Waccamaw River,

Horry County, South Carolina
Flood Risk Management Study
Draft Integrated Feasibility Report and Environmental Assessment
Appendices B-F

US Army Corps of Engineers

August 2024

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Appendix B: Cost Engineering

Classification of Estimate and Expected Accuracy

Alternative screening costs within this study have been prepared to an Estimate Class 5 Concept Screening level of accuracy per AACE International Recommended Practice No. 56R-08 (see Table 1; also similar to ASTM E 2516-06, Standard Classification for Cost Estimate Classification System). These costs are intended to inform Alternative selection and early budget planning purposes.

	Primary Characteristic	*Secondary Characteristic*			
ESTIMATE CLASS	**LEVEL OF PROJECT DEFINITION** Expressed as % of complete definition	**END USE** Typical purpose of estimate	**METHODOLOGY** Typical estimating method	**EXPECTED ACCURACY RANGE** Typical variation in low and high ranges	**PREPARATION EFFORT** Typical degree of effort relative to least cost index of 1
Class 5	0% to 2%	Concept Screening	Capacity Factored, Parametric Models, Judgment or Analogy	L: -20% to -50% H: +30% to +100%	1
Class 4	1% to 15%	Study or Feasibility	Equipment Factored or Parametric Models	L: -15% to -30% H: +20% to +50%	2 to 4
Class 3	10% to 40%	Budget Authorization, or Control	Semi-Detailed Unit Costs with Assembly Level Line Items	L: -10% to -20% H: +10% to +30%	3 to 10
Class 2	30% to 70%	Control or Bid/ Tender	Detailed Unit Cost with Forced Detailed Take-Off	L: -5% to -15% H: +5% to +20%	4 to 20
Class 1	50% to 100%	Check Estimate or Bid/Tender	Detailed Unit Cost with Detailed Take-Off	L: -3% to -10% H: +3% to +15%	5 to 100

Table 1: AACE International Recommended Practice No. 56R-08[1]

Construction Cost Estimate:

The following methodology is used in the preparation of the cost estimate for the Waccamaw River Feasibility Study:

a. The estimate is in accordance with the guidance contained in ER 1110-2-1302, Civil Works Cost Engineering.

b. The estimate is presented in Civilworks Work Breakdown Structure.

[1] Source: www.aacei.org.

c. The price level for the estimate is in 3rd Quarter of FY2024.

d. Construction costs developed by Estimating and Specifications Section, Engineering Division, Charleston District are based on a concept design developed by SAC Engineering team. Unit costs are developed using the M-CACES Second Generation (MII) software containing the 2023 English Cost Book Library which was used as a starting point. Historical cost data from similar projects are used for parametric estimate, and vendor quotes were used for non-Cost Book data. The estimate is documented with notes to explain the assumed construction methods, crews, productivity, and other specific information. The intent is to provide or convey a “fair and reasonable” estimate that which depicts the local market conditions.

e. Labor costs are based on the National Labor Library.

f. Bid competition: No contracting plan is done at this point. Bidding competition is assumed to be unrestricted since the overall work is typical to the area and the size of the project will likely draw multiple contractors to bid on the project. This assessment is reflected in the Abbreviated Risk Analysis.

g. Contract Acquisition Strategy: Acquisition strategy is not yet determined at this point. However, to reflect the historical market condition for this type of work, Prime Contractor is assumed to perform minimal earth work and will sub-contract out all remaining work.

h. Labor Shortages: It is assumed that there will be a normal labor market.

i. Materials: Most material costs are from the Cost Book Library. Vendor quotes were used for non-Cost Book items. Assumptions include:

   1. Rent materials will be part of the construction contract. No government furnished materials are assumed. Quoted delivery charge is used for hauling cost.
   2. Materials will be rented from local nearest available sources.
   3. Hauling: most hauling will be done by trucks. For trucking, it is assumed that the average speed is 30 mph factoring traffic hours in often congested major routes.

j. Equipment: Rates used are based on the latest USACE EP1110-1-8, Region III. Adjustments are made for fuel and facility capital cost of money (FCCM). Judicious use of owned versus rental rates was considered based on typical contractor usage and local equipment availability. Full FCCM/Cost of Money rate is latest available; MII program takes EP recommended discount, no other adjustments have been made to the FCCM.

k. Fuels (gasoline, on and off-road diesel) were based on local market averages

for on- road and off-road fuels in Houry County, SC. Since fuels fluctuate irrationally, an average was used.

l. Major crew and productivity rates were developed and studied by senior USACE estimators familiar with the type of work. All of the work is typical to the Charleston District. The crews and productivities were checked by local SAC estimators, discussions with contractors and comparisons with historical cost data.

m. Most crew work hours are assumed to be 8 hrs. 5 days/week which is typical to the area. It is anticipated that no overtime is required for reasons such as time of year restriction because there is none.

n. Mobilization and demobilization: Contractor mobilization and demobilization are based on the assumption that most of the contractors will take about one 8 hr. day to mobilize and one 8 hr. day to demobilize. Mob. and demob. cost is estimated from 1% to 5% of total construction costs depending on the size of work.

o. Field Office Overhead: Typically, civil works projects have field office overhead ranging from 10% to 15%, 15% was used for Field Office Overhead. Overhead assumptions may include: Superintendent, office manager, pickups, periodic travel, costs, communications, temporary offices (contractor and government), office furniture, office supplies, computers and software, as-built drawings and minor designs, tool trailers, staging setup, camp and kitchen maintenance and utilities, utility service, toilets, safety equipment, security and fencing, small hand and power tools, project signs, traffic control, surveys, temp fuel tank station, generators, compressors, lighting, and minor miscellaneous.

p. Home Office Overhead: A typical percentage was used (5%) for HOOH. The rates are based upon estimating and negotiating experience, and consultation with local construction representatives.

q. Profit: Since the Construction Cost Estimate is currently in a budgetary phase, profit is typically included at 10% for Prime Contractor. Sub-contractors' profit is 10% as well.

r. Sales Tax: State sales tax was applied at 6%. Also, a 2% local sales tax was included in the estimate. Total sales tax applied is 8%.

s. Bond: Bond is calculated at 0.64% using Bond Table in MII for the Prime contractor.

t. Contingency: Currently 25% is included in the cost estimate, but

contingency will be based on the outcome of the Cost and Schedule Risk Analysis for the TSP.

u. Escalation: No escalation to midpoint of construction according to tentative construction start dates is included in the MII estimate and non-MII estimates provided by SAC. Escalation will only be included in the Total Project Cost Summary (TPCS) to avoid duplicates.

v. Real Estate (RE): Costs were developed and provided by the Realty Specialist and placed in WBS-01 Lands and Damages. The RE cost for each alternative includes land costs, acquisition costs, and contingencies.

w. Environmental mitigation costs were developed and provided by the Biologist and placed in WBS-06 Fish and Wildlife Facilities. The Environmental mitigation cost for the features includes costs for impacts to forested wetlands, to EPA wetlands, and to restored habit. Additionally, environmental monitoring and adaptive management costs were included by the Biologist.

x. Cultural Resources Costs were developed and provided by the Archaeologist and placed in the WBS-18 Cultural Resource Preservation.

y. Pre-Construction Engineering and Design (PED): PED cost have not yet been added to the cost estimate. This will be included in the next update.

z. Supervision and Administration (S&A): S&A cost have not yet been added to the cost estimate. This will be included in the next update.

Cost Estimates

Table 2-1 show the project first cost for the Tentatively Selected Plan. All costs are August 2024 price level. These costs differ from what is shown on the main report due to refinements that have been made on the TSP. These changes would not affect the decisions made. The final report will reflect the final cost developed.

CW Feature Account	C3 - Relief Bridges	S3 - Barrier Removal
01 - Real Estate	$ 497,397.00	$ 106,086.00
04 - Barrier Removal	$ -	$ 1,979,223.08
06 - Fish and Wildlife	$ 305,513.78	$ 355,390.88
09 - Channels and Canals	$ 9,628,872.31	$ -
18 - Cultural Resource	$ 367,500.00	$ 91,875.00
Subtotal	**$ 10,799,283.09**	**$ 2,532,574.96**
30 - Planning, Engineering & Design (PED)	TBD	TBD
31 - Construction Management (S&A)	TBD	TBD
Total	**TBD**	**TBD**

Table 2-1

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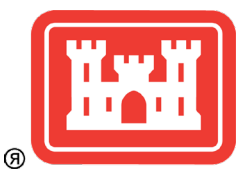
Waccamaw River, Horry County, South Carolina
Flood Risk Management Study
Draft Integrated Feasibility Report and Environmental Assessment

Appendix C. Environmental



Agency Scoping and ICT Meeting Record

From:	Hughes, Andrea W CIV USARMY CESAC (USA)
To:	Lorianne Riggin; Stout, Christopher; Hightower, Charles; Pace Wilber - NOAA Federal; tom_mccoy@fws.gov; harderS@dnr.sc.gov; MizellH@dnr.sc; Mark Caldwell; Kajumba, Ntale; Singh-White, Alva; Cynthia Cooksey - NOAA Federal; Stacie Crowe; Johnson, Elizabeth; Maggie Jamison; Culbreath, S. Michele; marshall_sasser@fws.gov; Smith, Whitney R
Cc:	Ward, Bethney P CIV USARMY CESAC (USA); Parrish, Nancy A CIV USARMY CESAC (USA); Buchanan, Jami L CIV USARMY CELRH (USA); Backus, Pamela N CIV USARMY CESAS (USA); mhyman@cityofconway.com; Markunas, Andrew
Subject:	Waccamaw River Flood Risk Management Feasibility Study Scoping and Interagency Coordination Team Meeting Invite
Date:	Friday, October 28, 2022 8:22:00 PM
Attachments:	Agency Scoping Letter and Study Area Map.pdf

Dear Agency Colleagues,

In accordance with Section 1005 of the Water Resources Reform and Development Act of 2014 and other applicable laws and regulations, the U.S Army Corps of Engineers, Charleston District plans to hold an Interagency Coordination Team (ICT) webinar meeting on 15 November 2022, from 1 p.m. to 3 p.m., to introduce the new feasibility study "Waccamaw River, Horry County, South Carolina: A Flood Risk Management Study". Our office invites you to participate in the meeting and provide any specific information, issues, or concerns that should be considered during the project scoping process and for National Environmental Policy Act (NEPA) compliance.

Please contact me by email at andrea.w.hughes@usace.army.mil regarding questions. WebEx information and an agenda will be sent out prior to the meeting.

Regards,

Andrea

Andrea W. Hughes
Biologist, Planning and Environmental Branch
U.S. Army Corps of Engineers, Charleston District
69-A Hagood Avenue
Charleston, South Carolina 29403
843.566.3857

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

28 October 2022

Planning and Environmental Branch

Dear Agency Colleague:

The U.S. Army Corps of Engineers, Charleston District (USACE) is initiating a feasibility study to develop and analyze alternatives for a flood risk management study located within the Waccamaw River Basin. This study, entitled the *Waccamaw River, Horry County, South Carolina,* is authorized by the Rivers and Harbor Acts of June 14, 1880, and of July 3, 1930; and Section 216 of the 1970 Flood Control Act (P.L. 91-611). The non-Federal sponsor for this study is Horry County.

The objectives of the study are to reduce the risk of damages from flooding within affected communities, decrease the risk to structures, industry, and public infrastructure, and to reduce life and safety risk associated with storm surge and riverine events. The study area includes the portion of the Waccamaw River Basin that lies within Horry County, South Carolina. The Waccamaw River Basin is located within the coastal plain of North and South Carolina and has a 1,640 square mile-drainage area: 598 square miles in South Carolina, and 1,042 square miles in North Carolina. The Waccamaw River is approximately 161 miles long and flows approximately 140 miles from Lake Waccamaw in Columbus County, North Carolina, southwesterly to Winyah Bay at Georgetown, South Carolina, which opens to the Atlantic Ocean. The lower 20 miles of the Waccamaw River are interconnected with the Pee Dee River. The study area encompasses approximately 81 miles of the Waccamaw River, and 546 square miles of the basin, including the City of Conway which is the county seat. Part of the Waccamaw River in Horry County is also the Atlantic Intracoastal Waterway.

Flood risk management measures that are currently being considered include: traditional structural measures such as barrier removal, channel modifications, channel diversions, levees/flood walls, retention/detention basins, floodplain benching, bank stabilization, and transportation-related recommendations; non-structural measures such as flood-proofing, home acquisition and relocation, structure elevation, and emergency planning; and natural and nature-based measures such as watershed farming, and riparian plantings. The study is still within the scoping phase, and therefore the list above may not include all management measures that are ultimately considered for the project; additional measures may be considered, and measures may be removed from consideration, as the study develops.

Pursuant to compliance with the National Environmental Policy Act (NEPA) and associated environmental laws and regulations, [including the Endangered Species Act, Fish and Wildlife Coordination Act, Clean Water Act, National Historic Preservation Act], USACE will be preparing a NEPA decision document to analyze the potential effects of identified alternatives. Information gathered during this scoping effort and over the course of the study will assist us in determining the appropriate NEPA compliance pathway. At this time we request your feedback on the scope of issues to be addressed, any resources or habitats of concern in

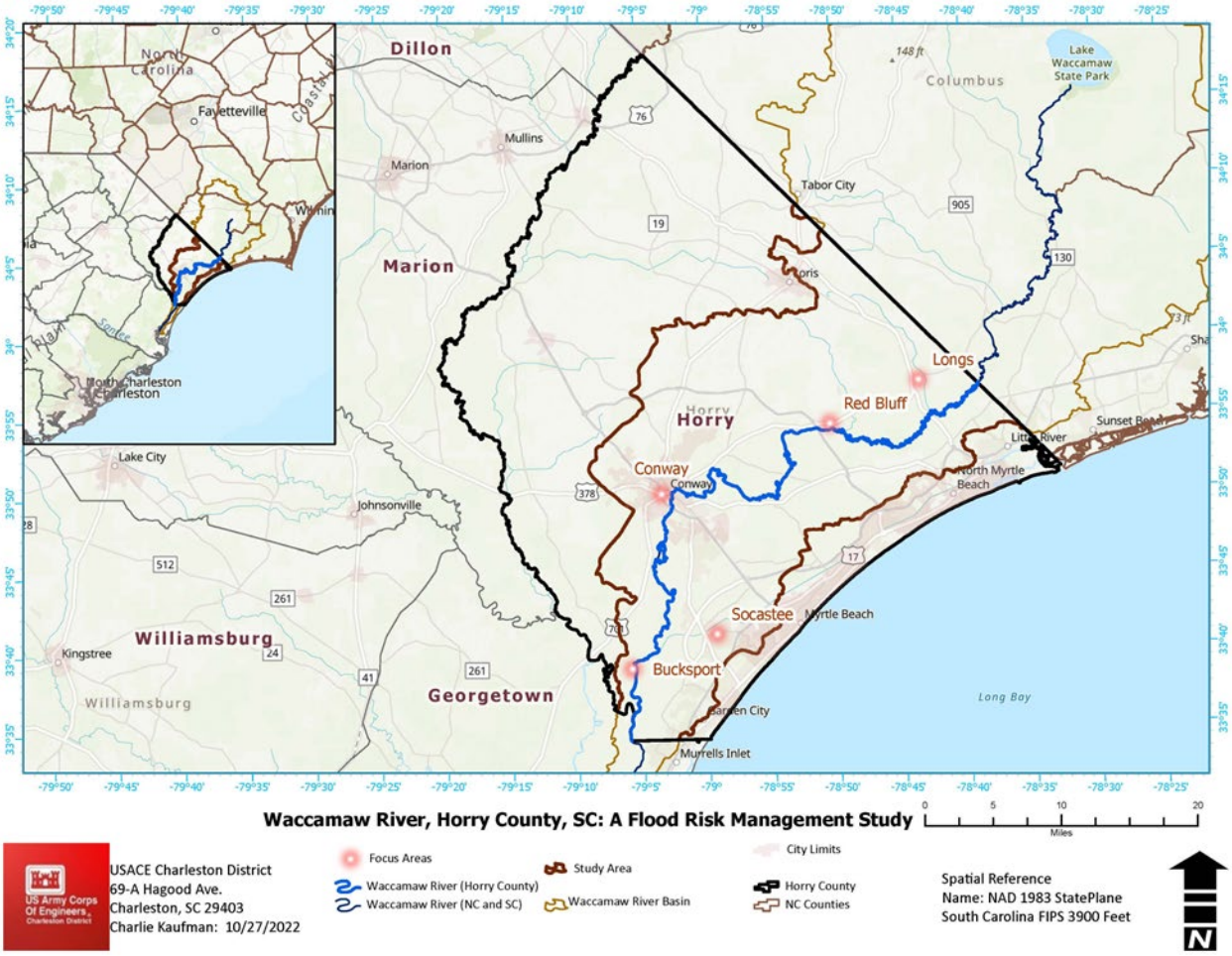
the study area, information on ongoing projects in the area, and any feedback you may have on the management measures we are considering.

We hope that you will be able to attend the Interagency Coordination Team (ICT) meeting scheduled for 15 November 2022. The meeting will be an opportunity for the agencies to gain additional information on the study and the measures being considered. We request that written feedback be provided within 30 days of receipt of this letter. If you have any questions on this matter, please feel free to contact Andrea Hughes by e-mail at andrea.w.hughes@usace.army.mil.

Sincerely,

for Nancy Parrish
Chief, Planning and Environmental Branch

Enclosure


Dillon
Marion
Williamsburg
Georgetown
Horry
Mullins
Marion
Tabor City
Loris
Longs
Red Bluff
Conway
Socastee
Myrtle Beach
Bucksport
Murrells Inlet
Garden City
Long Bay
Columbus
Lake Waccamaw State Park
Lake City
Johnsonville
Kingstree
Williamsburg
Fayetteville
North Carolina
North Myrtle Beach
Sunset Beach
Little River
Waccamaw River, Horry County, SC: A Flood Risk Management Study
Miles
USACE Charleston District
69-A Hagood Ave.
Charleston, SC 29403
Charlie Kaufman: 10/27/2022
Focus Areas
Waccamaw River (Horry County)
Waccamaw River (NC and SC)
Study Area
Waccamaw River Basin
City Limits
Horry County
NC Counties
Spatial Reference
Name: NAD 1983 StatePlane
South Carolina FIPS 3900 Feet
N

From: Singh-White, Alya
To: Hughes, Andrea W CIV USARMY CESAC (USA)
Cc: Dean, Kenneth; Buskey, Traci P.
Subject: [Non-DoD Source] EPA Scoping Comments on the Waccamaw River Flood Risk Management Study
Date: Monday, November 28, 2022 9:59:02 AM

Ms. Andrea Hughes
Biologist, Planning and Environmental Branch
U.S. Army Corps of Engineers, Charleston District
69A Hagood Avenue
Charleston, South Carolina 29403-5107
andrea.w.hughes@usace.army.mil

Re: EPA Scoping Comments on the Waccamaw River Flood Risk Management Study in Horry County, South Carolina

Dear Ms. Hughes:

The U.S. Environmental Protection Agency (EPA) has reviewed the letter, dated October 28, 2022, from Nancy Parrish of the U.S. Army Corps of Engineers (USACE), Charleston District, regarding the Waccamaw River, Horry County, South Carolina Study, in accordance with Section 309 of the Clean Air Act and Section 102(2)(C) of the National Environmental Policy Act (NEPA). According to the letter, the USACE is initiating a feasibility study to develop and analyze alternatives for flood risk management within the Waccamaw River Basin in Horry County, South Carolina. The purpose of the study is to reduce life safety risk and flood damage to communities, structures, industry, and infrastructure associated with storm surge and riverine events. The USACE has not yet determined the type of NEPA document that it will complete for the study.

The USACE is considering the following flood risk management measures for the study which may be altered as the project progresses: traditional structural measures such as barrier removal, channel modifications, channel diversions, levees/flood walls, retention/detention basins, floodplain benching, bank stabilization, and transportation-related recommendations; non-structural measures such as flood-proofing, home acquisition and relocation, structure elevation, and emergency planning; and natural and nature-based measures such as watershed farming, and riparian plantings. The type and location of flood risk management measures that will be implemented has yet to be determined.

Based on the EPA's review of the available information, the following scoping comments are provided for your consideration.

(1) **Environmental Justice (EJ):** Executive Order 12898 directs federal agencies to identify and address the disproportionately high and adverse human health on environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law. The EPA encourages the use of EJScreen (https://www.epa.gov/ejscreen), EPA's nationally consistent environmental justice screening and mapping tool, when conducting environmental justice scoping efforts. The tool provides information on environmental and socioeconomic indicators as well as pollution sources, health disparities, critical service gaps, and climate change data. The tool can help identify potential community vulnerabilities by calculating EJ Indexes and displaying other environmental and socioeconomic information.

EJScreen is a useful first step in highlighting locations that may be candidates for further analysis. The EPA recommends conducting a complete EJ analysis in order to identify people of color, indigenous and low-income communities within the project area, assess the potential impacts of the project on these communities, and determine whether such impacts are disproportionately high and adverse The EPA also recommends meaningfully engaging communities with EJ concerns early and throughout the NEPA process. To address potential barriers to meaningful engagement, consider using adaptive and innovative approaches to both public outreach and participation to meet the needs of the local community and businesses (i.e., engage local community leaders and groups in project planning, share project information at community events/meetings, virtual meetings, etc). The Environmental Justice Interagency Working Group's *Promising Practices for EJ Methodologies in NEPA Reviews* (*Promising Practices)*, dated March 2016, provides guiding principles agencies can consider (https://www.epa.gov/sites/default/files/2016-08/documents/nepa_promising_practices_document_2016.pdf).

The EPA recommends that the environmental document identify and address any disproportionate impacts on people of color, indigenous, and low-income populations. The EPA also recommends the environmental document discuss the input, concerns, and engagement of the affected communities. Furthermore, the EPA recommends the environmental document describe how community concerns or recommendations are used to develop proposed mitigation options or to further avoid or minimize impacts to human health and the environment.

(2) **Contaminated Sites:** The study area contains numerous RCRA facilities and underground storage tanks (UST) that have been identified in NEPAssist and the South Carolina Department of Health and Environmental Control UST registry. The EPA recommends conducting a Phase I and possibly a Phase II contamination site assessment to identify all contaminated site features within the study area. Contaminated sites should be avoided when selecting the location of certain project features (i.e., flood walls and retention basins). If avoidance is not possible, the site should be properly remediated prior to its use.

(3) **Federal Lands:** The Waccamaw National Wildlife Refuge is located within the project study area and is a diverse habitat to many species of flora and fauna. The refuge is managed by the U.S. Fish and Wildlife Service (USFWS); therefore, the EPA encourages the USACE to coordinate early with the USFWS regarding potential impacts to species and habitat within the wildlife refuge.

Thank you for the opportunity to provide scoping comments on the proposed study. If you have any questions regarding the EPA's comments, please contact me by phone at 404-562-9339 or via email at Singh-White.Alya@epa.gov.

Sincerely,

Alya Singh-White
Biologist | NEPA Project Manager
U.S. EPA Region 4
Office of the Regional Administrator
Strategic Programs Office | NEPA Section
61 Forsyth St SW

Atlanta, GA 30303
(404)-562-9339 | singh-white.alya@epa.gov

South Carolina Department of Natural Resources

Robert H. Boyles, Jr.
Director

Lorianne Riggin, Director
Office of Environmental Programs

November 22, 2022

U.S. Army Corps of Engineers
Planning & Environmental Branch
Attention: Andrea Hughes
andrea.w.hughes@usace.army.mil

Electronic submission

RE: Waccamaw River Flood Risk Management Study, Horry County, South Carolina

Dear Mrs. Hughes,

The South Carolina Department of Natural Resources (SCDNR) is the state agency charged by state law with the management, protection and enhancement of wildlife, fisheries and marine resources in South Carolina. Additionally, the SCDNR is responsible for formulating comprehensive policies for water resources through a State Water Plan to address issues affecting water supply, water quality, navigation, hydroelectric power, outdoor recreation, fish and wildlife needs, and other water resource interests.

Due to the SCDNR's responsibilities as a steward for the state's natural resources, the comments enclosed are for the purpose to aid in the development of National Environmental Policy Act (NEPA) documents to assess flood risk solutions in Horry County.

The SCDNR appreciates the opportunity to provide feedback for consideration in the development of NEPA measures to balance environmental protection and the potential flood risk solutions. Should you have any questions, please do not hesitate to contact me via email at RigginL@dnr.sc.gov or by phone at 803-734-4199.

Sincerely,

Lorianne Riggin

Lorianne Riggin
PO Box 167
Columbia, SC 29202
803-734-4199
rigginl@dnr.sc.gov

Waccamaw River Flood Risk Management Feasibility Study
Waccamaw River, Horry County, South Carolina

Project Summary

The U.S. Army Corps of Engineers Charleston District (USACE) is initiating a feasibility study, in conjunction with Horry County as a non-federal sponsor, to develop and analyze alternatives for a flood risk management study within the Waccamaw River Basin. The objectives of the study are to reduce the risk of damages from flooding within affected communities; decrease the risk to structures, industry and public infrastructure; and to reduce life and safety risk associated with storm surge and riverine events. The study area includes the portion of the Waccamaw River Basin that lies within Horry County; the basin has a 1,640 square mile drainage area (598 square miles in South Carolina) and contains the 161-mile long Waccamaw River. The study will encompass 81 miles of the Waccamaw River and 546 square miles of the basin, including the City of Conway.

The following flood risk management measures are currently being considered at the initiating phase of the feasibility study: traditional structural measures such as barrier removal, channel modifications, channel diversions, levees/flood walls, retention/detention basins, floodplain benching, bank stabilization, and transportation-related recommendations; non-structural measures such as flood-proofing, home acquisition and relocation, structure elevation, and emergency planning; and natural and nature-based measures such as riparian plantings.

SCDNR Comments

The Waccamaw River is vital to supporting a multitude of species, plant and animal, as it winds from the North Carolina to its terminus at Winyah Bay. The South Carolina Wildlife Action Plan (SWAP) was originally created in the Wildlife Conservation and Recreation Program created under the federal Appropriations Act of 2001 with a purpose to develop a wildlife conservation planning and restoration strategy for rare and sensitive species. Species are listed in the SWAP because they are rare or designated as at-risk due to knowledge deficiencies; species common in South Carolina but listed rare or declining elsewhere; or species that serve as indicators of detrimental environmental conditions. The 2015 SC SWAP states that the upper Waccamaw River in Horry County is one area of primary conservation concern due to the habitat located there for the following SWAP conservation priority species – the Carolina Pygmy Sunfish (*Elassoma boehlkei*), the Broadtail Madtom (*Noturus* sp. c.f. *leptacanthus*), and the Waccmaw spike (*Elliptio waccamawensis*).

Tables 1 and 2 attached include a list of all the SWAP conservation priority species, state protected species and federally protected species that need to be considered when developing flood risk management solutions in and around the Waccamaw River. Please note that the take of state threatened, and endangered species is prohibited under S.C. Code of Laws §50-15-20 and §50-15-30 respectively. Additionally, S.C. Code of Laws §16-11-590 provides additional protections for the Venus flytrap, a federal at-risk species and SWAP species of high conservation priority, that is now known from only a few populations in the world – two populations in Horry County, SC and in a few coastal counties of NC. This statute requires

landowner consent for the cutting, collection, breaking or other destruction to this globally rare plant species. The SCDNR will work with landowners where Venus flytrap may be impacted to remove and relocate these rare plants where minimization and avoidance of destruction of these species cannot occur.

The SC Geological Survey has existing geological map coverage of the proposed project area and should be useful when it comes to delineating deep versus braided Waccamaw River channels and the older floodplains that are evident in LiDAR. The Geological Survey maps can be found at the following link: https://www.dnr.sc.gov/geology/

Additionally, two papers regarding the drainage of the Waccamaw River are attached that were conducted in North Carolina; much of this will also be applicable to South Carolina regarding coastal wetlands and geology.

The SCDNR in collaboration with the NC Wildlife Resources Commission conducted a comprehensive fish community study in the Waccamaw River for the summer months of 2015, 2016 and 2017. Sampling efforts divided the river into segments based on the varying levels of dissolved oxygen. During the September 2018 flooding event associated with Hurricane Florence, dissolved oxygen levels in the Waccamaw River reached hypoxic levels, causing a river-wide fish kill event. Following this event, once water levels receded to within the banks of the river, in late October 2018, SCDNR conducted a sampling effort to get a snapshot of the fish kill. Standardized sampling was initiated again in the summer of 2019 to document the full extent of the fish kill and was continued until the summer of 2021. The results of the post Hurricane Florence study are also provided in the attached.

While this is a federal project, the SCDNR would like to note that the Fish and Wildlife Coordination Act (16. U.S.C 661 et seq) requires consultation with the state where ". . . waters of any stream or other body of water are proposed or authorized to be impounded, diverted, the channel deepened, or the stream or other body of water otherwise controlled or modified for any purpose whatever, including navigation and drainage by any department or agency of the United States or by any public or private agency under Federal permit or license, such department or agency shall first consult with the United States Fish and Wildlife Service, Department of the Interior, and with the head of the agency exercising administration over the wildlife resources of the particular State wherein the impoundment, diversion, or other control facility is to be constructed, with a view to the conservation of wildlife resources by preventing loss of and damage to such resources as well as providing for the development and improvement thereof in connection with such water-resource development." Therefore, the species identified in Tables 1 and 2, including those of SWAP conservation priority should be considered.

The SCDNR encourages the USACE to explore natural and nature-based solutions where possible. Additionally, any opportunities to assess increasing fishing pier or bank fishing access on the Waccamaw River as a part of this study would be of great interest to the SCDNR and a benefit to the public.

Attachment

Table 1. Animal Species for consideration during study development.

Scientific Name	Common Name	Federal Status	State Status	SWAP Priority
INSECT				
Bombus pensylvanicus	American Bumble Bee	At-Risk Species	Not Applicable	Not Applicable
Danaus plexippus	Monarch Butterfly	Candidate for listing	Not Applicable	Highest
FRESHWATER MUSSEL				
Elliptio complanata	Eastern Elliptio	Not Applicable	Not Applicable	Moderate
Elliptio congaraea	Carolina Slabshell	Not Applicable	Not Applicable	Moderate
Elliptio folliculata	Pod Lance	Not Applicable	Not Applicable	High
Elliptio producta	Atlantic Spike	Not Applicable	Not Applicable	High
Lampsilis cariosa	Yellow Lampmussel	Not Applicable	Not Applicable	Highest
Lampsilis splendida	Rayed Pink Fatmucket	Not Applicable	Not Applicable	High
Toxolasma pullus	Savannah Lilliput	Not Applicable	Not Applicable	Highest
Villosa delumbis	Eastern Creekshell	Not Applicable	Not Applicable	Moderate
CRAYFISH				
Procambarus ancylus	Coastal Plain Crayfish	Not Applicable	Not Applicable	Moderate
Procambarus blandingii	Santee Crayfish	Not Applicable	Not Applicable	Moderate
Procambarus braswelli	Waccamaw Crayfish	Not Applicable	Not Applicable	High
Procambarus chacei	Cedar Creek Crayfish	Not Applicable	Not Applicable	Moderate
Procambarus pearsei	Carolina Sandhills Crayfish	Not Applicable	Not Applicable	Moderate
FISH				
Acipenser brevirostrum	Shortnose Sturgeon	Federally Endangered	State Endangered	Highest
Acipenser oxyrinchus	Atlantic Sturgeon	Federally Endangered	Not Applicable	Highest
Alosa aestivalis	Blueback Herring	Not Applicable	Not Applicable	Highest
Alosa mediocris	Hickory Shad	Not Applicable	Not Applicable	Highest
Alosa sapidissima	American Shad	Not Applicable	Not Applicable	Highest
Ameiurus brunneus	Snail Bullhead	Not Applicable	Not Applicable	Moderate
Ameiurus catus	White Catfish	Not Applicable	Not Applicable	Moderate

Scientific Name	Common Name	Federal Status	State Status	SWAP Priority
Ameiurus platycephalus	Flat Bullhead	Not Applicable	Not Applicable	Moderate
Anguilla rostrata	American Eel	Not Applicable	Not Applicable	Highest
Chologaster cornuta	Swampfish	Not Applicable	Not Applicable	Moderate
Elassoma boehlkei	Carolina Pygmy Sunfish	Not Applicable	State Threatened	Highest
Enneacanthus obesus	Banded Sunfish	Not Applicable	Not Applicable	Moderate
Etheostoma serrifer	Sawcheek Darter	Not Applicable	Not Applicable	Moderate
Fundulus diaphanus	Banded Killifish	Not Applicable	Not Applicable	Moderate
Notropis chalybaeus	Ironcolor Shiner	Not Applicable	Not Applicable	Moderate
REPTILE				
Chelydra serpentina	Snapping Turtle	Not Applicable	Possession regulated under S.C. Code of laws 50-15-70	Moderate
Clemmys guttata	Spotted Turtle	At-Risk Species	State Threatened	High
Deirochelys reticularia	Chicken Turtle	Not Applicable	Possession regulated under S.C. Code of laws 50-15-70	Moderate
Heterodon simus	Southern Hog-nosed Snake	Not Applicable	State Threatened	Highest
Kinosternon baurii	Striped Mud Turtle	Not Applicable	Possession regulated under S.C. Code of laws 50-15-70	Moderate
Ophisaurus attenuatus	Slender Glass Lizard	Not Applicable	Not Applicable	Moderate
Pituophis melanoleucus	Pinesnake	Not Applicable	Not Applicable	Highest
Terrapene carolina	Eastern Box Turtle	Not Applicable	Possession regulated under S.C. Code of laws 50-15-70	Moderate
BIRD				
Anhinga anhinga	Anhinga	Migratory Bird Treaty Act	Not Applicable	Moderate
Ardea alba	Great Egret	Migratory Bird Treaty Act	Not Applicable	Not Applicable
Ardea herodias	Great Blue Heron	Migratory Bird Treaty Act	Not Applicable	Moderate
Butorides virescens	Green Heron	Migratory Bird Treaty Act	Not Applicable	Highest
Dryobates borealis	Red-cockaded Woodpecker	Federally Endangered	State Endangered	Highest
Egretta caerulea	Little Blue Heron	Migratory Bird Treaty Act	Not Applicable	Highest
Egretta thula	Snowy Egret	Migratory Bird Treaty Act	Not Applicable	Moderate
Elanoides forficatus	Swallow-tailed Kite	Migratory Bird Treaty Act	State Endangered	Highest

Scientific Name	Common Name	Federal Status	State Status	SWAP Priority
Haliaeetus leucocephalus	Bald Eagle	Bald & Golden Eagle Protection Act	State Threatened	High
Icterus galbula	Baltimore Oriole	Migratory Bird Treaty Act	Not Applicable	High
Mycteria americana	Wood Stork	Federally Threatened	State Endangered	Highest
Nyctanassa violacea	Yellow-crowned Night-Heron	Migratory Bird Treaty Act	Not Applicable	Highest
Nycticorax nycticorax	Black-crowned Night-Heron	Migratory Bird Treaty Act	Not Applicable	Highest
Sternula antillarum	Least Tern	Migratory Bird Treaty Act	State Threatened	Highest
MAMMAL				
Corynorhinus rafinesquii	Rafinesque's Big-eared Bat	Not Applicable	State Endangered	Highest
Eptesicus fuscus	Big Brown Bat	Not Applicable	Not Applicable	Highest
Lasiurus borealis	Eastern Red Bat	Not Applicable	Not Applicable	Highest
Lasiurus cinereus	Hoary Bat	Not Applicable	Not Applicable	Highest
Lasiurus seminolus	Seminole Bat	Not Applicable	Not Applicable	Highest
Myotis austroriparius	Southeastern Bat	Not Applicable	Not Applicable	Highest
Sciurus niger	Eastern Fox Squirrel	Not Applicable	Not Applicable	Moderate
Trichechus manatus	Florida Manatee	LT: Federally Threatened	State Endangered	Highest
Ursus americanus	American Black Bear	Not Applicable	Not Applicable	Moderate

Table 2. Plant Species for consideration during study development.

Scientific Name	Common Name	Federal Status	State Status	SWAP Priority
Agalinis aphylla	Scale-leaf Agalinis	Not Applicable	Not Applicable	Moderate
Calamovilfa brevipilis	Pinebarren Sandreed	Not Applicable	Not Applicable	Moderate
Carex decomposita	Cypress-knee Sedge, Epiphytic Sedge	Not Applicable	Not Applicable	High
Carex elliottii	Elliott's Sedge	Not Applicable	Not Applicable	Moderate
Ceratiola ericoides	Rosemary, Florida Rosemary, Sandhill Rosemary, Sand Heath	Not Applicable	Not Applicable	Moderate
Cladium mariscoides	Twig-rush, Fen-sedge, Smooth Sawgrass	Not Applicable	Not Applicable	Moderate
Coreopsis rosea	Rose Coreopsis	Not Applicable	Not Applicable	High
Dionaea muscipula	Venus Flytrap, Meadow Clam, Tippitiwitchet	At-Risk Species	Not Applicable	High
Eleocharis vivipara	Viviparous Spikerush	Not Applicable	Not Applicable	Moderate
Eupatorium recurvans	Recurved Eupatorium	Not Applicable	Not Applicable	Moderate

Scientific Name	Common Name	Federal Status	State Status	SWAP Priority
Fimbristylis perpusilla	Harper's Fimbry	At-Risk Species	Not Applicable	High
Gentiana autumnalis	Pinebarren Gentian	Not Applicable	Not Applicable	High
Lachnocaulon minus	Brown Bogbutton	Not Applicable	Not Applicable	Moderate
Lechea torreyi var. congesta	Sandhill Pinweed	Not Applicable	Not Applicable	Not Applicable
Lilaeopsis carolinensis	Carolina Lilaeopsis	Not Applicable	Not Applicable	Moderate
Lioplax subcarinata	Ridged Lioplax	Not Applicable	Not Applicable	High
Litsea aestivalis	Pondspice	Not Applicable	Not Applicable	High
Ludwigia brevipes	Long Beach Seedbox, Coastal Plain Water-purslane	Not Applicable	Not Applicable	High
Ludwigia lanceolata	Lanceleaf Seedbox	Not Applicable	Not Applicable	High
Ludwigia ravenii	Raven's Seedbox	At-Risk Species	Not Applicable	Not Applicable
Macbridea caroliniana	Carolina Birds-in-a-nest, Carolina Macbridea	Not Applicable	Not Applicable	High
Orthochilus ecristatus	Spiked Medusa, Smooth-lipped Eulophia	Not Applicable	Not Applicable	High
Oxypolis ternata	Savanna Cowbane	Not Applicable	Not Applicable	High
Parnassia caroliniana	Carolina Grass-of-Parnassus, Savanna Parnassia, Eyebright	Not Applicable	Not Applicable	High
Peltandra sagittifolia	Spoonflower, White Arrow-arum	Not Applicable	Not Applicable	Moderate
Plantago sparsiflora	Pineland Plantain	Not Applicable	Not Applicable	High
Rhexia aristosa	Awned Meadow-beauty, Bristly Meadow-beauty	Not Applicable	Not Applicable	High
Rhynchospora pallida	Pale Beaksedge	Not Applicable	Not Applicable	High
Sabatia decandra	Bartram's Rose-gentian	Not Applicable	Not Applicable	Moderate
Sabatia kennedyana	Plymouth Gentian	Not Applicable	Not Applicable	High
Sagittaria weatherbiana	Weatherby's Arrowhead	Not Applicable	Not Applicable	Moderate
Schwalbea americana	Chaffseed	Federally Endangered	Not Applicable	Highest
Solidago pulchra	Beautiful Goldenrod, Carolina Goldenrod	Not Applicable	Not Applicable	High
Spiranthes laciniata	Lace-lip Ladies'-tresses	Not Applicable	Not Applicable	Moderate
Sporobolus teretifolius	Wireleaf Dropseed	At-Risk Species	Not Applicable	High
Xyris brevifolia	Shortleaf Yellow-eyed-grass	Not Applicable	Not Applicable	Moderate
Xyris flabelliformis	Savanna Yellow-eyed-grass	Not Applicable	Not Applicable	Moderate

Additional Studies for Scoping

1. Stakeholder Perceptions of Wetland Restoration on Timber Land within the Waccamaw River Watershed
2. SCDNR Rivers and Streams Monitoring Waccamaw River Survey Post-Hurrican Florence
3. The Waccamaw Drainage System: Geology and Dynamics of a Coastal Wetland, Southeastern North Carolina

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

December 5, 2022 F/SER47:FR/pw

(Sent via Electronic Mail)

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

Attention: Andrea Hughes

Dear Colonel Clark:

NOAA's National Marine Fisheries Service (NMFS) reviewed the letter requesting scoping comments on significant resources or issues of concern with regard to the proposed feasibility study to implement flood risk management measures in the Waccamaw River Basin, Horry County, South Carolina. As the nation's federal trustee for the conservation and management of marine, estuarine, and diadromous fishery resources, the NMFS provides the following comments pursuant to the authorities of the Fish and Wildlife Coordination Act and the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

The Waccamaw River Basin is within the Coastal Plain of North and South Carolina and has a 1,640 square mile-drainage area. The Waccamaw River is approximately 161 miles long and flows approximately 140 miles from Lake Waccamaw in Columbus County, North Carolina, southwesterly to Winyah Bay at Georgetown, South Carolina, which opens to the Atlantic Ocean. The lower portion of the Waccamaw River connects with the Pee Dee River. The study area encompasses approximately 81 miles of the Waccamaw River, and 546 square miles of the basin, including the City of Conway. The Waccamaw River in Horry County includes part of the Atlantic Intracoastal Waterway.

Possible solutions to manage flood risks include both structural measures, such as dams, reservoirs, levees, and channel modifications, and nonstructural measures, such as elevating or relocating structures, flood proofing, and educating the public. Natural and nature-based features, such as green infrastructure, floodplain/channel restoration, and agricultural best management practices, will also be considered. The NMFS recommends the study include examination of living shorelines as a nature-based feature.

The mainstem Pee Dee River is designated critical habitat for the Carolina Distinct Population Segment of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). Because the Pee Dee and Waccamaw River are connected, Atlantic sturgeon are likely to occur within the study area. The study area also includes spawning or nursery habitat for American shad (*Alosa sapidissima*) and blueback herring (*Alosa aestivalis*). The many tributaries in the basin provide habitat for the catadromous American eel (*Anguilla rostrata*). Within the estuarine portion of the Waccamaw

River, the river and associated creeks provide essential fish habitat (EFH) for a number of NOAA-trust resource species, such as bluefish (*Pomatomus saltatrix*), summer flounder (*Paralichthys dentatus*), brown shrimp (*Farfantepenaeus aztecus*), and white shrimp (*Litopenaeus setiferus*).

Issues of concern to the NMFS are the potential structural measures. The NMFS has been actively working with other resource agencies in removing dams in the Coastal Plain of South Carolina to restore access to historical anadromous spawning and nursery areas. The NMFS would likely oppose any new dams and associated reservoirs. Additionally, levees and channel modifications frequently fail to reduce flooding. Levees increase the speed of the water, which will increase erosion of the shoreline downstream. Levee construction can also increase flooding of areas downstream of the levee. Channel modifications can also have the same negative impacts. It is unlikely the NMFS would support these measures if proposed.

Thank you for the opportunity to provide these comments. Please direct related questions or comments to the attention of Ms. Cynthia Cooksey at our Charleston Field Office. She can be reached at Cynthia.Cooksey@noaa.gov.

Sincerely,

WILBER.THOMAS.PAYSON.1365820186 Digitally signed by WILBER.THOMAS.PAYSON.1365820186 Date: 2022.12.05 12:29:56 -05'00'

/ for

Virginia M. Fay
Assistant Regional Administrator
Habitat Conservation Division

cc: COE, Andrea.W.Hughes@usace.army.mil
DHEC, trumbumt@dhec.sc.gov
SCDNR, CroweS@dnr.sc.gov
SAFMC, Roger.Pugliese@safmc.net
EPA, Laycock.Kelly@epa.gov
FWS, Mark_Caldwell@fws.gov
F/SER47, Cynthia.Cooksey@noaa.gov

Waccamaw River, Horry County, SC FRM Feasibility Study
Interagency Coordination Team Meeting
November 15, 2022 1:00 to 3:00 PM EST

Webinar Information:
URL: https://usace1.webex.com/meet/andrea.w.hughes
Call-in toll-free number: 1-844-800-2712
Access code for webinar and call-in: 1998 91 1089; Security code: 1234

Purpose:
This meeting constitutes the initial formation of the Interagency Coordination Team (ICT) for the Waccamaw River, Horry County, SC Flood Risk Management Study. The objectives for this meeting are to inform the ICT about the study and to gather input that will inform the scoping process.

MEETING NOTES

Attendees:

Elizabeth Johnson (SCDAH)	Mary Catherine Hyman (Conway)
Robert Larsen (SCDAH	John Rogers (Conway)
Lorianne Riggin (SCDNR)	Brandon Harrelson (Conway)
Cynthia Cooksey (NOAA)	Brandon Wagner (Horry County)
Pace Wilber (NOAA)	Tom Roth (Horry County)
Chris Stout (SCDHEC-OCRM)	Andrew Markunas (Horry County)
Mark Caldwell (USFWS)	Andrea Hughes (PDT)
Craig Sasser (USFWS)	Andrea Farmer (PDT)
Alya Singh-White (USEPA)	Pamela Backus (PDT)
Whitney Smith (USGS)	Nancy Parrish (PDT)
Adam Emrick (Conway)	Bethney Ward (PDT)

Welcome, Introductions, Review Agenda: Andrea H. welcomed the ICT and reviewed the agenda. Participants and the PDT introduced themselves.

Study Overview and Process: Pamela provided an overview of the study purpose, authorities, and planning process.

Progress on Scoping: Andrea H. reviewed the problems, objectives and constraints, and opportunities. Andrea also presented the PDT's progress on scoping that included the identified damage areas and the proposed measures currently being considered.

ICT Input: All agency participants were provided the opportunity to comment on the study. Many participants indicated it's too early in the process to be able to provide comment but will do so as more information becomes available. Also, several agencies indicated they support NNB measures. The comments that were received during the meeting are listed below:

Name	Affiliation	Comments
Chris Stout	OCRM	There are buyouts in the Socastee area associated with the SC Office of Resiliency. These are taking place separately from Federal funding. OCRM is currently reviewing a project in the Bucksport area at Cowford Swamp.
Mark Caldwell	USFWS	Recommends providing tax incentives for people to prevent the sale of lands for development. For buyouts, better to buy multiple properties to provide a large area that could be used for water storage.
Craig Sasser	USFWS	Refuge has been working with Ducks Unlimited, Nature Conservancy, and others to purchase and protect lands. Refuge has also been impacted by flooding. NRCS has the WRP program that provides funds for protecting, restoring and enhancing wetland areas. The funding amounts are based on timber values which do not provide enough incentive. Need additional funding resources to support this.
Elizabeth Johnson	SCDAH	Advised that information on cultural/historic sites is available on SC Archsite. Also recommended that we contact Alex Butler, the director at the SC Office of Resilience. (L. Riggin provided the web address)
Lorianne Riggin	SCDNR	DNR is in the process of purchasing property in the area. Lorianne suggested we use doodle poll for the next couple of meetings and requested a copy of presentation be sent out to attendees.

Wrap Up: Andrea H. advised PDT will continue to refine measures and work towards developing alternatives. She thanked participants for their attendance and input and indicated they could contact her if they thought of additional information that might be useful to the study. A doodle poll will be sent out for the next meeting.

Waccamaw River, Horry County, SC FRM Feasibility Study
Interagency Coordination Team Meeting
March 14, 2023 2:00 to 3:30 PM EST

Webinar Information:
URL: https://usace1.webex.com/meet/andrea.w.hughes
Call-in toll-free number: 1-844-800-2712
Access code for webinar and call-in: 1998 91 1089; Security code: 1234

Purpose:
The purpose of the meeting was to share new information regarding proposed measures/alternatives for the study.

MEETING NOTES

Attendees:

Andrea Hughes (USACE)
Tom McCoy (USFWS)
Cathy Breaux (USFWS)
Lorianne Riggin (SCDNR)
Chris Stout (SCDHEC-OCRM)

Welcome, Roll Call: Andrea H. welcomed the ICT and took roll call.

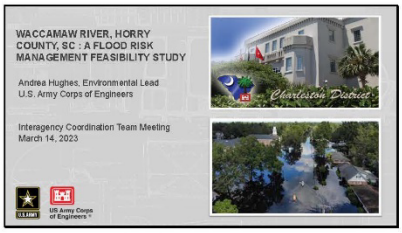
Review: Andrea H. provided a brief review of of the study purpose and authority, schedule, and conceptual measures from last meeting.

Progress on Scoping: Andrea H. provided visuals and descriptions for the potential structures and locations. Advised that any of these potential structures could change or be eliminated as USACE begins their econ and engineering modeling to determine feasibility. ** USACE engineers recently conducted a site visit to review a few of the potential measures. Notes are in the presentation.**

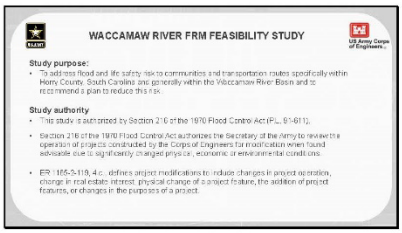
ICT Input: Discussion occurred during review of potential structures/locations. Information is included in the notes sections in the attached ppt.

Wrap Up: A doodle poll will be sent out for the next ICT meeting anticipated to occur in late May or early June 2023.

Slide 1

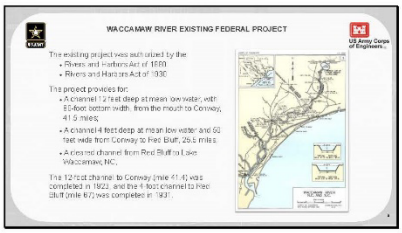


Slide 2



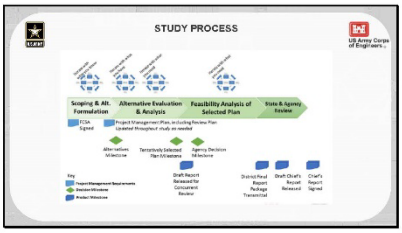
Recap from the last ICT meeting. Note the study authority is 216 which allows for review of Federal projects for modifications.

Slide 3



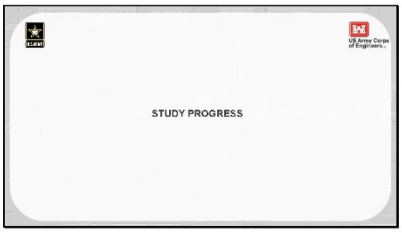
This is the existing federal project description. From the NC/SC line to Red Bluff, we are currently authorized to clear, not dredge. **Question during meeting: When was the last time the Waccamaw River was dredged? From the section of the Waccamaw River that is also the AIWW, the last dredging event occurred in 2002. USACE no longer dredges this segment of the AIWW because the current depth is sufficient. I contacted our navigation division to inquire about the rest of the Waccamaw River Federal Project and it has been at least 50 years (maybe more) since the river was dredged. It is not being maintained at this time.

Slide 4



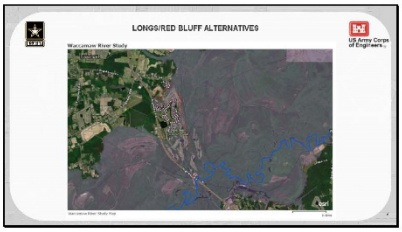
Typically, feasibility studies take 3 years; however, we have requested an extension due to the amount of modeling that will be required. The study is now projected to be a 4-year study.

Slide 5



The next slides will show the locations of proposed structural measures. At this time, the exact footprint of the structures has not been determined. Our engineers and economists are conducting modeling to determine the feasibility of the structures. This presentation does not reflect non-structural measures. We are still exploring buyouts, elevations, wet-proofing, dry-proofing, etc. **Question regarding alternatives – is each measure considered an alternative. For the final array of alternatives, each alternative should include a combination of measures – each measure would not stand alone as an alternative.

Slide 6



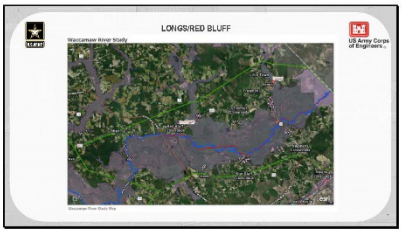
The red lines are the proposed structures. The pink dots indicate homes that have been damaged by flooding in the past. (Damages can range from 10% to complete loss.) While there could be an estimated length or height of a structure in the description, this may change once modeling is complete.

- Levee/Floodwall along Buck Creek: Estimated approximate 1.1 mile sheet pile floodwall or earthen levee to protect the Aberdeen neighborhood. Height of the wall is estimated at 7ft at this time, therefore a sheet pile wall would require a more extensive footing/foundation (height exceeds 5ft). Close proximity to Buck creek limits the space for this measure. Evacuation of this area is not always feasible because of an older population. Likely need a connection through the flood wall for irrigation purposes at the Aberdeen golf course. Site clearing would be required

for this measure, possible environmental impacts.

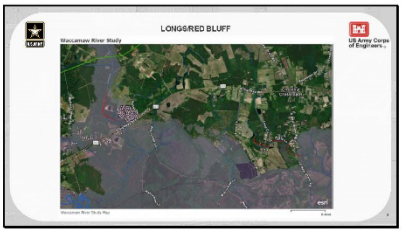
- Levee/Floodwall near Rolling Ridge Drive: This is the smaller area adjacent to Cox Lane. Estimated approximate 0.2 mile sheet pile flood wall or earthen levee to protect the homes along Rolling Ridge Drive area. Height of the wall is estimated at 7ft at this time, therefore a sheet pile wall would require a more extensive footing/foundation (height exceeds 5ft). Site clearing would be required for this measure, possible environmental impacts.
- **Post engineering site visit: Floodwalls are still a measure that will need to be modeled. If floodwall were to be constructed, would have to consider opening to allow golf course water withdrawals. Group noted that Buck Creek was channelized in one area with large berm adjacent. Some discussion on possible modifications to reduce flooding – benching, etc.
- ***Comment from agencies***: Advised that Cowpens Mitigation Bank and Phase 2 of Waccamaw Mitigation Bank are located in the study area.

Slide 7



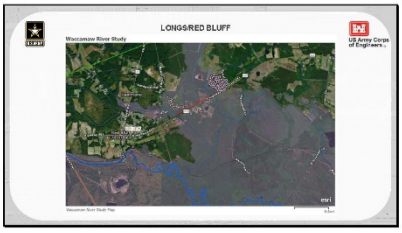
Channel modification + Bank stabilization: Approximately 15.5 miles length of channel modification to the Waccamaw River to increase conveyance of the stream and reduce flood depths in the Longs/Red Bluff area. The channel modification would extend from the NC/SC border to Veterans Hwy. Channel modification activities would include both clearing and snagging and possible excavation in areas where sediment accumulation has narrowed the channel width. This measure would also require concurrent bank stabilization measures along the river.
Question during the meeting: Can we provide the specific locations where excavation is proposed? I have reached out to our planner and engineers and requested specific locations where excavation is being considered. As soon as I have additional information, I will send this out in an e-mail. * Although engineers did not review this area during site visit, they clarified that at this time they are looking only considering clearing/snagging unless modeling indicates an issue with areas of the Waccamaw that have narrowed. ***

Slide 8



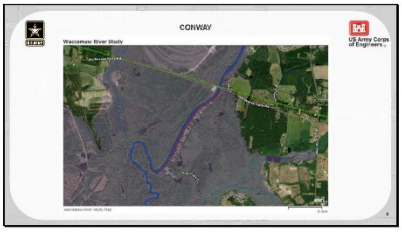
Benching: Floodplain benching using excavation methods upstream of HWY 905 along Simpson Creek and from Tributary 1 to Cold Water Branch. This measure would increase conveyance in these areas to reduce flood elevations around the adjacent damage areas that include residential homes.
**Question during meeting regarding what "benching" implied. Clarified that the proposal was to create a floodplain bench to provide additional storage during high water events. **
Site visit confirmed houses in the area are slab on grade. Noted a drainage ditch alongside Creek. Still considering creating a floodplain bench above the bridge to alleviate flooding.

Slide 9



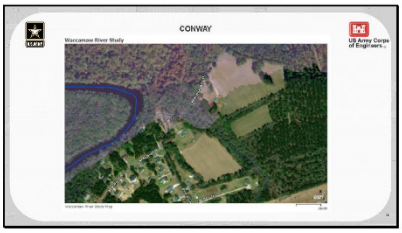
Drainage Improvements and Bank Stabilization: Look at adding culverts/water connection to HWY 905 between Todd Swamp and Simpson Creek where bottlenecking occurs. Clear out stream under bridge and add culverts or increase width at the bridge crossing over Simpson Creek. This could potentially be a collaboration project with SCDOT. Would alleviate flooding in the adjacent damage shown on map.
**Question during meeting: What storm event do we use to calculate storm damages? The Expected Annual Damages is a weighted average of the modelled events. Usually 2yr, 5yr, 10yr, 20yr, 50yr, 100yr, 200yr, and 500yr. The program used is HEC-FDA. Expected Damages are a summation of [(2-yr $damages * 50%) + (5-yr $damages * 20%) + … (500-yr $damages * 0.2%)]. The HEC-FDA program fills in/interpolates the gaps.

Slide 10



Floodwall along Gray Oaks Dr., estimated 0.93 miles in length. **Did not review during site visit**

Slide 11

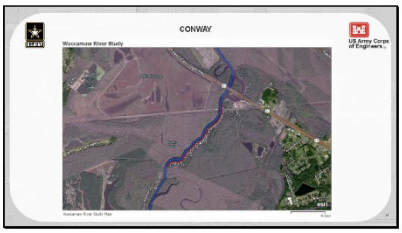


Potential ring levee around 6194 Bear Bluff Road, estimated 0.08 miles in length. **Did not review during site visit**

Slide 12

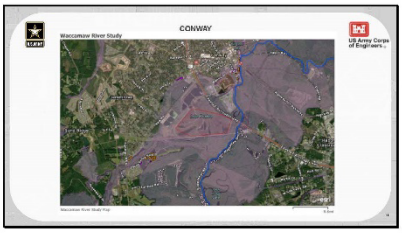
Proposed floodwall on outer bend downstream of oxbow on Lees Landing Circle, estimated 0.98 miles in length.
Proposed floodwall in Riverside drive area on the outer bend, estimated 0.78 miles in length. ** Did not review during site visit**

Slide 13



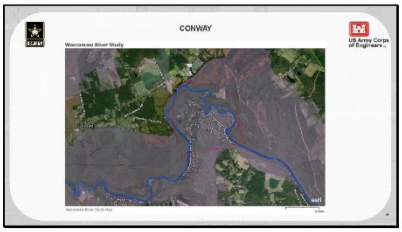
Potential floodwall along Waccamaw Drive, estimated 0.77 miles in length. **Did not review during site visit**

Slide 14



Dam/Retention: Lake Busbee was previously dammed and used for retention, it is currently drained. This measure would potentially restore the dam and retention area at Lake Busbee to reduce flood elevations in the surrounding damage area. Contamination of soils in this area may need to be mitigated prior to use of water storage. Area is approximately 800 acres, required depth is unknown at this time. ***Discussion on this proposal during meeting – Coal fired plant - Santee Cooper reclamation site for air. Lower dike was breached and area restored to wetlands. In order to restore the lake, the lower dike would need to be rebuilt. ***Question: Trying to understand how restoring this lake will protect structures in the surrounding area -what "damage area" would be addressed by restoration of the lake? Also, impacts to wetlands would require mitigation. Potentially mitigate for loss of reclamation AND loss of wetlands associated with restoration of dike. ** Did not review during site visit**

Slide 15

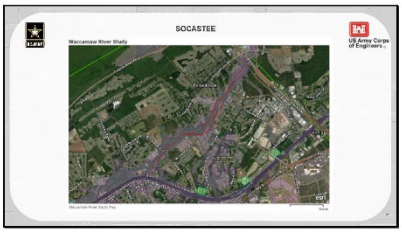


Clear and Snag*: Clear and snag debris from the oxbow around the Lees Landing area to increase conveyance and reduce flood elevations in the adjacent damage areas. Measure could also include removing accumulated sediment deposits if needed but would not change the sinuosity of the river. **During site visit they noted the area did not need clearing and snagging and homes along river were already elevated. This measure removed from consideration.**

Slide 16

Relief Bridge: Consider adding relief bridges/culverts at Highways 501, 905 and 378 to increase conveyance through these areas where potential bottlenecking is occurring. Relief Bridge(s) at 905 would require estimated 0.88 miles of elevation of the 4-lane road. Potential interference with a railroad crossing at 905 would require mitigation. ** Looking at potentially adding spans and clearing under existing bridge. Spans would need to be 80 feet apart per code which would be extensive. There is a canal on one side with an adjacent dirt road potentially for staging. **

Slide 17

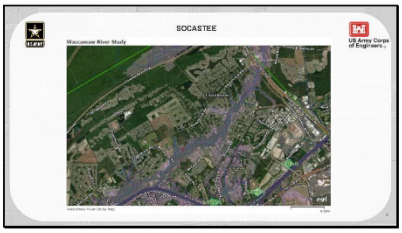


Floodwall: Proposed sheet pile wall approximately 1.35 miles on western outer bend of Socastee Creek to protect the Forestbrook neighborhood damage area. Sheet pile wall estimated 2.06 miles on eastern outer bend of Socastee Creek to protect the adjacent damage area around McCormick and Burcale Rd. If height of the wall exceeds 5 ft, would require a more extensive footing/foundation. ***Note: damages for Forestbrook, McCormick and Burcale Road are not shown on this figure. **Comment: Not aware of flood damages in the Forestbrook area. Most damages occur along the AIWW in the Socastee area. **Noted during site visit that the county is working on a project involving creating a floodplain bench in the Socastee area."

Slide 18

Dam/Retention with Channel to Socastee Creek: Approximate 55-acre space south of the 501 bridge could serve as a detention pond area with levees/flood barrier. Depth of the detention pond is unknown at this time. This would reduce flood elevations to the adjacent damage area (damage locations not shown on map). Would require excavation of a diversion channel from Socastee Creek to the retention/detention area. (There is an existing stream in this area.) ** Site visit notes - Currently a fire station is proposed between bridge and creek but has not started construction. Area of proposed retention is forested. Would need to be cleared.**

Slide 19

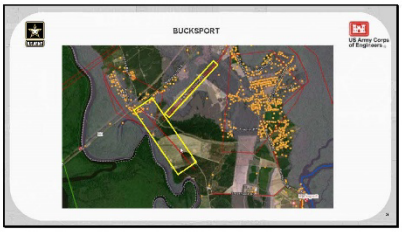


Barrier Removal: Remove the two existing weirs on the Socastee Creek Federal Project. Weirs were originally constructed to maintain a certain ground water level to mitigate loss of wetland area. With increased development in this area, weirs may not be needed to maintain water level. Water currently flows around the weirs, eroding the area and causing damage to the weir structures. This measure would increase conveyance in the adjacent damage area. **During site visit it was noted that water was high and flowing around the weirs and eroding banks. There was a house very close to one structure that received flood damages. Could potentially install a gate or remove the weirs. If they were to install a floodwall in this area there is not much room so could not create a levee. Would have to consider a different structure.**

Slide 20

Elevate/create levee out of the Pee Dee Hwy
Elevate or create levee out of the Pee Dee Hwy with 3.33 miles of pee dee river in floodplain. The Pee Dee River is a major source of flooding in Bucksport, with some flooding occurring from Waccamaw River. The downstream area of the Pee Dee Highway often floods in storms above 4% AEP. The elevation of the Pee Dee highway is 15-19 ft NAD27. Increase in elevation of roadway would range from 3-7 ft to protect Bucksport. Although other red lines (structures) are shown in the figure above – the only structure proposed for a levee is the Pee Dee Highway. The other potential structures were not carried forward.

Slide 21



Only the red lines that are outlined in yellow are locations carried forward. The other proposed structures shown (Treatment Rd, Bucksport Rd, etc) were removed.
Floodgate
Floodgate along the Pee Dee River to slow backwater, south of HWY 701. Estimated 0.92 miles that runs from upstream crossing under 701 bridge. Floodgate to prevent flows coming in from the Pee Dee with exact location and distance undefined. Corroborated with sponsor and projected to prevent 90% of the flooding in Bucksport with combination of road elevation of Big Bull Landing (approximately raising 7-8ft), which is a project that Horry County is in the process of submitting designs for permitting. This floodgate can prevent high flow events from the Pee Dee River. The flood stage for the Bucksport USGS gage is 19ft. The floodgate would need to be

6ft above to protect from the 1% AEP (annual exceedance probability-100year) and more frequent events. ***This measure received the most discussion/opposition. The Pee Dee River is designated critical habitat for sturgeon (under jurisdiction of NMFS). Any impacts to waters that drain to the Pee Dee River (Cowford Swamp) could be considered an impact to critical habitat and would require a biological opinion from NMFS. *** **During recent site visit engineers looked at two potential locations for the floodgate at bridges over Cowford Swamp near intersection with Pee Dee River. One bridge is at Highway 701 and other is at Big Bull Landing Rd. Not much room for staging if this measure is carried forward so potential to block traffic during construction. **

Waccamaw River, Horry County, SC FRM Feasibility Study
Interagency Coordination Team Meeting
September 27, 2023 2:00 to 3:30 PM EST

Webinar Information:
URL: https://usace1.webex.com/meet/andrea.w.hughes
Call-in toll-free number: 1-844-800-2712
Access code for webinar and call-in: 1998 91 1089; Security code: 1234

Purpose:
The purpose of the meeting was to share new information regarding current array of alternatives for the study.

MEETING NOTES

Attendees:

Andrea Hughes (USACE)
Nicole Sikula (USFWS)
Fritz Rohde (NMFS)
Stacie Crowe (SCDNR)
Chris Stout (SCDHEC-OCRM)
Michelle Culbreath (SCDHEC)
Alya Singh-White (USEPA)
Niko Brown (USACE)
Erica Stone (USACE)
Andrea Hughes (USACE)

Welcome/Administrative: Andrea H. welcomed the ICT and advised she would be retiring. Niko Brown will be taking over environmental responsibilities for the study and Erica Stone will serve as lead for the Interagency Coordination Team. E-mail contact information is below:

Niko.R.Brown@usace.army.mil

Erica.L.Stone@usace.army.mil

Progress on Alternatives: Andrea H. provided an overview of the current array of alternatives for the study (see attachment).

Main Points: USACE is still working towards the final array. The highlighted measures/alternatives have been removed. Modeling and geotechnical work is currently underway and the results could further refine this list. We hope to have a final array of alternatives in the next few months. The next step will be to choose the Tentatively Selected Plan (TSP) by April 2024.

Agency Input:

Fritz Rohde: Supports relief bridges. These were successfully incorporated into flood studies in NC**.** Would prefer to avoid in-water modifications but would support non-structural measures such as elevation and wet/dry floodproofing. NMFS supports alternative C5 (Conway) that includes relief bridges, elevation, and wet/dry floodproofing. Bucksport: NMFS supports road elevation but does not support floodgates. For Socastee, floodwalls on both sides of Socastee Creek could cause issues. NMFS supports weir removal and floodproofing.

Chris Stout: For Bucksport, advised County is proposing a relief ditch from Cowpers Swamp to the Waccamaw River (Waccamaw is lower elevation) in addition to floodgates for the Big Bull Landing road elevation project. (Project is out on public notice.)There are concerns with the project and with the proposed floodgate alternative for Bucksport. If the relief ditch is constructed, would there still be a need for the proposed gate? (The information will be passed on to the engineers to evaluate.) Chris advised that buyouts in this area are not feasible due to many properties being "heir property". The family member that originally owned the property died without a will and the home has been passed down from generation to generation. The family members have been living on the properties and paying taxes but their names are not on the deed which disqualifies them from applying for grant funds.

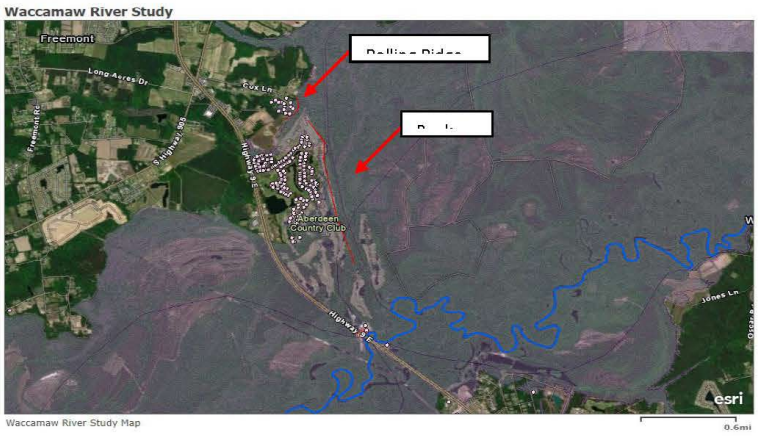
Socastee: Are the floodwalls necessary? Most of the damages are downstream. (NMFS agreed). Previous views of this area showed only a handful of structures identified as "damaged" from floods. Currently the Rosewood area located downstream of Forestbrook area is being demolished and will become green space. Also, could the Bucksport alternatives help with the flooding in Socastee? Will the modeling show this? (This information will be given to the engineers. The modeling should show if the Bucksport alternatives will affect the flooding in the Socastee area.)

Andrea provided that the next step is to finalize the array of alternatives and then select the TSP. She advised that the PDT would be notified of concerns raised today. If anyone has additional comments, please provide feedback now so they can be taken into account.

Erica Stone will schedule the next PDT meeting. The meeting will occur once modeling is complete and alternatives have been finalized.

Longs/Red Bluff

1. **LR1** - Levee/Floodwall along buck creek and rolling ridge drive:
   ~1.1 mile long and 5 to 9 ft high flood barrier (e.g., sheet pile floodwall or earthen levee) along Buck Creek by the Aberdeen Country Club and neighborhood AND ~0.2 mile long and 5 to 9 ft high flood barrier near Rolling Ridge Drive and Cox Lane.



2. **LR2** - ~~Channel modification + bank stabilization + wet/dry floodproofing~~
3. **LR3** - Benching upstream of 905, ~~add benching to Trib 1 to Cold Water Branch~~ Relief Bridges + wet/dry floodproofing

Simpson Creek Area Channel Benching/Terracing : Create terraces, or benches, between the channel and uplands along Simpson Creek from Highway 905, and from Tributary 1 of the Waccamaw River to Cold Water Branch near Dusty Lan and Loop Circle

4. **LR4** - ~~Drainage improvements + bank stabilization + benching + wet/dry floodproofing~~
5. **LR5 –** (NS Plan) Elevation + Wet/Dry Floodproofing
6. **LR6** - Levee/Floodwall along buck creek and rolling ridge drive + relief bridges + benching + wet/dry floodproofing

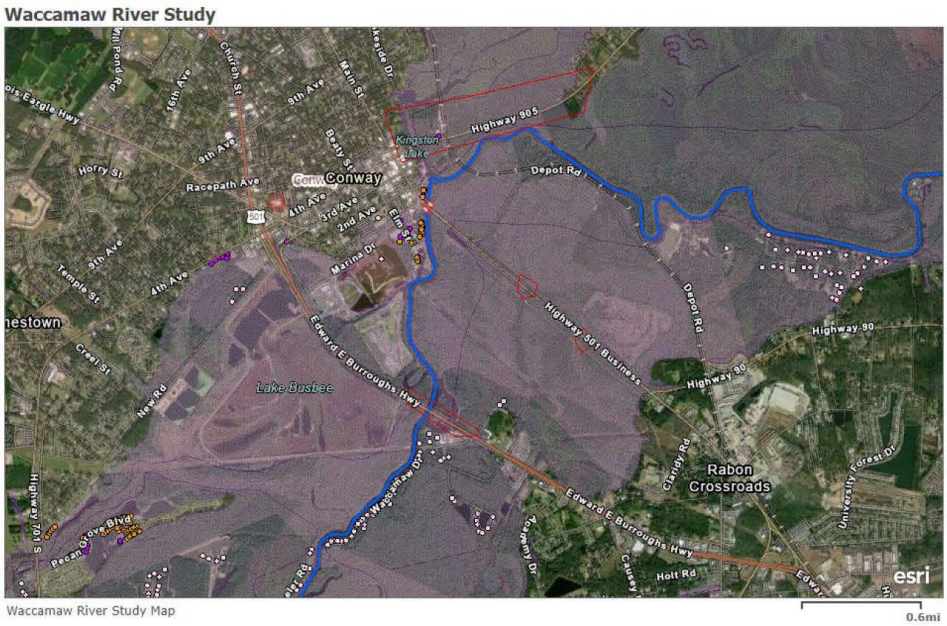
Relief Bridges: create relief bridges between Highway 905, Todd Swamp, and Simpson Creek with culverts and clearing under existing bridges to increase conveyance and alleviate backflow near Parker Driver, McNeil Chapel Road, Jefferson Road, and Mountain Drive.

Conway

1. ~~**C1** – Floodwall along Grey Oaks + Ring Levee around Bear Bluff + floodwall in Riverdale Drive area + Floodwall along Waccamaw Drive + Floodwall along Lee's Land (these are independent of each other)~~
2. **C2 –** Lake Busbee Modification + Elevation + Wet/Dry Floodproofing

   Modification could include weir structures/gates instead of restoring dam.
3. ~~**C3** – Clear and Snag + Relief Bridges~~
4. **C4 –** (NS Plan) Elevation + Wet/Dry Floodproofing
5. **C5** - ~~Clear and Snag~~ + Relief Bridges + Elevation + Wet/Dry Floodproofing

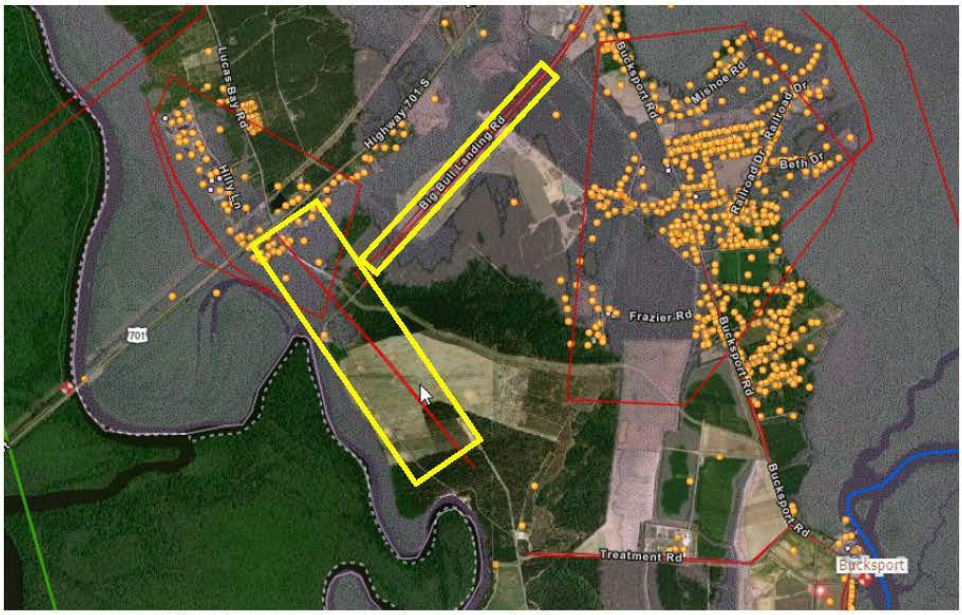
   Add relief bridges/culverts at 501, 905 and 378 to increase conveyance through these areas where potential bottlenecking is occurring. Relief Bridges at 905 would require 0.88 miles of elevation of the 4-lane road.



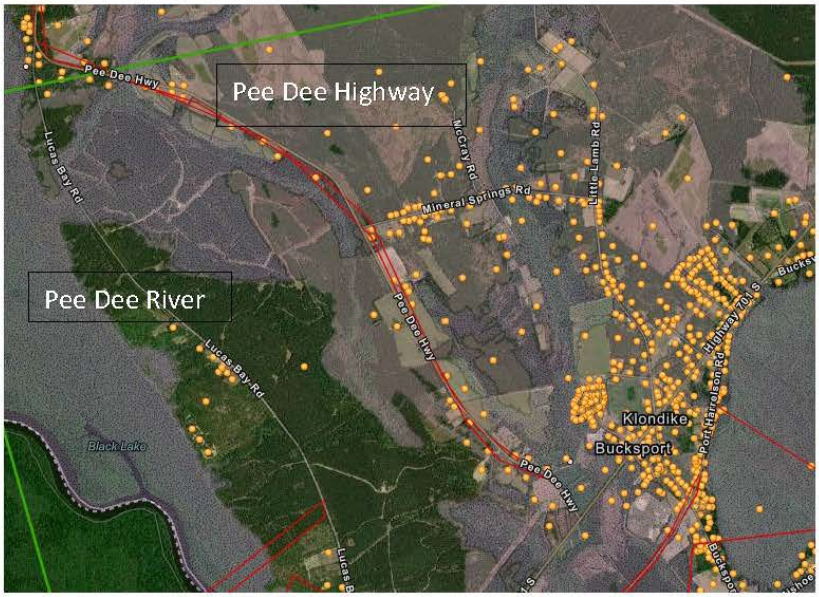
Bucksport

1. **B1** - Floodgate

   Floodgate along the Pee Dee River to slow backwater, south of HWY 701. Approximately 0.92 miles that runs from upstream crossing under 701 bridge. Floodgate to prevent flows coming in from the Pee Dee with exact location and distance undefined.



2. **B2** - Road elevation – PeeDee HWY (Lucas Bay Blvd)



3. **B3** – (NS Plan) Elevation + Wet/Dry Floodproofing

Socastee

1. **S1 -** Floodwall along Forestbrook ~~plus sheetpile wall near the bend of paw paw lane~~ +barrier removal (weirs)

2. **S2 -** Detention with channel to Socastee Creek + Structure Elevation + Floodproofing

3. **S3 -** Barrier removal + ~~benching~~ + Floodproofing
4. **S4 -** Floodwall along Forestbrook + Detention south of 501 with channel to Socastee Creek + Structure Elevation + Floodproofing
5. ~~**S5 –** (NS Plan) Elevation + Wet/Dry Floodproofing (some near the federal project are slab on grade and may be harder to elevate)~~

ICT Meeting February 16, 2024

-OPEN- 10 AM

Roll Call

USACE

Erica Stone, Niko Brown, Pamela Backus, Andrea Farmer, Lindsey LaRocque, Lance Maher, Bethney Ward

FWS

Craig Sasser, Julia Plasynski

SCDNR

Lorianne Riggin

EPA

Alya Singh-White

NMFS (HCD)

Fritz Rhode

NMFS (PRD?)

Andy Herndon

(SCDHEC) OCRM

Chris Stout

NRCS, (SCDHEC) BOW, USGS, NPS

None

Horry County

Andy Markunas, Brandon Wagner

Flood Impact Areas

Longs

Floodwall:

Fritz Rhode: Can you explain in detail plans for floodwall along Buck Creek?

Erica Stone: Providing details of alternative worksheet

Fritz Rhode: Trying to see where it relates to river?

Erica: Not on river

Lorianne from chat:

LRBNS7 – Water Farming - This option appears to potentially have impacts to Waccamaw HP and the Carter Stilley Mitigation Bank. Acquisition not possible for conservation land

Are we actively directing water there?

LRBNS3 - There is a Wood Stork Rookery near Dusty Road/Bear Grass Lane just north of Waccamaw HP boundary. Disturbance from construction is a concern

Conway

Craig Sasser working with FEMA and Ducks Unlimited acquiring land near relief bridges – will discuss with Craig offline.

Craig (in chat) Can you define elevation and acquisition please?

EN: Elevation is to lift structure above 1% AEP plus 2 ft of freeboard

EN: Acquisition is buyout

Fritz: please explain water farming

EN: Essentially acquisition? (Didn't get good notes on this)

Chris Stout: Office has been reviewing acquisition in Socastee along Rosewood and Lockwood Landing (30+ properties) and its demo of existing houses and driveways and becoming green space.

Bethney: We're aware of buyouts. If already been raised or buyout happened, wouldn't duplicate effort. We do not yet have inventory of properties applied to specifically.

from Craig Sasser to everyone: 10:32 AM

We are considering restoration (ie reforestation) for acquisitiuon tracts that DU and FEMA are working on. We added these areas to the refuge acquisition boundary for this opportunity.

from Lorianne Riggin to everyone: 10:33 AM

Just FYSA, any flowage easement or deed restriction proposed for addition to state property could be an issue. As mentioned earlier, Heritage Preserves are dedicated into the Corpus of the Trust and those restrictions include no intentional flooding. Any additional restrictions would have to be compliant with the intent the property was purchased. Additionally, the Department of Adminsitration would also have to sign off on any additional restrictions.

from Lorianne Riggin to everyone: 10:35 AM

Alternatively, keep in mind any areas adjacent to Waccamaw River HP that could be purchased for flood mitigation purposes could be additions after the fact to the existing HP. It would be something that would need to be creatively worked through between the County and the State.

Socastee

Floodwall and barrier removal

Fritz - I believe there was a lot of discussion about not using hard structures in this area?

Erica - Concerns have been considered and alternative is still being included

EN – consideration – under modeling phase of FWOP and it will be considered in TSP

Pamela – NS plan is meant in a way to offset impacts

Bucksport

Floodgate

Craig: Where would flap gate be located?

Lindsey: Pee Dee side of bridge, 25 along bridge, allows for flow up to 5 year

Erica: Big bull Landing is included in FWOP and modeling

from Lorianne Riggin to everyone: 10:48 AM

With the modeling - assume the frequency of closure will be provided with consideration of this alternative, correct?

Lindsey – yes

Fritz: would flood gate protect area in purple

Lindsey: Yes

Craig – DOT determined Cowford is actually tidal wetlands and has daily tides and was reason for shifting bridge upstream. If it experiences tidal exchange, want to know how modeled – there are also freshwater mussels in Cowford

Lindsey -modeled coastal and tidal influence, so we are investigating

Craig – we documented swallow tailed kite nests on backside of Cowford Swamp – concern with construction time of year

from Lorianne Riggin to everyone: 10:52 AM

With all of these alternatives, will the report include life of structure with consideration given to project sea level rise?

Lindsey: Life of project is 50-years to 2085

Raising Pee Dee Hwy

from Craig Sasser to everyone: 10:57 AM

Would purchasing additional ROW be necessary for elevating Pee Dee Highway?

Erica and EN: mentioned easement boundaries

Water Farming

from Lorianne Riggin to everyone: 10:57 AM

FYI - this property (south of Treatment Road in Bucksport) is in the Safe Harbor Program for red-cockaded woodpecker.

Fritz: What is water farming?

Erica - Perpetual easement to overflow flood and submerge unoccupied land…

from Craig Sasser to everyone: 10:59 AM

Are you all aware that GSWSA has wastewater lagoons in the water farming area proposed for Bucksport. These lagoons are the possible sources for invasive aquatic plants that are entering the waterways after flood events. Salvinia in particular. Areas should be excluded

Erica:

Reminder that official comments will be with draft report

Any additional comments?

None

-CLOSE- around 11:00

Fish and Wildlife Coordination Act Report Compliance Record

From: McCoy, Thomas (Tom)
To: Hughes, Andrea W CIV USARMY CESAC (USA)
Subject: [Non-DoD Source] Re: [EXTERNAL] Waccamaw River FRM CAR
Date: Thursday, June 29, 2023 12:58:55 PM

Hi Andrea,
Steve reached out to me last week and asked if it looked okay. I assumed that he reached out to you.
Sorry for that.

Based on my conversation last week with Steve, I would move forward and just document that you reached out several times.
Again sorry for the inconvenience it has caused.

Have 4th to you and your family!

If you have any questions, please reach out.
Thank you for your assistance in this matter.

Tom
Thomas (**Tom**) D. McCoy
Fish and Wildlife Administrator - Regional BIL/IRA Coordinator
Department of the Interior - U.S. Fish and Wildlife Service
Southeast Region (Region 4) Ecological Services
Charleston, South Carolina 29412
Cell Phone: 843.576.9862
Email: thomas_mccoy@fws.gov

From: Hughes, Andrea W CIV USARMY CESAC (USA) <Andrea.W.Hughes@usace.army.mil>
Sent: Thursday, June 29, 2023 12:36 PM
To: McCoy, Thomas (Tom) <thomas_mccoy@fws.gov>
Subject: RE: [EXTERNAL] Waccamaw River FRM CAR

Hi Tom,

I hate to have to bother you, but we still haven't heard back from Steve. Do you think its okay for Niko to proceed based on our discussions with you before Steve came on board? Maybe he's hoping to wait until they have a replacement, but it would be nice if Niko could start drafting sections.

Thanks again for your assistance.

Hope you have a great holiday.

Andrea

Andrea W. Hughes
Biologist, Planning and Environmental Branch
U.S. Army Corps of Engineers, Charleston District
69-A Hagood Avenue
Charleston, South Carolina 29403
843.754.4268

From: McCoy, Thomas (Tom) <thomas_mccoy@fws.gov>
Sent: Tuesday, June 20, 2023 2:10 PM
To: Hughes, Andrea W CIV USARMY CESAC (USA) <Andrea.W.Hughes@usace.army.mil>
Subject: [Non-DoD Source] Re: [EXTERNAL] Waccamaw River FRM CAR

Hi Andrea,
I apologize and sorry for the inconvenience. Please let me know if Steve does not reach back out to you by the end of the week as I sent him an email to respond. He would be the only one able to respond.

If you have any questions, please reach out.
Thank you for your assistance in this matter.

Tom
Thomas (**Tom**) D. McCoy
Fish and Wildlife Biologist – Regional IRA/BIL Coordinator
Department of the Interior - U.S. Fish and Wildlife Service
Southeast Region (Region 4) Ecological Services
Charleston, South Carolina 29412
Cell Phone: 843.576.9862
Email: thomas_mccoy@fws.gov

From: Hughes, Andrea W CIV USARMY CESAC (USA) <Andrea.W.Hughes@usace.army.mil>
Sent: Tuesday, June 20, 2023 1:58 PM
To: McCoy, Thomas (Tom) <thomas_mccoy@fws.gov>
Subject: [EXTERNAL] Waccamaw River FRM CAR

Hi Tom,

I apologize for having to bother you in your new position but I'm not sure where the CAR stands for Waccamaw now that you are gone. When I last discussed this with you (via e-mail) I mentioned Niko Brown from our office drafting the CAR with oversight by FWS – similar to how we handled the Charleston Peninsula FRM study. When I received Nancy's e-mail about your new position, I contacted Steve Ricks to confirm FWS would still be on board with Niko. Unfortunately, he hasn't responded. Niko has started gathering data and drafted a report outline but I've advised him to hold off for now. Can you advise? Is there someone else I should contact besides Rick?

Thanks so much for any assistance you can provide. I hope you are enjoying your new position. Just to let you know you are certainly missed here!

Andrea

Andrea W. Hughes
Biologist, Planning and Environmental Branch
U.S. Army Corps of Engineers, Charleston District
69-A Hagood Avenue
Charleston, South Carolina 29403
843.754.4268

Fish and Wildlife Coordination Act Report

on

Waccamaw River Flood Risk Management

Horry County, South Carolina

Prepared by:

Charleston District

U.S. Army Corps of Engineers

For:

U.S. Fish & Wildlife Service

Charleston Ecological Services Field Office

Habitat Conservation Division, Southeast Regional Office NOAA National Marine Fisheries Service

State Fish and Wildlife Agency Concurrence Letter

State of South Carolina
Department of Natural Resources

P.O. Box 167
Columbia, S.C. 29202
803-734-4199

Robert H. Boyles, Jr., *Director*
Lorianne Riggin, *Director, Office of Environmental Programs*

August 7, 2024

Julia Plasynski
SC Ecological Services Field Office
U.S. Fish and Wildlife Service (Region 4)
176 Croghan Spur Rd #100,
Charleston, SC 29407

Niko Brown
Charleston District
U.S. Army Corps of Engineers
69-A Hagood Avenue
Charleston, SC 29403

Electronic submittal

RE: Draft Fish & Wildlife Coordination Act Report, Waccamaw River Flood Risk Management Study.

Dear Mrs. Plasynski and Mr. Brown,

The Fish and Wildlife Coordination Act (FWCA) requires consultation with the fish and wildlife agencies of States where the "*...waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted . . . or otherwise controlled or modified... by any public or private agency under Federal permit or license...*". Consultation is to be undertaken for the purpose of "*...preventing loss of and damage to wildlife resources.*" (16 U.S.C. 661 et seq.). Therefore, personnel with the South Carolina Department of Natural Resources (SCDNR) reviewed and provided comments on the Draft Fish and Wildlife Coordination Act Report (DFWCAR) prepared by the United States Fish and Wildlife Service (USFWS) for the U.S. Army Corps of Engineers and Horry County Waccamaw River Flood Risk Management Study. Based on the information the SCDNR provided, and comments from the National Marine Fisheries Service, the SCDNR concurs with the assessment of impacts and recommendations to avoid impact that have been provided.

Sincerely,

Lorianne Riggin

Lorianne Riggin
RigginL@dnr.sc.gov
803-734-4199

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INTRODUCTION

Study Purpose

Since 2015, Horry County and all eight of its municipalities have faced multiple catastrophic flood events, exacerbated by factors such as tidal effects, relatively flat topography, and low elevation. These conditions contribute to slow draining and intensify the impact of flooding. The inundation of major transportation routes leaves coastal communities isolated from critical infrastructure and resources. For instance, Hurricane Joaquin resulted in 400 buildings with flood damage, and Hurricane Matthew resulted in 1,200 buildings with flood damage. Impacts from Hurricane Florence were more severe, with 2,000 buildings damaged at an estimated total market loss of $400 million. In the weeks following the storm, Highway 501 was the only accessible road from west of the Waccamaw River to Myrtle Beach communities and hotels.

The study will primarily investigate the reduction of flood risk to communities and transportation routes within Horry County. Since previous studies, sea level, storm frequency, and population has increased; therefore, the entire Waccamaw watershed needs to be studied to determine the most appropriate mitigation measures. This area is also continuously developing inland towards Conway and the Waccamaw River, so understanding flood risk management is vital.

The general scope of the study will be to consider a series of structural and non-structural management measures and develop implementable solutions to reduce flood risk.

Study Objectives

The following objectives have been identified to help achieve the study goal:

- Reduce the risk of damages to structures, industry, and public infrastructure within affected communities from flooding,
- Increase the reliability of evacuation and supply routes during flood events, and
- Reduce life-safety risk associated with the inundation of structures and public infrastructure throughout the study area.

Purpose of CAR

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

Authorities

The authority to investigate a flood control project for the Waccamaw River in Horry County, South Carolina is provided in Section 445 of Water Resources Development Act (WRDA) 1999 (P.L. 106-53).

Section 445 states:

> *The Secretary shall conduct a study to determine the feasibility of undertaking a flood control project for the Waccamaw River in Horry County, South Carolina.*

A completed U.S. Army Corps of Engineers (USACE) navigation project overlaps the study area. Section 445 of WRDA includes the authority to recommend Flood Risk Management (FRM) measures including structures or changes to the river in the footprint of this completed USACE navigation project, which was originally authorized by the Rivers and Harbor Acts of June 14, 1880 -S. Ex. Doc. 117, 46th Cong., 2d session and Annual Report, 1880, p. 848, and of July 3, 1930 - H. Doc. 82, 70th Cong, 1st session.

There are multiple completed USACE FRM projects within the Waccamaw River basin in Horry County, South Carolina. Section 216 of the Flood Control Act of 1970 (33 U.S.C. 549a) provides authority to review the operation of these FRM projects and recommend modifications. Section 216 states:

> *The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operation of projects the construction of which has been completed and which were constructed by the Corps of Engineers in the interest of navigation, flood control, water supply, and related purposes, when found advisable due the significantly changed physical or economic conditions, and to report thereon to Congress with recommendations on the advisability of modifying the structures or their operation, and for improving the quality of the environment in the overall public interest.*

These completed FRM projects were originally authorized under the following Continuing Authorities Program (CAP) authorities, Section 205 of the Flood Control Act of 1948, and Section 208 of the Flood Control Act of 1954.

Description of the Study Area

Overview

The entire study area is distributed into four flood impact areas within Horry County. These are segmented according to geographic relation to developed municipalities and defined based-on measures of impacts to structures from previous flooding events. These four flood impact areas are identified as Longs/Red Bluff, Conway, Socastee, and Bucksport (Figure A). This report will analyze the study area as a whole—or region of influence (ROI)—and the impacts of the proposed flood-mitigation measures on fish and wildlife.

Geographic and Ecological Features

The study area encompasses approximately 81 miles of the Waccamaw River from the North Carolina-South Carolina border to Wachesaw Landing in Horry County, South Carolina and equates to 345 square miles (mi^2) of the Lower Pee Dee Basin (HUC-6 030402). Within the broader Lower Pee Dee Basin, the study area functionally overlaps with at least three smaller basins being primarily the Waccamaw River (HUC-8 03040206), as well as partially within the Little Pee Dee (HUC-8 03040204) and Coastal Carolina-Sampit (HUC-8 03040207) basins. The ROI supports numerous different habitat types, including open water, freshwater marsh, managed wetlands, and others (Table 1, *Appendix A*).

The Waccamaw River Basin itself encompasses approximately 1,651 mi2 in southeastern North Carolina and northeastern South Carolina (597 mi^2 of which are in South Carolina). The Waccamaw River stems from Lake Waccamaw in Columbus County, NC, and flows 140 miles southwest accepting drainage from

Kingston Lake and the Atlantic Intracoastal Waterway via Socastee Creek and flowing further downstream to join the waters of the Great Pee Dee River before reaching Winyah Bay in Georgetown County, SC. Major tributaries to the river in Horry County include: Buck Creek, Simpson Creek, Todd Creek, Crabtree Swamp, and Tilly Swamp. The Waccamaw River has a maximum width of 4,000 feet in the tidal reaches of Winyah Bay, narrowing quickly (within two miles) to 2,000 feet and then narrowing gradually to 190 feet at Conway (river mile 42). From Conway to Red Bluff (river mile 67) widths range from 90 to 180 feet, and from Red Bluff to Lake Waccamaw (river mile 140), the width gradually decreases to 35 feet. Tidal influence is detectable as far upstream as Bellamy's Landing (river mile 83).

Floodplains of the Waccamaw River and its tributaries are generally broad, flat, swampy, and subject to frequent and prolonged overflow. The topography and hydrology of the Waccamaw River sets conditions for a high concentration of dissolved organic material and dark color, common of rivers known as "*blackwater*" rivers. The flat gradient and backwater effects from the Great Pee Dee and Little Pee Dee rivers, which contribute to the extremely slow downstream movement of floodwaters and urban flooding. When extreme weather events occur, flooding along the Waccamaw floodplain typically lasts a few days, but can last up to four to five weeks depending upon antecedent moisture conditions and rainfall intensity and duration. Several tributaries to the Waccamaw are affected by its backwater, particularly when local rainfall events affect the hydrology of tributaries prior to the Waccamaw.

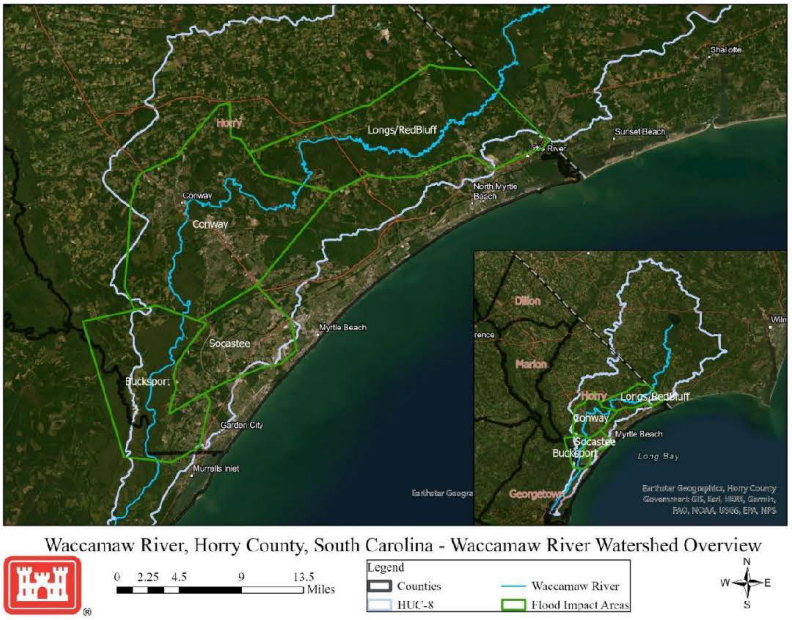

Figure A: Waccamaw River, Horry County, South Carolina project Waccamaw River Watershed overview

Protected Lands

The Waccamaw National Wildlife Refuge (NWR) consists of 23,000 acres of permanently protected land in

southwestern Horry County. A land acquisition program is in place as a mechanism to work with willing landowners to purchase additional tracts. The Waccamaw NWR spans across parts of Horry, Georgetown, and Marion Counties and encompasses large portions of the Waccamaw, Great Pee Dee, and Little Pee Dee watersheds. The NWR showcases a diversity of wildlife habitats, including a blackwater river swamp, alluvial river floodplain, forested wetlands, longleaf pine ecosystems, and tidal and managed historic rice fields. These tidal freshwater wetlands are some of the most diverse freshwater wetland systems found in North America. Additionally, refuge wetlands play a critical role in filtering storm water runoff and supplying vital drinking water resources for the greater Grand Strand region.

The Lewis Ocean Bay Heritage Preserve/Wildlife Management Area (LOBHP/WMA) is a 10,427-acre site owned and managed by the South Carolina Department of Natural Resources (SCDNR) that protects the best assemblage of Carolina bays in the state. The property consists of a mosaic of pine savannas and blackwater swamp forests that are home to 37 rare plant species, most of which are fire dependent. Two such species of global conservation importance include the Venus flytrap (*Dionaea muscipula*) and Raven's primrose willow (*Ludwigia ravenii*). Due to fire suppression and land conversion, the abundance and range of the Venus flytrap has been decimated; it is now known from only a few population in the world – two populations in Horry County and in a few coastal counties of North Carolina. The largest population in the state is centered on LOBHP/WMA.

In addition to rare plants, the LOBHP/WMA provides habitat for the federally endangered red-cockaded woodpecker (*Picoides borealis*) and the pine snake (*Pituophis melanoleucas*), both high conservation priority species in the State's Wildlife Action Plan due to loss of fire-maintained open canopy habitat, and black bear (*Ursus americanus*) a moderate conservation priority in the State Wildlife Action Plan. LOBHP/WMA supports habitat for a large stronghold for the coastal black bear population in South Carolina. The coastal bear population used to be one of the State's largest populations but is no longer due to development pressure and loss of habitat. Today's LOBHP/WMA coastal black bears move from the Carolina Forest area to the Waccamaw River to interact with populations of black bears in the Coastal Plain of North Carolina, maintaining genetic diversity for continued success of this population.

The SCDNR owned Waccamaw River Heritage Preserve/Wildlife Management Area (Waccamaw HP/WMA) is an 8,553-acre site established to protect a large, relatively unbroken riverine bottomland hardwood forest ecosystem that borders or surrounds the Waccamaw River. This property contains several rare plants such as Harper's fimbry (*Fimbristylis perpusilla*) and Plymouth gentian (*Sabatia kennedyana*). Waccamaw HP/WMA is also an important travel corridor for the coastal black bear population. The preserve provides a significant riparian buffer corridor along the Waccamaw River enhancing the water quality benefits of the entire watershed ecosystem. The preserve provides residents and visitors several outdoor recreation opportunities and direct access to the Waccamaw River through one of seven boat landings in the area.

In addition to the 41,980 acres protected by the USFWS and the SCDNR, there are approximately 4000 additional acres protected by local governments, municipalities and by private entities who chose to protect their properties with conservation easements.

Economic Growth

According to the United States Census Bureau, Horry County has over 350,000 residents as of 2019, with the median home value of $172,500 from the period between 2014 – 2018. The area is regionally and nationally significant due to the tourism draw and economic contributions of the Myrtle Beach Grand Strand region. Historical population data for Horry County showed a growth rate of 37% from 2000-2010, with

urban localities like Conway East seeing growth of up to 107% during the same period (US Census Bureau, Waccamaw Regional Council of Governments, SC Budget and Control Board). Projected growth from 2010-2030 was estimated to also be around 36.5%, with some localities like Little River and Myrtle Beach projected to continue growing by over 50% (GSATS 2035 Long Range Transportation Plan, US Census Bureau, Waccamaw Regional Council of Governments, SC Budget and Control Board). As a result of tremendous population increases and subsequent urban development patterns, the natural hydrology of the Waccamaw region has been altered significantly over the past several decades. One of the major physical changes associated with urban development is the increase in impervious surface area that covers the landscape.

Existing Projects in Study Area

There are several other USACE projects that are authorized under the Rivers and Harbors Act of 1880 and 1930 within the project area. Within the Waccamaw River, the USACE maintains a navigation channel 12 feet deep at mean low water (MLW), with an 80-foot bottom width from the mouth of the river into Winyah Bay upstream to Conway. This federal navigation channel was initially constructed in 1923 (41.5 miles). Upstream, the USACE also maintains a navigation channel 4 feet deep at MLW and 50 feet wide from Conway to Red Bluff (25.5 miles) which was initially constructed in 1931, and a cleared channel from Red Bluff to Lake Waccamaw, NC. The USACE also manages operations and maintenance along the Atlantic Intercoastal Waterway (AIWW), which spans the extent of coastal Horry County.

Horry County and Conway are actively advancing several projects independently which are designed to address flooding concerns in the study area. These projects are described in detail in the draft IFREA.

Future Condition of Resources

Overview

If current trends in land use and climate change continue, aquatic resources in the Coastal Plain of South Carolina will continue to be affected. Over the past several decades, habitats within South Carolina have become increasingly fragmented. Habitat decline, increases in invasive species, shifting climate regimes and salinity profiles, increasing development, and rising sea levels represent constraints and barriers to dispersal and migration of fish, wildlife, and plant species.

Land Use

In their IMAGINE 2040 Comprehensive Plan (Horry County Council 2019), Horry County identified approximately 40.66% of land use in the county as "*vacant land,*" which they define as "*land area not developed for a specific use or assigned a land use classification*". Another 20.9% is considered agricultural and forestland and 8.6% is conservation/preservation. Future land use, as envisioned in the plan, is anticipated to become 38.9% scenic and conservation areas and 35.2% rural, collectively making up about 74% of land use. Based on the similarities in how the County defines each of these land use types, it is likely that agricultural and forestland (equivalent to rural) will increase by up to roughly 15%. The conservation/preservation land will increase roughly 30% by 2040, while vacant land will no longer be considered "*vacant*". Given these assumptions alongside previous 20-year trends in changes in forested and wetland cover from 1996 to 2016, which saw roughly 10% decline in total area of these cover types, forested and wetland cover may continue to decline with expanding development.

In Horry County from 1996 to 2016, total net developed land cover increased from 8.43% to 12.7% (50.59%

increase) and impervious surfaces increased from 2.43% to 3.76% (54.37% increase). This is reflected in total net wetland cover decline of 5.32% (from 41.63% of total area to 39.42%) with associated conversion to developed land cover and a total net forested cover decline of 15.53% (from 51.6% of total area to 43.59%). However, forested cover changes are reflected in increases in both developed land covers and scrub/shrub. Similar changes occurred in the Waccamaw River Watershed over the same period (NOAA Coastal Services Center C-CAP Landcover Atlas 2024). A similar trend is expected to continue, particularly extending from current urban centers including Conway, Socastee, and the Grand Strand area.

Increases in impervious surfaces associated with continued development within coastal and inland watersheds leads to altered hydrological regimes, increased nutrient loading, bacteria and pathogens, and contaminants in waterways that reduce biological productivity and alter the food web. Tributaries and creeks are especially sensitive to these changes in land use. When watersheds are characterized by 20-30% impervious surface, ecological processes are impaired (Sanger et al. 2015). Development planning that occurs without wildlife resources in mind generally also leads to increased habitat fragmentation, conversion, and degradation, thereby affecting habitat connectivity, quality, and viability.

Climate Change

Rivers and estuaries and the species they support are at risk from climate change impacts such as changes in rainfall, temperature, sea levels, and salinity. Each of these factors are considered below.

Rainfall

Although not spatially or temporally homogenous, global-climate model simulations detect that global average precipitation will increase by about 1-3% per degree of warming (Allen and Ingram 2002; Hawkins and Sutton 2011; Richter and Xie 2008; Tabari et al. 2019). Furthermore, models have shown that in every year from 2015 - 2020, daily rainfall has deviated from natural variability more than 50% of the time as a result of rising temperatures. This shows how daily precipitation events are predictors of planetary warming (Ham et al. 2023).In the study area, more recent historical trends in rainfall have yielded little to no significant (SCOR 2023), however, this is anticipated to change in the coming years. Projections are analyzed in greater detail in the draft IFREA, but those for the Waccamaw Watershed indicate that the cumulative amount and max amounts of precipitation will significantly increase over the period of the study as well as the max number of dry days.

Increases in heavy precipitation events are key factors that affect the risk of floods. “Heavy precipitation” are instances in which the amount of rain or snow experienced in a location exceeds what is normal, whether that is total amount of precipitation, intensity, or frequency (EPA 2024). Precipitation extremes potentially pose the greatest social risk to South Carolina, rather than changes in monthly, seasonal, or annual averages. Moisture from the Gulf of Mexico and Atlantic fuels heavy precipitation events in South Carolina. In Conway, SC, a station found a statistically significant increase in heavy precipitation. One model predicted a 5-inch rainfall event has a one-in-ten chance of occurring in any given year when using 1930-1979 precipitation data, but a one-in-five chance of occurring using 1970-2019 data (SCOR 2023).

USACE (2023) modeled the Waccamaw River basin to help evaluate existing flood risk and as a tool to gauge the effectiveness of potential flood risk reduction projects. Findings included an increase in rainfall at the study location from approximately 12.68 inches to 14.53 inches for the 100-year average recurrence interval. This is an increase of approximately 14.6%. The results of the simulation indicate that climate non-stationarity could have a significant impact on future water surface elevations and flooding conditions within the Pee Dee and Waccamaw River basins. A 14.6% increase in total rainfall for a 96-hour event

produced a rise in water surface elevation of more than two feet for the Waccamaw River at Conway, SC.

Temperature

Current climate models predict continued warming across the southeast United States, with South Carolina projected to increase by 3°F (lower emissions model) to 10°F (higher emissions model) by the year 2100, depending on future greenhouse gas emissions. In the lower emissions scenario, the ensemble average of all models projects an additional increase of 4°F from the 1991-2020 average by 2100; it ranges from an increase of approximately 3°F in a cooler model to 5°F in a warmer model. It is important to note that this lower emissions scenario assumes decreasing greenhouse gas emissions in the next decade and leveling CO2 concentrations below 450 ppm by the end of the century. By contrast, the high emissions scenario leads to a much greater temperature increase – projected at 6°F, 8°F, and 10°F during the 21st century for the cooler model, ensemble average, and warmer model respectively. Projected changes in temperature extremes also vary by emissions scenario and individual model. By the end of the century, the number of days in which state averaged maximum temperature would exceed 95°F doubles in the lower emissions scenario, using output from a cooler model. In the higher emissions scenario with a warmer model, the number increases five-fold. Projections from a model ensemble average show changes in hot days across space and contrasts between emissions scenarios (SCOR 2023).

Higher temperatures create a higher risk of drought as rates of evapotranspiration increase, leading to increased frequency, duration, and intensity of drought in the coming years. Warmer ocean temperatures may provide more energy to hurricanes creating conditions for more intense storms adding to flooding concerns.

Temperature change is expected to shift species and their habitats in both time and space affecting species diversity and interactions at all trophic levels. Temperature has a direct effect on the physiology, maturation, and survivability of aquatic species whose metabolic rates fluctuate with environmental temperature. Temperature changes will likely affect the rate of energy transfer between the trophic levels as well. The timing and extent of species distributions and migration could also be affected by warming waters (SCDNR 2021).

Sea Level Rise

Recent research in the study area have indicated that rates of sea level rise (SLR) have averaged around one inch per year (Williams and O'Halloran 2023) and that water levels in the Waccamaw Watershed may outpace long-term projections. Analyses of water levels along the Waccamaw River have shown that although rapid changes in tidal range are not expected with current levels of SLR, mean low water is rising significantly faster than daily mean or high tide (Williams and O'Halloran 2023). The implication of these findings is likely to be increased periods of inundation in the tidal wetlands along the estuary and tidal river. As indicated by SCDNR (2021), despite uncertainty, most models project a rise of about two feet in South Carolina over the next century. Sea levels have already risen by approximately one foot in South Carolina and will most likely hit two feet by 2050. Projections for sea level rise by 2150 range from 2 to 16 feet (SCOR 2023).

The rise of two feet is expected to represent landward intrusion of 39-197 feet, affecting the boundaries between estuarine waters and tidal freshwater river and their associated habitats (e.g., tidal salt marsh) and wildlife. This estimate may, however, be an underestimation of SLR and intrusion into the watershed (Williams and O'Halloran 2023).

Salinity

Estuarine systems are at risk to impacts of climate change because of changes in sea level and variation in rainfall that may shift salinity profiles and changes in biotic composition. Rainfall and streamflow are tied directly to seasonal climatic conditions and shifts in salinity profiles in the estuarine system depend entirely upon freshwater input and rainfall. Changes in the location of the saltwater/freshwater interface will affect many freshwater and diadromous fish species. Saltwater will move further up the river systems as sea level rises. The success of species with low salt tolerances and diadromous fish will be limited by their ability to move upstream into better quality habitat due to habitat fragmentation (SCDNR 2021).Salinity profiles in estuaries are expected to change because of both sea level rise and changes in precipitation patterns. Sea level rise accompanied by drought will push salinity regimes up estuaries and landward compressing the available habitat. Drought has periodically affected all parts of the state. The historical record reveals considerable interannual and interdecadal variability, but no statistical trend. Rising temperatures in the 21st century will likely exacerbate agricultural and hydrologic drought (SCOR 2023). Coastal development will add to habitat compression resulting in reduction of saltmarsh habitat in the optimal salinity ranges. Estuarine species can tolerate salinity shifts over a tidal cycle, but they have optimal ranges and move in accordance with prevailing conditions. Sea level rise accompanied by drought would also lead to a reduction in abundance and reproduction of estuarine species that could affect all trophic levels.

Extended drought leads to drying out and dieback of coastal marshes as a result of acidification of the estuary. Salt marsh dieback will reduce primary productivity and increase vulnerability to predators of juvenile fishes and invertebrates due to reduction in cover (SCDNR 2021).

Study Timeline

Scope of CAR

Scoping for this study began in October 2022, when USACE solicited agency comments via a letter that described the study purpose and authorities. An Interagency Coordination Team (ICT) was formed and met in November 2022. The ICT consisted of state, federal, local, and regional stakeholders to review problems, objectives, constraints, and opportunities. The ICT met several times, including in March 2023, September 2023, and February 2024, to evaluate alternatives. Throughout this scoping phase, funds were allocated for development of a CAR to evaluate the potential impacts of study measures being considered on wildlife resources. Development of a draft report coincided with the selection of a tentatively selected plan and development of a draft Integrated Feasibility Report and Environmental Assessment (IFREA).

USACE and the Services agreed to build upon the existing study objectives and alternatives. The primary focus of the CAR is to further discovery of impacts to fish and wildlife resources from the proposed measures, as well as potential strategies for minimization and mitigation. The CAR will include potential permanent impacts to aquatic and benthic resources, while temporary impacts will be addressed in the IFREA. The temporary impacts are expected to be minor with implementation of standard best management practices. The descriptions of upland habitats and terrestrial resources in the study area and potential effects on these resources will also be included in the IFREA.

Following completion of the Draft IFREA, USACE will complete a period of "*optimization*," to refine the alternative plans by reducing costs and impacts to the environment. This will result in considerable and feasible adjustments to avoid impacts to natural resources.

Planning Efforts

A list of possible structural and nonstructural measures and natural or nature-based features was generated. An initial array of conceptual alternatives was formulated from the meetings. Several of the alternatives were then screened for their effectiveness in meeting study objectives, feasibility, cost, and other factors. The final array of alternatives included a no action alternative (or a Future Without Project alternative) and several action alternatives for each flood impact area. A draft IFREA is being prepared concurrently with this report and is meant to describe the initial array of conceptual alternatives and the final array in detail. Initial costs, engineering, and the potential for adverse environmental impacts of the final array of alternatives will also be evaluated as part of the Draft IFR/EA, which is intended to be released with a Draft Finding of No Significant Impact to the public and agencies for review in July 2024.

PROPOSED POTENTIAL ACTIONS

Overview

In the study area, the proposed structural measures include floodwalls/levees, a detention pond impounded by levees/flood barriers, removal of weirs, road elevation, floodgate, benching, and relief bridges. The proposed non-structural measures include buyouts/acquisition, elevating structures, and implementing flood water systems. Water farming is the proposed nature-based measure.

FISH AND WILDLIFE RESOURCES

Current Resources

Fish and wildlife resources in the aquatic environment of the ROI may include benthic and pelagic assemblages of aquatic and semi-aquatic invertebrates across various life stages; diadromous fish and fish of commercial and recreational value; semi-aquatic and aquatic herpetofauna; semi-aquatic and marine mammals; and a variety of waterbirds. Nearby terrestrial assemblages of invertebrates, herpetofauna, birds and mammals can also be found in the ROI.

Many of the known species in the ROI are documented within the Waccamaw River National Wildlife Refuge (NWR), and thus, many of the species inventoried herein are in reference to their known occurrence in the refuge. Some of these resources are listed as threatened or endangered species under the Endangered Species Act of 1973, as amended (16 USC §1531), for which the Services have jurisdiction. Table 1 shows the federally listed species that have the potential be found in the ROI due to their geographic ranges. This table was generated by the USFWS program called, "*Information for Planning & Consultation*" (IPAC). Although these species have the potential to be in the ROI due to their ranges, not all have suitable habitat in the area.

Table 1: Federally listed species under jurisdiction of the Services in the ROI

Common Name	Scientific Name	Status
American chaffseed	*Schwalbea americana*	E
Atlantic sturgeon	*Acipenser oxyrinchus*	E, CH*
Eastern black rail	*Laterallus jamaicensis jamaicensis*	T
Green Sea Turtle	*Chelonia mydas*	T, PCH
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	E, PCH
Leatherback Sea Turtle	*Dermochelys coriacea*	E, CH
Loggerhead Sea Turtle	*Caretta caretta*	E, CH
Monarch butterfly	*Danaus plexippus*	C
Northern long-eared bat	*Myotis septentrionalis*	E
Piping Plover	*Charadrius melodus*	T, CH
Pondberry	*Lindera melissifolia*	E
Red-cockaded woodpecker	*Picoides borealis*	E
Rufa Red Knot	*Calidris canutus rufa*	T, PCH
Shortnose sturgeon	*Acipenser brevirostrum*	E
Tricolored bat	*Perimyotis subflavus*	PE
West Indian manatee	*Trichechus manatus*	T, CH
Wood stork	*Mycteria americana*	T

Key: E - Endangered PE - Proposed Endangered T - Threatened C - Candidate CH - Critical Habitat PCH - Proposed Critical Habitat
*This is the sole critical habitat found within the ROI

The Waccamaw River is vital to supporting a multitude of species, plant and animal, as it winds from the North Carolina state line to its terminus at Winyah Bay. The South Carolina Wildlife Action Plan (SWAP) was originally created in the Wildlife Conservation and Recreation Program created under the federal Appropriations Act of 2001 with a purpose to develop a wildlife conservation planning and restoration strategy for rare and sensitive species. Species are listed in the SWAP because they are rare or designated as at-risk due to knowledge deficiencies; species common in South Carolina but listed rare or declining elsewhere; or species that serve as indicators of detrimental environmental conditions. The 2015 SC SWAP states that the upper Waccamaw River in Horry County is one area of primary conservation concern due to the habitat located there for the following SWAP conservation priority species – the Carolina Pygmy Sunfish (*Elassoma boehlkei*), the Broadtail Madtom (*Noturus* sp. c.f. *leptacanthus*), and the Waccamaw spike (*Elliptio waccamawensis*).

Tables 2 and 3 include a list of all the SWAP conservation priority species, state protected species and federally protected species that are located within the ROI and need to be considered when developing flood risk management solutions in and around the Waccamaw River. Please note that the take of state threatened, and endangered species is prohibited under S.C. Code of Laws §50-15-20 and §50-15-30 respectively. Additionally, S.C. Code of Laws §16-11-590 provides additional protections for the Venus flytrap (*Dionaea muscipula*), a federal at-risk species and SWAP species of high conservation priority, that is now known from only a few populations in the world – two populations in Horry County, SC and in a few coastal counties of NC. This statute requires landowner consent for the cutting, collection, breaking or other destruction to this globally rare plant species. The SCDNR will work with landowners where Venus flytrap may be impacted to remove and relocate these rare plants where minimization and avoidance of destruction of these species cannot occur.

Table 2: Animal Species for consideration during study development.

Scientific Name	Common Name	Federal Status	State Status	SWAP Priority
INSECT				
Bombus pensylvanicus	American Bumble Bee	At-Risk Species	Not Applicable	Not Applicable
Danaus plexippus	Monarch Butterfly	Candidate for listing	Not Applicable	Highest
FRESHWATER MUSSEL				
Elliptio complanata	Eastern Elliptio	Not Applicable	Not Applicable	Moderate
Elliptio congaraea	Carolina Slabshell	Not Applicable	Not Applicable	Moderate
Elliptio folliculata	Pod Lance	Not Applicable	Not Applicable	High
Elliptio producta	Atlantic Spike	Not Applicable	Not Applicable	High
Lampsilis cariosa	Yellow Lampmussel	Not Applicable	Not Applicable	Highest
Lampsilis splendida	Rayed Pink Fatmucket	Not Applicable	Not Applicable	High
Toxolasma pullus	Savannah Lilliput	Not Applicable	Not Applicable	Highest
Villosa delumbis	Eastern Creekshell	Not Applicable	Not Applicable	Moderate
CRAYFISH				
Procambarus ancylus	Coastal Plain Crayfish	Not Applicable	Not Applicable	Moderate
Procambarus blandingii	Santee Crayfish	Not Applicable	Not Applicable	Moderate
Procambarus braswelli	Waccamaw Crayfish	Not Applicable	Not Applicable	High
Procambarus chacei	Cedar Creek Crayfish	Not Applicable	Not Applicable	Moderate
Procambarus pearsei	Carolina Sandhills Crayfish	Not Applicable	Not Applicable	Moderate
FISH				
Acipenser brevirostrum	Shortnose Sturgeon	Federally Endangered	State Endangered	Highest
Acipenser oxyrinchus	Atlantic Sturgeon	Federally Endangered	Not Applicable	Highest
Alosa aestivalis	Blueback Herring	Not Applicable	Not Applicable	Highest
Scientific Name	**Common Name**	**Federal Status**	**State Status**	**SWAP Priority**
Alosa mediocris	Hickory Shad	Not Applicable	Not Applicable	Highest
Alosa sapidissima	American Shad	Not Applicable	Not Applicable	Highest
Ameiurus brunneus	Snail Bullhead	Not Applicable	Not Applicable	Moderate
Ameiurus catus	White Catfish	Not Applicable	Not Applicable	Moderate

Ameiurus platycephalus	Flat Bullhead	Not Applicable	Not Applicable	Moderate
Anguilla rostrata	American Eel	Not Applicable	Not Applicable	Highest
Chologaster cornuta	Swampfish	Not Applicable	Not Applicable	Moderate
Elassoma boehlkei	Carolina Pygmy Sunfish	Not Applicable	State Threatened	Highest
Enneacanthus obesus	Banded Sunfish	Not Applicable	Not Applicable	Moderate
Etheostoma serrifer	Sawcheek Darter	Not Applicable	Not Applicable	Moderate
Fundulus diaphanus	Banded Killifish	Not Applicable	Not Applicable	Moderate
Notropis chalybaeus	Ironcolor Shiner	Not Applicable	Not Applicable	Moderate
REPTILE				
Chelydra serpentina	Snapping Turtle	Not Applicable	Possession regulated under S.C. Code of laws 50-15-70	Moderate
Clemmys guttata	Spotted Turtle	At-Risk Species	State Threatened	High
Deirochelys reticularia	Chicken Turtle	Not Applicable	Possession regulated under S.C. Code of laws 50-15-70	Moderate
Heterodon simus	Southern Hog-nosed Snake	Not Applicable	State Threatened	Highest
Kinosternon baurii	Striped Mud Turtle	Not Applicable	Possession regulated under S.C. Code of laws 50-15-70	Moderate
Ophisaurus attenuatus	Slender Glass Lizard	Not Applicable	Not Applicable	Moderate
Pituophis melanoleucus	Pinesnake	Not Applicable	Not Applicable	Highest
Terrapene carolina	Eastern Box Turtle	Not Applicable	Possession regulated under S.C. Code of laws 50-15-70	Moderate
BIRD				
Anhinga anhinga	Anhinga	Migratory Bird Treaty Act	Not Applicable	Moderate
Ardea alba	Great Egret	Migratory Bird Treaty Act	Not Applicable	Not Applicable
Ardea herodias	Great Blue Heron	Migratory Bird Treaty Act	Not Applicable	Moderate
Scientific Name	**Common Name**	**Federal Status**	**State Status**	**SWAP Priority**
Butorides virescens	Green Heron	Migratory Bird Treaty Act	Not Applicable	Highest
Dryobates borealis	Red-cockaded Woodpecker	Federally Endangered	State Endangered	Highest
Egretta caerulea	Little Blue Heron	Migratory Bird Treaty Act	Not Applicable	Highest
Egretta thula	Snowy Egret	Migratory Bird Treaty Act	Not Applicable	Moderate
Elanoides forficatus	Swallow-tailed Kite	Migratory Bird Treaty Act	State Endangered	Highest

Haliaeetus leucocephalus	Bald Eagle	Bald & Golden Eagle Protection Act	State Threatened	High
Icterus galbula	Baltimore Oriole	Migratory Bird Treaty Act	Not Applicable	High
Mycteria americana	Wood Stork	Federally Threatened	State Endangered	Highest
Nyctanassa violacea	Yellow-crowned Night-Heron	Migratory Bird Treaty Act	Not Applicable	Highest
Nycticorax nycticorax	Black-crowned Night-Heron	Migratory Bird Treaty Act	Not Applicable	Highest
Sternula antillarum	Least Tern	Migratory Bird Treaty Act	State Threatened	Highest
MAMMAL				
Corynorhinus rafinesquii	Rafinesque's Big-eared Bat	Not Applicable	State Endangered	Highest
Eptesicus fuscus	Big Brown Bat	Not Applicable	Not Applicable	Highest
Lasiurus borealis	Eastern Red Bat	Not Applicable	Not Applicable	Highest
Lasiurus cinereus	Hoary Bat	Not Applicable	Not Applicable	Highest
Lasiurus seminolus	Seminole Bat	Not Applicable	Not Applicable	Highest
Myotis austroriparius	Southeastern Bat	Not Applicable	Not Applicable	Highest
Sciurus niger	Eastern Fox Squirrel	Not Applicable	Not Applicable	Moderate
Trichechus manatus	Florida Manatee	LT: Federally Threatened	State Endangered	Highest
Ursus americanus	American Black Bear	Not Applicable	Not Applicable	Moderate

Table 3: Plant Species for consideration during study development.

Scientific Name	Common Name	Federal Status	State Status	SWAP Priority
Agalinis aphylla	Scale-leaf Agalinis	Not Applicable	Not Applicable	Moderate
Calamovilfa brevipilis	Pinebarren Sandreed	Not Applicable	Not Applicable	Moderate
Carex decomposita	Cypress-knee Sedge, Epiphytic Sedge	Not Applicable	Not Applicable	High
Carex elliottii	Elliott's Sedge	Not Applicable	Not Applicable	Moderate
Ceratiola ericoides	Rosemary, Florida Rosemary, Sandhill Rosemary, Sand Heath	Not Applicable	Not Applicable	Moderate
Scientific Name	**Common Name**	**Federal Status**	**State Status**	**SWAP Priority**
Cladium mariscoides	Twig-rush, Fen-sedge, Smooth Sawgrass	Not Applicable	Not Applicable	Moderate
Coreopsis rosea	Rose Coreopsis	Not Applicable	Not Applicable	High
Dionaea muscipula	Venus Flytrap, Meadow Clam, Tippitiwitchet	At-Risk Species	Not Applicable	High

Eleocharis vivipara	Viviparous Spikerush	Not Applicable	Not Applicable	Moderate
Eupatorium recurvans	Recurved Eupatorium	Not Applicable	Not Applicable	Moderate
Fimbristylis perpusilla	Harper's Fimbry	At-Risk Species	Not Applicable	High
Gentiana autumnalis	Pinebarren Gentian	Not Applicable	Not Applicable	High
Lachnocaulon minus	Brown Bogbutton	Not Applicable	Not Applicable	Moderate
Lechea torreyi var. congesta	Sandhill Pinweed	Not Applicable	Not Applicable	Not Applicable
Lilaeopsis carolinensis	Carolina Lilaeopsis	Not Applicable	Not Applicable	Moderate
Lioplax subcarinata	Ridged Lioplax	Not Applicable	Not Applicable	High
Litsea aestivalis	Pondspice	Not Applicable	Not Applicable	High
Ludwigia brevipes	Long Beach Seedbox, Coastal Plain Water-purslane	Not Applicable	Not Applicable	High
Ludwigia lanceolata	Lanceleaf Seedbox	Not Applicable	Not Applicable	High
Ludwigia ravenii	Raven's Seedbox	At-Risk Species	Not Applicable	Not Applicable
Macbridea caroliniana	Carolina Birds-in-a-nest, Carolina Macbridea	Not Applicable	Not Applicable	High
Orthochilus ecristatus	Spiked Medusa, Smooth-lipped Eulophia	Not Applicable	Not Applicable	High
Oxypolis ternata	Savanna Cowbane	Not Applicable	Not Applicable	High
Parnassia caroliniana	Carolina Grass-of-Parnassus, Savanna Parnassia, Eyebright	Not Applicable	Not Applicable	High
Peltandra sagittifolia	Spoonflower, White Arrow-arum	Not Applicable	Not Applicable	Moderate
Plantago sparsiflora	Pineland Plantain	Not Applicable	Not Applicable	High
Rhexia aristosa	Awned Meadow-beauty, Bristly Meadow-beauty	Not Applicable	Not Applicable	High
Rhynchospora pallida	Pale Beaksedge	Not Applicable	Not Applicable	High
Sabatia decandra	Bartram's Rose-gentian	Not Applicable	Not Applicable	Moderate
Sabatia kennedyana	Plymouth Gentian	Not Applicable	Not Applicable	High
Sagittaria weatherbiana	Weatherby's Arrowhead	Not Applicable	Not Applicable	Moderate
Schwalbea americana	Chaffseed	Federally Endangered	Not Applicable	Highest
Solidago pulchra	Beautiful Goldenrod, Carolina Goldenrod	Not Applicable	Not Applicable	High
Scientific Name	**Common Name**	**Federal Status**	**State Status**	**SWAP Priority**
Spiranthes laciniata	Lace-lip Ladies'-tresses	Not Applicable	Not Applicable	Moderate
Sporobolus teretifolius	Wireleaf Dropseed	At-Risk Species	Not Applicable	High
Xyris brevifolia	Shortleaf Yellow-eyed-grass	Not Applicable	Not Applicable	Moderate
Xyris flabelliformis	Savanna Yellow-eyed-grass	Not Applicable	Not Applicable	Moderate

Invertebrates

Within the Waccamaw River basin are several insects, mollusks, and crustaceans that are of conservation concern. Throughout the Waccamaw River NWR, several mollusk species are known to inhabit open waters, including several freshwater mussels ranging from moderate to highest SWAP priority as identified by SCDNR (Table 2). These include Eastern elliptio, Carolina slabshell, pod lance, Atlantic spike, yellow lampmussel, rayed pink fatmucket, Savannah lilliput, and Eastern creekshell. Among the ROI, SCDNR (2023) has also documented mussels and variable spike and freshwater snails, such as the Eastern pondhorn (*Uniomerus carolinanus*) and ridged lioplax.

Among the crustaceans, several crayfish are designated as species of moderate to high conservation priority in the SWAP as decided by taxa groups that are coordinated by SCDNR with input from taxonomic experts. These include Coastal Plain crayfish, Santee crayfish, Waccamaw crayfish, Cedar Creek crayfish, and Carolina Sandhills crayfish. Among the broader study area, SCDNR (2023) has also documented the digger crayfish (*Creaserinus fodiens*). Further downstream near Winyah Bay, the Chesapeake blue crab (*Callinectes sapidus*) is a common crustacean in the estuary (SCDNR 2023). From the mouth of Winyah Bay at the Atlantic Ocean to just north of Butler Island in the Waccamaw River is designated by NOAA Fisheries as Essential Fish Habitat (EFH) Habitat of Particular Concern (HAPC) for penaeid shrimp.

There are also a few insects that are of conservation concern, such as the at-risk American bumble bee, the Palatka skipper (*Euphyes pilatka*) and the Monarch Butterfly, a candidate species for federal listing.

Monarch Butterflies

The Monarch Butterfly is a candidate for listing under the Endangered Species Act (ESA) and was considered a species of highest conservation priority in the 2015 SWAP (SCDNR 2015). Monarch Butterfly in inhabit a variety of habitats where they feed on nectar; however, the species is dependent upon milkweed species for reproduction as that is the sole food source for larvae (USFWS(*b*) n.d.).

Fish

Around 70 species of fish are known to occur within the boundaries of the Waccamaw River NWR, including freshwater, anadromous, catadromous, estuarine-dependent, and marine fish (USFWS(*a*) 2008). Among these, 23 species are listed in the SWAP as species of greatest conservation need (SGCN). Anadromous fish include the striped bass, American shad, hickory shad, blueback herring; catadromous fish species include the American eel; and freshwater fish include largemouth bass, redbreast sunfish, bluegill, redear sunfish, warmouth, pumpkinseed, black crappie, chain pickerel, redfin pickerel, bowfin, snail bullhead, white catfish, swampfish, Carolina pygmy sunfish (state threatened), banded sunfish, sawcheek darter, banded killifish, and ironcolor shiner. Both shortnose and Atlantic sturgeon, federally endangered species, are also documented in the Waccamaw River basin. Shortnose sturgeons are also a state endangered species.

Coastal, estuarine, and riverine waters that include all of Winyah Bay, and the Waccamaw River to the junction with the AIWW are designated as EFH for snapper-grouper and spiny lobster. Cartilaginous fishes, such as sandbar sharks (*Carcharhinus plumbeus*), Atlantic sharpnose sharks (*Rhizoprionodon terraenovae*), finetooth sharks (*Carcharhinus isodon*), blacktip sharks (*Carcharhinus limbatus*), lemon sharks (*Negaprion brevirostris*), spinner sharks (*Carcharhinus brevipinna*), and bull sharks (*Carcharhinus leucas*) can be

found in middle and lower portions of the Winyah Bay (Collatos et al. 2020). Winyah Bay to Georgetown is designated as EFH for neonate, juvenile and adult sand tiger sharks; neonate spinner (*Carcharhinus brevipinna*) and blacktip sharks; and juvenile sandbar sharks. Winyah Bay through the Waccamaw River up to Bull Creek is designated EFH for juvenile and adult tiger and blacktip sharks. Many species of shark in the bay become increasingly limited as salinity levels decline in the middle portions of the bay (around 25 ppt: Collatos et al. 2020), particularly during low tides (around 15 ppt: Collatos et al. 2020). Nevertheless, the bay may serve as secondary nursery grounds (Collatos et al. 2020) where juveniles mature and contribute to population growth.

Sturgeon

Carolina Unit 5 is designated as critical habitat for the Carolina and South Atlantic DPS of Atlantic sturgeon. However, the Waccamaw River is believed to not support spawning and juvenile recruitment or to contain suitable habitat features to support spawning above its confluence with Bull Creek which links it to the Pee Dee River. Post and Waldrop (2020 and 2022) have documented Atlantic Sturgeon ascending further up the Waccamaw River than in previous years. Two adults were detected at the receiver [river kilometer (RKM) 61] near Toddville in the spring of 2020. Additionally, six fish tagged in 2022 in the Waccamaw River remained in the river that year, travelling between RKM 25.7 and 49.1. The receiver at RKM 61 is the uppermost receiver in the river, so sturgeon may have potentially traveled even further upstream. This reflects the presence of sturgeon but does not indicate any spawning.

Marine Mammals

Marine mammals known in the ROI include bottlenose dolphin and West Indian manatee. Both are afforded Federal protection under the Marine Mammal Protection Act (MMPA), though the West Indian manatee is also a federally listed threatened species under the ESA and state endangered under state statute and regulations (SC Ann. 50-13; Code of Regulations 123-150).

While common bottlenose dolphins (*Tursiops truncatus*) can be found in nearshore coastal waters and estuaries of the Atlantic Coast from New York to Florida, bottlenose dolphin have been documented in numbers in Winyah Bay (Brusa 2012; Silva et al. 2019). Anecdotes in media stories have also provided some evidence of bottlenose dolphins in the Waccamaw River as far upstream as Conway, but often these stories involve rescue or mortality that follow these sightings. These individuals of the Northern South Carolina Estuarine System Stock (NSCESS) are described as dolphins that inhabit estuarine and coastal waters within 1 km of the shoreline form Murrells Inlet to Price Inlet (NOAA 2022).

Manatees

Manatees can inhabit both salt- and fresh-waters and are found at shallow depths (5-20'). In the waters of the continental U.S., they are most abundant in the warm waters of peninsular Florida. During the summer months, manatees on the eastern coast of Florida have been reported to travel as far north as Cape Cod, Massachusetts (BOEM 2022). Manatees that inhabit and travel through South Carolina waters during the warmer months will feed on saltmarsh grasses at high tide and submerged algae beds at low tide. Manatees have been sighted over the past five to eight years between Winyah Bay and the Waccamaw River up to about Conway (J. Lemeris, SCDNR, pers. comm. 2023), as well as throughout the AIWW.

Mammals

Within the Waccamaw River NWR, bottomland hardwood forests provide habitat for about 40 species of mammals. This includes black bear, bats, deer, bobcat, raccoon, beaver, mink, river otter, marsh rabbit, and squirrels. Among these, SGCN include eight species of bat, mink, Eastern woodrat, meadow vole, and black bear. Additionally, multiple species of bats have ranges in the study area and South Carolina is home to 15 different bat species. Species include Rafinesque's Big-eared (state endangered), Big Brown, Eastern Red, Hoary, Seminole and Southeastern bat species as well as federally protected bats such as the Northern Long-eared Bat (NLEB) and the proposed for listing, Tricolored Bat (TCB).

Bats

The NLEB is federally protected and listed as endangered. The TCB is proposed as endangered. In the spring, summer, and fall, NLEB and TCB occur in a wide variety of forested or wooded habitats where they roost and forage. NLEB roost under bark, and in cracks, crevices and cavities of live or dead trees, while TCB roost in clusters of leaves in live and dead deciduous trees, Spanish moss (*Tillandsia usneoides*), and clusters of dead pine needles. NLEB and TCB often overwinter in subterranean features (e.g., caves and abandoned mines) or other cave-like structures, but in the southern portions of their ranges, where caves and mines are sparse, NLEB and TCB also roost in trees, road-associated culverts, and bridges and remain active and feed during the winter (USFWS(*a*) 2024).

The Rafinesque's Big-eared Bat is state endangered. It inhabits black gum (*Nyssa sylvatica*) and water tupelo (*Nyssa aquatic*) stands, bald cypress (*Taxodium distichum*) swamp forests, maritime forests, and hardwood or mixed mature forested bottomlands (Cochran 1999, Hofmann et al. 1999, Lance et al. 2001, Gooding and Langford 2004, Trousdale and Beckett 2005). Trees standing 59 to 82 feet tall with large cavities, defined as 3.6 feet tall by 1.2 feet wide, should be surveyed to determine maternity roost occupancy May 1st to July 31st (Mirowsky 1998, Gooding and Langford 2004, Trousdale and Beckett 2005, Carver and Ashley 2008).

Amphibians and Reptiles

Within the Waccamaw River basin, over 100 species of amphibians and reptiles are likely to occur. Documented within the Waccamaw River NWR, aquatic salamanders include the greater siren (*Siren lacertina*), Eastern lesser siren (*Siren intermedia*), two-toed amphiuma (*Amphiuma means*), dwarf water dog (*Necturus punctatus*), and broken-striped newt (*Notophthalmus viridescens*). Common terrestrial salamanders within the NWR are the marbled salamander (*Ambystoma opacum*) and South Carolina slimy salamander (*Plethodon variolatus*). Among frogs, the most encountered are the American bull frog (*Lithobates catesbeianus*), Southern leopard frog *(Lithobates sphenocephalus*), and green treefrog (*Hyla cinerea*). Among snakes, the most widespread species are the brown water snake *(Nerodia taxispilota*) and Eastern cottonmouth (*Agkistrodon piscivorus*). Lastly, among turtles, the most common are the Florida cooter (*Pseudemys floridana*) and yellowbelly sliders (*Trachemys scripta scripta*). Over 20 SGCN are known to occur within the ROI including American alligator (*Alligator mississippiensis*), common snapping turtle (*Chelydra serpentina*), spotted turtle (*Clemmys guttata*) (state threatened), diamondback terrapin (*Malaclemys terrapin*), Southern hognose snake (*Heterodon simus*) (state threatened), chicken turtle (*Deirochelys reticularia*), striped mud turtle (*Kinosternon baurii*), slender glass lizard (*Ophisaurus attenuates*), pinesnake (*Pituophis melanoleucus*), and Eastern box turtle.

Sea Turtles

There are four species of sea turtles known to occur in or near waters of Winyah Bay, all of which are federally listed as threatened or endangered species: Kemp's ridley, leatherback, loggerhead and green.

Leatherback sea turtles, found in offshore waters, and Kemp's ridley sea turtles, found in nearshore waters, are not expected to be in the ROI. Loggerhead and green sea turtles are the most common species in South Carolina waters, and their distribution at different life stages varies including offshore waters, bays, inlets, river mouths, salt marshes, creeks, ship channels, and sandy beaches for nesting. Subadult and adult loggerheads move into coastal waters, such as Winyah Bay, to prey on mollusks, crustaceans, and fish. Although loggerheads and greens could be found in Winyah Bay, they are unlikely to wander into the shallow, altered tidal creeks upstream the Waccamaw River.

Threats to sea turtles include vessel strikes, dredging, fishing by-catch and entanglement, degradation of foraging habitat, pollution, and disease. Beyond the ROI, near Georgetown, critical habitat for nesting loggerhead sea turtles is federally designated extending in both directions from the mouth of Winyah Bay to North Inlet along North Island (LOGG-T-SC-01) and to North Santee Inlet along South Island (LOGG-T-SC-02 & LOGG-T-SC-03). Additionally, nearshore critical habitat is designated from North Inlet to Five Fathom Creek Inlet (crossing Winyah Bay and North Santee Inlet) from mean high water line seaward 1.6 kilometers (LOGG-N-6).

Birds

Within the Waccamaw River NWR, approximately 200 species of bird have been recorded (USFWS(*a*) 2008), of which 100 or more are listed in the SCDNR SWAP as SGCN (SCNDR 2014).

Contiguous forested wetland ecosystems within the Waccamaw watershed serve as important habitat for transient neotropical migratory species, as well as feeding, foraging, and nesting habitat for other temperate migratory and resident species (USWFS 2008). There are several bottomland hardwood birds that are SGCN within the ROI including barred owl (*Strix varia*), red-shouldered hawk (*Buteo lineatus*), wood duck (*Aix sponsa*), yellow-crowned night heron, great blue heron, green heron, little blue heron, snowy egret, black-crowned night heron, wood stork (state endangered and federally threatened), swallow-tailed kite (state endangered), bald eagle (state threatened and protected under the Bald & Golden Eagle Protection Act), yellow-billed cuckoo (*Coccyzus americanus*), Acadian flycatcher (*Empidonax virescens*), prothonotary warbler (*Protonotaria citrea*), Swainson's warbler (*Limnothlypis swainsonii*) and Northern parula (*Setophaga americana*). Swallow-tailed kites have their highest nesting density in South Carolina (2001-2004) within the NWR and represents among the northernmost nests known to the species.

Also, within the NWR are southern pine forests, which are valued by vulnerable species like Northern bobwhite (*Colinus virginianus*), Bachman's sparrow (*Peucaea aestivalis*), wintering Henslow's sparrow (*Ammodramus henslowii*), southeastern American kestrel (*Falco sparverius paulus*), brown-headed nuthatch (*Sitta pusilla*), Baltimore oriole, red-cockaded woodpecker (state and federally endangered), and prairie warbler (*Setophaga discolor*).

Coastal wetlands near the Winyah Bay drainage area, serve as wintering and staging areas for migratory waterfowl. The area also serves as wintering habitat for more ducks than any comparable habitat in South Carolina, and the river system provides a flight corridor for birds migrating between coastal wetlands. Forested floodplains also provide resting and feeding areas for waterfowl during stopovers. These include SGCN such as American green-winged teal (*Anas carolinensis*), mallards (*Anas platyrhynchos*), and

Northern pintails (*Anas acuta*). Wood ducks also nest and produce offspring year-round in the NWR.

In the southern reaches of the ROI, a highly vulnerable group of birds—marsh and wading birds—occupy tidal marsh. These include many SGCN such as American bittern (*Botaurus lentiginosus*), pied-billed grebe (*Podilymbusp Podiceps*), American coot (*Fulica americana*), king rail (*Rallus elegans*), least bittern (*Ixobrychus exilis*), and American purple gallinule (*Porphyrio martinicus*). Others include Great egrets, green herons, little blue herons, snowy egrets, yellow-crowned night herons, and black-crowned night herons. Nearby, shorebird habitats along the coastal plain may provide for more SGCN such as greater and lesser yellowlegs (*Tringa melanoleuca*; *Tri. flavipes),* spotted sandpiper (*Actitis macularius*), and American woodcock (*Scolopax minor*).

ESA Listed Birds

The endangered red-cockaded woodpecker (RCW) is known to nest within the NWR in mature pine forest of Sandy Island. Wood stork, a federally threatened and state endangered species, have also had rookeries documented in the ROI. Additionally, the federally protected, eastern black rail range is partially in the study area, but unlikely present due to unsuitable habitat. Finally, piping plovers and Rufa red knots are two federally protected shorebird species that are found along the SC coast.

The wide range of bald eagles span across coastal South Carolina and the study area. Bald eagles build their nests along coasts, riverbanks, and lakes. Usually in SC, nests are found in tall, live pines and are within one mile to large bodies of water. Bald eagles are federally protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.

Plants

SCDNR has identified numerous species of interest in the ROI including several at-risk species like Harper's fimbry, Venus flytrap, and wireleaf dropseed (Table 2, *Appendix A*). These more sensitive species of plants are most often found in habitats that have highly refined disturbance regimens and are often anthropogenically altered. Each of these at-risk species is addressed individually herein. However, more common plant species are mentioned or inferred based on their supporting habitats that are common throughout the study area and are referred to below.

Harper's fimbry is an annual sedge that occurs in the eastern U.S. on the Lower Coastal Plain, with highly variable year-to-year abundance at a site. The plants are restricted to areas in ponds and rivers that are exposed, but not desiccated, during seasonal low-water periods. Both alteration to site hydrology from drainage or excessive flooding impact the species and habitat negatively (NatureServe Explorer 2024*a*). Several observations of the species have been made by SCDNR (2023) since as recently as 2019 in the Longs/Red Bluff flood impact area of the ROI.

The Venus flytrap is a narrow endemic of the coastal plain of North and South Carolina, occurring in scattered pine savannas and flatwoods. The species has very narrow habitat needs which include frequent natural fire, open understory and low nutrient soils. This more often is in areas between pine savannas or wet pine flatwoods and pocosins, with predominately wet or moist soils (NatureServe Explorer 2024*b*). An observation of this species was made by SCDNR (2023) as recently as 2021 at a timber lot close to the floodplain of the Conway flood impact area.

Wireleaf dropseed is a perennial graminoid endemic to the Coastal Plain that grows in permanently moist to wet pine savannas. Often, the species is found in habitats like ponds and longleaf pine dominated landscapes

with interspersed patches of shrubs, but also is found in interhabitat areas of pine/oak/wiregrass uplands and red maple-sweet gum-swamp tupelo drainages, as well as pitcher plant bogs and broad seepage slopes of small streams (NatureServe Explorer 2024*c*). An observation of this species was made by SCDNR (2023) as recently as 2023 in a disturbed patch of woody wetland in a broader landscape including patches of developed land and evergreen forest in the Socastee flood impact area (See *Appendix A* for a full list of SGCN and non-SGCN plant species in the ROI) (SCDNR 2023).

ESA Listed Plants

Within the ROI, there are several plant species that are federally protected, such as American Chaffseed, and Pondberry. American chaffseed occurs in fire-maintained longleaf pine flatwoods and savannas. Chaffseed is dependent on factors like fire, mowing, or fluctuating water tables to maintain the open to partly-open conditions that it requires (USFWS(*a*) n.d.). 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 (USFWS(*c*) n.d.).

IMPACTS OF THE PROPOSED ACTIONS ON FISH AND WILDLIFE RESOURCES

The goals of flood risk management projects are to improve life safety and reduce property damages resulting from flooding. Historically, flood risk management has involved the construction of floodwalls and levees, modification of channels, use of culverts and bridges, and construction of floodgates among other things. The impacts of implementing these measures have been studied over time and their impacts on fish and wildlife resources are generally understood.

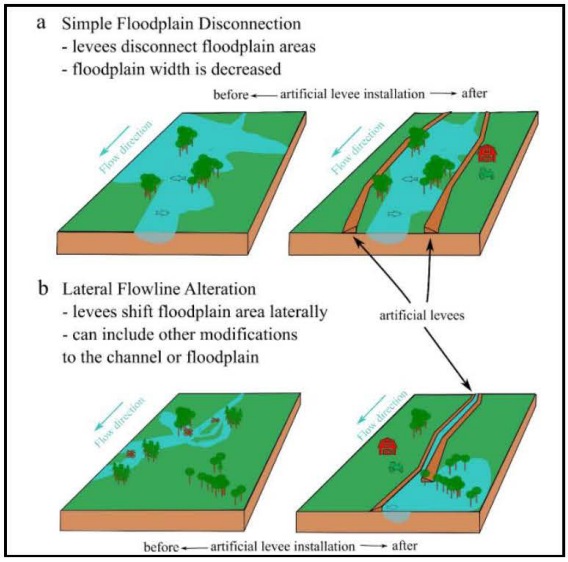

Figure B: Simple Floodplain Disconnection (a) and Lateral Flowline alteration (b) (Knox et al. 2022a).

Structural Measures

Levees/Flood Walls

In the Longs/Red Bluff region near the North Carolina border, along the basin tributary Buck Creek, a floodwall or levee is being considered as a measure to insure homes in Aberdeen and homes on Cox Lane. The measure would involve construction of a 7-foot high wall above existing grade to provide 1% annual exceedance probability (AEP) flood protection along approximately 1.3 miles of floodplain west of Buck Creek. In the Socastee region, upstream of where the Waccamaw River meets the AIWW is Socastee Swamp. An approximately 1.35-mile sheet pile floodwall is being considered for construction on the western outer bend of Socastee Creek to protect the Forestbrook neighborhood. An additional 2.06-mile portion would also be constructed on the eastern outer bend of Socastee Creek to protect McCormick and Burcale Road. The floodwall would be about 7-feet with extensive footing/foundation. The floodwalls being considered would also require drainage to prevent water build up behind the walls and would be accomplished by gates and/or pumps. The construction of levees/flood walls and their associated gates/pumps can lead to direct and indirect ecological impacts, such as floodplain disconnection, flowline alteration, hydrological changes, habitat modifications, and vegetation clearing. There may also be additional noise, vibration, and lighting from the construction activities.

Levees and floodwalls innately disconnect floodplains from waterways and result in simple floodplain disconnection, lateral flowline alteration, or both (Figure B) (Knox et al. 2022*a*). Floodplain disconnection directly reduces the area of active floodplain and lateral flowline alteration describes adjustment of the direction of flood waters and shifting of the locations of flooding.

Floodplain disconnection is an inevitable outcome of the proposed floodwall in Socastee, whereby floodwall structures would be constructed on both sides of Socastee Creek. This proposed structure runs parallel on both sides of the creek for about 1.35 miles prior to termination of the wall on the right side of the creek, and continuation of the floodwall on the left side the remaining 0.71 miles. Lateral flowline alteration is expected on the right side of the creek where the floodwall originates and terminates, likely resulting in a broader floodplain radiating from these points. At the Socastee Creek site, having some bends in the channel morphology, channel scouring is anticipated alongside changes to the floodplain mentioned above (i.e., floodplain disconnection and lateral flowline alteration) following heavy precipitation and flooding events.

Along Buck Creek, lateral flowline alteration is similarly anticipated at the origin and termination of the proposed floodwall. However, the intensity of this impact is expected to be offset to some degree by broadening of the floodplain on the left side of the creek. On the right side of the creek, lateral flowline alteration is likely to result in a broader floodplain and greater depths of inundation following heavy precipitation and flooding events. This can be attributed to the canalized waterway and lack of notable sinuosity.

In lotic ecosystems, hydrological connectivity involves four dimensions (longitudional, lateral, vertical, and temporal). Lateral hydrological connectivity (LHC) or lateral connectivity refers to the connection between the main channel and adjacent floodplain water bodies. Lateral connectivity is essential for ecosystem functioning, supporting high biodiversity, and providing ecosystem goods and services (Shen and Liu 2021).

Artificial levees lead to limiting lateral connectivity and the exchange of nutrient exchange, sediment, and organisms between floodplains and rivers (Knox et al. 2022*a*). This disconnection can completely change hydrology, impacting biogeochemical reactions and food webs. Impacting biogeochemical reactions and food webs may lead to ripple effects, eventually lowering overall function of the floodplain, resilience, and ecosystem diversity, and species composition and diversity (Knox et al. 2022*b*; Leyer 2005). Allochthonous

and autochthonous carbon sources are vital for floodplain food webs. Within hydrologically connected floodplains, there is greater habitat abundance and diversity. Past studies have found other potential impacts of levees on floodplain vegetation, including drier soil and loss of coastal wetland habitat (Morrison et al. 2018).

The implications for biological resources from the changes discussed above are a net loss of the relatively high biomass and biodiversity of floodplains. Organic matter productivity, being partly dependent on floodplain connectivity, enables the system to support a high biodiversity of fish, invertebrates, microbes and more. Hydrological or habitat connectivity between the different waterways and floodplain is important for dispersal of fish species and life-stages. Dispersal affects how fish access different recourses. Spatial extent of movement between habitats can be species-specific. It is likely that the loss of lateral habitat connectivity is a dominant driver of reduced persistence and productivity of fishes (Stoffels et al. 2022).

Additionally, many aquatic species in riverine systems undergo life history stages which require specific nursery habitat that are spatially and temporally variable, predominately in the form of branching shallow water habitats from a connected. Dead biomass in the form of large wood, can come from overbank flows and creates physical and ecological functions on floodplains (Knox et al. 2022*b*).

The aquatic and semi-aquatic species that utilize the rivers and creeks may be directly or indirectly impacted by the proposed activities. These species could include fish, aquatic salamanders, frogs, terrapins, turtles, alligators, mollusks, crustaceans, and others. As mentioned, the levees can alter habitat, including dead biomass, carbon sources, soil, sediments, and nutrients. This can upset the food webs, diversity, and composition of those species. Plant composition and diversity can be altered and therefore, wildlife that utilize specific plants can also be impacted. Additionally, the levees can serve as a barrier for the migration and movement of species, such as crayfish.

Detention

This measure would involve construction of a diversion channel from Socastee Creek to an approximately 55-acre area of existing woody wetlands and evergreen forest which would be converted to a detention pond for stormwater. An existing tributary will be channelized to act as a diversion channel for a passively controlled release into Socastee Creek. Depth of the detention pond is unknown currently. Given the existing stream and lower topography, this plan may include pumps and or gates features to prevent backwater spillage. This area is land locked by Edward E Burrough Hwy, private, and commercial property. Construction and maintenance access may require easements and acquisition. Currently assuming an active system for water retention and releases.

Construction activities associated with excavation such as site clearing, fill removal/placement, and restoration are required. Suitable fill material may be repurposed for pond impoundment (requires soil sampling). The creation of the detention pond can lead to direct and indirect ecological impacts, such as converting habitat, altering hydrology, disconnecting nutrients, and sediments, affecting species composition, and creating a concentration of pollutants in the pond. There may also be additional noise, vibration, and lighting from the specific construction activities.

The area of the proposed detention pond is currently a roughly even mix of woody wetlands and evergreen forest. The area of woody wetlands is at least periodically flooded during heavy precipitation events. This measure would involve conversion of existing habitats to open water and developed open area, with some areas of potentially intact habitat remaining, albeit with altered hydrology. In the unaffected areas surrounding the constructed detention pond, altered hydrology would have similar impacts to biomass and

biodiversity as are anticipated with floodwalls discussed above resulting from disconnection of nutrient cycling, sediment transport, and hydric conditions. Similarly, plant communities and composition shifts are expected. This can affect food webs, species interactions and composition, as mentioned above.

Creation of a detention pond can result in new wildlife habitat, including wildlife such as aquatic plants, fish, amphibians, and waterfowl. The ponds receive inputs of suspended particulate matter and nutrients. This can lead to sediment accumulation, less water volume, and biogeochemical activity, such as C sequestration. Depending on the design of the detention pond and usage of best management practices (BMPs) can influence the number of impervious surfaces, which can have significant influencers on the storage or discharge of stormwater (Schroer et al. 2018). For instance, the use of pumps, gates, channelization and substantial increases in impervious surfaces can have significant influences on the storage or discharge of stormwater and determine whether the resulting detention pond is "*wet*" (i.e., a permanent pool) or "*dry*." "*Wet*" detention ponds are the most common type across coastal South Carolina (Scaroni et al. 2021).

Wet detention ponds are storm water control structures providing both retention and treatment of contaminated storm water runoff. A typical wet detention pond design is shown in Figure 1. The pond consists of a permanent pool of water into which storm water runoff is directed. Runoff from each rain event is detained and treated in the pond until it is displaced by runoff from the next storm. By capturing and retaining runoff during storm events, wet detention ponds control both storm water quantity and quality. The pond's natural physical, biological, and chemical processes then work to remove pollutants (EPA 1999).

If not properly maintained, ponds can accumulate sediment and debris and have slope and/or outlet failures, resulting in high sediment and pollutant loadings to receiving waters. When sediment is removed from ponds as part of routine maintenance, contaminated sediments could require disposal at certified landfills. Stormwater pond surface waters are documented to have poor water quality indicators and other unintended, negative consequences. These ponds can accumulate large masses of algae, including some harmful algal species. They can be the sites of fish kills, accumulate debris and trash, and exhibit high concentrations of nutrients, chlorophyll a, chemicals, pesticides, fecal coliform bacteria (FCB), and have low dissolved oxygen (DO) concentrations. These conditions are not necessarily problematic, especially when a pond is considered a water treatment facility rather than an amenity. However, an opportunity may exist to improve pond water quality through changes in design and maintenance of ponds. Furthermore, regardless of their intended use, ponds attract humans and wildlife, as well as serving as a source of freshwater to estuarine systems (SCDHEC 2007). This may increase the exposure and risk of wildlife to high concentrations of pollutants and toxins. Furthermore, design of stormwater storage or discharge can influence the flow of total suspended solids and other associated contaminants into nearby Socastee Creek (Nix 1985; Stanley 1996). Control of the flow of total suspended solids (TSS) and pollutants downstream serves in limiting reduced dissolved oxygen concentrations and further deterioration of aquatic ecosystems (Bilotta and Brazier 2008).

Barrier Removal

Removal of the weirs along Socastee Creek would decrease the water depths affecting the upstream homes from the existing weirs. Other anticipated effects immediately proximal to weir removal include induced erosion and sedimentation of finer particles (Thomas et al. 2015) upstream and downstream and an increase in flow velocity upstream (Im et al. 2011). Impacts are expected from initial redistribution of fine sediment downstream of weir removal; however, rapid evacuation of fine sediments is likely to result in impacts being temporary and a general coarsening of the area would occur over longer periods. Weir removal research has shown several instream changes may occur which improve habitat heterogeneity as the channelizing effect of weirs is remediated and bed zones reflect changes in water level, velocity ranges, and

sediment distribution (Im et al. 2011; Thomas et al. 2015; Kim and Choi 2019).

Weirs are typically designed to facilitate fish passage, but can be barriers for nontarget weak-swimming or crawling species. They can disrupt streambed continuity and may limit movement of benthic organisms and aquatic and riparian-dependent species that require dry or shallowly-submerged surfaces for movement (USFS 2008).

Weir removal may improve upstream conditions without significantly affecting physical habitat downstream, increasing habitat suitability for a broader diversity of native lotic fish and invertebrate species (Im et al. 2011). Macroinvertebrates characterized as swimmers, clingers, and sprawlers benefit the most from weir removal, while reduced habitat for burrowers reflects a drop in species dominance (Kim and Choi 2019). Effects to fish community structure are dependent upon existing guilds and may exhibit modest changes in diversity and dominance of fish species generally (Im et al. 2019). However, greater continuity between upstream and downstream reaches is expected and there is some evidence for increased fish abundance following weir removal (Im et al. 2019). Furthermore, barrier removal improves capacity for movement of aquatic organisms in feeding and spawning and potentiates increases in their populations (Birnie-Gauvin et al. 2018). Potential improvements in habitat connectivity, lower trophic level biodiversity and increased populations provides for conditions of higher ecosystem function (Lefcheck et al. 2015; Thompson et al. 2017).

Road Elevation

Road elevation in the Bucksport flood impact area is proposed to include elevating approximately 7 miles of the Pee Dee Hwy, starting at US 701 Hwy and terminating at Pauley Swamp Road. This measure is being pursued to reduce flood risk for a 1% AEP event the Pee Dee Hwy would need to be raised by 3-7 feet (existing road elevation varies). Auxiliary drainage features to minimize pooling east of the roadway may be required. Raising the Pee Dee Highway and extending the roadside embankment laterally will result in the clearing of trees and the permanent loss of wetlands. This would also result in the loss of lateral connectivity of floodplains, which currently flow over the highway during high water events. As mentioned earlier, lateral disconnection can result in impacts to aquatic wildlife by changing food webs, vegetation, and species composition. However, impacts can be minimized through adequate maintenance of waterways through the addition of centralized culverts with floodplain culverts and bridges.The loss of wetlands can be detrimental to the wildlife that inhabit those lands and depend on that habitat. Wetlands are extremely productive ecosystems with a diversity of wildlife including songbirds, mammals, reptiles, and amphibians. Fish utilize wetlands for breeding sites and protection (Yarrow 2009). Depending on the size, material, and design of culverts, they can be harmful or beneficial for different species, , including the threatened West Indian manatee, endangered Northern long-eared bat, and the proposed endangered tricolored bat.. TCBs are opportunistic when it comes to their roosts. Newly installed culvert pipes can incidentally serve as an excellent roost. Culverts account for the majority of hibernacula documented in Mississippi, Georgia, and Louisiana (Limon et al. 2018, North American Bat Monitoring Program 2021). In road-associated culverts in the southern U.S., TCB move within and between culverts throughout the winter (Anderson et al. 2019).

There are a variety of ways in which culverts are detrimental and can prevent the movement of animals. Culverts can create barriers through elevation drops, becoming clogged with debris, excessive water velocities, the absence of bank-edge areas, excessive turbulence, insufficient water depth, and the discontinuity of channel substrate (USFS 2008).

Riparian wildlife may choose to cross over the road surface rather than pass through a crossing structure that does not have banks or other dry passage. However, if physical barriers, such as fencing or Jersey barriers

are present, passage across the roadway may be blocked. Even where passage over the road is not blocked physically, if the road supports hightraffic volumes, individual animals are likely to be killed trying to cross. For some long-lived species with low reproductive rates, such as turtles, roadkill can undermine the viability of populations significantly. Streamsimulation structures generally offer dry passage opportunities for ripariandependent species, since the structures are wide enough that the channel edges are dry much of the year (USFS 2008). Roadways have been documented to have significant effects on herpetofauna populations with high rates of direct mortalities on the roads as well as habitat fragmentation and reduction in gene flow and habitat utilization (Andrews et al. 2007). Research has shown that amphibians and reptiles can utilize culverts as wildlife crossings with roadways. The most successful structures for herpetofauna are a combined system of guide fences and underpasses to funnel organisms beneath roadways (Dodd et al. 2004; Aresco 2005; Andrew et al. 2007; Patrick 2010).

Crossing structures may be complete barriers—essentially blocking passage for all aquatic species—or they selectively may pass some species or lifestages while blocking others. Even for a particular species a partial barrier may allow passage for only the strongest swimming individuals in a population. Partial barriers are sometimes referred to as "filters" because of their selective nature in facilitating passage. Other structures may be barriers at certain times of the year (high-flow or low-flow conditions) but not others. For some species, the timing of movement is critical and temporary or seasonal barriers might seriously impact survival or reproduction within a population (USFS 2008).

Floodgate

The floodgate is expected to slow backwater in the Great Pee Dee River by restricting backflow through Cowford Swamp. Its function would permit flow below the 2-yr or 5-yr floodplain level from Cowford Swamp to the Great Pee Dee River; but provide actively controlled protection above these levels to provide a barrier for waters associated with 25-yr and 100-yr flood water. Situated between 701 HWY and Big Bull Landing on Marine Park Road, this structure is estimated to be 0.6 miles in length. The exact location and footprint remain undefined. From the center line of the gate/wall on each side, a perpetual 25-foot-wide easement is required for maintenance, plus a 10-foot-wide temporary easement during construction, totaling 70 feet. This structural measure would provide protection for communities on or near Frazier Road, Bucksport Road, and Railroad Drive. The structure would require supplemental drainage facilities such as additional gates and pumps to prevent water build up behind the gate.

Inherent to the additional surface area of impervious structure to be constructed for this measure are changes to water velocity and depth, scouring of sediment upstream and downstream, and the potential for debris to further impact flow and act as a physical barrier to the movement of aquatic organisms. These effects are of more concern when high water levels or flow rates increase output demands through the obstruction created by a floodgate of the nature proposed here.

Similar to an undershot sluice, flood events may inhibit the exchange of aquatic organisms between Cowford Swamp and Bull Creek where the increased velocity passing under the floodgate exceeds the 'burst' speed capacity of a fish or other aquatic organism (Beach 1984) (Figure C). Sluices which employ an undershot flow of water have been shown to negatively affect fish species assemblages and stock values by reducing the accessibility of waterways to migrant fish (Halls et al. 1998) as well as contributing to increased larval mortality (Marttin and de Graaf 2002). Large differences in head pressures on either side of the floodgate could expose fish and other aquatic organisms to elevated shear stresses and decompression levels, damaging early life stages and small-bodied fish (Pflugrath et al. 2019).

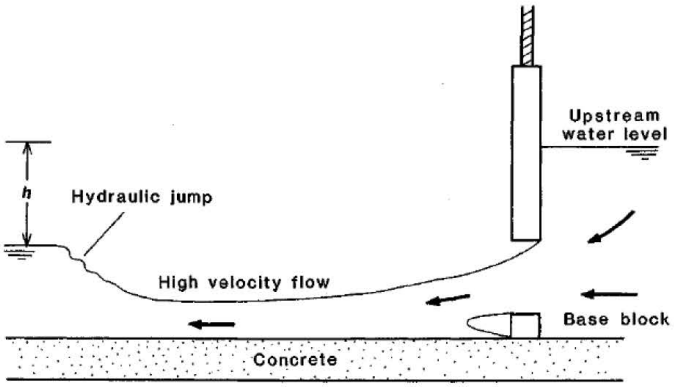

Figure 3 This form of undershot sluice makes fish passage very difficult, requiring both high speeds and long endurance times. The concrete base block enables a water jet to form, and the flat base allows the high velocity flow to persist over a considerable distance.

Figure C: Visual representation of potential physical effects and barriers to fish migration from floodgate construction (Beach 1984).

There is the potential for significant direct and indirect impacts to tidal habitats, water quality and aquatic resources by restricting tidal flow. Floodgate structures can result in impacts to natural resources through altering biological, chemical, and physical processes. The blocking of tidal flows can restrict access for fish and invertebrates to and from habitats that are necessary for feeding, spawning, migration, and predator avoidance as well as altering environmental conditions such as salinity, temperature and dissolved oxygen which directly affect an organism's fitness. Floodgates may also affect hydrology and hydrodynamics in creek systems which can cause alterations to physical and chemical dynamics such as sediment and nutrient flux which are critical factors in marsh building processes[1].

Benching/Terracing

This measure is anticipated to increase conveyance in this waterway and reduce flood elevations around the adjacent damage areas that include residential homes.

Floodplain benching is anticipated to increase channel capacity for conveyance during flood events but decrease water velocity and height during periodic high water in the creek by expanding above the bankfull width. An immediate impact of construction is that it would require excavation of the channel bank and some clearing of existing vegetation. Increasing conveyance of the waterway would also decrease durations of floodplain inundation, disrupting the disturbance regime to local floodplain forest. Potential impacts may include encroachment of more flood-intolerant plant species and reduced exchange of sediment and

[1] Giannico GR, Souder JA. 2005. The effects of tide gates on estuarine habitats and migratory fish. Oregon Sea Grant. ORESU-G-04-002.

nutrients between the channel and floodplain forest. This could result in impacts like those on reduced floodplain connectivity discussed for floodwalls and levees above.

Benching along the creek would disrupt durations of lateral connectivity to the floodplain and affect existing disturbance regimes as they relate to discharge rates from the channel but allow for formation of new ecological niches in depositional formations which may occur naturally outside channels. These may include a continuum of forms from smaller structures such as bars up to extensions of the floodplain (Vietz et al. 2004). This may mirror natural changes which occur in meandering channels whereby influence of local scale hydraulics, variability in channel width, and sedimentation patterns lead to formation and dissemination of in-stream benches (Vietz et al. 2004). This may benefit some aquatic assemblages, particularly fish yields and production, as they are known to be strongly correlated with the extent of accessible floodplain (Junk et al. 1989), and benching can increase the extent and duration of periodically inundated surfaces along banks of the waterway. Likewise, the added variation in the topographic gradient may support new, rich floral and faunal communities, as elevation has been correlated with plant species distribution in blackwater rivers in the southeast (Burke et al. 2003). Waterways with intermediate flood disturbance frequencies and intermediate levels of productivity have been shown to high species richness (Pollock et al. 1998). Though soil characteristics, nutrient availability, recruitment of large woody debris and other dynamic characteristics are also important for plant community structure in floodplains (Malanson and Butler 1990; Burke et al. 2003)

Relief Bridges

In Longs/Red Bluff, the measure would include adding culverts to the bridge on Highway 905 at the intersection of Simpson Creek and Todd Swamp. This measure may also include some clearing of debris and obstructions in the stream under the bridge. This measure is anticipated to alleviate flooding damage and backwater effects that occurs in high flood events in nearby neighborhoods at Parker Drive and McNeil Chapel Rd. This measure may also benefit Jefferson Rd and Mountain Drive. In Conway, the measure would include adding relief bridges or culverts along stretches of Highways 501 Bypass and 501 Business, as well as Hwy 905. Exact location and length of the bridges along these roadways is still being determined and will depend on the amount of additional flow needed.

Relief bridges and culverts both functionally have similar impacts on riverine systems, though impacts are generally more severe the narrower a waterway is constrained by such hardened structures. Culverts are known for reducing the movement of fish and other aquatic organisms through the creation of high velocity flows (Mahlum et al. 2014), high hanging heights (Burford et al. 2009), and when culverts are obstructed by built-up debris and sediment (Wellman et al. 2000). Culverts can also create novel habitats at a local scale when pools form downstream of the structures with scouring created by the displacement of flows (Wellman et al. 2000). The accumulation of fine sediments within and downstream of culverts can also occur, creating changes to benthic habitat for fish and invertebrates (Quigley and Harper 2000). All of these factors can contribute to changes in the biodiversity and community compositions of streams intersected by culverts and relief bridges.

Non-structural Measures

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

Buyouts/Acquisition

Buyout/acquistion structures include those subject to more frequent flooding (2- to 50-yr events), lacking structural suitability for elevation, or experiencing greater than 4 feet of flooding during a 100-yr event. Although this measure would not have any direct consequences for wildlife resources, there may be some levels of disturbance or potential for pollution through runoff resulting from any construction activities that may be pursued when repurposing acquired properties. This, however, would be expected to be of low impact and repurposing of properties could potentially involve reincorporation into the natural floodplain landscape. This could potentially benefit wildlife resources.

Elevation

Structures and utilities within the 2- to 50-yr floodplain subject to 1-3 feet of structural damage are eligible for elevation. Structures would be elevated above the 100-yr base flood elevation including 2 feet of additional freeboard. This plan excludes communities subject to flood risk reduction through structural means. This measure is not anticipated to have impacts to wildlife resources unless construction-related activities result in disturbances and pollution from runoff.

Flood Warning Systems

A flood warning system is expected to have few consequences for wildlife resources outside of any construction-related impacts and those associated with noise temporarily during use. Given the infrequency of noise emitted by these systems, impacts are expected to be minor.

Nature-based Measures

Water Farming

Overall, water farming is expected to have minimal environmental consequences, though site-specific considerations are relevant. Unless active measures were pursued by landowners to counter natural flooding regimes on the property, very little change is expected to result from this measure. Potential benefits may be realized from this measure for floodplain conservation as it prevents the potential for private development of the land.

The Bucksport measure for water farming overlaps or is nearby a developed area for sod farming, property in the Safe Harbor Program for red-cockaded woodpecker, and wastewater treatment facilities. Nearby sod farms are inadvertently a beneficial habitat for some shorebirds and migratory species, which obtain food resources when sod farms are inundated, and sod harvesting is occurring (Taylor and Galbraith 2007; Lehnen and Krementz 2013). This may include ESA species like the red knot (Sullivan et al. 2009). However, the areal extent currently proposed would likely have little impacts to these features and may in fact increase period of inundation and allow for more foraging opportunities for these species. Where this measure overlaps with properties in the Safe Harbor Program, there is potential for conflicting interests and may or may not be executable. Lastly, where there is potential for any interaction with wastewater facilities this measure should be avoided as to limit any potential for leaching of pollutants and propagules.

The Longs/Red Bluff measure for water farming predominately overlaps with the Waccamaw River Heritage Preserve and a Clean Water Act Mitigation Bank and therefore may preclude potential realization of this measure.

Summary and Potential for Cumulative Effects

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

Traditional flood risk structures can limit access to habitat and lead to loss of habitat in addition to altering habitat and food webs. Similar impacts could occur from measures such as floodwalls and floodgates constructed in floodplain networks. Flood control structures with gates and walls in a floodplain will influence exchange and inundation of vegetation, soils, and organisms on both sides of structures. Severity of effects on water quality, community composition and structure, and species richness depend on the degree of lost connectivity, with the greatest impacts expected where connectivity is completely severed. Complete disconnection of the floodplain is most similar to what could be expected from the floodwalls.

Use of hydraulic pumps along floodwalls the floodgate during storm surge events could impact aquatic resources depending on the duration and frequency of closure, changing water quality parameters critical in supporting aquatic life. Temporary construction activities could impact aquatic and terrestrial resources. Runoff from constructing structural and nonstructural measures could also result in impacts, if standard best management practices are not implemented.

Potential Conservation Measures for Fish and Wildlife Resources

While not all conservation measures may be applicable to the environmental conditions of the study area nor to the specific measure proposed in the tentatively selected plan, several studies provide ideas for avoiding or minimizing impacts to aquatic resources from building traditional flood risk structures in riparian environments.

Measures to Avoid Impacts

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

Measures to Minimize Impacts

Structural Measures

Impacts to environmental resources in the ROI can be minimized through designs that consider their effects and the implementation of Best Management Practices (BMPs). Examples of BMPs include using buffer strips along waterways and employing on-site sediment control structures.

In areas where structural measures are proposed, care should be taken to prevent the establishment of invasive species in disturbed habitats. Practices to limit invasion may include thorough inspection and cleaning of all construction equipment before and after use, preserving trees and riparian vegetation where

possible, reseeding with native plant species appropriate for the ecoregion in disturbed soil or fill areas, and implementing monitoring and maintenance plans that include measures to control invasive plants.

Construction extents should be surveyed and consider preserving different habitat, such as old trees, rare species, trees of unusual size or shape, and trees with special wildlife value for food, resting, and nesting. Preservation of a network of trees along structural measures can also provide both structural integrity to soils in the area, but also maintain microhabitat conditions that also preserve conditions for other species. For instance, shade trees may prevent soils from drying and hardening, retain soil structure and prevent erosion, and facilitate persistence of important geochemical processes.

Construction operations can also cause disturbance or destruction of important features during sensitive and critical periods. For instance, breeding and roosting behaviors displayed by some migratory bird species, like swallow-tailed kite, may be negatively impacted by presence of construction activities and associated noise. Other species, such as the aforementioned bat species, have critical periods for hibernation/torpor and pupping or summer occupancy. When preserving trees is not plausible, avoid removing known and suitable trees during their critical timeframes and conserving known maternity roosts. This includes conserving maternity roosting trees for the state endangered Rafinesque's big-eared bat. Any maternity roost tree identified should then be buffered with a 1000-foot radius and an avoidance for tree clearing implemented May 1st to July 31st. Maternity roost trees are defined as trees standing 59 to 82 feet tall with large, hollow, cavities – 4 feet tall by 1 feet wide external width, with large basal cavities potentially being preferential (Mirowsky 1998, Gooding and Langford 2004, Trousdale and Beckett 2005, Carver and Ashley 2008, Bat Conservation International and Southeastern Bat Diversity Network 2013). Construction can also follow the other minimize measures to minimize impacts to the different species (Found in the Service's "*Minimum Conservation Measures*" Guidelines). For aquatic animals, such as fish, construction operations should be avoided during migrations and spawning periods. The Great Pee Dee River is a spawning area that should be avoided during a spawning period. Depending on the species present in the area and the specific operations, the best time of year for construction activities might differ.

Isolated wetlands provide critical habitat for a variety of reptile and amphibian species. A key aspect of the herp lifecycle includes terrestrial movements and use of uplands habitats adjacent to these wetlands. The placement of a minimum of a 300-foot buffer between development of any hardened structures and adjacent wetlands would be beneficial to encompass and protect terrestrial movements of a variety of important herp species (Semlitsch and Bodie. 2003, Buhlmann et al. 2001, Buhlmann et al. 2009, Litzgus et al. 2004, Veysey Powell and Babbit, 2015). However, Semlitsch and Bodie (2003) recommends to completely protect the core habitats necessary to protect herpetofaua, a 600-meter (approximately 1900 feet) buffer would be needed.

Levees/Flood Walls

During construction, stressors such as pollution, noise, vibration, and lighting can affect fish and wildlife. Various construction techniques, including excavation, hauling, compaction, piling installation, clearing vegetation, and others can lead to these stressors. The equipment itself has the potential to emit fumes or leak gas that can harm the water quality, habitat, and living organisms. If dewatering, burning of debris, waste material processing, or other techniques are used, this can directly impact water quality, water depth, and aquatic organisms. The BMPs should focus on reducing direct and indirect impacts to the surrounding area, such as preventing water degradation, oil leaks, and other potential environmental stressors.

To aid in reducing the potential ecological harm, the floodwall may be setback a distance that allows some of the floodplain to go undisturbed directly by construction. Levee setbacks can help offset the damages

mentioned to geomorphology, hydrology, biogeochemistry, habitat, and biota. A setback may allow for some conservation of floodplain function and vegetation composition inside the floodwall (Gergel et al. 2002). Additionally, native plants and plant communities may be planted as an overall ecosystem restoration goal.

Levee setbacks have the potential to improve hydrologic aspects and can improve the levee's resiliency and risk reduction. This improvement can occur because there is more space for the floodwaters to disperse. However, hydrologic response is site-specific, and models can help estimate the response to a levee setback. Also, geomorphic structures, such as bypass channels, dikes, barbs, or hard points can help stimulate natural processes, such as moving sediment (Dahl et al. 2017). Where a large enough buffer between the floodwall design area and the channel does not exist to limit alteration of hydrology, this may result in a shift in plant communities as patterns of sedimentation and inundation become less varied, contributing ultimately to reducing habitat complexity and biodiversity.

Streamside forest buffers along the proposed diversion channel and detention pond should also be considered in design as buffers ≥30 meters have been shown to protect physical, chemical, and biological integrity of small streams (Sweeney and Newbold 2014). Readily available scientific literature indicates that the ability of vegetated buffers to trap suspended sediments are positively correlated with width and negatively correlated with slope (Wenger 1999). A literature review performed by Castelle et al (1994), found that buffers must be 30 meters (100 ft) wide to maintain the health of the biota in nearby streams, but that this width would need to be increased for steeper slopes. Peterjohn and Correll (1984) found that for a 5% slope, only ninety percent of the suspended sediment was trapped in the first 19 meters (62 ft), and that the entire 60-meter (164 ft) buffer trapped 94% of the sediment. Therefore, adjacent streams and wetlands would be protected by vegetated riparian buffers of at least 150-feet wide, wherever practicable. Any cleared/denuded vegetated buffer areas should be replanted in native woody vegetation in order to better protect adjacent aquatic resources.

During the planning phase, a model describing hydrologic response and different levee designs with differing size buffers would be helpful for understanding the full impacts. Other planning materials could include stormwater pollution prevention approaches, which can help describe erosion, sediment migration, and other potential waste factors of the project. During this phase, the associated construction stressors to wildlife and other organisms should be considered and mapped.

Detention

Detention ponds can serve as valuable habitat for sensitive wildlife like amphibians and reptiles in urban settings. Utilizing informed design and management of detention ponds can be critical in determining whether these anthropogenic counterparts to natural wetlands serve as valuable habitat or have detrimental impacts. Important characteristics that can affect amphibian and reptile biodiversity include water depth, shoreline geomorphology, cover of emergent vegetation, and aquatic connectivity (Hamer et al. 2012). Maintaining or improving the length of hydroperiods can aid in complete development of early life stages which may otherwise be truncated in natural ephemeral wetlands (Brand and Snodgrass 2010). Reducing contamination from pollutants suspended in local water inputs is also important for supporting aquatic wildlife, and can be achieved through inclusion of trash racks, forebays, and littoral shelves in design.

Detention ponds may support a richness of aquatic fauna that serve to enhance the resilience of natural systems in the ROI while simultaneously providing flood management benefits; however, some species such as beaver and waterfowl may require direct management to prevent the detention from having otherwise harmful impacts to waterbodies and the risk of flooding. Although beavers are often a keystone species in

wetland habitats, engineering habitat conditions suitable for a variety of other species, they may also impact flood risk abatement designs by clogging water control structures and affecting retention times. Similarly, detention ponds can serve as habitat for many bird species, but also attract nuisance birds like Canada geese which may impair water quality when abundant. Design parameters may discourage use by these species, such as decreasing pond size, perimeter area, and the ratio of open water to aquatic plant cover (Blackwell et al. 2008).

The West Indian Manatee's range does approach the proposed floodwalls connected to the detention pond. Depending on the hydrology of the affected streams and potential for manatees to enter the proposed areas, manatees may have the ability to enter the detention pond. Manatees have been found to utilize artificial warm water sites, such as power plants. Changing temperatures have caused manatees to stay in these warm water refuges for longer (Sattelberger et al. 2016). Wet detention ponds can increase stormwater temperatures and therefore, raise surface water temperatures (U.S. EPA 2021). It is important to recognize there is a potential for the detention pond to host warm water, which is attractive to manatees. In 2012, four manatees entered a large storm water treatment pond in Florida due to their curious nature. This resulted in an exclusion fence being added to the lake to prevent future access ("*Florida Fish and Wildlife Conservation Commission*" n.d).

The floodwalls leading to the detention pond should be designed to keep manatees from entering (i.e., exclusion fence). Floodgate designs capable of closing passively or without detectability of aquatic organism movements should not be considered for use, given the potential impacts to marine mammals. If construction occurs during the warmer months (i.e., spring and summer) when manatees may be in the study area, protective measures should be implemented to ensure take of manatees or other marine mammals (i.e., bottlenose dolphins) does not occur either directly or indirectly as a result of construction equipment or practices. The appropriate manatee mitigation guidelines created by the Service should be utilized: "*Manatee Protection Measures for South Carolina*" (USFWS 2021).

During the planning phase, a model describing hydrologic response should be created and utilized. By using models, informed design, and BMPs, the detention pond may provide more benefits. As mentioned, a forest buffer greater than 30 meters along the diversion channel and detention pond can be beneficial to protecting the integrity of the stream. In addition to the design parameters mentioned, the associated construction stressors (noise, vibration, light, etc.) to wildlife and other organisms should be considered during project planning.

Road Elevation

For the road elevation construction, the design of the culvert should consider different features for aquatic and terrestrial species. The construction of the culverts can impact aquatic animals directly. This can happen from dewatering erosion, pollution, and other factors, such as the time of the year when construction takes place. During construction, BMPs should be utilized to avoid impacts to aquatic animals.

During the in-water construction, there are risks to manatees, with the potential for injury or death of the animals. Additionally, manatees can become stuck and lost when entering culverts and pipes. The entrapment within culverts can lead to starvation, drowning, and death of the animals. Because of these impacts, there are specific guidelines for culvert construction, such as the usage of exclusion devices within culverts ("*Florida Fish and Wildlife Conservation Commission*" n.d.). Manatee mitigation measures should be used by contractors and subcontractors to avoid impacts to manatees: "*Manatee Protection Measures for South Carolina*" (USFWS 2021).

Culverts can impact aquatic animals indirectly as well. They can affect habitats by means of their effects on stream channels and flood plains. These impacts are not universally adverse, but beneficial effects are less common than detrimental ones. Focusing on the conservation of a single desirable species is not enough. The entire aquatic ecosystem is linked, and all species depend on each other for food and other essential interactions. As survival of a "target species" depends on a healthy and diverse ecosystem, it is essential to focus on habitat quality and continuity for aquatic communities rather than one individual species (USFS 2008).

When designing the culvert, the utilization of the U.S. Forest Service's stream simulation would be beneficial: "*Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings*" (USFS 2008). Stream simulation is a method for designing and building road-stream crossings intended to permit free and unrestricted movements of any aquatic species. Their guide aims to help national forests achieve their goal of maintaining the physical and biological integrity of the stream systems they manage, including existing populations of fish and other wildlife species (see National Forest Management Act, 16 U.S.C. 1600-1616). Habitat fragmentation is an important factor contributing to population declines of many fish, and crossing structures that are barriers are a large part of the problem. Stream simulation provides continuity through crossing structures, allowing all aquatic species present to move freely through them to access habitats, avoid adverse conditions, and seek food and mates. Stream simulation applies to crossing structures on any transportation network, including roads, trails, and railroads (USFS 2008).

However, culverts can be used as roosting areas for bats and therefore, be beneficial. Many species of bats have been documented using anthropogenic roosts, including bridges and culverts. Surveys have shown evidence for bats to prefer concrete bridges and culverts over other metal and wooden structures. This could be due to the thermal and frictional properties, which makes roosting easier (Wetzel and Roby 2023). The design of the culverts should consider including culvert weep holes, which have been found to be an alternative for hibernation. Two adjacent ceiling weep holes per culvert made from roughened concrete or similar material would provide footing locations for the roosting bats. Additionally, the use of roughened concrete on the walls, sides, and ceilings could also be attractive for the bats. However, if the design of the culverts are to discourage bat usage then the diameter of the culvert pipe would need to be 2 feet or less and/or smooth walled piping.

Additionally, culverts with smooth featureless surfaces can increase velocity flows and make it more difficult for fish and/or other aquatic animals to pass through. Culverts with more ridges can aid some wildlife species during their passing and provide them with more resting spots. Culverts can also block passage if there is insufficient water depth or by blocking sunlight. Therefore, shorter culverts can help bring in more sunlight and improve the fish's behavioral response. (Kozarek et al. 2017). The design of the culvert should consider these factors and design-features. Utilizing a model or using a stream simulation (USFS 2008) that describes potential hydrological effects can provide better insight into how fish may respond.

Culvert design should also consider all life stages of the waterway's fish. Until recently, where fish were a serious concern, designing culverts for passage of a target species (the "design fish") during its migration season was considered best practice. This practice, however, often does not achieve the best ecological results. For example, considerable resources have gone into facilitating passage of adult salmon and steelhead migrating to their spawning grounds, only for fishery biologists to find that accommodations made for adults did not even begin to cover the needs of juveniles of the same species. Sustaining a population

demands that all life stages must succeed, and fry, juveniles, and adults have different movement needs and capabilities.

During the design phase, different experts should compare the different design choices and their impacts on the ecosystem. For example, some fish may benefit from shorter culverts to ensure better sunlight, and deep enough water and ridges to allow an easier transition, but other wildlife may not. These structures should also be regularly inspected for maintenance and to ensure debris and obstructions do not impede movement.

The removal of trees can have harmful effects to the multiple species of bats that utilize the area. Bats require different trees for roosting. Here, the NLEB and TCB ranges are considered active year-round. During the planning and construction phase, the specific tree removal guidelines created by the Service should be utilized: "*Northern Long-eared Bat and Tricolored Bat Voluntary Environmental Review Process for Development Projects*" (USFWS(*a*) 2024). The design of the culverts may help offset the removal of the trees for the bats.

Floodgate

Design should consider inclusion of stilling basins extending below the floodgate to allow for diffusion of energy flowing under the gate during high water events and allowing for a rapid reduction of the high-water velocity by forming the hydraulic jump close to the floodgate (Beach 1984).

Numerous direct and indirect impacts to manatees may result during and after construction of a floodgate in the proposed area, given the proximity to Bull Creek—a waterway known to be used by manatees. Documented cases of direct impacts associated with in-water construction have included vessel interactions, entanglement and ingestion and entrainment, while indirect effects may include habitat obstruction, habitat degradation and noise (Hieb et al. 2021). Floodgates and locks are also the second most significant human-induced factor contributing to manatee fatalities, with closing barriers resulting in the slow-moving animal being crushed (Black and Leslie 2018). Floodgate designs capable of closing passively or without detectability of aquatic organism movements should not be considered for use, given the potential impacts to marine mammals. If construction occurs during the warmer months (i.e., spring and summer) when manatees may be in the study area, protective measures should be implemented to ensure take of manatees or other marine mammals (i.e., bottlenose dolphins) does not occur either directly or indirectly as a result of construction equipment or practices. The appropriate manatee mitigation guidelines created by the Service should be utilized ("*Manatee Protection Measures for South Carolina*" 2021).

Disturbance associated with construction of this measure may also have important consequences for the state-listed Swallow-tailed Kite if occurring during the post-breeding/pre-migration season (June to September). This study area overlaps with the northern-most extent of nesting for the species and the area around Cowford Swamp is known for nesting and roosting aggregations of this species (M. Sasser, pers. comm., 2024). The area is important over long periods of time as the species regularly displays high nest and roost site fidelity (Chiavacci et al. 2009; Cely and Meyer 2015). Repeated or intensive disturbance may displace many kites during this critical period of annual cycles (Cely and Meyer 2015). For these reasons, construction-related disturbance may result in loss of critical habitat for this local population and tree clearing should be avoided from March 1st – July 31st.

The use of pumping systems behind the floodgate may have direct and indirect effects on fish and aquatic organisms depending on design and operation. Given the risk of entrainment and indirect effects on fish

movements, pumps should be equipped with fine-mesh screening to lower this risk, and operation of pumps should be limited to nighttime periods of low fish abundance or movement (Norman et al. 2023). Similarly, lowering of floodgates should be conducted prior to diel movements of fish when pump operations are anticipated as to limit potential for fish entrainment (Norman et al. 2023).

Aside from the direct impacts to aquatic organisms at the interface of the floodgate, the intended reduction in flooding also has consequences for floodplain forest ecology at Cowford Swamp. Increasing conveyance of waters in the Great Pee Dee River and reducing the duration of inundation in Cowford Swamp is intended to limit extent and duration of flooding locally. Although this is intended to only limit flooding from events above the 5-year Annual Exceedance Probability (AEP), this will likely have some consequences for plant species assemblages and habitat diversity and complexity, as forest communities may respond to effects of long-term flood events including 50-year and 100-year events (Junk et al. 1989; Burke et al. 2003). For instance, sediment and debris deposition and scour patterns resulting from flood pulses contribute to patchiness within the riparian floodplain creating habitat niches and structural complexity (Stromberg et al. 1993).Furthermore, dampening of flood pulses below more infrequent events (i.e., 10-year AEP) may reduce disturbance rates below a "*geomorphic threshold*", whereby a substantial change in floodplain morphology and vegetation begins to occur (Graf 1983, Stromberg et al. 1993). Therefore, there are potential long-term consequences for species with habitat specializations within the floodplain.

Some herpetofauna depend on isolated wetlands that are fed by bankfull flows and/or other specific hydrological characteristics. Isolated wetlands provide critical habitat for a variety of reptile and amphibian species. A key aspect of the herp lifecycle includes terrestrial movements and use of uplands habitats adjacent to these wetlands. Small ephemeral wetlands are particularly important habitats for herpetofauna adapted to seasonal hydroperiods and the absence of predatory fish (Morin, 1983, Semlitsch et al., 1996). For example, over a 5-year period 16,155 individuals of 42 species of amphibians and reptiles were captured from an ephemeral pond only 0.16 ha in size (Dodd, 1992). Because several endemic and rare species of herpetofauna are associated with isolated wetlands (Dodd, 1995), loss of these habitats may significantly alter regional biodiversity (Dodd, 1992, Semlitsch and Bodie, 1998). Small isolated wetlands are focal points of herpetofaunal richness and abundance in managed coastal plain forests and contribute more to regional biodiversity than is implied by their small size or ephemeral hydrology. By incorporating small wetland values and functions into planning objectives, forest managers can significantly enhance the contribution of extensive young-growth forests to regional conservation of biodiversity (Russell et al. 2002).

Relief Bridges

The construction of the relief bridges and culverts can impact aquatic animals directly. This can happen from dewatering erosion, pollution, and other factors, such as the time of the year when construction takes place. During construction, BMPs should be utilized to avoid impacts to aquatic animals. As mentioned, culverts can negatively impact manatees and the USACE should follow the specific guidelines created by the Service: "*Manatee Protection Measures for South Carolina*" (USFWS 2021).

Culverts can impact aquatic animals indirectly as well. They can affect habitats by means of their effects on stream channels and flood plains and it is essential to focus on habitat quality and continuity for aquatic communities rather than one individual species (USFS 2008).

Culverts and bridges can be beneficial to bats due to their ability to act as a roosting structure. Bridges and culverts can have many characteristics suitable for bat occupation. Many bat species will take advantage of

cracks, crevices, voids, and other openings within structures. These can include cracks and openings caused by structural deterioration (e.g., cracking in concrete, rusted metal, etc.) and typical spaces existing via structural design (e.g., expansion joints). Bats may also roost in the open on rough surfaces or within drain or weep holes, along guardrails, and within jersey barriers or other voids. Additionally, many bridges and culvert designs create artificial "*cave-like*" environments where conditions are generally stable, thus allowing bats to use for extended periods of torpor, particularly in areas where natural cave-like habitats may be limited (USFWS(*b*) 2024).Surveys have shown a preference among bats for concrete bridges and culverts over other materials. In the culverts, weep holes and roughened concrete can be attractive for the bats. For the bridges, bats prefer parallel box beam and prestressed girder type bridges. On bridges, bat boxes, bat condos, or bat roosts can be installed as another management technique (Wetzel and Roby 2023). If plausible, the USACE can consider bat management techniques during the design of these structures.

However, again, there are a variety of ways in which these structures are detrimental and can prevent the movement of animals. Therefore, when designing the relief bridge and/or culvert, the utilization of the U.S. Forest Service's stream simulation method would be beneficial: "*Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings*" (USFS 2008).

Structure design should also consider all life stages of the waterway's fish. Sustaining a population demands that all life stages must succeed, and fry, juveniles, and adults have different movement needs and capabilities. During the design phase, different experts should compare the different design choices and their impacts on the ecosystem. For example, some fish may benefit from shorter culverts to ensure better sunlight, and deep enough water and ridges to allow an easier transition, but other wildlife may not. These structures should also be regularly inspected for maintenance and to ensure debris and obstructions do not impede movement.

Although there is some potential for habitat changes around and immediately downstream, the relief bridge proposed at Simpson Creek would likely improve longitudinal connectivity of the creek by improving conveyance otherwise impeded by the existing bridge infrastructure during high water periods. As mentioned, issues with culverts include sediment build-up, scouring, and increased flow velocity which can all affect stream habitat for fish and invertebrates; however, Simpson Creek is already impacted by an existing bridge and these effects to stream physics are generally the result of narrowing a stream through a hard structure, while this measure would widen the area for water to flow through. For this reason, there are lower impacts relative to construction of culverts where infrastructure does not already exist. There may also be some benefits where these issues common to culverts are relieved by improving conveyance.

Along Highway 905 in Conway would also likely be a net benefit to the environment following construction as it would enhance connectivity of floodplain habitat which is currently intersected by elevated roadways and bridges. Increasing downstream conveyance of floodwaters may reduce some of the areal extent of the floodplain but would allow for more natural movement of floodwaters throughout the system of floodplains. Relief at Highway 905 may also restore floodplain connectivity between the Waccamaw River and Kingston Lake which is currently reduced by the roadway. H&H modeling should inform extent of floodplain reduction.

Non-structural Measures

Repurposing of acquired properties for reincorporation into natural floodplains should be considered to enhance opportunities for wildlife and habitat within the watershed. Collaboration with local stakeholders

and agency partners is encouraged to identify plans and opportunities to manage acquired properties to ensure effective restoration. Examples of local stakeholders and partners could include the SCDNR, the local counties and cities, the Horry County Soil & Water Conservation District, and local organizations, such as The Coastal Conservation League and the Horry Chapter of Wildlife Action, Inc. BMPs for control of sediment and runoff, noise and disturbance, and other construction related impacts should also be implemented during the repurposing of any acquired properties and the implementation of property elevations and installation of flood warning systems. The acquired properties may be revegetated naturally and managed for invasive plants.

Nature-based Measures

Water farming is relatively poorly defined and may involve site-specific considerations for minimization of impacts. Movement of potential pollutants and invasive propagules between areas designated for water farming and waterways upon draining need be considered for protective measures or elimination from boundaries. Land management practices may also be important in areas where current management regimens would be abandoned because of implementation of water farming. For instance, if agricultural fields are abandoned in place of water farming, environmental consequences may be realized if the area is recolonized by invasive plants. Active management to ensure the area transitions to habitat more like that of native floodplains in the ecoregion along the waterway should be pursued.

Measures to Mitigate for Unavoidable Impacts

Construction of floodwalls and floodgates have the greatest potential to affect wetlands in the ROI and create the greatest need for mitigation. Wetland mitigation banking will need to be pursued to offset the loss of wetlands from floodplain disconnection and displacement.

Recommendations and Position of Service

The Service finds that the proposed flood risk management alternatives, while intended as a measure to protect against severe flood damage, is likely to result in the loss of natural resources surrounding the Waccamaw watershed. Natural resource communities in the watershed have been historically eliminated through fill and development as the county continues to grow and expand. The addition of flood risk measures represents a continuation of this expansion. While the project may create or restore ecological integrity under some measures, net negative impacts to woody wetlands and their biota are anticipated.

In preface to Section 7 consultation, the USFWS recommends the following suggestions regarding protected species for USACE use, analysis, and implementation, as undertaking these measures will also afford benefits to fish and wildlife species associated with protected species, and using the same habitats:

- Additional investigations, including hydraulics and hydrology modeling and impacts analysis with relative sea-level rise and cumulative impacts, should be conducted to determine if the construction of the storm walls or levees alter natural periods of inundation and could prove detrimental to their function and longevity (e.g., reduced existing water exchange regarding water depth, delays in water movement, water stacking, and impacts to water quality).

- Given the risk of entrainment and indirect effects on fish movements, pumps should be equipped with fine-mesh screening to lower this risk, and operation of pumps should be limited to nighttime periods of low fish abundance or movement. Similarly, lowering of floodgates should be conducted

prior to diel movements of fish when pump operations are anticipated as to limit potential for fish entrainment (Norman et al. 2023).

- All personnel associated with the project should be instructed about the potential presence of manatees, manatee speed zones, and the need to avoid collisions with and injury to manatees. Should a proposed action directly or indirectly affect the West Indian manatee, further coordination with the Service office will be necessary. More protection measures can be found in "*Manatee Protection Measures for South Carolina*" (USFWS 2021).

- Make all practicable efforts to avoid collisions, disturbances, and risk to the shortnose sturgeon and Atlantic sturgeon.

- Make all practicable efforts to avoid collisions and other disturbances affecting loggerhead, green, leatherback, and Kemp's ridley sea turtles. In the event that a turtle is injured or killed, USACE must contact the SC Marine Turtle Conservation Program stranding hotline at 843-633-1639.

- Avoid removing trees during sensitive timeframes (i.e. winter torpor, summer occupancy, pupping season) to avoid impacts to bats. Tricolored bats have been identified within the study area and NLEB may be present.

- When designing the culverts and relief bridges, planners should utilize the U.S. Forest Service guidelines and stream simulation method to avoid impacts to the entire ecosystem and associated species. The measures can be found in "*Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings*" (USFS 2008).

In addition to the recommendations from USFWS, NMFS has also provided rationalized support or otherwise for several measures to be considered in further refinement of project development.

NMFS fully supports:

- Nonstructural alternatives as its first option (i.e., acquisitions, elevations, and flood warning systems).
- For reasons cited above for each respective measure—barrier (weir) removal, raising of Pee Dee Highway with appropriate-sized bridges or culverts, limited benching, and relief bridges which include appropriately-sized culverts.

NMFS does not support, because of their unavoidable and potentially severe impacts to fish and wildlife resources, the following:

- Floodwalls or levees (and associated gates and pumps), detention ponds and floodgates. Levees are particularly egregious because while they may provide immediate protection to a section of stream bank, stream velocity increases and the downstream erosional impacts are intensified.

Lastly:

- A nature-based solution, water farming, poses a number of unknowns and may not be a viable measure. If the measure served as a deterrent to private development of the land, then it would be expected to provide some benefit."

APPENDIX A

Table A-1: Supporting habitats found throughout the ROI.

Habitat Type	Description
Open Water	Open water includes all unvegetated water bodies. In the ROI, this refers predominately to the Waccamaw River, some of its tributaries, and the mouth of the Waccamaw River at Winyah Bay.
Freshwater Marsh	Freshwater marsh are a type of freshwater wetlands dominated by emergent vegetation. Most of these marshes in the ROI are tidally influenced. Freshwater marshes remain flooded or saturated except during extremely dry weather periods. Most freshwater marshes in the ROI have intersecting abandoned dikes and canals erected for rice cultivation during the 18th and 19th centuries. This habitat type supports a great degree of plant diversity relative to similar habitats in the ROI. Common species of freshwater marsh plants are giant cutgrass, pickerelweed, wild rice, jewelweed, water parsnip, smartweeds, yellow pondlily, water hemlock, arrowhead, rose mallow, soft-stem bulrush, giant cordgrass, cattail, loosestrife, white water lily and alligator weed. Woody vegetation including tag alder, bald cypress, buttonbush, tupelo and black gum also grow on abandoned rice field levees.
Managed Wetlands	Managed wetlands in the ROI are generally former rice field areas impounded by dikes and levees, where hydrology is altered primarily for growth of emergent vegetation attractive to waterfowl. This may include smartweed, panic grass, wild millet, red root, water shield, spikerush, arrow-arrum, white water lily, southern naiad, Asiatic dayflower, soft-stem bulrush, wild rice, and water grass. Cultivated grains may also grown during drawdown periods.
Deciduous Forested Wetlands – Temporarily and Seasonally Flooded Tidal	Deciduous forested wetlands of this type are periodically influenced by tidal fluctuations. Flooding with lunar tides and high river flows often occurs in the winter through late spring. Inundation periods vary from few days to weeks in winter and early spring and as late as into the summer. These habitat types support a high level of diversity, but common trees include red maple, overcup oak, swamp chestnut oak, water oak, laurel oak, water hickory, green ash, sweet gum, river birch, swamp tupelo, bald cypress, and loblolly pine.
Deciduous Forested Wetlands – Semipermanently Flooded Tidal	Deciduous forested wetlands of this type remain flooded or saturated throughout most years but may be susceptible to drought periods. Tidal amplitudes influence water depths in these forests. Dominant plant species include swamp tupelo, bald cypress, green ash, water tupelo, and red maple.
Deciduous Forested and Shrub Wetlands – Regularly Flooded Tidal	Deciduous forested and shrub wetlands of this type remain flooded or saturated throughout most years. Water depths fluctuate regularly with tides. Dominant species of plants often include swamp privet, buttonbush, and tag alder.
Deciduous Forested and Shrub Wetlands – Temporarily Flooded or Saturated	Deciduous forested and shrub wetlands of this type remain flooded or saturated throughout the winter and briefly during spring. Tidal influences are often lacking in these habitats and usually occurs at the higher elevations. Typical plant species include swamp chestnut oak, water oak, cherrybark oak, loblolly pine, several species of hickories, white oak, tulip poplar, ironwood, sycamore, and sweetgum.
Deciduous Forested and Shrub Wetlands – Seasonal and Semipermanently Flooded	Deciduous forested and shrub wetlands of this type have varied periods of flooding, being for extensive periods during the growing season to throughout most of annual cycles. Tidal influence is little to none. Typical species in drier soils include water oak, green ash, American elm, and sweetgum. In wet soils species include overcup oak, water hickory, water tupelo, swamp tupelo, and bald cypress.
Evergreen Forested and Shrub Wetlands	Evergreen forested and shrub wetlands rarely experience inundation from flooding, but periodically retain soil moisture at the surface. This habitat is often at high elevations in the floodplain and results from poorly drained soils or pockets in surface topography. Common species include loblolly pine, spruce pine, live oak, and American holly. Beyond floodplain, habitats matching this definition may include bay swamps, pine savannahs, or wet pine

	flatwoods and are dominated by pond pine, loblolly bay, sweet bay, red bay, titi, fetter-bush, wax myrtle, zenobia, and sweet gallberry.
Upland Forests	Upland forests include any area that does not meet the definition of wetland or deepwater habitat as classified by Cowardin et al. (1979). Upland plant communities are highly diverse and include maritime sandhill community, longleaf pine savannahs, and flatwoods with intermittent inclusions of small evergreen and deciduous depressions, pocosins, freshwater depression meadows, broad-leafed deciduous swamps, and pond pine woodlands.

Table A-2: List of SGCN and non-SGCN plant species identified in the ROI by SCDNR (2023).

Common Name	Scientific Name	SWAP Priority
Scale-leaf Agalinis	*Agalinis aphylla*	Moderate
Pinebarrens Peanut-grass	*Amphicarpum amphicarpon*	N/A
Tawny Bluestem, Bog Bluestem	*Andropogon mohrii*	N/A
Purple Silkyscale	*Anthenantia rufa*	N/A
Big Three-awn	*Aristida condensata*	N/A
Stalked Milkweed, Savanna Milkweed	*Asclepias pedicellata*	N/A
Aquatic Milkweed	*Asclepias perennis*	N/A
Savanna Honeycomb-head, Yellow Balduina	*Balduina uniflora*	N/A
Crowfoot Sedge, Ravenfoot Sedge	*Carex crus-corvi*	N/A
Cypress-knee Sedge, Epiphytic Sedge	*Carex decomposita*	High
Elliott's Sedge	*Carex elliottii*	Moderate
Leatherleaf, Cassandra	*Chamaedaphne calyculata*	N/A
Twig-rush, Fen-sedge, Smooth Sawgrass	*Cladium mariscoides*	Moderate
Swamp Coreopsis	*Coreopsis gladiata*	N/A
Beadle's Coreopsis	*Coreopsis palustris*	N/A
Rose Coreopsis	*Coreopsis rosea*	High
Georgia Sunrose, Georgia Frostweed	*Crocanthemum georgianum*	N/A
Le Conte's Flatsedge	*Cyperus lecontei*	Moderate
Smallflower Halfchaff	*Cyperus subsquarrosus*	N/A
Venus Flytrap, Meadow Clam, Tippitiwitchet	*Dionaea muscipula*	High
Robbins's Spikerush	*Eleocharis robbinsii*	N/A
Viviparous Spikerush	*Eleocharis vivipara*	Moderate
Green-fly Orchid	*Epidendrum conopseum*	N/A
Recurved Eupatorium	*Eupatorium recurvans*	Moderate
Harper's Fimbry	*Fimbristylis perpusilla*	High
Swamp Jessamine	*Gelsemium rankinii*	N/A
Pinebarren Gentian	*Gentiana autumnalis*	High
Mud-babies, Dwarf-burhead	*Helanthium tenellum*	N/A
Pygmy Spiderlily, Waccamaw Spiderlily	*Hymenocallis pygmaea*	N/A
Sarvis Holly	*Ilex amelanchier*	N/A
Brown-fruited Rush	*Juncus pelocarpus*	N/A
Southern Bogbutton	*Lachnocaulon beyrichianum*	N/A
Brown Bogbutton	*Lachnocaulon minus*	Moderate
Carolina Lilaeopsis	*Lilaeopsis carolinensis*	Moderate
Pondspice	*Litsea aestivalis*	High
Long Beach Seedbox, Coastal Plain Water-purslane	*Ludwigia brevipes*	High
Carolina Birds-in-a-nest, Carolina Macbridea	*Macbridea caroliniana*	High

Narrowleaf Pondlily, Bonnets	*Nuphar sagittifolia*	N/A
Riverbank Evening-primrose	*Oenothera riparia*	N/A
Spiked Medusa, Smooth-lipped Eulophia	*Orthochilus ecristatus*	High
Savanna Cowbane	*Oxypolis ternata*	High
Carolina Grass-of-Parnassus, Savanna Parnassia, Eyebright	*Parnassia caroliniana*	High
Tidal Marsh Obedient-plant, Swamp Obedient-plant	*Physostegia leptophylla*	N/A
Sandhill Goldenaster	*Pityopsis pinifolia*	N/A
Pineland Plantain	*Plantago sparsiflora*	High
Swamp-forest Beaksedge	*Rhynchospora decurrens*	N/A
Narrow-fruit Horned Beaksedge	*Rhynchospora inundata*	N/A
Feather-bristled Beaksedge	*Rhynchospora oligantha*	N/A
Plymouth Gentian	*Sabatia kennedyana*	High
Weatherby's Arrowhead	*Sagittaria weatherbiana*	Moderate
Yellow Pitcherplant, Trumpets	*Sarracenia flava*	N/A
Chaffseed	*Schwalbea americana*	Highest
Baldwin's Nutrush	*Scleria baldwinii*	N/A
Beautiful Goldenrod, Carolina Goldenrod	*Solidago pulchra*	High
Wireleaf Dropseed	*Sporobolus teretifolius*	High
Smooth Hedge-nettle	*Stachys tenuifolia*	Moderate
Yellow Hatpins, Bantam-buttons	*Syngonanthus flavidulus*	N/A
Shortleaf Yellow-eyed-grass	*Xyris brevifolia*	Moderate
Elliott's Yellow-eyed-grass	*Xyris elliottii*	N/A
Savanna Yellow-eyed-grass	*Xyris flabelliformis*	Moderate
Florida Atamasco-lily, Red-margined Atamasco-lily	*Zephyranthes simpsonii*	High

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Clean Water Act Compliance Record (Placeholder)

ESA Compliance Record

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:
Project Code: 2024-0111771
Project Name: Waccamaw Flood Risk Study

07/03/2024 19:52:08 UTC

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 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 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:

https://www.fws.gov/sites/default/files/documents/endangered-species-consultation-handbook.pdf

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/program/migratory-bird-permit/what-we-do.

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/library/collections/threats-birds.

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/partner/council-conservation-migratory-birds.

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.

Note: IPaC has provided all available attachments because this project is in multiple field office jurisdictions.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Bald & Golden Eagles
- 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

This project's location is within the jurisdiction of multiple offices. However, only one species list document will be provided for all offices. The species and critical habitats in this document reflect the aggregation of those that fall in each of the affiliated office's jurisdiction. Other offices affiliated with the project:

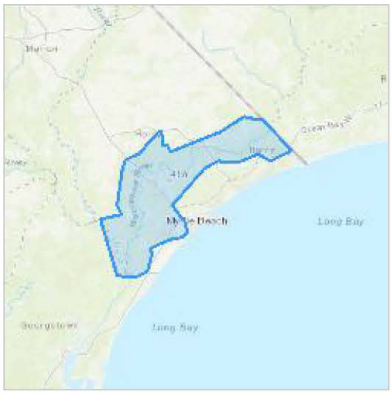
Raleigh Ecological Services Field Office
3916 Sunset Ridge Rd
Raleigh, NC 27607
(919) 856-4520

PROJECT SUMMARY

Project Code: 2024-0111771
Project Name: Waccamaw Flood Risk Study
Project Type: Bridge - New Construction
Project Description: This study is being performed to evaluate alternatives designed to reduce flood impacts in the areas of Longs/Red Bluff, COnway, Socastee and Bucksport. A number of structural and nonstructural alternatives were developed and evaluated and a TSP has been selected which involves (1) construction of three relief bridges in Conway along natural low-points in Highways 501, 501 Business and 905, and (2) removal of two existing low-head weirs on Socastee Creek in Socastee.

Project Location:

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@33.791596299999995,-79.01591121947823,14z



Counties: North Carolina and South Carolina

ENDANGERED SPECIES ACT SPECIES

There is a total of 19 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
Tricolored Bat *Perimyotis subflavus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/10515	Proposed 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
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-cockaded Woodpecker *Picoides borealis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/7614	Endangered
Rufa Red Knot *Calidris canutus rufa* There is **proposed** critical habitat for this species. Species profile: https://ecos.fws.gov/ecp/species/1864	Threatened
Wood Stork *Mycteria americana* Population: AL, FL, GA, MS, NC, SC No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8477	Threatened

REPTILES

NAME	STATUS
American Alligator *Alligator mississippiensis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/776	Similarity of Appearance (Threatened)
Green Sea Turtle *Chelonia mydas*	Threatened

NAME	STATUS
Population: North Atlantic DPS There is **proposed** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6199	
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

SNAILS

NAME	STATUS
Magnificent Ramshorn *Planorbella magnifica* There is **final** critical habitat for this species. Your location does not overlap the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6216	Endangered

INSECTS

NAME	STATUS
Monarch Butterfly *Danaus plexippus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9743	Candidate

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
Cooley's Meadowrue *Thalictrum cooleyi* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3281	Endangered
Pondberry *Lindera melissifolia* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1279	Endangered
Rough-leaved Loosestrife *Lysimachia asperulaefolia* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2747	Endangered

CRITICAL HABITATS

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

YOU ARE STILL REQUIRED TO DETERMINE IF YOUR PROJECT(S) MAY HAVE EFFECTS ON ALL ABOVE LISTED SPECIES.

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.

The following FWS National Wildlife Refuge Lands and Fish Hatcheries lie fully or partially within your project area:

FACILITY NAME	ACRES
WACCAMAW NATIONAL WILDLIFE REFUGE https://www.fws.gov/our-facilities?$keywords="%5C%22WACCAMAW+NATIONAL+WILDLIFE+REFUGE%5C%22"	37,930.458

BALD & GOLDEN EAGLES

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act[1] and the Migratory Bird Treaty Act[2].

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats[3], should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

1. The Bald and Golden Eagle Protection Act of 1940.
2. The Migratory Birds Treaty Act of 1918.
3. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

There are likely bald eagles present in your project area. For additional information on bald eagles, refer to Bald Eagle Nesting and Sensitivity to Human Activity

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

Project code: 2024-0111771 07/03/2024 19:52:08 UTC

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. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 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 "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

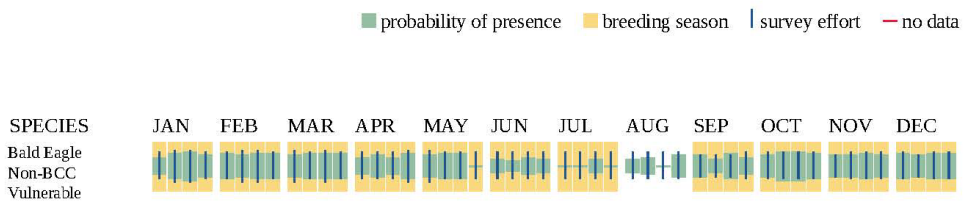
Probability of Presence (■)

Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

Breeding Season (■)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- 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
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

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[3] should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the "Supplemental Information on Migratory Birds and Eagles".

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)

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below 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
Bachman's Sparrow *Peucaea aestivalis* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/6177	Breeds May 1 to Sep 30

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. https://ecos.fws.gov/ecp/species/1626	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 https://ecos.fws.gov/ecp/species/9427	Breeds Mar 1 to Jul 15
Cerulean Warbler *Setophaga cerulea* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/2974	Breeds Apr 26 to Jul 20
Chimney Swift *Chaetura pelagica* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9406	Breeds Mar 15 to Aug 25
Chuck-will's-widow *Antrostomus carolinensis* 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/9604	Breeds May 10 to Jul 10
Coastal (waynes) Black-throated Green Warbler *Setophaga virens waynei* 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/11879	Breeds May 1 to Aug 15
Eastern Whip-poor-will *Antrostomus vociferus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/10678	Breeds May 1 to Aug 20
Grasshopper Sparrow *Ammodramus savannarum perpallidus* 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/8329	Breeds Jun 1 to Aug 20
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

NAME	BREEDING SEASON
Henslow's Sparrow *Centronyx henslowii* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3941	Breeds elsewhere
Kentucky Warbler *Geothlypis formosa* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9443	Breeds Apr 20 to Aug 20
King Rail *Rallus elegans* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8936	Breeds May 1 to Sep 5
Least Tern *Sternula antillarum antillarum* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/11919	Breeds Apr 25 to Sep 5
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 https://ecos.fws.gov/ecp/species/9511	Breeds Apr 25 to Aug 15
Pectoral Sandpiper *Calidris melanotos* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9561	Breeds elsewhere
Prairie Warbler *Setophaga discolor* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9513	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. https://ecos.fws.gov/ecp/species/9439	Breeds Apr 1 to Jul 31

NAME	BREEDING SEASON
Purple Sandpiper *Calidris maritima* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9574	Breeds elsewhere
Red-headed Woodpecker *Melanerpes erythrocephalus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9398	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 https://ecos.fws.gov/ecp/species/10633	Breeds elsewhere
Rusty Blackbird *Euphagus carolinus* 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/9478	Breeds elsewhere
Saltmarsh Sparrow *Ammospiza caudacuta* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9719	Breeds May 15 to Sep 5
Semipalmated Sandpiper *Calidris pusilla* 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/9603	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
Whimbrel *Numenius phaeopus hudsonicus* 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/11991	Breeds elsewhere
Willet *Tringa semipalmata* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/10669	Breeds Apr 20 to Aug 5

NAME	BREEDING SEASON
Wilson's Plover *Charadrius wilsonia* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9722	Breeds Apr 1 to Aug 20
Wood Thrush *Hylocichla mustelina* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9431	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 "Supplemental Information on Migratory Birds and Eagles", specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

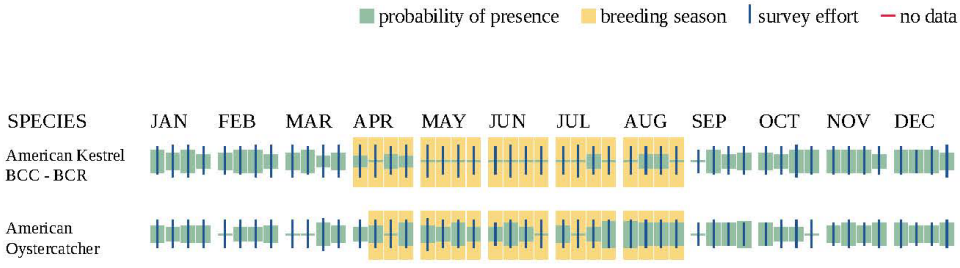
Probability of Presence (▪)

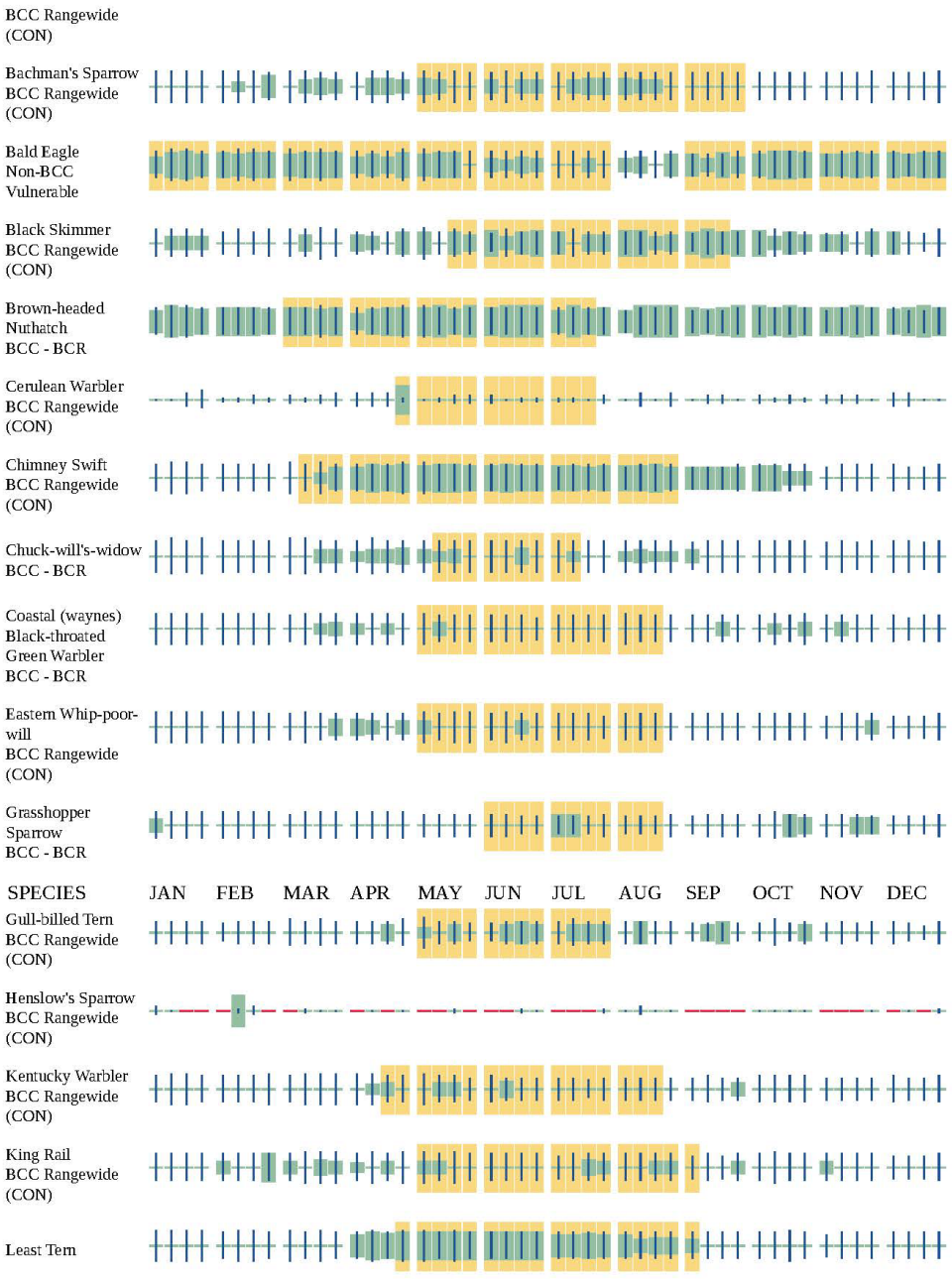
Green bars; the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during that week of the year.

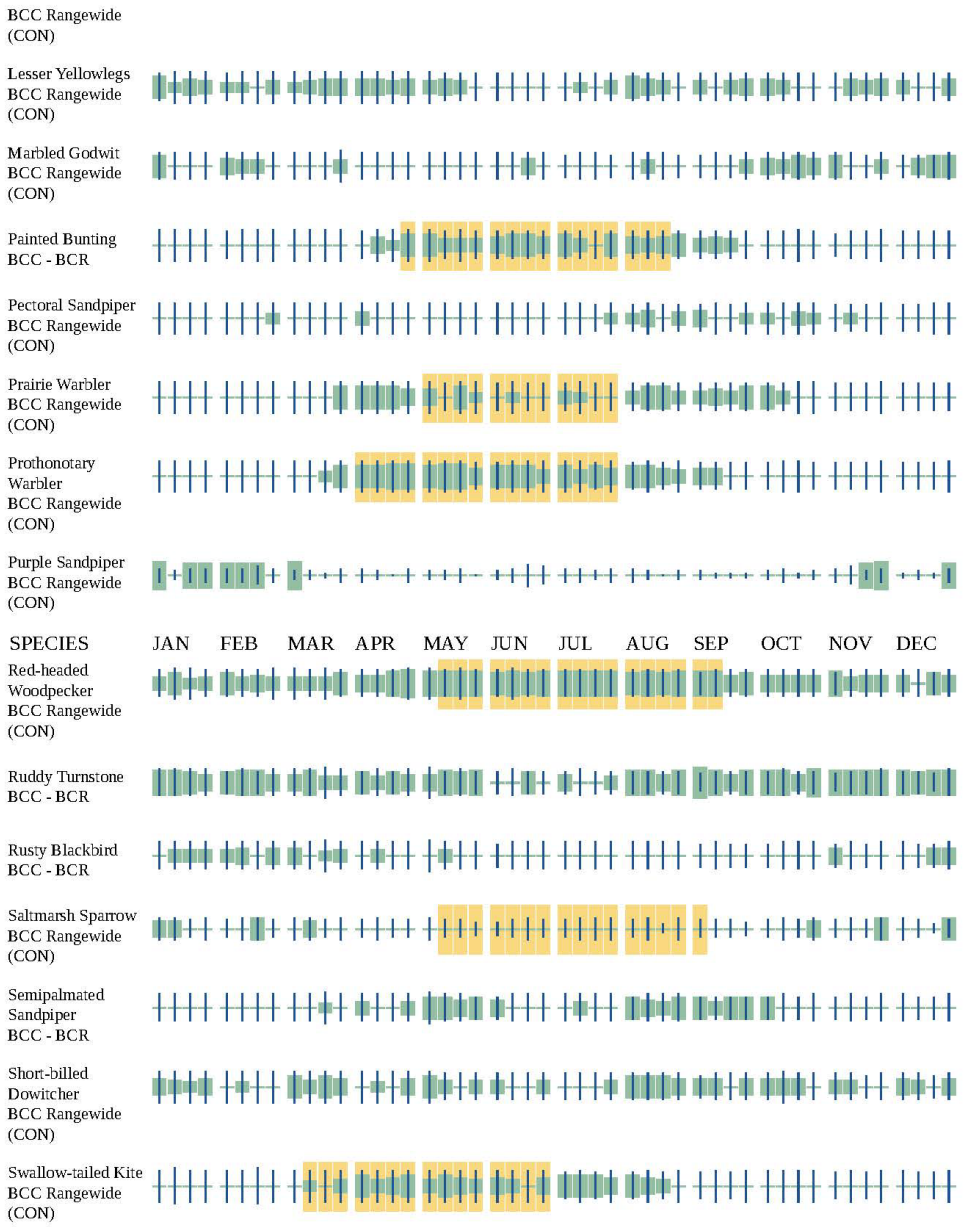
Breeding Season (▪)
Yellow bars; liberal estimate of the timeframe inside which the bird breeds across its entire range.

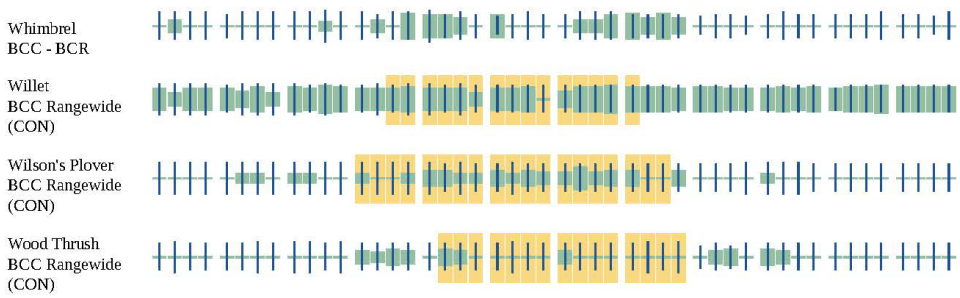
Survey Effort (|)
Vertical black lines; the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps.

No Data (–)
A week is marked as having no data if there were no survey events for that week.




BCC Rangewide (CON)
Bachman's Sparrow BCC Rangewide (CON)
Bald Eagle Non-BCC Vulnerable
Black Skimmer BCC Rangewide (CON)
Brown-headed Nuthatch BCC - BCR
Cerulean Warbler BCC Rangewide (CON)
Chimney Swift BCC Rangewide (CON)
Chuck-will's-widow BCC - BCR
Coastal (waynes) Black-throated Green Warbler BCC - BCR
Eastern Whip-poor-will BCC Rangewide (CON)
Grasshopper Sparrow BCC - BCR
SPECIES
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
Gull-billed Tern BCC Rangewide (CON)
Henslow's Sparrow BCC Rangewide (CON)
Kentucky Warbler BCC Rangewide (CON)
King Rail BCC Rangewide (CON)
Least Tern


BCC Rangewide (CON)
Lesser Yellowlegs BCC Rangewide (CON)
Marbled Godwit BCC Rangewide (CON)
Painted Bunting BCC - BCR
Pectoral Sandpiper BCC Rangewide (CON)
Prairie Warbler BCC Rangewide (CON)
Prothonotary Warbler BCC Rangewide (CON)
Purple Sandpiper 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
Saltmarsh Sparrow BCC Rangewide (CON)
Semipalmated Sandpiper BCC - BCR
Short-billed Dowitcher BCC Rangewide (CON)
Swallow-tailed Kite BCC Rangewide (CON)



Additional information can be found using the following links:

- Eagle Management https://www.fws.gov/program/eagle-management
- 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
- Supplemental Information for Migratory Birds and Eagles in IPaC https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action

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.

Due to your project's size, the list below may be incomplete, or the acreages reported may be inaccurate. For a full list, please contact the local U.S. Fish and Wildlife office or visit https://www.fws.gov/wetlands/data/mapper.HTML

FRESHWATER EMERGENT WETLAND

- PEM1Fd
- PEM1/SS1F
- PEM1Rd
- PEM1T
- PEM1Fx
- PEM1/SS4B
- PEM1B
- PEM1/SS4Bd
- PEM1/SS4A
- PEM1/SS4C
- PEM1C
- PEM1Cx
- PEM1Ad
- PEM1/FO1A
- PEM1/FO1C
- PEM1Bd

- PEM1Fh
- PEM1A
- PEM1/SS1C
- PEM1/SS1A
- PEM1R
- PEM1/FO4Cd
- PEM1Ax
- PEM1F
- PEM1Cd

FRESHWATER FORESTED/SHRUB WETLAND

- PFO1/2Ch
- PFO1/SS1C
- PFO1/2C
- PFO1/2A
- PFO1B
- PFO4/1C
- PSS1/4C
- PFO4A
- PFO1/2Cd
- PFO1/2F
- PFO1/2B
- PFO1/4B
- PFO1C

LAKE

- L1UBHx
- L1UBH
- L1UBHh

FRESHWATER POND

- PABGh
- PAB3V
- PABHx
- PAB4Hx

ESTUARINE AND MARINE WETLAND

- E2EM1N
- E2EM1P

RIVERINE

- R4SBCx

IPAC USER CONTACT INFORMATION

Agency: Army Corps of Engineers
Name: Niko Brown
Address: 69A Hagood Ave
City: Charleston
State: SC
Zip: 29403
Email niko.r.brown@usace.army.mil
Phone: 8433298145

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: 07/31/2024 20:24:11 UTC
Project code: 2024-0111771
Project Name: Waccamaw Flood Risk Study

Federal Nexus: yes
Federal Action Agency (if applicable): Army Corps of Engineers

Subject: Federal agency coordination under the Endangered Species Act, Section 7 for 'Waccamaw Flood Risk Study'

Dear Niko Brown:

This letter records your determination using the Information for Planning and Consultation (IPaC) system provided to the U.S. Fish and Wildlife Service (Service) on July 31, 2024, for 'Waccamaw Flood Risk Study' (here forward, Project). This project has been assigned Project Code 2024-0111771 and all future correspondence should clearly reference this number. **Please carefully review this letter. Your Endangered Species Act (Act) requirements may not be complete.**

Ensuring Accurate Determinations When Using IPaC

The Service developed the IPaC system and associated species' determination keys in accordance with the Endangered Species Act of 1973 (ESA; 87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) and based on a standing analysis. All information submitted by the Project proponent into IPaC must accurately represent the full scope and details of the Project.

Failure to accurately represent or implement the Project as detailed in IPaC or the Northern Long-eared Bat Rangewide Determination Key (DKey), invalidates this letter. ***Answers to certain questions in the DKey commit the project proponent to implementation of conservation measures that must be followed for the ESA determination to remain valid.***

Determination for the Northern Long-Eared Bat

Based upon your IPaC submission and a standing analysis completed by the Service, your project has reached the determination of "May Affect, Not Likely to Adversely Affect" the northern long-eared bat. Unless the Service advises you within 15 days of the date of this letter that your

IPaC-assisted determination was incorrect, this letter verifies that consultation on the Action is complete and no further action is necessary unless either of the following occurs:

- new information reveals effects of the action that may affect the northern long-eared bat in a manner or to an extent not previously considered; or,
- the identified action is subsequently modified in a manner that causes an effect to the northern long-eared bat that was not considered when completing the determination key.

15-Day Review Period

As indicated above, the Service will notify you within 15 calendar days if we determine that this proposed Action does not meet the criteria for a "may affect, not likely to adversely affect" (NLAA) determination for the northern long-eared bat. If we do not notify you within that timeframe, you may proceed with the Action under the terms of the NLAA concurrence provided here. This verification period allows the identified Ecological Services Field Office to apply local knowledge to evaluation of the Action, as we may identify a small subset of actions having impacts that we did not anticipate when developing the key. In such cases, the identified Ecological Services Field Office may request additional information to verify the effects determination reached through the Northern Long-eared Bat DKey.

Other Species and Critical Habitat that May be Present in the Action Area

The IPaC-assisted determination for the northern long-eared bat does not apply to the following ESA-protected species and/or critical habitat that also may occur in your Action area:

- American Chaffseed *Schwalbea americana* Endangered
- Canby's Dropwort *Oxypolis canbyi* Endangered
- Green Sea Turtle *Chelonia mydas* Threatened
- Kemp's Ridley Sea Turtle *Lepidochelys kempii* Endangered
- Leatherback Sea Turtle *Dermochelys coriacea* Endangered
- Monarch Butterfly *Danaus plexippus* Candidate
- Piping Plover *Charadrius melodus* Threatened
- Pondberry *Lindera melissifolia* Endangered
- Red-cockaded Woodpecker *Picoides borealis* Endangered
- Rufa Red Knot *Calidris canutus rufa* Threatened
- Tricolored Bat *Perimyotis subflavus* Proposed Endangered
- Wood Stork *Mycteria americana* Threatened

You may coordinate with our Office to determine whether the Action may affect the species and/or critical habitat listed above. Note that reinitiation of consultation would be necessary if a new species is listed or critical habitat designated that may be affected by the identified action before it is complete.

If you have any questions regarding this letter or need further assistance, please contact the South Carolina Ecological Services and reference Project Code 2024-0111771 associated with this Project.

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

Waccamaw Flood Risk Study

2. Description

The following description was provided for the project 'Waccamaw Flood Risk Study':

> This study is being performed to evaluate alternatives designed to reduce flood impacts in the areas of Longs/Red Bluff, Conway, Socastee and Bucksport. A number of structural and nonstructural alternatives were developed and evaluated and a TSP has been selected which involves (1) construction of three relief bridges in Conway along natural low-points in Highways 501, 501 Business and 905, and (2) removal of two existing low-head weirs on Socastee Creek in Socastee.

The approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/@33.817512550000004,-79.04267933844706,14z

DETERMINATION KEY RESULT

Based on the answers provided, the proposed Action is consistent with a determination of "may affect, but not likely to adversely affect" for the Endangered northern long-eared bat (*Myotis septentrionalis*).

QUALIFICATION INTERVIEW

1. Does the proposed project include, or is it reasonably certain to cause, intentional take of the northern long-eared bat or any other listed species?

   Note: Intentional take is defined as take that is the intended result of a project. Intentional take could refer to research, direct species management, surveys, and/or studies that include intentional handling/encountering, harassment, collection, or capturing of any individual of a federally listed threatened, endangered or proposed species?

   No

2. Your project overlaps with an area where northern long-eared bats may be present year-round. Time-of-year restrictions may not be appropriate for your project due to bats being active all year.

   Do you understand that your project may impact bats at any time during the year and time-of-year restrictions may not apply to your project?

   Yes

3. The action area does not overlap with an area for which U.S. Fish and Wildlife Service currently has data to support the presumption that the northern long-eared bat is present. Are you aware of other data that indicates that northern long-eared bats (NLEB) are likely to be present in the action area?

   Bat occurrence data may include identification of NLEBs in hibernacula, capture of NLEBs, tracking of NLEBs to roost trees, or confirmed NLEB acoustic detections. Data on captures, roost tree use, and acoustic detections should post-date the year when white-nose syndrome was detected in the relevant state. With this question, we are looking for data that, for some reason, may have not yet been made available to U.S. Fish and Wildlife Service.

   No

4. Does any component of the action involve construction or operation of wind turbines?

   Note: For federal actions, answer 'yes' if the construction or operation of wind power facilities is either (1) part of the federal action or (2) would not occur but for a federal agency action (federal permit, funding, etc.).

   No

5. Is the proposed action authorized, permitted, licensed, funded, or being carried out by a Federal agency in whole or in part?

   Yes

6. Is the Federal Highway Administration (FHWA), Federal Railroad Administration (FRA), or Federal Transit Administration (FTA) funding or authorizing the proposed action, in whole or in part?

   No

7. Are you an employee of the federal action agency or have you been officially designated in writing by the agency as its designated non-federal representative for the purposes of Endangered Species Act Section 7 informal consultation per 50 CFR § 402.08?

   Note: This key may be used for federal actions and for non-federal actions to facilitate section 7 consultation and to help determine whether an incidental take permit may be needed, respectively. This question is for information purposes only.

   Yes

8. Is the lead federal action agency the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC)? Is the Environmental Protection Agency (EPA) or Federal Communications Commission (FCC) funding or authorizing the proposed action, in whole or in part?

   No

9. Is the lead federal action agency the Federal Energy Regulatory Commission (FERC)?

   No

10. Have you determined that your proposed action will have no effect on the northern long-eared bat? Remember to consider the effects of any activities that would not occur but for the proposed action.

    If you think that the northern long-eared bat may be affected by your project or if you would like assistance in deciding, answer "No" below and continue through the key. If you have determined that the northern long-eared bat does not occur in your project's action area and/or that your project will have no effects whatsoever on the species despite the potential for it to occur in the action area, you may make a "no effect" determination for the northern long-eared bat.

    Note: Federal agencies (or their designated non-federal representatives) must consult with USFWS on federal agency actions that may affect listed species [50 CFR 402.14(a)]. Consultation is not required for actions that will not affect listed species or critical habitat. Therefore, this determination key will not provide a consistency or verification letter for actions that will not affect listed species. If you believe that the northern long-eared bat may be affected by your project or if you would like assistance in deciding, please answer "No" and continue through the key. Remember that this key addresses only effects to the northern long-eared bat. Consultation with USFWS would be required if your action may affect another listed species or critical habitat. The definition of Effects of the Action can be found here: https://www.fws.gov/media/northern-long-eared-bat-assisted-determination-key-selected-definitions

    No

11. Your project overlaps with an area where northern long-eared bats may be present year-round.

    Is suitable northern long-eared bat habitat present within 1000 feet of project activities?

    Yes

12. Will the action cause effects to a bridge?

    No

13. Will the action result in effects to a culvert or tunnel?

    No

14. Does the action include the intentional exclusion of northern long-eared bats from a building or structure?

    Note: Exclusion is conducted to deny bats' entry or reentry into a building. To be effective and to avoid harming bats, it should be done according to established standards. If your action includes bat exclusion and you are unsure whether northern long-eared bats are present, answer "Yes." Answer "No" if there are no signs of bat use in the building/structure. If unsure, contact your local U.S. Fish and Wildlife Services Ecological Services Field Office to help assess whether northern long-eared bats may be present. Contact a Nuisance Wildlife Control Operator (NWCO) for help in how to exclude bats from a structure safely without causing harm to the bats (to find a NWCO certified in bat standards, search the Internet using the search term "National Wildlife Control Operators Association bats"). Also see the White-Nose Syndrome Response Team's guide for bat control in structures

    No

.

15. Does the action involve removal, modification, or maintenance of a human-made structure (barn, house, or other building) **known or suspected to contain roosting bats?**

    No

16. Will the action directly or indirectly cause construction of one or more new roads that are open to the public?

    Note: The answer may be yes when a publicly accessible road either (1) is constructed as part of the proposed action or (2) would not occur but for the proposed action (i.e., the road construction is facilitated by the proposed action but is not an explicit component of the project).

    No

17. Will the action include or cause any construction or other activity that is reasonably certain to increase average daily traffic on one or more existing roads?

    Note: For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.). .

    No

18. Will the action include or cause any construction or other activity that is reasonably certain to increase the number of travel lanes on an existing thoroughfare?

    For federal actions, answer 'yes' when the construction or operation of these facilities is either (1) part of the federal action or (2) would not occur but for an action taken by a federal agency (federal permit, funding, etc.).

    No

19. Will the proposed action involve the creation of a new water-borne contaminant source (e.g., leachate pond pits containing chemicals that are not NSF/ANSI 60 compliant)?

    No

20. Will the proposed action involve the creation of a new point source discharge from a facility other than a water treatment plant or storm water system?

    No

21. Will the action include drilling or blasting?

    Yes

22. Will the drilling or blasting affect known or potentially suitable hibernacula, summer habitat, or active year-round habitat (where applicable) for the northern long-eared bat?

    Note: In addition to direct impacts to hibernacula, consider impacts to hydrology or air flow that may impact the suitability of hibernacula. Additional information defining suitable summer habitat for the northern long-eared bat can be found at: https://www.fws.gov/media/northern-long-eared-bat-assisted-determination-key-selected-definitions

    Yes

23. Will the proposed action result in the cutting or other means of knocking down, bringing down, or trimming of any trees suitable for northern long-eared bat roosting?

Note: Suitable northern long-eared bat roost trees are live trees and/or snags ≥3 inches dbh that have exfoliating bark, cracks, crevices, and/or cavities.

Yes

PROJECT QUESTIONNAIRE

Will all project activities by completed by November 30, 2024?

No

In what extent of the area (in acres) will trees be cut, knocked down, or trimmed during the inactive (hibernation) season for northern long-eared bat? **Note:** Inactive Season dates for spring staging/fall swarming areas can be found here: https://www.fws.gov/media/inactive-season-dates-swarming-and-staging-areas

0.3

Enter the extent of the action area (in acres) from which trees will be removed - round up to the nearest tenth of an acre. For this question, include the entire area where tree removal will take place, even if some live or dead trees will be left standing.

0.3

In what extent of the area (in acres) will trees be cut, knocked down, or trimmed during the active (non-hibernation) season for northern long-eared bat? **Note:** Inactive Season dates for spring staging/fall swarming areas can be found here: https://www.fws.gov/media/inactive-season-dates-swarming-and-staging-areas

0.3

Will all potential northern long-eared bat (NLEB) roost trees (trees ≥3 inches diameter at breast height, dbh) be cut, knocked, or brought down from any portion of the action area greater than or equal to 0.1 acre? If all NLEB roost trees will be removed from multiple areas, select 'Yes' if the cumulative extent of those areas meets or exceeds 0.1 acre.

Yes

Enter the extent of the action area (in acres) from which all potential NLEB roost trees will be removed. If all NLEB roost trees will be removed from multiple areas, entire the total extent of those areas. Round up to the nearest tenth of an acre.

0.3

For the area from which all potential northern long-eared bat (NLEB) roost trees will be removed, on how many acres (round to the nearest tenth of an acre) will trees be allowed to regrow? Enter '0' if the entire area from which all potential NLEB roost trees are removed will be developed or otherwise converted to non-forest for the foreseeable future.

0

Will any snags (standing dead trees) ≥3 inches dbh be left standing in the area(s) in which all northern long-eared bat roost trees will be cut, knocked down, or otherwise brought down?

No

IPAC USER CONTACT INFORMATION

Agency: Army Corps of Engineers
Name: Niko Brown
Address: 69A Hagood Ave
City: Charleston
State: SC
Zip: 29403
Email niko.r.brown@usace.army.mil
Phone: 8433298145

CZMA Compliance Record

General Coastal Zone Consistency (GCZC) Certification
Notification Request Form

The intent of General Coastal Zone Consistency Certifications (GCZC) is to provide a means by which certain activities determined to have minimal impact and to be consistent with the S. C. Coastal Zone Management Program (SCCZMP) may be authorized with minimal delay. GCZC's serve as the final staff coastal zone consistency certification decision associated with activities covered by applicable State permits unless DHEC CZC staff determine that an individual certification will be required, or unless otherwise specified. The GCZCs are issued under the provisions of Act 123 of the 1977 South Carolina General Assembly and the 1979 SCCZMP of the Department of Health and Environmental Control Division of Ocean and Coastal Resource Management.

Project Name:	
Waccamaw River Flood Risk Management	
Applicant Information: Company Name: US Army Corps of Engineers Contact Name: Niko Brown Address: 69A Hagood Ave Charleston, SC 29403 Phone #: 603-258-8589 E-mail: niko.r.brown@usace.army.mil	**Agent/Engineer Information:** Company Name: Contact Name: Address: Phone #: E-mail:
Site details: Address/Location: Locations in Conway and Socastee County: Horry TMS:	
Type of Permit Requested: (ex. NPDES, Mining, etc) General CZC Certification	**Name of Permitting Authority(s):** (ex. DHEC Bureau of Water) DES Bureau of Coastal Management

DHEC 0352 (11/2013)

Description of Proposed Activity(s):

Proposed actions include the following in Conway: Construction of three separate and complete relief bridges (cross drains) each of which are estimated to result in less than 0.1 acres of permanent wetland loss. Locations and dimensions are currently approximated as follows: 79.0358664°W 33.8391803°N on Highway 905 and about 75' both directions from centerline, 79.0335799°W 33.8255950°N on Highway 501 Business and about 100' both directions from centerline, 79.0408345°W 33.8166558°N on E Highway 501 and about 150' both directions from centerline. Each cross drain is estimated to be 22' in width.
Proposed actions include the following in Socastee: Removal of existing weirs at 78.9544022°W 33.7169176°N and 78.9674252°W 33.7104302°N.

List any other State permits or Coastal Zone Consistency certifications completed for this project site. If applicable, list project name and permit/CZC number.

None at this time. A pre-filing meeting request is being prepared for submission to DES Bureau of Water to request concurrence that General Certification for NWP applies with respect to NWP 14 and 53 for these actions.

Are impacts to wetlands proposed on this site? If yes, what is the acreage of the proposed wetland impact? (If over 0.10 acre, this project is not eligible for authorization under a GCZCs and an individual CZC Certification will be required.

Each cross drain would result in less than 0.10 acres of permanent wetland impacts.

No wetland impacts associated with weir removal.

If no, circle N/A. ☐

Submitted By (print): Niko Brown

Signature and Date: BROWN.NIKO.ROBERT.1617428810 Digitally signed by BROWN.NIKO.ROBERT.1617428810 Date: 2024.08.07 12:49:09 -04'00'

How to complete the form:

1. State basic required information to fullest extent.
2. Type of Permit Requested: list all state permits that has been requested to undertake the project. The general certification will apply to that project.
3. Name of Permitting Authorities: list all state permit authorities that administers permits listed in number 2.
4. Describe the project: be specific in listing the project that is requested. For example a highway, residential subdivision, water line, etc… The information should mimic applicable policies.
5. Describe any wetlands on site that are to be impacted. Any wetland impact over 0.10 acres renders the request ineligible for the GCZC program and the applicant must apply for an individual CZC.
6. Applicant signs, dates and submits the form.

DHEC 0352 (11/2013)

Waccamaw River, Horry County, South Carolina Flood Risk Management Study Draft Integrated Feasibility Report and Environmental Assessment Appendix D. Cultural Resources

US Army Corps of Engineers

September 2024

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Contents

1.0 Cultural and Historic Resources

The Waccamaw River feasibility study, located in Horry County, South Carolina, consists of four focus areas. The four areas include Longs/Red Bluff, Conway, Socastee, and Bucksport. In these areas, residents have experienced increasing episodes of flooding and consequential flood damage. While the goal of this feasibility study is to reduce flooding in residential areas, there is also a concern to cultural and historic resources within and near the project areas.

Flooding along the coast and reaching up rivers into low lying areas will cause flooding within/near historic properties and damage buildings. Damage may include, but is not limited to, structural damage and destruction of historic materials (e.g., furniture, textiles, archives, etc.). Erosion poses threats to historic properties and both terrestrial and submerged archaeological sites. Erosion can eliminate surface evidence of archaeological sites, wear away site layers, and displace materials from various cultural layers making recovery and interpretation challenging, if not impossible. Erosion will impact features more severely due to the disturbed nature of the soil, while leaving intact topographic layers less damaged.

On June 24, 2024, the Waccamaw Project Development Team (PDT) selected the Tentatively Selected Plan (TSP). The TSP includes bridge relief modifications in Conway and barrier/weir removal in the Socastee area. Additionally, none of the alternatives at Longs/Red Bluff and Bucksport were selected for the TSP.

The TSP will require additional cultural resource surveys within the footprint of the weir removal in Socastee and the bridge reliefs in Conway. Although no previously identified cultural resources were documented, a Phase I survey will be required within each of the project areas. Archaeological surveys will require funding in order to comply with Section 106 of the National Historic Preservation Act (NHPA).

1.1 Project Study Areas- Final Array of Alternatives

1.1.1 Longs/ Red Bluff

There are a total of 37 historic structures and 14 archaeological sites within the Longs/Red Bluff study area.

LR1-Levee/Floodwall Along Buck Creek at Rolling Ridge and Cox Lane

1.1.1.1 Existing Setting

Four previous cultural resources surveys have been performed in the area. No known sites are located within the project area. Eight archaeological sites are located within a half-mile of the study area (38HR135, 38HR137, 38HR232, 38HR472, 38HR546, 38HR547, 38HR548, and 38HR549). These include historic and prehistoric artifact scatters and a cemetery. Two sites are potentially eligible for NRHP listing (38HR232 and 38HR472), one is a multicomponent prehistoric and historic site and the other is the Bellamy Family Cemetery.

1.1.1.2 Future without Project Conditions

The future without project condition would continue to pose flood risk to both identified and

unidentified archaeological resources along Buck Creek and Cox Lane and possibly damage and erode sites during major flood events. Such damage could destroy site integrity and pose risk to exposing archaeological resources to looting.

LR3-Simpson Creek Benching, Relief Bridges

1.1.1.3 Existing Setting

There are no previous surveys performed in the area. No known sites are located within the project area. Two archaeological sites are located within a half-mile study area (38HR147 and 38HR148), both of which are documented as Late Archaic to Middle Woodland lithic and ceramic scatters and are recommended ineligible. The relief bridge portion is not historic and was constructed in 1986.

1.1.1.4 Future without Project Conditions

The future without project condition would continue to pose flood risk to both identified and unidentified archaeological resources along Simpson Creek and possibly damage and erode sites during major flood events. Such damage could destroy site integrity and pose risk to exposing archaeological resources to looting.

LR6-Levee/Floodwall Along Buck Creek and Rolling Ridge, Benching, Relief Bridges

1.1.1.5 Existing Setting

Levee/Floodwall: Four previous surveys have been performed in the area. No known sites are located within the project area. Eight archaeological sites are located within a half mile of the study area (38HR135, 38HR137, 38HR232, 38HR472, 38HR546, 38HR547, 38HR548, and 38HR549). These include historic and prehistoric artifact scatters and a cemetery. Two sites are potentially eligible (38HR232 and 38HR472), one of these is a multicomponent prehistoric and historic site and the other is the Bellamy Family Cemetery.

Benching and Relief Bridges: One previous survey was performed in the area. No known sites are located within the project area. Two archaeological sites are located within a half mile of the study area (38HR147 and 38HR148), both of which are documented as Late Archaic to Middle Woodland lithic and ceramic scatters and are recommended ineligible. The relief bridge portion is not historic and was constructed in 1986.

1.1.1.6 Future without Project Conditions

The future without project condition would continue to pose flood risk to both identified and unidentified archaeological resources along Buck Creek and Rolling Ridge and possibly damage and erode sites during major flood events. Such damage could destroy site integrity and pose risk to exposing archaeological resources to looting.

LRBNS3-Elevation

1.1.1.7 Existing Setting

Areas proposed for structural elevation were researched for identified cultural resources and

previously defined archaeological surveys using a half-mile study area. One historic structure is documented within the project area, while an additional four historic structures are documented within the half-mile study area. All historic structures date from the early 1900s to the 1950s and are not eligible for listing in the NRHP. Two archaeological sites (38HR595 and 38HR283) were documented within the study area. Site 38HR595 is an early 20th century house structure, while 38HR283 is a prehistoric site with an unknown cultural period component. Neither of these sites were determined to be eligible for listing in the NRHP. In addition to the archaeological sites, two previous surveys were documented within the half-mile study area.

1.1.1.8 Future without Project Conditions

The future without project condition would continue to pose flood risk to both identified and unidentified archaeological resources and possibly damage and erode sites during major flood events. Such damage could destroy site integrity and pose risk to exposing archaeological resources to looting. Historic structures located in low-lying areas would continue to be damaged during floods, risking increased maintenance/renovation costs and total loss of the structures' historical significance if damage continues.

LRBNS4-Acquisition

1.1.1.9 Existing Setting

Areas proposed for structural acquisition were researched for identified cultural resources and previously defined archaeological surveys using a half-mile study area. One historic structure is documented within the project area, while an additional four historic structures are documented within the half-mile study area. All historic structures date from the early 1900s to the 1950s and are not eligible for listing in the NRHP. Two archaeological sites (38HR595 and 38HR283) were documented within the study area. Site 38HR595 is an early 20th century house structure, while 38HR283 is a prehistoric site with an unknown cultural period component. Neither of these sites were determined to be eligible for listing in the NRHP. In addition to the archaeological sites, two previous surveys were documented within the half-mile study area.

1.1.1.10 Future without Project Conditions

The future without project condition would continue to pose flood risk to both identified and unidentified archaeological resources and possibly damage and erode sites during major flood events. Such damage could destroy site integrity and pose risk to exposing archaeological resources to looting. Properties would remain under private ownership, and the potential resources located on these properties would continue to be damaged by flooding events.

1.1.2 Conway

There are a total of 38 historic areas and 181 significant historic structures within the Conway project area.

C3-Relief Bridges

1.1.2.1 Existing Setting

Relief Bridge at Highway 905: there are no documented surveys or sites within the project area. Six archaeological sites are located within a half-mile study area (38HR1, 38HR32, 38HR62,

38HR63, 38HR317, and 38HR339), one of which is eligible (38HR1) and another that is potentially eligible (38HR32) for inclusion in the NRHP. There are several archaeological sites documented within the Waccamaw River in that area and three historic points in close proximity to the project area that will need to be better assessed. The sites located within the Waccamaw River are 38HR32, 38HR63, 38HR339, and 38HR62. The three historic points near the project area include Conway Railroad Station (not NRHP eligible), Atlantic Coastline Railroad Depot (NRHP-listed), and the Railroad bridge over the Waccamaw River (NRHP-eligible).

Relief Bridge at Highway 501 Business: there is one documented survey in the project study area, but none in the project area. There is one known site (368HR62) within the project area, which is documented as a 19th and 20th century site with unknown NRHP eligibility determination. There are four additional archaeological sites within a half-mile study area (38HR1, 38HR63, 38HR317, and 38HR339), one of which (38HR1) is determined eligible for the NRHP and is documented as a 19th century site within the Conway Downtown Historic District. Some of these sites are submerged cultural resources. The submerged sites include 38HR63, 38HR339, and 38HR62. A portion of the Waccamaw River Warehouse Historic District is within the project area, whereas the entirety of the Waccamaw River Warehouse Historic District and the Conway Downtown Historic District and portions of the Conway Residential Historic District are within the half-mile study area. There is a historic bridge (Waccamaw River Memorial Bridge) that is the focus of this alternative.

Relief Bridge at E Highway 501: there are two documented surveys within the project study area, but none in the project area. No archaeological sites are documented within a half-mile study area. Two historic structures within a half-mile study area, which are structures dating to the 1960s that are not eligible.

1.1.2.2 Future without Project Conditions

The future without project condition would continue to pose flood risk to both identified and unidentified archaeological resources and possibly damage and erode sites during major flood events near the roads. Such damage could destroy site integrity and pose risk to exposing archaeological resources to looting. Historic structures located near the roadways would continue to be damaged during floods.

C5-Comprehensive Structural and Non-Structural Plan

1.1.2.3 Existing Setting

The comprehensive structural and non-structural plan includes a combination of Relief Bridges (C3), structural elevation (CNS2), and acquisition (CNS1).

1.1.2.4 Future without Project Condition

The future without project condition would continue to pose flood risk to both identified and unidentified archaeological resources and possibly damage and erode sites during major flood events. Such damage could destroy site integrity and pose risk to exposing archaeological resources to looting.

CNS1-Acquisition

1.1.2.5 Existing Setting

Figure 1: Proposed acquisition areas along the Waccamaw River. Each acquisition area is shaded in yellow and was analyzed starting from upriver (northeast) and working down (southwest).

Acquisition Area 1 has had one survey performed that covers a portion of the project area. No cultural resources identified within the portion of the project area have been surveyed, but there is one archaeological site and five historic structures within the half-mile study area. The archaeological site (38HR121) is documented as an unknown prehistoric and 19th century multicomponent site that is potentially eligible for inclusion in the NRHP. The historic structures are not NRHP-eligible.

Acquisition Area 2 has had two surveys within the study area. Two archaeological sites (38HR182 and 38HR183) documented within the project area, which are a Late Archaic to Middle Woodland and 18th century multicomponent site and a Mississippian and 18th century multicomponent site, both of which are not eligible for listing in the NRHP. An additional 21 archaeological sites, along with 4 historic structures, are documented within the half-mile study area. Most of these are not NRHP-eligible, but a few sites (38HR468, 48HR469, and 38HR470) are potentially NRHP-eligible. The historic structures are not eligible for the NRHP.

Acquisition Area 3 has no documented surveys within the study area. There are 13 archaeological sites documented within the project area (38HR353-38HR364, 38HR366), with an additional archaeological site (38HR365) and 15 historic structures within the half-mile study area. The sites

within the project area are mostly prehistoric sites that are not eligible, but there are three Early to Middle Woodland sites (38HR358, 38HR360, 38HR364) that have unknown eligibility. The historic structures are not eligible.

Acquisition Area 4 has two documented surveys within the project area, and another within the half-mile study area. There are two archaeological sites (38HR7, 38HR34) and four historic structures present within the project area. One of the archaeological sites (38HR34) is documented as a 19th and 20th century site that is NRHP eligible, while the other resources are not eligible.

Acquisition Area 5 has no documented surveys or cultural resources present within the half-mile study area.

Acquisition Area 6 has no documented surveys within the study area. Two archaeological sites (38HR124, 38HR125) and one National Register Point (Buck's Upper Mill Farm) are documented within the project area. Both sites are potentially eligible and are documented as 18th and 19th century historic sites, and 38HR125 also has a 20th century component to it. One additional archaeological site (38HR35) and an additional seven historic structures are located within the half-mile study area. The site and three of the historic structures are potentially eligible.

Acquisition Area 7 has no documented surveys within the study area. There are no archaeological sites within the project area, but there is one archaeological site (38HR3) that is not eligible within the half-mile study area.

Acquisition Area 8 has two surveys documented within the project area, and an additional survey documented within the half-mile study area. There are no archaeological sites within the project area, but there are two archaeological sites (38HR171, 38HR172) and two historic structures within the half-mile study area, all of which are not eligible.

1.1.2.6 Future without Project Conditions

The future without project condition would continue to pose flood risk to both identified and unidentified archaeological resources and possibly damage and erode sites during major flood events. Such damage could destroy site integrity and pose risk to exposing archaeological resources to looting. Properties would remain under private ownership, and the potential resources located on these properties would continue to be damaged by flooding events.

1.1.3 Socastee

There are two historic areas and 38 historic structures within the Socastee project area.

S1-Floodwall and Barrier Removal

1.1.3.1 Existing Setting

Floodwall: No surveys have been performed in the project area, but four surveys have been performed in the half-mile study area. There are three archaeological sites (38HR47, 38HR163, 38HR385) within the half-mile study area. The archaeological site (38HR47) is an unknown prehistoric site. Site 38HR163 is a 20th century site, and site 38HR385 is identified as an unknown prehistoric site with a Middle Woodland component. Two historic structures are also located within the study area and are identified as mid 1950s structures. None of the resources are eligible for listing.

Barrier Removal:
Upstream Weir (North/East): No documented surveys in the project area, while there are two survey areas within the half-mile study area. No cultural resources are documented within the project area or the half-mile study area.

Downstream Weir (South/West): No documented surveys in the project area, while there are two survey areas within the half-mile study area. No cultural resources are documented within the project area, but two sites (38HR47, 38HR385) are documented within the half-mile study area. Both sites are prehistoric in nature and are not eligible.

1.1.3.2 Future without Project Conditions

The future without project condition would continue to pose flood risk to both identified and unidentified archaeological resources and possibly damage and erode sites during major flood events. Such damage could destroy site integrity and pose risk to exposing archaeological resources to looting.

S2-Detention Pond with Channel to Socastee Creek

1.1.3.3 Existing Setting

No surveys have been performed in the project area, but four surveys have been performed in the study area. No cultural resources are documented within the project area or the half-mile study area.

1.1.3.4 Future without Project Conditions

The future without project condition would continue to pose flood risk to both identified and unidentified archaeological resources along Socastee Creek and possibly damage and erode sites during major flood events. Such damage could destroy site integrity and pose risk to exposing archaeological resources to looting.

S3-Barrier Removal

1.1.3.5 Existing Setting

Upstream Weir (North/East): No documented surveys in the project area, while there are two survey areas within the half-mile study area. No cultural resources are documented within the project area or the half-mile study area.

Downstream Weir (South/West): No documented surveys in the project area, while there are two survey areas within the half-mile study area. No cultural resources are documented within the project area, but two sites (38HR47, 38HR385) are documented within the half-mile study area. Both sites are prehistoric in nature and are not eligible.

1.1.3.6 Future without Project Conditions

The future without project condition would continue to pose flood risk to both identified and unidentified archaeological resources and possibly damage and erode sites during major flood events. Such damage could destroy site integrity and pose risk to exposing archaeological resources to looting.

S4-Comprehensive Structural and Nonstructural Plan

1.1.3.7 Existing Setting

The comprehensive structural and nonstructural plan includes a floodwall (S1), a detention pond with channel to Socastee Creek (S2), and structural elevation (SNS1).

1.1.3.8 Future without Project Conditions

The future without project condition would continue to pose flood risk to both identified and unidentified archaeological resources and possibly damage and erode sites during major flood events. Such damage could destroy site integrity and pose risk to exposing archaeological resources to looting.

SNS1-Elevation

1.1.3.9 Existing Setting

Approximately 12 surveys have occurred within the project area and surrounding half-mile study area. There are 13 archaeological sites, 45 historic structures, one NRHP polygon, and two historic areas within the half-mile study area, some of which are located within the project area. At least three sites within the study area are documented as potentially eligible for inclusion in the NRHP. Site 38HR271 is documented as a 18th, 19th, and 20th century site, site 38HR273 is documented as a 19th and 20th century site, and site 38HR274 is documented as a 19th century site. The remaining sites are documented as not eligible or potentially not eligible for listing in the NRHP and range from prehistoric to historic sites (38HR272, 38HR367, 38HR368, 38HR385, 38HR578, 38HR579, 38HR580, 38HR591, 38HR592, 38HR593). Many of the historic structures belong to the Socastee Historic District, which is located within the project area. These historic properties include the Cooper Mercantile and Postal Store, Tenant House, Thomas Beaty Cooper House, Rubin Sarvis House, and the Socastee Intracoastal Waterway Bridge, all of which are contributing to the historic district. The Central Hall House is an eligible property located in a historic area as well. Other historic structures include other historic homes, barns, and churches, all of which are currently indicated as not eligible for the NRHP but may need to be reassessed.

1.1.3.10 Future without Project Conditions

The future without project condition would continue to pose flood risk to both identified and unidentified archaeological resources and possibly damage and erode sites during major flood events. Such damage could destroy site integrity and pose risk to exposing archaeological resources to looting. Historic structures located in low-lying areas would continue to be damaged during floods, risking increased maintenance/renovation costs and total loss of the structures' historical significance if damage continues.

SNS4-Acquisition

1.1.3.11 Existing Setting

Approximately 12 surveys have occurred within the project area and surrounding half-mile study area. There are 13 archaeological sites, 45 historic structures, one NRHP polygon, and two historic areas within the half-mile study area, some of which are located within the project area. At least three sites within the study area are documented as potentially eligible. Site 38HR271 is

documented as a 18th, 19th, and 20th century site, site 38HR273 is documented as a 19th and 20th century site, and site 38HR274 is documented as a 19th century site. The remaining sites are documented as not eligible or potentially not eligible and range from prehistoric to historic sites (38HR272, 38HR367, 38HR368, 38HR385, 38HR578, 38HR579, 38HR580, 38HR591, 38HR592, 38HR593). Many of the historic structures belong to the Socastee Historic District, which is located within the project area. These historic properties include the Cooper Mercantile and Postal Store, Tenant House, Thomas Beaty Cooper House, Rubin Sarvis House, and the Socastee Intracoastal Waterway Bridge, all of which are contributing to the historic district. The Central Hall House is an eligible property located in a historic area as well. Other historic structures include other historic homes, barns, and churches, all of which are currently indicated as not eligible, but may need to be reassessed.

1.1.3.12 Future without Project Conditions

The future without project condition would continue to pose flood risk to both identified and unidentified archaeological resources and possibly damage and erode sites during major flood events. Such damage could destroy site integrity and pose risk to exposing archaeological resources to looting. Properties would remain under private ownership, and the potential resources located on these properties would continue to be damaged by flooding events.

1.1.4 Bucksport

There are nine historic structures and six archaeological sites within the Bucksport project area.

B1-Floodgate

1.1.4.1 Existing Setting

Two previous surveys have been performed in the study area. There are no documented sites within the project area, but one site (38HR599) within a half-mile study area. Site 38HR599 is a 19th and 20th century site and is not eligible for NRHP listing.

1.1.4.2 Future without Project Conditions

The future without project condition would continue to pose flood risk to both identified and unidentified archaeological resources and possibly damage and erode sites during major flood events. Such damage could destroy site integrity and pose risk to exposing archaeological resources to looting. Properties would remain under private ownership, and the potential resources located on these properties would continue to be damaged by flooding events.

B2-Pee Dee Highway Elevation

1.1.4.3 Existing Setting

No previous surveys have been conducted within a half-mile study area. There are no documented sites within the project area, but there is one archaeological site (38HR631) and 24 historic structures within the half-mile study area. The site (38HR631) is documented as a 19th and 20th century house site that is ineligible for the NRHP. None of the 24 historic structures are documented as eligible, but ten of the historic structures are in close proximity to the project area and may need to be reassessed for eligibility. These structures include a structure dating to 1726,

a farm dating to the 1900s, a church dating to the 1950s, houses dating to the 19th and 20th centuries and other structures dating from the 1920s to 1950s.

1.1.4.4 Future without Project Conditions

The future without project condition would continue to pose flood risk to both identified and unidentified archaeological resources and possibly damage and erode sites during major flood events. Such damage could destroy site integrity and pose risk to exposing archaeological resources to looting. Historic structures located in low-lying areas would continue to be damaged during floods, risking increased maintenance/renovation costs and total loss of the structures' historical significance if damage continues.

BNS1-Acquisition

1.1.4.5 Existing Setting

No surveys have been conducted within the project area, but two survey lines are documented within the half-mile study area. There are no archaeological sites documented within the project area or within the half-mile study area. No historic structures are documented within the project area or study area.

1.1.4.6 Future without Project Conditions

The future without project condition would continue to pose flood risk to both identified and unidentified archaeological resources and possibly damage and erode sites during major flood events. Such damage could destroy site integrity and pose risk to exposing archaeological resources to looting. Properties would remain under private ownership, and the potential resources located on these properties would continue to be damaged by flooding events.

BNS2-Elevation

1.1.4.7 Existing Setting

No surveys have been conducted within the project area, but two surveys are documented within the half-mile study area. There are no archaeological sites documented within the project area or within the half-mile study area. No historic structures are documented within the project area or study area.

1.1.4.8 Future without Project Conditions

The future without project condition would continue to pose flood risk to both identified and unidentified archaeological resources and possibly damage and erode sites during major flood events. Such damage could destroy site integrity and pose risk to exposing archaeological resources to looting. Historic structures located in low-lying areas would continue to be damaged during floods, risking increased maintenance/renovation costs and total loss of the structures' historical significance if damage continues.

1.2 Tentatively Selected Plan

C3-Relief Bridges

1.2.1.1 Existing Setting

This plan includes adding relief bridges/culverts at Highway 501 Business, the Highway 501 bypass, and at Highway 905 to increase conveyance through these areas where potential bottlenecking is occurring (Figure 1). The exact location and length of the bridges along these roadways is still being determined and will depend on the amount of additional flow needed. Edward E. Burroughs relief bridges would most likely consist of culverts due to the proximity of the existing bridge. The proposed protections include decreasing the flood depths and size of the floodplain upstream of the Edward E. Burroughs highway along the Waccamaw River. This relief bridge would convey more water away from the inundated zone. This is expected to decrease the water depths and possibly decrease the size of the floodplain upstream of Highway 501 Business that crosses the Waccamaw River. Installation of drainage infrastructure on Highway 501 is proposed, which would consist of a new bridge and culverts to allow more flow and will be dependent on space and South Carolina Department of Transportation (SCDOT) requirements.

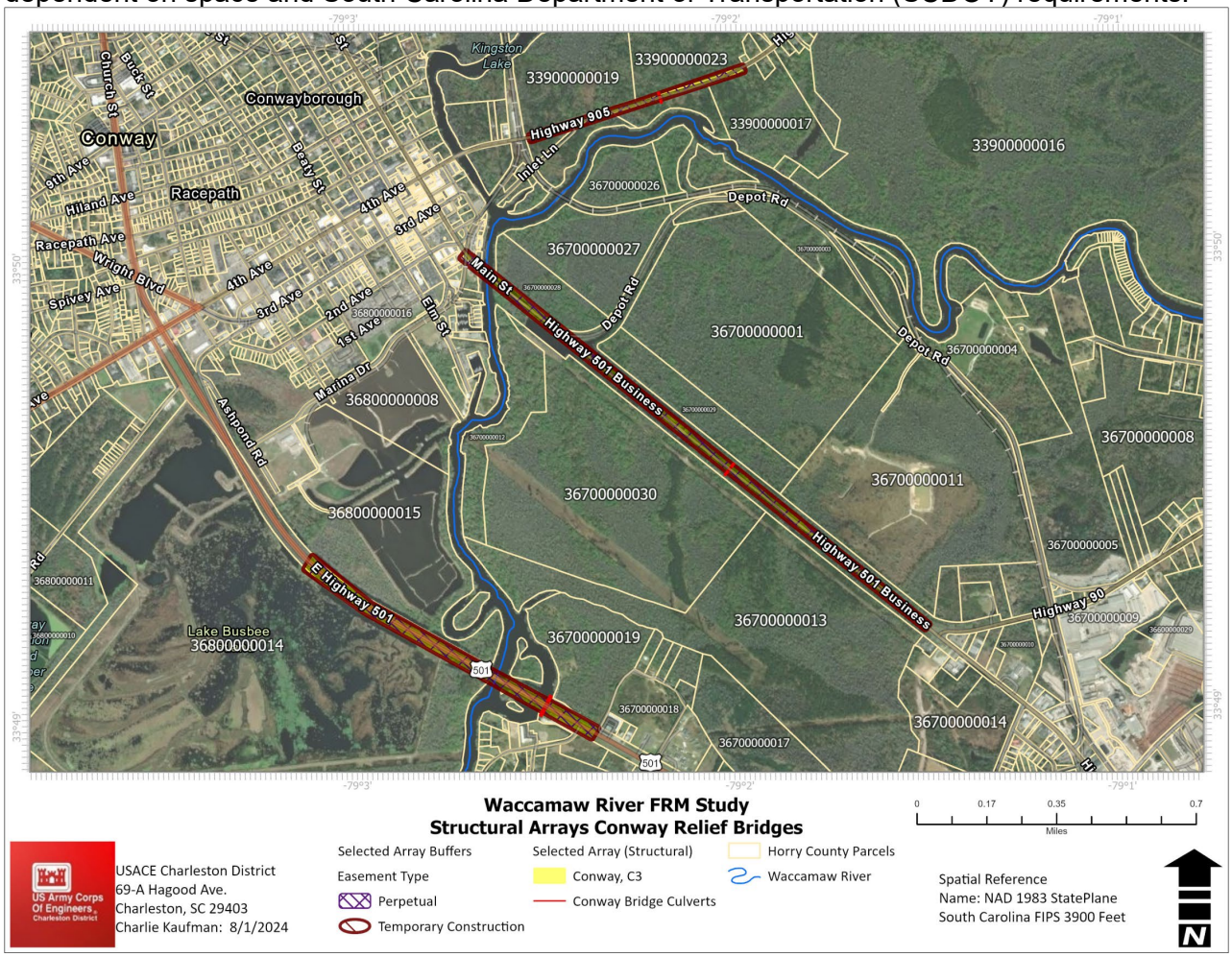

Figure 2: Total bridge reliefs in Conway. Construction of bridge culverts denoted by light red line. The Area of Potential Effect (APE) is defined as the project construction footprints, and any proposed staging or construction areas. A 0.5-mile study radius was implemented around each project area to determine if previous surveys or identified cultural resources were present.

For Relief at Highway 905, there are no documented cultural resources surveys in the project area. There are no known sites located within the project area. Six archaeological sites are within a half-mile study area (38HR1, 38HR32, 38HR62, 38HR63, 38HR317, and 38HR339), one of which is eligible (38HR1) and another that is potentially eligible (38HR32) for listing in the NRHP. There are several archaeological sites documented within the Waccamaw River in that area and three historic resources in close proximity to the project area that will need to be better assessed. The archaeological sites are located within the Waccamaw River and include 38HR32, 38HR63, 38HR339, and 38HR62. The three historic resources near the project area include Conway Railroad Station (not eligible for the NRHP), Atlantic Coastline Railroad Depot (NRHP-listed), and the Railroad bridge over the Waccamaw River (NRHP-eligible).

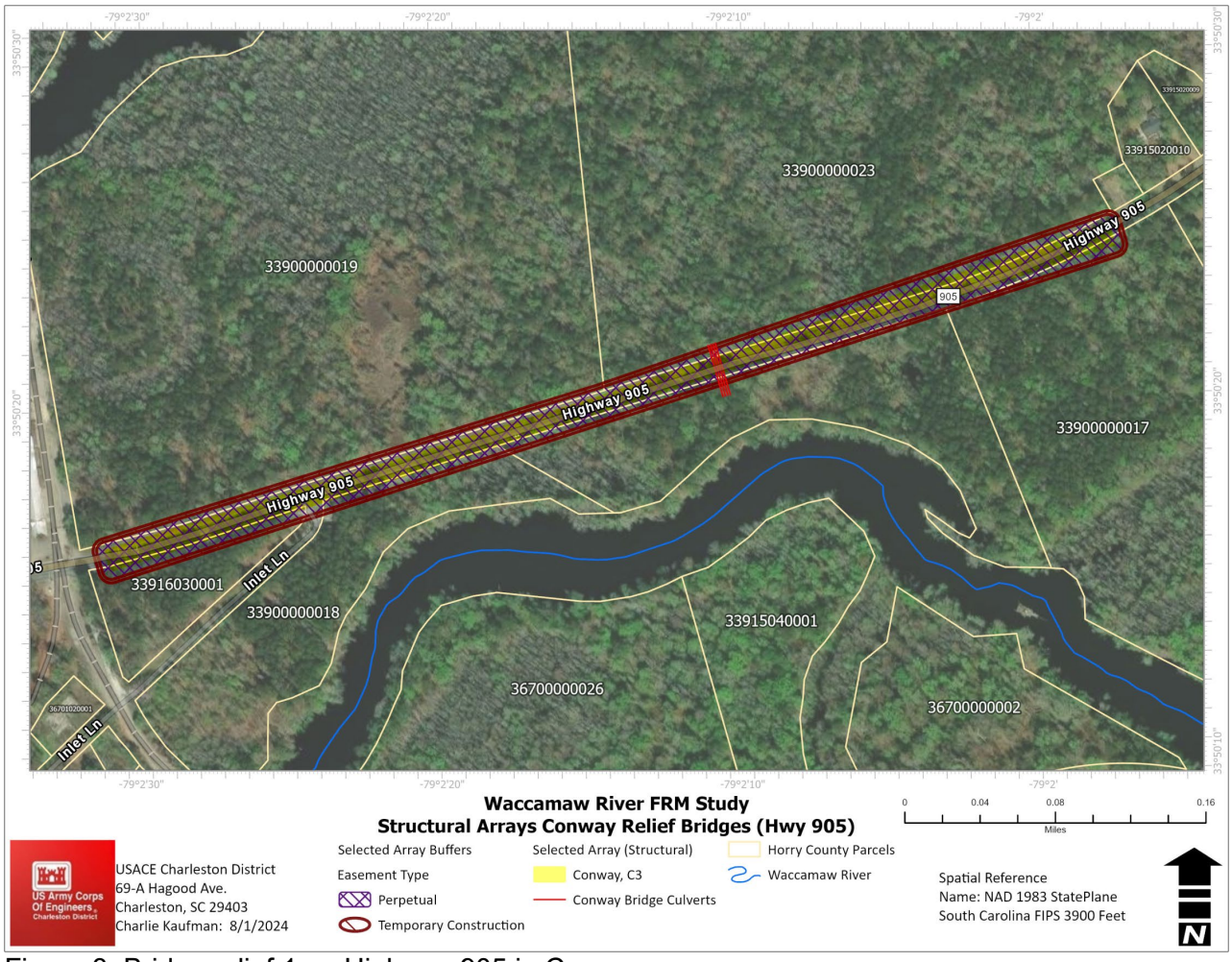

Figure 3: Bridge relief 1 on Highway 905 in Conway.

For Relief at Highway 501 Business, there is one documented cultural resources survey in the project study area, but none in the project area. There is one known archaeological site (368HR62) within the project area, which is documented as a 19th and 20th century site with unknown NRHP eligibility determination. There are four additional archaeological sites within a half-mile study area (38HR1, 38HR63, 38HR317, and 38HR339), one of which (38HR1) is determined eligible for listing in the NRHP and is documented as a 19th century site within the Conway Downtown Historic District. Some of these sites are submerged cultural resources. The submerged sites include 38HR63, 38HR339, and 38HR62. A portion of the Waccamaw River Warehouse Historic District is within the project area, whereas the entirety of the Waccamaw River Warehouse Historic District and the Conway Downtown Historic District and portions of the

Conway Residential Historic District are within the half-mile study area. There is a historic bridge (Waccamaw River Memorial Bridge) that is the focus of this alternative.

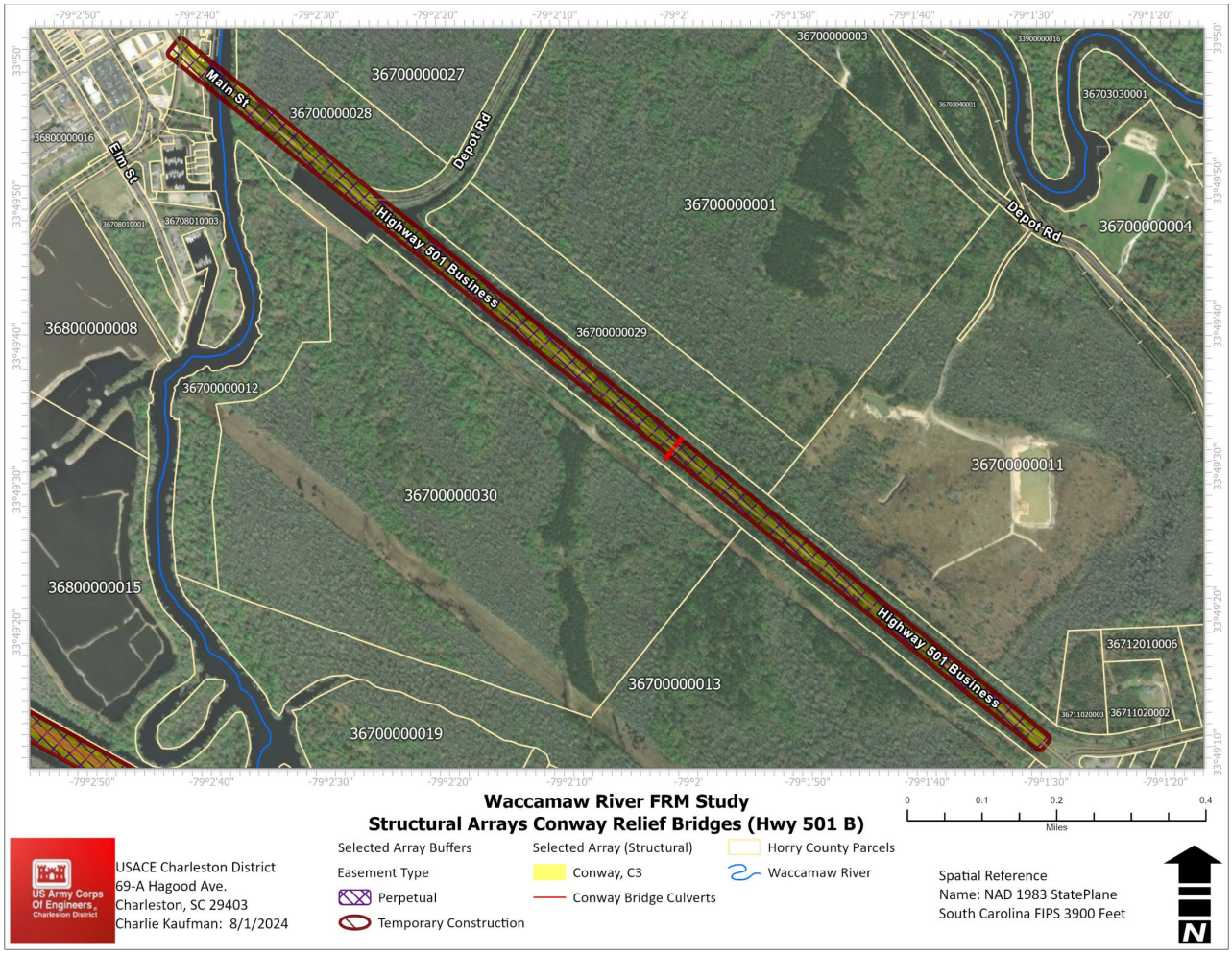

Figure 4: Bridge relief 2 on Highway 501 Business in Conway.

For Relief at E Highway 501, there are two documented surveys within the study area, but none in the project area. No archaeological sites are documented within a half-mile study area. There are two historic structures within a half-mile study area, which are structures dating to the 1960s that are not eligible for listing in the NRHP.

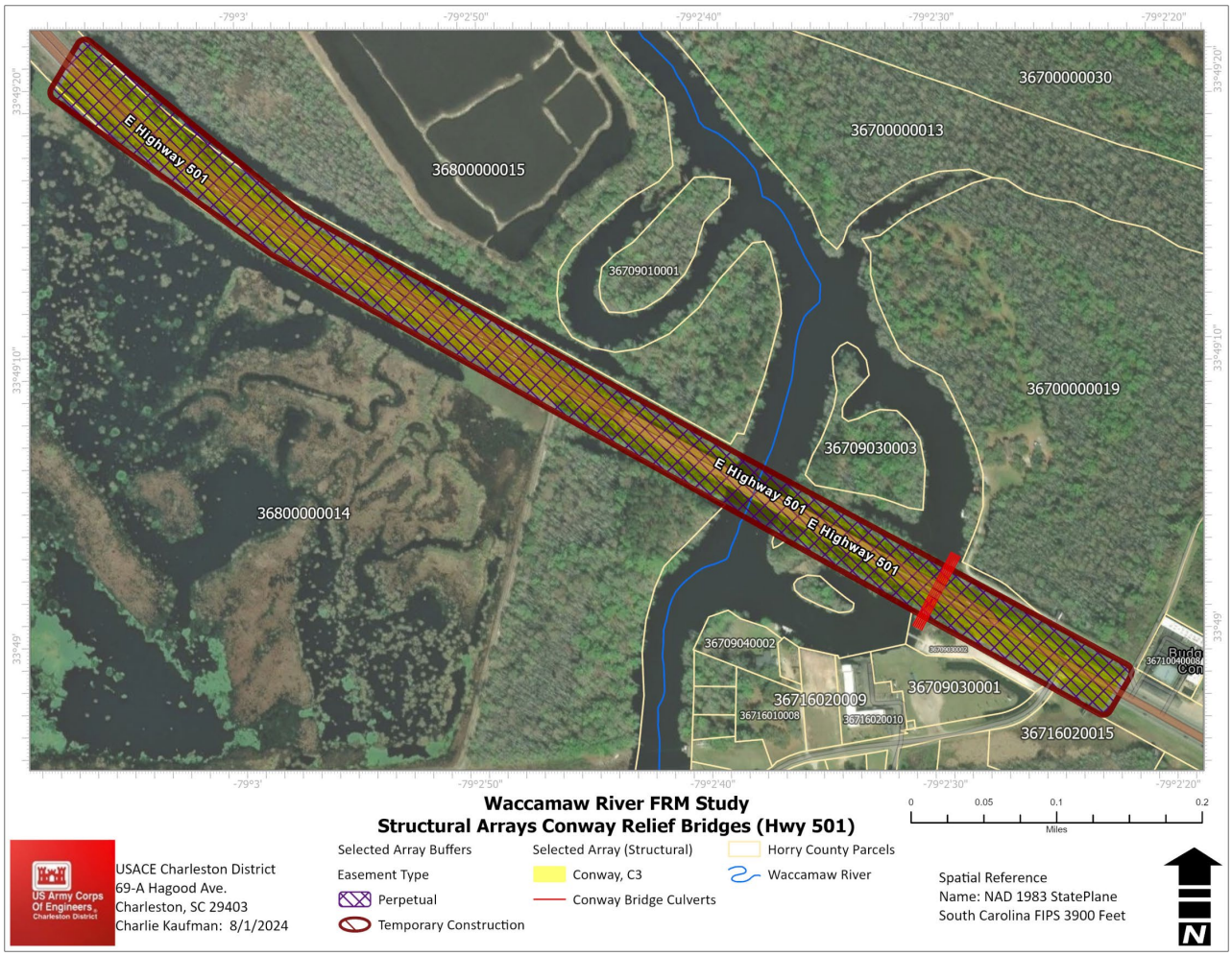

Figure 5: Bridge relief 3 on East Highway 501 in Conway.

The probability of the project area for containing unidentified cultural resources for this undertaking range from low to medium. Relief at Highway 905 and Relief at Highway 501 Business both have a moderate probability for containing previously unidentified cultural resources. A cultural resources survey needs to be conducted to make a determination of effects. Relief at Highway 501 has a low probability for cultural resources. Due to the lack of detailed project designs, it will not be possible to conduct fieldwork to identify and evaluate cultural resources or to determine the effects of the TSP on historic properties. Pursuant to 54 USC 306108, 36 CFR 800.4(b)(2), and 36 CFR 800.14(b)(1)(ii), the Corps is deferring final identification and evaluation of historic properties until after project approval, additional funding becomes available, and prior to construction by executing a Programmatic Agreement (PA). The Corps is currently consulting with the SHPO, state and local agencies, and appropriate federally recognized tribes on a PA. The PA will allow the Corps to complete the necessary cultural resources surveys during the follow-on Preconstruction, Engineering and Design (PED) phase.

S3-Barrier Removal

1.2.1.2 Existing Setting

This plan includes removing the two existing weirs on the Socastee Creek Federal Project. The weirs were originally constructed to maintain a certain ground water level to mitigate loss of wetland area. Water currently flows around the weirs, eroding the area and causing damage to

the weir structure. This measure would increase conveyance in the adjacent flood impact area.

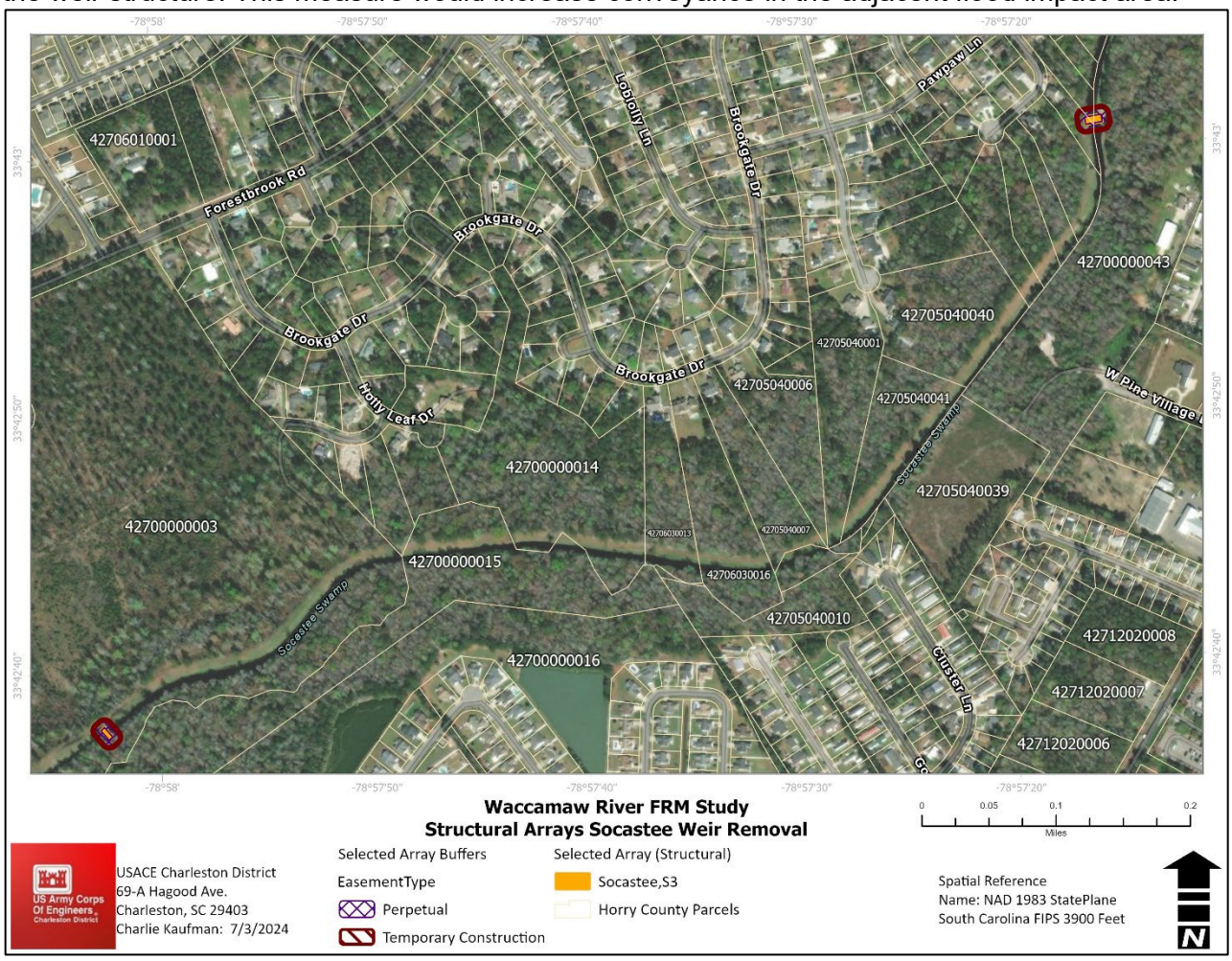

Figure 6: Upstream and downstream weirs proposed for removal in Socastee.

Upstream Weir (North/East): No documented surveys are located in the project area, while there are two survey areas within the half-mile study area. No cultural resources are documented within the project area or the half-mile study area.

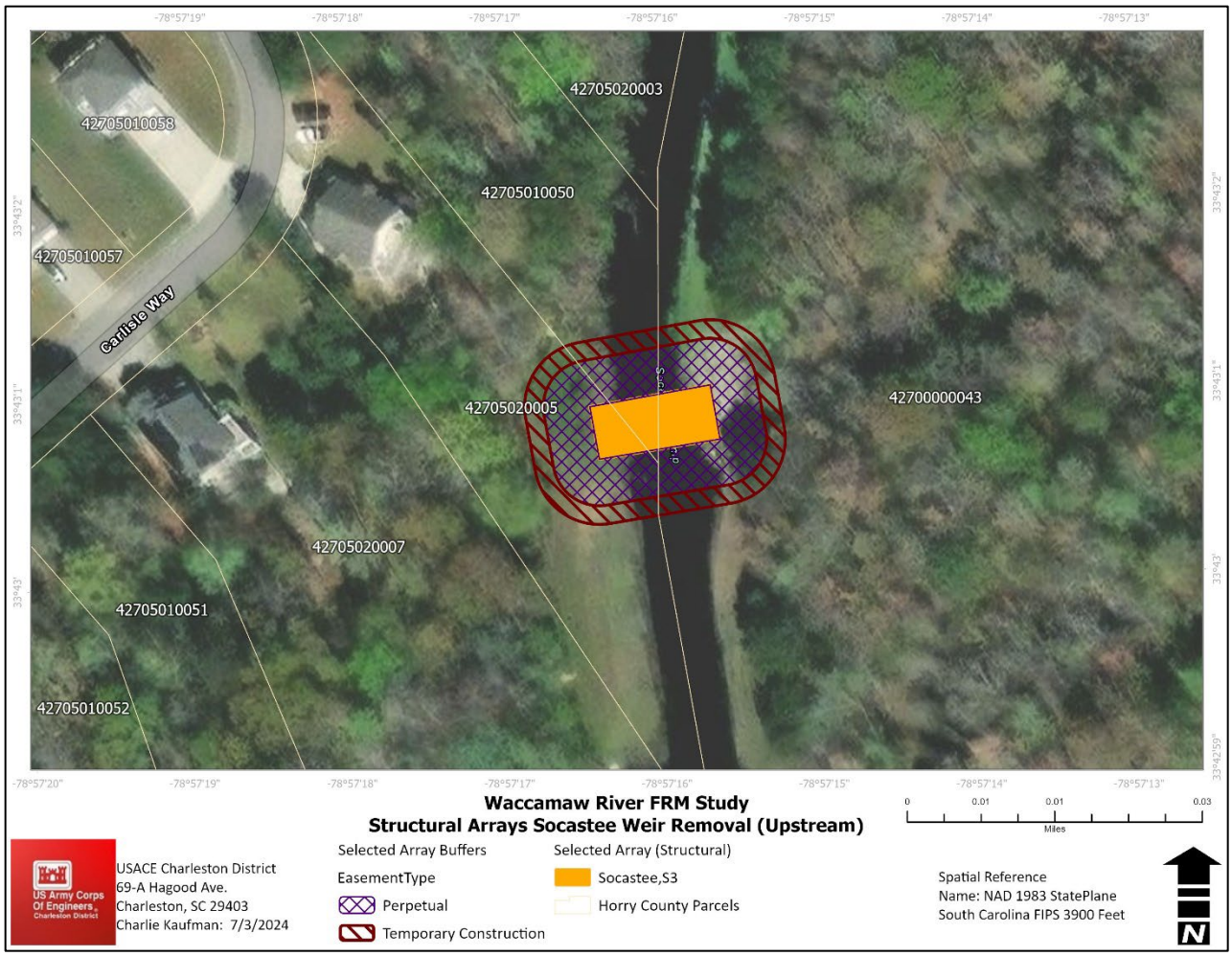

Figure 7: Upstream weir in Socastee.

Downstream Weir (South/West): No documented surveys are located in the project area, while there are two survey areas within the half-mile study area. No cultural resources are documented within the project area, but two sites (38HR47, 38HR385) are documented within the half-mile study area. Both sites are prehistoric in nature and are not eligible.

Figure 8: Downstream weir in Socastee.

The APE of the weir removals has a low probability of containing cultural resources. The lack of documented sites within the project area and the fact that nearby sites are recommended ineligible for inclusion in the NRHP and are located far enough outside the project area means that no impacts are anticipated. The weirs are not historic in nature (being constructed in 1993); however, additional cultural resources surveys may be needed once the final footprint of proposed ground disturbance for construction is determined. Due to the lack of detailed project designs, it will not be possible to conduct fieldwork to identify and evaluate cultural resources or to determine the effects of the TSP on historic properties. Pursuant to 54 USC 306108, 36 CFR 800.4(b)(2), and 36 CFR 800.14(b)(1)(ii), the Corps is deferring final identification and evaluation of historic properties until after project approval, additional funding becomes available, and prior to construction by executing a PA. The Corps is currently consulting with the SHPO, state and local agencies, and appropriate federally recognized tribes on a PA, which will allow the Corps to complete the necessary cultural resources surveys during the follow-on PED phase.

1.3 Initial Coordination Letters

The following are the initial coordination letters sent November 1, 2022 involving the Waccamaw FRM Project.

From: Farmer, Andrea A CIV (USA)
To: wenonah.haire@catawba.com; caitlin.rogers@catawba.com
Subject: Coordination Letter: Waccamaw River Flood Risk Management Feasibility Study Scoping and Interagency Coordination Team Meeting Invite--Horry County, South Carolina
Date: Tuesday, November 1, 2022 4:11:00 PM
Attachments: USACE SAC Waccamaw River FRM for Catawba Indian Nation Nov 2022.pdf
Enclosure Waccamaw FRM Study Area Map.pdf

Good afternoon Dr. Haire,

The Charleston District, U.S. Army Corps of Engineers, plans to hold an Interagency Coordination Team (ICT) webinar meeting on 15 November 2022, from 1 p.m. to 3 p.m., to introduce the new feasibility study "Waccamaw River, Horry County, South Carolina: A Flood Risk Management Study." Please see the attached letter for more information about this study and the proposed meeting. Our office invites you to participate in the meeting and provide any specific information, issues, or concerns that should be considered during the project scoping process and for National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance.

WebEx information and an agenda will be sent out prior to the meeting. Please let me know if you would like to attend the meeting and if you have any questions or concerns regarding this correspondence or the upcoming meeting. I look forward to receiving your response.

A hardcopy of this letter and enclosure will be sent to your Tribe (attn: Caitlin Rogers).

Best regards,

Andrea Farmer, RPA
Archaeologist, Savannah District
U.S. Army Corps of Engineers
912.412.3363 (cell)
Andrea.Adams.Farmer@usace.army.mil

From: Farmer, Andrea A CIV (USA)
To: Karen.Brunso@chickasaw.net
Subject: Coordination Letter: Waccamaw River Flood Risk Management Feasibility Study Scoping and Interagency Coordination Team Meeting Invite--Horry County, South Carolina
Date: Tuesday, November 1, 2022 4:11:00 PM
Attachments: USACE SAC Waccamaw River FRM for Chickasaw Nation Nov 2022.pdf
Enclosure Waccamaw FRM Study Area Map.pdf

Good afternoon Ms. Brunso,

The Charleston District, U.S. Army Corps of Engineers, plans to hold an Interagency Coordination Team (ICT) webinar meeting on 15 November 2022, from 1 p.m. to 3 p.m., to introduce the new feasibility study "Waccamaw River, Horry County, South Carolina: A Flood Risk Management Study." Please see the attached letter for more information about this study and the proposed meeting. Our office invites you to participate in the meeting and provide any specific information, issues, or concerns that should be considered during the project scoping process and for National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance.

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Best regards,

Andrea Farmer, RPA
Archaeologist, Savannah District
U.S. Army Corps of Engineers
912.412.3363 (cell)
Andrea.Adams.Farmer@usace.army.mil

From: Farmer, Andrea A CIV (USA)
To: 106NAGPRA@astribe.com; dfrazier@astribe.com
Subject: Coordination Letter: Waccamaw River Flood Risk Management Feasibility Study Scoping and Interagency Coordination Team Meeting Invite--Horry County, South Carolina
Date: Tuesday, November 1, 2022 4:11:00 PM
Attachments: USACE SAC Waccamaw River FRM for Absentee Shawnee Nov 2022.pdf
Enclosure Waccamaw FRM Study Area Map.pdf

Good afternoon Ms. Frazier,

The Charleston District, U.S. Army Corps of Engineers, plans to hold an Interagency Coordination Team (ICT) webinar meeting on 15 November 2022, from 1 p.m. to 3 p.m., to introduce the new feasibility study "Waccamaw River, Horry County, South Carolina: A Flood Risk Management Study." Please see the attached letter for more information about this study and the proposed meeting. Our office invites you to participate in the meeting and provide any specific information, issues, or concerns that should be considered during the project scoping process and for National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance.

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Best regards,

Andrea Farmer, RPA
Archaeologist, Savannah District
U.S. Army Corps of Engineers
912.412.3363 (cell)
Andrea.Adams.Farmer@usace.army.mil

From: Farmer, Andrea A CIV (USA)
To: HorryCountyHistoricalSociety@gmail.com
Subject: Coordination Letter: Waccamaw River Flood Risk Management Feasibility Study Scoping and Interagency Coordination Team Meeting Invite--Horry County, South Carolina
Date: Tuesday, November 1, 2022 4:10:00 PM
Attachments: USACE SAC Waccamaw River FRM for Horry County Historical Society Nov 2022.pdf
Enclosure Waccamaw FRM Study Area Map.pdf

Good afternoon,

The Charleston District, U.S. Army Corps of Engineers, plans to hold an Interagency Coordination Team (ICT) webinar meeting on 15 November 2022, from 1 p.m. to 3 p.m., to introduce the new feasibility study "Waccamaw River, Horry County, South Carolina: A Flood Risk Management Study." Please see the attached letter for more information about this study and the proposed meeting. Our office invites you to participate in the meeting and provide any specific information, issues, or concerns that should be considered during the project scoping process and for National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance.

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Best regards,

Andrea Farmer, RPA
Archaeologist, Savannah District
U.S. Army Corps of Engineers
912.412.3363 (cell)
Andrea.Adams.Farmer@usace.army.mil

From: Farmer, Andrea A CIV (USA)
To: HCGMuseum@horrycounty.org
Subject: Coordination Letter: Waccamaw River Flood Risk Management Feasibility Study Scoping and Interagency Coordination Team Meeting Invite--Horry County, South Carolina
Date: Tuesday, November 1, 2022 4:10:00 PM
Attachments: USACE SAC Waccamaw River FRM for Horry County Museum Nov 2022.pdf
Enclosure Waccamaw FRM Study Area Map.pdf

Good afternoon,

The Charleston District, U.S. Army Corps of Engineers, plans to hold an Interagency Coordination Team (ICT) webinar meeting on 15 November 2022, from 1 p.m. to 3 p.m., to introduce the new feasibility study "Waccamaw River, Horry County, South Carolina: A Flood Risk Management Study." Please see the attached letter for more information about this study and the proposed meeting. Our office invites you to participate in the meeting and provide any specific information, issues, or concerns that should be considered during the project scoping process and for National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance.

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Best regards,

Andrea Farmer, RPA
Archaeologist, Savannah District
U.S. Army Corps of Engineers
912.412.3363 (cell)
Andrea.Adams.Farmer@usace.army.mil

From: Farmer, Andrea A CIV (USA)
To: TindallN@horrycounty.org
Subject: Coordination Letter: Waccamaw River Flood Risk Management Feasibility Study Scoping and Interagency Coordination Team Meeting Invite--Horry County, South Carolina
Date: Tuesday, November 1, 2022 4:10:00 PM
Attachments: USACE SAC Waccamaw River FRM for Horry County HPC Nov 2022.pdf
Enclosure Waccamaw FRM Study Area Map.pdf

Good afternoon Nancy,

The Charleston District, U.S. Army Corps of Engineers, plans to hold an Interagency Coordination Team (ICT) webinar meeting on 15 November 2022, from 1 p.m. to 3 p.m., to introduce the new feasibility study "Waccamaw River, Horry County, South Carolina: A Flood Risk Management Study." Please see the attached letter for more information about this study and the proposed meeting. Our office invites you to participate in the meeting and provide any specific information, issues, or concerns that should be considered during the project scoping process and for National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance.

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Best regards,

Andrea Farmer, RPA
Archaeologist, Savannah District
U.S. Army Corps of Engineers
912.412.3363 (cell)
Andrea.Adams.Farmer@usace.army.mil

From: Farmer, Andrea A CIV (USA)
To: jlowe@alabama-quassarte.org
Subject: Coordination Letter: Waccamaw River Flood Risk Management Feasibility Study Scoping and Interagency Coordination Team Meeting Invite--Horry County, South Carolina
Date: Tuesday, November 1, 2022 4:10:00 PM
Attachments: USACE SAC Waccamaw River FRM for Alabama Quassarte Nov 2022.pdf
Enclosure Waccamaw FRM Study Area Map.pdf

Good afternoon Ms. Lowe,

The Charleston District, U.S. Army Corps of Engineers, plans to hold an Interagency Coordination Team (ICT) webinar meeting on 15 November 2022, from 1 p.m. to 3 p.m., to introduce the new feasibility study "Waccamaw River, Horry County, South Carolina: A Flood Risk Management Study." Please see the attached letter for more information about this study and the proposed meeting. Our office invites you to participate in the meeting and provide any specific information, issues, or concerns that should be considered during the project scoping process and for National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance.

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Best regards,

Andrea Farmer, RPA
Archaeologist, Savannah District
U.S. Army Corps of Engineers
912.412.3363 (cell)
Andrea.Adams.Farmer@usace.army.mil

From: Farmer, Andrea A CIV (USA)
To: ben@coastal.edu
Subject: Coordination Letter: Waccamaw River Flood Risk Management Feasibility Study Scoping and Interagency Coordination Team Meeting Invite--Horry County, South Carolina
Date: Tuesday, November 1, 2022 4:10:00 PM
Attachments: USACE SAC Waccamaw River FRM for Horry County Archives Center Nov 2022.pdf
Enclosure Waccamaw FRM Study Area Map.pdf

Good afternoon Ben,

The Charleston District, U.S. Army Corps of Engineers, plans to hold an Interagency Coordination Team (ICT) webinar meeting on 15 November 2022, from 1 p.m. to 3 p.m., to introduce the new feasibility study "Waccamaw River, Horry County, South Carolina: A Flood Risk Management Study." Please see the attached letter for more information about this study and the proposed meeting. Our office invites you to participate in the meeting and provide any specific information, issues, or concerns that should be considered during the project scoping process and for National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance.

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Best regards,

Andrea Farmer, RPA
Archaeologist, Savannah District
U.S. Army Corps of Engineers
912.412.3363 (cell)
Andrea.Adams.Farmer@usace.army.mil

From: Farmer, Andrea A CIV (USA)
To: thpo@estoo.net; rbarnes@estoo.net
Subject: Coordination Letter: Waccamaw River Flood Risk Management Feasibility Study Scoping and Interagency Coordination Team Meeting Invite--Horry County, South Carolina
Date: Tuesday, November 1, 2022 4:10:00 PM
Attachments: USACE SAC Waccamaw River FRM for Eastern Shawnee Oklahoma Nov 2022.pdf
Enclosure Waccamaw FRM Study Area Map.pdf

Good afternoon Mrs. Barnes,

The Charleston District, U.S. Army Corps of Engineers, plans to hold an Interagency Coordination Team (ICT) webinar meeting on 15 November 2022, from 1 p.m. to 3 p.m., to introduce the new feasibility study "Waccamaw River, Horry County, South Carolina: A Flood Risk Management Study." Please see the attached letter for more information about this study and the proposed meeting. Our office invites you to participate in the meeting and provide any specific information, issues, or concerns that should be considered during the project scoping process and for National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance.

WebEx information and an agenda will be sent out prior to the meeting. Please let me know if you would like to attend the meeting and if you have any questions or concerns regarding this correspondence or the upcoming meeting. I look forward to receiving your response.

Best regards,

Andrea Farmer, RPA
Archaeologist, Savannah District
U.S. Army Corps of Engineers
912.412.3363 (cell)
Andrea.Adams.Farmer@usace.army.mil

From: Farmer, Andrea A CIV (USA)
To: "rlarsen@scdah.sc.gov"; "rc@scdah.sc.gov"
Subject: Coordination Letter: Waccamaw River Flood Risk Management Feasibility Study Scoping and Interagency Coordination Team Meeting Invite--Horry County, South Carolina
Date: Tuesday, November 1, 2022 4:10:00 PM
Attachments: USACE SAC Waccamaw River FRM for SCDAH Nov 2022.pdf
Enclosure Waccamaw FRM Study Area Map.pdf

Good afternoon Robert,

The Charleston District, U.S. Army Corps of Engineers, plans to hold an Interagency Coordination Team (ICT) webinar meeting on 15 November 2022, from 1 p.m. to 3 p.m., to introduce the new feasibility study "Waccamaw River, Horry County, South Carolina: A Flood Risk Management Study." Please see the attached letter for more information about this study and the proposed meeting. Our office invites you to participate in the meeting and provide any specific information, issues, or concerns that should be considered during the project scoping process and for National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance.

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Best regards,

Andrea Farmer, RPA
Archaeologist, Savannah District
U.S. Army Corps of Engineers
912.412.3363 (cell)
Andrea.Adams.Farmer@usace.army.mil

From: Farmer, Andrea A CIV (USA)
To: "thpo@tttown.org"; "DFrank@tttown.org"
Subject: Coordination Letter: Waccamaw River Flood Risk Management Feasibility Study Scoping and Interagency Coordination Team Meeting Invite--Horry County, South Carolina
Date: Tuesday, November 1, 2022 4:10:00 PM
Attachments: USACE SAC Waccamaw River FRM for Thlopthlocco Tribal Town Nov 2022.pdf
Enclosure Waccamaw FRM Study Area Map.pdf

Good afternoon Mr. Frank,

The Charleston District, U.S. Army Corps of Engineers, plans to hold an Interagency Coordination Team (ICT) webinar meeting on 15 November 2022, from 1 p.m. to 3 p.m., to introduce the new feasibility study "Waccamaw River, Horry County, South Carolina: A Flood Risk Management Study." Please see the attached letter for more information about this study and the proposed meeting. Our office invites you to participate in the meeting and provide any specific information, issues, or concerns that should be considered during the project scoping process and for National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance.

WebEx information and an agenda will be sent out prior to the meeting. Please let me know if you would like to attend the meeting and if you have any questions or concerns regarding this correspondence or the upcoming meeting. I look forward to receiving your response.

Best regards,

Andrea Farmer, RPA
Archaeologist, Savannah District
U.S. Army Corps of Engineers
912.412.3363 (cell)
Andrea.Adams.Farmer@usace.army.mil

From: Farmer, Andrea A CIV (USA)
To: tonya@shawnee-tribe.com
Subject: Coordination Letter: Waccamaw River Flood Risk Management Feasibility Study Scoping and Interagency Coordination Team Meeting Invite--Horry County, South Carolina
Date: Tuesday, November 1, 2022 4:10:00 PM
Attachments: USACE SAC Waccamaw River FRM for Shawnee Tribe Nov 2022.pdf
Enclosure Waccamaw FRM Study Area Map.pdf

Good afternoon Ms. Tipton,

The Charleston District, U.S. Army Corps of Engineers, plans to hold an Interagency Coordination Team (ICT) webinar meeting on 15 November 2022, from 1 p.m. to 3 p.m., to introduce the new feasibility study "Waccamaw River, Horry County, South Carolina: A Flood Risk Management Study." Please see the attached letter for more information about this study and the proposed meeting. Our office invites you to participate in the meeting and provide any specific information, issues, or concerns that should be considered during the project scoping process and for National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance.

WebEx information and an agenda will be sent out prior to the meeting. Please let me know if you would like to attend the meeting and if you have any questions or concerns regarding this correspondence or the upcoming meeting. I look forward to receiving your response.

Best regards,

Andrea Farmer, RPA
Archaeologist, Savannah District
U.S. Army Corps of Engineers
912.412.3363 (cell)
Andrea.Adams.Farmer@usace.army.mil

From: Farmer, Andrea A CIV (USA)
To: "THPO@pci-nsn.gov"
Subject: Coordination Letter: Waccamaw River Flood Risk Management Feasibility Study Scoping and Interagency Coordination Team Meeting Invite--Horry County, South Carolina
Date: Tuesday, November 1, 2022 4:10:00 PM
Attachments: USACE SAC_Waccamaw River FRM for Pearch Band of Creek Indians_Nov 2022.pdf
Enclosure_Waccamaw FRM Study Area Map.pdf

Good afternoon Mr. Haikey,

The Charleston District, U.S. Army Corps of Engineers, plans to hold an Interagency Coordination Team (ICT) webinar meeting on 15 November 2022, from 1 p.m. to 3 p.m., to introduce the new feasibility study "Waccamaw River, Horry County, South Carolina: A Flood Risk Management Study." Please see the attached letter for more information about this study and the proposed meeting. Our office invites you to participate in the meeting and provide any specific information, issues, or concerns that should be considered during the project scoping process and for National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance.

WebEx information and an agenda will be sent out prior to the meeting. Please let me know if you would like to attend the meeting and if you have any questions or concerns regarding this correspondence or the upcoming meeting. I look forward to receiving your response.

Best regards,

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Archaeologist, Savannah District
U.S. Army Corps of Engineers
912.412.3363 (cell)
Andrea.Adams.Farmer@usace.army.mil

Best regards,

Andrea Farmer, RPA
Archaeologist, Savannah District
U.S. Army Corps of Engineers
912.412.3363 (cell)
Andrea.Adams.Farmer@usace.army.mil

From: Farmer, Andrea A CIV (USA)
To: David.cook@kialeqeetribe.net
Subject: Coordination Letter: Waccamaw River Flood Risk Management Feasibility Study Scoping and Interagency Coordination Team Meeting Invite--Horry County, South Carolina
Date: Tuesday, November 1, 2022 4:10:00 PM
Attachments: USACE SAC Waccamaw River FRM for Kialeqee Tribal Town Nov 2022.pdf
Enclosure Waccamaw FRM Study Area Map.pdf

Good afternoon Mr. Cook,

The Charleston District, U.S. Army Corps of Engineers, plans to hold an Interagency Coordination Team (ICT) webinar meeting on 15 November 2022, from 1 p.m. to 3 p.m., to introduce the new feasibility study "Waccamaw River, Horry County, South Carolina: A Flood Risk Management Study." Please see the attached letter for more information about this study and the proposed meeting. Our office invites you to participate in the meeting and provide any specific information, issues, or concerns that should be considered during the project scoping process and for National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance.

WebEx information and an agenda will be sent out prior to the meeting. Please let me know if you would like to attend the meeting and if you have any questions or concerns regarding this correspondence or the upcoming meeting. I look forward to receiving your response.

Best regards,

Andrea Farmer, RPA
Archaeologist, Savannah District
U.S. Army Corps of Engineers
912.412.3363 (cell)
Andrea.Adams.Farmer@usace.army.mil

From: Farmer, Andrea A CIV (USA)
To: "russtown@nc-cherokee.com"; Yerka, Stephen
Subject: Coordination Letter: Waccamaw River Flood Risk Management Feasibility Study Scoping and Interagency Coordination Team Meeting Invite--Horry County, South Carolina
Date: Tuesday, November 1, 2022 4:10:00 PM
Attachments: USACE SAC Waccamaw River FRM for Eastern Band Cherokee Nov 2022.pdf
Enclosure Waccamaw FRM Study Area Map.pdf

Good afternoon Mr. Townsend,

The Charleston District, U.S. Army Corps of Engineers, plans to hold an Interagency Coordination Team (ICT) webinar meeting on 15 November 2022, from 1 p.m. to 3 p.m., to introduce the new feasibility study "Waccamaw River, Horry County, South Carolina: A Flood Risk Management Study." Please see the attached letter for more information about this study and the proposed meeting. Our office invites you to participate in the meeting and provide any specific information, issues, or concerns that should be considered during the project scoping process and for National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance.

WebEx information and an agenda will be sent out prior to the meeting. Please let me know if you would like to attend the meeting and if you have any questions or concerns regarding this correspondence or the upcoming meeting. I look forward to receiving your response.

Best regards,

Andrea Farmer, RPA
Archaeologist, Savannah District
U.S. Army Corps of Engineers
912.412.3363 (cell)
Andrea.Adams.Farmer@usace.army.mil

From: Farmer, Andrea A CIV (USA)
To: Delaware Tribe of Indians (IL)
Subject: Coordination Letter: Waccamaw River Flood Risk Management Feasibility Study Scoping and Interagency Coordination Team Meeting Invite--Horry County, South Carolina
Date: Tuesday, November 1, 2022 4:10:00 PM
Attachments: USACE SAC Waccamaw River FRM for Delaware Tribe Nov 2022.pdf
Enclosure Waccamaw FRM Study Area Map.pdf

Good afternoon Mr. Heady,

The Charleston District, U.S. Army Corps of Engineers, plans to hold an Interagency Coordination Team (ICT) webinar meeting on 15 November 2022, from 1 p.m. to 3 p.m., to introduce the new feasibility study "Waccamaw River, Horry County, South Carolina: A Flood Risk Management Study." Please see the attached letter for more information about this study and the proposed meeting. Our office invites you to participate in the meeting and provide any specific information, issues, or concerns that should be considered during the project scoping process and for National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance.

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Best regards,

Andrea Farmer, RPA
Archaeologist, Savannah District
U.S. Army Corps of Engineers
912.412.3363 (cell)
Andrea.Adams.Farmer@usace.army.mil

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1.4 Draft Programmatic Agreement

The following is the draft PA for archaeological surveys of the TSP.

PROGRAMMATIC AGREEMENT AMONG
THE UNITED STATES ARMY CORPS OF ENGINEERS, CHARLESTON DISTRICT, AND THE SOUTH CAROLINA STATE HISTORIC PRESERVATION OFFICE, REGARDING THE WACCAMAW RIVER FLOOD RISK MANAGEMENT PROJECT, HORRY COUNTY, SOUTH CAROLINA

WHEREAS, the U.S. Army Corps of Engineers, Charleston District (hereinafter "Corps") has proposed to make flood risk management (FRM) improvements to the Waccamaw River in Horry County, South Carolina focusing on the removal of two weirs in Socastee and the implementation of bridge reliefs/cross drain at three locations in Conway (hereinafter the Project); and

WHEREAS, the Project involves flood reduction measures at the Waccamaw River within Socastee and Conway, which may result in effects on properties listed in or eligible for listing in the National Register of Historic Places (NRHP) (hereinafter, "historic properties") pursuant to the National Historic Preservation Act (NHPA), Section 106 (54 U.S.C. § 306108), as amended, and the implementing regulations for Section 106 (36 C.F.R. §800); and

WHEREAS, the proposed impacts include the potential for inadvertent discoveries and potential adverse effects to identified cultural resources within the Socastee and Conway construction footprints; and

WHEREAS, the Corps determined that a Phase I archaeological survey should be conducted within the construction footprints of both the Conway and Socastee project areas during the Pre-construction, Engineering, and Design (PED) phase of the project after signing a Finding of No Significant Impact (FONSI); and

WHEREAS, the Corps has prepared an integrated feasibility report and environmental assessment for the Waccamaw River Flood Risk Management Study to analyze impacts to cultural resources in accordance with requirements of the National Environmental Policy Act for the alternatives under consideration for this study; and

WHEREAS, the Corps has consulted with the South Carolina Historic Preservation Division (SC HPD) which serves as the South Carolina State Historic Preservation Office (SHPO) pursuant to 36 C.F.R. Part 800, the regulations implementing Section 106 of the NHPA (hereinafter Section 106); and

WHEREAS, pursuant to the consultation conducted under 36 CFR 800, the signatories have agreed that no historic resources listed or eligible for listing in the NRHP were identified within the APE of the Project, therefore, this programmatic agreement only covers archaeological resources.

WHEREAS, archaeological surveys have not been conducted within the Project's APE, as shown in Attachment A, and no previously recorded archaeological sites identified within the

Project's APE have been listed in or determined eligible for listing in the NRHP; and

WHEREAS the Corps, in consultation with the SHPO, has determined that the Undertaking has the potential to cause adverse effects to unrecorded archaeological sites which may be eligible for listing in the NRHP; and

WHEREAS, 36 CFR § 800.14(b)(1)[ii] allows federal agencies to fulfill their obligations under Section 106 through the development and implementation of programmatic agreements when effects on historic properties cannot be determined prior to approval of a project; and

WHEREAS, in accordance with 36 CFR § 800.14(b), the Corps has notified the Advisory Council on Historic Preservation (ACHP) of its intention to develop this programmatic agreement (hereinafter the "Agreement"), pursuant to 36 CFR § 800.14(b)(1)(ii) and the ACHP has declined to participate in the consultation; and

WHEREAS, in accordance with 36 CFR § 800.14(b)(2)(i), the Corps has invited the appropriate Federally recognized Indian tribes – Absentee Shawnee, Alabama-Quassarte Tribal Town, Catawba Indian Nation, Chickasaw Nation, Delaware Tribe of Indians, Eastern Band of Cherokee, Eastern Shawnee Tribe of Oklahoma, Kialegee Tribal Town, Poarch Band of Creek Indians, Shawnee Tribe, and Thlopthlocco Tribal Town – to consult on and sign this Agreement as Concurring Parties and none accepted; and

WHEREAS, in accordance with 36 CFR § 800.14(b)(2)(i), the Corps has invited the appropriate Federal, State, and local agencies- Horry County Historical Society, Horry County Museum, Horry County Historic Preservation Commission (HPC), South Carolina Department of Archives and History (SCDAH), Horry County Archives Center,

WHEREAS, in accordance with 36 CFR § 800.2(d) the Corps has solicited public comment on the Project through the public notice and notification of release of the draft feasibility study and environmental assessment on (TBD); and

NOW, THEREFORE, the Corps**,** and the SHPO **(**hereinafter the "Signatories," or "Signatory Parties") agree that the Project shall be implemented in accordance with the following stipulations in order to take into account the effects of the Project on historic properties.

STIPULATIONS

The Corps shall ensure that the following measures are carried out:

I. ARCHAEOLOGICAL HISTORIC PROPERTIES

A. Identification

1. Prior to initiating construction activities and in an effort to identify historic properties within the direct APE, the Corps shall complete efforts to identify archaeological sites eligible for listing in the NRHP within the direct APE for the Project in accordance with 36 CFR § 800.4(b). The Corps shall conduct these identification efforts pursuant

to the requirements of Stipulations VI.A. and VI.B. of this Agreement. Pursuant to Stipulation I.B. of this Agreement, the Corps shall provide the SHPO the opportunity to review and concur on a report of its findings.

2. The Corps shall conduct any further investigations necessary to evaluate the NRHP-eligibility of any archaeological site identified as a result of the activities described in Paragraph A.1 of this Stipulation. These evaluations shall be conducted in accordance with 36 CFR § 800.4(c), and pursuant to the requirements of Stipulations VI and VII.A. of this Agreement. Pursuant to Stipulation III.B., The Corps shall provide the SHPO the opportunity to review and concur, on a report of its findings.

B. Assessment of Effects

If archaeological sites meeting the criteria for listing on the NRHP are identified as a result of the activities described in Paragraphs A.1. and A.2. of this Stipulation, the Corps shall assess the effects of the Project on these properties in a manner consistent with 36 CFR § 800.5, and submit its findings to the SHPO for its review and concurrence for review and comment pursuant to Stipulation II.B.

C. Mitigation of Adverse Effects

The mitigation of adverse effects to archaeological sites eligible for listing in the NRHP shall be funded by the Corps and the Non-Federal Sponsor. No construction affecting an archaeological site eligible for listing in the NRHP shall be allowed to commence until the mitigation for adverse effects to that archaeological site have been completed. Mitigation may vary according to the type of effect, as follows:

1. If the Corps, in consultation with the SHPO and the Consulting Parties, determines that an archaeological site eligible for listing on the NRHP will be adversely affected by the Project, the Corps in consultation with the SHPO, shall determine whether avoidance or minimization of the adverse effects is practicable. If the adverse effects cannot be practicably avoided, the Corps, in consultation with the SHPO shall develop a treatment plan for the affected archaeological site. In a manner consistent with Stipulation I.B. of this Agreement, the Corps shall provide the SHPO the opportunity to review and concur with the treatment plan.

2. Any treatment plan the Corps develops for an archaeological site under the terms of this stipulation shall be consistent with the requirements of Stipulation VI.A. of this Agreement and shall include, at a minimum:

(a) Information on the portion of the property where data recovery or controlled site burial, as appropriate, is to be carried out, and the context in which the property is eligible for the NRHP;
(b) The results of previous research relevant to the project;
(c) Research problems or questions to be addressed, with an explanation of their relevance and importance;
(d) The field and laboratory analysis methods to be used, with a justification of their cost-effectiveness and how they apply to this particular property and the research needs;
(e) The methods to be used in artifact, data, and other records management;

(f) Explicit provisions for disseminating in a timely manner the research findings to professional peers;
(g) Arrangements for presenting to the public the research findings, focusing particularly on the community or communities that may have interests in the results;
(h) The curation of recovered materials and records resulting from the data recovery in accordance with 36 CFR Part 79;
(i) Conservation of materials from both submerged and terrestrial contexts as appropriate for the preservation of artifacts; and
(j) Procedures for evaluating and treating discoveries of unexpected remains during the course of the project, including necessary consultation with other parties.

3. The Corps shall ensure the treatment plan is implemented and that any agreed-upon data recovery field operations have been completed before ground- disturbing activities associated with the Project are initiated at or near the affected archaeological site. The Corps shall notify the SHPO once data recovery field operations have been completed so that a site visit may be scheduled, if the SHPO finds a visit appropriate. The proposed construction may proceed following this notification while the technical report is in preparation. The Corps shall ensure that the archaeological site form on file in the South Carolina Archaeological Site Files is updated to reflect the implementation of the treatment plan for each affected site.

II. PREPARATION AND REVIEW OF DOCUMENTS

A. Review

The SHPO agrees to provide comments to the Corps on all technical materials, findings, and other documentation arising from this Agreement within thirty (30) calendar days of receipt unless otherwise specified. If no comments are received from the SHPO, within the thirty (30) calendar-days review period, the Corps may assume that the non-responsive party has no comment. The Corps shall take into consideration all comments received in writing from the SHPO within the thirty (30) calendar-day review period, as specified in this Agreement.

B. Physical Documents
The Corps shall provide the SHPO one (1) hard copy on acid-free paper and one (1) in Adobe® Portable Document Format (.pdf) on compact disk of all final reports prepared pursuant to this Agreement.

III. CURATION STANDARDS

The Corps shall ensure that all original archaeological records (research notes, field records, maps, drawings, and photographic records) and all archaeological collections recovered from the Corps' Project area produced as a result of implementing the Stipulations of this Agreement are curated at a facility in accordance with 36 CFR 79, *Curation of Federally Owned and Administered Archaeological Collections*.

IV. CHANGES IN PROJECT SCOPE

In the event of any changes to the Project scope that may alter the APE, the Corps shall consult

with SHPO pursuant to 36 CFR § 800.2 through § 800.5.

V. STANDARDS

A. Research Standards

All work carried out pursuant to this Agreement shall meet or exceed the *Secretary of the Interior's Standards for Archaeology and Historic Preservation* (SOI's Standards; https://www.nps.gov/history/local-law/arch_stnds_0.htm).

B. Professional Standards

The Corps shall ensure that all work carried out pursuant to this Agreement shall be done by or under the direct supervision of the appropriate professionals who meet or exceed the *Secretary of the Interior's Professional Qualifications Standards* (Federal Register, Vol. 62, No. 119, pp. 33708-33723) in the appropriate discipline. The Corps shall ensure that consultants retained for services pursuant to this Agreement meet these standards.

C. Documentation Standards

All technical reports prepared pursuant to this Agreement shall be consistent with *Secretary of the Interior's Standards and Guidelines for Archaeological Documentation* (48 FR 44734-37), and South Carolina's Standards and Guidelines for Archaeological Investigations (Revised 2013) or any subsequent revisions or replacements of these documents.

VI. TREATMENT OF HUMAN REMAINS

A. Coordination

In the event human skeletal remains or burials are encountered during implementation of the Project, the Corps shall coordinate its compliance with Section 106 with other applicable federal, state, and local laws and reviews as appropriate.

B. Procedures

Historic and prehistoric human remains from non-federal, non-tribal lands are subject to protection under South Carolina's burial/unmarked grave/cemetery law(s). If human remains are discovered during construction, work in that portion of the project shall stop immediately. The remains shall be covered and/or protected in place in such a way that minimizes further exposure of and damage to the remains, and the Corps shall immediately consult with the SHPO. If the remains are found to be Native American, in accordance with applicable law, a treatment plan shall be developed by the Corps and SHPO in consultation with appropriate federally recognized Indian tribes. The Corps shall ensure that any treatment and reburial plan is fully implemented. If the remains are not Native American, the appropriate local authority shall be consulted to determine final disposition of the remains. Avoidance and preservation in place is the preferred option for treating human remains.

C. Additional Procedures

Additional procedures regarding the treatment of human remains are detailed in

Attachment B of this Agreement.

VII. POST-REVIEW DISCOVERIES

If properties are discovered that may be eligible for listing in the NRHP or unanticipated effects on historic properties found subsequent to the completion of surveys under Stipulations I-II, the Corps shall implement the discovery plan included as Attachment B of this Agreement.

VIII. COMMUNICATIONS

Electronic mail (email) may serve as the official correspondence method for all communications regarding this Agreement and its provisions. See Attachment C for a list of contacts and email addresses. Contact information in Attachment C may be updated as needed without an amendment to this Agreement. It is the responsibility of each party to the Agreement to immediately inform the Corps of any change in name, address, email address, or phone number of any point-of-contact. The Corps shall forward this information to all Signatories and Consulting Parties by email.

IX. MONITORING AND REPORTING

Each year on the anniversary of the execution of this Agreement until it expires or is terminated, the Corps shall provide all parties to this Agreement a summary report detailing work undertaken pursuant to its terms. Such report shall include any scheduling changes proposed, any problems encountered, and any disputes and objections received in the Corps' efforts to carry out the terms of this Agreement. The reporting period shall be the fiscal year from October 1 to September 30.

X. DISPUTE RESOLUTION

Should any Signatory to this Agreement object in writing at any time to any actions proposed under this Agreement, or the manner in which the terms of this Agreement are implemented, the Corps shall consult with the objecting party to resolve the objection. If the Corps determines that such objection cannot be resolved, the Corps will:

A. Documentation

Forward all documentation relevant to the dispute, including the Corps' proposed resolution, to the ACHP. The ACHP shall provide the Corps with its advice on the resolution of the objection within thirty (30) days of receiving adequate documentation. Prior to reaching a final decision on the dispute, the Corps shall prepare a written response that takes into account any timely advice or comments regarding the dispute from the ACHP, Signatories and Consulting Parties and provide them with a copy of this written response. The Corps shall then proceed according to its final decision.

B. Resolution

If the ACHP does not provide its advice regarding the dispute within the thirty (30) day time period, the Corps may make a final decision on the dispute and proceed accordingly. Prior to reaching such a final decision, the Corps shall prepare a written response that takes into account any timely comments regarding the dispute from the Signatories and Consulting Parties to

the Agreement, and provide them and the ACHP with a copy of such written response.

C. Continuity

The Corps' responsibilities to carry out all other actions subject to the terms of this Agreement that are not the subject of the dispute remain unchanged.

XI. ANTI-DEFICIENCY ACT

The Corps' obligations under this Agreement are subject to the availability of appropriated funds, and the stipulations of this Agreement are subject to the provisions of the Anti-Deficiency Act. The Corps shall make reasonable and good faith efforts to secure the necessary funds to implement this Agreement in its entirety. If compliance with the Anti- Deficiency Act alters or impairs the Corps' ability to implement the stipulations of this agreement, the Corps shall consult in accordance with the amendment and termination procedures found at Stipulations XII and XIII of this Agreement.

XII. AMENDMENTS

This Agreement may be amended when such an amendment is agreed to in writing by all Signatories. The amendment shall be effective on the date a copy is signed by all of the Signatories. Attachment D is a template for amendments.

XIII. TERMINATION

If any Signatory to this Agreement determines that its terms are not or cannot be carried out, that party shall immediately consult with the other Signatories to attempt to develop an amendment per Stipulation XIV, above. If within thirty (30) days (or another time period agreed to by all Signatories) an amendment cannot be reached, any Signatory may terminate the Agreement upon written notification to the other Signatories.

Once the Agreement is terminated, and prior to work continuing on the Project, the Corps must either (a) execute another Agreement pursuant to 36 CFR § 800.14, or (b) request, take into account, and respond to the comments of the ACHP under 36 CFR § 800.7. The Corps shall notify the Signatories as to the course of action it will pursue.

XIV. DURATION

This Agreement shall remain in effect until such time as the legal requirements for Section 106 are completed or until the end of the ten (10) year period beginning on the date the Agreement is signed by all Signatories, whichever is earlier. Six (6) months prior to the end of such ten (10) year period, the Corps shall consult with SHPO to reconsider the terms of the Agreement and amend it in accordance with Stipulation XII above, if necessary.

XV. EXECUTION OF THIS AGREEMENT

This Agreement may be executed in counterparts, with a separate signature page for each party. The Corps shall ensure that each party is provided with a copy of the fully executed Agreement.

Execution of this Agreement and its submission to the ACHP, and implementation of its terms, evidence that the Corps has afforded the ACHP an opportunity to comment on the Project and its effect on historic properties, and that the Corps has satisfied its Section 106 obligations regarding the effect of the Project on historic properties.

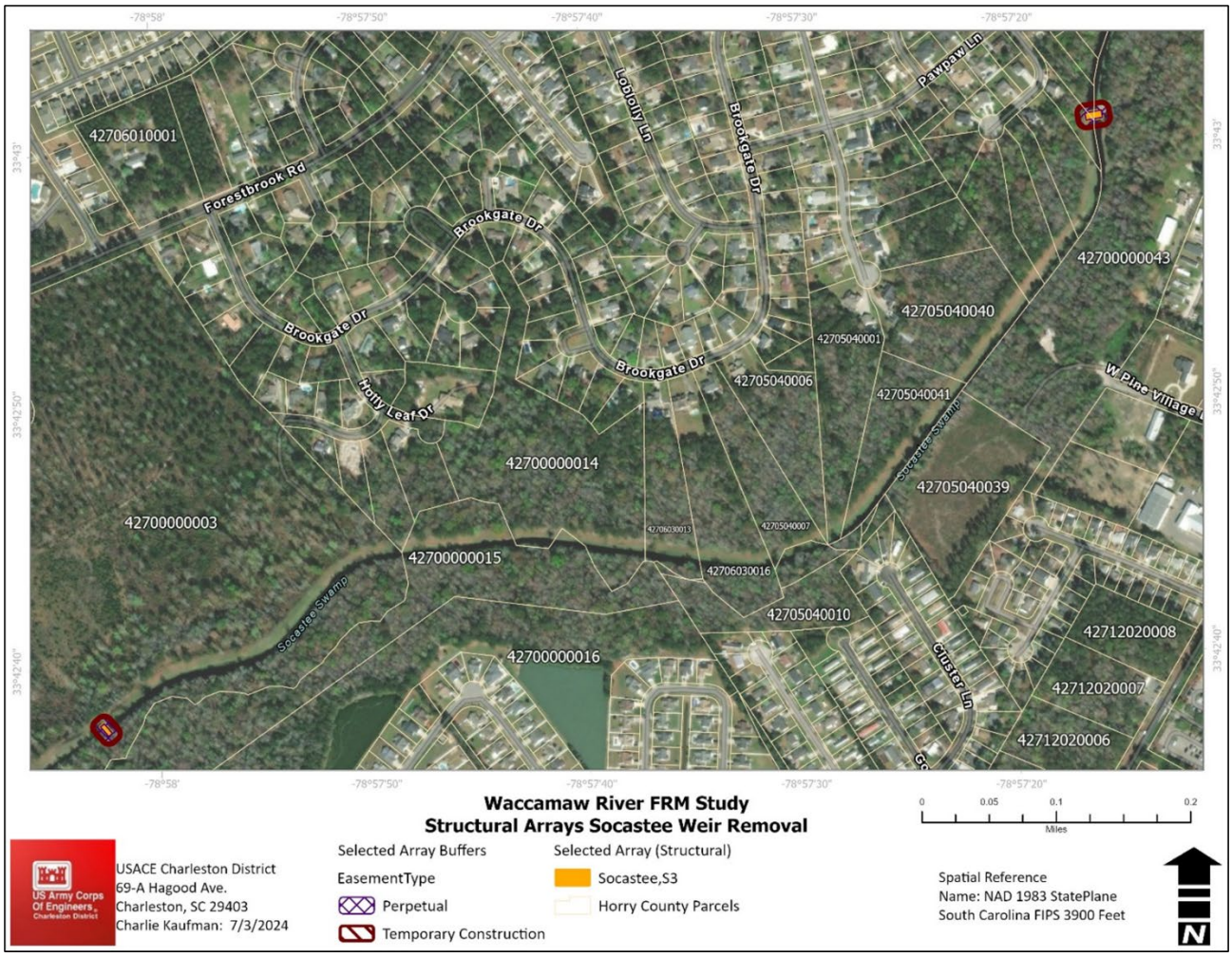
SIGNATORY:

U.S. Army Corps of Engineers, Charleston District

SIGNATORY:

South Carolina Historic Preservation Division

ATTACHMENT A: AREAS OF POTENTIAL EFFECT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-78°57'30"
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33°42'40"
42706010001
Forestbrook Rd
Brookgate Dr
Lobolly Ln
Pawpaw Ln
42700000043
42705040040
42705040001
42705040006
42705040041
W Pine Village
Holly Leaf Dr
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42705040039
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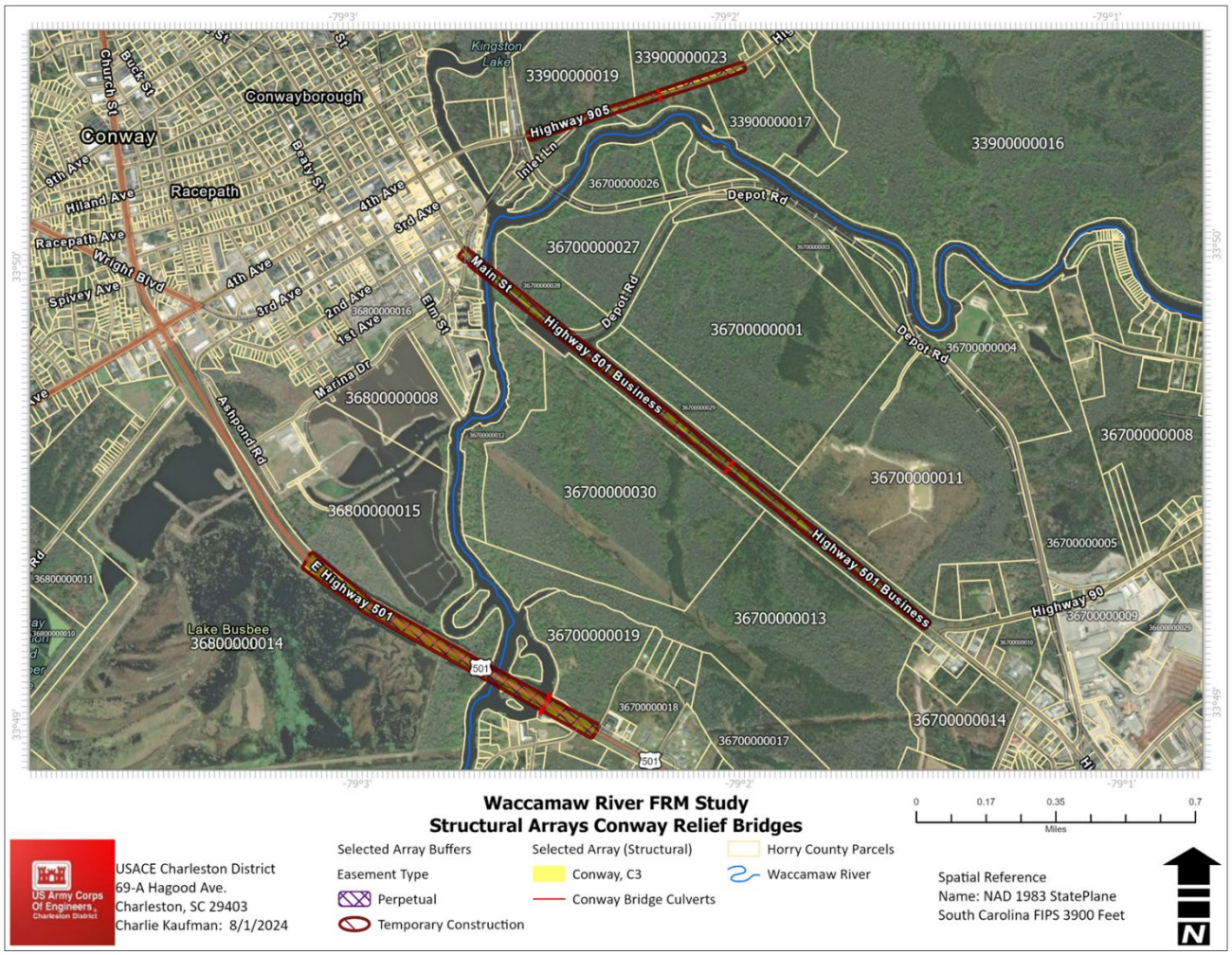
42706030013
42705040007
42700000015
42706030016
Socastee Swamp
42705040010
42712020008
42700000016
Custer Ln
42712020007
42712020006
Waccamaw River FRM Study
Structural Arrays Socastee Weir Removal
0 0.05 0.1 0.2
Miles
US Army Corps Of Engineers Charleston District
USACE Charleston District
69-A Hagood Ave.
Charleston, SC 29403
Charlie Kaufman: 7/3/2024
Selected Array Buffers
EasementType
Perpetual
Temporary Construction
Selected Array (Structural)
Socastee,S3
Horry County Parcels
Spatial Reference
Name: NAD 1983 StatePlane
South Carolina FIPS 3900 Feet
N


Waccamaw River FRM Study
Structural Arrays Conway Relief Bridges
USACE Charleston District
69-A Hagood Ave.
Charleston, SC 29403
Charlie Kaufman: 8/1/2024
Selected Array Buffers
Easement Type
Perpetual
Temporary Construction
Selected Array (Structural)
Conway, C3
Conway Bridge Culverts
Horry County Parcels
Waccamaw River
Spatial Reference
Name: NAD 1983 StatePlane
South Carolina FIPS 3900 Feet
0 0.17 0.35 0.7
Miles
N
Conway
Conwayborough
Racepath
Kingston Lake
Lake Busbee
36800000014
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36700000027
36700000001
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36700000011
36700000030
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36700000013
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36700000018
36700000017
36700000014
Highway 905
Main St
Highway 501 Business
E Highway 501
Depot Rd
Marina Dr
Ashpond Rd
Elm St
Inlet Ln
Church St
Beaty St
Hiland Ave
Racepath Ave
Wright Blvd
Spivey Ave
9th Ave
4th Ave
3rd Ave
2nd Ave
1st Ave
Highway 90
501

ATTACHMENT B

PROCEDURES FOR POST REVIEW DISCOVERIES

Post Review Discoveries

The Corps will ensure that construction documents contain the following provisions for the treatment of unanticipated archaeological discoveries:

"If previously unidentified historic properties or unanticipated effects to historic properties are discovered during contract activities, the contractor shall immediately halt all activity within a one hundred (100) foot radius of the discovery, notify the Corps Project Manager and the Corps Archaeologist of the discovery and implement interim measures to protect the discovery from looting and vandalism. Work in all other areas not the subject of the discovery may continue without interruption."

Immediately upon receipt of such notification from the construction contractor, the Corps Archaeologist shall:

1. Inspect the construction site to determine the extent of the discovery and ensure that the Undertaking in that area has halted;

2. Clearly mark the area of the discovery;

3. Implement additional measures, as appropriate, to protect the discovery from looting and vandalism;

4. Determine the extent of the discovery and provide recommendations regarding its National Register of Historic Places (NRHP) eligibility and treatment; and

5. Notify the Corps Project Manager, and the SHPO of the discovery describing the measures that have been implemented to comply with this Stipulation.

6. Notify the Federally Recognized Tribes within 48 hours of the discovery.

Upon receipt of the information required in subparagraphs 1-5 above, the Corps shall provide the SHPO with an assessment of the NRHP eligibility of the discovery and the measures proposed to resolve adverse effects. In making the evaluation, the Corps in consultation with the SHPO, may assume the discovery to be eligible for the NRHP for the purposes of Section 106 pursuant to 36 CFR Part 800.13(c). The SHPO shall respond to the Corps' assessment within forty-eight (48) hours of receipt.

The Corps shall take into account the SHPO recommendations on eligibility and treatment of the discovery and shall provide the SHPO with a report on the actions when implemented. The

Undertaking may proceed in the area of the discovery, once the Corps has determined that the actions undertaken to address the discovery pursuant to this Stipulation are complete.

Treatment of Human Remains

The Corps shall make all reasonable efforts to avoid disturbing gravesites, including those containing Native American human remains and associated funerary objects. If human remains and/or associated funerary objects are encountered during the course of the Undertaking, the Corps shall immediately halt the Undertaking in the area and contact the Corps Archaeologist and the appropriate city Police Department.

The Corps shall treat all human remains in a manner consistent with the ACHP's Policy Statement Regarding Treatment of Burial Sites, Human Remains and Funerary Objects (February 23, 2007; https://www.achp.gov/sites/default/files/policies/2018-06/ACHPPolicyStatementRegardingTreatmentofBurialSitesHumanRemainsandFuneraryObjects0207.pdf).

The Corps shall make a good faith effort to ensure that the general public is excluded from viewing any Native American burial site or associated funerary objects. The Consulting Parties to this PA agree to release no photographs of any Native American burial site or associated funerary objects to the press or general public. The Corps shall notify appropriate federally recognized Tribe(s) if their interest(s) have been established, when Native American burials, human skeletal remains, or funerary objects are encountered during the Undertaking. Following consultation by the Corps, the SHPO and identified Tribes with cultural affiliation, the Corps shall ensure that proper steps are taken regarding the remains. This could include the delivery of any Native American human skeletal remains and associated funerary objects recovered pursuant to this PA to the appropriate Tribe.

If the remains are determined to be historic and not Native American, the Corps shall consult with the SHPO and other appropriate Consulting Parties prior to any excavation by providing a treatment plan including the following information:

- The name of the property or archaeological site and specific location from which the recovery is proposed. If the recovery is from a known archaeological site, a state-issued site number must be included.
- Indication of whether a waiver of public notice is requested and why. If a waiver is not requested, a copy of the public notice to be published in a newspaper having general circulation in the Conway and Socastee area for a minimum of four weeks prior to recovery.
- A copy of the curriculum vitae of the skeletal biologist who will perform the analysis of the remains.
- A statement that the treatment of human skeletal remains and associated artifacts will be respectful.
- An expected timetable for excavation, osteological analysis, preparation of final report, and final disposition of remains.
- A statement of the goals and objectives of the removal of human remains (to include both excavation and osteological analysis).
- If a disposition other than reburial is proposed, a statement of justification for that decision.

The Corps Archaeologist shall submit the draft treatment plan to the Corps, and the SHPO for review and comment. All comments received within thirty (30) calendar days shall be addressed in the final treatment plan. Upon receipt of final approval in writing from the Corps Archaeologist, the treatment plan shall be implemented prior to those Undertaking activities that could affect the burial(s).

The Corps Archaeologist shall notify the Corps Project Manager and the SHPO in writing once the fieldwork portion of the removal of human remains is complete. The Undertaking in the area may proceed following this notification while the technical report is in preparation. The Corps Archaeologist may approve implementation of undertaking-related ground disturbing activities in the area of the discovery while the technical report is in preparation.

The Corps Archaeologist shall ensure that a draft report of the results of the recovery is prepared within one (1) year of the notification that archaeological fieldwork has been completed and submitted to the Corps and the SHPO for review and comment. All comments received within thirty (30) calendar days of receipt shall be addressed in the final treatment plan. When the final report has been approved by the Corps Archaeologist, two (2) copies of the document, bound and on acid-free paper and one (1) electronic copy in Adobe® Portable Document Format (.pdf) shall be provided to the SHPO.

The Corps Archaeologist shall notify the Corps Project Manager and the SHPO within fifteen (15) calendar days of final disposition of the human remains.

ATTACHMENT C CONTACTS

CONTACT INFORMATION

U.S. Army Corps of Engineers, Charleston District
Colonel
Project Manager

Archaeologist
South Carolina Historic Preservation Division
Director and SHPO

ATTACHMENT D
GLOSSARY AND ACRONYMS

Area of Potential Effects (APE) - the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist.

Consultation - the process of seeking, discussing, and considering the views of other participants, and, where feasible, seeking agreement with them regarding matters arising in the section 106 process.

Effect - alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register.

Historic property - any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria.

Magnetic Anomaly – a magnetic field variation recorded during the course of a magnetometer survey caused by ferrous and some other sources.

National Register of Historic Places (NRHP) - the official list of the Nation's historic places worthy of preservation. Authorized by the National Historic Preservation Act of 1966, the National Park Service's National Register of Historic Places is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect America's historic and archeological resources.

State Historic Preservation Officer (SHPO) - the official appointed or designated pursuant to section 101(b)(1) of the act to administer the State historic preservation program or a representative designated to act for the State historic preservation officer.

Treatment Plan – the document that details the approach that will be used to mitigate the adverse effect to a historic property.

Tribal Historic Preservation Officer (THPO) - the tribal official appointed by the tribe's chief governing authority or designated by a tribal ordinance or preservation program who has assumed the responsibilities of the SHPO for purposes of section 106 compliance on tribal lands in accordance with section 101(d)(2) of the act.

Undertaking - a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a Federal agency, including those carried out by or on behalf of a Federal agency; those carried out with Federal financial assistance; and those requiring a Federal permit, license or approval.

Waccamaw River,
Horry County, South Carolina
Flood Risk Management Study
Draft Integrated Feasibility Report and Environmental Assessment

Appendix E
Real Estate Plan

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TABLE OF CONTENTS

1.0 Statement of Purpose

1.1 Purpose

The Real Estate Plan (REP) is tentative in nature and focused on the Tentatively Selected Plan. The report is to be used for planning purposes only and all real estate requirements and cost estimates identified in the report are subject to change pending completion of the final plans and specifications.

Within the last 75 years, residents of Horry County have suffered significant structural and economic loss due to recurring exposure to flooding from the Waccamaw and Pee Dee Rivers. Intense rainfall in this region, and upstream reaches of the Waccamaw River, induce multi-phase flood events that have displaced communities for 10-30 days at a time. Flash, backwater, and tidal flooding pose a threat to structures (residential and commercial), local commerce, public infrastructure, critical facilities, and emergency services.

According to the 2023 U.S. Census Bureau, Horry County is the fourth most populated county in South Carolina and is home to over 397,000 people, making it the fourth most populated county in South Carolina.This region has been identified as the second fastest growing metropolitan area in the nation in part due to its proximity to Myrtle Beach, but also due to its opportunity for further development. Expected population and economic growth in Horry County present a need for modifications or improvements to existing projects and infrastructure.

The purpose of the Waccamaw River, Horry County, SC Flood Risk Management (FRM) Study, herein referred to as the Study, is to address flood and life safety risk to communities and transportation routes specifically within Horry County, South Carolina and generally within the Waccamaw River Basin and to recommend a plan to reduce this risk. Tidal effects, flat topography and low elevations result in slow subsidence when high water events occur. Flooding is significant and affects major transportation routes, leaving densely populated communities along the coast isolated and unable to receive supplies. Inundation of transportation routes blocks access to hospitals and other critical infrastructure.

Communities within the Basin are subject to flood risk stemming from frequent riverine flooding and severe storm events. The purpose of this study is to address flooding and life safety risk that impact communities, property, and infrastructure within Horry County, and recommend a course of action to reduce that risk.

This study is needed due to the scope of flooding, which has ranged from more frequent riverine flooding to severe and widespread impacts like those sustained during Hurricanes Joaquin (2015), Matthew (2016) and Florence (2018). Horry County is comprised of 1,255 square miles of mostly flat topography. This low-lying region is the middle ground between the inland river systems of South Carolina as waters exit into the Atlantic Ocean through

Winyah Bay. The confluence at Winyah Bay receives water from the Waccamaw River, the Pee Dee River, and the Atlantic Intracoastal Waterway. Waters collected within the Basin come from almost 6000 miles of streams across North and South Carolina and flow south along a gradual slope. Flat topography, low elevations, and tidal effects result in slow subsidence when high water events occur. Flooding is significant and affects major transportation routes, leaving densely populated communities along the coast isolated, displaced, and unable to receive supplies.

1.2 Study Authorization

The authority to investigate a flood control project for the Waccamaw River in Horry County, South Carolina was provided in Section 445 of WRDA 1999 (P.L. 106-53). Section 445 states:

The Secretary shall conduct a study to determine the feasibility of undertaking a flood control project for the Waccamaw River in Horry County, South Carolina.

There is a completed USACE navigation project that overlaps the study area. Section 445 necessarily includes the authority to recommend FRM measures including structures or changes to the river in the footprint of this completed USACE navigation project, which was originally authorized by the Rivers and Harbor Acts of June 14, 1880 -S. Ex. Doc. 117, 46th Cong., 2d session and Annual Report, 1880, p. 848, and of July 3, 1930 - H. Doc. 82, 70th Cong.

There are multiple completed USACE FRM projects within the Waccamaw River basin in Horry County, South Carolina. Section 216 of the Flood Control Act of 1970 (33 U.S.C. 549a) provides authority to review the operation of these FRM projects and recommend modifications. Section 216 states:

The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operation of projects the construction of which has been completed and which were constructed by the Corps of Engineers in the interest of navigation, flood control, water supply, and related purposes, when found advisable due the significantly changed physical or economic conditions, and to report thereon to Congress with recommendations on the advisability of modifying the structures or their operation, and for improving the quality of the environment in the overall public interest.

These completed FRM projects were originally authorized under the following Continuing Authorities Program authorities, Section 205 of the Flood Control Act of 1948 and Section 208 of the Flood Control Act of 1954.

1.3 Study Location

The entire Waccamaw River Basin (the Basin) is located in the states of North and South Carolina and covers some 1,640 square miles. The Waccamaw River begins in Columbus County, North Carolina and flows approximately 140 miles southwest, roughly paralleling the coast of the Atlantic Ocean until joined by the Atlantic Intracoastal Waterway (AIWW) and the Great Pee Dee River before reaching the tidal Winyah Bay in Georgetown County, South Carolina. The Basin includes all or portions of five counties as shown below in Figure 1. The study area is comprised of the Basin within Horry County, South Carolina. Population centers within the study area and flood impact areas evaluated in this study include the following municipalities and unincorporated areas: Longs, Red Bluff, Conway, Bucksport, and Socastee, shown in Figure-1 below:

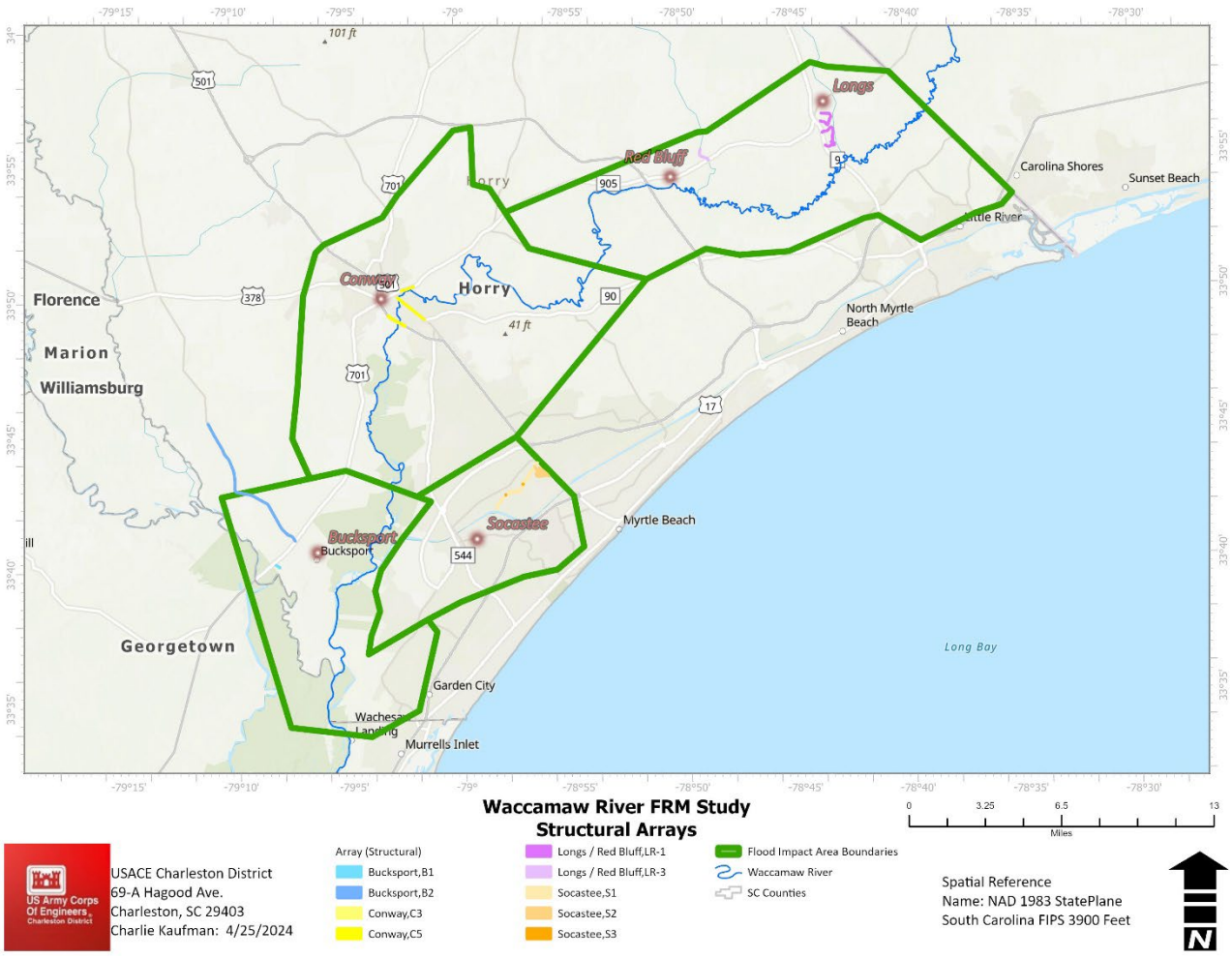


Figure-1, Waccamaw River Study Area

2.0 Real Estate Requirements

2.1 Project Description

This draft study was developed to identify, evaluate, and compare alternatives for flood risk management, consistent with USACE policy and regulations, for the purpose of reducing risk to life safety, property, and infrastructure in the Waccamaw River Basin. Numerous alternatives were evaluated throughout the study process, the Tentatively Selected Plan consists of the following features.

Conway Relief Bridges (C3): Construct three relief bridges/culverts at 501 Business, 501 Bypass, and 905 to increase conveyance through these areas where potential bottlenecking is occurring. Exact location and length of the bridges along these roadways is still being determined and will depend on the amount of additional flow needed. The proposed protections include decreasing the flood depths and size of the floodplain upstream of the Edward E. Burroughs highway along the Waccamaw River. This relief bridge would convey more water away from the inundated zone.

Conway Relief Bridge Modification OMRR&R would include annual inspection and clearing out of the culverts along with additional clearing necessary after any major flow event. This would be conducted by use of a long reach excavator and potentially a vac truck for maintenance and cleaning

Socastee Barrier Removal (S3): Removal of the two existing weirs along Socastee Creek – Both 40 foot wide and 10ft high – constructed from concrete and sheet pile. The weirs were originally constructed under the Socastee Creek Federal Project to maintain a certain ground water level to mitigate loss of wetland area. With increased development in this area, weirs may not be needed to maintain water level. Water currently flows around the weirs, eroding the area and causing damage to the weir structures. Removal of the weirs would increase conveyance in the adjacent flood impact area. This proposed measure is intended to decrease flood elevations at upstream homes along Socastee Creek. During and post construction turbidity curtains will need to be placed to trap or retain any sediment from going downstream. The banks will need to be stabilized and the O&M is considered under the current ICW project.

2.2 Required Lands, Easements, and Rights-of-Way

The non-Federal Sponsor will be responsible for acquiring, or ensuring the performance of acquiring, all the LER required for the construction, operation and maintenance of the Tentatively Selected Plan.

Table -1 below summarizes the LER required for the TSP. The LER required for the TSP will encompass an estimated land total of 6.32 acres and will impact approximately 36 parcels. Within the LER required, approximately 8 parcels were identified as publicly owned properties and approximately 28 parcels were identified as privately-owned properties.

Table-1, LER Requirements for TSP:

Location	Project Description	Estate Type	Acres	Number of Parcels Impacted	Ownership Type
Conway	Relief Bridges	Utility/Pipeline Estate	3.4 AC	12 Parcels	3 Public; 9 Private
Conway	Relief Bridges	Temporary Work Area Easement	2.5 AC	16 Parcels	5 Public; 11 Private
Socastee	Barrier Removal	Channel Improvement Estate	.28 AC	5 Parcels	Private
Socastee	Barrier Removal	Temporary Work Area Easement	.14 AC	3 Parcels	Private
		Total Acres	6.32 AC	36 Parcels	

2.3 Recommended Standard Estates

The recommended standard estate language is shown in Exhibit "A", attached to this REP. The following details the minimum interests in real property required for the Tentatively Selected Plan's construction, operation, and maintenance requirements:

Utility and/or Pipeline Easement (Standard Estate No. 13): Approximately 3.42 acres are required in perpetuity for the implementation of relief bridges/culverts at 501 Business, 501 Bypass, and 905. This measure impacts 12 parcels located in Conway, South Carolina.

Channel Improvement (Standard Estate Number No. 8): Approximately .28 of an acre of land is required in perpetuity for the removal of the two existing weirs along Socastee Creek. This measure impacts 5 properties in Socastee, South Carolina.

Temporary Work Area Easement (Standard Estate No. 15): Approximately 2.50 acres are required temporarily for relief bridge construction in Conway, South Carolina, and approximately .14 of an acre is required temporarily for the removal of the two existing weirs along Socastee Creek, South Carolina. All temporary work area easements will be required for approximately 3 years. The durations established for these easements are preliminary in nature and are subject to change.

2.4 Non-Standard Estates

There are no anticipated non-standard estates required for the project at this time. Should the need for a non-standard estate be identified during the design of the project, the estate will be drafted by the District and forwarded through Division for USACE HQ approval prior to completion of design.

3.0 Real Estate Owned by the Non-Federal Sponsor

Horry County owns approximately .002 of an acre of land required for the tentatively selected plan in fee. This portion of land is required for temporary construction purposes for the Highway 501 relief bridge/culvert measure.

USACE is in the process of coordinating with Horry County to obtain and review any recorded easements that were required for the construction of both weirs along Socastee Creek under the Socastee Creek Federal Project. Once reviewed, USACE will determine if the interests are sufficient for the tentatively selected plan. In accordance with ER 405-1-12, Section 12-18, The non-Federal sponsor shall not receive credit for the value of any LER, including incidental costs, that have been provided previously as an item of cooperation for another Federal project.

4.0 Existing Federal Projects

A variety of projects and activities are ongoing or have been completed in the Waccamaw River basin. While they are not part of this study, the scope and status of these efforts have been tracked for consideration in the planning process, conceptual design development and impact analysis. The following USACE Federal projects are located within the Study area:

Waccamaw River North and South Carolina Flood Control Report, 1951 (Completed): Outlines the feasibility of channelizing and clearing the river for the purpose of flood control.

Atlantic Intracoastal Waterway,1930 (Completed): Systematic improvements to connect coastal waterways along the southeast Atlantic.

Socastee Creek Flood Control Project, 1948 (Completed): Flood control and water related improvements within Socastee Creek, South Carolina.

5.0 Federally Owned Land

There are approximately ±.44 of an acre of Federally-owned lands, under the Fish and Wildlife Service, that are included within the lands required for construction of the relief bridges/culverts proposed at Highway 501 Business, as shown on Page 4 of Exhibit “B,” Real Estate Maps for the Tentatively Selected Plan. All federally owned lands that are required for the project are located in Conway, South Carolina. The appropriate legal document for real estate acquisition will be determined after additional coordination between USACE and the Fish and Wildlife Service.

As required by Section 906(a) of WRDA 86, in the case of any water resources project which is authorized to be constructed before, on, or after 17 November, 1986, construction

of which has not commenced as of such date, and which necessitates the mitigation of fish and wildlife losses, LER required to support mitigation must be acquired before commencement of construction of the project or it must be acquired concurrently with the LER required to support the basic project purpose, whichever the Secretary of the Army, or his designee, determines is appropriate.

The acquisition of mitigation lands is not included within this REP. Additional analysis is required to determine compensatory mitigation land requirements and coordination with the Fish and Wildlife Service.

6.0 Federal Navigation Servitude

The use of Navigational Servitude does not apply to this project.

7.0 Real Estate Mapping

Exhibit "B," attached to this REP, illustrates the LER required for the TSP. The GIS data depicted on the maps and parcel information used for this REP were obtained through the Horry County Office of Information Technology and Geographic Information Systems.

8.0 Induced Flooding

Based on the information available at the time of this report, the three relief bridges proposed in Conway, SC, and the two weir removals proposed in Socastee, SC, are likely to cause induced flooding impacts. Induced flooding and the associated real estate impacts will be further analyzed during the optimization phase of this Study and a Takings Analysis will be prepared by District Counsel.

9.0 Baseline Cost Estimate for Real Estate

The Baseline Cost Estimate for Real Estate (BCERE) attached to this REP as Exhibit "C", shows the estimated federal and non-federal financial costs attributed to the Tentatively Selected Plan's real estate requirements. The BCERE encompasses the non-Federal Sponsor's real estate acquisition costs for land payments and administrative costs, as shown in the 01, Lands and Damages Account. The 30 - Planning, Engineering and Design Account, contains the federal real estate administrative costs associated with the review and oversight of the non-Federal Sponsor during real estate acquisition.

The PDT developed separate costs for each proposed measure within the TSP therefore, the LER costs for the construction of relief bridges in Conway, SC and the LER costs for the removal of the two weirs in Socastee, SC were calculated as two separate plans. Table-2 and Table-3 below provide a summary of the BCERE(s) for the LER required for both plans located within Horry County, South Carolina.

Table-2, Baseline Cost Estimate Summary for the Construction of Relief Bridges/Culverts in Conway:

ACCOUNT	COSTS	CONTINGENCY	TOTAL
01 Land/Damages Account			
01 Land Payments	$ 678,674.00	$ 237,535.90	$916,209.90
01 NFS Administrative/Incidental Costs	$560,000.00		$560,000.00
Federal Administrative Costs	$ 280,000.00	$	$280,000.00
02 – Relocations	-	-	-
30 - Planning, Engineering and Design	-	-	-
TOTAL	$1,518,674.00	$237,535.90	$ 1,756,209.90

Table-3, Baseline Cost Estimate Summary for the Socastee Creek Weir Removals:

ACCOUNT	COSTS	CONTINGENCY	TOTAL
01 - Land/Damages Account			
01 Land Payments	$ 52,139.00	$ 18,248.65	$70,388.00
01 NFS Administrative/Incidental Costs	$100,000.00	$	$100,000.00
Federal Administrative Costs	$50,000.00	$	$50,000.00
02 – Relocations	-	-	-
30 - Planning, Engineering and Design	-	-	-
TOTAL	$202,139.00	$18,248.65	$220,388.00

Note: The costs outlined above are preliminary in nature and are subject to change. All updated real estate costs will be provided in the final report. Federal administrative costs are captured in the 01- Lands and Damages account for planning purposes however, these costs will be refined and captured in the 30 – Planning, Engineering and Design account for the final report.

10.0 Uniform Relocation Assistance

No relocation assistance benefits are anticipated for the proposed project. There are no residences or businesses that will be temporarily or permanently displaced, within the project area.

11.0 Minerals and Timber Activity

There are no known present or anticipated mineral extraction or timber harvesting activities within the LER required for the TSP.

12.0 Non-Federal Sponsor Capability Assessment

The Non-Federal Sponsor's Capability Assessment is shown on Exhibit "C", attached to this REP. The non-Federal Sponsor maintains the professional capability for land acquisitions and can reasonably obtain contract services if needed. The NFS has the responsibility to acquire all real estate interests required for the Project. The NFS shall accomplish all alterations and relocations of utilities/facilities, structures and improvements determined by the government to be necessary for construction of the Project. The NFS will have all operation and maintenance responsibility for the project after construction is completed.

Title to any acquired real estate will be retained by the NFS and will not be conveyed to the United States Government. Prior to advertisement of any construction contract, the NFS shall furnish to the government an Authorization for Entry for Construction to all lands, easements and rights-of-way, as necessary, as shown on Exhibit "D," attached to this REP. The NFS will also furnish to the government evidence supporting their legal authority to grant rights-of-way to such lands.

The NFS is entitled to receive credit against its share of project costs for the value of lands it provides and the value of the relocations that are required for the project. Generally, for the purpose of determining the amount of credit to be afforded, the value of the LERRD is the fair market value of the real property interest, plus certain incidental costs of acquiring those interests, that the NFS provided for the project as required by the Government.

13.0 Land Use Zoning

Zoning ordinances are not of issue with this project. Application or enactment of zoning ordinances is not to be used in lieu of acquisition.

14.0 Real Estate Acquisition Schedule

The NFS will be responsible for acquiring all real estate interests required for the project. It is projected that the proposed easements can be acquired within 12-18 months. Acquisition can begin when the Project Participation Agreement (PPA) has been signed, a notice to proceed with acquisition and final plans and specs have been completed and provided to the NFS by the District Chief of Real Estate.

Project phases have not yet been determined at this time and will be coordinated as the study progresses into the optimization phase. This REP will be updated as further information becomes available.

15.0 Utility/Facility Relocations

There are no known utility/facility relocations associated with the project at this time. Additional analysis will be conducted to identify any existing utilities that will be impacted

by the TSP and the associated real estate impacts.

16.0 Hazardous, Toxic & Radioactive Waste (HTRW)

The Draft Waccamaw River, Horry County, South Carolina Flood Risk Management Study Integrated Feasibility Report and Environmental Assessment (IFR/EA), Section 2.13.1, states that an assessment of HTRW in the study area was performed to determine the type and extent of HTRW contamination, if any, and how HTRW considerations will impact alternative project plans. A desktop review of geospatial information from all publicly available EPA databases which maintain HTRW data was performed and information of facilities registered to the EPA's Facility Registry Service was used to identify facilities and HTRW which may overlap with areas of proposed measures in the study area. Paragraph 2.14.1 of the IFR/EA provides the following HTRW site information:

"In the Conway flood impact area, a mining operation recorded in the Resource Conservation and Recovery Act (RCRA) information system (FRS ID: 110070516353) is adjacent to the US 501 Business Highway and within roughly half a mile from a structural measure proposed. The facility also shares part of the floodplain with a proposed structural measure. This facility has had one occurrence of non-compliance on record, but this referred to a lapse in record-keeping. In the Socastee flood impact area, eight facilities registered as producers of hazardous waste under RCRA exist within a half mile of a proposed structural measure. Of these eight facilities, one (FRS ID: 110013197824) has been cited for violations in the previous 5 years pertaining to labeling of hazardous wastes and the proper treatment and disposal of wastes at disposal facilities. However, none of these facilities are known to share a drainage or floodplain with the proposed measure and do not physically overlap with the extent of the proposed measure."

This Real Estate Plan will be updated to identify the exact HTRW sites located within the project alignment and any associated impacts acquisition. Any HTRW discovered during the acquisition of land easements, or preconstruction or construction phases would be the responsibility of the NFS to remove prior to initiation or completion of works.

17.0 Project Public Support

The NFS, represented by Horry County, has expressed support of the TSP. A letter of intent acknowledging the NFS's intent to support project implementation will be included in the final report.

Three public meetings were held early in the study to facilitate external input on the scope of the study. Identical meetings were repeated in locations of the communities affected by riverine flooding, including one ins Longs and Red Bluff, one in Bucksport, and one in the City of Conway that was also attended by the Socastee community. Attendees were introduced to the study and engaged with the study team through conversations and participatory mapping to help verify the extent and impacts of flooding, and to provide input on initial measures being considered to reduce flood risks. Attendees were also able to

submit input following the meetings through an online form. The input was used to focus the final array of alternatives. Discussions held during public events also established a community baseline from which the Other Social Effects and Environmental Quality accounts were used to evaluate plans. As of the date of this report, it is anticipated that Landowners will be in favor of the TSP. Landowners have previously expressed concerns regarding the significant flooding occurring along HWY 501 Business, HWY 501 Bypass, and HWY 905 in Conway, SC as well as flooding in Socastee, SC. USACE is in the process of coordinating additional public outreach meetings for public review and commenting on the TSP. The final REP will include additional information regarding public support of the TSP.

18.0 Non-Federal Sponsor Risk Notification

The NFS is not encouraged to acquire lands required for the project prior to execution of the PPA. Should the NFS proceed with acquisition of lands prior to execution of the PPA, it is at the risk of not receiving credit or reimbursement for any costs incurred in the connection with the acquisition process should the PPA not be signed. There is also risk in acquiring lands either not needed for the project or not acquired in compliance with requirements for crediting purposes in accordance with 49 CFR Part 24, dated March 2, 1989. A letter identifying risk of early acquisition was sent to the NFS on July 8, 2024, and is attached as Exhibit “E.”

19.0 Points of Contact

This REP was prepared in accordance with ER 405-1-12, Chapter 12 and is intended to present the overall plan describing the minimum real estate requirements (lands, easements, rights-of-way, relocations, and disposals needed for the construction, operation, maintenance, repair, and rehabilitation of the TSP. The point of contact for this REP is Lauren Mazzola, Realty Specialist, who may be contacted by phone at (912) 710-1344 or via email at Lauren.N.Mazzola@usace.army.mil.

Prepared By:

_____

Lauren Mazzola
Realty Specialist
Savannah District

Reviewed and Approved By:

_____

Chief, Real Estate Division

EXHIBIT A
STANDARD ESTATES

CHANNEL IMPROVEMENT EASEMENT (Standard Estate No. 8):

A perpetual and assignable right and easement to construct, operate, and maintain channel improvement works on, over and across (the land described in Schedule A) (Tract Nos. _____, _____ and _____) for the purposes as authorized by the Act of Congress approved_____, including the right to clear, cut, fell, remove and dispose of any and all timber, trees, underbrush, buildings, improvements and/or other obstructions therefrom; to excavate: dredge, cut away, and remove any or all of said land and to place thereon dredge or spoil material; and for such other purposes as may be required in connection with said work of improvement; reserving, however, to the owners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

UTILITY AND/OR PIPELINE EASEMENT (Standard Estate Number 13):

A perpetual and assignable easement and right-of-way in, on, over and across (the land described in Schedule A) (Tract Nos. _____,_____ and _____), for the location, construction, operation, maintenance, alteration; repair and patrol of (overhead) (underground) (specifically name type of utility or pipeline); together with the right to trim, cut, fell and remove therefrom all trees, underbrush, obstructions and other vegetation, structures, or obstacles within the limits of the right-of-way; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and
pipelines.

TEMPORARY WORK AREA EASEMENT (Standard Estate Number 15):

A temporary easement and right-of-way in, on, over and across (the land described in Schedule A) (Tract Nos. _____, _____ and _____), for a period not to exceed _____, beginning with date possession of the land is granted to the United States, for use by the United States, its representatives, agents, and contractors as a (borrow area) (work area), including the right to (borrow and/or deposit fill, spoil and waste material thereon) (move, store and remove equipment and supplies, and erect and remove temporary structures on the land and to perform any other work necessary and incident to the construction of the _____ Project, together with the right to trim, cut, fell and remove therefrom all trees, underbrush, obstructions, and any other

vegetation, structures, or obstacles within the limits of the right-of-way; reserving, however, to the landowners, their heirs and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines.

Waccamaw River FRM Study
Structural Arrays Conway Relief Bridges

0 0.17 0.35 0.7
Miles

Selected Array Buffers

EasementType

Perpetual

Temporary Construction

Selected Array (Structural)

Conway,C3

Horry County Parcels

Waccamaw River

US Army Corps Of Engineers Charleston District

USACE Charleston District
69-A Hagood Ave.
Charleston, SC 29403
Charlie Kaufman: 7/3/2024

Spatial Reference
Name: NAD 1983 StatePlane
South Carolina FIPS 3900 Feet

N

Waccamaw River FRM Study
Structural Arrays Socastee Weir Removal

0 0.05 0.1 0.2
Miles

Selected Array Buffers

EasementType

Perpetual

Temporary Construction

Selected Array (Structural)

Socastee,S3

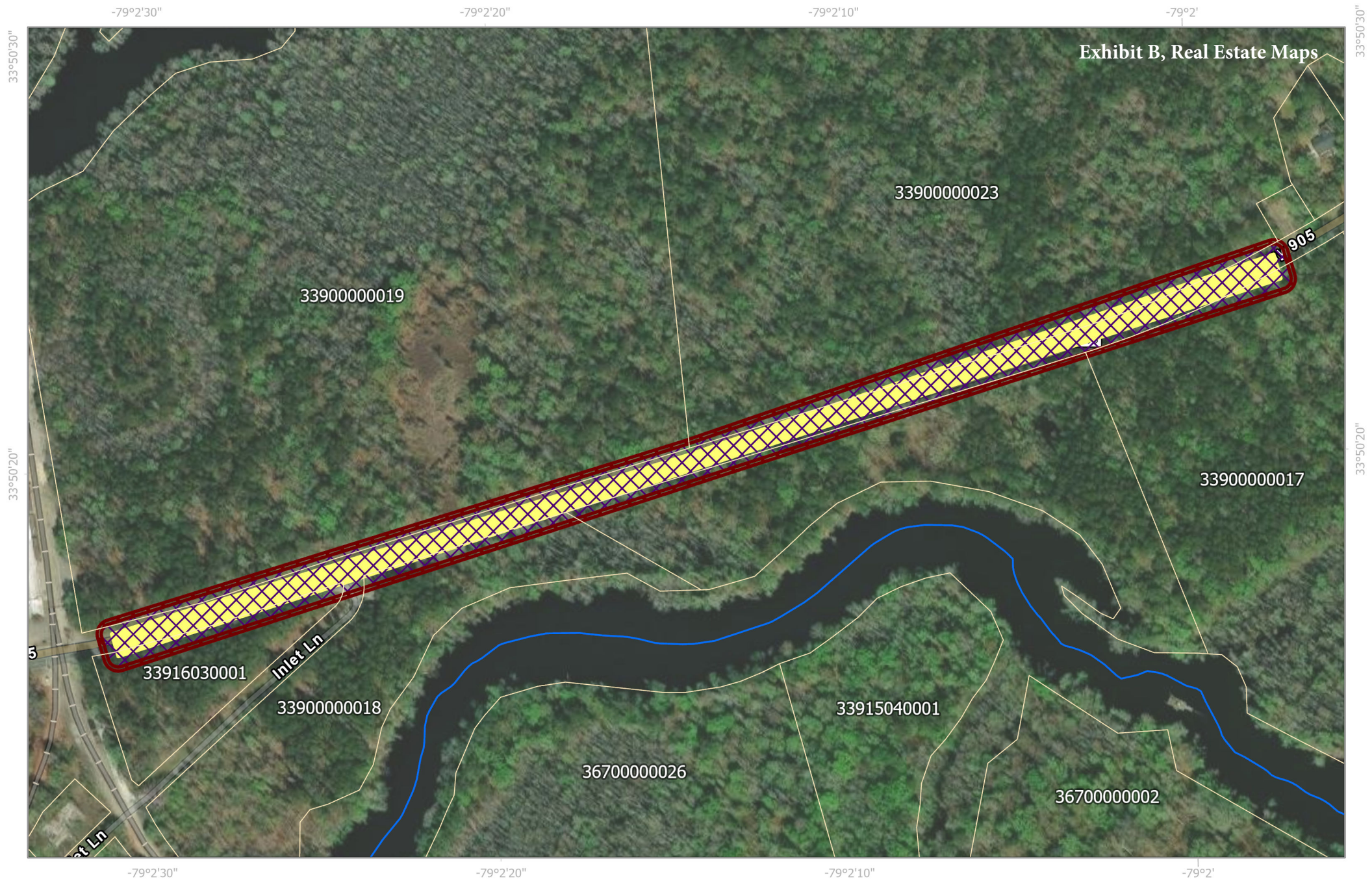
Horry County Parcels

US Army Corps Of Engineers Charleston District

USACE Charleston District
69-A Hagood Ave.
Charleston, SC 29403
Charlie Kaufman: 7/3/2024

Spatial Reference
Name: NAD 1983 StatePlane
South Carolina FIPS 3900 Feet

N



Waccamaw River FRM Study
Structural Arrays Conway Relief Bridges (Hwy 905)

0 0.04 0.08 0.16
Miles

Selected Array Buffers

EasementType

- Perpetual
- Temporary Construction

Selected Array (Structural)

- Conway,C3
- Horry County Parcels
- Waccamaw River

US Army Corps Of Engineers Charleston District

USACE Charleston District
69-A Hagood Ave.
Charleston, SC 29403
Charlie Kaufman: 7/3/2024

Spatial Reference
Name: NAD 1983 StatePlane
South Carolina FIPS 3900 Feet

N

Waccamaw River FRM Study
Structural Arrays Conway Relief Bridges (Hwy 501 B)

0 0.1 0.2 0.4
Miles

Selected Array Buffers

EasementType

- Perpetual
- Temporary Construction

Selected Array (Structural)

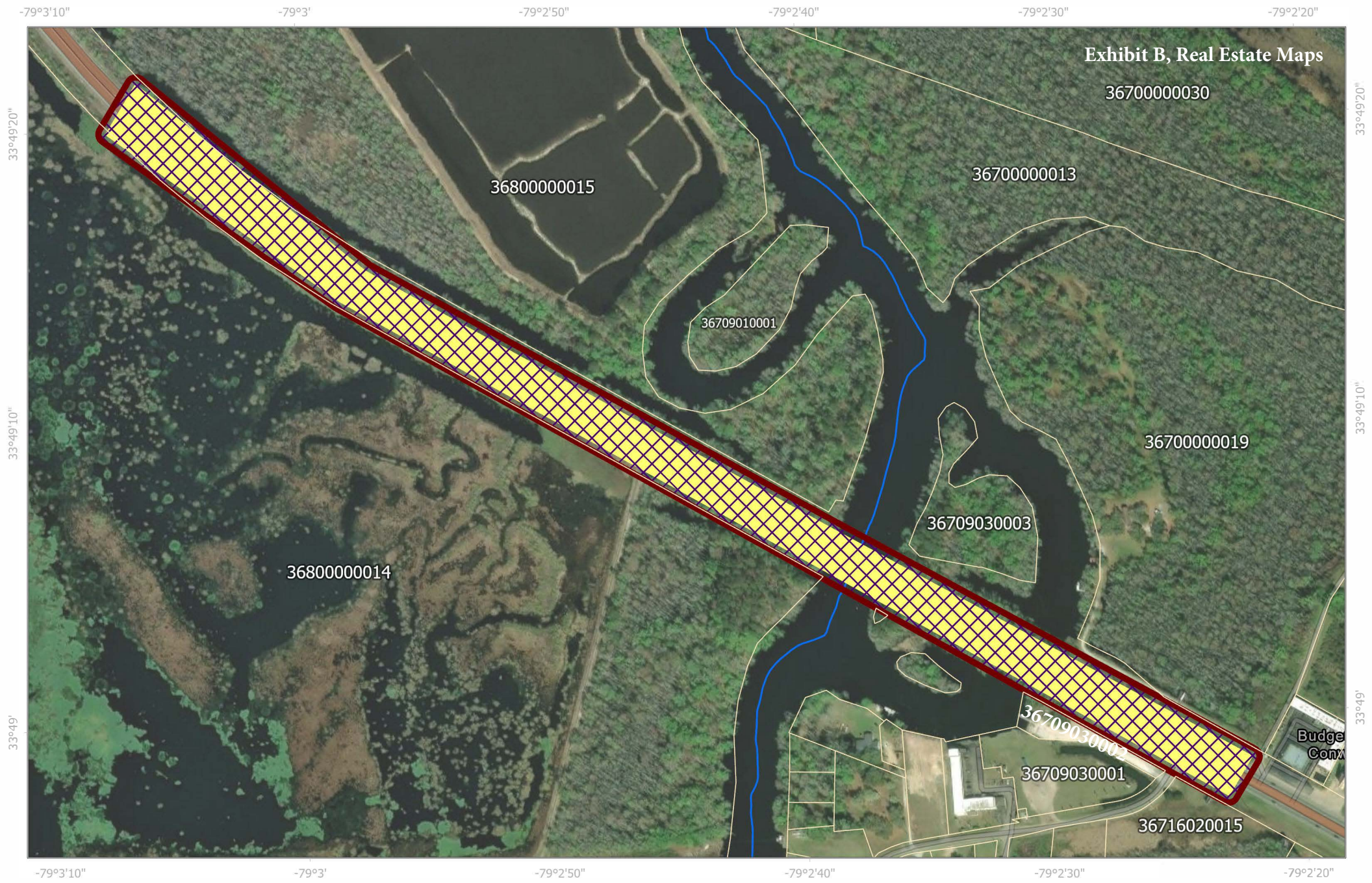
- Conway,C3
- Horry County Parcels
- Waccamaw River

US Army Corps Of Engineers Charleston District

USACE Charleston District
69-A Hagood Ave.
Charleston, SC 29403
Charlie Kaufman: 7/3/2024

Spatial Reference
Name: NAD 1983 StatePlane
South Carolina FIPS 3900 Feet

N



Waccamaw River FRM Study
Structural Arrays Conway Relief Bridges (Hwy 501)

0 0.05 0.1 0.2
Miles

Selected Array Buffers

EasementType

Perpetual

Temporary Construction

Selected Array (Structural)

Conway,C3

Horry County Parcels

Waccamaw River

US Army Corps Of Engineers Charleston District

USACE Charleston District
69-A Hagood Ave.
Charleston, SC 29403
Charlie Kaufman: 7/3/2024

Spatial Reference
Name: NAD 1983 StatePlane
South Carolina FIPS 3900 Feet

N

Waccamaw River FRM Study
Structural Arrays Socastee Weir Removal (Downstream)

0 0.01 0.01 0.02
Miles

Selected Array Buffers

EasementType

Perpetual

Temporary Construction

Selected Array (Structural)

Socastee,S3

Horry County Parcels

Spatial Reference
Name: NAD 1983 StatePlane
South Carolina FIPS 3900 Feet

N

US Army Corps Of Engineers Charleston District

USACE Charleston District
69-A Hagood Ave.
Charleston, SC 29403
Charlie Kaufman: 7/3/2024

Waccamaw River FRM Study
Structural Arrays Socastee Weir Removal (Upstream)

0 0.01 0.01 0.03
Miles

US Army Corps Of Engineers Charleston District

USACE Charleston District
69-A Hagood Ave.
Charleston, SC 29403
Charlie Kaufman: 7/3/2024

Selected Array Buffers

EasementType

- Perpetual
- Temporary Construction

Selected Array (Structural)

- Socastee,S3
- Horry County Parcels

Spatial Reference
Name: NAD 1983 StatePlane
South Carolina FIPS 3900 Feet

N

WACCAMAW RIVER FLOOD RISK MANAGEMENT INTEGRATED FEASIBILITY STUDY AND ENVIRONMENTAL ASSESSMENT

EXHIBIT C

ASSESSMENT OF NON-FEDERAL SPONSOR'S REAL ESTATE ACQUISITION CAPABILITY

I. NON-FEDERAL SPONSOR:

Horry County, South Carolina

II. LEGAL AUTHORITY:

a. Does the Non-Federal Sponsor have legal authority to acquire and hold title to real property for project purposes?

Yes, Horry County, South Carolina, as the Non-Federal Sponsor for a federal civil works project, has the legal authority to acquire and hold title to real property for project purposes under S.C. Code Ann. § 4-9-30(2)

b. Does the Non-Federal Sponsor have the power of eminent domain for this project?

Yes, Horry County, South Carolina, as the Non-Federal Sponsor, has the power of eminent domain under the South Carolina Eminent Domain Procedures Act, Section 28-2-10, et seq.

c. Does the Non-Federal Sponsor have "quick-take" authority for this project?

Yes, Horry County, South Carolina, as the Non-Federal Sponsor, has this authority under the South Carolina Eminent Domain Procedures Act, S.C. Code Ann. § 28-2-10, et seq.

d. Are any of the lands/interests in the land required for the project located outside the Non-Federal Sponsor's political boundary?

No, all lands required for the project are within the Sponsor's political boundary.

e. Are any of the lands/interests in the land required for the project owned by an entity whose property the Non-Federal Sponsor cannot condemn?

There are federally-owned properties required for the project in which the Non-Federal Sponsor cannot condemn.

III. HUMAN RESOURCES REQUIREMENTS:

a. Will the Non-Federal Sponsor's in-house staff require training to become familiar with the real estate requirements of Federal projects including P.L. 91-646, as amended?

No, the Sponsor does not require training to become familiar with the real estate requirements of Federal projects, including P.L. 91-646.

b. If the answer to II.a is yes, has a reasonable plan been developed to provide such training?

Not Applicable.

c. Does the Non-Federal Sponsor's in-house staff have sufficient real estate acquisition experience to meet its responsibilities for the project?

Yes, the Sponsor's in-house staff has sufficient real estate acquisition experience to meet its responsibilities for the project.

d. Is the Non-Federal Sponsor's projected in-house staffing level sufficient considering its other workload, if any, and the project schedule?

Yes, the Non-Federal Sponsor's projected in-house staffing level is sufficient in regards to other workload and project schedule.

e. Can the Non-Federal Sponsor obtain contractor support, if required, in a timely fashion?

Yes, if necessary, the Non-Federal Sponsor can obtain contract support in a timely fashion to assist with real estate acquisition for the project.

f. Will the Non-Federal Sponsor likely request USACE assistance in acquiring real estate?

As of this assessment, the Non-Federal Sponsor has not requested USACE assistance to acquire the real estate on their behalf. It is unlikely USACE would acquire the real estate on behalf of the Non-Federal Sponsor since the Sponsor: (1) possesses the professional capability to acquire the real estate needed for the project; (2) can reasonably obtain, if necessary, real estate acquisition contracting services from sources other than the Federal Government; (3) have sufficient general and legal acquisition authority to acquire all the real estate required for the project; and (4) intend on entering into a partnership agreement with the local municipality to assist with real estate acquisition activities. However, since the standard project partnership agreement offers the Sponsor the opportunity to request USACE assistance

with real estate acquisition, the option remains open to the Sponsor for further discussion.

IV. OTHER PROJECT VARIABLES:

a. Will the Non-Federal Sponsor's staff be located within reasonable proximity to the project site?

Yes, the Non-Federal Sponsor's staff is located within a reasonable proximity to the project site.

b. Has the Non-Federal Sponsor approved the project/real estate schedule/ milestones?

USACE and the Non-Federal Sponsor will coordinate and assess real estate acquisition requirements and processes, including experiences from other partnered civil works projects. As of this assessment the Non-Federal Sponsor has not approved real estate schedule/milestones.

V. OVERALL ASSESSMENT:

a. Has the Non-Federal Sponsor performed satisfactorily on other USACE projects?

Yes, the Non-Federal Sponsor has performed satisfactorily on other completed and on-going USACE projects.

b. With regard to this project, the Non-Federal Sponsor is anticipated to be: Highly capable/ fully capable/ moderately capable/ marginally capable/ insufficiently capable?

The Non-Federal Sponsor is highly capable of performing its real estate acquisition responsibilities for the project.

VI. COORDINATION:

a. Has this assessment been coordinated with the Non-Federal Sponsor?

This assessment has been coordinated with the Non-Federal Sponsor.

b. Does the Non-Federal Sponsor concur with this assessment?

This assessment has been coordinated with the Non-Federal Sponsor for concurrence.

Prepared By:

_____

Reviewed and Approved By:

_____

AUTHORIZATION FOR ENTRY FOR CONSTRUCTION

I _____, _____ for the
(Name of accountable official) (Title)

(Sponsor Name), do hereby certify that the (Sponsor Name) has acquired the real property interest required by the Department of the Army, and otherwise is vested with sufficient title and interest in lands to support construction for (Project Name, Specifically identified project features, etc.). Further, I hereby authorize the Department of the Army, its agents, employees and contractors, to enter upon (identify tracts)
to construct (Project Name, Specifically identified project features, etc.) as set forth in the plans and specifications held in the U. S. Army Corps of Engineers' (district, city, state)

WITNESS my signature as _____ for the
(Title)

(Sponsor Name) this _____ day of _____, 2022.

BY: _____
(Name)

_____
(Title)

ATTORNEY'S CERTIFICATE OF AUTHORITY

I, _____ , _____ for the
(Name) (Title of legal officer)

(Sponsor Name), certify that _____ has
(Name of accountable official)

authority to grant Authorization for Entry; that said Authorization for Entry is executed by the proper duly authorized officer; and that the Authorization for Entry is in sufficient form to grant the authorization therein stated.

WITNESS my signature as _____ for the
(Title)

(Sponsor Name), this _____ day of _____, _____.

BY: _____
(Name)

_____
(Title)

DEPARTMENT OF THE ARMY
SAVANNAH DISTRICT, CORPS OF ENGINEERS
100 W. OGLETHORPE AVENUE
SAVANNAH, GEORGIA 31401-3640

July 9, 2024

SUBJECT: Waccamaw River Flood Risk Management Study

Horry County
Attn: Honorable Johnny Gardner, Chairman
1301 Second Avenue
Conway, South Carolina 29526

Dear Chairman Gardner:

The intent of this letter is to formally advise Horry County, as the potential non-Federal sponsor for the subject project, of the risks associated with land acquisition prior to the execution of the Project Partnership Agreement (PPA), completion of the project design, or prior to the Government's formal notice to proceed with real estate acquisition. If a non-Federal sponsor deems it necessary to commence acquisition prior to an executed PPA for whatever reason, the non-Federal sponsor assumes full and sole responsibility for any and all costs, responsibility, or liability arising out of the acquisition effort.

Generally, these risks include, but may not be limited to, the following:

(1) Congress may not appropriate funds to construct the proposed project;

(2) The proposed project may otherwise not be funded or approved for construction;

(3) A PPA mutually agreeable to the non-Federal sponsor and the Government may not be executed and implemented;

(4) The non-Federal sponsor may incur liability and expense by virtue of its ownership of contaminated lands, or interests therein, whether such liability should arise out of local, state, or Federal laws or regulations including liability arising out of CERCLA, as amended;

(5) The non-Federal sponsor may acquire interests or estates that are later determined by the Government to be inappropriate, insufficient, or otherwise not required for the project;

(6) The non-Federal sponsor may initially acquire insufficient or excessive real property acreage which may result in additional negotiations and/or benefit payments under P.L. 91-646, as well as the payment of additional fair market value to affected landowners which could have been avoided by delaying acquisition until after PPA execution and the Government's notice to commence acquisition and performance of LERRD; and

(7) The non-Federal sponsor may incur costs or expenses in connection with its decision to acquire or perform LERRD in advance of the executed PPA and the Government's notice to proceed which may not be creditable under the provisions of Public Law 99-662 or the PPA.

We appreciate the County's participation in this project. Should you have questions or concerns pertaining to this letter, please feel free to contact Ms. Lauren Mazzola, Realty Specialist at (912) 710-1344 or by email at lauren.n.mazzola@usace.army.mil

Sincerely,

J. Morgan Kearns
Savannah District
Chief, Acquisition Branch
Real Estate Division

Appendix F. Economics

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Appendix F. Economics

1 BACKGROUND INFORMATION

1.1 INTRODUCTION

General This appendix presents an economic evaluation of the riverine flood risk reduction measures for the Waccamaw River Flood Risk Management study. The evaluation area includes four damage areas amongst them Bucksport, City of Conway, Socastee, and Longs/Red Bluff. The report was prepared in accordance with Engineer Regulation (ER) 1105-2-100, Planning Guidance Notebook, (ER) 1105-2-103, Policy for Conducting Civil Works Planning Studies, and ER 1105-2-101, Planning Guidance, Risk Analysis for Flood Damage Reduction Studies. The National Economic Development Procedures Manual for Flood Risk Management and Coastal Storm Risk Management, prepared by the Water Resources Support Center, Institute for Water Resources, was also used as a reference, along with the User's Manual for the Hydrologic Engineering Center Flood Damage Analysis Model (HEC-FDA).

The economic appendix consists of a description of the methodology used to determine National Economic Development (NED) damages under future without project conditions, Regional Economic Development (RED) values, and project costs. During 2024, the damages and costs of all alternatives in the final array were calculated using the FY 2024 Federal discount rate of 2.75 percent and a period of analysis with the year 2035 as the base year. Subsequent refinement of the alternatives that had positive net annual benefits resulted in updated costs which were calculated using October 2023 price levels and annualized using the FY 2024 Federal discount rate of 2.75 percent and a period of analysis of 50 years with the year 2035 as the base year. The expected annual damage and benefit estimates were compared to the annual construction costs and the associated OMRR&R costs for each of the project measures.

Past Flood Damages According to the National Center for Environmental Information (NCEI), Horry County and the participating jurisdictions have experienced 29 flood events since 1995 and an additional 60 flash floods. One of the most significant was Hurricane Floyd, which brought three different floods to Horry County. More than 1,700 homes were damaged. Of those over 200 homes were substantially damaged which qualified them for assistance under the Hazard Mitigation Grant Program.

From 2015-2019 Horry County would experience flooding events each year. Flooding from the storm remnants of Hurricane Joaquin would affect the area in 2015, Hurricane Matthew in 2016, Hurricane Irma in 2017, Hurricane Florence in 2018, and Hurricane Dorian in 2019. Following the storm fragments of Hurricane Joaquin, Horry County received more than 20 inches of rain in 48 hours which overburdened drainage capabilities throughout the county resulting in flash flooding and ultimately the third highest crest on record for the Waccamaw River. Excessive rainfall once again caused record breaking flooding from Hurricane Matthew in 2016 and the National Weather

Service in Wilmington issued its first-ever flash flood emergency for Horry County as flooding became widespread and life-threatening. Hurricane Florence in 2018 produced heavy rains throughout the County for 3 days and rain totals in the Loris area reached 23.63 inches causing major flooding issues. Brush trucks, small boats and the National Guard high-water vehicles were utilized to help get over 100 residents out of their flooded homes. In addition to residential homes being affected, Loris City Hall also had extensive damage as a portion of the roof collapsed due to the rainfall. The flood from Florence set the new record in Conway of 21.16 feet of inundation also surpassing the old record of 17.89 feet set by Hurricane Matthew. There were 1,941 homes impacted and the reported cost of damage from Hurricane Florence flooding was $41.5 Million in Horry County. Hurricane Dorian in 2019 produced heavy periods of rain, but not to the extent experienced in the prior two storms. Some low-lying areas of the County experienced flash flooding.

NED Benefit Categories Considered Per Planning Guidance "There are three primary benefit categories, reflecting three different responses to a flood hazard reduction plan. Inundation reduction benefits are the increases in net income generated by the affected land uses when the same land use pattern and intensity of use is assumed for both with- and without-project conditions. Intensification benefits are increases in net income generated by intensified floodplain activities when the floodplain use is the same with and without the project but an activity (or activities) is more intense with the project. The third category of benefits is location benefits. If an activity is added to the floodplain because of a plan, the location benefit is the difference between aggregate net incomes (including economic rent) in the economically affected area with and without the project. The magnitude of location benefits that can be claimed is limited by policy. In general, the NED Plan will be formulated to protect existing development and vacant property that is interspersed with existing development. This analysis for Horry County analyzes only inundation reduction benefits related to depreciated structure values, contents values, and damages to automobiles associated with various structure types.

Additional NED Benefit Categories NOT Considered The NED benefit categories not addressed in this economic appendix prior to selection of a Tentatively Selected Plan (TSP) include the following:

- Emergency Cost Reduction Benefits. Emergency costs are those costs incurred by a community during and immediately following a major storm. Examples include travel, meal, cleanup supplies, unpaid labor, and vandalism costs.
- Indirect losses to the national economy because of disruptions in the production of goods and services by industries affected by the storm or riverine flooding.
- Increased cost of operations for industrial facilities following a flood event relative to normal business operations.
- Physical loss of agricultural crops grown to be sold for commercial profit.
- Traffic detour time due to flooded roadways.

Regional Economic Development When the economic activity lost in a flooded region can be transferred to another area or region in the national economy, these losses

cannot be included in the NED account. However, the impacts on the employment, income, and output of the regional economy are considered part of the RED account. The input-output macroeconomic model RECONS is used to address the impacts of the construction spending associated with the project alternatives.

Other Social Effects The other social effects (OSE) account includes impacts to life safety, vulnerable populations, local economic vitality, and community optimism. Impacts on these topics are a natural outcome of civil works projects and are often qualitatively discussed in the OSE account. These types of benefits were estimated using the C-Best tool and can be found in the Main Report Sections 4.11 Socioeconomics and Environmental Justice and 5.1.4 Other Social Effects.

1.2 DESCRIPTION OF THE STUDY AREA

Geographic Location

The study area is comprised of the Waccamaw River Basin within Horry County, South Carolina. The study area boundary is divided into four flood impact areas: Bucksport, Conway, Longs/Red Bluff, and Socastee as shown below in Figures 1- 4. These areas are based on jurisdictional boundaries but are also reflective of geographic and socioeconomic qualities unique to each. The study area is largely urban with mostly residential structures. An inventory of residential and non-residential structures was developed using the National Structure Inventory (NSI) version 2.0 for the portions of the county impacted by riverine flooding. The structure inventory for the economic analysis includes all structures within the extent of inundation for the 0.2% annual exceedance probability (AEP) event in the future without project condition.

Figures 1 – 4 show the structure inventory and the boundaries of the impact area within the 500-yr floodplain. Table 1, on page 13, depicts the number of structures and structure type count with respect to each impact area.

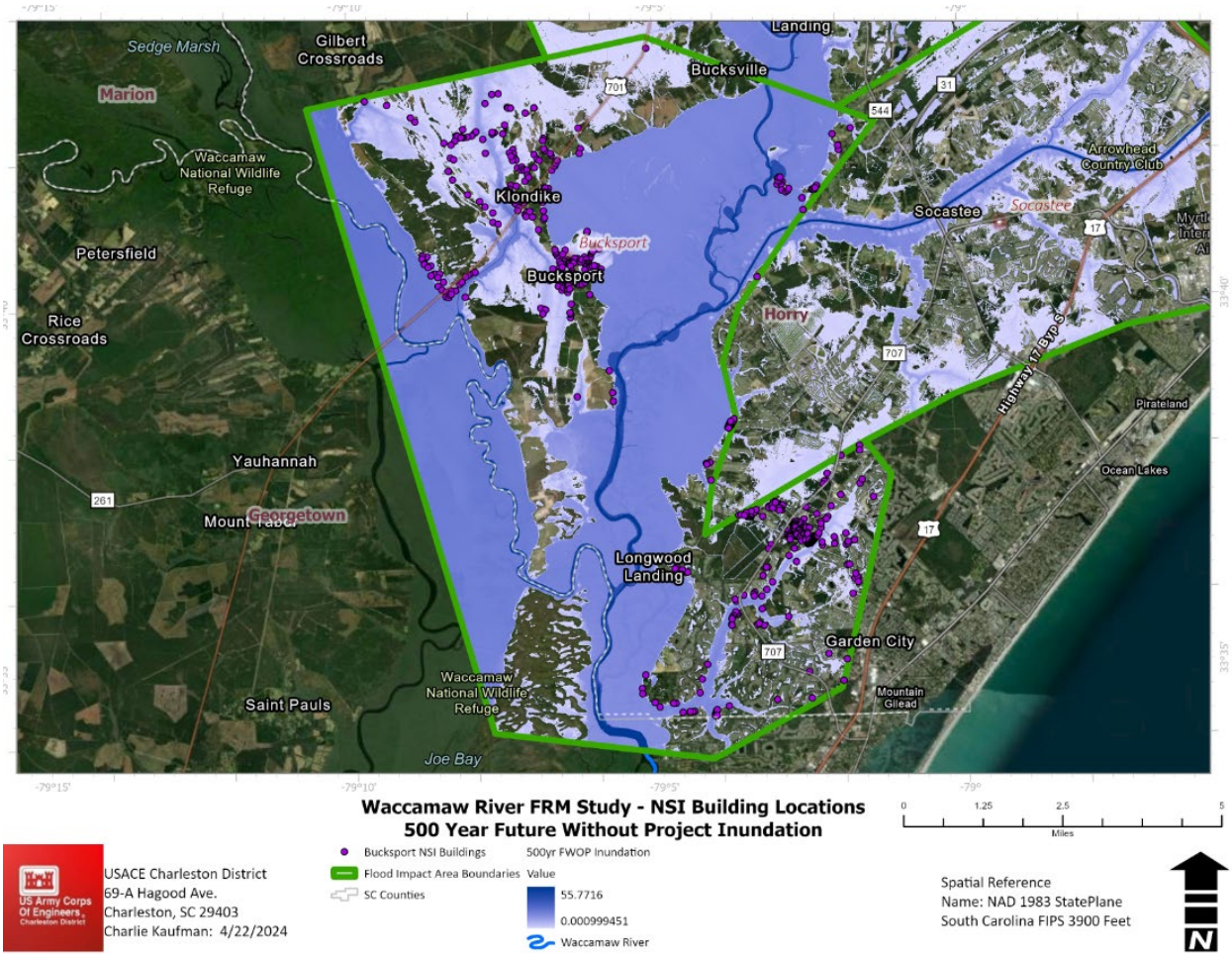

Figure 1 Bucksport NSI Building Locations Within 500-year Floodplain

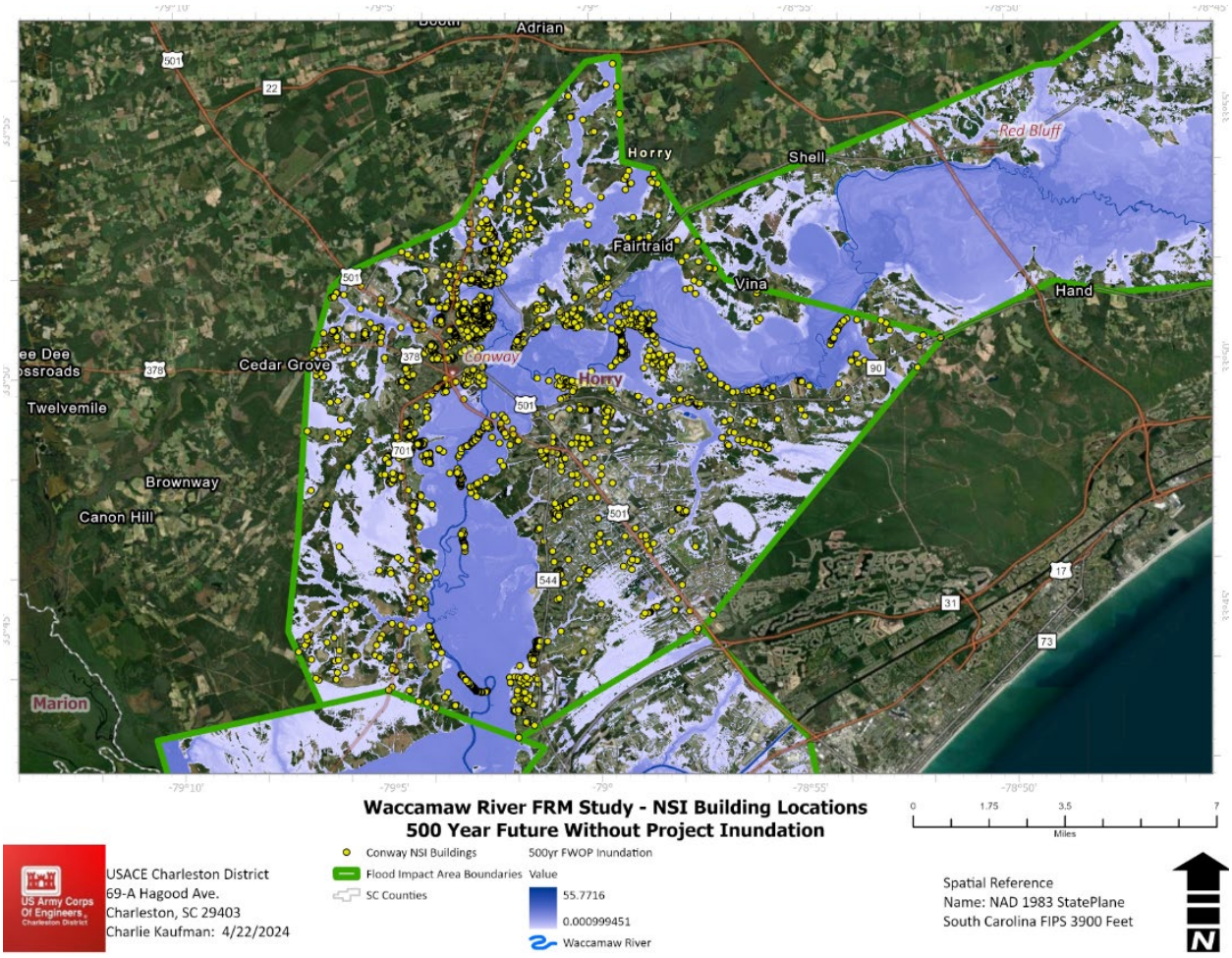

Figure 2 Conway NSI Building Locations Within 500-year Floodplain

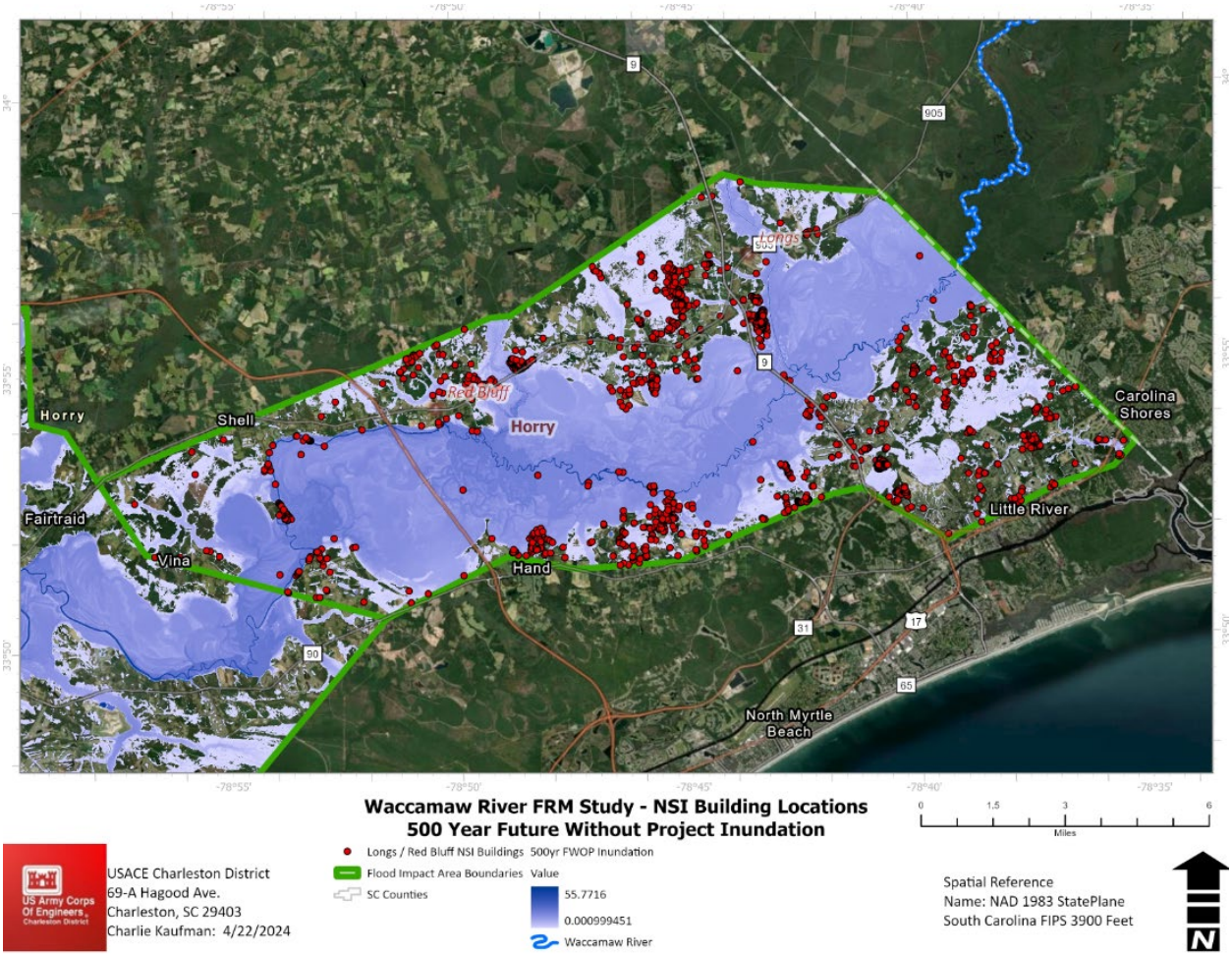

Figure 3 Longs/RedBluff NSI Building Locations Within 500-year Floodplain

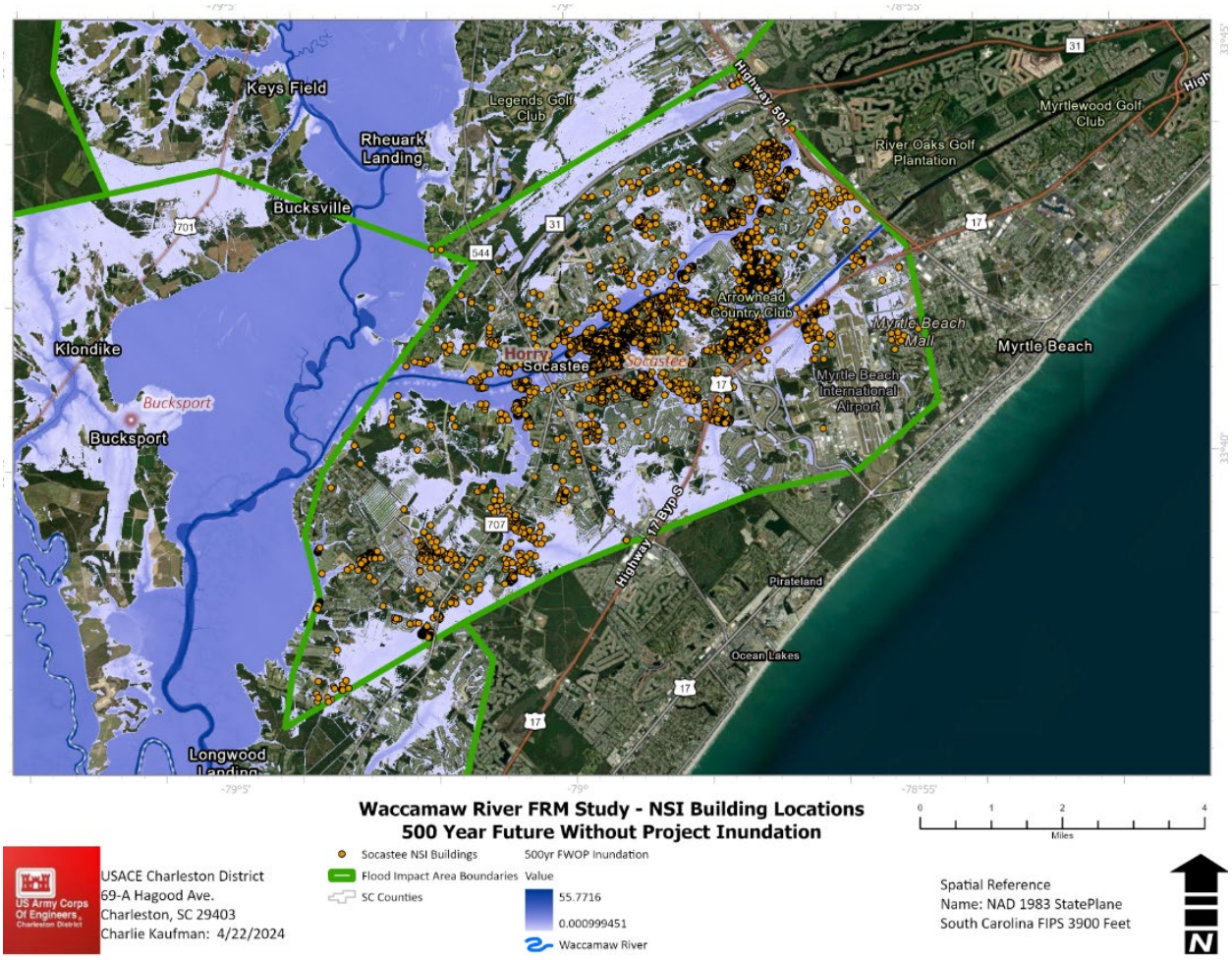

Figure 4 Socastee NSI Building Locations Within 500-year Floodplain

Impact Areas The study area comprises four impact areas, which were designated by the full USACE team and the Flood Risk Management Planning Center of Expertise (FRM-PCX). The impact areas begin with Bucksport.

Bucksport

Residential and commercial establishments within this area branch off into distinct community sectors almost exclusively from HWY 701, Bucksport Road and the Pee Dee HWY. Flooding affects transportation along these routes, causing evacuation difficulties that lead to prolonged displacement. A considerable segment of the community contends with social vulnerabilities, stemming from historical underinvestment and limited economic opportunities.

Conway

Much of the City of Conway is composed of residential and commercial development including many historical structures and places. Residential and commercial establishments within this area are scattered across various distinct community sectors,

primarily situated along, or in the immediate vicinity of, Historic HWY 501, HWY 501 Business, HWY 905, Mill Pond Road, Sherwood Drive, E Country Club, and the Waccamaw Wildlife Refuge. Flooding not only affects the integrity of the natural and built environment, but it reduces reliability of these routes impeding emergency response services during and after storm events.

Many of Horry County's essential services are stationed in Conway, including Conway Medical Center, Horry County Police Department, Emergency Operating Center, and Emergency Management Office. Thus, impeding roadway access in Conway increases risk to residents via compromising the provision of these essential services in Conway, Socastee, Bucksport, and Mrytle Beach. A significant portion of the population in this community faces social vulnerabilities, including factors such as age, income, and limited education, which magnify the challenges of recovery following a disaster. Additionally, these social attributes contribute to prolonged displacement for residents.

Longs and Red Bluff

Due to the shared hydraulic, social, and environmental characteristics, Longs and Red Bluff were investigated as a single population center. These unincorporated areas are situated just north of the Waccamaw River. The primary inflowing tributaries are Buck Creek, Simpson Creek, and Todd Swamp and can be characterized as predominately woody wetlands, evergreen forest, agricultural areas, and redevelopment scattered throughout. Homes and businesses in this reach of the Basin are spread out among diverse and independent community sectors primarily along HWY 905, HWY 9, HWY 90, Red Bluff Road (also referred to as HWY 31E), Old Reaves Ferry Road, and Lee's Landing Circle. Inundation disrupts transportation along these roadways which contributes to evacuation challenges resulting in long-term displacement. A large percentage of residents in this community exhibit social vulnerabilities such as age, income, and limited education that result in a disproportionate recovery period post disaster.

Socastee

Socastee is subject to inundation for weeks at a time as a result of the tidal and backwater effects from the Waccamaw, Atlantic Intracoastal Waterway (AIWW) and Socastee Creek. Within the unincorporated area, the built environment was carefully intertwined with the natural abundance of water resources. The Waccamaw River and adjacent floodplains border Socastee in the Northwest, including Carolina Bays and major tributaries like Socastee Creek, to the South, where Myrtle Beach abuts the Atlantic Ocean, and in the center, where the AIWW differentiates coastal and inland waters. This area is heavily populated with development that caters to the residential and commercial community. Flooding along the bridge crossing on HWY 544 and HWY 501, result in challenges and delay to residents' return and recovery, prolonging displacement.

Table 1 shows the structure count by impact area and structure type (residential and non-residential). Non- residential structures include commercial, industrial, and public structures. The study area has a total of 7,267 structures.

Table 1 Structure Count by Structure Type and Impact Area

Impact Area	Residential Count	Non-Residential Count	Total
Bucksport	537	26	563
Conway	2056	203	2259
Longs-RedBluff	1090	60	1150
Socastee	3105	190	3295
Total	**6788**	**479**	**7267**

1.2 SOCIOECONOMIC SETTING

The four primary population centers of Bucksport, Socastee, Longs/RedBluff, and Conway make up the study areas. The population in these study areas has remained stable and is expected to continue to do so. Compared to Conway, Longs/RedBluff, and Socastee, Bucksport has experienced a population decline following the 2000 Census. Table 2 displays the population trend contextualizing population data on a countywide and on a statewide basis. The trends are analyzed from the year 1990 to 2020. The table indicates a population growth from all three levels. County and state levels have a higher growth rate, which can be explained by migration patterns. As depicted in Table 3, the race of the study areas is predominantly white, with the exception of Bucksport.

Table 2 Decennial Population

Area	1990	2000	2010	2020
Bucksport	1,022	1,117	876	745
Conway	9,819	12,722	17,103	24,849
Longs/Red Bluff	6,112	7,778	6,645	9,523
Socastee	10,426	14,295	19,952	22,213
Horry County	144,053	198,019	269,291	351,029
South Carolina	3,486,703	4,012,012	4,625,364	5,118,425

Source: Social Explorer – ACS 2020 (5-year Estimates)

Table 3 Race of Population

Area	White Alone	African American Alone	Asian Alone
Bucksport	7.0%	88.7%	0.0%
Conway	61.7%	29.6%	1.2%
Longs/Red Bluff	79.7%	18.0%	0.0%
Socastee	73.3%	7.5%	2.1%
Horry County	77.10%	11.4%	1.3%
South Carolina	63.4%	25.0%	1.8%

Source: Social Explorer - ACS 2020 (5-Year Estimates) and 2020 Census Population and Race/Hispanic Origin

Table 4 shows the number of households over the same period. The total number of

households in the study areas has shown a steadily increasing trend from 1990 to 2020 with the exception of Bucksport. Bucksport experienced an increase from 1990 to 2000 but declined by -35% from 2000 to 2020. Table 5 depicts the Median Household Income for the project area, Horry County, and the State of South Carolina.

Table 4 Total Households

Area	2020	2010	2000	1990
South Carolina	1,961,481	1,741,994	1,533,854	1258044
Horry County, South Carolina	136,219	112,057	81,800	55764
Bucksport CDP, South Carolina	233	345	359	297
Conway city, South Carolina	8,247	6,375	4,259	3,655
Longs/Red Bluff CDP, South Carolina	3,707	2,857	4,189	2,306
Socastee CDP, South Carolina	9,308	7,220	5,593	3,789

Source: ACS Survey Data

Table 5 Median Household Income

Area	1990	2000	2010	2020
Bucksport	$ 12,540	$24,038	$25,417	$44,181
Conway	$21,241	$32,155	$35,999	$42,840
Longs/Red Bluff	$12,010	$37,736	$36,947	$59,070
Socastee	$28,381	$40,436	$42,452	$47,296
Horry County	$24,959	$36,470	$41,568	$51,570
South Carolina	$26,256	$37,082	$42,452	$54,864

Source: ACS Survey Data

Table 6 depicts civilian employed population 16 years and over. The leading employment sectors for the four study areas, include Educational Services, and Health Care and Social Assistance; Arts, Entertainment, and Recreation, and Accommodation and Food Services; and Retail Trade. Table 7 shows the labor force, employment, unemployment, and unemployment rate for the project areas, Horry County, and the State of South Carolina. The unemployment rate for Conway is the highest (11.8%) and doubles the unemployment rates for Horry County and the State of South Carolina.

Table 6 Industry by Occupation for Employed Civilian Population 16 Years and Over

	South Carolina		Horry County, South Carolina		Bucksport CDP, South Carolina		Conway City, South Carolina		Longs/RedBluff CDP, South Carolina		Socastee CDP, South Carolina	
Total Employed Civilian Population 16 Years and Over:	2,312,831		150,783		339		10,082		3,735		11,835	
Agriculture, Forestry, Fishing and Hunting, and Mining	21,707	0.9%	623	0.4%	0	0.0%	5	0.1%	37	1.0%	0	0.0%
Construction	159,136	6.9%	13,689	9.1%	0	0.0%	478	4.7%	259	6.9%	1,522	12.9%
Manufacturing	310,653	13.4%	5,903	3.9%	39	11.5%	591	5.9%	147	3.9%	354	3.0%
Wholesale Trade	55,126	2.4%	2,703	1.8%	0	0.0%	81	0.8%	27	0.7%	281	2.4%
Retail Trade	272,348	11.8%	24,404	16.2%	108	31.9%	1,789	17.7%	581	15.6%	1,886	15.9%
Transportation and Warehousing, and Utilities	121,924	5.3%	5,701	3.8%	24	7.1%	369	3.7%	176	4.7%	308	2.6%
Information	34,945	1.5%	2,437	1.6%	0	0.0%	276	2.7%	61	1.6%	210	1.8%
Finance and Insurance, and Real Estate and Rental and Leasing	132,837	5.7%	9,772	6.5%	7	2.1%	546	5.4%	199	5.3%	746	6.3%
Professional, Scientific, and Management, and Administrative and Waste Management Services	242,008	10.5%	16,135	10.7%	28	8.3%	722	7.2%	230	6.2%	1,479	12.5%
Educational Services, and Health Care and Social Assistance	510,174	22.1%	26,979	17.9%	87	25.7%	2,401	23.8%	504	13.5%	1,338	11.3%
Arts, Entertainment, and Recreation, and Accommodation and Food Services	231,450	10.0%	29,894	19.8%	37	10.9%	1,811	18.0%	645	17.3%	2,927	24.7%
Other Services, Except Public Administration	117,145	5.1%	8,194	5.4%	0	0.0%	754	7.5%	771	20.6%	619	5.2%
Public Administration	103,378	4.5%	4,349	2.9%	9	2.7%	259	2.6%	98	2.6%	165	1.4%

Source: DP03 Selected Economic Characteristics 2022 ACS 5-year Estimates

Table 7 Labor Force, Employment, Unemployment, and Unemployment Rate

	Bucksport	Conway	Longs/Red Bluff	Socastee	Horry County	State of South Carolina
Labor Force	339	11,435	3,908	12,451	160,352	2,448,315
Employment	339	10,082	3,735	11,835	150,783	2,312,831
Unemployment	0	1,353	173	616	9,569	135,484
Unemployment Rate	0%	11.8%	4.4%	0.50%	6.0%	5.5%

Source: Census data ACS 2022 5-year unless noted

Compliance with Policy Guidance Letter (PGL) 25 and Executive Order 11988

Based on the socioeconomic data, Horry County has experienced tremendous population and employment growth. Given that dynamic, it is expected that development will occur in the study area with or without riverine flood risk reduction measures and will not conflict with PGL 25 and EO 11988, which states that the primary objective of a flood risk reduction project is to protect existing development, rather than to make undeveloped land available for more valuable uses.

1.4 CRITICAL INFRASTRUCTURE

Bridges, communication towers, water treatment plant, Emergency Operations Center (EOC) , hospitals, and government buildings are the identified critical infrastructure that may have flood risk, although flood depths are expected to remain at or just below the foundation at the 0.2% AEP event. Figure 5 shows the critical facilities/infrastructure for Horry County, which comprises all four damage centers of the the study area

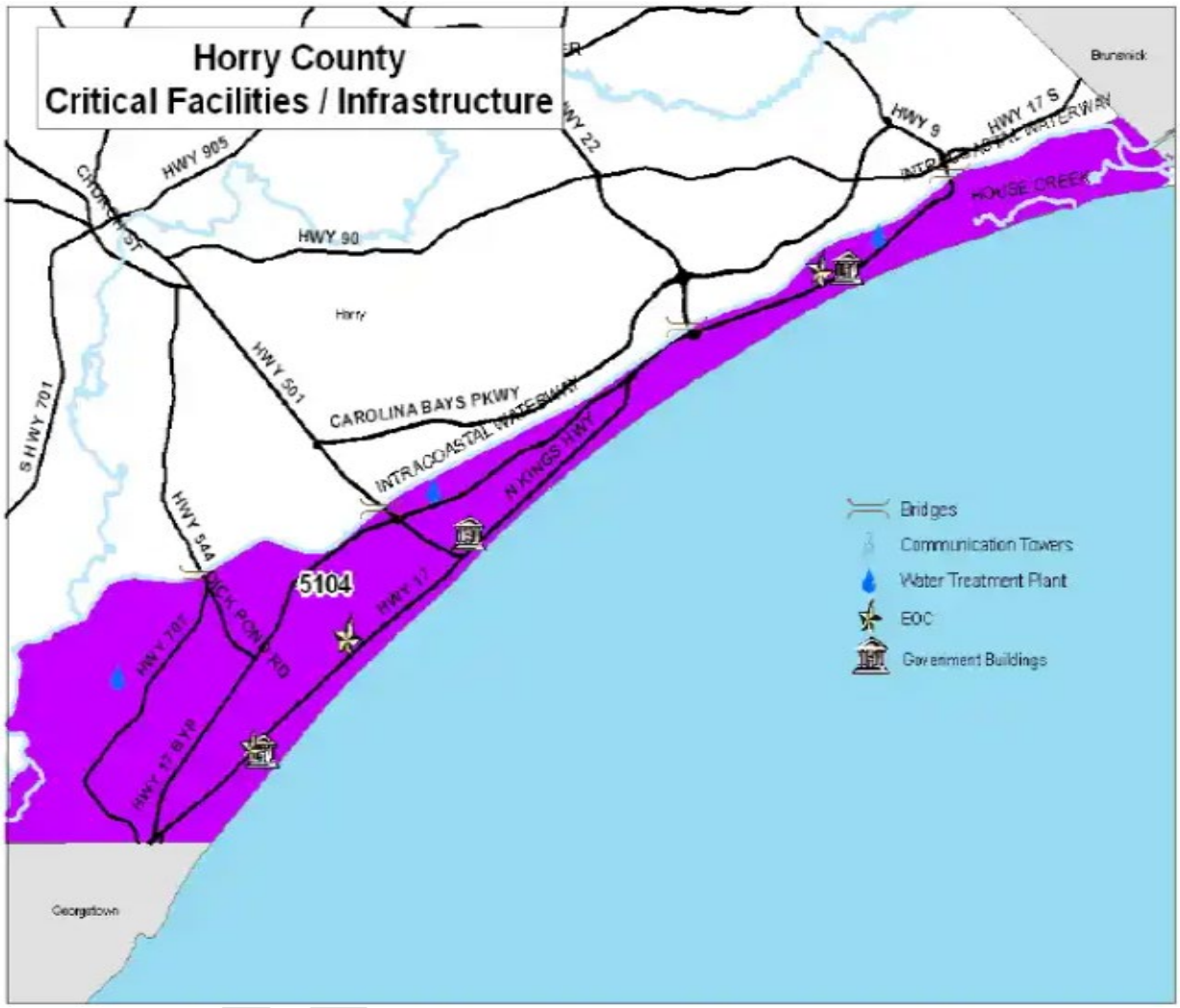

Figure 5 Critical Infrastructure

I1.5 SCOPE OF THE STUDY

As reported in the socioeconomics section, Horry County is home to over 350,000 people making it the fourth most populated county in South Carolina according to the U.S. Census Bureau. Between 2010 and 2020 the population of Horry County grew by 30%. This region has been identified as the second fastest growing metropolitan area in the nation in part due to its proximity to Myrtle Beach, but also its opportunity for further

development. Expected population and economic growth in Horry County present a need for modifications or improvements to existing projects and infrastructure.

Problem Description. According to the National Center for Environmental Information (NCEI), Horry County and the participating jurisdictions have experienced 29 flood events since 1995 and an additional 60 flash floods. One of the most damaging was Hurricane Floyd (1999), which brought three different floods to Horry County. During the storm, the intense rainfall could not drain away faster than it collected, flooding yards, parks, intersections, parking lots, building entrances and low-lying areas.

The flooding problem in Waccamaw River poses the following risks: risk of damage to property and infrastructure; risk to life safety; risk to cultural heritage, population, and other social effects; risk of streambank erosion that damages private property and public infrastructure; risk of negative impacts to water quality; risk of environmental damages and human health safety impacts from industrial flooding; and national and regional economic impacts.

Array of Alternatives

Alternatives were strategically formulated under 5 alternative types: Flood Barriers, Detention and Diversion, Floodplain Relief, Nonstructural Only, and Comprehensive. The study team carefully assembled an initial array of alternatives for each impact area. Despite the deliberate assortment of alternatives by functionality, the study team incorporated nonstructural measures in each of the alternative type (aside for flood barriers) because field investigations suggested there would not be a “one size fits all” solution. The inclusion of nonstructural measures optimizes the opportunity for community resilience. Table 8 below depicts the Alternatives for each of the four impact areas.

Table 8 Array of Alternatives for the Four Impact Areas

Bucksport

Plans	Plan Type	Brief Plan Description
B-NA	No Action	No Action
B-1	Structural	Floodgate
B-2	Structural	Pee Dee Hwy Elevation
BNS-2	Nonstructural	Structures Elevation and Acquisition

Conway

Plans	Plan Type	Brief Plan Description
C-NA	No Action	No Action
C-3	Structural	Relief Bridges
C-5	Comprehensive	Relief Bridges, Structure Elevation, and Acquisition
CNS-1	Nonstructural	Acquisition and Structure Elevation

Longs Red Bluff

Plans	Plan type	Brief Plan Description
LR-NA	No Action	No Action
LR-1	Flood Barriers	Levee/Floodwall along Buck Creek at Rolling Ridge and Cox Lane
LR-3	Floodplain Relief	Simpson Creek Benching, Relief Bridges
LR-6	Comprehensive	Levee/Floodwall along Buck Creek and Rolling Ridge, Benching, Relief Bridges
LRBNS-3	Nonstructural	Acquisition and Structure Elevation

Socastee

Plans	Plan Type	Brief Plan Description
S-NA	No Action	No Action
S-1	Structural	Floodwall and Barrier Removal
S-2	Structural	Detention Pond with Channel to Socastee Creek
S-3	Structural	Barrier Removal
S-4	Comprehensive	Floodwall, Barrier Removal, Detention Pond with Channel to Socastee Creek, and Structure Elevation
SNS-3	Nonstructural	Structure Elevation and Acquisition

Nonstructural Alternatives consisted of two criteria pertaining to the 50-yr flood for all four damage areas. If the 50-yr flood depth resulted in 1-3 feet of water above the first floor, then the structure was eligible for a 2-foot raise (subject to engineering restrictions based upon foundation type and other pertinent criteria). If a structure was estimated with more than 3-foot of water above the first floor, then the structure was identified for an acquisition or buy-out.

2 ECONOMIC AND ENGINEERING INPUTS TO THE HEC-FDA MODEL

2.1 HEC-FDA MODEL

Model Overview The Hydrologic Engineering Center Flood Damage Analysis (HEC-FDA) Version 1.4.3 USACE-certified model was used to calculate the damages and benefits for this evaluation. The economic and engineering inputs necessary for the model to calculate damages for the project base year (2035) include the existing condition structure inventory, contents-to-structure value ratios, first floor heights and water depths, depth-damage relationships, and without-project and with-project stage-probability relationships.

The uncertainty surrounding each of the economic and engineering variables was also entered into the model. Either a normal probability distribution, with a mean value and a standard deviation, or a triangular probability distribution, with a most likely, a maximum and a minimum value, was entered into the model to quantify the uncertainty associated with the key economic variables. A normal probability distribution was entered into the model to quantify the uncertainty surrounding the ground elevations. A 50-year period of record was used to quantify the hydrologic uncertainty or error surrounding the stage-probability relationships in consultation with the H&H engineer. The following economic inputs section is divided into four primary components:

- **Structure Inventory** – discusses methodology, structural value estimation, content-to-structure value ratios, and flood related damages
- **Elevation Data & Sampling** – discusses ground surface elevation, foundation heights, first floor elevations, and sampling structural attributes
- **Structure Inventory Uncertainty** – discusses the uncertainty distributions surrounding structure values, content-to- structure value ratios, and flood related damages and costs, and how the distributions were generated
- **Depth Damage Relationships** – discusses the depth damage relationships, uncertainty and how the distributions were generated

2.2 ECONOMIC INPUTS TO THE HEC-FDA MODEL

Structure Inventory A structure inventory of residential and non-residential structures for the study area was obtained using the National Structure Inventory (NSI), version 2.0. The NSI was originally created by USACE to simplify the GIS pre-processing workflow for the Modeling Mapping and Consequence center (MMC) and was recently upgraded to version 2 using upgraded data sources and algorithms. The NSI 2.0 database was significantly improved through various techniques described in subsequent sections.

NSI 2.0 sources its structural attribute data from tax assessed parcel data (available through CoreLogic), business location data available through Esri/Infogroup, and HAZUS (where other datasets were unavailable). NSI 2.0 data is not an exact representation of reality, but rather contains many county-level, state-level, or regional assumptions applied to individual structures, often by random assignment. As such, while county or other large aggregations of structures will be accurate on average, individual structure characteristics may not be accurate. Although these and other accuracy issues exist, the NSI 2.0 dataset functions as an available common and consistent standard for the United States. The chief advantage of NSI 2.0 over other national datasets is its spatial accuracy, which is a significant improvement over the census block level accuracy that NSI 1.0 relied on.

Occupancy Types The NSI 2.0 database comes with its own list of occupancy types, which describes the type of structure more than simply residential or non-residential. Occupancy types are important because they are used to assign depth-damage relationships to determine the rate at which a structure is damaged given a depth of water. This study utilized these three different occupancy type categories including commercial, industrial, or residential. Two additional aspects to note include:

- **NSI 2.0** – Occupancy type descriptions come with the original NSI 2.0 data and were the starting point for the study. NSI 2.0 occupancy types were verified during sampling.
- **Depth-Damage Relationships** – The NSI 2.0 occupancy types did not match the occupancy types required to use for the depth-damage relationships that were selected for the local flooding conditions. Professional judgment was used again to sort each structure type into the most representative occupancy type that the depth damage relationships offered.

Table 9 shows the occupancy type to depth-damage relationship assignment. Further descriptions of each occupancy type can be found in subsequent sections of the report.

Table 9 Structure Types

NSI 2.0OccType	Depth-Damage OccType Assignment
COM1	Retail & Personal Services
COM3	Repairs and Home Use Groceries and Convenience Stores
COM4	Professional Services
COM8	Groceries, Convenience Stores, and Dining/Recreation
COM4	Retail and Personal Services
GOV1	Public Facilities
IND1	Warehouses and Contractors
RES1-1SNB	One Story Pier and Beam
RES1-2SNB	Two+ Stories Pier and Beam
RES1-3SNB	Three Stories Pier and Beam No Basement
RES1-SLNB	Split Level No Basement
RES1-1SWB	One Story w Basement
RES1-2SWB	Two Stories w Basement
RES1-3SWB	Three Stories w Basement
RES1-SLWB	Split Level w Basement
RES3	PT 1 Apt Building

Structure Values As previously identified in the description of NSI 2.0, the national database has limitations and oversimplifications that lead to unacceptable levels of uncertainty for a feasibility level study. To overcome the limitations and reduce uncertainty, Horry County depreciated assessment values for property improvements (separate from land) were obtained and used to adjust NSI 2.0 values. Also, both Producer Price Index values and Civil Works Construction Cost Index System was used to reevaluate the depreciated replacement values referencing the state of South Carolina versus the US. Those two indices resulted in NSI 2.0 values being reduced by 15% for inputs into the HEC-FDA 1.4.3 program.

Depth-Damage Relationships and Residential and Non-Residential Content-to-Structure Value Ratios Content-to-structure values were obtained from coastal depth damage curves previously approved for use in both MVD and SWD for studies (Morganza FRM in coastal Louisiana and Texas Coastal Comprehensive Feasibility) that exhibited similar topographies, flooding characteristics, and building types. Specifically, the set of curves developed for Long Duration/Fresh Water were used. This was based both upon the type of flooding described by local water resource officials as well as the modeled events performed by USACE H&H.

Elevation Data & Sampling Elevation data associated with the ground surface, foundation heights, and first floors of structures are critical to the economic analysis and feasibility of projects/alternatives. Given the low-resolution of foundation height data provided with the NSI 2.0 database, a statistically significant sample was calculated to inform a windshield survey to improve the estimates associated with foundation and subsequent first floor elevations. The sample was also utilized to measure a handful of other structural attributes, detailed later in this section.

Two “windshield” surveys were conducted:

- The first survey involved comparing foundation heights using Google Earth Street View and comparing those observations to the NSI 2.0 foundation heights.
- The second was with an engineering team driving throughout the damage areas, focusing in particular on structures near the Waccamaw River to compare/verify attributes to those found in the NSI 2.0 database.

The first (preliminary) survey in Google Street View included the maximum and minimum foundation height expected by occupancy type in this study area. Thirty residential and 30 non-residential structures for each damage area were included in the initial sample.

A second in-person windshield survey was conducted for further data refinement/ to ensure data accuracy. Approximately 350 structures were surveyed for foundation height, relative depreciated state, placement, and other structure characteristics by members of the study team—10 for Bucksport, 190 for Socastee, and 150 for Conway (Longs Red Bluff had already been screened out based upon benefits and costs developed for an initial set of HEC-FDA runs that did not adjust for structures affected by WRDA 1990 Section 308 requirements. Since these resulted in negative Net Annual Benefits, there was no need to rerun once post 1991 structures were adjusted out of the 1% annual exceedance probability floodplains).

The variables sampled included:

- Foundation height – measured from the bottom of the front door to adjacent ground, each step was assumed to be 8 inches
- Foundation type – designated as either slab on grade or crawlspace
- Story count – measured as either one, or two or more stories
- Existing condition – qualitative judgment of the condition of the exterior of the structure condition
- Verification of occupancy type – confirmation of the purpose and existence of occupancy

First Floor Height Uncertainty The uncertainty surrounding the foundation heights was determined by referencing the HEC-FDA user manual. A Google Street View survey was assumed to be less accurate than use of stadia, but more accurate than an aerial survey with a 5 ft contour interval. This resulted in the uncertainty around foundation height being determined as distributed normally with a .5 ft standard deviation. This estimate will be further refined post-TSP when a new field survey will be conducted.

2.3 ENGINEERING INPUTS TO THE HEC-FDA MODEL

Stage-Probability Relationships Stage-probability relationships were provided for the existing without-project condition (2035) and future without-project condition (2084). Future condition hydraulics were provided, as modest changes are expected during the period of analysis.

The H&H engineer provided water surface profiles from HEC-RAS for eight AEP events including the 50%, 20%, 10%, 4%, 2%, 1%, 0.5%, and 0.2%. The without-project water surface profiles were based on riverine flood events. Hydraulic data was provided in geo-referenced 2D format.

Uncertainty Surrounding the Stage-Probability Relationships A 50-year equivalent record length was used to quantify the uncertainty surrounding the stage-probability relationships for the study area. Based on this equivalent record length, the HEC-FDA model calculated the confidence limits surrounding the stage-probability functions.

3 NATIONAL ECONOMIC DEVELOPMENT (NED) FLOOD DAMAGE AND BENEFIT CALCULATIONS

3.1 HEC-FDA MODEL CALCULATIONS

The HEC-FDA model was utilized to evaluate flood damages using risk-based analysis. Damages were reported for each of the 4 study areas. A range of possible values, defined by the probability distributions for each economic variable (first floor heights, structure and content values, and depth-damage relationships), were entered into the HEC-FDA model to calculate the uncertainty surrounding the elevation-damage, or stage-damage, relationships for structures and contents. The model also used the number of years that stages were recorded to determine the hydrologic uncertainty surrounding the stage-probability relationships.

The possible occurrences of each variable are determined through a Monte Carlo process, which samples random values from each defined probability distribution. The number of iterations performed affects the simulation execution time and the quality and accuracy of the results. This process was conducted simultaneously for each economic and hydrologic variable. The resulting mean value and probability distributions represent an estimate of the full set of possible outcomes.

3.2 STAGE-DAMAGE RELATIONSHIPS WITH UNCERTAINTY

The HEC-FDA model used the economic and engineering inputs to generate a stage-damage relationship for each structure category in the study area under both existing and future without conditions. The possible occurrences of each economic variable were derived by Monte Carlo simulation.

3.3 STAGE-PROBABILITY RELATIONSHIPS WITH UNCERTAINTY

The HEC-FDA model used an equivalent record length of 50 years for this study area to generate a stage-probability relationship with uncertainty for the existing and future without project conditions by graphical analysis. 50 years was selected by the hydraulic engineer to represent the length of records analyzed during the calibration process that

the hydraulic model underwent. The model used the eight stage-probability events together with the equivalent record length to define the full range of the stage-probability functions by interpolating between the data points. Confidence bands surrounding the stages for each of the probability events were also provided.

3.4 WITHOUT-PROJECT EXPECTED ANNUAL DAMAGES

The model used Monte Carlo simulation to sample from the stage-probability curve with uncertainty. For each of the iterations within the simulation, stages were simultaneously selected for the entire range of probability events. The sum of all damage values divided by the number of iterations run by the model yielded the expected value, or mean damage value, with confidence bands for each probability event. The probability-damage relationships are integrated by weighting the damages corresponding to each magnitude of flooding (stage) by the percentage chance of exceedance (probability). From these weighted damages, the model determined the expected annual damages (EAD) with confidence bands (uncertainty). For the without- project alternative, the expected annual damages (EAD) were totaled for the study area to obtain the total without-project EAD under base year (2035) conditions. Table 10 displays the damages by reach and type of asset that are damaged for the year 2035 under without-project conditions.

Table 10 Equivalent Annual Damage Without Project Condition ($ millions)

Reach	Non-Residential	Residential	Autos	Total
Bucksport	$0.4	$0.9	$0.1	$1.4
Conway	$3.2	$7.1	$1.4	$11.7
Socastee	$1.4	$6.0	$0.7	$8.1
Longs	$3.4	$3.2	S0.7	$7.3
Total	$8.4	$17.2	$2.9	$28.5

***FY 2024 price levels**

3.5 WITH-PROJECTED EXPECTED ANNUAL DAMAGES

The alternatives were run through HEC-FDA, which allows for determining damages reduced by damage category. Table 11 shows the damages reduced and residual damages for each plan.

Table 11 With-Project Equivalent Ann. Damages (Residual Risk) by Damage Category ($ millions)

Bucksport Alternatives	Total Without Equivalent Damages	Total With-Project Damages	Damages Reduced
No Action	$1.4	$1.4	$0
Floodgate	$1.4	$0.9	$0.5
Pee Dee Hwy Elevation	$1.4	$0.8	$0.6
Structures Elevation and Acquisition	$1.4	$1.2	$0.2

Conway Alternatives	Total Without Equivalent Damages	Total With-Project Damages	Damages Reduced
No Action	$11.7	$11.7	$0
Relief Bridges	$11.7	$10.2	$1.5
Relief Bridges, Structures Elevation, and Acquisition	$11.7	$9.9	$1.8
Acquisition and Structures Elevation	$11.7	$11.4	$0.3

Socastee Alternatives	Total Without Equivalent Damages	Total With-Project Damages	Damages Reduced
No Action	$8.1	$8.1	$0
Floodwall and Barrier Removal	$8.1	$7.4	$0.7
Detention Pond with Channel to Socastee Creek	$8.1	$7.7	$0.4
Barrier Removal	$8.1	$7.4	$0.7
Floodwall, Barrier Removal, Detention Pond with Channel to Socastee Creek, and Structure Elevation	$8.1	$7.1	$1.0
Structures Elevation and Acquisition	$8.1	$7.4	$0.7

Longs Alternatives	Total Without Equivalent Damages	Total With-Project Damages	Damages Reduced
No Action	$7.3	$7.3	$0
Levee/Floodwall along Buck Creek at Rolling Ridge and Cox Lane	$7.3	$7.2	$0.1
Simpson Creek Benching, Relief Bridges	$7.3	$7.2	$0.1
Levee/Floodwall along Buck Creek and Rolling Ridge, Benching, Relief Bridges	$7.3	$7.1	$0.2
Acquisition and Structures Elevation	$7.3	$6.8	$0.5

***FY 2024 price levels and 2.75% discount rate; 50-year period of analysis**

4 PROJECT COSTS

Construction Schedule For the purposes of computing interest during construction (IDC), only the Conway Weir and Socastee Bridge modifications were computed. These were the only two alternatives to have positive net benefits. IDC was less than $100,000 for each based upon durations of several months using a mid-year payment schedule and 2.75% discount rate. Cost estimates for the final array were developed by the Charleston Cost Engineering Branch.

Socastee Alternatives					
	Floodwall and Barrier Removal	Detention Pond with Channel to Socastee Creek and Elevation	Barrier Removal	Floodwall, Barrier Removal, Detention Pond with Channel to Socastee Creek, and Structure Elevation	Structure Elevation and Acquisition
Total Project Costs					
First Cost	$136.7	$96.8	$1.6	$310.9	$141.6
Interest During Construction	$0	$0	$0.01	$0	$0
Total Investment Cost	$136.7	$96.8	$1.6	$310.9	$141.6
Estimated Annual Costs					
Annualized Project Costs	$5.1	$3.6	$0.1	$11.5	$5.3
Annual OMRR&R	$0	$0	$0.01	$0	$0
Total Annual Costs	$5.1	$3.6	$0.1	$11.5	$5.3

Annual Project Costs. The FY 2024 Federal interest rate of 2.75 percent was used to discount the costs to the base year and then amortize the costs over the 50-year period of analysis.

Table 12 Summary of Costs for Each Alternative in Millions of Dollars at Each Project Area/Reach/Damage Area

Bucksport Alternatives			
	Floodgate	Pee Dee Hwy Elev	Acquisition & Elevation
Total Project Costs			
First Cost	$22.4	$80.5	$11.3
Interest During Construction	$0	$0	$0
Total Investment Cost	$22.4	$80.5	$11.3
Estimated Annual Costs			
Annualized Project Costs	$0.8	$3.0	$0.4
Annual OMRR&R	$0	$0	$0
Total Annual Costs	$0.8	$3.0	$0.4

Longs Alternatives				
	Floodwall	Benching and Relief Bridges	Floodwall, Benching, Relief Bridges, and Non-Structural	Structure Elevation and Acquisition
Total Project Costs				
First Cost	$79.1	$70.6	$184.0	$34.3
Interest During Construction	$0	$0	$0.0	$0
Total Investment Cost	$79.1	$70.6	$184.0	$34.3
Estimated Annual Costs				
Annualized Project Costs	$2.9	$2.6	$6.8	$1.3
Annual OMRR&R	$0	$0	$0.01	$0
Total Annual Costs	$2.9	$2.6	$6.8	$1.3

FY 2024 price levels; 2.75% discount rate; 50-year period of analysis

5 RESULTS OF THE ECONOMIC ANALYSIS

5.1 NET BENEFIT ANALYSIS

Calculation of Net Benefits The expected annual benefits attributable to the alternatives carried forward were compared to the annual costs to develop a benefit-to-cost ratio for the alternatives. The net benefits for the alternatives were calculated by subtracting the annual costs from the expected annual benefits. The net benefits were used to determine the economic justification of the alternatives. Net benefit calculations for the with-project condition were computed using the HEC-FDA that contained the stage frequency- damage relationships for the study. Table 13 shows the net benefits and benefit-cost ratio for the alternatives. The benefits throughout the appendix have been updated to reflect FY24 price levels.

Table 13 Economic Net Benefits and BCR of Alternatives Carried Forward ($ millions)

Bucksport Alternatives	Average Annual Costs	Average Annual Benefits	Net Annual Benefits	Benefit to Cost Ratio
Floodgate	$0.8	$0.5	$ -0.3	0.6
Pee Dee Highway Elevation	$3.0	$0.6	$ -2.4	0.2
Acquisition and Elevation	$0.4	$0.2	$ -0.2	0.5

Conway Alternatives	Average Annual Costs	Average Annual Benefits	Net Annual Benefits	Benefit to Cost Ratio
Relief Bridges	$0.3	$1.5	$1.2	5.3
Relief Bridges, Structure Elevation, and Acquisition	$6.7	$1.8	$ -4.9	0.3
Acquisition and Elevation	$6.5	$0.3	$ -6.2	0.1

Socastee Alternatives	Average Annual Costs	Average Annual Benefits	Net Annual Benefits	Benefit to Cost Ratio
Floodwall and Barrier Removal	$5.1	$0.4	$ -4.7	0.1
Detention Pond with Channel to Socastee Creek and Elevation	$3.6	$0.4	$ -3.2	0.1
Barrier Removal	$0.1	$0.7	$0.6	9.1
Floodwall, Barrier Removal, Detention Pond with Channel to Socastee Creek, and Structure Elevation	$11.5	$1.0	$ -10.5	0.1
Structure Elevation and Acquisition	$5.3	$0.7	$ -4.6	0.1

Longs Alternatives	Average Annual Costs	Average Annual Benefits	Net Annual Benefits	Benefit to Cost Ratio
Floodwall	$2.9	$0.1	$ -2.8	0.1
Benching and Relief Bridges	$2.6	$0.1	$ -2.5	0.1
Floodwall, Benching, Relief Bridges, and Non-Structural	$6.8	$0.2	$ -6.6	0.1
Structure Elevation and Acquisition	$1.3	$0.5	$ -0.8	0.4

FY 2024 price levels
50-year period of analysis
2.75% discount rate

The alternatives that reasonably maximize net benefits and are the NED/TSP plans are the Conway Relief Bridges and the Socastee Barrier Removal. These components of NED/TSP plans are separable, and they function without generating externalities or impacts to WSE at the other site. Table 14 shows the cost and benefit summary of the NED plans at the current federal discount rate as well as a 7% discount rate (per OMB).

Table 14 Summary of Costs and Benefits for the NED/TSP Alternatives

Conway Relief Bridges		
Total Project Costs	2.75%	7.0%
First Cost	$7,386,000	$7,386,000
Interest During Construction	$42,000	$105,000
Total Investment Cost	$7,428,000	$7,491,000
Estimated Annual Costs		
Annualized Project Costs	$275,000	$543,000
Annual OMRR&R	$10,000	$10,000
Total Annual Costs	$285,000	$553,000
Average Annual Benefits		
Total Annual Benefits	$1,500,000	$1,500,000
Net Annual Benefits	$1,200,000	$947,000
Benefit to Cost Ratio	5.26	2.71
Residual Risk (With Project EAD)	$10,200,000	$10,200,000

Socastee Barrier Removal		
Total Project Costs	2.75%	7.0%
First Cost	$1,640,000	$1,640,000
Interest During Construction	$3,700	$9,300
Total Investment Cost	$1,643,700	$1,649,300
Estimated Annual Costs		
Annualized Project Costs	$61,000	$120,000
Annual OMRR&R	$10,000	$10,000
Total Annual Costs	$71,000	$130,000
Average Annual Benefits		
Total Annual Benefits	$648,000	$648,000
Net Annual Benefits	$577,000	$518,000
Benefit to Cost Ratio	9.13	4.98
Residual Risk (With Project EAD)	$7,400,000	$7,400,000

FY 2024 price levels
50-year period of analysis
2.75% discount rate

The risk analysis is a section of the report that discusses the risk and uncertainty associated with the HEC-FDA model and the economic benefits. The HEC-FDA model was utilized for the existing condition and with project alternatives. The risk analysis uses expected annual damages instead of equivalent annual damages since future conditions are the same as existing conditions.

The HEC-FDA model incorporates the uncertainty surrounding the economic and engineering inputs to generate results that can be used to assess the performance of proposed plans. The HEC-FDA model was used to calculate expected annual without-project and with-project damages and the damages reduced for each of the project alternatives. Table 20 shows the mean expected annual benefits and the benefits at the 75, 50, and 25 percentiles for Alternative 3b, the NED plan. These percentiles reflect the percentage chance that the benefitswill be greater than or equal to the indicated values. The table indicates the percent chance that the expected annual benefits will exceed the expected annual costs therefore the benefit cost ratio is greater than one and the net benefits are positive.

Table 20 can be understood to show that there is a 75% chance that the expected annual damages reduced (annual benefits) of Alternative 3b (the NED plan) will exceed $718, and therefore a 75% chance that the BCR will exceed 1.44.

Table 20. Probability Benefits Exceed Costs (Thousands of Dollars)

Alternative 3b (NED Plan)	**0.75**	**0.5 (Median)**	**Mean**	**0.25**
Total Average Annual Cost	$498			
Total Average Annual Benefits	$718	$1,164	$1,277	$1,691
Net Benefits	$220	$666	$779	$1,193
BCR	1.44	2.34	2.56	3.40

FY 2023 price levels
50-year period of analysis
2.75% discount rate

5.4 COMPLIANCE WITH SECTION 308 OF WRDA 1990

Section 308 of the Water Resource Development Act (WRDA) 1990 limits structures built or substantially improved after July 1, 1991 in designated floodplains not elevated to the 1% AEP flood elevation from being included in the benefit base of the economic analysis. Using the Horry County 1994 FEMA maps, structures built in 1994 and after were omitted from the 2-yr through 50-yr floodplains.

6 RESULTS OF THE REGIONAL ECONOMIC DEVELOPMENT ANLYSIS (RED)

When the economic activity lost in a flooded region can be transferred to another area or region in the national economy, these losses cannot be included in the NED account. However, the impacts on the employment, income, and output of the regional economy are considered part of the RED account. The input-output macroeconomic model USACE Regional Economic System (RECONS) can be used to address the impacts of the construction spending associated with the project alternatives. The RECONS model utilizes a total construction cost of a project that is attributable to contracts being awarded to complete the construction of the project. This cost excludes USACE labor associated with planning, engineering, and design, as well as economic costs like interest during construction.

REGIONAL ECONOMIC SYSTEM (RECONS) ANALYSIS

The regional economic development (RED) account measures changes in the distribution of regional economic activity resulting from each alternative. Evaluations of regional effects are measured using nationally consistent projection of income, employment, output, and population.

The USACE Online Regional Economic System 2.0 (RECONS) is a system designed to provide estimates of regional, state, and national contributions of federal spending associated with Civil Works and American Recovery and Reinvestment Act (ARRA) Projects. It also provides a means for estimating the forward linked benefits (stemming from effects) associated with non-federal expenditures sustained, enabled, or generated by USACE Recreation, Navigation, and Formally Utilized Sites Remedial Action Program (FUSRAP). Contributions are measured in terms of economic output, jobs, earnings, and/or value added.

The RECONS model uses fixed allocations to local, state, and national sources to avoid double counting. RECONS uses the IMpact analysis for PLANning (IMPLAN©) software and data system, provided by the Minnesota IMPLAN Group, to estimate the economic impact or contribution of Civil Works spending and associated economic effects of USACE programs and infrastructure. IMPLAN created IO models for all the impact areas defined by the project team. The multipliers within these models were created with RPCs based on the trade flow dataset included in IMPLAN.

The RECONS model was run for all alternatives associated with the four focus areas: Bucksport, Conway, Longs/Red Bluff and Socastee. Results are shown for three levels of geography: local, state, and national impact areas. For example, in Longs/Red Bluff, the expenditures $70,617,962 (for Alternative LR3) support a total of 680.0 full-time equivalent jobs, $37,632,384 in labor income, $46,127,690 in the gross regional product, and $78,049,236 in economic output in the local impact area. More broadly,

these expenditures support 1,227 full-time equivalent jobs, $84,690,534 in labor income, $111,854,061 in the gross regional product, and $191,860,096 in economic output in the nation.

Table 15 RECONS Model Results

Bucksport				
Alternative	**Metric**	**Local**	**State**	**US**
Alternative B1: Floodgate on Pee Dee River to slow backwater, south of HWY 701	***Total Impact***	$24,760,717	$34,046,656	$60,866,626
	Value Added	$14,633,772	$20,421,216	$35,485,124
	Jobs Created	216.0	267.0	389.0
Alternative B2: Road elevation. Elevate/create levee out of Pee Dee HWY	***Total Impact***	$88,935,526	$122,288,752	$218,620,700
	Value Added	$52,561,570	$73,348,910	$127,455,440
	Jobs Created	775	958.0	1398.0
Alternative B3: Floodgate + Road Elevation	***Total Impact***	$113,696,244	$156,335,409	$279,487,328
	Value Added	$67,195,342	$93,770,127	$162,940,565
	Jobs Created	991.0	1224.0	1787.0

Conway				
Alternative	**Metric**	**Local**	**State**	**US**
Alternative C3: Floodplain Relief (bridge relief)	***Total Impact***	$8,942,688	$12,296,438	$21,982,854
	Value Added	$5,285,196	$7,375,415	$12,815,961
	Jobs Created	78.0	96.0	141.0
Alternative C5: Comprehensive Structural (relief bridges) + Nonstructural Plan	***Total Impact***	$201,655,360	$277,281,571	$495,707,824
	Value Added	$119,179,846	$166,313,750	$2,888,996,691
	Jobs Created	1757.0	2172.0	3169.0

Longs-Red Bluff				
Alternative	**Metric**	**Local**	**State**	**US**
Alternative LR1: Floodwall. Levee/Floodwall along buck creek	***Total Impact***	$87,450,181	$120,246,363	$214,969,436
	Value Added	$51,683,720	$72,123,883	$125,328,761
	Jobs Created	762.0	942.0	1374.0
Alternative LR3: Floodplain benching and relief bridge	***Total Impact***	$78,049,236	$107,319,809	$191,860,096
	Value Added	$46,127,690	$64,370,523	$111,854,061
	Jobs Created	680	841.0	1,227.00
Alternative LR6: Comprehensive structural and nonstructural	***Total Impact***	$165,499,417	$227,566,172	$406,829,532
	Value Added	$97,811,410	$136,494,407	$237,180,821
	Jobs Created	1442.0	1782.0	2601.0

Socastee				
Alternative	**Metric**	**Local**	**State**	**US**
Alternative S1	***Value Added***	$89,286,752	$124,598,169	$216,509,209
	Jobs Created	1316.0	1627.0	2374.0
Alternative S2: Detention with channel to Socastee swamp	***Total Impact***	$107,010,262	$147,142,003	$263,051,898
	Value Added	$63,243,876	$88,255,914	$153,358,739
	Jobs Created	932.0	1152.0	1682.0
Alternative S3: Barrier Removal	***Total Impact***	$1,979,650	$2,722,073	$4,866,363
	Value Added	$1,169,988	$1,632,702	$2,837,080
	Jobs Created	17.0	21.0	31.0
Alternative S4: Comprehensive Structural + Non-Structural Plan	***Total Impact***	$260,065,145	$357,596,605	$639,290,358
	Value Added	$153,700,472	$214,486,784	$372,705,028
	Jobs Created	2266.0	2801.0	4087.0