Dry Weight Corrected"		7900	ug/kg	50.0			104		(70%-130%)	
Toluene-d8		SW846 8260D Volatiles, Solid "Dry Weight Corrected"		7710	ug/kg	50.0			102		(81%-120%)	

Notes:

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Certificate of Analysis

Report Date: February 8, 2022

Company :	GEAR - Gator Engineering & Aquifer Restoration, Inc
Address :	1928 Boothe Circle
	Longwood, Florida 32750
Contact:	Neeld Wilson
Project:	Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-11	Project:	PPAY00421
Sample ID:	568586008	Client ID:	PPAY001
Matrix:	Soil		
Collect Date:	26-JAN-22 12:30		
Receive Date:	26-JAN-22		
Collector:	Client		
Moisture:	11.3%		

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Metals Analysis-ICP												
SW846 3050B/6010D Lead Solid "Dry Weight Corrected"												
Lead		96200	352	2130	ug/Kg	94.7	1	TXT1	01/27/22	1921	2222991	1
Semi-Volatile-GC/MS												
SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"												
1,1'-Biphenyl	U	ND	4470	14900	ug/kg	0.0331	40	ND2	01/29/22	0049	2223119	2
1,2,4,5-Tetrachlorobenzene	U	ND	4470	14900	ug/kg	0.0331	40					
2,3,4,6-Tetrachlorophenol	U	ND	4470	14900	ug/kg	0.0331	40					
2,4,5-Trichlorophenol	U	ND	4470	14900	ug/kg	0.0331	40					
2,4,6-Trichlorophenol	U	ND	4470	14900	ug/kg	0.0331	40					
2,4-Dichlorophenol	U	ND	4470	14900	ug/kg	0.0331	40					
2,4-Dimethylphenol	U	ND	4470	14900	ug/kg	0.0331	40					
2,4-Dinitrophenol	U	ND	4470	29800	ug/kg	0.0331	40					
2,4-Dinitrotoluene	U	ND	4470	14900	ug/kg	0.0331	40					
2,6-Dinitrotoluene	U	ND	4470	14900	ug/kg	0.0331	40					
2-Chloronaphthalene	U	ND	447	1490	ug/kg	0.0331	40					
2-Chlorophenol	U	ND	4470	14900	ug/kg	0.0331	40					
2-Methyl-4,6-dinitrophenol	U	ND	4470	14900	ug/kg	0.0331	40					
2-Methylnaphthalene	U	ND	447	1490	ug/kg	0.0331	40					
2-Nitrophenol	U	ND	4470	14900	ug/kg	0.0331	40					
3,3'-Dichlorobenzidine	U	ND	4470	14900	ug/kg	0.0331	40					
4-Bromophenylphenylether	U	ND	4470	14900	ug/kg	0.0331	40					
4-Chloro-3-methylphenol	U	ND	5960	14900	ug/kg	0.0331	40					
4-Chloroaniline	U	ND	4470	14900	ug/kg	0.0331	40					
4-Chlorophenylphenylether	U	ND	4470	14900	ug/kg	0.0331	40					
4-Nitrophenol	U	ND	4470	14900	ug/kg	0.0331	40					
Acenaphthene	U	ND	447	1490	ug/kg	0.0331	40					
Acenaphthylene	U	ND	447	1490	ug/kg	0.0331	40					
Acetophenone	U	ND	4470	14900	ug/kg	0.0331	40					
Anthracene	U	ND	447	1490	ug/kg	0.0331	40					
Atrazine	U	ND	5960	14900	ug/kg	0.0331	40					
Benzaldehyde	U	ND	4470	14900	ug/kg	0.0331	40					
Benzo(a)anthracene	U	ND	447	1490	ug/kg	0.0331	40					
Benzo(a)pyrene	U	ND	447	1490	ug/kg	0.0331	40					
Benzo(b)fluoranthene	U	ND	447	1490	ug/kg	0.0331	40					
Benzo(ghi)perylene	U	ND	447	1490	ug/kg	0.0331	40					
Benzo(k)fluoranthene	U	ND	447	1490	ug/kg	0.0331	40					
Butylbenzylphthalate	U	ND	447	1490	ug/kg	0.0331	40					

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Certificate of Analysis

Report Date: February 8, 2022

Company :	GEAR - Gator Engineering & Aquifer Restoration, Inc
Address :	1928 Boothe Circle
	Longwood, Florida 32750
Contact:	Neeld Wilson
Project:	Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-11	Project:	PPAY00421
Sample ID:	568586008	Client ID:	PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Semi-Volatile-GC/MS												
SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"												
Caprolactam	U	ND	4470	14900	ug/kg	0.0331	40					
Carbazole	U	ND	447	1490	ug/kg	0.0331	40					
Chrysene	U	ND	447	1490	ug/kg	0.0331	40					
Di-n-butylphthalate	U	ND	447	1490	ug/kg	0.0331	40					
Di-n-octylphthalate	U	ND	447	1490	ug/kg	0.0331	40					
Dibenzo(a,h)anthracene	U	ND	447	1490	ug/kg	0.0331	40					
Dibenzofuran	U	ND	4470	14900	ug/kg	0.0331	40					
Diethylphthalate	U	ND	447	1490	ug/kg	0.0331	40					
Dimethylphthalate	U	ND	447	1490	ug/kg	0.0331	40					
Diphenylamine	U	ND	4470	14900	ug/kg	0.0331	40					
Fluoranthene	U	ND	447	1490	ug/kg	0.0331	40					
Fluorene	U	ND	447	1490	ug/kg	0.0331	40					
Hexachlorobenzene	U	ND	4470	14900	ug/kg	0.0331	40					
Hexachlorobutadiene	U	ND	4470	14900	ug/kg	0.0331	40					
Hexachlorocyclopentadiene	U	ND	4470	14900	ug/kg	0.0331	40					
Hexachloroethane	U	ND	4470	14900	ug/kg	0.0331	40					
Indeno(1,2,3-cd)pyrene	U	ND	447	1490	ug/kg	0.0331	40					
Isophorone	U	ND	4470	14900	ug/kg	0.0331	40					
N-Nitrosodipropylamine	U	ND	4470	14900	ug/kg	0.0331	40					
Naphthalene	U	ND	447	1490	ug/kg	0.0331	40					
Nitrobenzene	U	ND	4470	14900	ug/kg	0.0331	40					
Pentachlorophenol	U	ND	4470	14900	ug/kg	0.0331	40					
Phenanthrene	U	ND	447	1490	ug/kg	0.0331	40					
Phenol	U	ND	4470	14900	ug/kg	0.0331	40					
Pyrene	U	ND	447	1490	ug/kg	0.0331	40					
bis(2-Chloro-1-methylethyl)ether	U	ND	4470	14900	ug/kg	0.0331	40					
bis(2-Chloroethoxy)methane	U	ND	4470	14900	ug/kg	0.0331	40					
bis(2-Chloroethyl) ether	U	ND	4470	14900	ug/kg	0.0331	40					
bis(2-Ethylhexyl)phthalate	U	ND	447	1490	ug/kg	0.0331	40					
m,p-Cresols	U	ND	4470	14900	ug/kg	0.0331	40					
m-Nitroaniline	U	ND	4470	14900	ug/kg	0.0331	40					
o-Cresol	U	ND	4470	14900	ug/kg	0.0331	40					
o-Nitroaniline	U	ND	4920	14900	ug/kg	0.0331	40					
p-Nitroaniline	U	ND	4470	14900	ug/kg	0.0331	40					
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												

Certificate of Analysis

Report Date: February 8, 2022

Company : GEAR - Gator Engineering & Aquifer Restoration, Inc
Address : 1928 Boothe Circle

Longwood, Florida 32750
Contact: Neeld Wilson
Project: Gator Engineering & Aquifer Restoration, Inc

Client Sample ID: SB-11 Project: PPAY00421
Sample ID: 568586008 Client ID: PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												
1,1,1-Trichloroethane	U	ND	0.435	1.31	ug/kg	1.16	1	JM6	02/04/22	1421	2226063	3
1,1,2,2-Tetrachloroethane	U	ND	0.435	1.31	ug/kg	1.16	1					
1,1,2-Trichloroethane	U	ND	0.435	1.31	ug/kg	1.16	1					
1,1-Dichloroethane	U	ND	0.435	1.31	ug/kg	1.16	1					
1,1-Dichloroethylene	U	ND	0.435	1.31	ug/kg	1.16	1					
1,2,3-Trichlorobenzene	U	ND	0.435	1.31	ug/kg	1.16	1					
1,2,4-Trichlorobenzene	U	ND	0.435	1.31	ug/kg	1.16	1					
1,2-Dibromo-3-chloropropane	U	ND	0.654	1.31	ug/kg	1.16	1					
1,2-Dibromoethane	U	ND	0.435	1.31	ug/kg	1.16	1					
1,2-Dichlorobenzene	U	ND	0.435	1.31	ug/kg	1.16	1					
1,2-Dichloroethane	U	ND	0.435	1.31	ug/kg	1.16	1					
1,2-Dichloropropane	U	ND	0.435	1.31	ug/kg	1.16	1					
1,3-Dichlorobenzene	U	ND	0.435	1.31	ug/kg	1.16	1					
1,4-Dichlorobenzene	U	ND	0.435	1.31	ug/kg	1.16	1					
1,4-Dioxane	U	ND	21.8	65.4	ug/kg	1.16	1					
2-Butanone	U	ND	2.18	6.54	ug/kg	1.16	1					
2-Hexanone	U	ND	2.18	6.54	ug/kg	1.16	1					
4-Methyl-2-pentanone	U	ND	2.18	6.54	ug/kg	1.16	1					
Acetone	U	ND	2.18	6.54	ug/kg	1.16	1					
Benzene	U	ND	0.435	1.31	ug/kg	1.16	1					
Bromochloromethane	U	ND	0.435	1.31	ug/kg	1.16	1					
Bromodichloromethane	U	ND	0.435	1.31	ug/kg	1.16	1					
Bromoform	U	ND	0.435	1.31	ug/kg	1.16	1					
Bromomethane	U	ND	0.435	1.31	ug/kg	1.16	1					
Carbon disulfide	U	ND	2.18	6.54	ug/kg	1.16	1					
Carbon tetrachloride	U	ND	0.435	1.31	ug/kg	1.16	1					
Chlorobenzene	U	ND	0.435	1.31	ug/kg	1.16	1					
Chloroethane	U	ND	0.435	1.31	ug/kg	1.16	1					
Chloroform	U	ND	0.435	1.31	ug/kg	1.16	1					
Chloromethane	U	ND	0.435	1.31	ug/kg	1.16	1					
Cyclohexane	U	ND	0.435	1.31	ug/kg	1.16	1					
Dibromochloromethane	U	ND	0.435	1.31	ug/kg	1.16	1					
Dichlorodifluoromethane	U	ND	0.435	1.31	ug/kg	1.16	1					
Ethylbenzene	U	ND	0.435	1.31	ug/kg	1.16	1					
Isopropylbenzene	U	ND	0.435	1.31	ug/kg	1.16	1					
Methyl acetate	U	ND	2.18	6.54	ug/kg	1.16	1					

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Certificate of Analysis

Report Date: February 8, 2022

Company :	GEAR - Gator Engineering & Aquifer Restoration, Inc
Address :	1928 Boothe Circle
	Longwood, Florida 32750
Contact:	Neeld Wilson
Project:	Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-11	Project:	PPAY00421
Sample ID:	568586008	Client ID:	PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Volatile Organics												
SW846 8260D Volatiles, Solid "Dry Weight Corrected"												
Methylcyclohexane	U	ND	0.435	1.31	ug/kg	1.16	1					
Methylene chloride		7.24	2.18	6.54	ug/kg	1.16	1					
Styrene	U	ND	0.435	1.31	ug/kg	1.16	1					
Tetrachloroethylene	U	ND	0.435	1.31	ug/kg	1.16	1					
Toluene	U	ND	0.435	1.31	ug/kg	1.16	1					
Trichloroethylene	U	ND	0.435	1.31	ug/kg	1.16	1					
Trichlorofluoromethane	U	ND	0.435	1.31	ug/kg	1.16	1					
Trichlorotrifluoroethane	U	ND	2.18	6.54	ug/kg	1.16	1					
Vinyl chloride	U	ND	0.435	1.31	ug/kg	1.16	1					
cis-1,2-Dichloroethylene	U	ND	0.435	1.31	ug/kg	1.16	1					
cis-1,3-Dichloropropylene	U	ND	0.435	1.31	ug/kg	1.16	1					
m,p-Xylenes	U	ND	0.872	2.62	ug/kg	1.16	1					
o-Xylene	U	ND	0.435	1.31	ug/kg	1.16	1					
tert-Butyl methyl ether	U	ND	0.435	1.31	ug/kg	1.16	1					
trans-1,2-Dichloroethylene	U	ND	0.435	1.31	ug/kg	1.16	1					
trans-1,3-Dichloropropylene	U	ND	0.435	1.31	ug/kg	1.16	1					

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 3050B	SW846 3050B Prep	CD3	01/27/22	1555	2222990
SW846 3541	Prep Method 3541 8270E BNA for Soil	JM3	01/28/22	1203	2223116
SW846 5035A	SW846 5035A Prep	JM6	02/04/22	0930	2226061

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	SW846 3050B/6010D	
2	SW846 3541/8270E	
3	SW846 8260D	

Surrogate/Tracer Recovery	Test	Result	Nominal	Recovery%	Acceptable Limits
2-Fluorobiphenyl	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	1210 ug/kg	1860	65	(26%-118%)
Nitrobenzene-d5	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	1090 ug/kg	1860	58	(28%-110%)
p-Terphenyl-d14	SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"	1300 ug/kg	1860	70	(26%-130%)
2,4,6-Tribromophenol	SW846 3541/8270E SVOA, Solid (Automated	1430 ug/kg	3730	38	(26%-128%)

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Certificate of Analysis

Report Date: February 8, 2022

Company : GEAR - Gator Engineering & Aquifer Restoration, Inc
Address : 1928 Boothe Circle

Longwood, Florida 32750
Contact: Neeld Wilson
Project: Gator Engineering & Aquifer Restoration, Inc

Client Sample ID:	SB-11	Project:	PPAY00421
Sample ID:	568586008	Client ID:	PPAY001

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
		Soxhlet) "Dry Weight Corrected"										
2-Fluorophenol		SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"			2150 ug/kg	3730			58	(30%-108%)		
Phenol-d5		SW846 3541/8270E SVOA, Solid (Automated Soxhlet) "Dry Weight Corrected"			2360 ug/kg	3730			63	(29%-116%)		
1,2-Dichloroethane-d4		SW846 8260D Volatiles, Solid "Dry Weight Corrected"			66.2 ug/kg	50.0			101	(76%-127%)		
Bromofluorobenzene		SW846 8260D Volatiles, Solid "Dry Weight Corrected"			76.7 ug/kg	50.0			117	(70%-130%)		
Toluene-d8		SW846 8260D Volatiles, Solid "Dry Weight Corrected"			67.6 ug/kg	50.0			103	(81%-120%)		

Notes:

Column headers are defined as follows:

DF: Dilution Factor
DL: Detection Limit
MDA: Minimum Detectable Activity
MDC: Minimum Detectable Concentration
Lc/LC: Critical Level
PF: Prep Factor
RL: Reporting Limit
SQL: Sample Quantitation Limit

QC Summary

Report Date: February 8, 2022

GEAR - Gator Engineering & Aquifer Restoration, Inc
1928 Boothe Circle
Longwood, Florida

Contact: **Neeld Wilson**

Workorder: **568586**

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Metals Analysis-ICP										
Batch 2222991										
QC1205007052 568586001 DUP										
Lead		16600		15300	ug/Kg	7.81		(0%-20%)	TXT1	01/27/22 18:50
QC1205007051 LCS										
Lead	43400			41800	ug/Kg		96.3	(80%-120%)		01/27/22 18:45
QC1205007050 MB										
Lead			J	689	ug/Kg					01/27/22 18:41
QC1205007053 568586001 MS										
Lead	67300	16600		76800	ug/Kg		89.6	(75%-125%)		01/27/22 18:52
QC1205007054 568586001 SDILT										
Lead		127		33.2	ug/L	31.1		(0%-20%)		01/27/22 18:55
Semi-Volatile-GC/MS										
Batch 2223119										
QC1205007310 LCS										
1,1'-Biphenyl	1660			877	ug/kg		53*	(57%-118%)	ND2	01/28/22 16:31
1,2,4,5-Tetrachlorobenzene	1660			837	ug/kg		51	(51%-110%)		
2,3,4,6-Tetrachlorophenol	1660			911	ug/kg		55	(52%-120%)		
2,4,5-Trichlorophenol	1660			977	ug/kg		59	(58%-120%)		
2,4,6-Trichlorophenol	1660			901	ug/kg		54	(52%-119%)		
2,4-Dichlorophenol	1660			905	ug/kg		55	(52%-116%)		

QC Summary

Workorder: **568586**

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Semi-Volatile-GC/MS										
Batch 2223119										
2,4-Dimethylphenol	1660			743	ug/kg		45*	(47%-96%)	ND2	01/28/22 16:31
2,4-Dinitrophenol	1660		J	487	ug/kg		29	(18%-92%)		
2,4-Dinitrotoluene	1660			1040	ug/kg		63	(52%-120%)		
2,6-Dinitrotoluene	1660			970	ug/kg		59	(58%-112%)		
2-Chloronaphthalene	1660			907	ug/kg		55	(49%-108%)		
2-Chlorophenol	1660			905	ug/kg		55	(55%-107%)		
2-Methyl-4,6-dinitrophenol	1660			580	ug/kg		35	(23%-110%)		
2-Methylnaphthalene	1660			977	ug/kg		59	(47%-99%)		
2-Nitrophenol	1660			867	ug/kg		52*	(53%-113%)		
3,3'-Dichlorobenzidine	1660			699	ug/kg		42	(35%-109%)		
4-Bromophenylphenylether	1660			1020	ug/kg		61	(56%-113%)		
4-Chloro-3-methylphenol	1660			973	ug/kg		59	(54%-119%)		
4-Chloroaniline	1660			541	ug/kg		33*	(36%-90%)		
4-Chlorophenylphenylether	1660			976	ug/kg		59	(53%-117%)		
4-Nitrophenol	1660			905	ug/kg		55	(39%-130%)		

QC Summary

Workorder: **568586**

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Semi-Volatile-GC/MS										
Batch 2223119										
Acenaphthene	1660			953	ug/kg		58	(53%-104%)	ND2	01/28/22 16:31
Acenaphthylene	1660			888	ug/kg		54*	(55%-104%)		
Acetophenone	1660			795	ug/kg		48*	(50%-103%)		
Anthracene	1660			985	ug/kg		59	(54%-109%)		
Atrazine	1660			1210	ug/kg		73	(54%-133%)		
Benzaldehyde	1660		J	150	ug/kg		9*	(25%-83%)		
Benzo(a)anthracene	1660			868	ug/kg		52*	(58%-110%)		
Benzo(a)pyrene	1660			990	ug/kg		60	(50%-114%)		
Benzo(b)fluoranthene	1660			999	ug/kg		60	(51%-111%)		
Benzo(ghi)perylene	1660			870	ug/kg		53	(42%-122%)		
Benzo(k)fluoranthene	1660			1120	ug/kg		68	(49%-118%)		
Butylbenzylphthalate	1660			1090	ug/kg		66	(51%-123%)		
Caprolactam	1660			888	ug/kg		54	(51%-122%)		
Carbazole	1660			974	ug/kg		59	(51%-118%)		
Chrysene	1660			1030	ug/kg		62	(59%-112%)		

QC Summary

Workorder: 568586

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Semi-Volatile-GC/MS										
Batch 2223119										
Di-n-butylphthalate	1660			1110	ug/kg		67	(55%-122%)	ND2	01/28/22 16:31
Di-n-octylphthalate	1660			1210	ug/kg		73	(50%-135%)		
Dibenzo(a,h)anthracene	1660			908	ug/kg		55	(48%-132%)		
Dibenzofuran	1660			942	ug/kg		57	(54%-112%)		
Diethylphthalate	1660			1080	ug/kg		65	(58%-121%)		
Dimethylphthalate	1660			1050	ug/kg		63	(52%-118%)		
Diphenylamine	1660			971	ug/kg		59	(52%-107%)		
Fluoranthene	1660			1060	ug/kg		64	(52%-122%)		
Fluorene	1660			1010	ug/kg		61	(52%-110%)		
Hexachlorobenzene	1660			1030	ug/kg		62	(53%-111%)		
Hexachlorobutadiene	1660			906	ug/kg		55	(49%-110%)		
Hexachlorocyclopentadiene	1660			490	ug/kg		30	(24%-85%)		
Hexachloroethane	1660			856	ug/kg		52	(46%-94%)		
Indeno(1,2,3-cd)pyrene	1660			972	ug/kg		59	(47%-128%)		
Isophorone	1660			926	ug/kg		56	(55%-105%)		

QC Summary

Workorder: **568586**

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Semi-Volatile-GC/MS										
Batch 2223119										
N-Nitrosodipropylamine	1660			976	ug/kg		59	(45%-112%)	ND2	01/28/22 16:31
Naphthalene	1660			916	ug/kg		55	(53%-100%)		
Nitrobenzene	1660			910	ug/kg		55	(52%-106%)		
Pentachlorophenol	1660			807	ug/kg		49	(35%-118%)		
Phenanthrene	1660			1010	ug/kg		61	(52%-108%)		
Phenol	1660			866	ug/kg		52	(49%-111%)		
Pyrene	1660			1060	ug/kg		64	(45%-112%)		
bis(2-Chloro-1-methylethyl)ether	1660			950	ug/kg		57	(39%-115%)		
bis(2-Chloroethoxy)methane	1660			834	ug/kg		50*	(52%-100%)		
bis(2-Chloroethyl) ether	1660			902	ug/kg		54	(48%-104%)		
bis(2-Ethylhexyl)phthalate	1660			1130	ug/kg		68	(44%-127%)		
m,p-Cresols	1660			943	ug/kg		57	(50%-118%)		
m-Nitroaniline	1660			685	ug/kg		41	(40%-113%)		
o-Cresol	1660			917	ug/kg		55	(53%-111%)		
o-Nitroaniline	1660			922	ug/kg		56	(50%-119%)		

QC Summary

Workorder: 568586

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Semi-Volatile-GC/MS										
Batch 2223119										
p-Nitroaniline	1660			880	ug/kg		53	(38%-141%)	ND2	01/28/22 16:31
**2,4,6-Tribromophenol	3310			1880	ug/kg		57	(26%-128%)		
**2-Fluorobiphenyl	1660			848	ug/kg		51	(26%-118%)		
**2-Fluorophenol	3310			1640	ug/kg		49	(30%-108%)		
**Nitrobenzene-d5	1660			820	ug/kg		50	(28%-110%)		
**Phenol-d5	3310			1840	ug/kg		56	(29%-116%)		
**p-Terphenyl-d14	1660			1030	ug/kg		62	(26%-130%)		
QC1205007309 MB										
1,1'-Biphenyl			U	ND	ug/kg					01/28/22 16:03
1,2,4,5-Tetrachlorobenzene			U	ND	ug/kg					
2,3,4,6-Tetrachlorophenol			U	ND	ug/kg					
2,4,5-Trichlorophenol			U	ND	ug/kg					
2,4,6-Trichlorophenol			U	ND	ug/kg					
2,4-Dichlorophenol			U	ND	ug/kg					
2,4-Dimethylphenol			U	ND	ug/kg					
2,4-Dinitrophenol			U	ND	ug/kg					

QC Summary

Workorder: 568586

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Semi-Volatile-GC/MS										
Batch 2223119										
2,4-Dinitrotoluene			U	ND	ug/kg				ND2	01/28/22 16:03
2,6-Dinitrotoluene			U	ND	ug/kg					
2-Chloronaphthalene			U	ND	ug/kg					
2-Chlorophenol			U	ND	ug/kg					
2-Methyl-4,6-dinitrophenol			U	ND	ug/kg					
2-Methylnaphthalene			U	ND	ug/kg					
2-Nitrophenol			U	ND	ug/kg					
3,3'-Dichlorobenzidine			U	ND	ug/kg					
4-Bromophenylphenylether			U	ND	ug/kg					
4-Chloro-3-methylphenol			U	ND	ug/kg					
4-Chloroaniline			U	ND	ug/kg					
4-Chlorophenylphenylether			U	ND	ug/kg					
4-Nitrophenol			U	ND	ug/kg					
Acenaphthene			U	ND	ug/kg					
Acenaphthylene			U	ND	ug/kg					

QC Summary

Workorder: **568586**

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch 2223119											
Acetophenone			U	ND	ug/kg				ND2	01/28/22	16:03
Anthracene			U	ND	ug/kg						
Atrazine			U	ND	ug/kg						
Benzaldehyde			U	ND	ug/kg						
Benzo(a)anthracene			U	ND	ug/kg						
Benzo(a)pyrene			U	ND	ug/kg						
Benzo(b)fluoranthene			U	ND	ug/kg						
Benzo(ghi)perylene			U	ND	ug/kg						
Benzo(k)fluoranthene			U	ND	ug/kg						
Butylbenzylphthalate			U	ND	ug/kg						
Caprolactam			U	ND	ug/kg						
Carbazole			U	ND	ug/kg						
Chrysene			U	ND	ug/kg						
Di-n-butylphthalate			U	ND	ug/kg						
Di-n-octylphthalate			U	ND	ug/kg						

QC Summary

Workorder: **568586**

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Semi-Volatile-GC/MS										
Batch 2223119										
Dibenzo(a,h)anthracene			U	ND	ug/kg				ND2	01/28/22 16:03
Dibenzofuran			U	ND	ug/kg					
Diethylphthalate			U	ND	ug/kg					
Dimethylphthalate			U	ND	ug/kg					
Diphenylamine			U	ND	ug/kg					
Fluoranthene			U	ND	ug/kg					
Fluorene			U	ND	ug/kg					
Hexachlorobenzene			U	ND	ug/kg					
Hexachlorobutadiene			U	ND	ug/kg					
Hexachlorocyclopentadiene			U	ND	ug/kg					
Hexachloroethane			U	ND	ug/kg					
Indeno(1,2,3-cd)pyrene			U	ND	ug/kg					
Isophorone			U	ND	ug/kg					
N-Nitrosodipropylamine			U	ND	ug/kg					
Naphthalene			U	ND	ug/kg					

QC Summary

Workorder: 568586

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Semi-Volatile-GC/MS										
Batch 2223119										
Nitrobenzene			U	ND	ug/kg				ND2	01/28/22 16:03
Pentachlorophenol			U	ND	ug/kg					
Phenanthrene			U	ND	ug/kg					
Phenol			U	ND	ug/kg					
Pyrene			U	ND	ug/kg					
bis(2-Chloro-1-methylethyl)ether			U	ND	ug/kg					
bis(2-Chloroethoxy)methane			U	ND	ug/kg					
bis(2-Chloroethyl) ether			U	ND	ug/kg					
bis(2-Ethylhexyl)phthalate			U	ND	ug/kg					
m,p-Cresols			U	ND	ug/kg					
m-Nitroaniline			U	ND	ug/kg					
o-Cresol			U	ND	ug/kg					
o-Nitroaniline			U	ND	ug/kg					
p-Nitroaniline			U	ND	ug/kg					
**2,4,6-Tribromophenol	3290			2130	ug/kg		65	(26%-128%)		

QC Summary

Workorder: 568586

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Semi-Volatile-GC/MS										
Batch 2223119										
**2-Fluorobiphenyl	1640			1130	ug/kg		69	(26%-118%)	ND2	01/28/22 16:03
**2-Fluorophenol	3290			2020	ug/kg		61	(30%-108%)		
**Nitrobenzene-d5	1640			1080	ug/kg		66	(28%-110%)		
**Phenol-d5	3290			2320	ug/kg		71	(29%-116%)		
**p-Terphenyl-d14	1640			1270	ug/kg		77	(26%-130%)		
QC1205007311 568503017 MS										
1,1'-Biphenyl	1650	U	ND	886	ug/kg		54	(19%-123%)		01/28/22 17:26
1,2,4,5-Tetrachlorobenzene	1650	U	ND	817	ug/kg		49	(24%-110%)		
2,3,4,6-Tetrachlorophenol	1650	U	ND	1060	ug/kg		64	(28%-125%)		
2,4,5-Trichlorophenol	1650	U	ND	1040	ug/kg		63	(29%-120%)		
2,4,6-Trichlorophenol	1650	U	ND	932	ug/kg		56	(26%-127%)		
2,4-Dichlorophenol	1650	U	ND	948	ug/kg		57	(23%-120%)		
2,4-Dimethylphenol	1650	U	ND	776	ug/kg		47	(20%-105%)		
2,4-Dinitrophenol	1650	U	ND	971	ug/kg		59	(28%-120%)		
2,4-Dinitrotoluene	1650	U	ND	1160	ug/kg		70	(28%-120%)		
2,6-Dinitrotoluene	1650	U	ND	1030	ug/kg		62	(27%-120%)		

QC Summary

Workorder: 568586

Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Semi-Volatile-GC/MS											
Batch 2223119											
2-Chloronaphthalene	1650	U	ND		924	ug/kg		56	(16%-118%)	ND2	01/28/22 17:26
2-Chlorophenol	1650	U	ND		893	ug/kg		54	(19%-108%)		
2-Methyl-4,6-dinitrophenol	1650	U	ND		1080	ug/kg		66	(17%-112%)		
2-Methylnaphthalene	1650	U	ND		996	ug/kg		60	(19%-110%)		
2-Nitrophenol	1650	U	ND		873	ug/kg		53	(20%-110%)		
3,3'-Dichlorobenzidine	1650	U	ND	J	175	ug/kg		11*	(12%-110%)		
4-Bromophenylphenylether	1650	U	ND		1020	ug/kg		62	(25%-120%)		
4-Chloro-3-methylphenol	1650	U	ND		1050	ug/kg		64	(27%-122%)		
4-Chloroaniline	1650	U	ND	J	241	ug/kg		15*	(26%-88%)		
4-Chlorophenylphenylether	1650	U	ND		1020	ug/kg		62	(25%-124%)		
4-Nitrophenol	1650	U	ND		1120	ug/kg		68	(16%-132%)		
Acenaphthene	1650	U	ND		979	ug/kg		59	(17%-113%)		
Acenaphthylene	1650	U	ND		919	ug/kg		56	(23%-112%)		
Acetophenone	1650	U	ND		868	ug/kg		53	(19%-118%)		
Anthracene	1650	U	ND		1040	ug/kg		63	(21%-113%)		

QC Summary

Workorder: 568586

Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Semi-Volatile-GC/MS											
Batch 2223119											
Atrazine	1650	U	ND		1320	ug/kg		80	(28%-133%)	ND2	01/28/22 17:26
Benzaldehyde	1650	U	ND		597	ug/kg		36	(10%-97%)		
Benzo(a)anthracene	1650	U	ND		974	ug/kg		59	(24%-116%)		
Benzo(a)pyrene	1650	U	ND		1070	ug/kg		65	(23%-120%)		
Benzo(b)fluoranthene	1650	U	ND		1140	ug/kg		69	(22%-122%)		
Benzo(ghi)perylene	1650	U	ND		983	ug/kg		60	(15%-120%)		
Benzo(k)fluoranthene	1650	U	ND		1140	ug/kg		69	(22%-130%)		
Butylbenzylphthalate	1650	U	ND		1210	ug/kg		73	(21%-133%)		
Caprolactam	1650	U	ND		1030	ug/kg		63	(22%-125%)		
Carbazole	1650	U	ND		1070	ug/kg		65	(19%-123%)		
Chrysene	1650	U	ND		1090	ug/kg		66	(23%-120%)		
Di-n-butylphthalate	1650	U	ND		1210	ug/kg		73	(28%-120%)		
Di-n-octylphthalate	1650	U	ND		1300	ug/kg		79	(27%-132%)		
Dibenzo(a,h)anthracene	1650	U	ND		1020	ug/kg		62	(17%-118%)		
Dibenzofuran	1650	U	ND		972	ug/kg		59	(24%-116%)		

QC Summary

Workorder: **568586**

Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Semi-Volatile-GC/MS											
Batch 2223119											
Diethylphthalate	1650	U	ND		1170	ug/kg		71	(29%-120%)	ND2	01/28/22 17:26
Dimethylphthalate	1650	U	ND		1100	ug/kg		67	(28%-120%)		
Diphenylamine	1650	U	ND		977	ug/kg		59	(23%-111%)		
Fluoranthene	1650	U	ND		1190	ug/kg		72	(24%-122%)		
Fluorene	1650	U	ND		1060	ug/kg		64	(20%-119%)		
Hexachlorobenzene	1650	U	ND		1050	ug/kg		64	(27%-113%)		
Hexachlorobutadiene	1650	U	ND		855	ug/kg		52	(18%-110%)		
Hexachlorocyclopentadiene	1650	U	ND		575	ug/kg		35	(18%-75%)		
Hexachloroethane	1650	U	ND		783	ug/kg		47	(18%-102%)		
Indeno(1,2,3-cd)pyrene	1650	U	ND		1090	ug/kg		66	(14%-122%)		
Isophorone	1650	U	ND		932	ug/kg		56	(17%-110%)		
N-Nitrosodipropylamine	1650	U	ND		997	ug/kg		60	(18%-120%)		
Naphthalene	1650	U	ND		894	ug/kg		54	(18%-110%)		
Nitrobenzene	1650	U	ND		889	ug/kg		54	(21%-110%)		
Pentachlorophenol	1650	U	ND		1150	ug/kg		69	(17%-128%)		

QC Summary

Workorder: 568586

Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Semi-Volatile-GC/MS											
Batch 2223119											
Phenanthrene	1650	U	ND		1050	ug/kg		64	(20%-117%)	ND2	01/28/22 17:26
Phenol	1650	U	ND		850	ug/kg		52	(18%-119%)		
Pyrene	1650	U	ND		1180	ug/kg		72	(22%-124%)		
bis(2-Chloro-1-methylethyl)ether	1650	U	ND		911	ug/kg		55	(15%-114%)		
bis(2-Chloroethoxy)methane	1650	U	ND		826	ug/kg		50	(23%-112%)		
bis(2-Chloroethyl) ether	1650	U	ND		868	ug/kg		53	(19%-112%)		
bis(2-Ethylhexyl)phthalate	1650	U	ND		1230	ug/kg		75	(19%-133%)		
m,p-Cresols	1650	U	ND		963	ug/kg		58	(24%-120%)		
m-Nitroaniline	1650	U	ND		500	ug/kg		30	(18%-106%)		
o-Cresol	1650	U	ND		928	ug/kg		56	(20%-120%)		
o-Nitroaniline	1650	U	ND		996	ug/kg		60	(26%-120%)		
p-Nitroaniline	1650	U	ND		765	ug/kg		46	(14%-133%)		
**2,4,6-Tribromophenol	3300		1750		1880	ug/kg		57	(26%-128%)		
**2-Fluorobiphenyl	1650		842		735	ug/kg		45	(26%-118%)		
**2-Fluorophenol	3300		1560		1420	ug/kg		43	(30%-108%)		

QC Summary

Workorder: 568586

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Semi-Volatile-GC/MS										
Batch 2223119										
**Nitrobenzene-d5	1650	811		713	ug/kg		43	(28%-110%)	ND2	01/28/22 17:26
**Phenol-d5	3300	1760		1660	ug/kg		50	(29%-116%)		
**p-Terphenyl-d14	1650	839		1050	ug/kg		64	(26%-130%)		
QC1205007312 568503017 MSD										
1,1'-Biphenyl	1630	U	ND	947	ug/kg	7	58	(0%-30%)		01/28/22 17:54
1,2,4,5-Tetrachlorobenzene	1630	U	ND	879	ug/kg	7	54	(0%-30%)		
2,3,4,6-Tetrachlorophenol	1630	U	ND	1110	ug/kg	5	68	(0%-30%)		
2,4,5-Trichlorophenol	1630	U	ND	1110	ug/kg	6	68	(0%-30%)		
2,4,6-Trichlorophenol	1630	U	ND	993	ug/kg	6	61	(0%-30%)		
2,4-Dichlorophenol	1630	U	ND	985	ug/kg	4	61	(0%-30%)		
2,4-Dimethylphenol	1630	U	ND	817	ug/kg	5	50	(0%-30%)		
2,4-Dinitrophenol	1630	U	ND	1020	ug/kg	5	63	(0%-30%)		
2,4-Dinitrotoluene	1630	U	ND	1180	ug/kg	2	73	(0%-30%)		
2,6-Dinitrotoluene	1630	U	ND	1090	ug/kg	6	67	(0%-30%)		
2-Chloronaphthalene	1630	U	ND	984	ug/kg	6	60	(0%-30%)		
2-Chlorophenol	1630	U	ND	924	ug/kg	3	57	(0%-30%)		

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QC Summary

Workorder: 568586

Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Semi-Volatile-GC/MS											
Batch 2223119											
2-Methyl-4,6-dinitrophenol	1630	U	ND		1120	ug/kg	4	69	(0%-30%)	ND2	01/28/22 17:54
2-Methylnaphthalene	1630	U	ND		1050	ug/kg	5	64	(0%-30%)		
2-Nitrophenol	1630	U	ND		922	ug/kg	5	57	(0%-30%)		
3,3'-Dichlorobenzidine	1630	U	ND	J	183	ug/kg	4	11*	(0%-30%)		
4-Bromophenylphenylether	1630	U	ND		1080	ug/kg	5	66	(0%-30%)		
4-Chloro-3-methylphenol	1630	U	ND		1070	ug/kg	1	66	(0%-30%)		
4-Chloroaniline	1630	U	ND	J	207	ug/kg	15	13*	(0%-30%)		
4-Chlorophenylphenylether	1630	U	ND		1080	ug/kg	6	66	(0%-30%)		
4-Nitrophenol	1630	U	ND		1110	ug/kg	1	68	(0%-30%)		
Acenaphthene	1630	U	ND		1040	ug/kg	6	64	(0%-30%)		
Acenaphthylene	1630	U	ND		973	ug/kg	6	60	(0%-30%)		
Acetophenone	1630	U	ND		900	ug/kg	4	55	(0%-30%)		
Anthracene	1630	U	ND		1060	ug/kg	1	65	(0%-30%)		
Atrazine	1630	U	ND		1340	ug/kg	1	82	(0%-30%)		
Benzaldehyde	1630	U	ND		618	ug/kg	4	38	(0%-30%)		

QC Summary

Workorder: 568586

Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Semi-Volatile-GC/MS											
Batch 2223119											
Benzo(a)anthracene	1630	U	ND		979	ug/kg	1	60	(0%-30%)	ND2	01/28/22 17:54
Benzo(a)pyrene	1630	U	ND		1090	ug/kg	1	67	(0%-30%)		
Benzo(b)fluoranthene	1630	U	ND		1170	ug/kg	3	72	(0%-30%)		
Benzo(ghi)perylene	1630	U	ND		966	ug/kg	2	59	(0%-30%)		
Benzo(k)fluoranthene	1630	U	ND		1190	ug/kg	4	73	(0%-30%)		
Butylbenzylphthalate	1630	U	ND		1270	ug/kg	5	78	(0%-30%)		
Caprolactam	1630	U	ND		1010	ug/kg	2	62	(0%-30%)		
Carbazole	1630	U	ND		1080	ug/kg	1	66	(0%-30%)		
Chrysene	1630	U	ND		1100	ug/kg	1	68	(0%-30%)		
Di-n-butylphthalate	1630	U	ND		1230	ug/kg	2	76	(0%-30%)		
Di-n-octylphthalate	1630	U	ND		1300	ug/kg	1	80	(0%-30%)		
Dibenzo(a,h)anthracene	1630	U	ND		993	ug/kg	3	61	(0%-30%)		
Dibenzofuran	1630	U	ND		1040	ug/kg	7	64	(0%-30%)		
Diethylphthalate	1630	U	ND		1200	ug/kg	3	74	(0%-30%)		
Dimethylphthalate	1630	U	ND		1160	ug/kg	5	71	(0%-30%)		

QC Summary

Workorder: 568586

Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Semi-Volatile-GC/MS											
Batch 2223119											
Diphenylamine	1630	U	ND		1020	ug/kg	4	63	(0%-30%)	ND2	01/28/22 17:54
Fluoranthene	1630	U	ND		1180	ug/kg	1	73	(0%-30%)		
Fluorene	1630	U	ND		1120	ug/kg	6	69	(0%-30%)		
Hexachlorobenzene	1630	U	ND		1080	ug/kg	3	66	(0%-30%)		
Hexachlorobutadiene	1630	U	ND		915	ug/kg	7	56	(0%-30%)		
Hexachlorocyclopentadiene	1630	U	ND		728	ug/kg	23	45	(0%-30%)		
Hexachloroethane	1630	U	ND		838	ug/kg	7	52	(0%-30%)		
Indeno(1,2,3-cd)pyrene	1630	U	ND		1060	ug/kg	3	65	(0%-30%)		
Isophorone	1630	U	ND		981	ug/kg	5	60	(0%-30%)		
N-Nitrosodipropylamine	1630	U	ND		1040	ug/kg	4	64	(0%-30%)		
Naphthalene	1630	U	ND		939	ug/kg	5	58	(0%-30%)		
Nitrobenzene	1630	U	ND		950	ug/kg	7	58	(0%-30%)		
Pentachlorophenol	1630	U	ND		1180	ug/kg	3	72	(0%-30%)		
Phenanthrene	1630	U	ND		1080	ug/kg	3	67	(0%-30%)		
Phenol	1630	U	ND		873	ug/kg	3	54	(0%-30%)		

QC Summary

Workorder: **568586**

Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Semi-Volatile-GC/MS											
Batch 2223119											
Pyrene	1630	U	ND		1170	ug/kg	1	72	(0%-30%)	ND2	01/28/22 17:54
bis(2-Chloro-1-methylethyl)ether	1630	U	ND		956	ug/kg	5	59	(0%-30%)		
bis(2-Chloroethoxy)methane	1630	U	ND		869	ug/kg	5	53	(0%-30%)		
bis(2-Chloroethyl) ether	1630	U	ND		926	ug/kg	6	57	(0%-30%)		
bis(2-Ethylhexyl)phthalate	1630	U	ND		1300	ug/kg	5	80	(0%-30%)		
m,p-Cresols	1630	U	ND		994	ug/kg	3	61	(0%-30%)		
m-Nitroaniline	1630	U	ND		439	ug/kg	13	27	(0%-30%)		
o-Cresol	1630	U	ND		955	ug/kg	3	59	(0%-30%)		
o-Nitroaniline	1630	U	ND		1030	ug/kg	3	63	(0%-30%)		
p-Nitroaniline	1630	U	ND		744	ug/kg	3	46	(0%-30%)		
**2,4,6-Tribromophenol	3250		1750		2170	ug/kg		67	(26%-128%)		
**2-Fluorobiphenyl	1630		842		880	ug/kg		54	(26%-118%)		
**2-Fluorophenol	3250		1560		1630	ug/kg		50	(30%-108%)		
**Nitrobenzene-d5	1630		811		822	ug/kg		51	(28%-110%)		
**Phenol-d5	3250		1760		1870	ug/kg		57	(29%-116%)		

QC Summary

Workorder: **568586**

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Semi-Volatile-GC/MS										
Batch 2223119										
**p-Terphenyl-d14	1630	839		1130	ug/kg		69	(26%-130%)	ND2	01/28/22 17:54
Volatile-GC/MS										
Batch 2226063										
QC1205013233 LCS										
1,1,1-Trichloroethane	50.0			47.3	ug/kg		95	(71%-131%)	JM6	02/04/22 08:21
1,1,2,2-Tetrachloroethane	50.0			54.0	ug/kg		108	(69%-123%)		
1,1,2-Trichloroethane	50.0			49.4	ug/kg		99	(73%-117%)		
1,1-Dichloroethane	50.0			47.4	ug/kg		95	(72%-121%)		
1,1-Dichloroethylene	50.0			42.9	ug/kg		86	(68%-128%)		
1,2,3-Trichlorobenzene	50.0			49.1	ug/kg		98	(68%-124%)		
1,2,4-Trichlorobenzene	50.0			48.1	ug/kg		96	(66%-128%)		
1,2-Dibromo-3-chloropropane	50.0			50.5	ug/kg		101	(61%-134%)		
1,2-Dibromoethane	50.0			50.3	ug/kg		101	(76%-122%)		
1,2-Dichlorobenzene	50.0			47.9	ug/kg		96	(73%-116%)		
1,2-Dichloroethane	50.0			49.6	ug/kg		99	(66%-119%)		
1,2-Dichloropropane	50.0			51.6	ug/kg		103	(71%-120%)		
1,3-Dichlorobenzene	50.0			47.4	ug/kg		95	(71%-120%)		

QC Summary

Workorder: 568586

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Volatile-GC/MS										
Batch 2226063										
1,4-Dichlorobenzene	50.0			47.6	ug/kg		95	(71%-113%)	JM6	02/04/22 08:21
2-Butanone	250			252	ug/kg		101	(61%-134%)		
2-Hexanone	250			250	ug/kg		100	(58%-146%)		
4-Methyl-2-pentanone	250			252	ug/kg		101	(65%-126%)		
Acetone	250			254	ug/kg		102	(60%-138%)		
Benzene	50.0			51.6	ug/kg		103	(71%-120%)		
Bromochloromethane	50.0			49.5	ug/kg		99	(73%-123%)		
Bromodichloromethane	50.0			47.6	ug/kg		95	(72%-130%)		
Bromoform	50.0			50.5	ug/kg		101	(65%-134%)		
Bromomethane	50.0			39.9	ug/kg		80	(61%-138%)		
Carbon disulfide	250			253	ug/kg		101	(68%-133%)		
Carbon tetrachloride	50.0			46.4	ug/kg		93	(70%-136%)		
Chlorobenzene	50.0			48.1	ug/kg		96	(73%-118%)		
Chloroethane	50.0			37.1	ug/kg		74	(67%-125%)		
Chloroform	50.0			49.2	ug/kg		98	(75%-124%)		

QC Summary

Workorder: 568586

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Volatile-GC/MS										
Batch 2226063										
Chloromethane	50.0			37.7	ug/kg		75	(55%-131%)	JM6	02/04/22 08:21
Cyclohexane	50.0			49.4	ug/kg		99	(63%-128%)		
Dibromochloromethane	50.0			46.4	ug/kg		93	(72%-130%)		
Dichlorodifluoromethane	50.0			36.8	ug/kg		74	(48%-156%)		
Ethylbenzene	50.0			48.3	ug/kg		97	(71%-118%)		
Isopropylbenzene	50.0			52.8	ug/kg		106	(70%-122%)		
Methyl acetate	250			259	ug/kg		103	(61%-134%)		
Methylcyclohexane	50.0			49.9	ug/kg		100	(65%-127%)		
Methylene chloride	50.0			44.7	ug/kg		89	(70%-120%)		
Styrene	50.0			47.9	ug/kg		96	(72%-124%)		
Tetrachloroethylene	50.0			44.7	ug/kg		89	(70%-125%)		
Toluene	50.0			48.4	ug/kg		97	(71%-119%)		
Trichloroethylene	50.0			50.3	ug/kg		101	(72%-117%)		
Trichlorofluoromethane	50.0			39.9	ug/kg		80	(65%-131%)		
Vinyl chloride	50.0			43.6	ug/kg		87	(64%-132%)		

QC Summary

Workorder: **568586**

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Volatile-GC/MS										
Batch 2226063										
cis-1,2-Dichloroethylene	50.0			47.9	ug/kg		96	(71%-124%)	JM6	02/04/22 08:21
cis-1,3-Dichloropropylene	50.0			48.6	ug/kg		97	(74%-129%)		
m,p-Xylenes	100			97.5	ug/kg		98	(71%-120%)		
o-Xylene	50.0			49.8	ug/kg		100	(71%-122%)		
tert-Butyl methyl ether	50.0			49.4	ug/kg		99	(64%-130%)		
trans-1,2-Dichloroethylene	50.0			45.6	ug/kg		91	(71%-122%)		
trans-1,3-Dichloropropylene	50.0			48.0	ug/kg		96	(74%-125%)		
**1,2-Dichloroethane-d4	50.0			49.3	ug/L		99	(76%-127%)		
**Bromofluorobenzene	50.0			52.8	ug/L		106	(70%-130%)		
**Toluene-d8	50.0			47.9	ug/L		96	(81%-120%)		
QC1205014283 LCS										
1,1,1-Trichloroethane	50.0			45.6	ug/kg		91	(71%-131%)		02/07/22 09:22
1,1,2,2-Tetrachloroethane	50.0			49.3	ug/kg		99	(69%-123%)		
1,1,2-Trichloroethane	50.0			47.5	ug/kg		95	(73%-117%)		
1,1-Dichloroethane	50.0			47.5	ug/kg		95	(72%-121%)		
1,1-Dichloroethylene	50.0			42.1	ug/kg		84	(68%-128%)		

QC Summary

Workorder: **568586**

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Volatile-GC/MS										
Batch 2226063										
1,2,3-Trichlorobenzene	50.0			43.3	ug/kg		87	(68%-124%)	JM6	02/07/22 09:22
1,2,4-Trichlorobenzene	50.0			44.3	ug/kg		89	(66%-128%)		
1,2-Dibromo-3-chloropropane	50.0			45.0	ug/kg		90	(61%-134%)		
1,2-Dibromoethane	50.0			46.4	ug/kg		93	(76%-122%)		
1,2-Dichlorobenzene	50.0			45.4	ug/kg		91	(73%-116%)		
1,2-Dichloroethane	50.0			48.5	ug/kg		97	(66%-119%)		
1,2-Dichloropropane	50.0			49.6	ug/kg		99	(71%-120%)		
1,3-Dichlorobenzene	50.0			44.8	ug/kg		90	(71%-120%)		
1,4-Dichlorobenzene	50.0			44.7	ug/kg		89	(71%-113%)		
2-Butanone	250			231	ug/kg		92	(61%-134%)		
2-Hexanone	250			231	ug/kg		92	(58%-146%)		
4-Methyl-2-pentanone	250			238	ug/kg		95	(65%-126%)		
Acetone	250			228	ug/kg		91	(60%-138%)		
Benzene	50.0			49.3	ug/kg		99	(71%-120%)		
Bromochloromethane	50.0			47.9	ug/kg		96	(73%-123%)		

QC Summary

Workorder: 568586

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Volatile-GC/MS										
Batch 2226063										
Bromodichloromethane	50.0			46.4	ug/kg		93	(72%-130%)	JM6	02/07/22 09:22
Bromoform	50.0			47.0	ug/kg		94	(65%-134%)		
Bromomethane	50.0			52.7	ug/kg		105	(61%-138%)		
Carbon disulfide	250			243	ug/kg		97	(68%-133%)		
Carbon tetrachloride	50.0			44.7	ug/kg		89	(70%-136%)		
Chlorobenzene	50.0			46.0	ug/kg		92	(73%-118%)		
Chloroethane	50.0			45.9	ug/kg		92	(67%-125%)		
Chloroform	50.0			48.2	ug/kg		96	(75%-124%)		
Chloromethane	50.0			51.9	ug/kg		104	(55%-131%)		
Cyclohexane	50.0			46.5	ug/kg		93	(63%-128%)		
Dibromochloromethane	50.0			44.9	ug/kg		90	(72%-130%)		
Dichlorodifluoromethane	50.0			56.6	ug/kg		113	(48%-156%)		
Ethylbenzene	50.0			46.3	ug/kg		93	(71%-118%)		
Isopropylbenzene	50.0			50.2	ug/kg		100	(70%-122%)		
Methyl acetate	250			237	ug/kg		95	(61%-134%)		

QC Summary

Workorder: 568586

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Volatile-GC/MS										
Batch 2226063										
Methylcyclohexane	50.0			46.2	ug/kg		92	(65%-127%)	JM6	02/07/22 09:22
Methylene chloride	50.0			42.6	ug/kg		85	(70%-120%)		
Styrene	50.0			45.4	ug/kg		91	(72%-124%)		
Tetrachloroethylene	50.0			43.4	ug/kg		87	(70%-125%)		
Toluene	50.0			47.9	ug/kg		96	(71%-119%)		
Trichloroethylene	50.0			48.5	ug/kg		97	(72%-117%)		
Trichlorofluoromethane	50.0			50.4	ug/kg		101	(65%-131%)		
Vinyl chloride	50.0			57.0	ug/kg		114	(64%-132%)		
cis-1,2-Dichloroethylene	50.0			47.9	ug/kg		96	(71%-124%)		
cis-1,3-Dichloropropylene	50.0			46.2	ug/kg		92	(74%-129%)		
m,p-Xylenes	100			93.0	ug/kg		93	(71%-120%)		
o-Xylene	50.0			47.3	ug/kg		95	(71%-122%)		
tert-Butyl methyl ether	50.0			44.1	ug/kg		88	(64%-130%)		
trans-1,2-Dichloroethylene	50.0			44.6	ug/kg		89	(71%-122%)		
trans-1,3-Dichloropropylene	50.0			47.1	ug/kg		94	(74%-125%)		

QC Summary

Workorder: 568586

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Volatile-GC/MS										
Batch 2226063										
**1,2-Dichloroethane-d4	50.0			50.2	ug/L		100	(76%-127%)	JM6	02/07/22 09:22
**Bromofluorobenzene	50.0			52.1	ug/L		104	(70%-130%)		
**Toluene-d8	50.0			48.7	ug/L		97	(81%-120%)		
QC1205013234 MB										
1,1,1-Trichloroethane			U	ND	ug/kg					02/04/22 10:13
1,1,2,2-Tetrachloroethane			U	ND	ug/kg					
1,1,2-Trichloroethane			U	ND	ug/kg					
1,1-Dichloroethane			U	ND	ug/kg					
1,1-Dichloroethylene			U	ND	ug/kg					
1,2,3-Trichlorobenzene			U	ND	ug/kg					
1,2,4-Trichlorobenzene			U	ND	ug/kg					
1,2-Dibromo-3-chloropropane			U	ND	ug/kg					
1,2-Dibromoethane			U	ND	ug/kg					
1,2-Dichlorobenzene			U	ND	ug/kg					
1,2-Dichloroethane			U	ND	ug/kg					
1,2-Dichloropropane			U	ND	ug/kg					

QC Summary

Workorder: 568586

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Volatile-GC/MS										
Batch 2226063										
1,3-Dichlorobenzene			U	ND	ug/kg				JM6	02/04/22 10:13
1,4-Dichlorobenzene			U	ND	ug/kg					
1,4-Dioxane			U	ND	ug/kg					
2-Butanone			U	ND	ug/kg					
2-Hexanone			U	ND	ug/kg					
4-Methyl-2-pentanone			U	ND	ug/kg					
Acetone			U	ND	ug/kg					
Benzene			U	ND	ug/kg					
Bromochloromethane			U	ND	ug/kg					
Bromodichloromethane			U	ND	ug/kg					
Bromoform			U	ND	ug/kg					
Bromomethane			U	ND	ug/kg					
Carbon disulfide			U	ND	ug/kg					
Carbon tetrachloride			U	ND	ug/kg					
Chlorobenzene			U	ND	ug/kg					

QC Summary

Workorder: **568586**

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Volatile-GC/MS										
Batch 2226063										
Chloroethane			U	ND	ug/kg				JM6	02/04/22 10:13
Chloroform			U	ND	ug/kg					
Chloromethane			U	ND	ug/kg					
Cyclohexane			U	ND	ug/kg					
Dibromochloromethane			U	ND	ug/kg					
Dichlorodifluoromethane			U	ND	ug/kg					
Ethylbenzene			U	ND	ug/kg					
Isopropylbenzene			U	ND	ug/kg					
Methyl acetate			U	ND	ug/kg					
Methylcyclohexane			U	ND	ug/kg					
Methylene chloride			U	ND	ug/kg					
Styrene			U	ND	ug/kg					
Tetrachloroethylene			U	ND	ug/kg					
Toluene			U	ND	ug/kg					
Trichloroethylene			U	ND	ug/kg					

QC Summary

Workorder: 568586

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Volatile-GC/MS										
Batch 2226063										
Trichlorofluoromethane			U	ND	ug/kg				JM6	02/04/22 10:13
Trichlorotrifluoroethane			U	ND	ug/kg					
Vinyl chloride			U	ND	ug/kg					
cis-1,2-Dichloroethylene			U	ND	ug/kg					
cis-1,3-Dichloropropylene			U	ND	ug/kg					
m,p-Xylenes			U	ND	ug/kg					
o-Xylene			U	ND	ug/kg					
tert-Butyl methyl ether			U	ND	ug/kg					
trans-1,2-Dichloroethylene			U	ND	ug/kg					
trans-1,3-Dichloropropylene			U	ND	ug/kg					
**1,2-Dichloroethane-d4	50.0			47.0	ug/L		94	(76%-127%)		
**Bromofluorobenzene	50.0			50.0	ug/L		100	(70%-130%)		
**Toluene-d8	50.0			48.2	ug/L		96	(81%-120%)		
QC1205014284 MB										
1,1,1-Trichloroethane			U	ND	ug/kg					02/07/22 11:08
1,1,2,2-Tetrachloroethane			U	ND	ug/kg					

QC Summary

Workorder: **568586**

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Volatile-GC/MS										
Batch 2226063										
1,1,2-Trichloroethane			U	ND	ug/kg				JM6	02/07/22 11:08
1,1-Dichloroethane			U	ND	ug/kg					
1,1-Dichloroethylene			U	ND	ug/kg					
1,2,3-Trichlorobenzene			U	ND	ug/kg					
1,2,4-Trichlorobenzene			U	ND	ug/kg					
1,2-Dibromo-3-chloropropane			U	ND	ug/kg					
1,2-Dibromoethane			U	ND	ug/kg					
1,2-Dichlorobenzene			U	ND	ug/kg					
1,2-Dichloroethane			U	ND	ug/kg					
1,2-Dichloropropane			U	ND	ug/kg					
1,3-Dichlorobenzene			U	ND	ug/kg					
1,4-Dichlorobenzene			U	ND	ug/kg					
1,4-Dioxane			U	ND	ug/kg					
2-Butanone			U	ND	ug/kg					
2-Hexanone			U	ND	ug/kg					

QC Summary

Workorder: **568586**

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Volatile-GC/MS										
Batch 2226063										
4-Methyl-2-pentanone			U	ND	ug/kg				JM6	02/07/22 11:08
Acetone			U	ND	ug/kg					
Benzene			U	ND	ug/kg					
Bromochloromethane			U	ND	ug/kg					
Bromodichloromethane			U	ND	ug/kg					
Bromoform			U	ND	ug/kg					
Bromomethane			U	ND	ug/kg					
Carbon disulfide			U	ND	ug/kg					
Carbon tetrachloride			U	ND	ug/kg					
Chlorobenzene			U	ND	ug/kg					
Chloroethane			U	ND	ug/kg					
Chloroform			U	ND	ug/kg					
Chloromethane			U	ND	ug/kg					
Cyclohexane			U	ND	ug/kg					
Dibromochloromethane			U	ND	ug/kg					

QC Summary

Workorder: 568586

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Volatile-GC/MS										
Batch 2226063										
Dichlorodifluoromethane			U	ND	ug/kg				JM6	02/07/22 11:08
Ethylbenzene			U	ND	ug/kg					
Isopropylbenzene			U	ND	ug/kg					
Methyl acetate			U	ND	ug/kg					
Methylcyclohexane			U	ND	ug/kg					
Methylene chloride			U	ND	ug/kg					
Styrene			U	ND	ug/kg					
Tetrachloroethylene			U	ND	ug/kg					
Toluene			U	ND	ug/kg					
Trichloroethylene			U	ND	ug/kg					
Trichlorofluoromethane			U	ND	ug/kg					
Trichlorotrifluoroethane			U	ND	ug/kg					
Vinyl chloride			U	ND	ug/kg					
cis-1,2-Dichloroethylene			U	ND	ug/kg					
cis-1,3-Dichloropropylene			U	ND	ug/kg					

QC Summary

Workorder: 568586

Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Volatile-GC/MS											
Batch 2226063											
m,p-Xylenes				U	ND	ug/kg				JM6	02/07/22 11:08
o-Xylene				U	ND	ug/kg					
tert-Butyl methyl ether				U	ND	ug/kg					
trans-1,2-Dichloroethylene				U	ND	ug/kg					
trans-1,3-Dichloropropylene				U	ND	ug/kg					
**1,2-Dichloroethane-d4	50.0				46.9	ug/L		94	(76%-127%)		
**Bromofluorobenzene	50.0				49.7	ug/L		99	(70%-130%)		
**Toluene-d8	50.0				48.8	ug/L		98	(81%-120%)		
QC1205013235 568814005 PS											
1,1,1-Trichloroethane	50.0	U	ND		41.6	ug/L		83	(60%-135%)		02/07/22 16:29
1,1,2,2-Tetrachloroethane	50.0	U	ND		45.7	ug/L		91	(53%-130%)		
1,1,2-Trichloroethane	50.0	U	ND		45.0	ug/L		90	(51%-132%)		
1,1-Dichloroethane	50.0	U	ND		44.2	ug/L		88	(62%-124%)		
1,1-Dichloroethylene	50.0	U	ND		38.6	ug/L		77	(53%-136%)		
1,2,3-Trichlorobenzene	50.0	U	ND		38.1	ug/L		76	(31%-137%)		
1,2,4-Trichlorobenzene	50.0	U	ND		37.5	ug/L		75	(29%-142%)		

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QC Summary

Workorder: 568586

Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Volatile-GC/MS											
Batch 2226063											
1,2-Dibromo-3-chloropropane	50.0	U	ND		39.2	ug/L		78	(42%-135%)	JM6	02/07/22 16:29
1,2-Dibromoethane	50.0	U	ND		43.8	ug/L		88	(55%-129%)		
1,2-Dichlorobenzene	50.0	U	ND		41.8	ug/L		84	(33%-128%)		
1,2-Dichloroethane	50.0	U	ND		43.6	ug/L		87	(58%-122%)		
1,2-Dichloropropane	50.0	U	ND		46.3	ug/L		93	(56%-121%)		
1,3-Dichlorobenzene	50.0	U	ND		40.7	ug/L		81	(36%-132%)		
1,4-Dichlorobenzene	50.0	U	ND		40.6	ug/L		81	(31%-125%)		
2-Butanone	250	U	ND		204	ug/L		82	(36%-139%)		
2-Hexanone	250	U	ND		209	ug/L		83	(32%-146%)		
4-Methyl-2-pentanone	250	U	ND		215	ug/L		86	(48%-131%)		
Acetone	250	J	3.58		204	ug/L		80	(33%-148%)		
Benzene	50.0	U	ND		46.9	ug/L		94	(54%-126%)		
Bromochloromethane	50.0	U	ND		43.7	ug/L		87	(59%-125%)		
Bromodichloromethane	50.0	U	ND		41.3	ug/L		83	(56%-130%)		
Bromoform	50.0	U	ND		41.3	ug/L		83	(50%-136%)		

QC Summary

Workorder: 568586

Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Volatile-GC/MS											
Batch 2226063											
Bromomethane	50.0	U	ND		48.5	ug/L		97	(33%-139%)	JM6	02/07/22 16:29
Carbon disulfide	250	U	ND		220	ug/L		88	(49%-139%)		
Carbon tetrachloride	50.0	U	ND		41.3	ug/L		83	(51%-138%)		
Chlorobenzene	50.0	U	ND		43.5	ug/L		87	(46%-126%)		
Chloroethane	50.0	U	ND		42.9	ug/L		86	(48%-126%)		
Chloroform	50.0	U	ND		44.9	ug/L		90	(61%-126%)		
Chloromethane	50.0	U	ND		47.5	ug/L		95	(44%-143%)		
Cyclohexane	50.0	J	0.680		44.6	ug/L		88	(42%-137%)		
Dibromochloromethane	50.0	U	ND		40.6	ug/L		81	(53%-132%)		
Dichlorodifluoromethane	50.0	U	ND		52.8	ug/L		106	(45%-149%)		
Ethylbenzene	50.0	U	ND		43.6	ug/L		87	(43%-128%)		
Isopropylbenzene	50.0	U	ND		48.2	ug/L		96	(39%-142%)		
Methyl acetate	250	U	ND		218	ug/L		87	(48%-144%)		
Methylcyclohexane	50.0	U	ND		43.1	ug/L		86	(34%-140%)		
Methylene chloride	50.0	U	ND		41.5	ug/L		83	(56%-124%)		

QC Summary

Workorder: 568586

Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Volatile-GC/MS											
Batch 2226063											
Styrene	50.0	U	ND		42.5	ug/L		85	(39%-132%)	JM6	02/07/22 16:29
Tetrachloroethylene	50.0	U	ND		40.9	ug/L		82	(46%-134%)		
Toluene	50.0	J	0.420		45.9	ug/L		91	(52%-127%)		
Trichloroethylene	50.0	U	ND		45.1	ug/L		90	(52%-132%)		
Trichlorofluoromethane	50.0	U	ND		46.8	ug/L		94	(52%-130%)		
Vinyl chloride	50.0	U	ND		52.5	ug/L		105	(53%-138%)		
cis-1,2-Dichloroethylene	50.0	U	ND		44.9	ug/L		90	(56%-128%)		
cis-1,3-Dichloropropylene	50.0	U	ND		42.4	ug/L		85	(49%-133%)		
m,p-Xylenes	100	U	ND		88.5	ug/L		89	(40%-128%)		
o-Xylene	50.0	U	ND		45.0	ug/L		90	(43%-129%)		
tert-Butyl methyl ether	50.0	U	ND		41.3	ug/L		83	(52%-135%)		
trans-1,2-Dichloroethylene	50.0	U	ND		41.4	ug/L		83	(54%-126%)		
trans-1,3-Dichloropropylene	50.0	U	ND		43.0	ug/L		86	(49%-134%)		
**1,2-Dichloroethane-d4	50.0		48.9		48.6	ug/L		97	(76%-127%)		
**Bromofluorobenzene	50.0		55.0		51.8	ug/L		104	(70%-130%)		

QC Summary

Workorder: **568586**

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Volatile-GC/MS										
Batch 2226063										
**Toluene-d8	50.0	53.8		49.5	ug/L		99	(81%-120%)	JM6	02/07/22 16:29
QC1205013236 568814005 PSD										
1,1,1-Trichloroethane	50.0	U ND		43.4	ug/L	4	87	(0%-20%)		02/07/22 16:55
1,1,2,2-Tetrachloroethane	50.0	U ND		48.6	ug/L	6	97	(0%-20%)		
1,1,2-Trichloroethane	50.0	U ND		46.4	ug/L	3	93	(0%-20%)		
1,1-Dichloroethane	50.0	U ND		45.4	ug/L	3	91	(0%-20%)		
1,1-Dichloroethylene	50.0	U ND		38.8	ug/L	1	78	(0%-20%)		
1,2,3-Trichlorobenzene	50.0	U ND		38.7	ug/L	2	77	(0%-20%)		
1,2,4-Trichlorobenzene	50.0	U ND		37.0	ug/L	1	74	(0%-20%)		
1,2-Dibromo-3-chloropropane	50.0	U ND		42.8	ug/L	9	86	(0%-20%)		
1,2-Dibromoethane	50.0	U ND		45.9	ug/L	5	92	(0%-20%)		
1,2-Dichlorobenzene	50.0	U ND		42.5	ug/L	2	85	(0%-20%)		
1,2-Dichloroethane	50.0	U ND		44.9	ug/L	3	90	(0%-20%)		
1,2-Dichloropropane	50.0	U ND		47.7	ug/L	3	95	(0%-20%)		
1,3-Dichlorobenzene	50.0	U ND		41.4	ug/L	2	83	(0%-20%)		
1,4-Dichlorobenzene	50.0	U ND		41.0	ug/L	1	82	(0%-20%)		

GEL LABORATORIES LLC

2040 Savage Road Charleston, SC 29407 - (843) 556-8171 - www.gel.com

QC Summary

Workorder: 568586

Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Volatile-GC/MS											
Batch 2226063											
2-Butanone	250	U	ND		215	ug/L	5	86	(0%-20%)	JM6	02/07/22 16:55
2-Hexanone	250	U	ND		218	ug/L	5	87	(0%-20%)		
4-Methyl-2-pentanone	250	U	ND		222	ug/L	3	89	(0%-20%)		
Acetone	250	J	3.58		212	ug/L	4	83	(0%-20%)		
Benzene	50.0	U	ND		48.6	ug/L	4	97	(0%-20%)		
Bromochloromethane	50.0	U	ND		45.0	ug/L	3	90	(0%-20%)		
Bromodichloromethane	50.0	U	ND		43.1	ug/L	4	86	(0%-20%)		
Bromoform	50.0	U	ND		44.6	ug/L	8	89	(0%-20%)		
Bromomethane	50.0	U	ND		51.9	ug/L	7	104	(0%-20%)		
Carbon disulfide	250	U	ND		225	ug/L	2	90	(0%-20%)		
Carbon tetrachloride	50.0	U	ND		41.9	ug/L	2	84	(0%-20%)		
Chlorobenzene	50.0	U	ND		44.5	ug/L	2	89	(0%-20%)		
Chloroethane	50.0	U	ND		45.0	ug/L	5	90	(0%-20%)		
Chloroform	50.0	U	ND		45.5	ug/L	1	91	(0%-20%)		
Chloromethane	50.0	U	ND		49.8	ug/L	5	100	(0%-20%)		

QC Summary

Workorder: **568586**

Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Volatile-GC/MS											
Batch 2226063											
Cyclohexane	50.0	J	0.680		44.9	ug/L	1	89	(0%-20%)	JM6	02/07/22 16:55
Dibromochloromethane	50.0	U	ND		41.7	ug/L	3	83	(0%-20%)		
Dichlorodifluoromethane	50.0	U	ND		54.3	ug/L	3	109	(0%-20%)		
Ethylbenzene	50.0	U	ND		44.3	ug/L	2	89	(0%-20%)		
Isopropylbenzene	50.0	U	ND		48.9	ug/L	2	98	(0%-20%)		
Methyl acetate	250	U	ND		228	ug/L	4	91	(0%-20%)		
Methylcyclohexane	50.0	U	ND		42.9	ug/L	0	86	(0%-20%)		
Methylene chloride	50.0	U	ND		42.1	ug/L	2	84	(0%-20%)		
Styrene	50.0	U	ND		43.9	ug/L	3	88	(0%-20%)		
Tetrachloroethylene	50.0	U	ND		39.1	ug/L	4	78	(0%-20%)		
Toluene	50.0	J	0.420		46.1	ug/L	0	91	(0%-20%)		
Trichloroethylene	50.0	U	ND		47.0	ug/L	4	94	(0%-20%)		
Trichlorofluoromethane	50.0	U	ND		47.6	ug/L	2	95	(0%-20%)		
Vinyl chloride	50.0	U	ND		56.2	ug/L	7	112	(0%-20%)		
cis-1,2-Dichloroethylene	50.0	U	ND		45.9	ug/L	2	92	(0%-20%)		

QC Summary

Workorder: 568586

Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date Time
Volatile-GC/MS											
Batch 2226063											
cis-1,3-Dichloropropylene	50.0	U	ND		43.7	ug/L	3	87	(0%-20%)	JM6	02/07/22 16:55
m,p-Xylenes	100	U	ND		89.3	ug/L	1	89	(0%-20%)		
o-Xylene	50.0	U	ND		46.2	ug/L	3	92	(0%-20%)		
tert-Butyl methyl ether	50.0	U	ND		42.8	ug/L	4	86	(0%-20%)		
trans-1,2-Dichloroethylene	50.0	U	ND		41.7	ug/L	1	83	(0%-20%)		
trans-1,3-Dichloropropylene	50.0	U	ND		44.0	ug/L	2	88	(0%-20%)		
**1,2-Dichloroethane-d4	50.0		48.9		48.5	ug/L		97	(76%-127%)		
**Bromofluorobenzene	50.0		55.0		52.2	ug/L		104	(70%-130%)		
**Toluene-d8	50.0		53.8		49.6	ug/L		99	(81%-120%)		

Notes:

The Qualifiers in this report are defined as follows:

- ** Analyte is a surrogate compound
- < Result is less than value reported
- > Result is greater than value reported
- A The TIC is a suspected aldol-condensation product
- B The target analyte was detected in the associated blank.
- C Analyte has been confirmed by GC/MS analysis
- D Results are reported from a diluted aliquot of the sample
- E %difference of sample and SD is >10%. Sample concentration must meet flagging criteria
- E Concentration of the target analyte exceeds the instrument calibration range
- FB Mercury was found present at quantifiable concentrations in field blanks received with these samples. Data associated with the blank are deemed invalid for reporting to regulatory agencies
- H Analytical holding time was exceeded

QC Summary

Workorder: 568586

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time

J	See case narrative for an explanation
J	Value is estimated
JNX	Non Calibrated Compound
N	Metals--The Matrix spike sample recovery is not within specified control limits
N	Organics--Presumptive evidence based on mass spectral library search to make a tentative identification of the analyte (TIC). Quantitation is based on nearest internal standard response factor
N	Presumptive evidence based on mass spectral library search to make a tentative identification of the analyte (TIC). Quantitation is based on nearest internal standard response factor
N/A	RPD or %Recovery limits do not apply.
N1	See case narrative
ND	Analyte concentration is not detected above the detection limit
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
P	Organics--The concentrations between the primary and confirmation columns/detectors is >40% different. For HPLC, the difference is >70%.
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.
R	Sample results are rejected
U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
UJ	Compound cannot be extracted
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Y	Other specific qualifiers were required to properly define the results. Consult case narrative.
Y	QC Samples were not spiked with this compound
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.
h	Preparation or preservation holding time was exceeded

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.
^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.
* Indicates that a Quality Control parameter was not within specifications.
For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

Technical Case Narrative
Industrial Prepay Accounts
SDG #: 568586

GC/MS Volatile

Product: **Volatile Organic Compounds (VOC) by Gas Chromatograph/Mass Spectrometer**
Analytical Method: SW846 8260D
Analytical Procedure: GL-OA-E-038 REV# 28
Analytical Batch: 2226063

Preparation Method: SW846 5035A
Preparation Procedure: GL-OA-E-039 REV# 13
Preparation Batch: 2226061

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
568586001	SB-4
568586002	SB-5
568586003	SB-6
568586004	SB-7
568586005	SB-8
568586006	SB-9
568586007	SB-10
568586008	SB-11
1205013233	Laboratory Control Sample (LCS)
1205013234	Method Blank (MB)
1205013235	568814005(NonSDG) Post Spike (PS)
1205013236	568814005(NonSDG) Post Spike Duplicate (PSD)
1205014283	Laboratory Control Sample (LCS)
1205014284	Method Blank (MB)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Calibration Information

Continuing Calibration Verification Requirements
All Calibration Verification Standards (CCV) did not meet the acceptance criteria as outlined in Method 8260D for samples and the associated QC. However, the method allows for a designated number of outliers dependent on the requested analyte list. This SDG satisfied the 8260D outlier acceptance criteria. The results are reported.

Technical Information

Sample Dilutions/Methanol Dilutions
Samples 568586001 (SB-4), 568586003 (SB-6), 568586004 (SB-7), 568586005 (SB-8), 568586006 (SB-9) and 568586007 (SB-10) were analyzed using a methanol dilution extraction procedure because the sample matrices

were not amenable to more concentrated analyses.

Analyte	568586					
	001	003	004	005	006	007
Several	50X	50X	50X	50X	50X	50X

Sample Re-extraction/Re-analysis
Samples 1205013235 (Non SDG 568814005PS), 1205013236 (Non SDG 568814005PSD), 568586001 (SB-4), 568586003 (SB-6), 568586004 (SB-7), 568586005 (SB-8), 568586006 (SB-9) and 568586007 (SB-10) were re-analyzed due to unacceptable surrogate or internal standard recoveries in the initial analysis. The re-analyses confirmed/and or passed and were reported.

GC/MS Semivolatile

Product: **Analysis of Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry**
Analytical Method: SW846 3541/8270E
Analytical Procedure: GL-OA-E-009 REV# 46
Analytical Batch: 2223119

Preparation Method: SW846 3541
Preparation Procedure: GL-OA-E-066 REV# 9
Preparation Batch: 2223116

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
568586001	SB-4
568586002	SB-5
568586003	SB-6
568586004	SB-7
568586005	SB-8
568586006	SB-9
568586007	SB-10
568586008	SB-11
1205007309	Method Blank (MB)
1205007310	Laboratory Control Sample (LCS)
1205007311	568503017(NonSDG) Matrix Spike (MS)
1205007312	568503017(NonSDG) Matrix Spike Duplicate (MSD)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Quality Control (QC) Information

Laboratory Control Sample (LCS) Recovery

The LCS and/or LCSD (See Below) did not meet spike recovery acceptance criteria. The failures are known to be poor responding analytes as stated per the Method. This may account for the low recoveries and the data were reported.

Sample	Analyte	Value
1205007310 (LCS)	4-Chloroaniline	33* (36%-90%)

The LCS and/or LCSD (See Below) spike recoveries were not within the acceptance limits. The associated MS and/or MSD passed recoveries. It appears that the low spike recoveries were isolated to the LCS or LCSD only and were the result of a poor extraction.

Sample	Analyte	Value
1205007310 (LCS)	1, 1'-Biphenyl	53* (57%-118%)
	2, 4-Dimethylphenol	45* (47%-96%)
	2-Nitrophenol	52* (53%-113%)
	Acenaphthylene	54* (55%-104%)
	Acetophenone	48* (50%-103%)
	Benzaldehyde	9* (25%-83%)
	Benzo(a)anthracene	52* (58%-110%)
	bis(2-Chloroethoxy)methane	50* (52%-100%)

Spike Recovery Statement
The MS or MSD (See Below) recovered spiked analytes outside of the established acceptance limits. As similar recoveries were displayed in the MS and MSD, the failures were attributed to sample matrix interference and the data were reported.

Sample	Analyte	Value
1205007311 (Non SDG 568503017MS)	3, 3'-Dichlorobenzidine	11* (12%-110%)
1205007312 (Non SDG 568503017MSD)	3, 3'-Dichlorobenzidine	11* (12%-110%)

The MS and/or MSD (See Below) did not meet spike recovery acceptance criteria. The failures are known to be poor responding analytes as stated per the Method. This may account for the low recoveries and the data were reported.

Sample	Analyte	Value
1205007311 (Non SDG 568503017MS)	4-Chloroaniline	15* (26%-88%)
1205007312 (Non SDG 568503017MSD)	4-Chloroaniline	13* (26%-88%)

<u>Technical Information</u>

Sample Dilutions
Samples 568586001 (SB-4), 568586003 (SB-6), 568586004 (SB-7), 568586005 (SB-8), 568586006 (SB-9), 568586007 (SB-10) and 568586008 (SB-11) were diluted due to the presence of non-target analytes. The data from the dilutions are reported.

Miscellaneous Information

Additional Comments
Diphenylamine Statement
Diphenylamine has now superseded N-Nitroso-diphenylamine as a CCC in EPA Method 8270C. Previous versions of EPA Method 8270 (prior to 8270C) listed N-Nitroso-diphenylamine as a CCC. However, as stated in EPA Method 8270C, Revision 3, December, 1996, Section 1.4.5, "N-Nitroso-diphenylamine decomposes in the gas chromatographic inlet and cannot be separated from Diphenylamine." Studies of these two compounds at GEL, both independent of each other and together, show that they not only coelute, but also have similar mass spectra. The GEL Mobile Lab will report N-Nitroso-diphenylamine and Diphenylamine as N-Nitroso-diphenylamine on all reports and forms.

Metals

Product: **Determination of Metals by ICP**
Analytical Method: SW846 3050B/6010D
Analytical Procedure: GL-MA-E-013 REV# 32
Analytical Batch: 2222991

Preparation Method: SW846 3050B
Preparation Procedure: GL-MA-E-009 REV# 29
Preparation Batch: 2222990

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
568586001	SB-4
568586002	SB-5
568586003	SB-6
568586004	SB-7
568586005	SB-8
568586006	SB-9
568586007	SB-10
568586008	SB-11
1205007050	Method Blank (MB)**ICP**
1205007051	Laboratory Control Sample (LCS)
1205007054	568586001(SB-4L) Serial Dilution (SD)
1205007052	568586001(SB-4D) Sample Duplicate (DUP)
1205007053	568586001(SB-4S) Matrix Spike (MS)

The samples in this SDG were analyzed on a "dry weight" basis.

Data Summary:

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

Technical Information

Preparation/Analytical Method Verification
Method SW-846 3050B is not a total digestion technique for most samples. It is a very strong acid digestion that will dissolve almost all elements that could become environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

Radiochemistry

Product: **Dry Weight**
Preparation Method: ASTM D 2216 (Modified)
Preparation Procedure: GL-OA-E-020 REV# 13
Preparation Batch: 2222977

The following samples were analyzed using the above methods and analytical procedure(s).

GEL Sample ID#	Client Sample Identification
568586001	SB-4
568586002	SB-5
568586003	SB-6
568586004	SB-7
568586005	SB-8
568586006	SB-9
568586007	SB-10
568586008	SB-11
1205007033	568586001(SB-4) Sample Duplicate (DUP)

The samples in this SDG were analyzed on an "as received" basis.

Data Summary:

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

Page: 1 of 1
Project #: PPAY00421
GEL Quote #:
COC Number (1):
PO Number:

GEL Laboratories LLC
Chemistry | Radiochemistry | Radiobioassay | Specialty Analytics

Chain of Custody and Analytical Request

568586

GEL Work Order Number: *GEL Project Manager: Samuel Hogan*

GEL Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: Neeld Wilson Phone #: (407)853-4555 ext 24
Project/Site Name: HAZMAT PH2 Fax #
Address: 1928 Boothe Circle, , Longwood, FL 32750
Collected By: WILSON Send Results To: neeld@gearengineer.com

Sample Analysis Requested (5) (Fill in the number of containers for each test)

<-- Preservative Type (6)

Sample ID * For composites - indicate start and stop date/time	*Date Collected (mm-dd-yy)	*Time Collected (Military) (hhmm)	QC Code (2)	Field Filtered (3)	Sample Matrix (4)	Should this sample be considered: Radioactive (If yes, please supply isotopic info.)	(7) Known or possible Hazards	Total number of containers	VOCs	SVOCs/Metals								Comments Note: extra sample is required for sample specific QC
SB-4	1-26-22	9:45a	G		SO	N	N	5	✓	✓								
SB-5	1-26-22	10:15a	G		SO	N	N	5	✓	✓								
SB-6	1-26-22	11:45a	G		SO	N	N	5	✓	✓								
SB-7	1-26-22	11:00a	G		SO	N	N	5	✓	✓								
SB-8	1-26-22	11:15a	G		SO	N	N	5	✓	✓								
SB-9	1-26-22	12:10p	G		SO	N	N	5	✓	✓								
SB-10	1-26-22	12:20p	G	-	SO	N	N	5	✓	✓								
SB-11	1-26-22	12:30	G		SO	N	N	5	✓	✓								

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
[signature]	1/26/22	1:25p	1 [signature]	1/26/22	1325
2			2		
3			3		

TAT Requested: Normal: ____ Rush: ____ Specify: ________

Fax Results: [ ] Yes [ ] No

Select Deliverable: [ ] C of A [ ] QC Summary [ ] level 1 [ ] Level 2 [ ] Level 3 [ ] Level 4

Additional Remarks: 203557

For Lab Receiving Use Only: Custody Seal Intact? [ ] Yes [ ] No Cooler Temp: 4 °C

> For sample shipping and delivery details, see Sample Receipt & Review form (SRR.)

Sample Collection Time Zone: [ ] Eastern [ ] Pacific [ ] Central [ ] Mountain [ ] Other:

1.) Chain of Custody Number = Client Determined

2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite

3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.

4.) Matrix Codes: DW=Drinking Water, GW=Groundwater, SW=Surface Water, WW=Waste Water, W=Water, ML=Misc Liquid, SO=Soil, SD=Sediment, SL=Sludge, SS=Solid Waste, O=Oil, F=Filter, P=Wipe, U=Urine, F=Fecal, N=Nasal

5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. 8260B - 3, 6010B/7470A - 1).

6.) Preservative Type: HA = Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = Hexane, ST = Sodium Thiosulfate, If no preservative is added = leave field blank

7.) KNOWN OR POSSIBLE HAZARDS

RCRA Metals
As = Arsenic **Hg= Mercury**
Ba = Barium **Se= Selenium**
Cd = Cadmium **Ag= Silver**
Cr = Chromium **MR= Misc. RCRA metals**
Pb = Lead

Characteristic Hazards
FL = Flammable/Ignitable
CO = Corrosive
RE = Reactive

TSCA Regulated
PCB = Polychlorinated biphenyls

Listed Waste
LW= Listed Waste
(F,K,P and U-listed wastes.)
Waste code(s):

Other
OT= Other / Unknown
(i.e.: High/low pH, asbestos, beryllium, irritants, other misc. health hazards, etc.)
Description:

Please provide any additional details below regarding handling and/or disposal concerns. (i.e.: Origin of sample(s), type of site collected from, odd matrices, etc.)

GEL Laboratories LLC

SAMPLE RECEIPT & REVIEW FORM

Client: PPAY	SDG/AR/COC/Work Order: 568586
Received By: STACY BOONE	Date Received: JANUARY 26, 2022
Carrier and Tracking Number	Circle Applicable: FedEx Express FedEx Ground UPS Field Services Courier Other

Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.
A)Shipped as a DOT Hazardous?			Hazard Class Shipped: UN#: If UN2910, Is the Radioactive Shipment Survey Compliant? Yes___ No___
B) Did the client designate the samples are to be received as radioactive?			COC notation or radioactive stickers on containers equal client designation.
C) Did the RSO classify the samples as radioactive?			Maximum Net Counts Observed* (Observed Counts - Area Background Counts): ___0___CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3
D) Did the client designate samples are hazardous?			COC notation or hazard labels on containers equal client designation.
E) Did the RSO identify possible hazards?			If D or E is yes, select Hazards below. PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

	Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1	Shipping containers received intact and sealed?				Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2	Chain of custody documents included with shipment?				Circle Applicable: Client contacted and provided COC COC created upon receipt
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*				Preservation Method: Wet Ice Ice Packs Dry ice None Other: *all temperatures are recorded in Celsius TEMP: 4 C
4	Daily check performed and passed on IR temperature gun?				Temperature Device Serial #: IR7-21 Secondary Temperature Device Serial # (If Applicable):
5	Sample containers intact and sealed?				Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6	Samples requiring chemical preservation at proper pH?				Sample ID's and Containers Affected: If Preservation added, Lot#:
7	Do any samples require Volatile Analysis?				If Yes, are Encores or Soil Kits present for solids? Yes___ No___ NA___(If yes, take to VOA Freezer) Do liquid VOA vials contain acid preservation? Yes___ No___ NA___(If unknown, select No) Are liquid VOA vials free of headspace? Yes___ No___ NA___ Sample ID's and containers affected:
8	Samples received within holding time?				ID's and tests affected:
9	Sample ID's on COC match ID's on bottles?				ID's and containers affected:
10	Date & time on COC match date & time on bottles?				Circle Applicable: No dates on containers No times on containers COC missing info Other (describe)
11	Number of containers received match number indicated on COC?				Circle Applicable: No container count on COC Other (describe)
12	Are sample containers identifiable as GEL provided by use of GEL labels?				
13	COC form is properly signed in relinquished/received sections?				Circle Applicable: Not relinquished Other (describe)

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials NRC Date 1/28/22 Page 1 of 1

GL-CHL-SR-001 Rev 7

List of current GEL Certifications as of 08 February 2022

State	Certification
Alabama	42200
Alaska	17−018
Alaska Drinking Water	SC00012
Arkansas	88−0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH−0169
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330−15−00283, P330−15−00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho	SC00012
Illinois NELAP	200029
Indiana	C−SC−01
Kansas NELAP	E−10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana Drinking Water	LA024
Louisiana NELAP	03046 (AI33904)
Maine	2019020
Maryland	270
Massachusetts	M−SC012
Massachusetts PFAS Approv	Letter
Michigan	9976
Mississippi	SC00012
Nebraska	NE−OS−26−13
Nevada	SC000122021−1
New Hampshire NELAP	2054
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R−158
Oklahoma	2019−165
Pennsylvania NELAP	68−00485
Puerto Rico	SC00012
S. Carolina Radiochem	10120002
Sanitation Districts of L	9255651
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235−21−19
Utah NELAP	SC000122021−36
Vermont	VT87156
Virginia NELAP	460202
Washington	C780

APPENDIX C
LAB CHAIN OF CUSTODY AND FIELD NOTES

Page: 1 of 1
Project #: PPAY00421
GEL Quote #:
COC Number (1):
PO Number:

GEL Laboratories LLC
Chemistry | Radiochemistry | Radiobioassay | Specialty Analytics

Chain of Custody and Analytical Request

GEL Work Order Number: *GEL Project Manager: Samuel Hogan*

GEL Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: Neeld Wilson Phone #: (407)853-4555 ext 24
Project/Site Name: HAZMAT PH2 Fax #
Address: 1928 Boothe Circle, , Longwood, FL 32750
Collected By: WILSON Send Results To: neeld@gearengineer.com

Sample Analysis Requested (5) (Fill in the number of containers for each test)

Sample ID * For composites - indicate start and stop date/time	*Date Collected (mm-dd-yy)	*Time Collected (Military) (hhmm)	QC Code (2)	Field Filtered (3)	Sample Matrix (4)	Should this sample be considered: Radioactive (If yes, please supply isotopic info.)	(7) Known or possible Hazards	Total number of containers	VOCs	SVOCs/Metals									<– Preservative Type (6) Comments Note: extra sample is required for sample specific QC
SB-4	1-26-22	9:45a	G		SO	N	N	5	✓	✓									
SB-5	1-26-22	10:15a	G		SO	N	N	5	✓	✓									
SB-6	1-26-22	11:45a	G		SO	N	N	5	✓	✓									
SB-7	1-26-22	11:00a	G		SO	N	N	5	✓	✓									
SB-8	1-26-22	11:15a	G		SO	N	N	5	✓	✓									
SB-9	1-26-22	12:10p	G		SO	N	N	5	✓	✓									
SB-10	1-26-22	12:20p	G	-	SO	N	N	5	✓	✓									
SB-11	1-26-22	12:30	G		SO	N	N	5	✓	✓									

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1 [signature]	1/26/22	1:25p	1 [signature]	1/26/22	1325
2			2		
3			3		

TAT Requested: Normal: ____ Rush: ____ Specify: ____

Fax Results: [ ] Yes [ ] No

Select Deliverable: [ ] C of A [ ] QC Summary [ ] level 1 [ ] Level 2 [ ] Level 3 [ ] Level 4

Additional Remarks: 203557

For Lab Receiving Use Only: Custody Seal Intact? [ ] Yes [ ] No Cooler Temp: 4 °C

> For sample shipping and delivery details, see Sample Receipt & Review form (SRR.)

Sample Collection Time Zone: [ ] Eastern [ ] Pacific [ ] Central [ ] Mountain [ ] Other:

1.) Chain of Custody Number = Client Determined

2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite

3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.

4.) Matrix Codes: DW=Drinking Water, GW=Groundwater, SW=Surface Water, WW=Waste Water, W=Water, ML=Misc Liquid, SO=Soil, SD=Sediment, SL=Sludge, SS=Solid Waste, O=Oil, F=Filter, P=Wipe, U=Urine, F=Fecal, N=Nasal

5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. 8260B - 3, 6010B/7470A - 1).

6.) Preservative Type: HA = Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = Hexane, ST = Sodium Thiosulfate, If no preservative is added = leave field blank

7.) KNOWN OR POSSIBLE HAZARDS

RCRA Metals
As = Arsenic Hg= Mercury
Ba = Barium Se= Selenium
Cd = Cadmium Ag= Silver
Cr = Chromium MR= Misc. RCRA metals
Pb = Lead

Characteristic Hazards
FL = Flammable/Ignitable
CO = Corrosive
RE = Reactive

TSCA Regulated
PCB = Polychlorinated biphenyls

Listed Waste
LW= Listed Waste
(F,K,P and U-listed wastes.)
Waste code(s):

Other
OT= Other / Unknown
(i.e.: High/low pH, asbestos, beryllium, irritants, other misc. health hazards, etc.)
Description:

Please provide any additional details below regarding handling and/or disposal concerns. (i.e.: Origin of sample(s), type of site collected from, odd matrices, etc.)

1-26-22 Charleston HazMat Ph 2 (84)

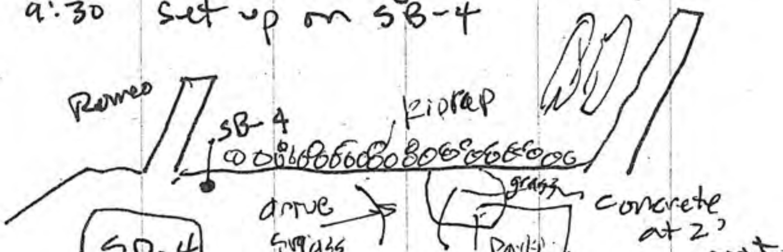
7:15 Mob to FLETC

7:45 Meet Julie and Moffatt Nichol to check

8:30 Group at Romeo Pier to discuss scope and walkdown

9:15 Mark borings with flags

9:30 Set up on SB-4



SB-4

0-1 Dark Brown silty f. snd w/ fibers root

1-2 " " " " " & wet

OVA depth	Reading
0-1 ft	0.0
1-2 ft	0.2 sample collected

Depth to water = 2.40'

SB-5

0-1 Dk to brown sl. clayey silty f snd

1-2 Brown sl clayey silty f. sand, wet

	OVA	Reading		Depth to Water 2.44'
	1 ft	0.1		
	2 ft	0.1	sample	
10:15	3 ft	0.1	"	

1-26-22 Hazmat Ph 2 (85)

Handrock at 2' over area of SB-6-8

10:40 Sample upper 2 ft of

SB-7 Brown sl. clayey, sl silty, f snd

	OVA	Reading
	1'	0.3
11:00	2'	0.6 Sample @ 11:00

SB-8 Brown sl. clayey sl silty f. snd

	OVA	reading
	1'	0.2
11:15	2'	0.3 sample @ 11:15

11:40 SB-6 Dark brown sl silty f. snd

0-1 Brown sl clayey silty f snd

1-2 " " " "

	OVA	Reading
	1	0.1
11:45	2	0.2 Sample at 11:45

12:00 SB-9

0-1 Brown sl. silty f. snd

1-2 " " " "

2-3 " " " "

	OVA	Reading	Water table 3.95
	1	0.2	
12:10	2	0.2 Sample at 12:10	
	3	0.1	
	4	0.1	

1-26-22 HazMat Ph 2

SB-10 12:15

0-1 Brown sl clayey f sand

1-2 " "

2-3 " "

3-4 " "

OVA	Reading
1	1.2 Sample 12:20
2	0.8
3	0.9
4	0.8

12:20 Soil Sample @ 1 ft

SB-11

0-1 Brown gray sl. clayey f sand

1-2 " "

2-3 " "

3-4 " "

OVA	Reading
12:30 1	0.4 Sample at 12:30
2	0.3
3	0.2
4	0.3

1:00 Mob to lab to deliver samples

1:25 Drop off at lab

1:40 Mob to office / to Kyle

8:20 Arrive

Appendix G: South Carolina Agency Coordination & Consultation

moffatt & nichol
4700 Falls of Neuse Road, Suite 300
Raleigh, North Carolina 27609

(919) 781-4626
www.moffattnichol.com

September 1, 2022

S.C. Office of Ocean and Coastal Resource Management (OCRM)
c/o Chris Stout, Coastal Zone Consistency Section Manager
1362 McMillan Ave., Suite 400
Charleston, SC 29405

Attn: Mr. Chris Stout, Coastal Zone Consistency Section Manager

Subject: **National Oceanic and Atmospheric Administration - Office of Marine and Aviation Operations, Southeast Marine Operations Hub Project**

Dear Mr. Stout,

The NOAA Office of Marine and Aviation Operations (NOAA/OMAO) intends to carry out improvements to the NOAA/OMAO Southeast Marine Operations Hub located at 2234 South Hobson Avenue in North Charleston. As proposed in the attached documents, the proposed project includes the following components:

1. Demolition of the existing pier infrastructure deemed to be functionally inadequate,
2. Construction of a new pier facility at the same location as the existing pier,
3. Dredging of an area around the new pier facility,
4. Construction of a seawall that would alleviate intermittent flooding conditions on site,
5. Construction of an optional living shoreline, and
6. Upland infrastructure improvements, including construction of a 5,000 square foot warehouse building.

Based upon the attached analysis of the relevant rules and regulations of the South Carolina coastal program, the U.S. Coast Guard has determined that the proposed activities are consistent to the maximum extent practicable with all applicable enforceable policies detailed in the Federally approved 1979 South Carolina Coastal Program Document, as well as the 1995 Coastal Management Program Policies and Procedures Update Document. Therefore, pursuant to Subpart C of 15 CFR 930.30, Moffatt & Nichol, on behalf of Mr. Timothy R. Calohan PE, NOAA, respectfully submits this request for concurrence from the OCRM with our consistency determination. We have also provided the following supplemental information as attachments to this submittal:

- DRAFT Environmental Assessment prepared for project,
- Coastal Zone Management Act, Federal Consistency Determination
- Set of permit drawings prepared for Joint Federal and State Permit Application,
- Project Narrative prepared for Joint Federal and State Permit Application (without attachments), and
- Dredge Spoil Sediment Contamination Study.

Should you have any questions about this submission, or if we can provide any additional information to facilitate your review of our findings, please feel free to contact me at dhuggett@moffattnichol.com or at (919) 645-0649.

Sincerely,

MOFFATT & NICHOL

NOAA Representative

Doug V Huggett

Timothy R. Calohan

Doug Huggett
Senior Environmental Permit Specialist

Timothy R. Calohan, PE Senior Project Manager

cc:

Timothy Calohan - NOAA
Steve Wagner – Ahtna Infrastructure & Technologies

dhec
Healthy People. Healthy Communities.

November 14, 2022

Timothy Calohan
National Oceanic and Atmospheric Administration
2234 South Hobson
N Charleston, SC 29405

RE: NOAA Office of Marine and Aviation Operations Center, HPN-6Y1B-3S505
Charleston County

Dear Mr. Calohan:

This Coastal Zone Consistency Determination Conditional Concurrence is in response to the U. S. Department of Commerce National Oceanic and Atmospheric Administration Office of Marine and Aviation Operations (NOAA/OMAO) Coastal Zone Consistency Determination submitted to South Carolina Department of Health and Environmental Control Office of Ocean and Coastal Resource Management (Department) on September 13, 2022. Department's review began on September 13, 2022.

The proposed activity consists of improvements to the existing NOAA OMAO office and facilities. The proposed work includes:

1. Demolition of the existing pier infrastructure deemed to be functionally inadequate,
2. Construction of a new pier facility at the same location as the existing pier,
3. Dredging of an area around the new pier facility,
4. Construction of a seawall that would alleviate intermittent flooding conditions on site,
5. Construction of an optional living shoreline, and
6. Upland infrastructure improvements, including construction of a 5,000 square foot warehouse building.

Specifically, the proposed activity would include the recapitalization of the Pier through demolition of the existing fixed pier, including in-water piles and mooring structures, associated facilities, and utility network. The replacement pier will be a floating pier, approximately 360' long by 60' wide with a 160' long by 30' wide gangway for ship berthing operations. The project will also include the dredging of approximately 154,607 cubic yards of material from the area surrounding the new pier. A seawall will be constructed to stabilize the riverbank east of the pier. The proposed cantilever sheet pile seawall would be located several feet from the existing revetment. The height of the wall would be approximately 5 to 6 feet above the average existing grade along its alignment or 10.5-feet North American Vertical Datum of 1988 (NAVD88). It would span the length of the shoreline approximately 620 feet eastward from the proposed steel trestle of the pier. An 8-foothigh chain-link fence would replace the existing one between the existing walking path behind the NOAA facility and the seawall.

The proposed project may also include a living shoreline. The proposed living shoreline would include a hybrid marsh with rock sill at a 2 to 2.5' elevation (NAVD88). The marsh would be established using native species, to include *Sporobolus alterniflorus* (S. alterniflora, Smooth Cordgrass), *Sporobolus pumilus* (S. patens, Saltmeadow Cordgrass), and *Juncus roemerianus* (Black Needlerush). The rock sill will have a crest elevation of 2.5' (NAVD88) with stone size D50. Oyster seeding along the rock sill is recommended.

Additionally, areas of existing asphalt parking will be disturbed to allow for project-related activities. These include the construction of a new 5,000 square foot warehouse facility to be constructed within the existing parking lot west of the NOAA facility, installation of new underground utilities, and installation of resilient curbing along the parcel boundary. The existing fences and gates will also be removed and replaced.

The purpose for the project is to recapitalize the Pier to re-establish homeport operations and maintenance functions for NOAA vessels, the Nancy Foster and Ronald H. Brown, and other visiting government vessels. For efficiency and continuance of operation, NOAA ships would be strategically berthed at a NOAA operated facility located closer in proximity to their dedicated or primary mission support area.

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 Marine Related Facilities (*Docks*), Wildlife and Fisheries Management, Dredging *(Dredging and Spoil Disposal),* Public Services and Facilities (*Public and Quasi-Public Buildings),* Erosion Control, Activities in Areas of Special Resource Significance (*Navigational Channels),* and Stormwater Management *(Runoff)* policies contained in the SCCZMP.

1. All construction BMPs must be installed, inspected and maintained to hold sediment onsite and to protect any adjacent or downstream critical area, wetlands and waters through the life of the project. Upon completion of construction activities, all disturbed (includes undeveloped) areas, including those impacted for access, must be immediately stabilized.

2. All spoil is disposed of in a permanent upland Confined Disposal Facility. Should there be a need to modify this aspect of the project, supplemental coordination with the Department will be necessary to determine the suitability of the revised disposal site.

3. The construction of the living shoreline must use native vegetation and local source material for any oyster seeding.

4. In the event that any historic or cultural resources and/or archaeological materials are found during the course of work, the applicant must notify the State Historic Preservation Office and the South Carolina Institute of Archaeology and Anthropology. Historic or cultural resources consist of those sites listed in the National Register of

Historic Places and those sites that are eligible for the National Register. Archaeological materials consist of any items, fifty years old or older, which were made or used by man. These items include, but are not limited to, stone projectile points (arrowheads), ceramic sherds, bricks, worked wood, bone and stone, metal and glass objects, and human skeletal materials.

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

Sincerely,

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

cc: Mr. Douglas Huggett, Moffatt & Nichol
Mr. Steve Wagner, Ahtna Infrastructure & Technologies

moffatt & nichol

4700 Falls of Neuse Road, Suite 300
Raleigh, North Carolina 27609

(919) 781-4626
www.moffattnichol.com

June 8, 2022

S.C. Department of Health and Environmental Control
Water Quality Certification and Wetlands Section
c/o Logan Ress
2600 Bull Street
Columbia, SC 29201
(Submitted via email to wqcwetlands@dhec.sc.gov)

Attn: Logan Ress

Subject: Pre-filing Meeting Request – Charleston County – NOAA/OMAO Southeast Marine Operations Hub

Dear Ms. Ress:

The NOAA Office of Marine and Aviation Operations (NOAA/OMAO) intends to carry out improvements to the NOAA/OMAO Southeast Marine Operations Hub located at 2324 South Hobson Avenue in North Charleston.

The project is located within and adjacent to the Cooper River. As proposed, the proposed project includes the following components:

1. Demolition of existing pier infrastructure deemed to be functionally inadequate,

2. Construction of a new pier facility,

3. Dredging of an area around the new pier facility,

4. Construction of a seawall landward of the critical area line to alleviate flooding conditions resulting from severe weather, king tide events and sea level rise,

5. Construction of an optional living shoreline, and

6. Upland development activities, including construction of a 5,000-sf warehouse building.

Dredging is anticipated to occur that will extend out 180 feet from the centerline of the proposed pier (150 feet from the edge of the proposed pier) and extend out to the navigational channel of the Cooper River. Dredging will be done to a maximum depth of -27 ft MLLW (-25' target elevation plus a -2 foot over dredge allowance). The dredge activities will result in the excavation of an area of 373,323 sf (+/- 8.5 acres) of the Cooper River and will also result in the excavation of approximately 154,607 CY of material. Disposal of these dredge spoils will take place at a nearby U.S. Army Corps of Engineers disposal area(s) located within the Cooper River. The area to be dredged does not include any area of wetland or submerged aquatic vegetation habitat. A dredge material sampling and analysis plan has been implemented for this project, and the report detailing this effort and analysis of the samples will be included in the Water Quality Certification submittal for the project.

In association with the proposed living shoreline, there will be 21,000 sf of material (clean sand and riprap) placed within the waters of the Cooper River. There will be no wetland or stream impacts associated with the proposed project.

With this information in mind, Moffatt and Nichol, on behalf of NOAA/OMAO, respectfully submits this required pre-filing notification. It should be noted that an agency scoping meeting was held for the proposed project on July 1, 2021. Should you have any questions about this submission, or if we can provide any additional information to facilitate your review of our findings, please feel free to contact me at jfleschpate@moffattnichol.com or at (919) 239-2791.

Sincerely,

MOFFATT & NICHOL

Julie Flesch-Pate

Julie Flesch-Pate, CPM, LEED AP
Environmental and Planning Group Manager

NOAA Representative

Timothy R. Calohan

Timothy R. Calohan, PE
Senior Project Manager

Cc: Charleston Corps District Office

Submitted via email to SAC.RD.Charleston@USACE.army.mil

From:	Ress, Logan D.
To:	Flesch-Pate, Julie
Cc:	Steve Wagner; Huggett, Douglas
Subject:	Re: Pre-filing Meeting Request – Charleston County – NOAA/OMAO Southeast Marine Operations Hub
Date:	Tuesday, June 14, 2022 1:23:12 PM
Attachments:	image001.png image002.png image003.png image004.png

---

CAUTION: This email originated from outside of the organization.

Good afternoon Julie,

The Department has received your request but will not be requiring a pre-filing meeting for this project.

Thanks,

Logan

Logan Ress
Project Manager
Water Quality Certification and Wetland Section
S.C. Dept. of Health & Environmental Control
Office: (803) 898-4333
Connect: www.scdhec.gov Facebook Twitter

From: Flesch-Pate, Julie <jfleschpate@moffattnichol.com>
Sent: Monday, June 13, 2022 3:05 PM
To: WQCWetlands <wqcwetlands@dhec.sc.gov>
Cc: Steve Wagner <swagner@ahtna.net>; Huggett, Douglas <dhuggett@moffattnichol.com>
Subject: Pre-filing Meeting Request – Charleston County – NOAA/OMAO Southeast Marine Operations Hub

*** Caution. This is an EXTERNAL email. DO NOT open attachments or click links from unknown senders or unexpected email. ***

To Whom it May Concern,

Please see attached information regarding the Charleston County, NOAA/OMAO Southeast Marine Operations Hub project. Thank you in advance for your review.

Sincerely,

Julie Flesch-Pate CPM, LEED AP, MBA
Planning and Environmental Group Leader

4700 Falls of Neuse | Raleigh, NC 2609
P 919.781.4626 | M 919.532.9874

moffatt & nichol

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Appendix H: Threatened & Endangered Species

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Carolina Ecological Services
176 Croghan Spur Road, Suite 200
Charleston, SC 29407-7558
Phone: (843) 727-4707 Fax: (843) 727-4218

In Reply Refer To: June 24, 2022
Project code: 2022-0057716
Project Name: Southeast Marine Operations Hub Project (Pier Romeo Recapitalization)

Subject: Verification letter for the 'Southeast Marine Operations Hub Project (Pier Romeo Recapitalization)' project under the January 5, 2016, Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-eared Bat and Activities Excepted from Take Prohibitions.

Dear Julie Flesch-Pate:

The U.S. Fish and Wildlife Service (Service) received on June 24, 2022 your effects determination for the 'Southeast Marine Operations Hub Project (Pier Romeo Recapitalization)' (the Action) using the northern long-eared bat (*Myotis septentrionalis*) key within the Information for Planning and Consultation (IPaC) system. This IPaC key assists users in determining whether a Federal action is consistent with the activities analyzed in the Service's January 5, 2016, Programmatic Biological Opinion (PBO). The PBO addresses activities excepted from "take"[1] prohibitions applicable to the northern long-eared bat under the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.).

Based upon your IPaC submission, the Action is consistent with activities analyzed in the PBO. The Action may affect the northern long-eared bat; however, any take that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR §17.40(o). Unless the Service advises you within 30 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that the PBO satisfies and concludes your responsibilities for this Action under ESA Section 7(a)(2) with respect to the northern long-eared bat.

Please report to our office any changes to the information about the Action that you submitted in IPaC, the results of any bat surveys conducted in the Action area, and any dead, injured, or sick northern long-eared bats that are found during Action implementation. If the Action is not completed within one year of the date of this letter, you must update and resubmit the information required in the IPaC key.

This IPaC-assisted determination allows you to rely on the PBO for compliance with ESA Section 7(a)(2) only for the northern long-eared bat. It **does not** apply to the following ESA-protected species that also may occur in the Action area:

- American Chaffseed *Schwalbea americana* Endangered
- Bachman's Warbler (=wood) *Vermivora bachmanii* Endangered
- Canby's Dropwort *Oxypolis canbyi* Endangered
- Eastern Black Rail *Laterallus jamaicensis ssp. jamaicensis* Threatened
- Frosted Flatwoods Salamander *Ambystoma cingulatum* Threatened
- Green Sea Turtle *Chelonia mydas* Threatened
- Kemp's Ridley Sea Turtle *Lepidochelys kempii* Endangered
- Leatherback Sea Turtle *Dermochelys coriacea* Endangered
- Loggerhead Sea Turtle *Caretta caretta* Threatened
- Piping Plover *Charadrius melodus* Threatened
- Pondberry *Lindera melissifolia* Endangered
- Red Knot *Calidris canutus rufa* Threatened
- Red-cockaded Woodpecker *Picoides borealis* Endangered
- West Indian Manatee *Trichechus manatus* Threatened
- Wood Stork *Mycteria americana* Threatened

If the Action may affect other federally listed species besides the northern long-eared bat, a proposed species, and/or designated critical habitat, additional consultation between you and this Service office is required. If the Action may disturb bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act is recommended.

---

[1]Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct [ESA Section 3(19)].

Action Description

You provided to IPaC the following name and description for the subject Action.

1. Name

Southeast Marine Operations Hub Project (Pier Romeo Recapitalization)

2. Description

The following description was provided for the project 'Southeast Marine Operations Hub Project (Pier Romeo Recapitalization)':

> NOAA - OMAO is proposing to recapitalize Pier Romeo at 2234 South Hobson Avenue, North Charleston, South Carolina, to re-establish homeport operations and maintenance functions for NOAA vessels, the Nancy Foster and Ronald H. Brown. For efficiency and continuance of operation, NOAA ships would be strategically berthed at a NOAA operated facility located closer in proximity to their dedicated or primary mission support area.
> The project would replace the existing pier with a floating pier generally within the same environmental footprint. Additional project objectives include minimizing impacts associated with reoccurring storm surges and flood inundation and reducing future flood risks based on predicted climate change and SLR information derived from NOAA's Coastal Study Report

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@32.849736899999996,-79.9427689557732,14z

Determination Key Result

This Federal Action may affect the northern long-eared bat in a manner consistent with the description of activities addressed by the Service's PBO dated January 5, 2016. Any taking that may occur incidental to this Action is not prohibited under the final 4(d) rule at 50 CFR §17.40(o). Therefore, the PBO satisfies your responsibilities for this Action under ESA Section 7(a)(2) relative to the northern long-eared bat.

Determination Key Description: Northern Long-eared Bat 4(d) Rule

This key was last updated in IPaC on May 15, 2017. Keys are subject to periodic revision.

This key is intended for actions that may affect the threatened northern long-eared bat.

The purpose of the key for Federal actions is to assist determinations as to whether proposed actions are consistent with those analyzed in the Service’s PBO dated January 5, 2016.

Federal actions that may cause prohibited take of northern long-eared bats, affect ESA-listed species other than the northern long-eared bat, or affect any designated critical habitat, require ESA Section 7(a)(2) consultation in addition to the use of this key. Federal actions that may affect species proposed for listing or critical habitat proposed for designation may require a conference under ESA Section 7(a)(4).

Determination Key Result

This project may affect the threatened Northern long-eared bat; therefore, consultation with the Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.) is required. However, based on the information you provided, this project may rely on the Service's January 5, 2016, *Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-Eared Bat and Activities Excepted from Take Prohibitions* to fulfill its Section 7(a)(2) consultation obligation.

Qualification Interview

1. Is the action authorized, funded, or being carried out by a Federal agency?

   Yes
2. Have you determined that the proposed action will have "no effect" on the northern long-eared bat? (If you are unsure select "No")

   No
3. Will your activity purposefully **Take** northern long-eared bats?

   No
4. [Semantic] Is the project action area located wholly outside the White-nose Syndrome Zone?

   Automatically answered
   No
5. Have you contacted the appropriate agency to determine if your project is near a known hibernaculum or maternity roost tree?

   Location information for northern long-eared bat hibernacula is generally kept in state Natural Heritage Inventory databases – the availability of this data varies state-by-state. Many states provide online access to their data, either directly by providing maps or by providing the opportunity to make a data request. In some cases, to protect those resources, access to the information may be limited. A web page with links to state Natural Heritage Inventory databases and other sources of information on the locations of northern long-eared bat roost trees and hibernacula is available at www.fws.gov/media/nleb-roost-tree-and-hibernacula-state-specific-data-links-0.

   Yes
6. Will the action affect a cave or mine where northern long-eared bats are known to hibernate (i.e., hibernaculum) or could it alter the entrance or the environment (physical or other alteration) of a hibernaculum?

   No
7. Will the action involve Tree Removal?

   Yes

8. Will the action only remove hazardous trees for the protection of human life or property?
   Yes

Project Questionnaire

If the project includes forest conversion, report the appropriate acreages below. Otherwise, type ‘0’ in questions 1-3.

1. Estimated total acres of forest conversion:

0

2. If known, estimated acres of forest conversion from April 1 to October 31

0

3. If known, estimated acres of forest conversion from June 1 to July 31

0

If the project includes timber harvest, report the appropriate acreages below. Otherwise, type ‘0’ in questions 4-6.

4. Estimated total acres of timber harvest

0

5. If known, estimated acres of timber harvest from April 1 to October 31

0

6. If known, estimated acres of timber harvest from June 1 to July 31

0

If the project includes prescribed fire, report the appropriate acreages below. Otherwise, type ‘0’ in questions 7-9.

7. Estimated total acres of prescribed fire

0

8. If known, estimated acres of prescribed fire from April 1 to October 31

0

9. If known, estimated acres of prescribed fire from June 1 to July 31

0

If the project includes new wind turbines, report the megawatts of wind capacity below. Otherwise, type ‘0’ in question 10.

10. What is the estimated wind capacity (in megawatts) of the new turbine(s)?

0

IPaC User Contact Information

Agency: Department of Commerce
Name: Julie Flesch-Pate
Address: 4700 Falls of Neuse, Suite 300
City: Raleigh
State: NC
Zip: 27609
Email jfleschpate@moffattnichol.com
Phone: 9197814626

Lead Agency Contact Information

Lead Agency: Army Corps of Engineers
Name: Timothy Calohan
Email: timothy.calohan@noaa.gov
Phone: 2065266647

United States Department of the Interior

FISH AND WILDLIFE SERVICE
South Carolina Ecological Services
176 Croghan Spur Road, Suite 200
Charleston, SC 29407-7558
Phone: (843) 727-4707 Fax: (843) 727-4218

In Reply Refer To: December 16, 2022
Project Code: 2022-0058769
Project Name: Southeast Marine Operations Hub Project (Pier Romeo Recapitalization)

Subject: List of threatened and endangered species that may occur in your proposed project location or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Northern Long-eared Bat: Additionally, please note that on March 23, 2022, the Service published a proposal to reclassify the northern long-eared bat (NLEB) as endangered under the Endangered Species Act. The U.S. District Court for the District of Columbia has ordered the Service to complete a new final listing determination for the NLEB by November 2022 (Case 1:15-cv-00477, March 1, 2021). The bat, currently listed as threatened, faces extinction due to the range-wide impacts of white-nose syndrome (WNS), a deadly fungal disease affecting cave-dwelling bats across the continent. The proposed reclassification, if finalized, would remove the current 4(d) rule for the NLEB, as these rules may be applied only to threatened species. Depending on the type of effects a project has on NLEB, the change in the species' status may trigger the need to re-initiate consultation for any actions that are not completed and for which the Federal action agency retains discretion once the new listing determination becomes effective (anticipated to occur by December 30, 2022). If your project may result in incidental take of NLEB after the new listing goes into effect this will first need to addressed in an updated consultation that includes an Incidental Take Statement. If your project may require re-initiation of consultation, please contact our office for additional guidance.

Migratory Birds: In addition to responsibilities to protect threatened and endangered species under the Endangered Species Act (ESA), there are additional responsibilities under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) to protect native birds from project-related impacts. Any activity, intentional or unintentional, resulting in take of migratory birds, including eagles, is prohibited unless otherwise permitted by the U.S. Fish and Wildlife Service (50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)). For more information regarding these Acts see https://www.fws.gov/birds/policies-and-regulations.php.

The MBTA has no provision for allowing take of migratory birds that may be unintentionally killed or injured by otherwise lawful activities. It is the responsibility of the project proponent to comply with these Acts by identifying potential impacts to migratory birds and eagles within applicable NEPA documents (when there is a federal nexus) or a Bird/Eagle Conservation Plan (when there is no federal nexus). Proponents should implement conservation measures to avoid or minimize the production of project-related stressors or minimize the exposure of birds and their resources to the project-related stressors. For more information on avian stressors and recommended conservation measures see https://www.fws.gov/birds/bird-enthusiasts/threats-to-birds.php.

In addition to MBTA and BGEPA, Executive Order 13186: *Responsibilities of Federal Agencies to Protect Migratory Birds*, obligates all Federal agencies that engage in or authorize activities that might affect migratory birds, to minimize those effects and encourage conservation measures that will improve bird populations. Executive Order 13186 provides for the protection of both migratory birds and migratory bird habitat. For information regarding the implementation of Executive Order 13186, please visit https://www.fws.gov/birds/policies-and-regulations/executive-orders/e0-13186.php.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Code in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Migratory Birds
- Marine Mammals
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

South Carolina Ecological Services
176 Croghan Spur Road, Suite 200
Charleston, SC 29407-7558
(843) 727-4707

Project Summary

Project Code: 2022-0058769
Project Name: Southeast Marine Operations Hub Project (Pier Romeo Recapitalization)
Project Type: Boatlift/Boathouse/Dock/Pier/Piles - Maintenance/Modificaton
Project Description: The National Oceanic and Atmospheric Administration (NOAA) Office of Marine and Aviation Operations (OMAO) proposes to recapitalize Pier Romeo (the Pier) through the replacement of the existing pier (the project), located on the southern bank of the Cooper River at the Federal Law Enforcement Training Center (FLETC), at 2234 South Hobson Avenue, North Charleston, South Carolina (NOAA site). Construction of the proposed project would be initiated in Fall of 2023.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@32.85092555,-79.94200101259142,14z

Counties: Charleston County, South Carolina

Endangered Species Act Species

There is a total of 15 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Endangered
West Indian Manatee *Trichechus manatus* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. ***This species is also protected by the Marine Mammal Protection Act, and may have additional consultation requirements.*** Species profile: https://ecos.fws.gov/ecp/species/4469	Threatened

Birds

NAME	STATUS
Bachman's Warbler (=wood) *Vermivora bachmanii* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3232	Endangered
Eastern Black Rail *Laterallus jamaicensis ssp. jamaicensis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10477	Threatened
Piping Plover *Charadrius melodus* Population: [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered. There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot *Calidris canutus rufa* There is **proposed** critical habitat for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Red-cockaded Woodpecker *Picoides borealis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7614	Endangered

Reptiles

NAME	STATUS
Green Sea Turtle *Chelonia mydas* Population: North Atlantic DPS There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	Threatened
Kemp's Ridley Sea Turtle *Lepidochelys kempii* There is **proposed** critical habitat for this species. Species profile: https://ecos.fws.gov/ecp/species/5523	Endangered
Leatherback Sea Turtle *Dermochelys coriacea* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1493	Endangered
Loggerhead Sea Turtle *Caretta caretta* Population: Northwest Atlantic Ocean DPS There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1110	Threatened

Amphibians

NAME	STATUS
Frosted Flatwoods Salamander *Ambystoma cingulatum* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/4981	Threatened

Flowering Plants

NAME	STATUS
American Chaffseed *Schwalbea americana* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1286	Endangered
Canby's Dropwort *Oxypolis canbyi* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7738	Endangered
Pondberry *Lindera melissifolia* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1279	Endangered

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Migratory Birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Kestrel *Falco sparverius paulus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA https://ecos.fws.gov/ecp/species/9587	Breeds Apr 1 to Aug 31
American Oystercatcher *Haematopus palliatus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8935	Breeds Apr 15 to Aug 31

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Sep 1 to Jul 31
Black Skimmer *Rynchops niger* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/5234	Breeds May 20 to Sep 15
Brown-headed Nuthatch *Sitta pusilla* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Mar 1 to Jul 15
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 25
Gull-billed Tern *Gelochelidon nilotica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9501	Breeds May 1 to Jul 31
Lesser Yellowlegs *Tringa flavipes* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Marbled Godwit *Limosa fedoa* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9481	Breeds elsewhere
Painted Bunting *Passerina ciris* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Apr 25 to Aug 15
Prairie Warbler *Dendroica discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Prothonotary Warbler *Protonotaria citrea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Ruddy Turnstone *Arenaria interpres morinella* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere

NAME	BREEDING SEASON
Rusty Blackbird *Euphagus carolinus* This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Short-billed Dowitcher *Limnodromus griseus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9480	Breeds elsewhere
Swallow-tailed Kite *Elanoides forficatus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8938	Breeds Mar 10 to Jun 30
Willet *Tringa semipalmata* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 5
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability Of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence

in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

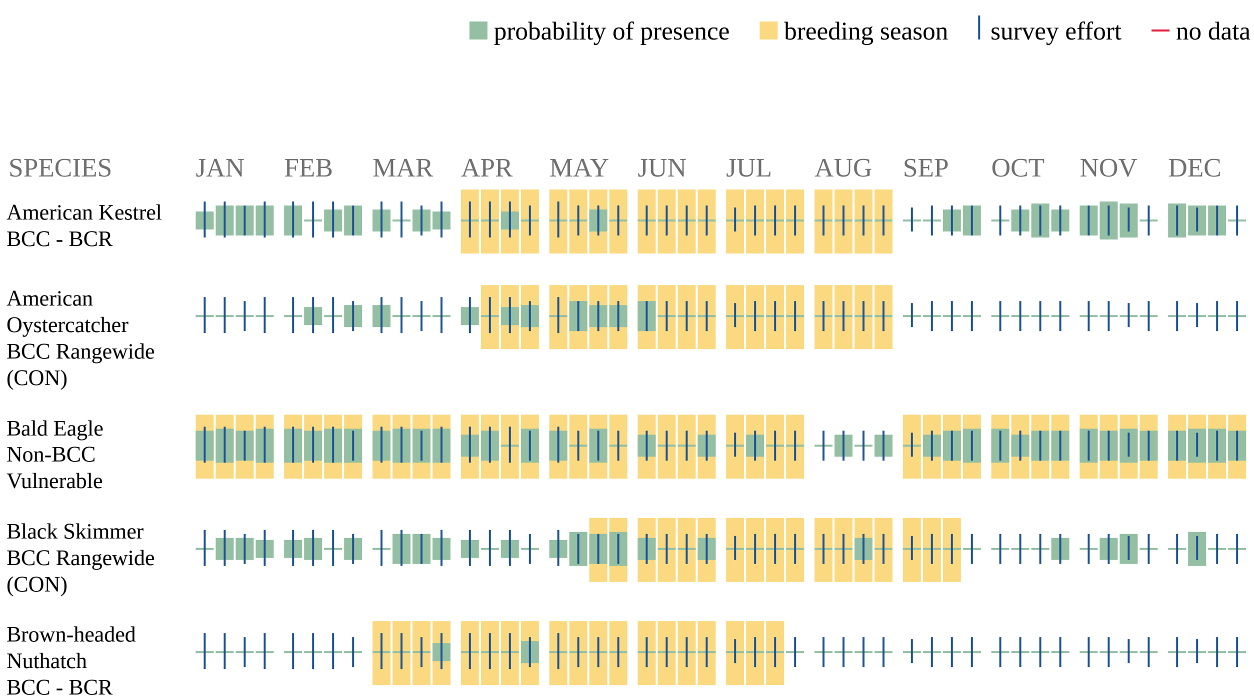
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

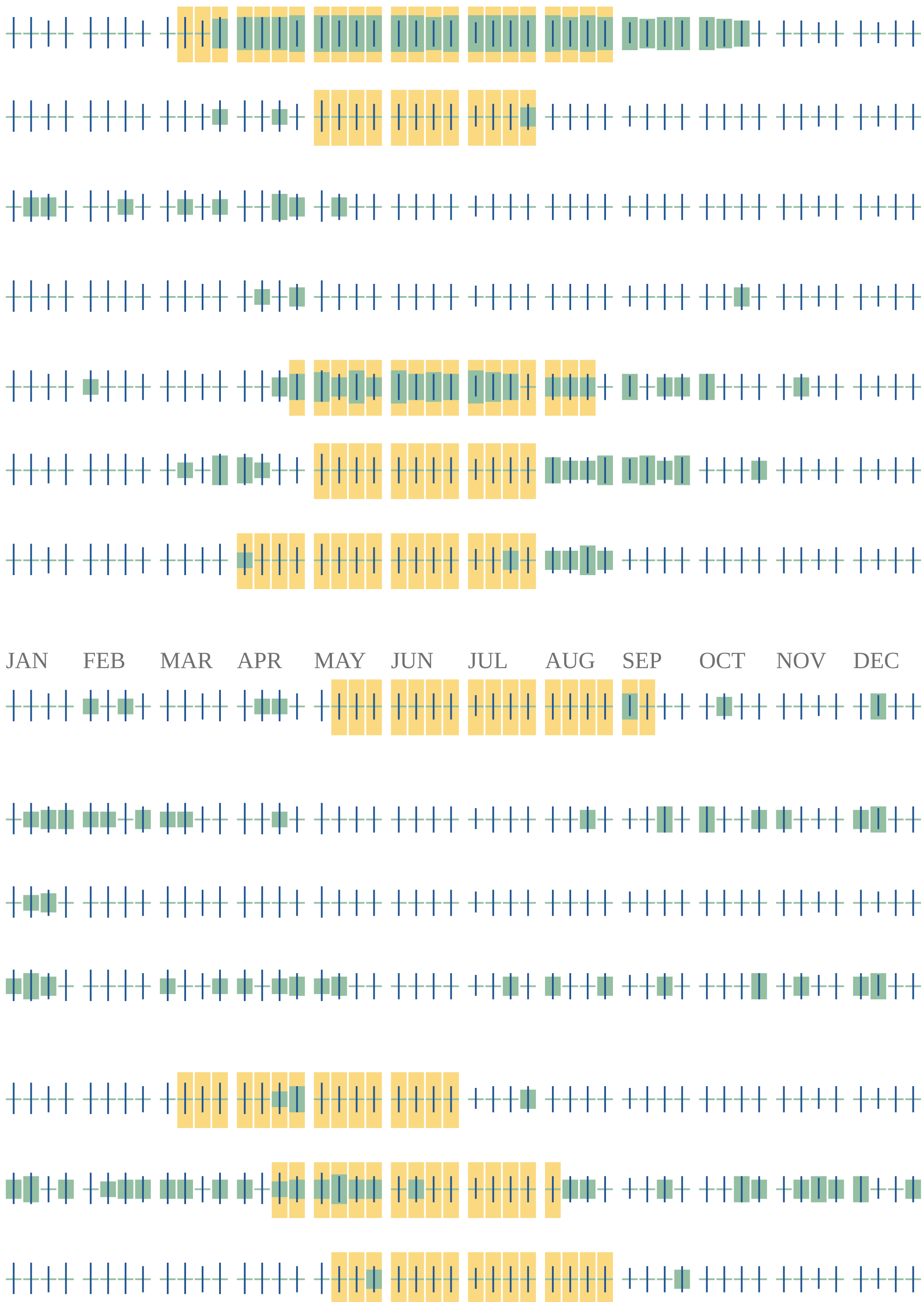
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.





Chimney Swift
BCC Rangewide
(CON)

Gull-billed Tern
BCC Rangewide
(CON)

Lesser Yellowlegs
BCC Rangewide
(CON)

Marbled Godwit
BCC Rangewide
(CON)

Painted Bunting
BCC - BCR

Prairie Warbler
BCC Rangewide
(CON)

Prothonotary Warbler
BCC Rangewide
(CON)

SPECIES JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Red-headed Woodpecker
BCC Rangewide
(CON)

Ruddy Turnstone
BCC - BCR

Rusty Blackbird
BCC - BCR

Short-billed Dowitcher
BCC Rangewide
(CON)

Swallow-tailed Kite
BCC Rangewide
(CON)

Willet
BCC Rangewide
(CON)

Wood Thrush
BCC Rangewide
(CON)

Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species

- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

Migratory Birds FAQ

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?
Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects
For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?
If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Marine Mammals

Marine mammals are protected under the Marine Mammal Protection Act. Some are also protected under the Endangered Species Act[1] and the Convention on International Trade in Endangered Species of Wild Fauna and Flora[2].

The responsibilities for the protection, conservation, and management of marine mammals are shared by the U.S. Fish and Wildlife Service [responsible for otters, walruses, polar bears, manatees, and dugongs] and NOAA Fisheries[3] [responsible for seals, sea lions, whales, dolphins, and porpoises]. Marine mammals under the responsibility of NOAA Fisheries are **not** shown on this list; for additional information on those species please visit the Marine Mammals page of the NOAA Fisheries website.

The Marine Mammal Protection Act prohibits the take of marine mammals and further coordination may be necessary for project evaluation. Please contact the U.S. Fish and Wildlife Service Field Office shown.

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1. The Endangered Species Act (ESA) of 1973.
2. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is a treaty to ensure that international trade in plants and animals does not threaten their survival in the wild.
3. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

NAME

West Indian Manatee *Trichechus manatus*
Species profile: https://ecos.fws.gov/ecp/species/4469

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

ESTUARINE AND MARINE DEEPWATER

- E1UBL

IPaC User Contact Information

Agency: Department of Commerce
Name: Julie Flesch-Pate
Address: 4700 Falls of Neuse, Suite 300
City: Raleigh
State: NC
Zip: 27609
Email jfleschpate@moffattnichol.com
Phone: 9197814626

Appendix I: Cultural Resources Survey Report

NOAA OMAO Charleston Pier Romeo Recapitalization Project at FLETC, Charleston

Charleston County, South Carolina



May 2021

Brockington
CULTURAL RESOURCES CONSULTING

NOAA OMAO Charleston Pier Romeo Recapitalization Project at FLETC, Charleston

Charleston County, South Carolina

May 2021

Prepared for:
Moffatt & Nichol
Raleigh, North Carolina

and

Ahtna Environmental, Inc.
Renton, Washington

Prepared by:

Ralph Bailey, RPA

and

Lannie E. Kittrell, MHP

and

Gordon P. Watts, Jr., Ph.D., RPA
Tidewater Atlantic Research, Inc.
Washington, North Carolina

Brockington and Associates, Inc.

Atlanta • Charleston • Savannah

Table of Contents

List of Figures

List of Tables

1.0 Introduction

In April 2021, Brockington and Associates, Inc. (Brockington) conducted a cultural resources survey of Pier Romeo in North Charleston, Charleston County, South Carolina. The survey was conducted for Moffatt & Nichol and Ahtna Infrastructure and Technologies, LLC as part of the Charleston Pier Romeo Recapitalization Project. The purpose of the survey is to identify and evaluate all historic properties (i.e., sites, buildings, structures, objects, or districts listed on or eligible for the National Register of Historic Places [NRHP]) that may be affected by this undertaking. The assessment of effect of the proposed development on historic properties is required by the State Historic Preservation Office (SHPO) and Section 106 of the National Historic Preservation Act (NHPA).

Pier Romeo is located at 2234 South Hobson Avenue in North Charleston. The property consists of an office building, several support structures and utilities, a parking lot, and a concrete pier on the Cooper River that is 650 feet long and 30 feet wide. The facility was part of the former Navy Base and is now used by the National Oceanic and Atmospheric Administration (NOAA). NOAA is planning to remove the existing fixed pier and replace it with a new, possibly floating, operable pier. The location of the Pier Romeo project tract and previously recorded cultural resources is show in Figure 1.1. The new pier will be approximately the same length as the existing and slightly wider. The project will also include other minor improvements to utilities and the parking lot. There is the possibility that a warehouse will be constructed adjacent to or in the existing parking lot. No changes are planned for the office building.

The office building at 2234 South Hobson Avenue (the former Bachelor Officers Quarters, Naval Air Station, Naval Base Charleston; also known as RTC-1) and two support structures (RTC-4 and X30A) are previously recorded cultural resources on the project tract (Goodwin 1995). During the current survey, we recorded the pier (SHPO Site No. 8422) and revisited RTC-1 (SHPO Site No. 8423) and two support structures (SHPO Site Nos. 8423.01 and 8423.02). The pier was constructed in 1947. RTC-1 was constructed in 1944. The location of the historic architectural resources is shown on a modern aerial photograph (Figure 1.2). Goodwin recommended RTC-1, RTC-4, and X30A not eligible for listing in the NRHP in their 1995 report and survey of the former Navy Base. Additionally, we recommend the pier not eligible for the NRHP. No potentially significant anomalies, sonar targets, or bottom features were identified within the underwater survey area of the pier. The uplands have been completely disturbed by the twentieth-century built environment; therefore, no shovel testing was conducted. The proposed recapitalization project at Pier Romeo will have no effect on historic properties.

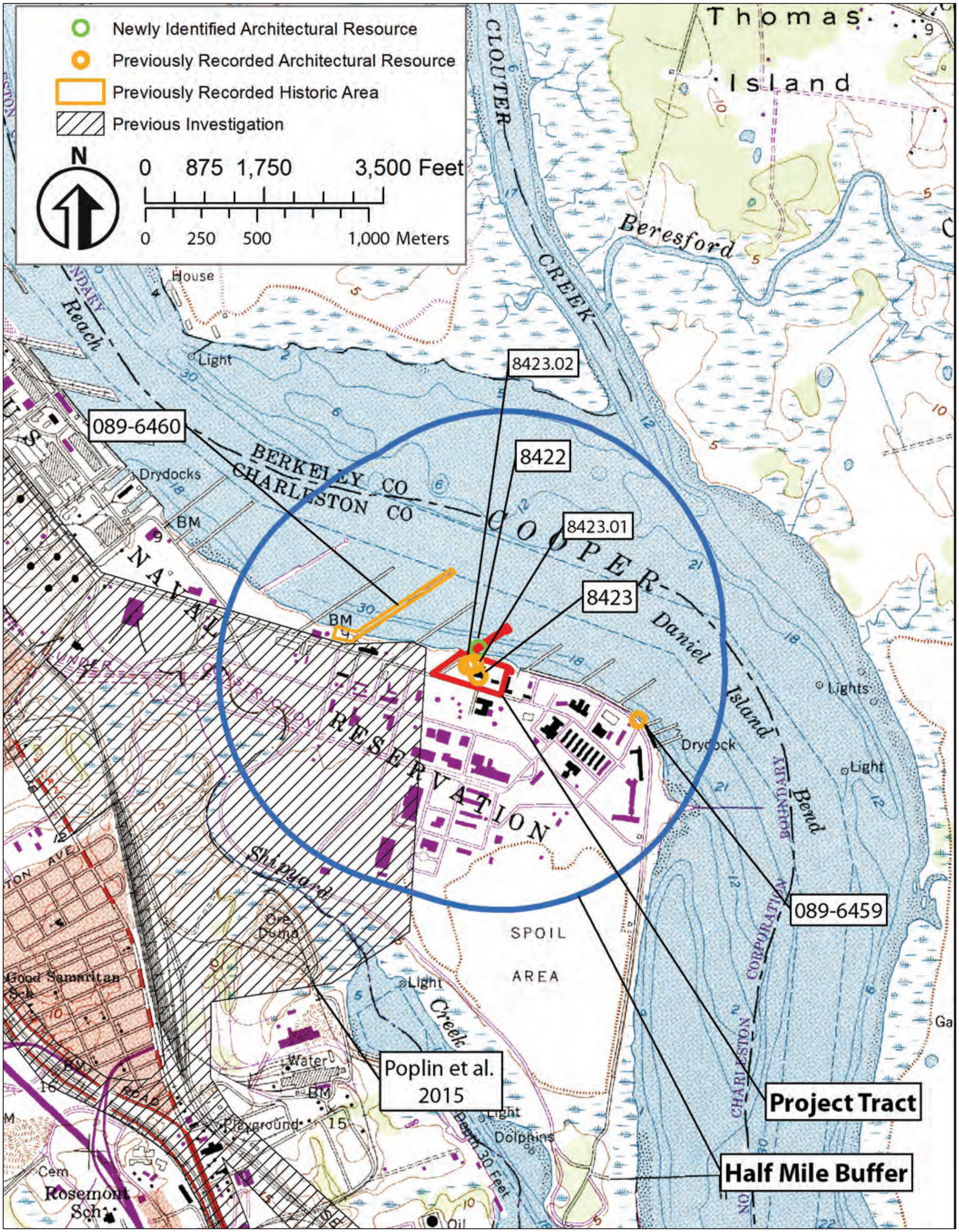

Figure 1.1 Location of the Pier Romeo project tract and previously recorded cultural resources within a half-mile radius (USGS 1958 *Charleston* quadrangle).

Figure 1.2 Location of the project tract and historic architectural resources recorded during the survey on a modern aerial photograph.

2.0 Methods of Investigation

2.1 Project Objectives

The cultural resources survey of the Pier Romeo project attempted to locate and assess the significance of all cultural resources that may be directly or indirectly affected by implementation of the project. Tasks performed to accomplish these objectives included background research, archaeological and architectural survey, and NRHP assessment. Descriptions of methods employed for each of these tasks follow.

2.2 Background Research

Senior project staff utilized primary and secondary materials and online resources to conduct background research for this project. Prior to the field investigations, the Brockington staff consulted ArchSite (http://www.scarchsite.org/), South Carolina's online database of cultural resources, to determine if previously identified archaeological sites, previously identified historic architectural resources, or historic properties lie in or near the project. Project staff researched archival materials available from the Charleston Naval Complex Redevelopment Authority (RDA), the South Carolina Department of Archives and History (SCDAH), and previous investigations available from NOAA.

Parcel data was also retrieved from the Charleston County online GIS website (https://gisccweb.charlestoncounty.org/Public_Search/). Brockington personnel also consulted secondary resources such as cultural resource management reports. Important secondary resources included cultural resource management reports by Shmookler (1995), Fick et al (1995), Goodwin (1995), and Owens et al. (2015); environmental assessments by URS (2008) and EnSafe/Allen & Hoshall (1995); and NRHP nomination forms.

2.3 Archaeological Survey

The archaeological survey was limited to the bottom of the Cooper River within 100 feet of the existing pier. Detailed methods for the underwater survey are included in Tidewater Atlantic's survey report that is attached as Appendix B.

An archaeological sensitivity assessment of the former Navy Base, including the project tract, was conducted in 1995. Investigators concluded that the potential for significant archaeological sites to be present anywhere on the former base is low due to the extensive development necessitated by mission objectives. They recommended that no additional archaeological work be undertaken at the former base (Shmookler 1995:7-1). To ensure that these conclusions and recommendations are appropriate for the current time and place, the project archaeologist conducted background research and a thorough visual inspection of the project tract. The project consists of made land from early twentieth-century dredging. In addition, the entire project tract has been significantly altered and developed. No potentially undisturbed areas that may warrant shovel testing were identified.

2.4 Architectural Survey

Brockington conducted architectural survey of the Pier Romeo Project on April 13, 2021. Brockington SOI-qualified architectural historian Lannie Kittrell (MHP) completed the architectural survey. The survey attempted to identify, record, and evaluate all historic architectural resources 45 years old or older (buildings, sites, structures, objects, and districts) in the architectural APE. The architectural APE is approximately 6.3 acres and includes the building at 2234 South Hobson Avenue, an associated parking lot, and Pier Romeo (see Figures 1.1 and 1.2). Field survey methods complied with the *Survey Manual: South Carolina Statewide Survey of Historic Properties* (SCDAH 2018). In accordance with the scope of work and standard SCDAH survey practice, the architectural historian walked the project tract, recording each surveyed resource. Photographs were made with a digital single lens reflex camera with TIFF and JPEG files. Brockington photographed the façade or an oblique with the façade of each resource.

To identify previously recorded architectural resources within the APE, Brockington's architectural historian reviewed available information from ArchSite, NRHP listings, and the following cultural resource investigations and environmental assessments:

- *City of North Charleston, Historical and Architectural Survey* (Fick et al. 1995).
- *Inventory, Evaluation, and Nomination of Military Installations: Naval Base Charleston* (Goodwin, R. Christopher and Associates, Inc 1995).
- *Architectural Survey in Support of South Carolina Public Railway's Proposed Intermodal Container Transfer Facility, Charleston County, South Carolina* (Owens et al 2015).
- *Draft Environmental Baseline Survey, Facilities RTC-1, RTC-4, 200, 1874, 330 (Pier R), Naval Base Charleston, Charleston, South Carolina* (EnSafe/Allen & Hoshall 1995).
- *Phase I Environmental Site Assessment Pier Romeo, NOAA Coastal Services Center, Charleston, Charleston County, South Carolina* (URS Corporation 2008).

Brockington's architectural historian also reviewed historic aerial photographs, historic USGS topographic quadrangle maps, and information gathered from Charleston County property records to identify approximate dates of construction.

The principal criterion used by the SCDAH to define historic architectural resources is a 50-year minimum age; however, that rule does not always allow for the recordation of all historically significant resources. This could include resources related to the civil rights movement, the Cold War, or the development of tourism in South Carolina. In addition, certain other classes of architectural resources may be recorded (SCDAH 2018:9):

- Architectural resources representative of a particular style, form of craftsmanship, method of construction, or building type.
- Properties associated with significant events or broad patterns in local, state, or national history.
- Properties that convey evidence of the community's historical patterns of development.
- Historic cemeteries and burial grounds.
- Historic landscapes such as parks, gardens, and agricultural fields
- Properties that convey evidence of significant "recent past" history (i.e., civil rights movement, Cold War, etc.).
- Properties associated with the lives or activities of persons significant in local, state, or national history.
- Sites where ruins, foundations, or remnants of historically significant structures are present.

For a resource to be eligible for documentation, the architectural historian must determine that it retains some degree of integrity. According to the SCDAH (2018:10), a resource that has integrity:

> retains its historic appearance and character… [and] conveys a strong feeling of the period in history during which it achieved significance. Integrity is the composite of seven qualities: location, design, setting, materials, workmanship, feeling, and association. To have a reasonable degree of integrity, a property must possess at least several of these qualities.

Integrity is also evaluated in the context of the local region. While in the field, the architectural historian evaluated the integrity of each identified historic architectural resource.

Following SCDAH (2018) guidelines, the architectural historian recorded all the architectural resources in the project area on SC SSHP survey forms in digital format. Appropriate USGS maps show the location of each architectural resource. The completed forms, including the various maps and photographs, were prepared for SCDAH for review. Following SCDAH (2018) guidelines, the architectural survey used English units of measurement in descriptions of resources presented in this report and in the forms. Photography for this project included digital images produced by methods demonstrated to meet the 75-year permanence standard required by the National Park Service (NPS) and the SCDAH (NPS 2013; SCDAH 2018:31).

2.5 NRHP Assessment of Cultural Resources

2.5.1 Overview

All cultural resources encountered were assessed as to their significance based on the criteria of the NRHP. As per 36 CFR 60.4, there are four broad evaluative criteria for determining the significance of a particular resource and its eligibility for the NRHP. Any resource (building, structure, site, object, or district) may be eligible for the NRHP that:

A. is associated with events that have made a significant contribution to the broad pattern of history;
B. is associated with the lives of persons significant in the past;
C. embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, possesses high artistic value, or represents a significant and distinguishable entity whose components may lack individual distinction; or
D. has yielded, or is likely to yield, information important to history or prehistory.

A resource may be eligible under one or more of these criteria. Criteria A, B, and C are most frequently applied to historic buildings, structures, objects, non-archaeological sites (e.g., battlefields, natural features, designed landscapes, or cemeteries), or districts. The eligibility of archaeological sites is most frequently considered with respect to Criterion D. Also, a general guide of 50 years of age is employed to define "historic" in the NRHP evaluation process. That is, all resources greater than 50 years of age may be considered. However, more recent resources may be considered if they display "exceptional" significance (Sherfy and Luce 1998).

2.5.1 Assessing Archaeological Sites and Architectural Resources

Following *National Register Bulletin: How to Apply the National Register Criteria for Evaluation* (Savage and Pope 1998), evaluation of any resource requires a twofold process. First, the resource must be associated with an important historical context. If this association is demonstrated, the integrity of the resource must be evaluated to ensure that it conveys the significance of its context. The applications of both of these steps are discussed in more detail below.

Determining the association of a resource with a historical context involves five steps (Savage and Pope 1998). First, the resource must be associated with a particular facet of local, regional (state), or national history. Secondly, one must determine the significance of the identified historical facet/context with respect to the resource under evaluation. A lack of Native American archaeological sites within a project area would preclude the use of contexts associated with the pre-contact use of a region.

The third step is to demonstrate the ability of a particular resource to illustrate the context. A resource should be a component of the locales and features created or used during the historical period in question. For example, early nineteenth-century farmhouses, the ruins of African American slave settlements from the 1820s, and/or field systems associated with particular antebellum plantations in the region would illustrate various aspects of the agricultural development of the region prior to the Civil War. Conversely, contemporary churches or road networks may have been used during this time period but do not reflect the agricultural practices suggested by the other kinds of resources.

The fourth step involves determining the specific association of a resource with aspects of the significant historical context. Savage and Pope (1998) define how one should consider a resource under each of the four criteria of significance. Under Criterion A, a property must have existed at the time that a particular event or pattern of events occurred, and activities associated with the event(s) must have occurred at the site. In addition, this association must be of a significant nature, not just a casual occurrence (Savage and Pope 1998). Under Criterion B, the resource must be associated with historically important individuals. Again, this association must relate to the period or events that convey historical significance to the individual, not just that this person was present at this locale (Savage and Pope 1998). Under Criterion C, a resource must possess physical features or traits that reflect a style, type, period, or method of construction; display high artistic value; or represent the work of a master (an individual whose work can be distinguished from others and possesses recognizable greatness) (Savage and Pope 1998). Under Criterion D, a resource must possess sources of information that can address specific important research questions (Savage and Pope 1998). These questions must generate information that is important in reconstructing or interpreting the past (Butler 1987; Townsend et al. 1993). For archaeological sites, recoverable data must be able to address specific research questions.

After a resource is associated with a specific significant historical context, one must determine which physical features of the resource reflect its significance. One should consider the types of resources that may be associated with the context, how these resources represent the theme, and which aspects of integrity apply to the resource in question (Savage and Pope 1998). As in the antebellum agriculture example given above, a variety of resources may reflect this context (farmhouses, ruins of slave settlements, field systems, etc.). One must demonstrate how these resources reflect the context. The farmhouses represent the residences of the principal landowners who were responsible for implementing the agricultural practices that drove the economy of the South Carolina area during the antebellum period. The slave settlements housed the workers who conducted the vast majority of the daily activities necessary to plant, harvest, process, and market crops.

Once the above steps are completed and the association with a historically significant context is demonstrated, one must consider the aspects of integrity applicable to a resource. Integrity is defined in seven aspects of a resource; one or more may be applicable depending on the nature of the resource under evaluation. These aspects are location, design, setting, materials, workmanship, feeling, and association (36 CFR 60.4; Savage and Pope 1998). If a resource does not possess integrity with respect to these aspects, it cannot adequately reflect or represent its associated historically significant context. Therefore, it cannot be eligible for the NRHP. To be considered eligible under Criteria A and B, a resource must retain its essential physical characteristics that were present during the event(s) with which it is associated. Under Criterion C, a resource must retain enough of its physical characteristics to reflect the style, type, etc., or work of the artisan that it represents. Under Criterion D, a resource must be able to generate data that can address specific research questions that are important in reconstructing or interpreting the past.

3.0 Natural and Cultural Settings

3.1 Natural Setting

3.1.1 Regional Overview

Topography in the region generally consists of low ridges between meandering channels of the many streams that drain the Lower Coastal Plain. The ridges consist of sandy and loamy soils; more clayey soils and sediments occur in the drainages, marshes, and swamps that border the streams. The coast above and below the Wando River estuary consists of small to large barrier islands that form part of the Sea Island Complex in South Carolina (Kovacik and Winberry 1987:24). These low islands contain sandy uplands derived from eolian and marine sediments generally dating from terminal Pleistocene or early Holocene fluctuations in sea level. Networks of salt marshes, tidal flats, and small creeks have developed between the Sea Islands and the more interior landforms (Kovacik and Winberry 1987).

A series of terraces formed by late Tertiary and Quaternary period marine sediments characterizes the Coastal Plain. The project area lies on the most recent terraces (the Pamlico and the Talbot) that formed near the end of the Pleistocene Epoch (Miller 1971:70).

Although much of the area has been developed, extensive stands of maritime forest remain. Widmer (1976) presents a model of late Pre-Contact and early Contact period vegetation patterns for the region, following major vegetation types presented by Braun (1950). Widmer's (1976) model includes six major classes:

- Pine Savannah
- Longleaf Pine Forest
- Southern Mixed Hardwood Forest
- Southern Hardwood Swamp
- Freshwater Marsh
- Tidal Marsh

Before intensive Contact period settlement and agricultural modification, the project area probably contained a similar series of vegetation communities. General sources such as Quarterman and Keever (1962) and Shelford (1963) summarize information on floral and faunal communities for the area. Most of the extant woodlands today are mixed pine/hardwood forests. A mixed forest supports an active faunal community, including deer and small mammals (e.g., various squirrels and mice, opossum, raccoon, rabbit, fox, skunk), birds (e.g., various songbirds, ducks and wading birds, quail, turkey, doves, hawks, owls), and reptiles/amphibians (e.g., frogs, toads, lizards, snakes, turtles, alligator). Fresh and saltwater fish are abundant in the streams and marshes of the region, and shellfish are present in large numbers in most of the tidally affected waters throughout the region.

3.1.2 Past Environments

Profound changes in climate and dependent biophysical aspects of regional environments have been documented over the last 20,000 years (the time of potential human occupation of the Southeast). Major changes include a general warming trend, melting of the large ice sheets of the Wisconsin glaciation in northern North America, and the associated rise in sea level. This sea level rise was dramatic along the South Carolina coast (Brooks et al. 1989), with an increase of as much as 100 meters (m) during the last 20,000 years. At 10,000 years ago (the first documented presence of human groups in the region) the ocean was located 80-160 kilometers (km) east of its present position. Unremarkable Coastal Plain flatwoods probably characterized the project area. Sea level steadily rose from that time until about 5,000 years ago, when the sea reached essentially modern levels. During the last 5,000 years, there was a 400-to-500-year cycle of sea level fluctuations of about two m (Brooks et al. 1989; Colquhoun et al. 1981). Figure 3.1 summarizes recent fluctuations in the region.

As sea level rose to modern levels, it altered the gradients of major rivers and flooded near-coast river valleys, creating estuaries like the Cooper-Ashley-Wando River mouths. These estuaries became great centers for saltwater and freshwater resources and thus population centers for human groups. Such dramatic changes affected any human groups living in the region.

The general warming trend that led to the melting of glacial ice and the rise in sea level also greatly affected vegetation communities in the Southeast.

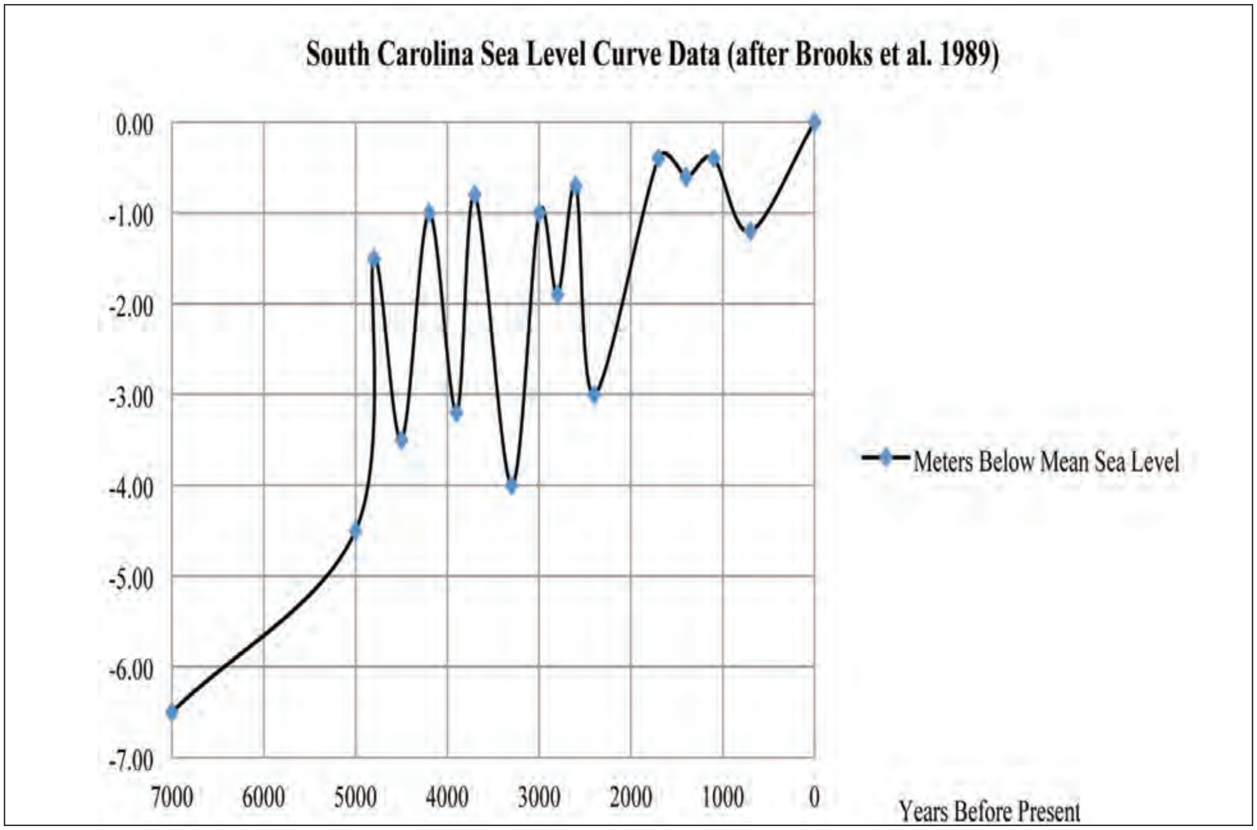

Figure 3.1 South Carolina sea level curve data (after Brooks et al. 1989).

During the late Wisconsin glacial period, until about 12,000 years ago, boreal forest dominated by pine and spruce covered most of the Southeast. This forest changed from coniferous trees to deciduous trees by 10,000 years ago. Northern hardwoods, such as beech, hemlock, and alder, dominated the new deciduous forest, with oak and hickory beginning to increase in number.

With continuation of the general warming and drying trend, oak and hickory came to dominate, along with southern species of pine; pollen data suggest that oak and hickory reached a peak at 7,000 to 5,000 years ago (Watts 1970, 1980; Whitehead 1965, 1973). Since then, the general climatic trend in the Southeast has been toward cooler and moister conditions, and the present Southern Mixed Hardwood Forest as defined by Quarterman and Keever (1962) has become established. Faunal communities also changed dramatically during this time. Several large mammal species (e.g., mammoth, mastodon, horse, camel, giant sloth) became extinct at the end of the glacial period, approximately 12,000 to 10,000 years ago. Pre-contact human groups that had focused on hunting these large mammals readapted their strategy to exploitation of smaller mammals, primarily deer in the Southeast.

3.2 Cultural Setting

The cultural history of North America generally is divided into three eras: Pre-Contact, Contact, and Post-Contact. The Pre-Contact era refers primarily to the Native American groups and cultures that were present for at least 10,000 to 12,000 years prior to the arrival of Europeans. The Contact era refers to the time of exploration and initial European settlement on the continent. The Post-Contact era refers to the time after the establishment of European settlements, when Native American populations usually were in rapid decline. Within these eras, finer temporal and cultural subdivisions have been defined to permit discussions of particular events and the lifeways of the peoples who inhabited North America at that time.

3.2.1 The Pre-Contact Era

In South Carolina, the Pre-Contact era is divided into four stages (after Willey and Phillips 1958). These include the Lithic, Archaic, Woodland, and Mississippian. Specific technologies and strategies for procuring resources define each of these stages, with approximate temporal limits also in place. Within each stage, with the exception of the Lithic stage, there are temporal periods that are defined on technological bases as well. A brief description of each stage follows, including discussions of the temporal periods within each stage. Readers are directed to Goodyear and Hanson (1989) for more detailed discussions of particular aspects of these stages and periods in South Carolina.

The Lithic Stage

The beginning of the human occupation of North America is unclear. For most of the twentieth century, archaeologists believed that humans arrived on the continent near the end of the last Pleistocene glaciation, termed the Wisconsinan in North America, a few centuries prior to 10,000 BC. The distinctive fluted projectile points and blade tool technology of the Paleoindians (described below) occurs throughout North America by this time. During the last few decades of the twentieth century, researchers began to encounter artifacts and deposits that predate the Paleoindian period at a number of sites in North and South America.

To date, these sites are few in number. The most notable are Meadowcroft Rock Shelter in Pennsylvania (Adovasio et al. 1990; Carlisle and Adovasio 1982), Monte Verde in Chile (Dillehay 1989, 1997; Meltzer et al. 1997), Cactus Hill in Virginia (McAvoy and McAvoy 1997), and most recently, the Topper/Big Pine Tree site in Allendale County, South Carolina (Goodyear 1999). All of these sites contain artifacts in stratigraphic locales below Paleoindian deposits. Radiocarbon dates indicate occupations at the Meadowcroft and Topper/Big Pine Tree sites that are 10,000 to 20,000 years earlier than the earliest Paleoindian occupations. Cactus Hill produced evidence of a blade technology that predates Paleoindian sites by 2,000 to 3,000 years. Monte Verde produced radiocarbon dates comparable to those at North and South American Paleoindian sites, but reflects a very different lithic technology than that evidenced at Paleoindian sites. Similarly, the lithic artifacts associated with the other pre-Paleoindian deposits discovered to-date do not display the blade technology so evident during the succeeding period.

Unfortunately, the numbers of artifacts recovered from these sites are too small at present to determine if they reflect a single technology or multiple approaches to lithic tool manufacture. Additional research at these and other sites will be necessary to determine how they relate to the better-known sites of the succeeding Paleoindian period and how these early sites reflect the peopling of North America and the New World.

Paleoindian Period (10,000 to 8000 BC). An identifiable human presence in the South Carolina Coastal Plain began about 12,000 years ago with the movement of Paleoindian hunter-gatherers into the region. Initially, the Paleoindian period is marked by the presence of distinctive fluted projectile points and other tools manufactured on stone blades. Excavations at sites throughout North America have produced datable remains that indicate that these types of stone tools were in use by about 10,000 BC.

Goodyear et al. (1989) review the evidence for the Paleoindian occupation of South Carolina. Based on the distribution of the distinctive fluted spear points, they see the major sources of highly workable lithic raw materials as the principal determinant of Paleoindian site location, with a concentration of sites at the Fall Line possibly indicating a subsistence strategy of seasonal relocation between the Piedmont and Coastal Plain. Based on data from many sites excavated in western North America, Paleoindian groups generally were nomadic, with subsistence focusing on the hunting of large mammals, specifically the now-extinct mammoth, horse, camel, and giant bison. In the east, Paleoindians apparently hunted smaller animals than their western counterparts, although extinct species (such as bison, caribou, and mastodon) were routinely exploited where present. Paleoindian groups were probably small, kin-based bands of 50 or fewer persons. As the environment changed at the end of the Wisconsinan glaciation, Paleoindian groups had to adapt to new forest conditions in the Southeast and throughout North America.

The Archaic Stage

The Archaic stage represents the adaptation of Southeastern Native Americans to Holocene environments. By 8000 BC, the forests had changed from sub-boreal types common during the Paleoindian period to more modern types. The Archaic stage is divided into three temporal periods: Early, Middle, and Late. Distinctive projectile point types serve as markers for each of these periods. Hunting and gathering was the predominant subsistence mode throughout the Archaic periods, although incipient use of cultigens probably occurred by the Late Archaic period. Also, the terminal Archaic witnessed the introduction of a new technology, namely, the manufacture and use of pottery.

Early Archaic Period (8000 to 6000 BC). The Early Archaic corresponds to the adaptation of native groups to Holocene conditions. The environment in coastal South Carolina during this period was still colder and moister than at present, and an oak-hickory forest was establishing itself on the Coastal Plain (Watts 1970, 1980; Whitehead 1965, 1973). The megafauna of the Pleistocene became extinct early in this period, and more typically modern woodland flora and fauna were established. The Early Archaic adaptation in the South Carolina Lower Coastal Plain is not clear, as Anderson and Logan (1981:13) report:

> At the present, very little is known about Early Archaic site distribution, although there is some suggestion that sites tend to occur along river terraces, with a decrease in occurrence away from this zone.

Early Archaic finds in the Lower Coastal Plain are typically corner- or side-notched projectile points, determined to be Early Archaic through excavation of sites in other areas of the Southeast (Claggett and Cable 1982; Coe 1964). Generally, Early Archaic sites are small, indicating a high degree of mobility.

Archaic groups probably moved within a regular territory on a seasonal basis; exploitation of wild plant and animal resources was well planned and scheduled. Anderson and Hanson (1988) developed a settlement model for the Early Archaic period (8000 to 6000 BC) in South Carolina involving movement of relatively small groups (bands) on a seasonal basis within major river drainages. The Charleston region is located within the range of the Saluda/Broad band. Anderson and Hanson (1988) hypothesize that Early Archaic use of the Lower Coastal Plain was limited to seasonal (springtime) foraging camps and logistic camps. Aggregation camps and winter base camps are suggested to have been near the Fall Line.

Middle and Preceramic Late Archaic Period (6000 to 2500 BC). The trends initiated in the Early Archaic, i.e., increased population and adaptation to local environments, continued through the Middle Archaic and Preceramic Late Archaic. Climatically, the region was still warming, and an oak-hickory forest dominated the coast until after 3000 BC, when pines became more prevalent (Watts 1970, 1980). Stemmed projectile points and ground stone artifacts characterize this period, and sites increased in size and density through the period.

Blanton and Sassaman (1989) recently reviewed the archaeological literature on the Middle Archaic period. They document an increased simplification of lithic technology during this period, with increased use of expedient, situational tools. Furthermore, they argue that the use of local lithic raw materials is characteristic of the Middle and Late Archaic periods. Blanton and Sassaman (1989:68) conclude that "the data at hand suggest that Middle Archaic populations resorted to a pattern of adaptive flexibility as a response to 'mid-Holocene environmental conditions such as variable precipitation, sea level rise, and differential vegetational succession." These processes resulted in changes in the types of resources available from year to year.

Ceramic Late Archaic Period (2500 to 1000 BC). By the end of the Late Archaic period, two developments occurred that changed human lifeways on the South Carolina Coastal Plain. Sea level rose to within one meter of present levels, and the extensive estuaries now present were established (Colquhoun et al. 1981). These estuaries were a reliable source of shellfish, and the Ceramic Late Archaic period saw the first documented emphasis on shellfish exploitation. During the Late Archaic, "the first extensive evidence of significant human occupations appear on the coast. Late Archaic coastal sites vary from isolated finds, small camps, and minor middens to large amorphous shell middens" (Russo 2002:E9). It was also during this time that the first pottery appeared on the South Carolina coast. In the project region, this pottery is represented by the fiber-tempered Stallings series and the sand-tempered or untempered Thom's Creek series. Decorations include punctation, incising, finger pinching, and simple stamping. The ceramic sequence for the central coast of South Carolina is presented in Table 3.1.

The best-known Ceramic Late Archaic-period sites are shell rings, which occur frequently along tidal marshes. "Preceding the Woodland and Mississippian mound-building periods by thousands of years, shell rings are among the earliest large-scale architectural features found in the United States" (Russo 2002:E8). These are usually round or oval rings of shell and other artifacts, with a relatively sterile area in the center. Today, many of these rings are in tidal marsh waters. "In areas where the use of shell rings was a tradition, ring builders deposited the shells in circular and semi-circular piles ranging in size from 30 to 250 meters in diameter and one to six meters in height" (Russo 2002:E9). Russo (2002:E53) summarizes three commonly accepted theories for the function of shell rings.

In terms of the place of shell rings in the larger pattern of settlement, other non-ring sites associated with shell rings are not well known. One model suggests that amorphous middens represent base camps, while shell rings served as communal centers (Michie 1979). Another suggests that shell rings were the base camps or villages of Thoms Creek coastal settlement (Trinkley 1980:312). A third suggests that shell rings may represent both villages and ceremonial centers, and it is up to the archeologist to figure out the function of each shell ring empirically rather than typologically (Russo 2004).

Brockington's archaeological investigations at 38CH1781, near the Lighthouse Point Shell Ring (38CH12) on James Island, supports Russo's (2004) idea that shell rings represent both villages and ceremonial centers (Baluha and Poplin 2005). Regardless, these sites attest to a high degree of sedentism, at least seasonally, by Ceramic Late Archaic peoples.

The Woodland Stage

The Woodland stage is marked by the widespread use of pottery, with many new and regionally diverse types appearing with changes in the strategies and approaches to hunting and gathering. Native Americans appear to be living in smaller groups than during the preceding Ceramic Late Archaic period, but the overall population likely increased. The Woodland is divided into three temporal periods (Early, Middle, and Late), marked by distinctive pottery types. Also, there is an interval when Ceramic Late Archaic ceramic types and Early Woodland ceramic types were being manufactured at the same time, often on the same site (see Espenshade and Brockington 1989). It is unclear at present if these coeval types represent distinct individual populations, some of whom continued to practice Archaic lifeways, or technological concepts that lingered in some areas longer than in others.

Early Woodland Period (1500 BC to AD 200). In the Early Woodland period, the region was apparently an area of interaction between widespread ceramic decorative and manufacturing traditions. The paddle-stamping tradition dominated the decorative tradition to the south, and fabric impressing and cord marking dominated to the north and west (Blanton et al. 1986; Caldwell 1958; Espenshade and Brockington 1989).

The subsistence and settlement patterns of the Early Woodland period suggest population expansion and the movement of groups into areas minimally used in the earlier periods. Early and Middle Woodland sites are the most common on the South Carolina coast and generally consist of shell middens near tidal marshes, along with ceramic and lithic scatters in a variety of other environmental zones. It appears that group organization during this period was based on the semi-permanent occupation of shell midden sites, with the short-term use of interior coastal strand sites.

Middle Woodland Period (200 BC to AD 500). The extreme sea level fluctuations that marked the Ceramic Late Archaic and Early Woodland periods ceased during the Middle Woodland period. The Middle Woodland period began as sea level rose from a significant low stand at 300 BC, and for the

Table 3.1 Ceramic Sequence for the Central South Carolina Coast.

Period/Era	Date	Ceramic Types
Contact	AD 1550-1715	Ashley Burnished Plain, Complicated Stamped, Cob Marked, Line Block Stamped
Late Mississippian	AD 1400-1550	Irene/Pee Dee Burnished Plain, Complicated Stamped, Incised
Early Mississippian	AD 1100-1400	Savannah/Jeremy Burnished Plain, Check Stamped, Complicated Stamped
Late Woodland	AD 900-1100	Wilmington Cord Marked
		Wando Check Stamped, Cord Marked, Fabric Impressed, Simple Stamped
		Santee Simple Stamped
		McClellanville Cord Marked, Fabric Impressed
		St. Catherines Cord Marked, Fabric Impressed, Net Impressed
	AD 500-900	Wilmington Cord Marked, Fabric Impressed, Plain
		Wando Check Stamped, Cord Marked, Fabric Impressed, Simple Stamped
		McClellanville Cord Marked, Fabric Impressed
		Deptford Cord Marked, Fabric Impressed
		Cape Fear Cord Marked, Fabric Impressed, Plain
		Berkeley Cord Marked, Fabric Impressed, Plain
Middle Woodland	AD 200-500	Berkeley Check Stamped, Cord Marked, Fabric Impressed, Plain
		Cape Fear Cord Marked, Fabric Impressed, Plain
		Deptford Brushed, Check Stamped, Cord Marked, Fabric Impressed, Plain
		Wilmington Check Stamped, Cord Marked, Fabric Impressed, Plain
	200 BC-AD 200	Deptford Brushed, Check Stamped, Simple Stamped, Plain
Early Woodland	500-200 BC	Deptford Brushed, Check Stamped, Simple Stamped, Plain
	1500-500 BC	Refuge Dentate Stamped, Incised, Punctate, Simple Stamped, Plain
Ceramic Late Archaic	2500-1000 BC	Thom's Creek Drag and Jab Punctate, Finger Pinched, Incised, Simple Stamped, Plain
		Stallings Drag and Jab Punctate, Finger Pinched, Incised, Simple Stamped, Plain

majority of the period, the sea level remained within one meter of current levels (Brooks et al. 1989). The comments of Brooks et al. (1989:95) are pertinent in describing the changes in settlement:

> It is apparent that a generally rising sea level, and corresponding estuarine expansion, caused an increased dispersion of some resources (e.g., small inter-tidal oyster beds in the expanding tidal creek network…). This hypothesized change in the structure of the subsistence resource base may partially explain why these sites tend to be correspondingly smaller, more numerous, and more dispersed through time.

Survey and testing data from a number of sites in the region clearly indicate that Middle Woodland period sites are the most frequently encountered throughout the region. These sites include small, single-house shell middens, larger shell middens, and a wide variety of shell-less sites of varying size and density in the interior. The present data from the region suggest seasonal mobility, with certain locations revisited on a regular basis (e.g., 38GE46 [Espenshade and Brockington 1989]). Subsistence remains indicate that oysters and estuarine fish were major faunal contributors, while hickory nut and acorn have been recovered from ethnobotanical samples (Drucker and Jackson 1984; Espenshade and Brockington 1989; Trinkley 1976, 1980).

The Middle Woodland period witnessed increased regional interaction and saw the incorporation of extralocal ceramic decorative modes into the established Deptford technological tradition. As Caldwell (1958) first suggested, the period saw the expansion and subsequent interaction of groups of different regional traditions (Espenshade 1986, 1990).

Late Woodland Period (AD 500 to 1100). The nature of Late Woodland adaptation in the region is unclear due to a general lack of excavations of Late Woodland components, but Trinkley (1989:84) offers this summary:

> In many respects the South Carolina Late Woodland may be characterized as a continuation of previous Middle Woodland cultural assemblages. While outside the Carolinas there were major cultural changes, such as the continued development and elaboration of agriculture, the Carolina groups settled into a lifeway not appreciably different from that observed for the past 500 to 700 years.

The Late Woodland represents the most stable Pre-Contact period in terms of sea level change, with sea level for the entire period between 0.4 and 0.6 meters below the present high marsh surface (Brooks et al. 1989). It would be expected that this general stability in climate and sea level would result in a well-entrenched settlement pattern, but the data are not available to address this expectation. In fact, the interpretation of Late Woodland adaptations in the region has been somewhat hindered by past typological problems.

Overall, the Late Woodland is noteworthy for its lack of check-stamped pottery. However, recent investigations by Poplin et al. (2002) indicate that the limestone-tempered Wando series found along the Wando and Cooper rivers near Charleston Harbor displays all of the Middle Woodland decorative elements, including check stamping, but appears to have been manufactured between AD 700 and 1200. Excavations at the Buck Hall site (38CH644) in the Francis Marion National Forest suggest that McClellanville and Santee ceramic types were employed between AD 500 and 900 and represent the dominant ceramic assemblages of this period (Cable et al. 1991; Poplin et al. 1993).

The sea level change at this time caused major shifts in settlement and subsistence patterns. The rising sea level and estuary expansion caused an increase in the dispersal of resources such as oyster beds, and thus a corresponding increase in the dispersal of sites. Semi-permanent shell midden sites continue to be common in this period, although overall site frequency appears to be lower than in the Early Woodland. Instead, there appears to be an increase in short-term occupations along the tidal marshes. Espenshade et al. (1994) state that at many of the sites postdating the Early Woodland period, the intact shell deposits appear to represent short-term activity areas rather than permanent or semi-permanent habitations.

The Mississippian Stage

Approximately 1,000 years ago, Native American cultures in much of the Southeast began a marked shift away from the settlement and subsistence practices common during the Woodland periods. Some settlements became quite large, often incorporating temple mounds or plazas. The use of tropical cultigens (e.g., corn and beans) became more common. Hierarchical societies developed, and technological, decorative, and presumably religious ideas spread throughout the Southeast, supplanting what had been distinct regional traditions in many areas. In coastal South Carolina, the Mississippian stage is divided into two temporal periods, Early and Late. Previous sequences for the region separated Mississippian ceramic types into three periods (Early, Middle, and Late), following sequences developed in other portions of the Southeast. However, a simpler characterization of the technological advancements made from AD 1000 to 1500 appears more appropriate. During these centuries, the decorative techniques that characterize the Early Mississippian period slowly evolved without the appearance of distinctly new ceramic types until the Late Mississippian.

Early Mississippian Period (AD 1100 to 1400). In much of the Southeast, the Mississippian stage is marked by major mound ceremonialism, regional redistribution of goods, chiefdoms, and maize horticulture as a major subsistence activity. It is unclear how early and to what extent similar developments occurred in coastal South Carolina. The ethnohistoric record, discussed in greater detail below, certainly indicates that seasonal villages and maize horticulture were present in the area, and that significant mound centers were present in the interior Coastal Plain to the north and west (Anderson 1989; DePratter 1989; Ferguson 1971, 1975).

Distinct Mississippian ceramic phases are recognized for the region (Anderson et al. 1982; Anderson 1989). In coastal South Carolina, the Early Mississippian period is marked by the presence of Jeremy-phase (AD 1100 to 1400) ceramics, including Savannah Complicated Stamped, Savannah Check Stamped, and Mississippian Burnished Plain types. By the end of the Late Woodland period, cord-marked and fabric-impressed decorations are replaced by complicated stamped decorations. Anderson (1989:115) notes, "characteristically, Mississippian complicated stamped ceramics do not appear until at least AD 1100, and probably not until as late as AD 1200, over much of the South Carolina area." Poplin et al.'s (1993) excavations at the Buck Hall site (38CH644) produced radiocarbon dates around AD 1000 for complicated stamped ceramics similar to the Savannah series. This represents the earliest date for complicated stamped wares in the region and may indicate an earlier appearance of Mississippian types than previously assumed.

Sites of the period in the region include shell middens, sites with apparent multiple- and single-house shell middens, and oyster processing sites (e.g., 38CH644 [Poplin et al. 1993]). Adaptation during this period apparently saw a continuation of the generalized Woodland hunting-gathering-fishing economy, with perhaps a growing importance on horticulture and storable foodstuffs. Anderson (1989) suggests that environmental unpredictability premised the organization of hierarchical chiefdoms in the Southeast beginning in the Early Mississippian period; the redistribution of stored goods (i.e., tribute) probably played an important role in the Mississippian social system. Maize was recovered from a feature suggested to date to the Early Mississippian period from 38BK226, near St. Stephen (Anderson et al. 1982:346).

Late Mississippian Period (AD 1400 to 1550). During this period, the regional chiefdoms apparently realigned, shifting away from the Savannah River centers to those located in the Oconee River basin and the Wateree-Congaree basin. As in the Early Mississippian, the Charleston Harbor area apparently lacked any mound centers, although a large Mississippian settlement was present on the Ashley River that may have been a "moundless" ceremonial center (South 2002). Regardless, it appears that the region was well removed from the core of Cofitachequi, the primary chiefdom to the interior (Anderson 1989; DePratter 1989). DePratter (1989:150) specifies:

> The absence of sixteenth-century mound sites in the upper Santee River valley would seem to indicate that there were no large population centers there. Any attempt to extend the limits of Cofitachequi even farther south and southeast to the coast is pure speculation that goes counter to the sparse evidence available.

Pee Dee Incised and Complicated Stamped, Irene Incised and Complicated Stamped, and Mississippian Burnished Plain ceramics mark the Late Mississippian period. Simple-stamped, cord-marked, and check-stamped pottery apparently was not produced in this period.

3.2.2 The Contact Era

The Contact era begins in South Carolina with the first Spanish explorations into the region in the 1520s. Native American groups encountered by the European explorers and settlers probably were living in a manner quite similar to the late Pre-Contact Mississippian groups identified in archaeological sites throughout the Southeast. Indeed, the highly structured Native American society of Cofitachequi, formerly located in central South Carolina and visited by De Soto in 1540, represents an excellent example of the Mississippian social organizations present throughout southeastern North America during the late Pre-Contact period (Anderson 1985). However, the initial European forays into the Southeast contributed to the disintegration and collapse of the aboriginal Mississippian social structures; disease, warfare, and European slave raids all contributed to the rapid decline of the regional Native American populations during the sixteenth century (Dobyns 1983; Ramenofsky 1982; Smith 1984). By the late seventeenth century, Native American groups in coastal South Carolina apparently lived in small, politically and socially autonomous, semi-sedentary groups (Waddell 1980). By the middle eighteenth century, very few Native Americans remained in the region; all had been displaced or annihilated by the ever-expanding English colonial settlement of the Carolinas (Bull 1770 cited in Anderson and Logan 1981:24-25).

The ethnohistoric record from coastal South Carolina suggests that the Contact-era groups of the region followed a seasonal pattern that included summer aggregation in villages for planting and harvesting domesticates and dispersal into one- to three-family settlements for the remainder of the year (Rogel 1570 [in Waddell 1980:147-151]). This coastal adaptation is apparently very similar to the Guale pattern of the Georgia coast, as reconstructed by Crook (1986:18). Specific accounts of the Contact-era groups of the region, the Sewee and the Santee, have been summarized by Waddell (1980). It appears that both groups included horticultural production within their seasonal round, but did not have permanent, year-round villages. Trinkley (1981) suggests that Sewee groups produced a late variety of Pee Dee ceramics in the region; this late variety may correspond to the Ashley ware initially described by South (1973, 2002; see also Anderson et al. 1982). Recent excavations at 38BK1633 on Daniel Island (Lansdell et al. 2008) exposed the remnants of a Contact-era hamlet or farmstead. Ashley Complicated Stamped, Cob Marked, and Line Block Stamped ceramics dominate the assemblage. The site contains portions of three separate houses, a probable corncrib, and large fire/refuse pits. Substantial volumes of animal bone and ethnobotanical remains occur in these pits, including charred corncob and peach pits.

Waddell (1980) identified 19 distinct groups between the mouth of the Santee River and the mouth of the Savannah River in the middle of the sixteenth century. Anderson and Logan (1981:29) suggest that many of these groups probably were controlled by Cofitachequi, the dominant Mississippian center/polity in South Carolina, prior to its collapse. By the seventeenth century, all were independently organized. These groups included the Coosaw, Kiawah, Etiwan, and Sewee "tribes" near the Charleston peninsula. The Coosaw inhabited the area to the north and west along the Ashley River. The Kiawah were apparently residing at Albemarle Point and along the lower reaches of the Ashley River in 1670 but gave their settlement to the English colonists and moved to Kiawah Island; in the early eighteenth century, they moved south of Combahee River (Swanton 1952:96). The Etiwans were mainly settled on or near Daniel Island to the northeast of Charleston, but their range extended to the head of the Cooper River. The territory of the Sewee met the territory of the Etiwan high up the Cooper and extended to the north as far as the Santee River (Orvin 1973:14). Mortier's map of Carolina, prepared in 1696, shows the Sampas (Sompa) between the Cooper and Wando rivers, to the northeast of Daniel Island, and the Wando tribe and Sewel [*sic*] tribe fort east of the Wando River, northeast of Daniel Island (St. Thomas Isle).

3.2.3 The Post-Contact Era

Spanish exploration on the South Carolina coast began as early as 1514, and a landing party went ashore in the Port Royal vicinity (now Beaufort County) in 1520 at a spot they named Santa Elena (Hoffman 1983:64; Rowland et al. 1996). From that time on, the Port Royal area was of great interest to the Spanish, French, and English. This was not a permanent settlement, however. The first Spanish attempt at a permanent settlement on the South Carolina coast, in 1526, was San Miguel de Gualdape. It appears to have been in the Winyah Bay area, near Georgetown (Quattlebaum 1956). The French, under Jean Ribault, also attempted to establish a settlement on the South Carolina coast in 1562. This settlement, on Parris Island, was called Charlesfort and was also unsuccessful.

French presence on the South Carolina coast drew the Spanish back to protect their original interests. Spanish forces attacked Charlesfort but found it abandoned and established their own settlement of Santa Elena in 1566. Recent archaeological evidence indicates that the Spanish built their new settlement of Santa Elena on top of the destroyed French settlement (DePratter et al. 1997). The Cusabo, a local tribe, were less than friendly, but despite numerous attacks and several burnings, the Spanish settlers did not abandon Santa Elena until 1587 (Lyon 1984). The Spanish maintained their interest in Santa Elena as part of a series of missions on the Sea Islands from St. Augustine, Florida through Georgia and into South Carolina; Spanish friars were at "St. Ellens" when William Hilton visited the area in 1663 (Covington 1978:8-9; Hilton 1664). During its 20-year existence, Santa Elena served as the base for the first serious explorations into the interior of the state.

Colonial Period (1670 to 1783)

European colonization of South Carolina began with temporary Spanish and French settlements in the sixteenth century. These settlements were in the Beaufort area at the southern end of the coast. The English, however, were the first Europeans to establish permanent colonies. In 1663, King Charles II made a proprietary grant to a group of powerful English courtiers who had supported his return to the throne in 1660 and who sought to profit from the sale of the new lands. These Lords Proprietors, including Sir John Colleton, Sir William Berkeley, and Sir Anthony Ashley Cooper, provided the basic rules of governance for the new colony. They also sought to encourage settlers, many of whom came from the overcrowded island of Barbados in the early years.

These Englishmen from Barbados first settled at Albemarle Point on the west bank of the Ashley River in 1670. By 1680, they moved their town down the river to Oyster Point, the present location of Charleston, and called it Charles Towne. These initial settlers, and more who followed them, quickly spread along the central South Carolina coast. By the second decade of the eighteenth century, they had established settlements from the Port Royal Harbor in Beaufort County northward to the Santee River in Georgetown County.

The Church Act of 1706 established the parish as the local unit of government. Counties or districts within Carolina were divided into parishes, with the local church serving as the administrative center. The project area is located in a region where several parishes meet: St. Philip and St. Michaels; St. James, Goose Creek; St. George, Dorchester; and St. Andrews parishes.

Some of the earliest economic development of the region focused on the Indian trade. Early Indian trader Dr. Henry Woodward mentions that Maurice Mathews had opened trade from Fair Lawn, near Moncks Corner, by July 1678 (Fagg 1970). This was north of the project area, farther up the Cooper River. Figure 3.2 presents a portion of a circa 1696 map showing only scattered settlements in or near the project area. However, agricultural industries soon replaced the fur and skin trade in the region.

Trade with the Indians was pursued aggressively through the beginning of the eighteenth century, but by 1716, conflicts with the Europeans and disease had drastically reduced the local native population. Trade with the interior Catawba and Cherokee would continue throughout the eighteenth century. The importance of rivers for the early trade of the colony is demonstrated by cuts the colonists made to circumvent oxbows, as in the Cooper River, or cuts through low areas such as through the Wappoo Creek near James Island to link the Stono and Ashley rivers. These cuts made traffic on the rivers quicker and more efficient.

Settlers also took advantage of the extensive woodlands of the region, harvesting the timber cleared from the land for the production of naval stores. Lumber, tar, turpentine, and resin all were produced from the forests cleared for agricultural lands (Gregorie 1961:20; Orvin 1973). Evidence of these harvesting activities includes many small circular tar kilns, found throughout the region (Hart 1986). The lumber industry continued to be very important in the economy of the Charleston area, even to the present day.

Another one of the important commercial ventures in the early settlements of the Lowcountry was the raising of cattle. The climate in South Carolina allowed year-round grazing, and the many necks of land surrounded by rivers and creeks along the coast provided naturally bounded cow pens and allowed the cattle to range freely. Additionally, cattle ranching was a low-capital industry with a natural market in the West Indies. Cattle ranching in South Carolina began in the late seventeenth century in the Charleston area, and by the early eighteenth century, it had extended into what is now Colleton County, between the Edisto and Combahee rivers (Rowland et al. 1996:85-88).

The colony's early settlements grew slowly, and despite its geographic spread, the South Carolina Lowcountry contained only around 5,000 European and African inhabitants in 1700. Many of the early settlements and plantations in the Carolina colony focused on the Cooper and Wando rivers. Areas adjacent to the rivers provided the best opportunity for profitable agricultural production, and the rivers were the best avenues of transportation to Charleston or other settlements in the region (South and Hartley 1985). Interior tracts also were opened as timber harvesting cleared more lands.

Large purchases of land throughout the Lowcountry, for agriculture and for cattle pasturage, created problems between the white settlers and the Yamasee Indians, whose lands were steadily and rapidly encroached upon. Angered by a combination of mistreatment from traders and encroachments on their land, the Yamasee-led Indian coalition

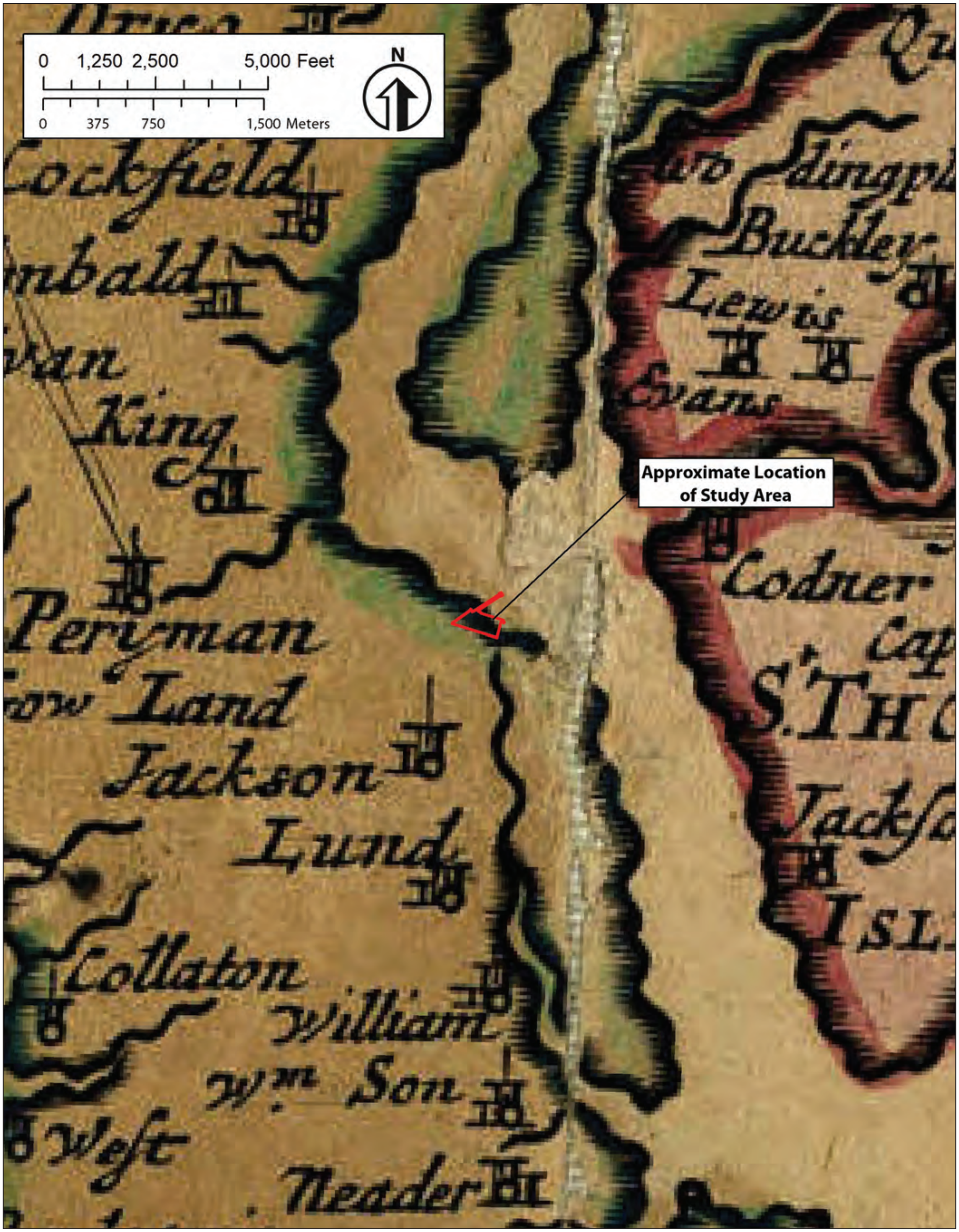

Figure 3.2 A portion of Mortier's (1696) map of South Carolina showing the approximate location of the project area.

attacked the colonists in the Yamasee War in 1715 but did not succeed in dislodging them (Covington 1978:12). While the Yamasee staged a number of successful raids through the 1720s, by 1728, British destruction of their villages in Spanish Florida secured the frontier and made the area more accessible for renewed white settlement.

The capacity of the Lords Proprietors to govern the colony effectively declined in the early years of the eighteenth century. Governance under the Lords Proprietors became increasingly arbitrary, while wars with Indians arose and the colonial currency went into steep depreciation. According to a historian of colonial South Carolina, "proprietary attitudes and behavior…convinced many of the dissenters—who at one time had composed the most loyal faction—that the crown was a more reliable source of protection against arbitrary rule" (Weir 1983:94). South Carolina's legislature sent a petition to Parliament in 1719, requesting that royal rule supplant that of the Lords Proprietors.

After several years in limbo, South Carolinians received a degree of certainty in 1729 when the crown purchased the Proprietors' interests, and in 1730, when the new royal governor, Robert Johnson, arrived in the colony. Johnson arrived with a plan to create townships throughout the colony as a way to ensure the orderly settlement of the backcountry. His scheme originally included nine townships, primarily along the major rivers in the colony. Johnson permitted the settlement of these areas on the headright system, which apportioned 50 acres of land to every individual who settled there. Many of these settlers established plantations that were directed toward the production of cash crops. Main plantation residences and facilities were established on the low bluffs of the rivers and readily accessible river landings.

Although the early colonists considered the soils on either side of the Ashley River unfavorable for agriculture, the direct access to Charleston provided by the river made the area desirable for settlement by some of the wealthiest people in the region. The settlements typically were located on bluffs within a few hundred yards of the river. A map of the region shows the grand plantation settlements that existed along the banks of the Ashley and Cooper rivers from the early 1700s to the end of the Civil War (Figure 3.3).

With the rapidly increasing wealth in the South Carolina Lowcountry, and with the Yamasee War largely behind them, the population began to swell. By 1730, the colony had 30,000 residents, at least half of whom were enslaved. A 1755 magazine cited by Peter Wood estimates that by 1723, South Carolina residents had imported over 32,000 enslaved workers (Wood 1974). The growing population, particularly the growing black majority in the Lowcountry, increased pressure for territorial expansion. Fears of a slave rebellion as well as fears of attack from the Indians led Charles Towne residents to encourage settlement in the backcountry.

Although the earliest South Carolina economy centered on naval stores and the skin and slave trade with the Native Americans, by the end of the seventeenth century, the colonists had begun to experiment with rice cultivation. Rice became the most profitable and stable commodity of the region during the eighteenth century. Lowcountry plantation owners constructed elaborate dams and irrigation systems for the rice fields. The slave trade brought and enslaved people from western Africa to perform the many tasks necessary to produce cash crops on the plantations. Slave labor was especially used for rice production, with knowledgeable enslaved Africans (i.e., those taken from African rice-producing societies) conducting (and directing) most of the activities associated with rice growing and harvesting (Joyner 1984). The many freshwater, lowland swamps in the Charles Towne area proved tillable, and production for export increased rapidly. By 1715, Charles Towne exported more than 8,000 barrels of rice annually; this number increased to 40,000 by the 1730s.

Indigo was cultivated intensively as a cash crop between 1741 and 1776 (Pinckney 1976). The indigo crop was prized for the dye that was extracted from it. The dye was used in expensive linen and silk cloth; most particularly, the dye was desirable for the dark blue color used in wool military uniforms (Lawson 1972:3). The British government, dependent on French colonies for this dye, began heavily subsidizing the crop in America in 1748. Unfortunately for the Carolinians, however, the Revolutionary War ended the bounty on indigo, making it unprofitable (Lawson 1972).

Both indigo and rice were labor-intensive, laying the basis for South Carolina's dependence on Af-

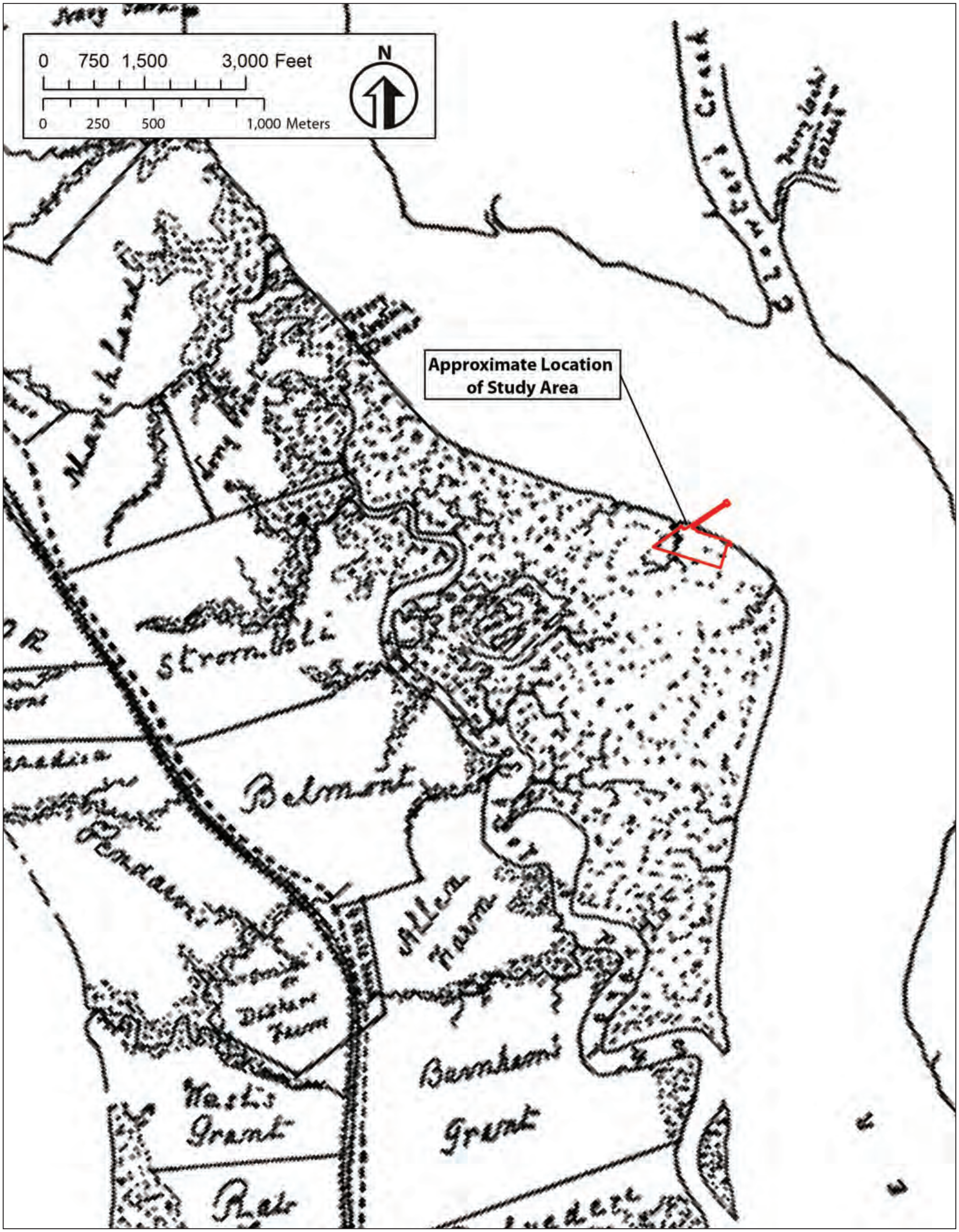

Figure 3.3 A map of the region showing the grand plantation settlements that existed around the time of the American Revolution (Smith 1988).

rican slave labor, much as sugar had done in the West Indies and tobacco had done in the Chesapeake Bay area (Coclanis 1989; Wood 1974). Many plantation owners used their available slave labor to manufacture brick. The proper clay for brick making existed on many plantations along the banks of the Cooper, Wando, and Ashley rivers. Bricks were needed locally for the construction of plantation buildings, as well as for the planters' townhouses in Charleston. The brickyards usually were located near boat landings, as the rivers provided a suitable means of transportation to Charleston. The Charleston brick market expanded dramatically in the 1740s, when the local building code was changed to require all new construction to use fireproof materials. In most instances, at least one brickyard was maintained on large Lowcountry rice plantations (Wayne 1992:114).

Planters such as the Hamlins, on the neck of Charleston, tended to augment their planting with tending taverns or inns, since most travelers approaching Charleston from the north and west traveled Goose Creek Road or Dorchester Road. The Quarter House Tavern served travelers beginning in the early 1700s (Smith 1988:65). As early as 1720, the location and tavern were mentioned in the deeds (Charleston County Deed Books [CCDB] H:211). Smith (1988) notes that the tavern may have been used to quarter militia in the early days of the colony, hence the name Quarter House. However, he was never certain of the derivation of its name, and other local residents claimed it was so called because it was one quarter of the way to Dorchester Town (Smith 1988:65-66). Figure 3.3 (above) shows the location of the Quarter House about the time of the American Revolution in 1776.

The early history of the City of Charleston and its physical development may be found in a number of published works, from the succinct delineations of various neighborhoods provided in Hudgins (1994) and Stoney (1990), to the historical narratives written by Rogers (1980) and Fraser (1989), and the extensive studies of the East Side by Rosengarten (1987) and Grimes and Zierden (1988). The following overview of Charleston's early history synthesizes these earlier works.

By 1704, Charleston had become a walled port, bounded on the west by Meeting Street, on the south by Water Street, on the north by Cumberland Street, and on the east by the waters, creeks, and marshes of the Cooper River. The walls were partially destroyed by hurricanes in 1713 and 1714 and were dismantled (in 1717 or 1718) after the successful conclusion of the Yamasee Indian War (Coclanis 1989:5, 179-180; Rogers 1980:56). In 1739, the town line was moved northward to the vicinity of present-day Beaufain and Hasell streets. By the next year, the city's population had increased 500 percent since 1700, and its areal size had almost doubled. The number of wharves along the Cooper River, or "bridges" as they were called locally, had increased from two in 1704 to eight in 1740.

The city's first suburb was developed in 1747. Ansonborough was named for British Navy commander George Anson, who served on the Carolina Station from 1724 to 1735. Anson acquired the land in 1726. By the mid-1760s, this area was well-established as a middle-class neighborhood from Hasell Street northward to George Street. In 1769, the suburb's northern boundary—and ultimately that of the city until the mid-nineteenth century—was established by the creation of Boundary Street. This new avenue was 70 feet wide, just two feet narrower than Broad Street, the city's widest boulevard. Boundary Street (presently Calhoun Street) ran from the "Broad Path," or present-day King Street, east to Scarborough (now Anson) Street.

In the 1760s, two smaller subdivisions were opened adjacent to Ansonborough, toward the river and to the north and east, but still south of Boundary Street. These were the lands of Henry Laurens (on the south) and Christopher Gadsden (on the north). Boundary Creek flowed eastward into the Cooper River from the foot of Boundary Street and north of Gadsden's property; marsh cut into the peninsula as far as the eastern end of the hornwork and present-day Meeting Street. Beyond Boundary Creek lay the area known as the Charleston "Neck," a term which had come to identify the peninsula north of the burgeoning city. [NOTE: The term now refers to the area much farther north between Heriot Street and the North Charleston city line. In this discussion, the term *Neck* will be used in its historic context to define the area north of Calhoun Street].

A wide band of property stretching from river to river, and between present-day Calhoun and Line streets, had been granted to Richard Cole in the earliest years of the settlement. In 1677, this tract was re-granted to Richard Batten. It was subsequently subdivided, with a large portion east of the "Broad Path" becoming the property of the Wragg family. Another section, just across Boundary Creek from Ansonborough and Gadsden's Middlesex development, was the property of the Mazycks. The Village of Hampstead, a block of land belonging to Henry Laurens, was located along Town Creek just beyond present-day Mary Street. In the late 1760s, Laurens attempted to develop the area along the lines of an English village, but the project failed to grow. Thus, the countryside that characterized the Neck immediately above present Calhoun Street and lands farther north was open, thinly populated, pastureland for most of the eighteenth century.

The Revolutionary War

The American colonies declared their independence from Britain in 1776, following several years of increasing tension due to unfair taxation and trade restrictions imposed on them by the British Parliament. South Carolinians were divided during the war, although most citizens ultimately supported the American cause. Those individuals who remained loyal to the British government tended to reside in Charleston or in certain enclaves within the interior of the province.

Britain's Royal Navy attacked Fort Sullivan (later renamed Fort Moultrie) near Charleston in 1776. The British failed to take the fort, and the defeat bolstered the morale of American revolutionaries throughout the colonies. The British military then turned their attention northward. They returned in 1778, however, besieging and capturing Savannah late in December. A major British expeditionary force landed on Seabrook Island in the winter of 1780, and then marched north and east to invade Charleston from its landward approaches (Lumpkin 1981:42-46). Charleston was able to offer few defenses.

The British moved slowly and deliberately toward Charleston from their landing on the North Edisto River behind Seabrook Island. Advance units crossed the Ashley River at Drayton Hall on March 20, 1780 and camped near the well-known Quarter House tavern. On the 29th of March, the main army crossed over the river to Charleston Neck, several miles above town, and used the Quarter House as command headquarters (Uhlendorf 1938). Then, on April 1st, Major James Moncrieff, chief engineer for the British Army, directed the excavation of the enemy's first siege parallel 730 m (800 yards) from the American works (Lumpkin 1981:42-46). The rebel South Carolinians were not prepared for an attack in this direction. They were besieged and entirely captured in May after offering a weak defense. Charleston subsequently became a base of operations for British campaigns into the interior of South Carolina, Georgia, and North Carolina. However, the combined American and French victory over Lord Cornwallis at Yorktown in 1782 effectively destroyed British military activity in the South and forced a negotiated peace (Lumpkin 1981). The 13 colonies gained full independence, and the English evacuated Charleston in December 1782.

Antebellum Period (1783 to 1865)

In 1783, the year the Treaty of Paris was signed, ending the war with Britain, the City of Charleston was incorporated, and the city limit moved north to Boundary Street. The city's name was also changed from "Charles Town" to Charleston. As the city grew in the closing years of the eighteenth century, so did development on the Neck. In 1785, both Meeting and King streets were extended up the peninsula. Mazyckborough was laid out in 1786, bounded by the Cooper River to the east, Chapel Street to the North, Elizabeth Street to west, and Boundary Street to the south. Between 1801 and 1806, Wraggborough was developed, defined by Mazyckborough and the river on the east, Boundary Street on the south, Meeting Street to the east, and Mary Street on the north. Across Meeting Street, the City and the State exchanged the blocks on which the eighteenth century defenses had been located (at present-day Marion Square), a portion of it becoming the site of a tobacco inspection facility by 1790, and 35 years later, the site of the Citadel.

Through the onset of the Civil War in 1861, the developed portions of the Charleston Neck lay south of Line Street, which is now immediately south of the Crosstown Expressway. A lightly developed area lay north of Line Street on the west side of King Street, leading up to the Washington Race Course (what is now Hampton Park). With the exception of this scatter of houses, the Upper Peninsula was still largely plantation acreage.

Plantations devoted to staple-crop agriculture, surrounded by legions of small, yeoman-owned farms, dominated the Lowcountry landscape in the early and mid-nineteenth century (McCurry 1995). Figure 3.4 shows the project area and the surrounding area in 1825, revealing few settlements. Rice and cotton were the chief staples, and both crops were grown on many plantations, with the low-lying areas used as rice fields and the higher and drier upland areas plowed and planted with cotton. Agricultural products remained the primary industry of the region throughout the early nineteenth century.

Plantations in the area were devoted primarily to rice, some quite extensively. By 1860, for example, Peter Gaillard Stoney at Medway Plantation (north of the project area) produced 175,000 pounds of rice, while Daniel DeSaussure Graves at Back River Plantation produced 50,000 pounds of the staple. Plantations on Daniel Island across the Cooper River from the project area focused on Sea Island and short staple cotton. Along with rice and cotton, plantations on the neck tended to also produce cattle, subsistence crops, like corn and peas and garden crops to sell in Charleston. Small armies of enslaved Africans worked these plantations.

Extensive military action occurred around Charleston during the Civil War. These operations, however, occurred south and southwest of the project area. The project area was located well behind the primary Confederate defense lines, and there is little probability that earthworks were constructed there.

Postbellum Period (1865 to 1918)

Following the Civil War, the mode of production shifted from plantations with slave labor to tenant farms or sharecropped plots in most of the region. As a result, the population became dispersed throughout the landscape as individual families became responsible for smaller tracts of land. Most of the rice lands were abandoned after the Civil War, since adequate pools of labor and capital were not available to continue the crop's profitable cultivation. The trend of population dispersal continued in the rural areas into the twentieth century.

In 1867, a post-Civil War land boom occurred along the South Carolina coast due to the presence of phosphates. Over the next 30 years, phosphate and fertilizer plants sprouted up along the rivers as old plantation owners and Northern investors sought to get rich converting the massive phosphate deposits into marketable fertilizers. The mining industry supplied a source of hard cash to thousands of unemployed formerly enslaved workers and their families but did little to obviate their place on the lower end of the postbellum economic scale. The depression of 1893 and more easily extractable deposits in Tennessee and Florida brought an end to the South Carolina phosphate industry in the first decades of the twentieth century (Shick and Doyle 1985; Shuler et al. 2006).

In the 1890s, the City of Charleston acquired much of the land within the project area for the anticipated growth of the City. Charleston planned Chicora Park, designed by the Olmstead Brothers, as a rural retreat for City residents. In 1901, the US Navy (USN) purchased the nascent Chicora Park and much of the surrounding land to create what would become Navy Base Charleston. In 1905, General Asbestos and Rubber Company (GARCO) erected a sizable manufacturing facility on the west bank of the Cooper River about one mile north. Workers on the base and at the factory quickly settled in the area, and the unincorporated small town became known as North Charleston. By World War II, residential areas had stretched to the south bank of Filbin Creek, located north of the project area. Figure 3.5 presents a 1915 map of the North Charleston area showing the growing industrial town of North Charleston and the expanding network of roads that support transportation and housing along the east side of the Charleston-Summerville road (Old State Road).

US Navy Installation

Development of a USN installation on the Cooper River began in 1901. A portion of the landscaping that was started in Chicora Park was retained in the northern end of the navy base, where the quarters for senior officers were constructed. Rail connections with the Atlantic Coast Line and Seaboard Air Line tracks to the west (both completed in 1889 along the route of the original Charleston-to Hamburg rail line- the oldest rail line in the United States) were quickly established to provide ready access for the materials needed to repair and outfit USN vessels.

The facility (called the Charleston Navy Yard) initially provided repair services for USN vessels

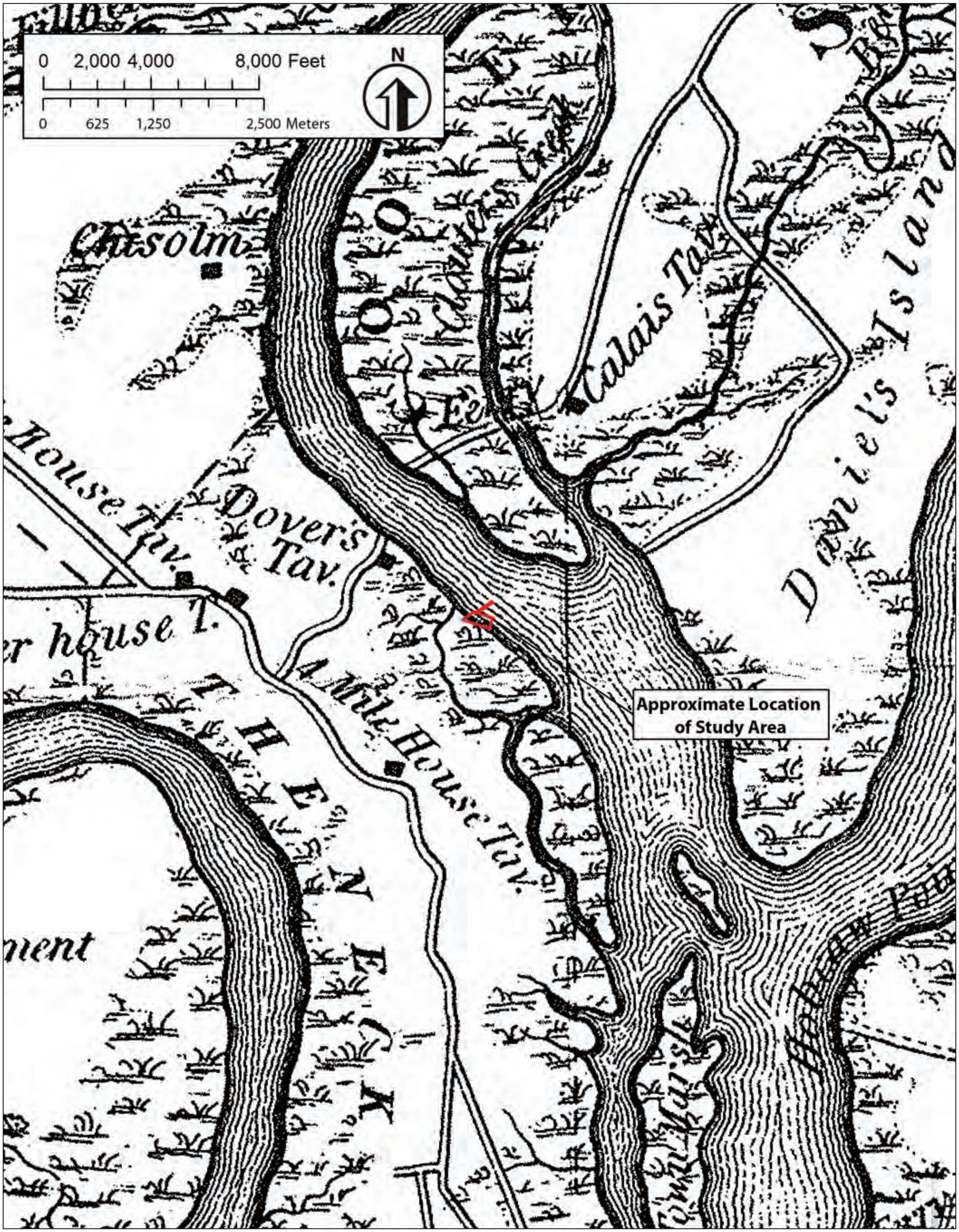

Figure 3.4 A portion of Mills' (1825) map of Charleston County showing the approximate location of the project area.

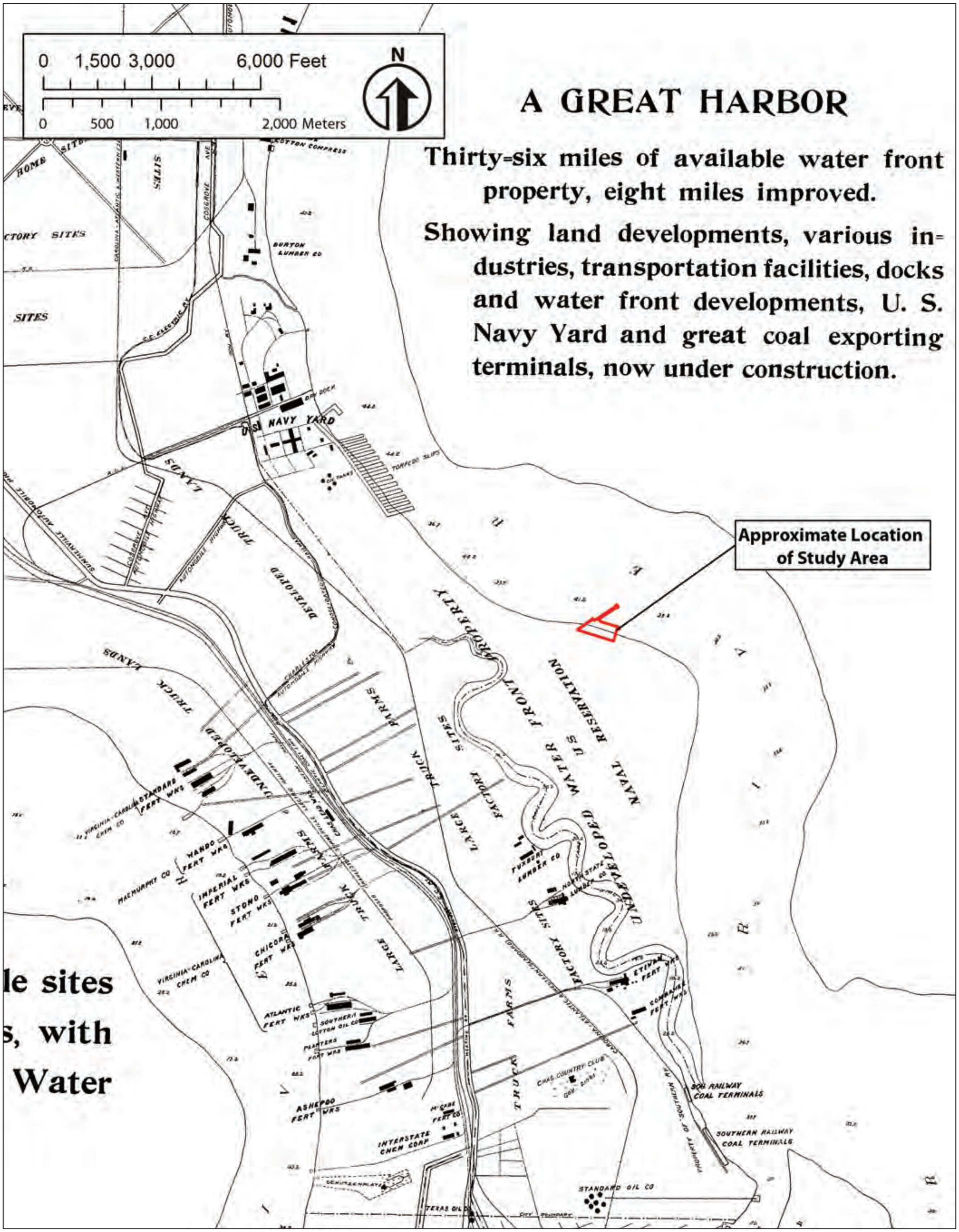

Figure 3.5 A portion of the 1915 Industrial and Commercial Map of Charleston (McCrady Brothers and Cheves, Inc., 1915).

along the southeast Atlantic Seaboard. By 1910, the USN was expanding its shipbuilding capabilities, and the Charleston Navy Yard experienced growth associated with this expansion. By the entry of the United States into World War I (WWI), the navy yard also based a torpedo boat squadron, training facilities and specialist schools, and support naval factories.

Shipbuilding expanded during WWI, although the Charleston yard was not designed to build battleships or cruisers, the largest warships of the USN. The factories established here also expanded their operations to accommodate the growth of the USN during the nation's involvement in a world war. The end of WWI saw a drastic reduction in the US military and the Charleston Navy Yard. Many of the factories, schools, and training facilities closed. Ship repair and construction were minimal. Some facilities were even dismantled.

During the inter-war years, the primitive submarines and aircraft of WWI developed into more sophisticated weapons. As naval aviation increased in importance, aviation at naval installations also grew. Aviation was one of the few military activities that received funding for new construction during the military cutbacks of the 1920s and early 1930s. An emergency landing field was established at the Charleston Navy Yard in 1929, in the south yard. In 1935, the U.S. Coast Guard established a reservation at the airfield and constructed buildings. The Coast Guard air station at the Charleston Navy Yard opened in 1936 and was the only Coast Guard air station between Cape May, New Jersey and Miami, Florida.

The early 1930s witnessed a return to naval expansion as the United States began to compete with the growing powers of Europe and the Far East. The Charleston Navy Yard began its greatest period of growth over the late 1930s and the early 1940s as the United States prepared for and entered World War II (WWII). The Charleston Navy Yard focused on the repair and construction of destroyers and destroyer escorts, and a plethora of small service, support, and specialty vessels. Over 25,000 workers were employed at the shipyard in 1943, with four dry-docks in operation.

This period witnessed the expansion of the facility to its southern limits, with massive dredging and filling operations necessary to create the land needed to support the shipbuilding and repair activities along the Cooper River. In addition to building and repair, the yard also was the home of anti-submarine activities using both fixed wing and lighter-than-air machines (blimps). The Navy established a new Naval Air Station two miles south of the shipyard on what was, prior to the 1941 dredging activities, undeveloped marshland. The Naval Air Station was the center of Charleston's WWII anti-submarine efforts. The air station supporting these activities was closed at the end of WWII. The Naval Reserve assumed control of the buildings, and in 1952, the former air station became part of the Naval Reserve fleet training center (Goodwin 1995).

Although the end of WWII witnessed a drop in activity, the Charleston Navy Yard became Naval Base Charleston and received the headquarters of the Fleet Mineforce. As the USN changed its vessels during the 1950s and 1960s, the Naval Shipyard began the construction and maintenance of nuclear powered vessels, with a fifth dry-dock built in the 1960s to accommodate nuclear-powered Polaris missile submarines that were home-berthed at Charleston. Naval Base Charleston replenished the nuclear missile submarines (including their ballistic missiles and nuclear warheads) that patrolled the Atlantic Ocean throughout the Cold War era. All of these facilities remained in operation until 1996, when the USN closed Naval Base Charleston.

The USN entered a Programmatic Agreement (PA) with the SC SHPO, requiring the adaptive reuse of the historic buildings and structures on the base to satisfy the Navy's obligations under the National Historic Preservation Act. The Charleston Naval Complex Redevelopment Authority (RDA) are the current managers of the Charleston Naval Complex, as the former base is called today. The RDA was created to manage the conversion of the former Naval Base Charleston into a non-military commercial/ industrial complex within these parameters. The RDA continues this function today and must abide by the PA implemented by the USN and the SHPO when the base was closed.

As the USN activities expanded during the early and mid-twentieth century, so too did the residential and commercial neighborhoods adjacent to the installation. Residences were needed for the thousands of workers who came to the shipyard for employment. Commercial enterprises sprang up to support these workers and the growing naval population on the base itself. Eventually, this growth contributed to the establishment of the City of North Charleston around the navy base. When the base closed in 1996, growth diminished in the surrounding neighborhoods, although the residential districts continue to be occupied in full.

North Charleston

In the 1930s, large portions of land in the South Carolina Coastal Plain were purchased by northern-owned paper mill companies which manufactured Kraft paper for the growing United States packaging industry. Most prominent in the Charleston area was West Virginia Pulp and Paper Company (Westvaco), which began operations in North Charleston just northeast of the project area in 1937. The mill provided several hundred needed jobs for the local economy suffering through the Great Depression.

The coming of World War II boosted the local economy as the military poured hundreds of millions of dollars into the Charleston area, not only at the existing US Navy base and older coastal fortifications, but also at new facilities such as Starke General Hospital, Charleston Ordnance Depot, and the Charleston Port of Embarkation, all located in and near North Charleston.

After the war, most of the military installations were returned to private hands. Development pressure made the smaller urban areas around Charleston, such as North Charleston, centers of a burgeoning population. In 1972, North Charleston incorporated, taking in much of the land from the Charleston City limit to Goose Creek along both the Ashley and Cooper rivers. These areas became industrial and residential subdivisions. By the end of the twentieth century, North Charleston was one of South Carolina's largest cities, covering 60 square miles and a population exceeding 80,000.

3.2.4 A Brief History of Pier Romeo and the Officers' Barracks

Located at the southern end of the navy base, Pier Romeo (Facility 330) is a poured reinforced concrete pier built in 1947 by the Navy for berthing naval vessels at the Naval Base Charleston. The pier is approximately 650 feet in length. Figure 3.6 shows the project tract in 1957. A one-story concrete block building, constructed circa 1985, is located at the northeast end of the pier and was originally developed as an electrical substation. The pier was improved in 1987 (URS 2008). Along the length of the pier and suspended beneath the pier are lines for air, sewer, electrical, steam, salt water, and freshwater (EnSafe/Allen & Hoshall 1995).

The building at today's 2234 South Hobson Avenue (formerly known as RTC-1) was constructed in 1944 as the Naval Air Station Bachelor Officers Quarters for the naval seaplane unit at the Naval Base Charleston. The Bachelor Officers Quarters, designed by J. E. Sirrine & Co. Architects and Engineers out of Greenville, fronted Naval Air Station Road. The seaplane unit operated during the WWII period, with the airfield located east of the building. The seaplane unit was disestablished following the end of WWII, and the barracks was converted into a training facility for the U.S. Naval Reserve. Prior to the Navy's transfer of this property to NOAA in 1996, the building had been used as a Naval Reserve Readiness Center training facility (EnSafe/Allen & Hoshall 1995).

A concrete block substation (X30A) is located northwest of the former Officers Quarters. In 1995, this building housed four transformers. Additionally, a concrete block building with poured concrete floor (RTC-4) is north of the former Bachelor Officers Quarters and was used for the storage of paints, chemicals, and lawn maintenance equipment (EnSafe/Allen & Hoshall 1995).

The former Bachelor Officers' Quarters building, including non-historic additions, was 32,752-square feet in 1995. The building is constructed of concrete block and clad in stucco. In the early 1990s, portions of the interior were remodeled, asbestos pipe insulation was removed and replaced with non-ACM insulation, ceiling tiles were removed and replaced with drop ceilings, and windows were replaced with aluminum-frame windows. Then in 1995, in preparation for transfer of the building to NOAA, the building underwent another interior remodel (EnSafe/Allen & Hoshall 1995). According to historic aerial images, between 1994 and 2002 a large square building was added to the original central entrance, and a shed just north of RTC-4 was razed.

The Navy transferred ownership of the pier as well as the former Naval Air Station Bachelor Officers Quarters and several utility buildings to

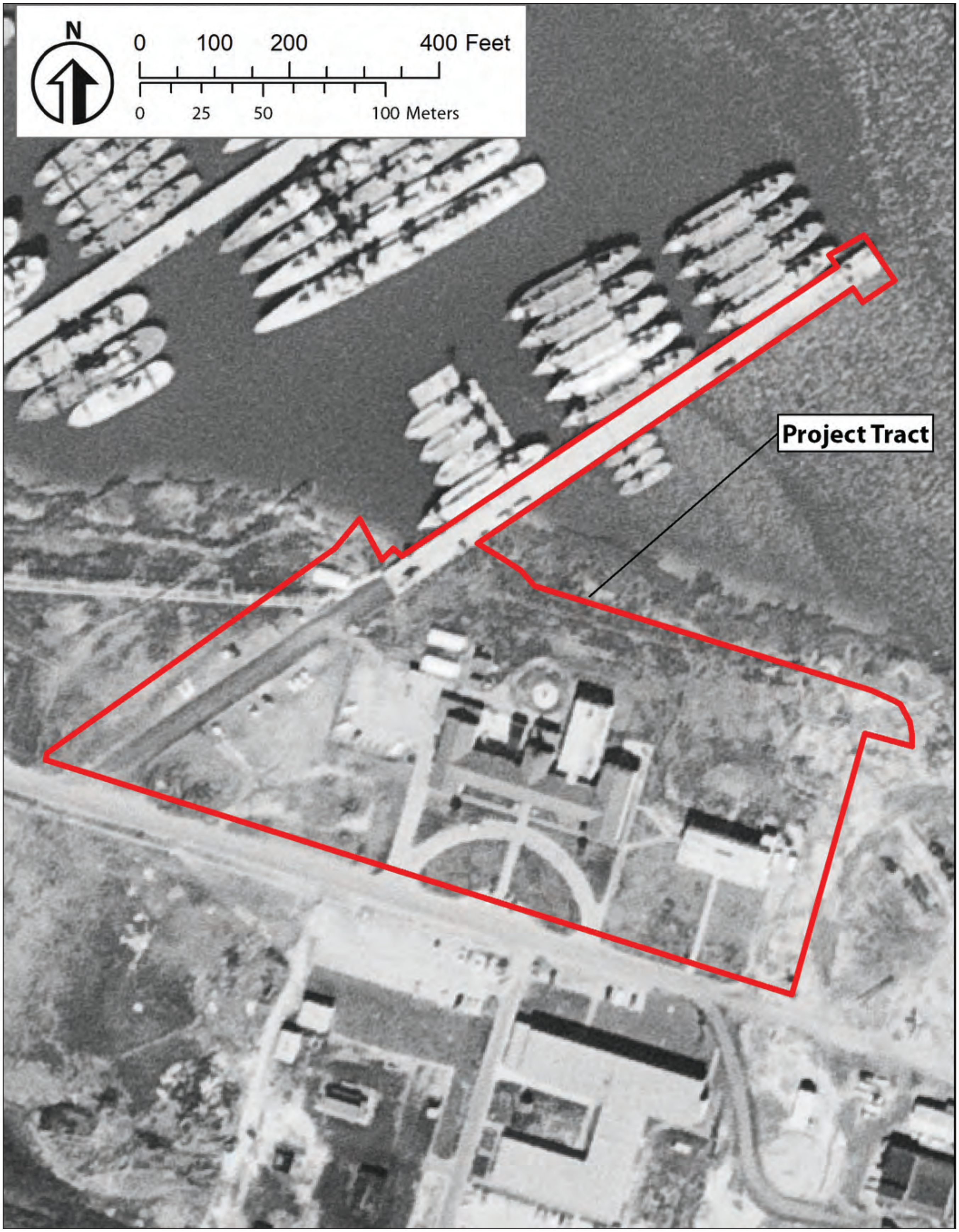

Figure 3.6 Aerial photograph showing the project tract in 1957.

NOAA's Marine Operations Center in 1996. NOAA previously docked one vessel at the pier until NOAA Marine Operations Center transferred ownership of the pier to NOAA's Coastal Services Center (CSC) in 2005. The CSC allowed a partner agency to dock vessels at the pier. The CSC discontinued electrical and water supply services to the pier in 2006 due to it not being utilized by NOAA CSC (URS 2008). Since 2016, a portion of the vacant Pier Romeo has served as a fabricated beach and nesting area for imperiled least terns. As a multiagency project including S.C. Department of Natural Resources and South Carolina Audubon, the least tern is successfully nesting at the site (Peterson 2016).

Previous Investigations

Brockington's architectural historian reviewed the following previous investigations for information on the resources and the project area.

- *City of North Charleston Historical and Architectural Survey*. Prepared for the City of North Charleston and the SC Department of Archives and History, Columbia, South Carolina. Fick et al 1995.
- *Inventory, Evaluation, and Nomination of Military Installations: Naval Base Charleston*. Prepared for the US Army Corps of Engineers, Baltimore District, Baltimore, Maryland. Goodwin, R. Christopher and Associates, Inc. 1995.
- *Draft Environmental Baseline Survey, Facilities RTC-1, RTC-4, 200, 1874, 330 (Pier R), Naval Base Charleston, Charleston, South Carolina. Prepared for Department of the Navy Southern Division, Naval Facilities Engineering Command, North Charleston, South Carolina.* Prepared by EnSafe/Allen & Hoshall, Mt. Pleasant, South Carolina. April 1995. [this report details the five Naval Base Charleston facilities that encompassed approximately 6.5 acres planned to be transferred to NOAA]
- *Phase I Environmental Site Assessment Pier Romeo, NOAA Coastal Services Center, Charleston, Charleston County, South Carolina*. Prepared for National Oceanic and Atmospheric Administration, Coastal Services Center. Prepared by URS Corporation. November 4, 2008.
- *Architectural Survey in Support of South Carolina Public Railway's Proposed Intermodal Container Transfer Facility, Charleston County, South Carolina*. Prepared for South Carolina Public Railways, Charleston, South Carolina and Atkins USA, Inc., Jacksonville, Florida. Prepared by Sheldon Owens, Rachel Bragg, and Eric C. Poplin. January 2015.
- *Proposed Real Property Improvements and Maintenance Activities for the Office for Coastal Management Facility at 2234 South Hobson Avenue, former Charleston Navy Yard, Charleston, Charleston County, South Carolina*. Prepared by NOAA, Office of Coastal Management. October 4, 2018. (and November 9, 2018 response letter from SHPO).

4.0 Results and Recommendations

4.1 Results of the Architectural Survey

For the architectural survey, Brockington's architectural historian identified four architectural resources on the project tract (SHPO Site Nos. 8422 and 8423). These resources date to the 1940s and were part of the former Naval Base Charleston (today's Charleston Naval Complex). Brockington revisited the previously recorded former Bachelor Officers Quarters, Naval Air Station and two associated utility buildings (Goodwin 1995) and assigned them SHPO Site Numbers. See Appendix C for supporting documentation. New SC SSHP Survey Forms were completed for each resource (see Appendix A).

4.1.1 Pier Romeo (SHPO Site Number 8422)

SHPO Site No. 8422 (Charleston County Parcel ID 4000000004) is Pier Romeo, located on the southern shore of the Cooper River on federally owned land adjacent to 2234 South Hobson Avenue. The building at 2234 South Hobson Avenue currently houses offices for NOAA, Office of Coastal Management, U.S. Department of Commerce. The masonry pier is referenced as Pier Romeo, Facility 330, H330, and Pier R, according to Naval Base Charleston maps and archives from the RDA. The pier was constructed in 1947 on the south end of the navy base on land that, prior to 1941 dredging activities, was marshland. The pier was originally constructed for the berthing of naval vessels. In 1996, Naval Base Charleston transferred the building and pier to NOAA. The pier is currently unused and vacant. Today, the pier houses a mock beach/nesting area for least terns and other shorebirds. The nesting project is a multiagency effort to provide protected places for annual nesting and includes an area of pea gravel laid on the surface of the pier. Figures 4.1-4.5 present current views of SHPO Site No. 8422.

The linear pier, constructed of concrete with a circa 1985 concrete block electrical building at the end, is approximately 650 feet long and 30 feet wide. It is poured concrete with concrete piers and treated wood poles. The pier is situated northeast/southwest and parallel to numerous other piers jutting out into the Cooper River along the shore at the former Charleston Naval Base. Pipes for electrical and water usage run the length of the structure. The pier appears to be in good structural condition, with the exception of some rotting wood piers. Character defining features include the pier identification signage at the southern end of the pier, the linear masonry structure, and the unadorned electrical building at the end of the pier.

SHPO Site No. 8422 retains integrity of location, design, materials, and workmanship. The structure lacks integrity of setting, feeling, and association due to the numerous changes in the built environment surrounding the pier since the closure of the Naval Air Station and closure of the former Naval Base Charleston. In addition, the pier is currently vacant and unused. Brockington recommends this resource not eligible for the NRHP under Criterion C (*architecture*) due to a lack of distinct architectural characteristics and because it is not a significant example of a type, period, or method of construction. Limited archival research did not identify this pier and/or its original owner(s) with an important historical event or series of events; therefore, we do not recommend it eligible for listing under Criteria A *(events*) or B (*people*). The resource does not have the potential to yield information under Criterion D (*information potential*). Brockington recommends SHPO Site No. 8422 not eligible for listing in the NRHP.

4.1.2 2234 Hobson Avenue Office Building (SHPO Site Number 8423)

SHPO Site No. 8423 (Charleston County Parcel ID 4000000004) at 2234 South Hobson Avenue, North Charleston, originally the Naval Air Station Bachelor Officers Quarters at the Charleston Navy Yard (later called Naval Base Charleston), currently houses offices for NOAA, Office for Coastal Management, U.S. Department of Commerce. The building is also referred to as RTC-1 and HX-30, according to Naval Base Charleston maps and archives from the RDA. Architects were J. E. Sirrine & Co. Architects and Engineers of Greenville, SC. The historic core of the building is an E-shaped, two-story, masonry building, clad in stucco, with a gabled roof. Figures 4.6-4.8 presents current views of SHPO Site No. 8423.

Figure 4.1 SHPO Site No. 8422, Pier Romeo, facing southwest.

Figure 4.2 SHPO Site No. 8422, Pier Romeo with concrete block building at end, facing northeast.

Figure 4.3 SHPO Site No. 8422, Pier Romeo, south elevation, facing northeast.

Figure 4.4 SHPO Site No. 8422, Pier Romeo, facing northeast from Sentry house.

Figure 4.5 SHPO Site No. 8422, Pier Romeo signage, facing north from parking lot.

The building has undergone several exterior alterations and additions since it was built in 1944 as the barracks for bachelor officers of the Navy Base Charleston seaplane unit. The building is situated between the Cooper River and South Hobson Avenue and is oriented north/south with its primary façade (the south elevation) fronting South Hobson Avenue. The rear elevation of the former barracks faces the Cooper River and Pier Romeo.

The historic core of the E-shaped, two-story building runs east to west, parallel to South Hobson Avenue and the Cooper River shoreline, with the three gabled wings off the north elevation. The foundation is concrete. By the early 1950s, a two-story wing was added on the north elevation between the central and easternmost wings. Today, the exterior of the entire building is stucco-covered masonry, the roof is clad in asphalt shingle, and the windowsills are concrete. The windows are non-historic, one-over-one, operable, replacement metal windows. Non-historic additions include the central entry building on Hobson Avenue, an additional two-story, gabled wing between the central wing and the westernmost wing, and the attached, elevated buildings on the east that appear to house the building's mechanical equipment.

SHPO Site No. 8423 retains integrity of location but lacks integrity of design, materials, setting, feeling, and association due to multiple additional alterations to the original building materials. Brockington recommends this resource not eligible for the NRHP under Criterion C (*architecture*) due to a lack of distinctive architectural characteristics, the use of non-historic materials, and because it is not a representative example of a type, period, or method of construction. Limited archival research did not identify the former barracks and/or its original owner(s) with an important historical event or series of events; therefore, we recommend it not eligible for listing under Criteria A (*events*) or B (*people*). The resource does not have the potential to yield information under Criterion D (*information potential*). SHPO Site No. 8423 is recommended not eligible for listing in the NRHP. In addition, Goodwin recommended this resource not eligible (1995).

Figure 4.6 SHPO Site No. 8423, RTC-1, rear elevation, facing south.

Figure 4.7 SHPO Site No. 8423, RTC-1, southwest oblique facing northeast.

Figure 4.8 SHPO Site No. 8423, RTC-1, rear elevation, facing southwest.

4.1.3 Support Structure (SHPO Site Number 8423.01)

SHPO Site No. 8423.01 (RTC-4) was built as a support structure in 1944. It is a one-story, concrete block building north of the former Bachelor Officers Quarters (SHPO Site No. 8423). The storage building has a shed roof clad in metal and stucco-covered masonry foundation. Windows include two operable, one-over-one light windows on the north elevation and one on the south elevation. Windows have concrete sills. There is one metal door on the west elevation accessible via a metal staircase and platform. It was used for the storage of paints, chemicals, and lawn maintenance equipment (Figure 4.9, top).

SHPO Site No. 8423.01 retains integrity of location but lacks integrity of design, materials, setting, feeling, and association. Brockington recommends this resource not eligible for the NRHP under Criterion C (*architecture*) due to a lack of distinctive architectural characteristics, the use of non-historic materials, and because it is not a representative example of a type, period, or method of construction. Limited archival research did not identify the former barracks and/or its original owner(s) with an important historical event or series of events; therefore, we recommend it not eligible for listing under Criteria A (*events*) or B (*people*). The resource does not have the potential to yield information under Criterion D (*information potential*). SHPO Site No. 8423.01 is recommended not eligible for listing in the NRHP. In addition, Goodwin recommended this resource not eligible (1995).

4.1.4 Transfer Station (SHPO Site Number 8423.02)

SHPO Site No. 8423.02 was originally a transformer station (X30A) located northwest of the former Bachelor Officers Quarters (SHPO Site No. 8423). The building dates to 1944. The one-story, stucco-covered masonry, flat roofed building rests on a stucco-covered foundation and has an open north elevation that currently is clad in metal fencing. The storage building has no windows, and it has one metal door on its east elevation. In 1995, this building housed four transformers (Figure 4.9, bottom). The current use is unknown.

SHPO Site No. 8423.02 retains integrity of location but lacks integrity of design, materials, setting, feeling, and association. Brockington recommends this resource not eligible for the NRHP under Criterion C (*architecture*) due to a lack of distinctive architectural characteristics, the use of non-historic materials, and because it is not a representative example of a type, period, or method of construction. Limited archival research did not identify the former barracks and/or its original owner(s) with an important historical event or series of events; therefore, we do not recommend it eligible for listing under Criteria A (*events*) or B (*people*). The resource does not have the potential to yield information under Criterion D *(information potential*). SHPO Site No. 8423.02 is recommended not eligible for listing in the NRHP. In addition, Goodwin recommended this resource not eligible (1995).

4.2 Project Summary

There are previously recorded cultural resources on the project tract. The current NOAA office building (and two support structures) were documented and recommended not eligible for the NRHP (Goodwin 1995), but they were not assigned SHPO site numbers. During the current survey, we recorded the pier (SHPO Site No. 8422) and revisited the office building (SHPO Site No. 8423) and two support buildings (SHPO Site Nos. 8423.01 and 8423.02). The pier was constructed in 1947. The office building was constructed in 1944. We recommend these resources not eligible for the NRHP. No potentially significant anomalies, sonar targets, or bottom features were identified within the underwater survey area of the pier. The uplands consist of made land and have been completely disturbed by the twentieth-century built environment; therefore, no shovel testing was conducted. No anomalies or potential historic resources were identified during the underwater archaeological survey around the pier. The proposed recapitalization project at Pier Romeo will have no effect on historic properties.

Figure 4.9 SHPO Site No. 8423.01, RTC-4, northwest oblique facing southeast (top), and SHPO Site No. 8423.02, X30A, northwest oblique facing southeast (bottom).

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Appendix A
Survey Forms

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

Site No. 8422 Status U Revisit

Quadrangle Name: Charleston

Tax Map No. 4000000004

SURVEY FORM

Identification

Historic Name: Pier 330 (H330 or Pier R), Charleston Navy Yard

Common Name: Pier Romeo, NOAA Office of Coastal Management, U.S. Department of Commerce

Address/Location: 2234 South Hobson Avenue

City: North Charleston Vicinity of County: Charleston

Ownership: Federal Category: Structure Other:

Historical Use: Defense

Current Use: Vacant/Not in use

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Other:

Construction Date: 1947

Construction: Masonry

Historic Core Shape:

Exterior Walls:

Other:

Foundation:

Commercial Form:

Roof Shape:

Other:

Roof Material:

Stories:

Porch Shape:

Other:

Porch Width:

Description/Significant Features:

the pier is approximately 650 feet long and 30 feet wide. It is poured concrete with concrete piers and treated wood poles. Pipes for electrical and water run the length of the structure. The pier features a ca. 1985 concrete block electrical building at the end, 2 Sentry houses, and an entrance sign at the southern/land side of the pier.

Alterations (include date(s), if known):

Architect(s)/Builder(s):

Historical Information

Historical Information:

design, date of construction, materials, etc.

Source(s) of Information:

H330 site plans and construction drawings, CNC Redevelopment Authority

Digital Photo ID(s)

File Name:	View:	Other:
08422001	Facing Southwest	
08422002	Facing Northeast	
08422003	Facing Northeast	
08422004	Facing Northeast	
08422005	Facing North	
08422006	Facing Southwest	

Program Management

Recorded by:	Organization:	Date Recorded:
L Kittrell	Brockington and Associates, Inc.	04/26/2021

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

Site No. 8423 Status U Revisit ✓

Quadrangle Name: Charleston

Tax Map No. 4000000004

SURVEY FORM

Identification

Historic Name: Naval Air Station Bachelor Officers Quarters, Charleston Navy Yard

Common Name: NOAA Office for Coastal Management, U.S. Department of Commerce

Address/Location: 2234 South Hobson Avenue

City: North Charleston Vicinity of County: Charleston

Ownership: Federal Category: Building Other:

Historical Use: Defense

Current Use: Government

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Other:

Construction Date: 1944 Construction: Masonry

Historic Core Shape: Exterior Walls: Stucco

Other: Foundation: Stuccoed masonry

Commercial Form: Roof Shape: Gable, lateral

Other: Roof Material: Composition shingle

Stories: 2 stories Porch Shape:

Other: Porch Width:

Description/Significant Features:

the historic core of the building is an E-shaped, two-story, masonry building, clad in stucco, with a lateral gabled roof and end gabled end and central wings. The building runs east to west, parallel to todays' South Hobson Avenue and the Cooper River shoreline. Window sills are concrete.

Alterations (include date(s), if known):

Doors and windows are non-historic. Windows are 1/1, operable, replacement metal windows. Non-historic additions include the central entry building on Hobson Avenue, an additional 2-story gabled wing between the central wing and the westernmost wing, and the attached, elevated buildings on the east that appear to house the building's mechanical equip.

Architect(s)/Builder(s):

J. E. Sirrine & Co. Architects and Engineers, Greenville, SC

Historical Information

Historical Information:

design, architect, dates of construction and alterations. date of construction

Source(s) of Information:

site plans and construction drawings, CNC Redevelopment Authority. Goodwin (1995).

Digital Photo ID(s)

File Name:	View:	Other:
08423001	Facing Northeast	
08423002	Facing North	
08423003	Facing Northwest	
08423004	Facing South	
08423005	Facing South	
08423006	Facing Southeast	
08423007	Facing Southwest	
08423008	Facing East	

Program Management

Recorded by:	Organization:	Date Recorded:
L Kittrell	Brockington and Associates, Inc.	04/26/2021

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

Site No. 8423.01 Status U Revisit ✓

Quadrangle Name: Charleston

Tax Map No. 4000000004

SURVEY FORM

Identification

Historic Name: RTC-4, Naval Air Station Bachelor Officers Quarters, Charleston Navy Yard

Common Name: NOAA Office for Coastal Management, U.S. Department of Commerce

Address/Location: 2234 South Hobson Avenue

City: North Charleston Vicinity of County: Charleston

Ownership: Federal Category: Building Other:

Historical Use: Defense

Current Use: Government

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date:	1944	Construction:	Masonry	Other:
Historic Core Shape:		Exterior Walls:	Other	concrete block
Other:		Foundation:	Stuccoed masonry	
Commercial Form:		Roof Shape:	Other	shed
Other:		Roof Material:	Other metal	
Stories:	1 story	Porch Shape:	Shed	
Other:		Porch Width:	Full façade	

Description/Significant Features:

It is a one-story, concrete block building north of the former Bachelor Officers Quarters. It features a shed roof clad in metal, shed roof porch, and stucco-covered masonry foundation. Windows include 2 operable, 1/1 light windows on the north elevation, and 1 on the south elevation.

Alterations (include date(s), if known):

Non-historic metal door on the west elevation accessible via a non-historic metal staircase and platform. Windows appear non-historic with additional storm windows.

Architect(s)/Builder(s):

Historical Information

Historical Information:

design, location. date of construction

Source(s) of Information:

site plans and construction drawings, CNC Redevelopment Authority. Goodwin (1995).

Digital Photo ID(s)

File Name:	View:	Other:
08423009	Facing Southeast	
08423010	Facing East	
08423011	Facing Northeast	

Program Management

Recorded by:	Organization:	Date Recorded:
L Kittrell	Brockington and Associates, Inc.	04/26/2021

Statewide Survey of Historic Properties

State Historic Preservation Office
South Carolina Department of Archives and History
8301 Parklane Road
Columbia, SC 29223-4905 (803) 896-6100

Site No. 8423.02 Status U Revisit ✓

Quadrangle Name: Charleston

Tax Map No. 4000000004

SURVEY FORM

Identification

Historic Name: X30A, Naval Air Station Bachelor Officers Quarters, Charleston Navy Yard

Common Name: NOAA Office for Coastal Management, U.S. Department of Commerce

Address/Location: 2234 South Hobson Avenue

City: North Charleston Vicinity of County: Charleston

Ownership: Federal Category: Building Other:

Historical Use: Defense

Current Use: Government

SHPO National Register Determination of Eligibility: Not Eligible

Property Description

Construction Date: 1944

Historic Core Shape:

Other:

Commercial Form:

Other:

Stories: 1 story

Other:

Construction: Masonry Other:

Exterior Walls: Stucco

Foundation: Stuccoed masonry

Roof Shape: Flat

Roof Material: Other concrete

Porch Shape:

Porch Width:

Description/Significant Features:

The one-story, stucco-covered masonry, flat roofed building rests on a stucco-covered foundation and has an open north elevation that currently is clad in metal fencing. The storage building has no windows, and one metal door on its east elevation.

Alterations (include date(s), if known):

Architect(s)/Builder(s):

Historical Information

Historical Information:

design. date of construction

Source(s) of Information:

site plans and construction drawings, CNC Redevelopment Authority. Goodwin (1995).

Digital Photo ID(s)

File Name:	View:	Other:
08423012	Facing Southeast	
08423013	Facing Southwest	
08423014	Facing Northwest	

Program Management

Recorded by:	Organization:	Date Recorded:
L Kittrell	Brockington and Associates, Inc.	04/26/2021

Appendix B
Underwater Survey Report

Report Entitled:

A Phase I Remote-Sensing Archaeological Survey at Romeo Pier on the Cooper River, North Charleston, South Carolina

Submitted to:

Brockington & Associates
498 Wando Park Boulevard
Suite 700
Mt. Pleasant, South Carolina 29464

Submitted by:

Gordon P. Watts, Jr., Ph.D, RPA
Principal Investigator

Tidewater Atlantic Research, Inc.
P. O. Box 2494
Washington, North Carolina 27889

Submittal Date:

20 April 2021

Abstract

Brockington and Associates (Brockington) of Mt. Pleasant, South Carolina is working with Moffatt & Nichol of Raleigh, North Carolina to permit NOAA improvements to Pier Romeo in North Charleston, South Carolina. In order to determine any adverse effects on potentially significant submerged cultural resources, Brockington contracted Tidewater Atlantic Research (TAR) of Washington, North Carolina to conduct a submerged cultural resource remote-sensing survey of the Romeo Pier-Cooper River area of potential effect. Work performed by TAR underwater archaeologists consisted of a remote-sensing survey using both magnetic and acoustic equipment. Remote-sensing survey operations were carried out on 13 April 2021. Analysis of the magnetic and acoustic data identified no potentially significant anomalies, sonar targets, or bottom features within the Romeo Pier survey area. Based on the data generated by the remote-sensing survey, no National Register of Historic Places eligible submerged cultural resources will be impacted by proposed project activities. Consequently, no additional archaeological investigation in the study area is recommended.

Table of Contents

Page

List of Figures

List of Tables

Introduction

Brockington and Associates (Brockington) of Mt. Pleasant, South Carolina is working with Moffatt & Nichol (M&N) of Raleigh, North Carolina to permit NOAA improvements to Pier Romeo in North Charleston, South Carolina. In order to determine any adverse effects on potentially significant submerged cultural resources, Brockington contracted Tidewater Atlantic Research (TAR) of Washington, North Carolina to conduct a submerged cultural resource remote-sensing survey of the Romeo Pier-Cooper River area of potential effect. Work performed by TAR underwater archaeologists consisted of a remote-sensing survey using both magnetic and acoustic equipment.

The remote-sensing investigation carried out by TAR was designed to meet current survey criteria required by the South Carolina State Historic Preservation Officer (SHPO) and to comply with guidelines recommended by the South Carolina Institute of Archaeology and Anthropology, Maritime Research Division (SCIAA-MRD). The survey was designed to comply with the National Historic Preservation Act of 1966, as amended, through 1992 (36 CFR 800, *Protection of Historic Properties*), the Abandoned Shipwreck Act of 1987 (*Abandoned Shipwreck Act Guidelines*, National Park Service, *Federal Register*, Vol. 55, No. 3, December 4, 1990, pages 50116-50145), the National Environmental Policy Act of 1969 (Public Law 11-190), Executive Order 11593, the South Carolina Underwater Antiquities Act of 1991, the Advisory Council on Historic Preservation Procedures for the protection of historic and cultural properties (36 CFR Part 800), and guidelines described in 36 CFR 64 and CFR 66. Results of the investigation are designed to furnish NOAA, Brockington, and M&N with archaeological data required to comply with Federal and State of South Carolina submerged cultural resource legislation and regulations.

To reliably identify anomalies associated with submerged cultural resources, survey equipment included both magnetic and acoustic remote sensing. Data was collected employing a cesium magnetometer, sidescan sonar, and sub-bottom profiler. Navigation and data collection was accomplished using differential global positioning and HYPACK survey software. To ensure sufficient data would be available to locate any potentially significant magnetic anomalies and sonar targets in the project areas, remote-sensing data were collected along parallel lanes spaced on 50-foot intervals. Field work performed by TAR underwater archaeologists was carried out on 13 April 2021. U.S. Secretary of Interior qualified project personnel included Principal Investigator Gordon Watts, Field Director Ralph Wilbanks and Vessel Captain Steve Howard.

Analysis of the magnetic and acoustic data identified no potentially significant anomalies, sonar targets or bottom sediment features in the proposed project site. Based on the data generated by the remote-sensing survey, no National Register of Historic Places (NRHP) eligible submerged cultural resources will be impacted by proposed project activities and no additional investigation is recommended.

Project Location

Romeo Pier is located on the Cooper River in North Charleston, South Carolina (Figure 1).

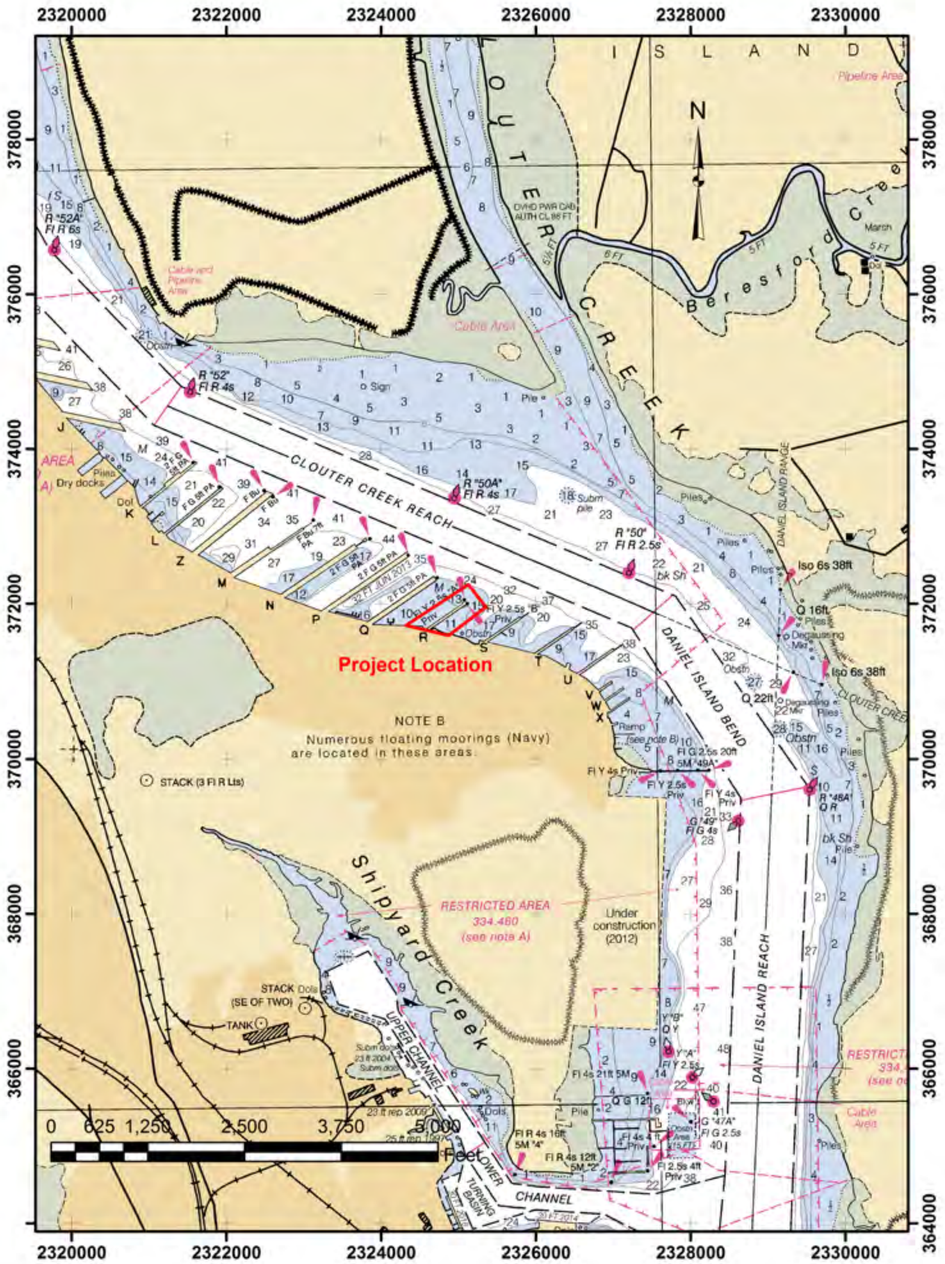

Figure 1. Romeo Pier project location (Detail of NOAA Chart 11524-1).

The Romeo Pier survey area is a 6.9-acre polygon measuring 890 feet in maximum length from southwest to northeast, and as much as 400 feet in width southeast to northwest. Border points for the current study area are identified in Figure 2. South Carolina State Plane (SCSP) North American Datum 1983 (NAD 83); and U.S. Survey Foot (USSF) coordinates for those points are identified in Table 1.

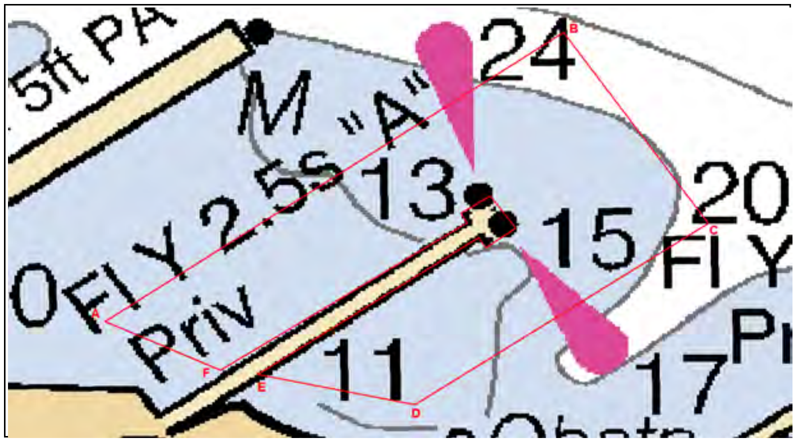

Figure 2. Border point locations for Romeo Pier survey area.

Border Point	X Coordinate	Y Coordinate
A	2324480.2	371828.2
B	2325209.7	372334.1
C	2325439.4	372000.1
D	2324972.6	371683.1
E	2324723.3	371735.3
F	2324663.9	371743.3

Table 1. Romeo Pier survey border point coordinates.

Remote-Sensing Survey Methodology

In order to reliably identify submerged cultural resources, TAR archaeologists conducted a systematic remote-sensing survey of the Romeo Pier survey site. Survey activities were conducted from a 25-foot Parker survey vessel (Figure 3). In order to fulfill the requirements for South Carolina survey activities, magnetic and acoustic remote-sensing equipment were employed. This combination of remote sensing represents the state of the art in submerged cultural resource location technology and offers the most reliable and cost-effective method to locate and identify potentially significant targets. Data collection was controlled using a differential global positioning system (DGPS). DGPS produces highly accurate coordinates necessary to support a sophisticated navigation program and assures reliable target location.

Figure 3. Twenty-five foot Parker survey vessel.

An EG&G GEOMETRICS G-882 marine cesium magnetometer, capable of plus or minus 0.001 gamma resolution, was employed to collect magnetic data in the survey area (Figure 4). To produce the most comprehensive magnetic record, data was collected at 10 samples per second. The magnetometer sensor was towed approximately 18 feet above the bottom surface, except where shallow water dictated otherwise, at a speed of approximately four knots. Magnetic data were recorded as a data file associated with the computer navigation system. Data from the survey were contour plotted using QUICKSURF software to facilitate anomaly location and definition of target signature characteristics. All magnetic data were correlated with the acoustic remote-sensing records.

Figure 4. Geometrics G-882 cesium vapor magnetometer.

A 445/900 kHz KLEIN 3900 digital sidescan sonar (interfaced with SONARPRO SONAR PROCESSING SYSTEM) was employed to collect acoustic data in the survey area (Figure 5). The sidescan sonar transducer was deployed and maintained between five and seven feet below the water surface except where shallow water dictated otherwise. Acoustic data were collected using a range scale of 50 meters to provide a minimum of 200% coverage and high-target signature definition. Acoustic data were recorded as a digital file with SONARPRO and tied to the magnetic and positioning data by the Hypack digital navigation and data collection system.

Figure 5. Klein System 3900 digital sidescan sonar.

Acoustic sub-bottom data was collected using an EDGETECH 3100P Portable sub-bottom profiler with an SB-216S transducer (Figure 6). The SB-216S provides three frequency spectrums between 2 and 15kHz with a pulse length of 20 msec. Penetration in coarse and calcareous sand is factory rated at 6 meters with between 2 and 10cm of vertical resolution. During the survey the sub-bottom transducer was deployed and maintained between three to five feet below the water surface. To facilitate target identification, sub-bottom sonar records were electronically tied to DGPS coordinates and recorded as a digital file using EDGETECH's DISCOVER software.

Figure 6. EdgeTech SB-216S tow vehicle.

A TRIMBLE AgGPS was used to control navigation and data collection in the survey area. That system has an accuracy of plus or minus three feet, and can be used to generate highly accurate coordinates for the computer navigation system on the survey vessel. The DGPS was employed in conjunction with an onboard laptop loaded with HYPACK navigation and data collection software

(Figure 7). Positioning data generated by the navigation system were tied to magnetometer, sonar and subbottom profiler records by regular annotations to facilitate target location and anomaly analysis. All data is related to the SCSP Coordinate System, NAD 83, USSF.

Figure 7. Computer navigation and data collection systems located on the vessel helm.

Magnetic Signature and Acoustic Target Evaluation

While no absolute criteria for identification of potentially significant magnetic and/or acoustic target signatures exist, available literature confirms that reliable analysis must be made on the basis of certain characteristics. Magnetic signatures must be assessed on the basis of three basic factors. The first factor is intensity and the second is duration. The third consideration is the nature of the signature; e.g. positive monopolar, negative monopolar, dipolar or multi-component. Unfortunately, shipwreck sites have been demonstrated to produce each signature type under certain circumstances. Some shipwreck signatures are more apparent than others.

Large vessels, constructed of iron or wood, produce magnetic signatures that can be reliably identified. Smaller vessels, or disarticulated vessel remains, are more complex to identify. Their signatures are frequently difficult, if not impossible, to distinguish from single objects and/or modern debris. In fact, some small vessels produce little or no magnetic signature. Unless ordnance, ground tackle or cargo associated with the hull produces a detectable signature, some sites are impossible to identify magnetically. It is also difficult to magnetically distinguish some small wrecks from modern debris. As a consequence, magnetic targets must be subjectively assessed according to intensity, duration and signature characteristics. The final decision concerning potential significance must be made on the basis of anomaly attributes, historical navigation patterns, and a responsible balance between historical and economic priorities.

Acoustic signatures must also be assessed on the basis of several basic characteristics. Perhaps the most important factor in acoustic analysis is the configuration of the signature. As the acoustic record represents a reflection of specific target features, wreck signatures are often a highly detailed and accurate image of architectural and construction features. On sites with less structural integrity acoustic signatures often reflect more of a geometric pattern that can be identified as structural material. Where hull remains are disarticulated the pattern can be little more than a texture on the bottom surface representing structure, ballast or shell hash associated with submerged deposits. Unfortunately, shipwreck sites have been demonstrated to produce a variety of signature characteristics under different circumstances. Like magnetic signatures, some acoustic shipwreck signatures are more apparent than others. Large vessels, whether iron or wood, can produce acoustic signatures that can be reliably identified.

Smaller vessels or disarticulated vessel remains are inevitably more difficult. Their acoustic signatures are frequently difficult, if not impossible, to distinguish from concentrations of snags and/or modern debris. In fact, some small vessels produce little or no acoustic signature. As a consequence, acoustic targets must be subjectively assessed according to intensity of return over background, elevation above bottom and geometric image characteristics. The final decision concerning potential significance of less readily identifiable targets must be made on the basis of anomaly attributes, historical patterns of navigation in the project area and a responsible balance between historical and economic priorities.

Remote-Sensing Data Analysis

Magnetometer data was collected in the form of HYPACK raw data files. Each line file was reviewed by the principal investigator to identify and characterize anomalies that could be generated by submerged cultural resources. Anomaly signatures suggestive of significant submerged cultural material were isolated and analyzed in accordance with anomaly intensity, duration, areal extent and signature characteristics suggestive of the material generating the anomalies. Analysis of each anomaly included consideration of magnetic and acoustic signature characteristics previously demonstrated to be reliable indicators of historically significant submerged cultural resources. Assessment of each anomaly included recommendations for additional investigation to determine the exact nature of the cultural material that generated the signature and its potential NRHP significance. Using QUICKSURF software, a magnetic contour map of the survey area was produced to aid in analysis and data representation. The contour map included target location coordinates in SCSP, NAD 83, USSF coordinates.

Sidescan sonar data was collected in the form of raw SonarPro XTF data files. Sub-bottom profiler data was also collected in the form of raw Explorer JSF data files. Each line of acoustic data was reviewed by the principal investigator using SONARWIZ software to identify and characterize targets that could be generated by submerged cultural resources. Acoustic target signatures suggestive of significant submerged cultural material were isolated and analyzed in accordance with image intensity, duration, areal extent and configuration characteristics. Analysis of each target image included consideration of acoustic signature characteristics previously demonstrated to be reliable indicators of historically significant submerged cultural resources. Using SONARWIZ software a sonar coverage mosaic map of the survey area was produced to aid in analysis and data representation.

Survey Area Data Analysis

Magnetic and acoustic data were collected on 12 survey lines in the current study area (Figure 8). Line-by-line analysis of the magnetometer data and contouring at 20 gammas confirmed that no potentially significant magnetic anomalies were present in the survey area (Figure 9). All of the anomalies are associated with Romeo Pier, bulkhead structures, riprap, abandoned dredge pipe, and a ship berthed [13 April 2021] at adjacent Sierra Pier. Line-by-line analysis and mosaicking of the sonar data identified no significant acoustic targets (Figure 10). Line-by-line analysis of the study area sub-bottom profiler data identified no evidence of relict landform features or targets associated with the magnetic anomalies (Figure 10).

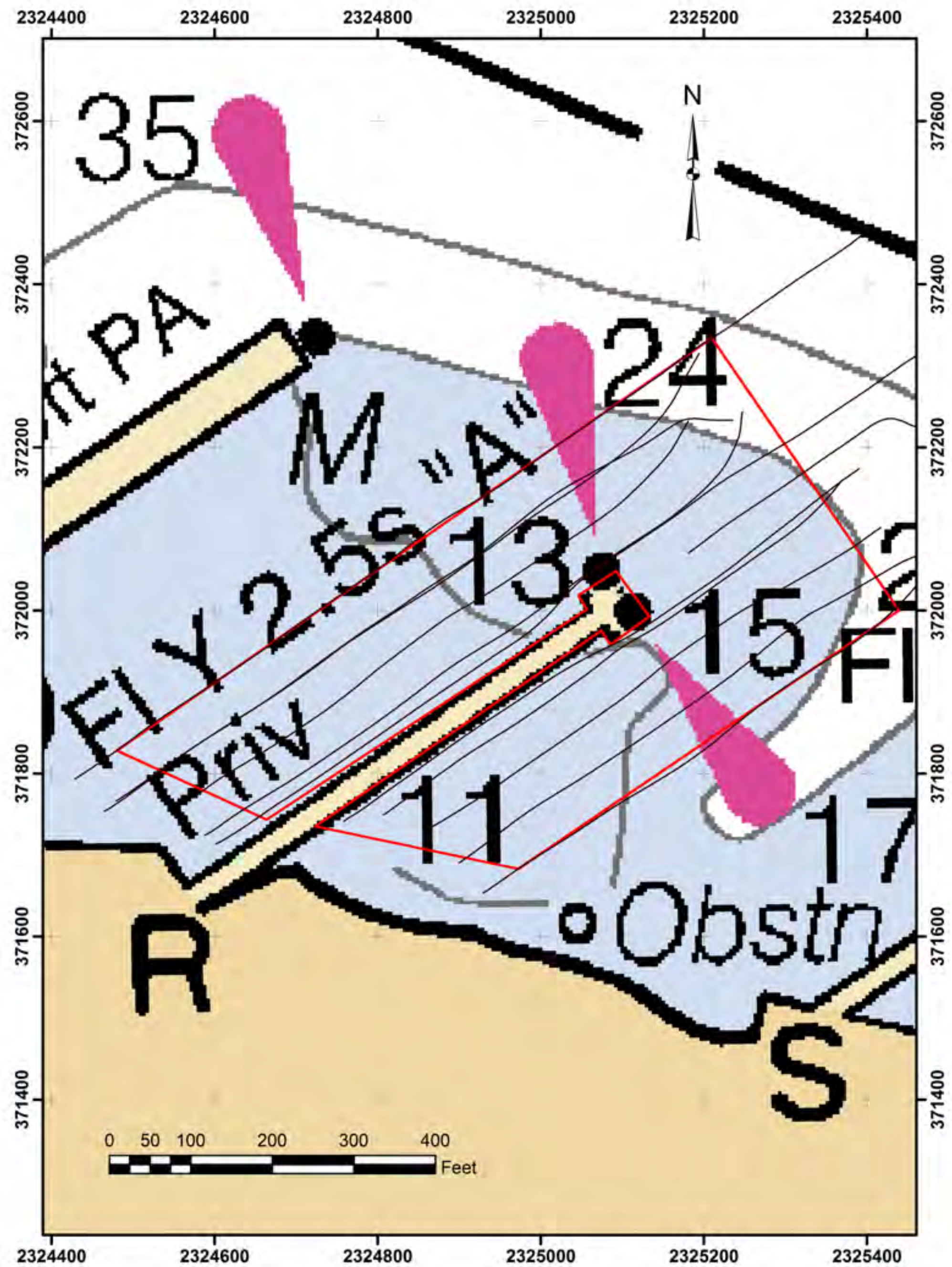

Figure 8. Romeo Pier survey as-run tracklines.

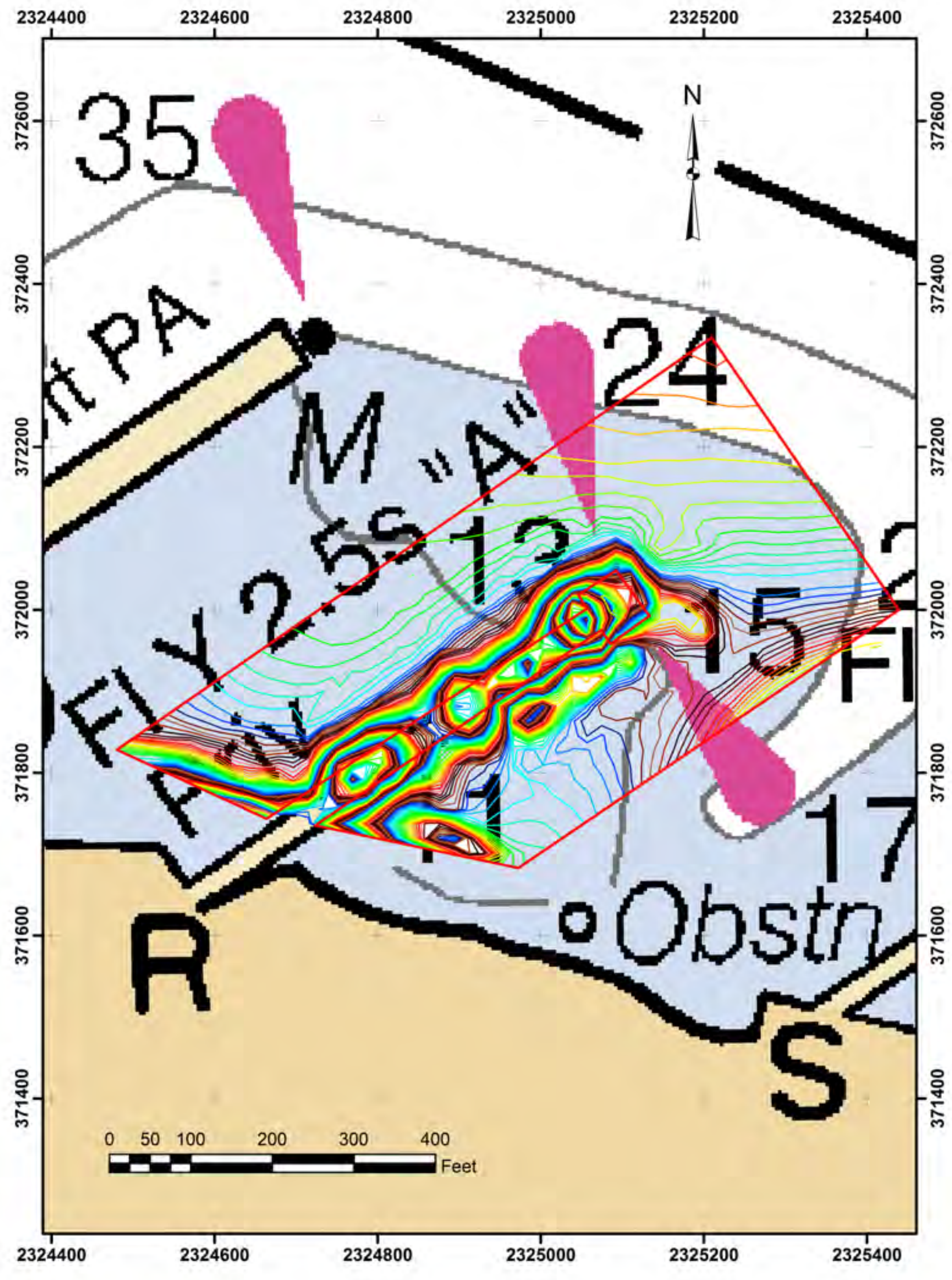

Figure 9. Romeo Pier contoured magnetometer data.

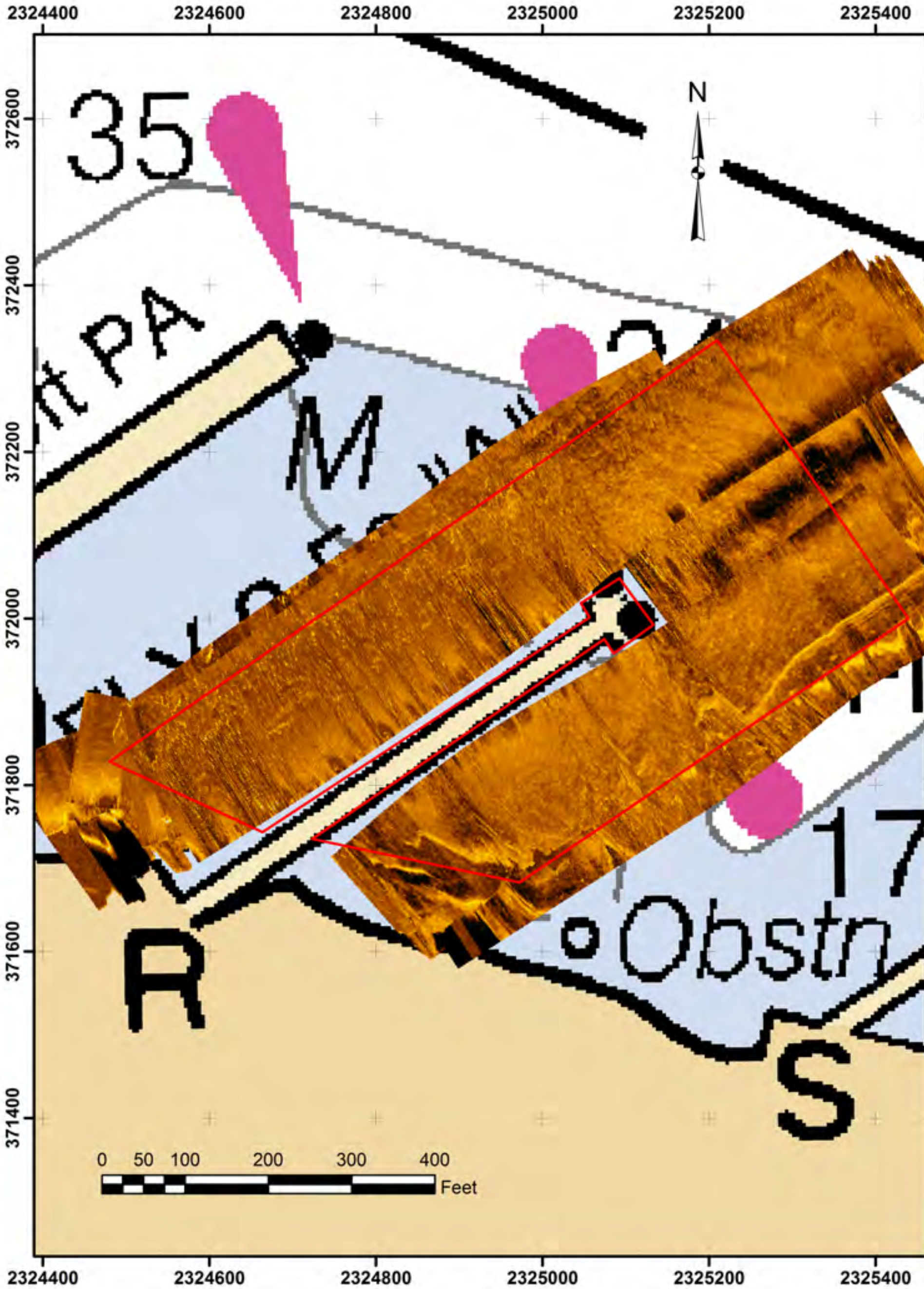

Figure 9. Romeo Pier sonar coverage mosaic.

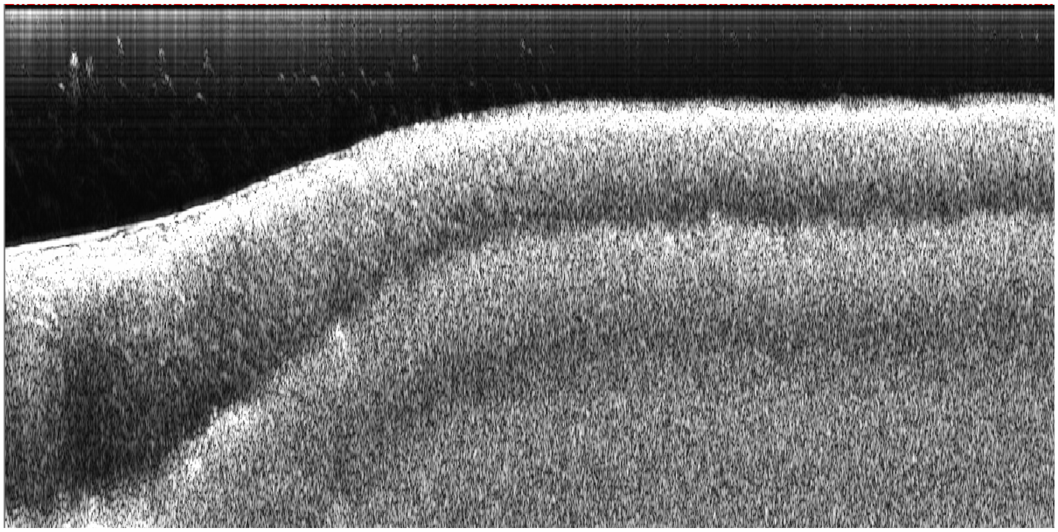

Figure 10. Sub-bottom profiler data example from Line Number 08.

Conclusions and Recommendations

Data generated by the remote-sensing survey identified no potentially significant magnetic anomalies or sonar targets in the Romeo Pier survey area. All of the magnetic anomalies are associated with Romeo Pier, bulkhead structures, riprap, abandoned dredge pipe, and a ship berthed [13 April 2021] at adjacent Sierra Pier. No significant targets were identified in the sidescan sonar data. Analysis of the sub-bottom profiler data identified no potentially significant geological features or targets associated with the magnetic anomalies. Based on data generated by the remote-sensing survey, no NRHP eligible submerged cultural resources will be impacted by proposed project construction activities. Consequently, no additional archaeological investigation in the study area is recommended.

Unexpected Discovery Protocol

In the event that any project activities expose potential prehistoric or historic cultural material not identified during the remote-sensing survey, construction companies under contract to work on Romeo Pier should *immediately* shift operations away from the site (or sites) and *immediately* notify the respective Point of Contact for NOAA, M&N, and Brockington. M&N and Brockington should forthwith notify the South Carolina SHPO (W. Eric Emerson) and the SCIAA-MRD (James Spirek). Notification should address the exact location and where possible, the nature of material impacted by project construction activities, and proposed options for immediate archaeological inspection and assessment of the site.

Appendix C
Supporting Documention

Delivery Order No. 0020
Contract No. DACW31-89-D-0059

US Army Corps
of Engineers
Baltimore District

INVENTORY, EVALUATION, AND NOMINATION OF MILITARY INSTALLATIONS: NAVAL BASE CHARLESTON

Final Report

April 19, 1995

R. Christopher Goodwin and Associates, Inc.
337 East Third Street
Frederick, Maryland 21701

Prepared for

U.S. Army Corps of Engineers
Baltimore District
P.O. Box 1715
Baltimore, MD 21203-1715

HABS/HAER INVENTORY

Building Number: RTC 1
Structure Name: Building RTC 1
Location: Hobson Avenue, Naval Base Charleston, Charleston, SC
Construction Date: 1944
Use Original/Present: BOQ, NAS/Reserve Training Center
Rating: 3
Condition: Good
Description:
Building RTC 1 is a two-story barracks that faces south off Hobson Avenue. It has a T-shaped plan and is 238 ft. long x 143 ft. wide x 24 ft. high. The building has 15 bays along the front elevation and 9 bays along the side. It has a concrete wall foundation. The exterior walls are stuccoed. The cross-gabled roof is clad with composition roll. The primary entry is slightly recessed and is located in the center of the south elevation. The doorway has modern double glass doors in a metal frame and has a brick surround. The windows are modern replacements, aluminum-frame, one-over-one-light double-hung sash. The windows have concrete sills. An exterior brick chimney is located on the north elevation. A second exterior wall brick chimney is located at the end wall of the rear wing. A two-story, rectangular concrete block addition is attached to the rear elevation. Single-story, shed-roofed additions are located at the ends of two of the rear wings.

History:
Building RTC 1 was built in 1944 as a bachelor officers' quarters to support the naval air station, established at this location in 1942. The air station was the center of Charleston's World War II anti-submarine efforts. Blimps and seaplanes assigned to the station patroled the coastline. In 1946, the air station was decommissioned. The buildings were used by the Naval Reserve. In 1952, the former air station became part of the fleet training center. In 1950, the two-story rear wing was added to the building. The building currently serves as an administration function as a Reserve Training Center and was remodeled extensively during the 1980s.

Significance:
This building was constructed as quarters for the naval air station during World War II. It is associated with an historic context illustrating the development of Naval Base Charleston (Criterion A), and represents an example of a major building type (Criterion C). However, the building does not possess integrity of materials, design, or feeling to qualify for listing in the National Register of Historic Places. The facilities for the naval air station were dispersed over a wide area, so no cohesive historic district or grouping of facilities to illustrate the World War II naval air station exists.

Continued

Continuation Of: Building RTC 1

Sources:

Charleston Navy Yard. "The Industrial History of Charleston Navy Yard, 1939-1945, [1945]." TS. Navy Department Library, Washington Navy Yard, Washington, DC.

McNeil, Jim. Charleston's Navy Yard. Charleston, SC: Naval Civilian Administrator's Association, 1985.

Smith, P.B. "Sixty Years at Charleston Naval Shipyard." Bureau of Ships Journal 11 (March 1962): 16-19.

U.S. Army Corps of Engineers. Historic and Archeological Resources Protection Plan for Naval Base Charleston, Charleston, South Carolina. Mobile, Alabama: Mobile District, U.S. Army Corps of Engineers, 1991.

Installation Maps, various dates from 1913 to 1946.

Inventoried By: Deborah Cannan, Katherine Grandine, Hampton Tucker
Affiliation: R. Christopher Goodwin & Associates, Inc
Inventory Date: April 1993
Roll Number: 109
Frame Numbers: 5,6,8

HABS/HAER INVENTORY

Building Number: RTC 4
Structure Name: Building RTC 4
Location: Hobson Avenue, Naval Base Charleston, Charleston, SC
Construction Date: 1944
Use Original/Present: Support Structure, NAS/Storage-Reserve Center
Rating: 3
Condition: Good
Description:
Building RTC 4 is a one-story utility building located behind RTC 1. It faces northwest off Hobson Avenue. It has a rectangular plan and is 35 ft. long x 15 ft. wide x 10 ft. high. The building has one bay along the front elevation and one bay along the side. It has a concrete wall foundation. The exterior walls are concrete block. The building has a shed roof with overhanging eaves. The main entry is a single wood door accessed by a wooden stair. The windows are wood sash, six-over-six-light, double-hung sash with concrete sills. A one-story metal addition is attached to the east elevation. The building adjoins a fenced area containing a corrugated metal storage facility.

History:
According to the Detailed Inventory of Naval Shore Facilities, Building RTC 4 was constructed in 1944 as a support structure for the Naval Air Station. However, the 1946 annual map does not show a building of similar size at this location. Instead, it shows three mess attendants' barracks (Buildings 3-A, 3-B, and 39) that support the bachelor officers' quarters. If this building were constructed in 1944, it may be a remnant of Building 39 that has been altered subsequently. The naval air station was the center of Charleston's World War II anti-submarine efforts. Blimps and seaplanes assigned to the station patroled the coastline. In 1946, the air station was decommissioned. The buildings were used by the Naval Reserve. In 1952, the former air station became part of the fleet training center. The building currently serves as a storage facility for the Reserve Center.

Significance:
This building is a minor support building with a construction date attributed to 1944. If this construction date is accurate, this structure is associated with an historic context illustrating the development of Naval Base Charleston during World War II (Criterion A). However the individual building does not possess the qualities of significance for listing in the National Register of Historic Places. The facilities for the naval air station were dispersed over a wide area, so no cohesive historic district or grouping of support facilities for the World War II naval air station exists. In addition, the building does

Continued

Continuation Of: Building RTC 4

not possess integrity of design to qualify for listing in the National Register of Historic Places.

Sources:

Charleston Navy Yard. "The Industrial History of Charleston Navy Yard, 1939-1945, [1945]." TS. Navy Department Library, Washington Navy Yard, Washington, DC.

McNeil, Jim. Charleston's Navy Yard. Charleston, SC: Naval Civilian Administrator's Association, 1985.

Smith, P.B. "Sixty Years at Charleston Naval Shipyard." Bureau of Ships Journal 11 (March 1962): 16-19.

U.S. Army Corps of Engineers. Historic and Archeological Resources Protection Plan for Naval Base Charleston, Charleston, South Carolina. Mobile, Alabama: Mobile District, U.S. Army Corps of Engineers, 1991.

Installation Maps, various dates from 1913 to 1946.

Inventoried By: Deborah Cannan, Katherine Grandine, Hampton Tucker
Affiliation: R. Christopher Goodwin & Associates, Inc
Inventory Date: April 1993
Roll Number: 109
Frame Numbers: 7

HABS/HAER INVENTORY

Building Number: X30A
Structure Name: Building X30A
Location: Hobson Avenue, Naval Base Charleston, Charleston, SC
Construction Date: 1944
Use Original/Present: Transformer Station, NAS/Utility Transformer Station
Rating: 3
Condition: Good
Description:
Building X30A is a one-story utility building that faces east off Hobson Avenue. It has a rectangular plan and is 18 ft. long x 14 ft. wide x 10 ft. high. The building has one bay across the front and one bay along the side. The building is constructed of poured concrete on a poured concrete wall foundation. The roof is a concrete slab. There is a single metal door.

History:
This building was constructed to support the naval air station, established at this location in 1942. The air station was the center of Charleston's World War II anti-submarine efforts. Blimps and seaplanes assigned to the station patroled the coastline. In 1946, the air station was decommissioned. The buildings were used by the Naval Reserve. In 1952, the former air station became part of the fleet training center.

Significance:
This building was constructed as a minor support building for the naval air station during World War II. It is associated with an historic context illustrating the development of Naval Base Charleston (Criterion A), but the individual building does not possess the qualities of significance for listing in the National Register of Historic Places. The facilities for the naval air station were dispersed over a wide area, so no cohesive historic district or grouping of support facilities for the World War II naval air station exists.

Sources:

Charleston Navy Yard. "The Industrial History of Charleston Navy Yard, 1939-1945, [1945]." TS. Navy Department Library, Washington Navy Yard, Washington, DC.

McNeil, Jim. Charleston's Navy Yard. Charleston, SC: Naval Civilian Administrator's Association, 1985.

Smith, P.B. "Sixty Years at Charleston Naval Shipyard." Bureau of Ships Journal 11 (March 1962): 16-19.

U.S. Army Corps of Engineers. Historic and Archeological Resources Protection Plan for Naval Base Charleston, Charleston, South Carolina. Mobile, Alabama: Mobile District, U.S. Army Corps

Continued

Continuation Of: Building X30A

of Engineers, 1991.

Installation Maps, various dates from 1913 to 1946.

Inventoried By: Deborah Cannan, Katherine Grandine, Hampton Tucker
Affiliation: R. Christopher Goodwin & Associates, Inc
Inventory Date: April 1993
Roll Number: 106
Frame Numbers: 17,18

Appendix J: Federal Agency Coordination

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of the Chief Administrative Officer
Facilities Engineering Office – Western Region
7600 Sand Point Way NE
Seattle, WA 98115

September 13, 2022

VIA ELECTRONIC MAIL
Mr. David Bernhart
Assistant Regional Administrator for Protected Resources
National Marine Fisheries Service
Southeast Regional Office
St. Petersburg, Florida

Re: Request for Initiation of Expedited Informal Consultation under section 7(a)(2) of the Endangered Species Act for the NOAA OMAO Southeast Marine Operations Hub Project North Charleston Pier Romeo Recapitalization Project (SAC-2021-00965)

Dear Mr. Bernhart:

On behalf of the National Oceanic and Atmospheric Administration (NOAA) Office of Marine and Aviation Operations (OMAO) please accept this letter to serve as our request for initiation of expedited informal consultation under section 7(a)(2) of the Endangered Species Act (ESA) for the Southeast Marine Operations Hub Project (formally referred to as Pier Romeo Recapitalization).

We have conducted early coordination with your staff, Karla Reece, on January 21, 2022, to confirm the proposed project, as described below, falls under the expedited informal consultation threshold. The NOAA-OMAO is requesting concurrence for the determination that the proposed project may affect, but is not likely to adversely affect, any ESA-listed species and would have no effect on critical habitat. Our supporting analysis is provided below.

The U.S. Army Corps of Engineers (USACE) Charleston District indicated that the South Atlantic Regional Biological Opinion (SARBO) would be applicable in this instance since previous USACE permits had repeatedly approved dredging adjacent to Pier Romeo to -35' MLW with 2'allowable overdepth since 1968, and this proposed reconstruction of Pier Romeo is proposing to dredge that previously disturbed area to only -25'MLW with 1' allowable overdepth.

Pursuant to our request for expedited informal consultation, we are providing the following project information:

- A description of the action to be considered.
- A description of the action area.
- A description of any listed species or critical habitat that may be affected by the action.
- An analysis of the potential routes of effect on any listed species or critical habitat.

Additionally, the project's conceptual design plans and pertinent technical studies prepared in support of this consultation are provided as attachments.

If you have additional questions or comments, please contact me at 206-471-2468 or via email at timothy.calohan@noaa.gov.

Sincerely,

Timothy R. Calohan

Timothy R Calohan, PE
Senior Project Manager
Facilities Engineering Office
Office of the Chief Administrative Officer
National Oceanic & Atmospheric Administration
US Department of Commerce
7600 Sand Point Way, Seattle, WA 98115
206-526-6647 o
206-471-2468 c
timothy.calohan@noaa.gov

Attachments

Attachment A: Project Information Pertinent of NOAA Consultation
Attachment B: Pier Romeo Concept Plans
Attachment C: Coastal Studies Report
Attachment D: Sampling and Analysis Plan
Attachment E: Draft Noise Assessment Technical Report

From:	Baker, Rachel
To:	Pace Wilber - NOAA Federal
Cc:	Morrison, Samantha; Flesch-Pate, Julie; Huggett, Douglas
Subject:	Pier Romeo Recapitalization Project EFH Worksheet
Date:	Monday, July 25, 2022 4:40:02 PM
Attachments:	NOAA Pier Romeo_EFHWorksheet.pdf image001.png image002.png image003.png image004.png

Dear Mr. Pace:

Thank you for your assistance in preparing the attached EFH information. On behalf of the National Oceanic and Atmospheric Administration (NOAA) Office of Marine and Aviation Operations (OMAO) please accept the attached EFH Worksheet to serve as our request for informal consultation with your agency regarding EFH for the Southeast Marine Operations Hub Project (formally referred to as Pier Romeo Recapitalization).

Thank you,

Rachel Baker
Environmental Associate

301 Greenfield Dr. | Newport, NC 28570
| M 919.606.5813

moffatt & nichol

EFH Assessment Worksheet rev. August 2021

Please read and follow all of the directions provided when filling out this form.

1. General Project Information

Date Submitted: 07/14/2022

Project/Application Number: SAC-2021-00965

Project Name: North Charleston Pier Romeo Recapitalization Project

Project Sponsor/Applicant: Moffatt & Nichol

Federal Action Agency (or state agency if the federal agency has provided written notice delegating the authority[1]): NOAA Office of Marine and Aviation Operations (OMAO)

Fast-41: Yes ☐ No ☑

Action Agency Contact Name: Timothy Calohan, PE

Contact Phone: 206-526-6647 Contact Email: timothy.calohan@noaa.gov

Address, City/Town, State:

7600 Sand Point Way
Seattle, WA 9811

2. Project Description

[2]Latitude: 32.850167N Longitude: 79.943028W

Body of Water (e.g., HUC 6 name): Charleston Harbor watershed (03050201-07), Cooper River, Charleston, SC

Project Purpose:

The purpose of the Project is to recapitalize the Pier Romeo Pier to reestablish homeport operations and maintenance functions for NOAA vessels and other visiting government vessels.

Project Description:

Pier Romeo consists of a reinforced concrete pier, approximately 44,793 square-feet in size and approximately 650 feet in length as well as a substation at the northeast end of the pier. The pier and its associated substation and utility system were decommissioned in 2006. This project will include major improvements to existing berthing facilities and an updated utility system including new utility substation buildings and lighting. The project will build back Pier Romeo to a fully viable berthing facility enabling the agency to support sustainable, safe navigation along the east coast for NOAA vessels and other visiting government vessels. For efficiency and continuance of operation, NOAA ships are strategically berthed at locations closer in proximity to their dedicated or primary mission support area.

Anticipated Duration of In-Water Work including planned Start/End Dates and any seasonal restrictions proposed to be included in the schedule:

In-water work is anticipated to last 6 months starting in Fall 2023, exact dates are to be determined. There are no seasonal restrictions included in the project schedule at this time.

[1] A federal agency may designate a non-Federal representative to conduct an EFH consultation by giving written notice of such designation to NMFS. If a non-federal representative is used, the Federal action agency remains ultimately responsible for compliance with sections 305(b)(2) and 305(b)(4)(B) of the Magnuson-Stevens Act. [2] Provide the decimal, or the degrees, minutes, seconds values for latitude and longitude using the World Geodetic System 1984 (WGS84) and negative degree values where applicable.

3. Site Description

EFH includes the biological, chemical, and physical components of the habitat. This includes the substrate and associated biological resources (e.g., benthic organisms, submerged aquatic vegetation, shellfish beds, salt marsh wetlands), the water column, and prey species.

Is the project in designated EFH[3]?	☑ Yes	☐ No
Is the project in designated HAPC?	☑ Yes	☐ No
Does the project contain any Special Aquatic Sites[4]?	☐ Yes	☑ No
Is this coordination under FWCA only?	☐ Yes	☑ No

Total area of impact to EFH (indicate sq ft or acres): 385,723 sq. ft.

Total area of impact to HAPC (indicate sq ft or acres): 385,723 sq. ft.

Current range of water depths at MLW	Salinity range (PPT):	Water temperature range (°F):
-2 to -25 ft	10 to 25 PPT	50°F to 86°F

[3]Use the tables in Sections 5 and 6 to list species within designated EFH or the type of designated HAPC present. See the worksheet instructions to find out where EFH and HAPC designations can be found. [4] Special aquatic sites (SAS) are geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important easily disrupted ecological values. These areas are generally recognized as significantly influencing or positively contributing to the general overall environmental health or vitality of the entire ecosystem of a region. They include sanctuaries and refuges, wetlands, mudflats, vegetated shallows, coral reefs, and riffle and pool complexes (40 CFR Subpart E). If the project area contains SAS (i.e. sanctuaries and refuges, wetlands, mudflats, vegetated shallows/SAV, coral reefs, and/or riffle and pool complexes, describe the SAS, species or habitat present, and area of impact.

4. Habitat Types

In the table below, select the location and type(s) for each habitat your project overlaps. For each habitat type selected, indicate the total area of expected impacts, then what portion of the total is expected to be temporary (less than 12 months) and what portion is expected to be permanent (habitat conversion), and if the portion of temporary impacts will be actively restored to pre- construction conditions by the project proponent or not. A project may overlap with multiple habitat types.

Habitat Location	**Habitat Type**	**Total impacts (lf/ft²/ft³)**	**Temporary impacts (lf/ft²/ft³)**	**Permanent impacts (lf/ft²/ft³)**	**Restored to pre-existing conditions?***
Estuarine	Substrate (silt/mud)	373,323 sq. ft.	373,323 sq. ft.		No
Estuarine	Shore (rock)	12,400 sq. ft.		12,400 sq. ft.	No
Estuarine	Water column	385,723 sq. ft.	373,323 sq. ft.	12,400 sq. ft.	No
Select one	Select One				Select one
Select one	Select One				Select one
Select one	Select One				Select one
Select one	Select One				Select one
Select one	Select One				Select one

*Restored to pre-existing conditions means that as part of the project, the temporary impacts will be actively restored,such as restoring the project elevations to pre-existing conditions and replanting. It does not include natural restoration or compensatory mitigation.

Submerged Aquatic Vegetation (SAV) Present?:

Yes: ☐ No: ☑

If the project area contains SAV, or has historically contained SAV, list SAV species and provide survey results including plans showing its location, years present and densities if available. Refer to Section 12 below to determine if local SAV mapping resources are available for your project area.

n/a

Sediment Characteristics:

The level of detail required is dependent on your project – e.g., a grain size analysis may be necessary for dredging. In addition, if the project area contains rocky/hard bottom habitat [6](pebble, cobble, boulder, bedrock outcrop/ledge) identified as Rocky (coral/rock), Substrate (cobble/gravel), or Substrate (rock) above, describe the composition of the habitat using the following table.

Substrate Type* (grain size)	Present at Site? (Y/N)	Approximate Percentage of Total Substrate on Site
Silt/Mud (<0.063mm)	Yes	96.6%
Sand (0.063-2mm)	Yes	3.4%
Rocky: Pebble/Gravel /Cobble(2-256mm)**	No	
Rocky: Boulder (256-4096mm)**	No	
Rocky: Coral	No	
Bedrock**	No	

[6]The type(s) of rocky habitat will help you determine if the area is cod HAPC.

* Grain sizes are based on Wentworth grain size classification scale for granules, pebbles, cobbles, and boulders.

** Sediment samples with a content of 10% or more of pebble-gravel-cobble and/or boulder in the top layer (6-12 inches) should be delineated and material with epifauna/macroalgae should be differentiated from bare pebble-gravel-cobble and boulder.

If no grain size analysis has been conducted, please provide a general description of the composition of the sediment. If available please attach images of the substrate.

See Attachment A for images of the substrate.

Diadromous Fish (migratory or spawning habitat- identify species under Section 10 below):

Yes: ☑ No: ☐

5. EFH and HAPC Designations

Within the Southeast Atlantic Region, EFH has been designated by the South Atlantic Fisheries Management Council and NOAA Fisheries. Use the EFH mapper to determine if EFH may be present in the project area and enter all species that have designated EFH. Optionally, you may review the EFH text descriptions linked to each species in the EFH mapper and use them to determine if the described habitat is present at your project site. If the habitat characteristics described in the text descriptions do not exist at your site, you may be able to exclude some species or life stages from additional consideration. For example, the water depths at your site are shallower that those described in the text description for a particular species or life stage. We recommend this for larger projects to help you determine what your impacts are.

Species/ Habitats Present:

- penaeid shrimp nursery habitat
- Atlantic sturgeon spawning habitat
- shortnose sturgeon spawning habitat
- American shad spawning habitat
- river herring spawning habitat
- blue crab habitat
- red drum habitat

6. Habitat Areas of Particular Concern (HAPCs)

HAPCs are subsets of EFH that are important for long-term productivity of federally managed species. HAPCs merit special consideration based their ecological function (current or historic), sensitivity to human-induced degradation, stresses from development, and/or rarity of the habitat. While many HAPC designations have geographic boundaries, there are also habitat specific HAPC designations for certain species, see note below. Use the EFH mapper to identify HAPCs within your project area. Select all that apply.

☑ Shell Bottom/ Oyster aggregations*

*For the purposes of this review, shell bottom habitat is defined as estuarine intertidal or subtidal substrate comprised of surface shell concentrations of living or dead oysters (Crassostrea virginica).

7. Activity Details

Select all that apply	Project Type/Category
☐	Agriculture
☐	Aquaculture - List species here:
☑	Bank/shoreline stabilization (e.g., living shoreline, groin, breakwater, bulkhead)
☐	Beach renourishment
☑	Dredging/excavation
☐	Energy development/use e.g., hydropower, oil and gas, pipeline, transmission line, tidal or wave power, wind
☑	Fill
☐	Forestry
☐	Infrastructure/transportation (e.g., culvert construction, bridge repair, highway, port, railroad)
☐	Intake/outfall
☐	Military (e.g., acoustic testing, training exercises)
☐	Mining (e.g., sand, gravel)
☐	Overboard dredged material placement
☑	Piers, ramps, floats, and other structures
☐	Restoration or fish/wildlife enhancement (e.g., fish passage, wetlands, mitigation bank/ILF creation)
☐	Survey (e.g., geotechnical, geophysical, habitat, fisheries)
☐	Water quality (e.g., storm water drainage, NPDES, TMDL, wastewater, sediment remediation)
☐	Other:

8. Effects Evaluation

Select all that apply	Potential Stressors Caused by the Activity
☐	Underwater noise
☑	Water quality/turbidity/ contaminant release
☑	Vessel traffic/barge grounding
☐	Impingement/entrainment
☐	Prevent fish passage/spawning
☑	Benthic community disturbance
☐	Impacts to prey species

Select all that apply and if temporary[9] or permanent		Habitat alterations caused by the activity
Temp	Perm	
☐	☑	Water depth change
☐	☐	Tidal flow change
☐	☑	Fill
☐	☐	Habitat type conversion
☐	☐	Other:
☐	☐	Other:

[9] Temporary in this instance means during construction. [10] Entrainment is the voluntary or involuntary movement of aquatic organisms from a water body into a surface diversion or through, under, or around screens and results in the loss of the organisms from the population. Impingement is the involuntary contact and entrapment of aquatic organisms on the surface of intake screens caused when the approach velocity exceeds the swimming capability of the organism.

Details - project impacts and mitigation

Briefly describe how the project would impact each of the habitat types selected above and the amount (i.e., acreage or sf) of each habitat impacted. Include temporary and permanent impact descriptions and direct and indirect impacts. For example, dredging has a direct impact on bottom sediments and associated benthic communities. The turbidity generated can result in a temporary impact to water quality which may have an indirect effect on some species and habitats such as winter flounder eggs, SAV or rocky habitats. The level of detail that you provide should be commensurate with the magnitude of impacts associated with the proposed project. Attach supplemental information if necessary.

This project would temporarily impact approximately 373,323 sq. ft. of substrate (silt/mud) in estuarine habitat due to the dredging requirements for the construction of the replacement pier and accommodations for berthing vessels. Impacts to the substrate and associated benthic communities due to dredging will be temporary. Due to the history of dredging in this project area and the commercialization of the project area and its vicinity, no SAV is present and the presence of benthic communities is minimal. However, turbidity generated may result in temporary impacts to the water column in reducing water quality for shortnose sturgeon and Atlantic sturgeon in the area.

Approximately 12,400 sq. ft. of estuarine shoreline and adjacent water column will be impacted from this project due to the construction of a sheet pile seawall and living shoreline. The addition of a seawall is expected to be placed at the same general location as the existing chain-link fence that borders the shoreline, and therefore is not expected to cause significant changes in the shoreline habitat. However, a living shoreline is expected to improve the overall ecological functionality of the river shoreline by adding high-quality aquatic habitat where it does not exist today.

What specific measures will be used to avoid and minimize impacts, including project design, turbidity controls, acoustic controls, and time of year restrictions? If impacts cannot be avoided or minimized, why not?

See Attachment B for a comprehensive list of avoidance and minimization efforts.

Is compensatory mitigation proposed? Yes ☐ No ☑

If compensatory mitigation is not proposed, why not? If yes, describe plans for compensatory mitigation (e.g. permittee responsible, mitigation bank, in-lieu fee) and how this will offset impacts to EFH and other aquatic resources. Include a proposed compensatory mitigation and monitoring plan as applicable.

The proposed project has been designed to avoid and minimize impacts to aquatic resources, while also meeting the stated purposes and needs of the project. Therefore, compensatory mitigation is not being proposed.

9. Effects of Climate Change

Effects of climate change should be included in the EFH assessment if the effects of climate change may amplify or exacerbate the adverse effects of the proposed action on EFH. Use the Intergovernmental Panel on Climate Change (IPCC) Representative Concentration Pathways (RCP) 8.5/high greenhouse gas emission scenario (IPCC 2014), at a minimum, to evaluate the future effects of climate change on the proposed projections. For sea level rise effects, use the intermediate-high and extreme scenario projections as defined in Sweet et al. (2017). For more information on climate change effects to species and habitats relative to NMFS trust resources, see Guidance for Integrating Climate Change Information in Greater Atlantic Region Habitat Conservation Division Consultation Processes.

1. Could species or habitats be adversely affected by the proposed action due to projected changes in the climate?If yes, please describe how:

   No

2. Is the expected lifespan of the action greater than 10 years? If yes, please describe project lifespan:

   No. Project construction is anticipated to take approximately 1 year.

3. Is climate change currently affecting vulnerable species or habitats, and would the effects of a proposed action be amplified by climate change? If yes, please describe how:

   No

4. Do the results of the assessment indicate the effects of the action on habitats and species will be amplified by climate change? If yes, please describe how:

   No

5. Can adaptive management strategies (AMS) be integrated into the action to avoid or minimize adverse effects of the proposed action as a result of climate? If yes, please describe how:

   No

10. Federal Agency Determination

Federal Action Agency's EFH determination (select one)	
☐	There is no adverse effect[7] on EFH or EFH is not designated at the project site. EFH Consultation is not required. This is a FWCA only request.
☐	The adverse effect[7] on EFH is not substantial. This means that the adverse effects are no more than minimal, temporary, or can be alleviated with minor project modifications or conservation recommendations. This is a request for an abbreviated EFH consultation.
☐	The adverse effect[7] on EFH is substantial. This is a request for an expanded EFH consultation. We will provide more detailed information, including an alternatives analysis and NEPA documents, if applicable.

[7] An adverse effect is any impact that reduces the 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. 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.

11. Fish and Wildlife Coordination Act

Under the FWCA, federal agencies are required to consult with us if actions that the authorize, fund, or undertake will result in modifications to a natural stream or body of water. Federal agencies are required to consider the effects these modifications may have on fish and wildlife resources, as well as provide for the improvement of those resources. Under this authority, we consider the effects of actions on NOAA-trust resources, such as anadromous fish, shellfish, crustaceans, or their habitats, that are not managed under a federal fisheries management plan. Some examples of other NOAA-trust resources are listed below. Some of these species, including diadromous fishes, serve as prey for a number of federally-managed species and are therefore considered a component of EFH pursuant to the MSA. We will be considering the effects of your project on these species and their habitats as part of the EFH/FWCA consultation process and may make recommendations to avoid, minimize or offset and adverse effects concurrently with our EFH conservation recommendations.

Please contact our Greater Atlantic Regional Fisheries Office, Protected Resources Division regarding potential impacts to marine mammals or species listed under the Endangered Species Act and the appropriate consultation procedures.

Fish and Wildlife Coordination Act Resources

Species known to occur at site (list others that may apply)	Describe habitat impact type (i.e., physical, chemical, or biological disruption of spawning and/or egg development habitat, juvenile nursery and/or adult feeding or migration habitat). Please note, impacts to federally listed species of fish, sea turtles, and marine mammals must be coordinated with the GARFO Protected Resources Division.
American eel	See Attachment C for habitat impact description for all listed species.
American shad	
Atlantic menhaden	
Atlantic sturgeon	
blue crab	
blueback herring	
Eastern oyster	
horseshoe crab	
shortnose sturgeon	
other species:	
other species:	
other species:	
other species:	
other species:	
other species:	

Attachment A

Sediment Core Report

<table>
<tr>
<td>PR-01 (0-3 ft)
*top foot of core was unconsolidated and washing out, not used in analysis

<u>Characterization:</u> CH
<u>Texture:</u> very soft
<u>Munsell Color:</u> 10Y 10.5/1
<u>Odor:</u> organic/ sulfur</td>
<td>
</td>
</tr>
<tr>
<td>PR 01 (3-6 ft)

<u>Characterization:</u> CH
<u>Texture:</u> very soft
<u>Munsell Color:</u> 10Y 10.5/1, color change at 5 ft to 10YR 2/1
<u>Odor:</u> organic/ sulfur (until 4 ft, then odorless)</td>
<td>
</td>
</tr>
<tr>
<td>PR-01 (6-9 ft)

<u>Characterization:</u> CH
<u>Texture:</u> very soft
<u>Munsell Color:</u> 10YR 2/1
<u>Odor:</u> odorless</td>
<td>
</td>
</tr>
</table>

PR-01 (9-12 ft) Characterization: CH Texture: very soft Munsell Color: 10YR 2/1 color change at 5YR 2.5/1 Odor: odorless Penetration length: 12.79 ft. Core recovery: 11.79 ft	
PR-02 (0-3 ft) *top foot of core was unconsolidated and washing out, not used in analysis Characterization: CH Texture: very soft Munsell Color: N 2.25 Odor: organic/sulfur	
PR-02 (3-6 ft) Characterization: CH Texture: very soft Munsell Color: N 2.25, color change at 4 ft to 5GY 2.5/1 Odor: organic/sulfur, change at 4 ft to odorless	

PR-02 (6-9 ft) <u>Characterization:</u> CH <u>Texture:</u> very soft <u>Munsell Color:</u> 5GY 2.5/1 <u>Odor:</u> odorless	
PR-02 (9-11 ft) <u>Characterization:</u> CH <u>Texture:</u> very soft <u>Munsell Color:</u> 5GY 2.5/1, color change at 10 ft to 10 GY 2.5/1 <u>Odor:</u> odorless <u>Penetration length:</u> 12 ft <u>Core Recovery:</u> 11 ft	
PR-03 (0-3 ft) <u>Characterization:</u> CH <u>Texture:</u> very soft <u>Munsell Color:</u> 10Y3/1, color change at 2 feet to 10GY 2.5/1 <u>Odor:</u> organic/sulfur	

PR-03 (3-6 ft) Characterization: CH Texture: very soft Munsell Color: 10GY 2.5/1, color change at 5 ft to 10R 2/1 Odor: organic/sulfur, change at 4 ft to odorless	
PR-03 (6-9 ft) Characterization: CH Texture: very soft Munsell Color: 10R 2/1, color change around 8 ft to N 2.25 Odor: odorless Penetration length: 9 ft Core Recovery: 8.7 ft *bottom layer after 8 ft was discarded	

PR-04 (0-3 ft) <u>Characterization:</u> CH <u>Texture:</u> very soft <u>Munsell Color:</u> 5GY 3/1, color change at 2 ft to 5YR 2.5/1 <u>Odor:</u> organic/sulfur, change at 2 ft to at odorless	
PR-04 (3-6 ft) <u>Characterization:</u> CH <u>Texture:</u> very soft <u>Munsell Color:</u> 5YR 2.5/1, color change at 4 ft to 5GY 2.5/1 <u>Odor:</u> organic/sulfur, change at 2 ft to at odorless <u>Penetration length:</u> 6 ft <u>Core Recovery:</u> 5.5 ft *last 1.3 feet (approx.) discarded	

PR-05 (0-3 ft) *top 0.4 ft (approx.) unconsolidated, not used in analysis <u>Characterization:</u> CH <u>Texture:</u> very soft <u>Munsell Color:</u> 5Y 3/2 <u>Odor:</u> organic/sulfur	
PR-05 (3-6ft) <u>Characterization:</u> CH <u>Texture:</u> very soft <u>Munsell Color:</u> 5Y 3/2, color change at 3 ft to 2.5Y 2.5/1 <u>Odor:</u> organic/sulfur, change around 3.8 ft to odorless	
PR-05 (6-9 ft) <u>Characterization:</u> CH <u>Texture:</u> very soft <u>Munsell Color:</u> 2.5Y 2.5/1, color change at 7 ft to 5YR 2.5/1 <u>Odor:</u> odorless	

PR-05 (9-12 ft) Characterization: CH Texture: very soft Munsell Color: 5YR 2.5/1, color change at 11 ft to 10 YR 2/1 Odor: odorless Penetration length: 12.5 ft Core recovery: 12.1 ft	
PR-06 (0-3 ft) Characterization: CH Texture: very soft Munsell Color: 5GY 2.5/1 Odor: organic/ sulfur	
PR-06 (3-6 ft) Characterization: CH Texture: very soft Munsell Color: 5GY 2.5/1 Odor: organic/ sulfur, change at 4 ft to odorless	

<table>
<tr>
<td>PR-06 (6-9 ft)

<u>Characterization:</u> CH
<u>Texture:</u> very soft
<u>Munsell Color:</u> 5GY 2.5/1, color change at 8 ft to N2
<u>Odor:</u> odorless</td>
<td>
</td>
</tr>
<tr>
<td>PR-06 (9-12 ft)

<u>Characterization:</u> CH
<u>Texture:</u> very soft
<u>Munsell Color:</u> 5GY 2.5/1, color change at 13 ft to 5RP 2/1
<u>Odor:</u> odorless

<u>Penetration length:</u> 14.5 ft
<u>Core recovery:</u> 12.83 ft</td>
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</table>

Attachment B

Avoidance and Minimization Efforts

Avoidance and Minimization Efforts

The following avoidance and minimization efforts have been incorporated in the proposed project design:

- Through the construction of a floating pier structure, and the incorporation of a sea wall for flood control purposes and the optional living shoreline, the project design is intended to adapt to SLR.
- Project design is intended to stabilize adjacent shoreline and reduce flood risk over the long-term.
- The project has been designed to maintain a vegetative buffer between the water and upland activities.
- Measures would be implemented to ensure that raw concrete and grout does not contact the water.
- The use of creosote or pressure treated piles would be avoided.
- Stormwater controls would be implemented to minimize pollutants in aquatic habitats.
- The number of and size of piles used would be the minimum necessary.
- Measures would be implemented to ensure that contaminants and sediments do not enter aquatic habitats through discharge.
- S.C. Department of Health and Environmental Control approved sediment control and erosion prevention practices would be implemented.
- Holes left by piles would be filled with clean substrate.
- There would be no temporary storage of dredged material in the water.
- Noise-generating work would be conducted in a manner that would minimize acoustic effects.
- Noise attenuation and minimization measures would be utilized during pile driving.
- The project would attempt to avoid or minimize activities with significant acoustic effects during sensitive life stages of Endangered Species Act-listed species, federally managed species, or NOAA trust resources.
- Stationary noise-generating equipment would be located away from sensitive receptors.
- Internal combustion engine-driven equipment would be fitted with intake and exhaust mufflers.
- Construction and operations equipment would be turned off when not in use.

Attachment C

Fish And Wildlife Coordination Act Resources

Fish and Wildlife Coordination Act Resources

The following species are known to occur at the proposed project site:

- American eel
- American shad
- Atlantic menhaden
- Atlantic sturgeon
- blue crab
- blueback herring
- Eastern oyster
- horseshoe crab
- shortnose sturgeon

The proposed project design consists of an approximate 320-linear-foot-long and 62-foot-wide floating pier that would replace the existing pier. The floating pier would be connected to an approximate 200- to 300-foot steel access trestle banked by concrete wingwalls. The abutment for the access trestle will fan out into wingwalls. The proposed floating pier would be placed within the same environmental footprint of the existing pier. The floating pier would be secured and stabilized by approximately 8 concrete piles. The piles would be 60 to 70 feet in length and 24-inches-wide with 0.5-inch-thick steel rods.

Impacts to listed protected endangered and threatened species are considered detrimental to the project if it consists of a "take" of any species listed previously in the affected environment section. Other implications of the proposed project design include both land-based and water-based impacts that would alter a species' habitat and its survivability.

Based on land-based analysis, the take of a species or detrimental construction activity to land-based resources would not be expected. Based on in-water work, the removal of the pre-existing pier and habitat created by the pier would remove existing conditions that many fish and other mammals have utilized in the past. However, considering the construction time frame, including demolition of the pier, it would be expected that over the longevity of the new pier, new habitat would form, which would result in displaced species of concern and threatened and endangered species would re-form around the pier. These potential impacts are anticipated to be minor. Minor impacts are defined in this report as minimal impact in the extent or quantity of damage resulting in habitat loss to protected species and their critical habitat.

Attachment D

Demolition Methodology and Potential Impacts to Marine Life due to Stressors

Demolition Methodology and Potential Impacts to Marine Life due to Stressors

The Southeast Marine Operations Hub Project requires demolishing the existing Pier Romeo at the NOAA OMAO's Charleston facility. A construction company, which has yet to be identified, would complete this work. The following details proposed project construction activity and methods for construction and demolition.

- Project specification will stipulate the use of barges towed by tugboat to transport mechanical and hydraulic equipment to Pier Romeo.
- A vibratory hammer will be used to dislodge existing piles when feasible. There would be limited instances where the vibratory hammer cannot be used to remove the piles. In this case, a crane and clam bucket would be used, or piles would be sheared off below the riverbed and lifted by crane onto the barge.
- Piles that are removed would be loaded onto a barge and disposed of in compliance with federal, state, and local debris management requirements. The in-water demolition is anticipated to have the shortest duration within the six-month construction period.

Turbidity

Turbidity in water is anticipated to increase during project demolition due to the disturbance of riverbed sediment. An increase in turbidity in water can be a stressor for fish species in proximity to demolition activities. When a waterbody becomes more turbid, or saturated with sediments, species such as the Atlantic sturgeon and shortnose sturgeon could experience short-term impacts such as being driven from food resources in the immediate areas where in-water work would occur. Although not all in-water turbidity can be avoided during demolition, it can be minimized through the successful implementation of Best Management Practices (BMPs). The following BMPs would be used during in-water work.

- Remove piles with a vibratory hammer when feasible and limit the potential need for removal by clamshell bucket or pile shearing.
- Develop a project-specific dredge material transport and dewatering plan developed by the project contractor. Agency approval of the plan would be completed prior to demolition activities.
- Remove piles slowly to reduce sediment disturbances within the water column.
- Develop and maintain a project schedule that would avoid or minimize sediment disturbance during sensitive life stages (i.e. migration and spawning) of ESA-listed species, federally managed species, and other NOAA-trust resources such as anadromous fish and shellfish. This may include isolating in-water work or implementing time of year restrictions.

Noise & Vibration

The Project is located in an active marine and industrial area and is near both NAVAC and South Carolina Port facilities. Underwater noise and vibration would be expected to occur at a level higher than that in other areas of the Cooper River that experience less in-water activity. An increase in noise and vibration can be a stressor to Atlantic and shortnose sturgeon. The activity of most concern with the highest acoustic impacts would be mechanical pile driving. Using vibratory hammers during demolition activities is anticipated to minimize in-water noise and vibration. Compared to other types of pile hammers, the vibratory hammer would have the least amount of change to in-water noise levels and vibration. Pile driving activities would be limited to approximately eight hours per day and would not exceed more than 12 hours per day.

Prior to demolition, a project schedule would be developed to avoid and minimize noise during sensitive life stages (migration and spawning) of ESA-listed species, federally managed species, and other NOAA-trust resources such as anadromous fish. This may include isolating in-water work or implementing time of year restrictions. Additionally, all project demolition activities would adhere to the required in-water construction moratoriums and would take protective measures during construction activity to observe for occurrences of manatee or dolphin species and discontinue operations if the species are sited within 50 feet of the construction activity.

Habitat Restoration

Demolition of the pier would remove piles that are presently used by a well-established oyster population. The construction of a new floating-pier would require the placement of less piles which was a determining factor for carrying forward the floating pier conceptual design due to the likelihood for reducing environmental impacts in the waters of the Cooper River. The proposed living shoreline would serve to both replace and integrate nature-based hardening elements for the continued establishment of the oyster population in proximity to the pier.

Vessel Interactions

The demolition phase of the proposed project would require equipment and marine debris transport, resulting in a minimal increased risk for vessel traffic (an anticipated increase of two vessels at a time at the site location and the associated tugboats). As mentioned above, protective measures during project activity, including demolition and construction, will be taken to observe for occurrences of manatee or dolphin species. If the species are sited within 50 feet of the activity, operations will be discontinued.

Attachment E

Living Shoreline Design

Living Shoreline Design

The proposed project includes the option of constructing a +/- 600' foot long living shoreline waterward of the proposed seawall. If implemented, the optional living shoreline design would involve the removal of the existing riprap along the shoreline, the construction of an approximately 20-foot wide (base width) rock sill on filter fabric, backfilling behind the sill, and planting area behind the sill with appropriate marsh vegetation (see Figure 1). It is anticipated that this design would adapt to sea level rise by adding mass and height to the sill structure over time through naturally occurring oyster growth and recruitment, and through natural sedimentation processes raising the height of the backfill area over time (see Figure 2).

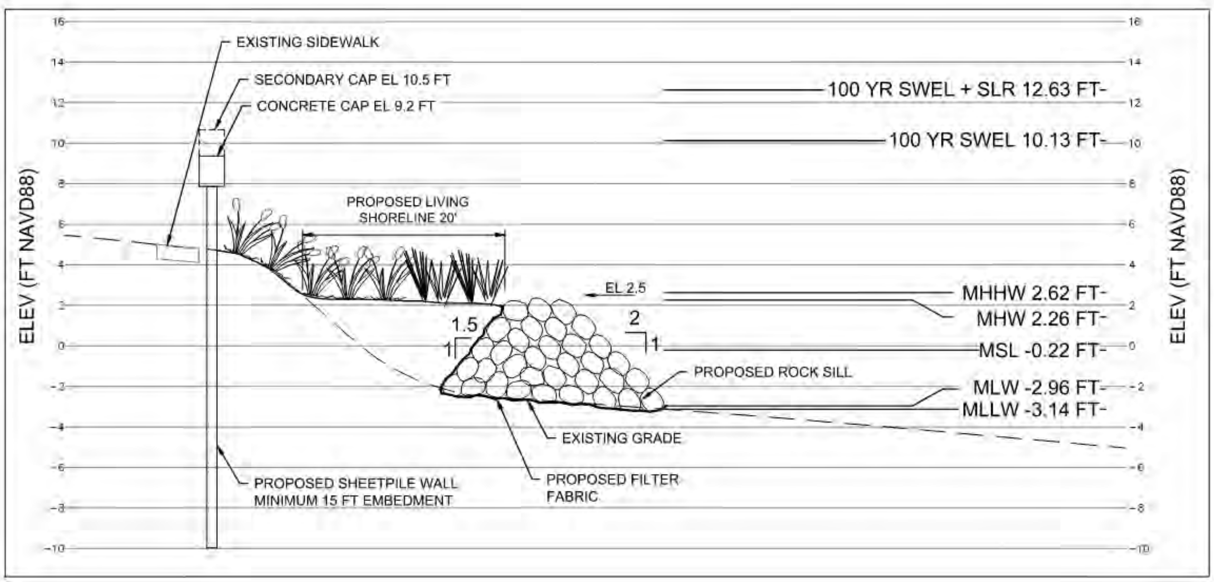

Figure 1. Optional Sill with Living Shoreline Typical Section

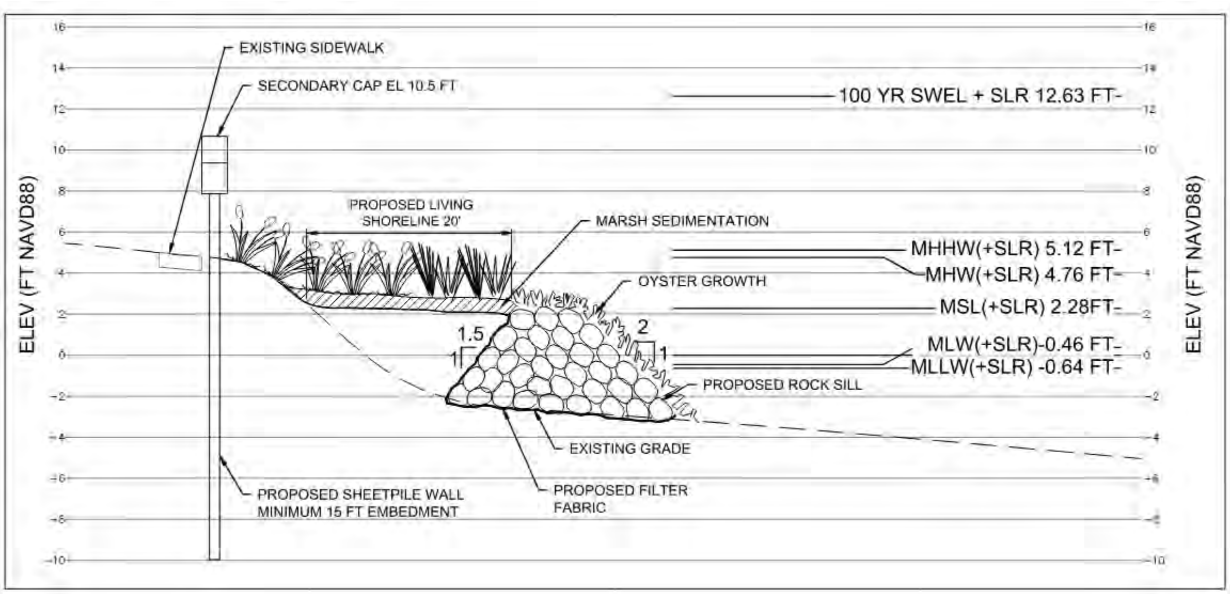

Figure 2. Optional Sill with Living Shoreline with Natural Sedimentation and Oyster Growth

Construction of the optional sill and living shoreline would result in the filling of 21,000 square feet of open water.

Should the living shoreline option described above not be implemented, the existing revetment along the shoreline would be enhanced and expanded by adding new riprap material, placed on filter fabric (see Figure 3).

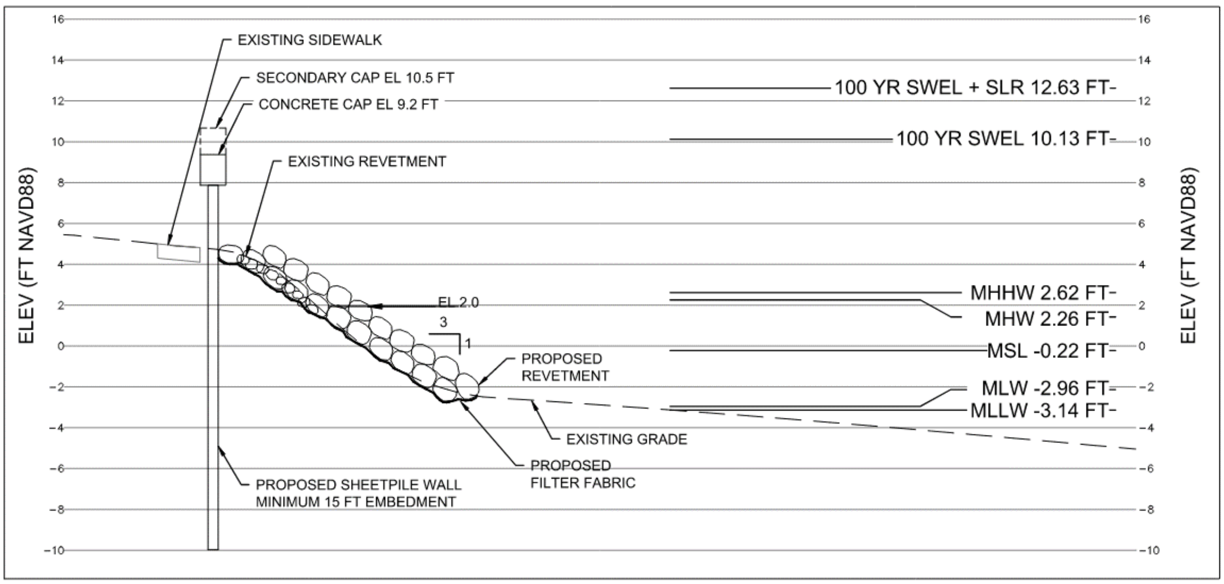

Figure 3. Proposed Wall and Revetment Improvements (Without Optional Sill and Living Shoreline)

The option of implementing this living shoreline design will be reliant upon certain triggers. Presently, the project site is experiencing shoreline washouts and areas around the pier are collapsing. Based on predictions from NOAA's studies on future sea level rise conditions, this project site exhibits a need to be made more resilient for high tides, king tides, and other weather-related events. NOAA's staff feel as though this living shoreline design adds a layer of additional protection to other design components focused on improving resiliency of the NOAA site in anticipation of future sea level rise and in response to the deterioration of the shoreline in areas where riprap exists today. Additionally, this design exemplifies NOAA's overall mission to conserve and manage coastal and marine ecosystems and resources.

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

02/21/2023

F/SER31:MT
SERO-2022-02469

Timothy R Calohan, PE
Senior Project Manager
Facilities Engineering Office
Office of the Chief Administrative Officer
National Oceanic & Atmospheric Administration
7600 Sand Point Way, Seattle, WA 98115

Ref.: NOAA Office of Marine and Aviation Operations, Southeast Marine Operations Hub Project, North Charleston Pier Romeo Recapitalization Project, Charleston County, South Carolina – EXPEDITED TRACK

Dear Timothy Calohan:

This letter responds to your February 6, 2023, request pursuant to Section 7 of the Endangered Species Act (ESA) for consultation with the National Marine Fisheries Service (NMFS) on the subject action.

We reviewed the action agency's consultation request document and related materials. Based on our knowledge, expertise, and the action agency's materials, we concur with the action agency's conclusions that the proposed action is not likely to adversely affect the NMFS ESA-listed species and/or designated critical habitat.

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations that were revised or added to 50 CFR part 402 in 2019 ("2019 Regulations," see 84 FR 44976, August 27, 2019) without making a finding on the merits. On September 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of the district court's July 5 order. On November 14, 2022, the Northern District of California issued an order granting the government's request for voluntary remand without vacating the 2019 regulations. The District Court issued a slightly amended order two days later on November 16, 2022. As a result, the 2019 regulations remain in effect, and we are applying the 2019 regulations here. For purposes of this consultation and in an abundance of caution, we considered whether the substantive analysis and conclusions articulated in the letter of concurrence would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions would not be any different.

This concludes your consultation responsibilities under the ESA for species and/or designated critical habitat under NMFS's purview. Reinitiation of consultation is required and shall be requested by the action agency or by NMFS where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) take occurs; (b) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in this consultation; (c) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not previously considered in this consultation; or (d) if a new species is listed or critical habitat designated that may be affected by the action.

We look forward to further cooperation with you on other projects to ensure the conservation of our threatened and endangered marine species and designated critical habitat. If you have any questions on this consultation, please contact Michael Tucker, Consultation Biologist, at (727) 209-5981 or by email at Michael.Tucker@noaa.gov.

Sincerely,

WUNDERLICH.MARY.JANE.1400345488

Digitally signed by WUNDERLICH.MARY.JANE.1400345488
Date: 2023.02.21 11:01:04 -05'00'

for David Bernhart
Assistant Regional Administrator
for Protected Resources

File: 1514-22.e

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

October 7, 2022

Timothy R Calohan, PE, Senior Project Manager
Facilities Engineering Office
Office of the Chief Administrative Officer
National Oceanic & Atmospheric Administration
U.S. Department of Commerce
7600 Sand Point Way, Seattle, Washington 98115

Re: Request for Informal Consultation under section 7(a)(2) of the Endangered Species Act for the NOAA OMAO Southeast Marine Operations Hub Project North Charleston Pier Romeo Recapitalization Project (SAC- 2021-00965), Charleston County, South Carolina FWS Log No. 2022-0058769

Dear Mr. Calohan:

The U.S. Fish and Wildlife Service (Service) has reviewed the information in your September 13, 2022, letter regarding the proposed Southeast Marine Operations Hub Project (Pier Romeo Recapitalization) in Charleston County, South Carolina. Pursuant to section 7(a)(2) of the Endangered Species Act, as amended (16 U.S.C. 1531 et seq.) (ESA), the National Oceanic and Atmospheric Administration (NOAA) Office of Marine and Aviation Operations (OMAO) requested that the Service provide concurrence or comments regarding potential impacts to federally listed species resulting from the proposed project.

The project purpose is to improve critical infrastructure and mission support capabilities, including the provision of operational and logistical support two NOAA vessels and other visiting government vessels. NOAA-OMAO analyzed effects of the proposed project on ESA listed species that may be present within the action area (Table 2 in Biological Assessment). The only species included that the Service has jurisdiction for under the ESA is the West Indian manatee (*Trichechus manatus*), and thus the only species that the Service will be consulting on.

NOAA-OMAO has made a determination of *may affect but is not likely to adversely affect* for West Indian manatee. Attached to this letter are the 2021 South Carolina Manatee Protection Measures, which can be used to reduce potential construction-related impacts to the manatees. With the agreement to implement these measures, the Service concurs with your determination.

As always, due to obligations under the ESA, the potential impacts of this project must be reconsidered if: (1) new information reveals impacts of this identified action may affect any 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 designated that may be affected by the identified action.

If you have any questions, please contact the Service's project manager, Ms. Melanie Olds at melanie_olds@fws.gov or (843) 300-0413, and reference FWS Log No. 2022-0058769.

Sincerely,

Thomas D. McCoy

Thomas D. McCoy
Field Supervisor

Attachment

Manatee Protection Measures
for South Carolina

To reduce potential construction-related impacts to the manatee to discountable and insignificant levels, the Service recommends implementing the following *Standard Manatee Protection Measures* to all projects affecting the coastal waters of South Carolina.

The permittee will comply with the following construction conditions for manatee protection:

1. The permittee shall instruct all personnel associated with the project of the potential presence of manatees and the need to avoid collisions with manatees. All construction personnel **must** monitor water-related activities for the presence of manatee(s).

2. The permittee shall advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973.

3. Barriers must not impede manatee movement and additionally any siltation barriers used during the project shall be made of material in which manatees cannot become entangled and must be properly secured, and regularly monitored to avoid manatee entrapment.

4. All vessels associated with the project shall operate at "no wake/idle" speeds at all times while in the construction area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will follow routes of deep water whenever possible.

5. If manatee(s) are seen within 100 yards of the active construction area all appropriate precautions shall be implemented to ensure protection of the manatee. These precautions shall include the operation of all moving equipment no closer than 50 feet to a manatee. Operation of any equipment closer than 50 feet to a manatee shall necessitate immediate shutdown of that equipment. Activities will not resume until the manatee(s) has departed the project area of its own volition, or until 30 minutes has elapsed if the manatee(s) has not reappeared within 50 feet of the operation. Animals must not be herded away or harassed into leaving.

6. The permittee understands and agrees that all in-water lines (rope, chain, and cable, including the lines to secure turbidity curtains) must be stiff, taut, and non-looping. Examples of such lines are heavy metal chains or heavy cables that do not readily loop and tangle. Flexible in-water lines, such as nylon rope or any lines that could loop or tangle, must be enclosed in a plastic or rubber sleeve/tube to add rigidity and prevent the line from looping and tangling. In all instances, no excess line is allowed in the water. Where appropriate in water wires, cables, should be fitted with PVC sleeve from the surface to the bottom to prevent any potential scraping of the passing manatees.

7. Any collision with and/or injury to a manatee shall be reported immediately to the U.S. Fish and Wildlife Service contacts: Melanie Olds, South Carolina Manatee Lead,

Charleston Field Office, at 843-727-4707 ext. 40413; or Terri Calleson, Manatee Recovery Coordinator, North Florida Field Office, at 904-731-3286.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of the Chief Administrative Officer
Facilities Engineering Office – Western Region
7600 Sand Point Way NE
Seattle, WA 98115

September 13, 2022

VIA ELECTRONIC MAIL

Mr. Mark Caldwell
South Carolina Ecological Services Field Office
Ecological Services
176 Croghan Spur Road, Suite 200
Charleston, SC 29407

Re: Request for Informal Consultation under section 7(a)(2) of the Endangered Species Act for the NOAA OMAO Southeast Marine Operations Hub Project North Charleston Pier Romeo Recapitalization Project (SAC-2021-00965)

Dear Mr. Caldwell:

On behalf of the National Oceanic and Atmospheric Administration (NOAA) Office of Marine and Aviation Operations (OMAO) please accept this letter to serve as our request for initiation of informal consultation under section 7(a)(2) of the Endangered Species Act (ESA) for the Southeast Marine Operations Hub Project (formally referred to as Pier Romeo Recapitalization).

The NOAA-OMAO is requesting concurrence that the proposed project may affect, but is not likely to adversely affect, any ESA-listed species and would have no effect on critical habitat. The U.S. Army Corps of Engineers (USACE) Charleston District indicated that the South Atlantic Regional Biological Opinion (SARBO) would be applicable in this instance since previous USACE permits had repeatedly approved dredging adjacent to Pier Romeo to -35' MLW with 2'allowable overdepth since 1968, and this proposed reconstruction of Pier Romeo is proposing to dredge that previously disturbed area to only -25'MLW with 2' allowable overdepth.

Pursuant to our request for informal consultation, we are providing the following project information:

- A description of the action to be considered.
- A description of the action area.
- A description of any listed species or critical habitat that may be affected by the action.
- An analysis of the potential routes of effect on any listed species or critical habitat.

Additionally, the project's conceptual design plans and pertinent technical studies prepared in support of this consultation are provided as attachments.

If you have additional questions or comments, please contact me at 206-471-2468 or via email at timothy.calohan@noaa.gov.

Sincerely,

Timothy R. Calohan

Timothy R Calohan, PE
Senior Project Manager
Facilities Engineering Office
Office of the Chief Administrative Officer
National Oceanic & Atmospheric Administration
US Department of Commerce
7600 Sand Point Way, Seattle, WA 98115
206-526-6647 o
206-471-2468 c
timothy.calohan@noaa.gov

Attachments

Attachment A: Project Information Pertinent of NOAA Consultation
Attachment B: Pier Romeo Concept Plans
Attachment C: Coastal Studies Report
Attachment D: Sampling and Analysis Plan
Attachment E: Draft Noise Assessment Technical Report
Attachment F: FWS Species List

Appendix K: Public Scoping & Agency Coordination & Consultation

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MEMORANDUM

To: Steve Wagner

From: Julie Flesch-Pate, CPM, LEED AP

Date: 07/01/21

Subject: Pier Romeo Agency Scoping Meeting

Attendees:

Timothy Calohan	NOAA		Julie Flesch-Pate	M&N
Mark George	NOAA		Doug Huggett	M&N
Erik Juergensen	NOAA		Stephanie Oslick	M&N
Greg Raymond	NOAA		Dawn York	M&N
Brantley Bain	NOAA		Maggie Jamison	SCDNR
Cindy Cooksey	NOAA		Stacie Crowe	SCDNR
Chelsea Fannin	USACE		Mark Caldwell	FWS
Cortney Stevens	USACE		Joshua Hoke	SCDHEC
Steve Wagner	Ahtna			

On July 1, 2021, an agency scoping meeting was held to receive input on the proposed recapitalization of Pier Romeo from resource agencies and regulatory agencies with project permitting authority.

The meeting was initiated with introduction provided by participants.

Doug Huggett stated the purpose of the meeting, project goals, and provided a brief project history via a PowerPoint presentation.

Tim Calohan provided clarification on project need being that the recapitalization of the Pier was proposed because the FLETC locations that NOAA is currently utilizing for the berthing of the Ronald H. Brown and the Nancy Foster is to be used by the U.S. Coast Guard in the future.

The dredging footprint would be smaller than what the PowerPoint illustration showed. It would not reach to the shoreline but would instead be limited to the navigational path to and from the Pier. Tim stated that the areas in the vicinity of the project area had been dredged historically. Much of the dredge material may be silt. The composition of material would be dependent on the depth of dredging.

Man-made habitat for Least Terns on Pier Romeo will be recreated with the new construction. The initial Pier habitat was a volunteer conservation effort. The U.S. Fish and Wildlife Service (FWS) has indicated their willingness to participate in the consideration of options to recreate the habitat. Project construction is anticipated to include an elevated structure intended specifically to recreate Least Tern habitat. At this early stage of project development, the size and location of planned replacement habitat is a work in progress. The current habitat provided on the pier is approximately 3,500 square feet.

Section 7 Coordination with NOAA NMFS is underway for the Atlantic Sturgeon. Mark Caldwell stated that the FWS also required coordination for the West Indian Manatee.

According to NOAA, a proposal for 15% design-build (DB) will be awarded in September of 2021 with an additional award to bridge an additional 15% design in February 2022. The full DB design/construction phase is due to be bid out in September 2022. The milestone date for Federal permit approval is November 2022, allowing for construction to be initiated by Spring/Summer of 2023.

Each participating agency was asked to provide their input on the project. Input received is as follows:

U.S. Army Corp of Engineers (USACE)

Chelsey Fannin confirmed that NOAA is the lead agency for the project. USACE concerns at this early stage of project development consist of needing additional project information such as the following:

- Dredging details. This project is subject to 404 regulation and may be subject to Section 408 review/permission. Chelsey will coordinate with the USACE Civil Works Group to make this determination.
- Requirement for sediment characterization. Testing may be required at the project site and at the disposal site. Specific requirements will be provided for a sedimentation analysis plan that at a minimum would provide the method of dredging, chemical composition, grain size.
- Noise minimization BMP for natural habitat (sturgeon, fish, marine mammals, migratory birds and specifically the Least Tern)
- Illumination / Lighting effects on natural habitat (e.g. sea turtles)

The USACE will coordinate with the established South Carolina dredging committee on the dredging analysis plan once the sediment analysis plan is completed and needed information on methodology and local of dredge material use or disposal are known.

Dawn York inquired about the interest of beneficial use of dredging materials. The USACE encouraged the consideration of this methodology for sediment management but stated that it would be up to NOAA as to what disposal options they consider for dredged materials. With the continuation of the Charleston Harbor Post 45 Deeping Project in the Charleston harbor it may be a challenge to locate a disposal site near the project. USACE Sites that have historically been available for dredging disposal are at capacity due to the Post 45 dredging project. It was recommended that NOAA reach out to the SC Ports Authority for possible locations for dredge material storage.

Steve Wagner stated that preliminary attempts to locate a disposal site near the project area had not been fruitful and he acknowledges difficulties in finding a feasible option for site disposal.

Courtney Stevens brought attention to the new 401 Water Quality Certification (WQC) process in South Carolina. She recommended that the website be used to reference information pertaining to the new process. The 401 WQC approval is needed before Section 404 permit final, Section 408 permission, and Critical Habitat Permit approval.

The USACE believed that the project as currently proposed would need to be processed as an Individual Permit. The USACE aims to reach final approval in a 120-day timeframe. However, processing of the Section 401 permit, which must be issued before the USACE takes final action, could require anywhere between 180 days to one year to grant approval.

A Critical Habitat Permit from SCOCRM will also be required. The Section 401 permit would need to be issued before the critical area permit could be finalized. Josh Hoke also indicated that the state's port authority must be coordinated with as a part of the Critical Area permit review.

Coordination with the U.S. Environmental Protection Agency may also be needed to help ensure that the project would not affect other Federal project in the vicinity.

South Carolina Department of Natural Resources (SCDNR)

Stacie Crowe is to check to see if there is an established SCDNR sturgeon moratorium within or near the project study area.

SCDNR is interested to learn more about the methodology of dredging for the project. Stacie stated that her agency would prefer the use of a hydraulic dredge as opposed to utilizing a "bucket-to-barge" approach. An environmental bucket would likely be required if the bucket-to-barge method was to be utilized.

U.S. Fish and Wildlife Service (FWS)

Mark echoed concerns about dredge materials, storage of dredge materials and increased site lighting.

Tim stated that NOAA intends to work again with FWS, other agencies and local conservation groups to re-create the existing Least Tern habitat.

Mark stated that habitat does not necessarily need to be over water and in some instances, habitat can be provided on building roof tops or other flat structures. He also stated that typically the manatees would not be present in waters less than 68 degrees Fahrenheit, so that projects taking place during cooler months should not represent as much of a threat to this species.

South Carolina Department of Health and Environmental Control

Josh from SCDHEC expressed some concern about the extent offshore of shoreline stabilization that was indicated in the PowerPoint presentation. Josh indicated that State laws would allow for a project to extend offshore for erosion control, but not necessarily for flood control. Flood control structures would need to be located at or landward of the shoreline. Both Moffatt & Nichol and NOAA confirmed that the shoreline would not be extended waterward or notably modified as part of the anticipated stabilization process.

Josh indicated that a Critical Area Permit will be required for the project, and that a critical area survey, which remain valid for five years, will be a required part of the permit application. He also indicated that the issuance of a 401 permit by the SC Bureau of Water will be required before the Critical Area Permit can be issued. Josh will provide contact information for the Section 401 permit reviewer for this area.

It was also stated that State permits are valid for 5 years. After that time, the applicant can apply for a 1-year extension provided that work has begun on the project. If work has not begun at the end of the 5-year permit time limit, a new permit will be required.

Josh stated that he did not believe that a Federal Consistency Determination would be needed for the project.

A question was asked about the need for any blasting on the project, to which Tim Calohan responded that no blasting is anticipated.

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Raleigh, NC 27609

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www.moffattnichol.com

MEMORANDUM

To: Steve Wagner

From: Samantha Morrison

Julie Flesch-Pate, CPM, LEED AP

Date: 10/26/22

Subject: Permitting Agency Meeting _ Pier Romeo Recapitalization, Charleston South Carolina

A permitting agency meeting occurred on 10/26/2022. Those in attendance were as follows.

Timothy Calohan	NOAA		Julie Flesch-Pate	M&N
Mark George	NOAA		Samantha Morrison	M&N
Erik Juergensen	NOAA		Steve Wagner	Ahtna
Cynthia Cooksey	NOAA		Logan Ress	DHEC
Chelsea Fannin	USACE		Chris Stout	DHEC

Summary of Topics

Status of Project Development

o Draft EA, Public Notice

- Thirty-day Notice of Availability timeframe ends on 11/9/2022.

o Project Schedule, NOAA is tracking to release RFP for design-build project by 02/2023 and release award by 09/2023. After the project is awarded, hoping to complete design phase within 7-9 months. Anticipate starting construction between May-July 2024.

o Section 106, SHPO and Tribal Coordination

- Section 106: SHPO concurs with the assessment that no properties listed in or eligible for listing in the National Register of Historic Places (NRHP) would be affected by project implementation. Tribal notification letters sent out 10/3/2022. Eastern Shawnee Tribe indicated No Adverse Effect.

o Coordination with Port Authority regarding dredging plan.

o Coordination with DHEC and Navy regarding areas in proximity of the project area that are included in an active NAVY CERCLA permit.

Section 7 Consultation Activity to Date

o NOAA – Habitat Conservation Division.

- Cynthia Cooksey stated that responses provided by Moffatt & Nichol on behalf of NOAA regarding her comments are sufficient and no additional coordination is needed by NOAA at this time. She indicated that she would provide an email.

o NOAA – ESA.

- No comments have been received by the project team.

o USFWS has no additional comments.

- Concurrence with determination of, may affect but is not likely to adversely affect.

Permitting Status Updates

o JPA:

- Chelsea Fannin stated that comments would be forthcoming, and that additional information would be needed prior to Public Notice being issued. Comments were received by NOAA in an email on 10/26/2022. M&N to work with Ahtna to get revised plan sheets that will include:
    - o Dredge footprint, and
    - o State Plane Coordinates on the outermost corners of the pier as well as the outermost corners of the dredge footprint,
    - o Square footage measurement in cubic yards of the riprap revetment in front of the seawall, below the MHW line, in the instance that the living shoreline is not a part of the project construction,
    - o A copy of your 401-pre-filing meeting request.

The 401-pre-filing meeting request was provided in an email to Chelsea Fannin by Logan Ress on 10/27/2022.

o CZM Consistency Determination:

- Chris Stout indicated that information provided is complete and he had no comments.

o NPDES permit:

- A new general contract needed. Logan sent contact information for Crystal Rippy. M&N will contact Crystal to get information on South Carolina's NPDES program so that NOAA can plan accordingly in the overall project schedule.
- Anticipated timeframe of permit processing? Chelsea Fannin stated that 401 Water Quality Certification needed to be complete prior to approval of the USACE 404 and that could take up to 300-days, but she believes based on project information thus far, that a permit may be issued sooner. Logan Ress also stated that it was likely that permits could be issued sooner than the typical 300-day timeframe.

Dredge Planning

- The USACE recommends that NOAA engage as soon as possible to come to an agreement on the required process.

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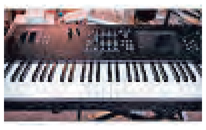

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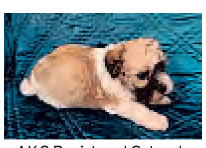

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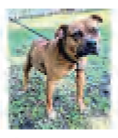

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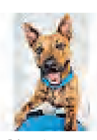
Dogs



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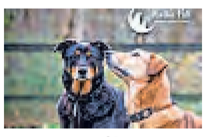

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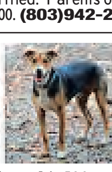

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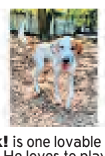

Puck! is one lovable hound mix! He loves to play with everyone he meets. Come visit Pet Helpers at 1447 Folly Rd to meet her.

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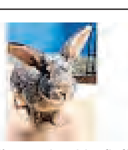

Tiki! is an adorable, fluffy bunny waiting to find a forever home! Visit him today at 1447 Folly Rd.

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CRAGAR S/S MAG WHEELS (3) 13" x 5.5" 4 Lug $60. OBO Call/Txt: 843-566-4785 for pictures

EDELBROCK INTAKE MANIFOLD p/n 2121 Ford 260-302 $160. Call/Txt: 843-566-4785 for pictures

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PUBLIC NOTICE
Cooper Estates LP will apply to SCDHEC-OCRM for a permit to authorize the replacement and extension of an existing community boat ramp (proposed 14'x122') and the addition of an 8'x40' floating dock section to an existing 8'x30' floating dock. The site is located at the terminus of Cottingham Drive on Shem Creek in the Town of Mount Pleasant, Charleston County, South

Filing Notice

Carolina.
Comments will be received by the Office of Ocean and Coastal Resource Management; attention: Project Manager, 1362 McMillan Avenue; Suite 400; Charleston, South Carolina 29405 until October 24, 2022.
AD# 2026970

General Notices

NOTICE OF AVAILABILITY OF ENVIRONMENTAL ASSESSMENT FOR THE SOUTHEAST MARINE OPERATIONS HUB PROJECT OF NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION – OFFICE OF MARINE AND AVIATION OPERATIONS AT THE FEDERAL LAW ENFORCEMENT TRAINING CENTER

CHARLESTON COUNTY, SOUTH CAROLINA

The National Oceanic and Atmospheric Administration (NOAA) has prepared a Draft Environmental Assessment (EA) Of Proposed Changes for the Southeast Marine Operations Hub Project, in accordance with the National Environmental Policy Act of 1969. The EA analyzes the environmental effect of the proposed recapitalization of Pier Romeo in Charleston, South Carolina. Proposed changes would re-establish the berthing operation of NOAA vessels, including the Nancy Foster, and Ronald H. Brown. Additional improvements include adding operating support facilities, and critical infrastructure. Proposed improvements would increase site resiliency through measures that would provide protection from storm surge flooding while lessening the deterioration of the site shoreline. Project-related environmental effects are not anticipated to have significantly adverse impact on the natural and physical environment, or to be of long duration, and would not require irretrievable commitments of resources.
The Draft EA is available for review and comment on the NOAA website at: https://www.noaa.gov/administration/draft-nepa-environmental-assessment-public-notice
NOAA invites the public to submit comments on the Draft EA until Wednesday, November 2nd, 2022, to:

Mark George
NOAA/DSRC
325 Broadway
Boulder, CO 80305
seco@noaa.gov
No return replies will be provided. Comments received will be considered during the preparation of the Final EA.

Invitation to Bid

ADVERTISEMENT
On or about September 30, 2022, plans and specifications for the Daniel Island West Cell Dredge Material Containment Area (DMCA) Improvements project located in Daniel Island, South Carolina, will be available for distribution to qualified contractors by the South Carolina Ports Authority (SCPA).
A non-mandatory pre-bid conference will be held on October 13, 2022 at 10:00 a.m. at SCPA Headquarters located at 200 Ports Authority Drive, Mount Pleasant, South Carolina, 29464.
Instructions for submitting a Bid are included in the specifications. There will be a public opening of bids received at the SCPA Headquarters located at 200 Ports Authority Drive, Mount Pleasant, South Carolina, 29464 on October 28, 2022 at 11:00 a.m.
The work includes vegetation clearing, DMCA ditching and borrow material processing, soil excavation, earth moving, dike raising, bird island construction, removal of existing drainage structures, and construction of new drainage structures. The work is located on an approximately 175-acre site located at the southwestern end of Daniel Island.
Interested parties may download, at no cost, the Plans and Specifications from the South Carolina Ports Authority's Legal Notices website (www.scspa.com/resources/legal-notices). Hardcopies of the Plans and Specifications will not be provided by the Authority.
AD# 2025592

ADVERTISEMENT
On or about October 10, 2022, bid documents for the "Navy Base Intermodal Facility Site Development" project in North Charleston, South Carolina, will be available for distribution to qualified bidders by the South Carolina Ports Authority (SCPA).
A non-mandatory pre-bid conference will be held on October 19, 2022 at 2:00 PM at the Hugh Leatherman Terminal Field Office located at 2025 Bainbridge Avenue in North Charleston.
Sealed bid packages will be accepted at SCPA Headquarters until 3:00 PM on November 17, 2022. Instructions for submitting a Bid are included in the bid documents.
The project involves developing a 120-acre parcel at the former Charleston Navy Base to construct an intermodal facility. The work includes, but is not limited to, clearing and grubbing, demolition of site utilities, surcharging, erosion and sediment control, earthwork, grading, installation of a stormwater drainage system with stormwater ponds. The work also includes installing new water, sewer, electrical, communication, fire protection, and compressed air systems, sound walls, paving, pavement markings, signage, fencing, site lighting, trackwork, and foundations for rail mounted gantry cranes.
Interested parties may download, at no cost, the Plans and Specifications from the SCPA's Legal Notices website (www.scspa.com/resources/legal-notices).
Hardcopies of the Plans and Specifications will not be provided by SCPA.
AD# 2025561

ADVERTISEMENT REQUEST FOR QUALIFICATIONS
RFQ NUMBER:
3107-02-22/23
RFQ NAME:
Environmental Consulting for Brownfields Grant
OWNER:
Berkeley County Government
PO Box 6122
Moncks Corner, S.C. 29461
RECEIPT OF BIDS: Separate sealed bids for the above referenced project will be received by the Owner until 11:00 AM LOCAL TIME, THURSDAY, OCTOBER 27, 2022, at which time bids will be publicly identified in the Council Conference Room, Room 125, at 1003 Highway 52, Moncks Corner, South Carolina. Due to the possibility of negotiation with offerors, prices will not be divulged at the time of closing.
RFQ DESCRIPTION: Berkeley County Government is soliciting qualification statements from firms to provide Professional Environmental Services for Brownfields Environmental Site Assessment and Related Activities.
RFQ DOCUMENTS AVAILABLE: **Offerors must be registered, free of charge, to view and download a copy of the RFQ document and receive electronic notification of any addenda from the Berkeley County Web Site:**
Web Address: https://www.berkeleycountysc.gov/drupal/dept/procurement
QUESTIONS: Questions should be directed to Kayla Dyson via email: Kayla.dyson@berkeleycountysc.gov
Kayla Dyson
Berkeley County
Office of Procurement
AD# 2026223

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From:	Messersmith, Mark
To:	Flesch-Pate, Julie
Cc:	Steve Wagner; Morrison, Samantha; Fannin, Chelsea B CIV USARMY CESAC (USA); Lagarenne, Walter
Subject:	RE: NOAA - Southeast Marine Operations Hub Project (formally the Pier Romeo recapitalization project)
Date:	Wednesday, August 31, 2022 9:13:13 AM
Attachments:	image001.png image003.png image004.png image006.png image008.png image010.png image012.png image013.png image014.png image015.png image016.png

Thanks for following up on this Julie.

Respectfully,

Mark

Mark J. Messersmith

ENVIRONMENTAL MANAGER
SOUTH CAROLINA PORTS AUTHORITY
200 PORTS AUTHORITY DR.
MT. PLEASANT, SC 29464
OFFICE (843) 375-3102
MOBILE (843) 991-2242
scspa.com

From: Flesch-Pate, Julie <jfleschpate@moffattnichol.com>
Sent: Tuesday, August 30, 2022 5:18 PM
To: Messersmith, Mark <MMessersmith@scspa.com>
Cc: Steve Wagner <swagner@ahtna.net>; Morrison, Samantha <samantha.morrison@moffattnichol.com>; Fannin, Chelsea B CIV USARMY CESAC (USA) <Chelsea.B.Fannin@usace.army.mil>; Lagarenne, Walter <WLagarenne@scspa.com>
Subject: RE: NOAA - Southeast Marine Operations Hub Project (formally the Pier Romeo recapitalization project)

NOTICE: EXTERNAL EMAIL

Hello Mark,

The information you provided is very beneficial to NOAA's on-going development of an efficient strategy for dredge material management on this important pier rehabilitation project. I will revert their replies to your initial questions as soon as we have further information to share regarding any negotiations of placement fees and future maintenance dredging activities. In the meantime, should you have any other questions regarding the project, or if I can be of further assistance in that regard, please don't hesitate to reach out to me.

Thank you,

Julie Flesch-Pate CPM, LEED AP, MBA
Planning and Environmental Group Leader

4700 Falls of Neuse | Raleigh, NC 2609
P 919.781.4626 | M 919.532.9874

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From: Messersmith, Mark <MMessersmith@scspa.com>
Sent: Wednesday, August 3, 2022 8:15 AM
To: Flesch-Pate, Julie <jfleschpate@moffattnichol.com>
Cc: Steve Wagner <swagner@ahtna.net>; Morrison, Samantha <samantha.morrison@moffattnichol.com>; Fannin, Chelsea B CIV USARMY CESAC (USA) <Chelsea.B.Fannin@usace.army.mil>; Lagarenne, Walter <WLagarenne@scspa.com>
Subject: RE: NOAA - Southeast Marine Operations Hub Project (formally the Pier Romeo recapitalization project)

Julie,

That is a very large volume of material for the initial dredging. That would take up about 15% of our current overall capacity. We currently charge $4/cy of dredge material placement to ensure that we have the ability to continually make improvements to the dikes and spillway structures to maximize their use. The rate of $4/cy is subject to change periodically.

Within the Clouter Creek and Daniel Island Dredged Material Containment Areas (DMCA's) there are 8 managed cells. USACE controls about 1900 acres of them across 6 of the cells. SCPA has roughly 370 acres across the other two. We also have a DMCA at an area called Drum Island which is another roughly 100 acres in size. One of the USACE controlled cells is likely a better fit and less burdensome overall. That being said, we're always willing to find a way to support other maritime interests.

I do have a few initial questions for you….

- Can NOAA pay our disposal fee?
- Can you send me some engineering or permit drawings of your project?
- Also, it sounds like the initial dredging volume is estimated at around 154kcy. What is the anticipated frequency and volume of maintenance dredging to support your operations?

Thanks,

Mark

Mark J. Messersmith
ENVIRONMENTAL MANAGER
SOUTH CAROLINA PORTS AUTHORITY
200 PORTS AUTHORITY DR.
MT. PLEASANT, SC 29464
OFFICE (843) 375-3102
MOBILE (843) 991-2242
scspa.com

From: Flesch-Pate, Julie <jfleschpate@moffattnichol.com>
Sent: Tuesday, August 2, 2022 3:30 PM
To: Messersmith, Mark <MMessersmith@scspa.com>
Cc: Steve Wagner <swagner@ahtna.net>; Morrison, Samantha <samantha.morrison@moffattnichol.com>; Fannin, Chelsea B CIV USARMY CESAC (USA) <Chelsea.B.Fannin@usace.army.mil>
Subject: NOAA - Southeast Marine Operations Hub Project (formally the Pier Romeo recapitalization project)

NOTICE: EXTERNAL EMAIL

Dear Mr. Messersmith:

I am contacting you on behalf of NOAA regarding the federally proposed Southeast Marine Operations Hub Project. My reason for contacting you is to inquire about the need for early coordination with the South Carolina State Port Authority (SCSPA) on the federally proposed project at the NOAA facility, located at 2234 South Hobson Avenue, North Charleston, South Carolina (NOAA site).

NOAA is currently in the environmental review (NEPA) and permitting phases of project development. We intend to submit permit applications for 404 permitting, 401 Water Quality Certification and a federal agency determination for consistency with the SC Coastal Zone Management Program document within the next 30-days. I was provided your contact information by our assigned USACE project manager, Chelsea Fannin, for the purposes of determining what project information would facilitate our coordination with SCSPA.

The National Oceanic and Atmospheric Administration (NOAA) Office of Marine and Aviation Operations (OMAO) proposes to recapitalize Pier Romeo (the pier) through the replacement of the existing pier (the project), located on the southern bank of the Cooper River at the Federal Law Enforcement Training Center (FLETC), at 2234 South Hobson Avenue, North Charleston, South Carolina (NOAA site). The project would also include facility infrastructure improvements to enhance site resiliency from sea level rise (SLR) concerns, King Tides, and localized flooding due to weather events. The existing pier, associated utilities, and structures have been condemned and needs to be removed and replaced to allow for the homeporting of NOAA vessels at this facility. The project would include complete removal of the existing pier and all associated structures and utilities above water, in the water, and landside of the pier. Dredging of the river bottom is required to provide sufficient depth for navigation of the NOAA vessels to the pier. A draft Sample and Analysis Plan Results report has been completed and provided to the USACE for their review. The existing bathymetry within the proposed dredge areas ranges from approximately -10 to -25 ft. Dredging at Pier Romeo would be performed to achieve the anticipated -25 ft MLLW design depth (project depth) within the dredge area. The total planned volume of dredged material is approximately 154,607 cy (this volume includes a two-foot allowable overdepth). Based on the draft report findings, material at Pier Romeo would be suitable for hydraulic placement at Clouter Creek and/or Daniel Island sediment management areas.

I look forward to hearing from you on your interest in this important NOAA project.

Sincerely,

Julie Flesch-Pate CPM, LEED AP, MBA
Planning and Environmental Group Leader

4700 Falls of Neuse | Raleigh, NC 2609
P 919.781.4626 | M 919.532.9874

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