US Army Corps of Engineers®

Charleston District

ATLANTIC INTRACOASTAL WATERWAY in SOUTH CAROLINA

APPENDIX I: 401 WATER QUALITY CERTIFICATION

August 2023

From:	Hughes, Andrea W CIV USARMY CESAC (USA)
To:	"wqcwtlands@dhec.sc.gov"
Cc:	Smarr, Haley
Subject:	AIWW 401 Water Quality Certification Request
Date:	Tuesday, April 11, 2023 1:09:00 PM
Attachments:	AIWW adjacent landowners.xlsx Appendices A-E AIWW 401 Request.pdf Publication PN and Receipt.pdf Prefiling request.pdf State 401 Application.pdf

Please see the attached PCN, 401 permit attachment, list of adjacent property owners, appendices, copy of public notice and receipt and proof of pre-filing request. An affidavit of publication will be forwarded once it is received from the Post and Courier.

I hereby certify that all information contained herein is true, accurate, and complete to the best of my knowledge and belief.

I hereby request that the certifying authority review and take action on this CWA 401 certification request within the applicable reasonable period of time.

Andrea Hughes

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

Joint Federal and State Application Form **For Activities Affecting Waters of the United States** **Or Critical Areas of the State of South Carolina**	**This Space for Official Use Only** Application No.____________________________ Date Received____________________________ Project Manager___________________________ Watershed # ____________________________

Authorities: 33 USC 401, 33 USC 403, 33 USC 407, 33 USC 408, 33 USC 1341, 33 USC 1344, 33 USC 1413 and Section 48-39-10 et. Seq of the South Carolina Code of Laws. These laws require permits for activities in, or affecting, navigable waters of the United States, the discharge of dredged or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters. The Corps of Engineers and the State of South Carolina have established a joint application process for activities requiring both Federal and State review or approval. Under this joint process, you may use this form, together with the required drawings and supporting information, to apply for both the Federal and/or State permit(s).

Drawings and Supplemental Information Requirements: In addition to the information on this form, you must submit a set of drawings and, in some cases, additional information. A completed application form together with all required drawings and supplemental information is required before an application can be considered complete. See the attached instruction sheets for details regarding these requirements. You may attach additional sheets if necessary to provide complete information.

1. Applicant Last Name: Hughes	11. Agent Last Name (agent is not required):
2. Applicant First Name: Andrea	12. Agent First Name:
3. Applicant Company Name: US Army Corps of Engineers	13. Agent Company Name:
4. Applicant Mailing Address: 69A Hagood Avenue	14. Agent Mailing Address:
5. Applicant City: Charleston	15. Agent City:
6. Applicant State: SC / 7. Applicant Zip: 29403	16. Agent State: / 17. Agent Zip:
8. Applicant Area Code and Phone No.: 843.754.4268	18. Agent Area Code and Phone No.:
9. Applicant Fax No.:	19. Agent Fax No.:
10. Applicant E-mail: andrea.w.hughes@usace.army.mil	20. Agent E-mail:

21. Project Name: AIWW Maintenance Dredging and Dredge Material Placement	22. Project Street Address: see attached for description of location
23. Project City: / 24. Project County:	25. Project Zip Code: / 26. Nearest Waterbody:
27. Tax Parcel ID:	28. Property Size (acres):
29. Latitude:	30. Longitude:

31. Directions to Project Site (Include Street Numbers, Street Names, and Landmarks and attach additional sheet if necessary):
See attached

32. Description of the Overall Project and of Each Activity in or Affecting U.S. Waters or State Critical Areas (attach additional sheets if needed)
See attached

33. Overall Project Purpose and the Basic Purpose of Each Activity In or Affecting U.S. Waters (attach additional sheets if needed):
See attached

34. Type and quantity of Materials to Be Discharged

Material	Quantity	Unit
Dirt or Topsoil:	______	☐ cubic yards
Clean Sand:	______	☐ cubic yards
Mud:	______	☐ cubic yards
Clay:	______	☐ cubic yards
Gravel, Rock, or Stone:	______	☐ cubic yards
Concrete:	______	☐ cubic yards
Other (describe): Dredge Materials	3.38M	☒ cubic yards
TOTAL:	3.38 M	cubic yards

See attached

35. Type and Quantity of Impacts to U.S. Waters (including wetlands).

Impact	Quantity	acres	sq.ft.	Quantity	cubic yards
Filling:	______	☐ acres	☐ sq.ft.	______	☐ cubic yards
Backfill & Bedding:	______	☐ acres	☐ sq.ft	______	☐ cubic yards
Landclearing:	______	☐ acres	☐ sq.ft	______	☐ cubic yards
Dredging:	______	☐ acres	☐ sq.ft.	3.38M	☒ cubic yards
Flooding:	______	☐ acres	☐ sq.ft.	______	☐ cubic yards
Draining/Excavation:	______	☐ acres	☐ sq.ft.	______	☐ cubic yards
Shading:	______	☐ acres	☐ sq.ft.	______	☐ cubic yards
TOTALS:	______	acres	______ sq.ft.	3.38M	cubic yards

See attached

36. Individually list wetland impacts including mechanized clearing, fill, excavation, flooding, draining, shading, etc. and attach a site map with location of each impact (attach additional sheets if needed).

Impact No.	Wetland Type	Distance to Receiving Water body (LF)	Purpose of Impact (road crossing, impoundment, flooding, etc)	Impact Size (acres)
N/A				
			Total Wetland Impacts (acres)	

37. Individually list all seasonal and perennial stream impacts and attach a site map with location of each impact (attach additional sheets)

Impact No.	Seasonal or Perennial Flow	Average Stream Width (LF)	Impact Type (road crossing, impoundment, flooding, etc)	Impact Length (LF)
See attached				
			Total Stream Impacts (Linear Feet)	

38. Have you commenced work on the project site? ☐ YES ☐ NO If yes, describe all work that has occurred and provide dates.

Maintenance Dredging of the AIWW has been ongoing since construction was completed in 1940.

39. Describe measures taken to avoid and minimize impacts to Waters of the United States:
No estuarine or marine emergent vegetation, tidal creeks, or oyster reefs would be directly or indirectly impacted by the dredging project. Maintenance dredging would result in short-term, localized impacts to the water column and sub-bottom habitat such as increased turbidity, reduced dissolved oxygen, and loss of benthic communities in the dredged areas. However, these areas would return to normal once dredging activities cease. In addition, best management practices, including measures to prevent pollutants from entering the water or migration of sediments, would be implemented as appropriate. Any impacts to water chemistry, such as dissolved oxygen or salinity concentrations are expected to be short term and insignificant.

40. Provide a brief description of the proposed mitigation plan to compensate for impacts to aquatic resources or provide justification as to why mitigation should not be required (Attach a copy of the proposed mitigation plan for review).

No mitigation is proposed. The action is maintenance dredging of a federal channel with placement in existing upland and in-water placement sites, and beneficial use placement along the beaches and nearshore of Sullivan's Island and Isle of Palms, SC.

41. See the attached sheet to list the names and addresses of adjacent property owners.
See attached excel list.

42. List all Corps Permit Authorizations and other Federal , State, or Local Certifications, Approvals, Denials received for work described

As a result of the Clean Water Act of 1977, SCDHEC issued a 401 water quality certification for the AIWW and other dredging projects on September 18, 1978 (AIWW P/N 74-4A-032). A public notice (P/N 79-2R-061) for disposal activities associated with the AIWW, including in-water disposal, was issued on March 7, 1978. Copies of these documents are included in Appendix E for this permit application.

43. Authorization of Agent. I hereby authorize the agent whose name is given on page one of this application to act in my behalf in the processing of this application and to furnish supplemental information in support of this application. [1]

Applicant's Signature Date

44. Certification. Application is hereby made for a permit or permits to authorize the work and uses of the work as described in this application. I certify that the information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent for the applicant. [1]

Applicant's Signature Date Agent's Signature Date

[1]The application must be signed by the person who desires to undertake the proposed activity or it may be signed by a duly authorized agent if the authorization statement in blocks 11 and 43 have been completed and signed. 18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

Operation and Maintenance Activities for the Atlantic Intracoastal Waterway In South Carolina

401 Water Quality Certification Request

U.S. ARMY CORPS OF ENGINEERS
CHARLESTON DISTRICT
69-A HAGOOD AVENUE
CHARLESTON, SOUTH CAROLINA
April 2023

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Appendices

1.0 Background

The U.S. Army Corps of Engineers, Charleston District (USACE) is currently updating National Environmental Policy Act (NEPA) compliance for dredging and placement activities associated with the Atlantic Intracoastal Waterway in South Carolina.

Construction of the Atlantic Intracoastal Waterway (AIWW) in South Carolina was completed in 1940 and authorized by the following Rivers and Harbors Acts: September 19, 1890; June 13, 1902-H. Doc. 63rd Congress, 1st Session; March 3, 1925-S. Doc. 178, 68th Congress, 2nd Session; July 3, 1930-H. Doc. 41, 71st Congress, 1st Session; August 31, 1935-Rivers and Harbors Committee Doc. 11, 72nd Congress, 1st Session; August 26, 1937- Rivers and Harbors Committee Doc. 6, 75th Congress, 1st Session; March 2, 1945-H. Doc. 327, 76th Congress, 1st Session.

Prior to 1937, federal authorization provided for a channel 8 feet deep and 75 feet wide from Southport, N.C. to Georgetown, S.C., a distance of 95.2 miles; 10 feet deep and 90 feet wide from Georgetown to Charleston Harbor, a distance of 62.8 miles; and 7 feet deep and 75 feet wide to Savannah, Georgia, a distance of 120 miles. In 1937, based on the justification presented in the August 26, 1937 Rivers and Harbors Committee document number 6, 75th Congress, 1st Session, authorization was granted for deepening and maintenance of a channel 12 feet deep and 90 feet wide. Operation and maintenance of the waterway has been ongoing since construction was completed in 1940.

USACE distributed a draft Environmental Impact Statement (EIS) titled *Maintenance Dredging of the Atlantic Intracoastal Waterway, South Carolina*, to the public and federal and state agencies for review on September 15, 1975. The South Carolina Department of Health and Environmental Control, Programs Development Division, provided comments advising of the preference to avoid dredge placement in marsh, selection of new disposal sites, and information regarding shoaling and placement. Comments were addressed in the Final EIS published April 1976. As a result of the Clean Water Act of 1977, SCDHEC issued a 401 water quality certification for the AIWW and other dredging projects on September 18, 1978 (AIWW P/N 74-4A-032). A public notice (P/N 79-2R-061) associated with disposal activities for the AIWW, including in-water disposal, was issued on March 7, 1978. Copies of these documents are included in Appendix E.

2.0 Project Location

Within the State of South Carolina, the AIWW extends 237 miles long. Charleston District maintains 212 miles of the AIWW beginning at the North Carolina – South Carolina state line above Little River Inlet and extending to Port Royal Sound near Hilton Head (Figure 1). Savannah District maintains the portion of the AIWW in South Carolina that extends from Port Royal Sound to the South Carolina/Georgia state line.

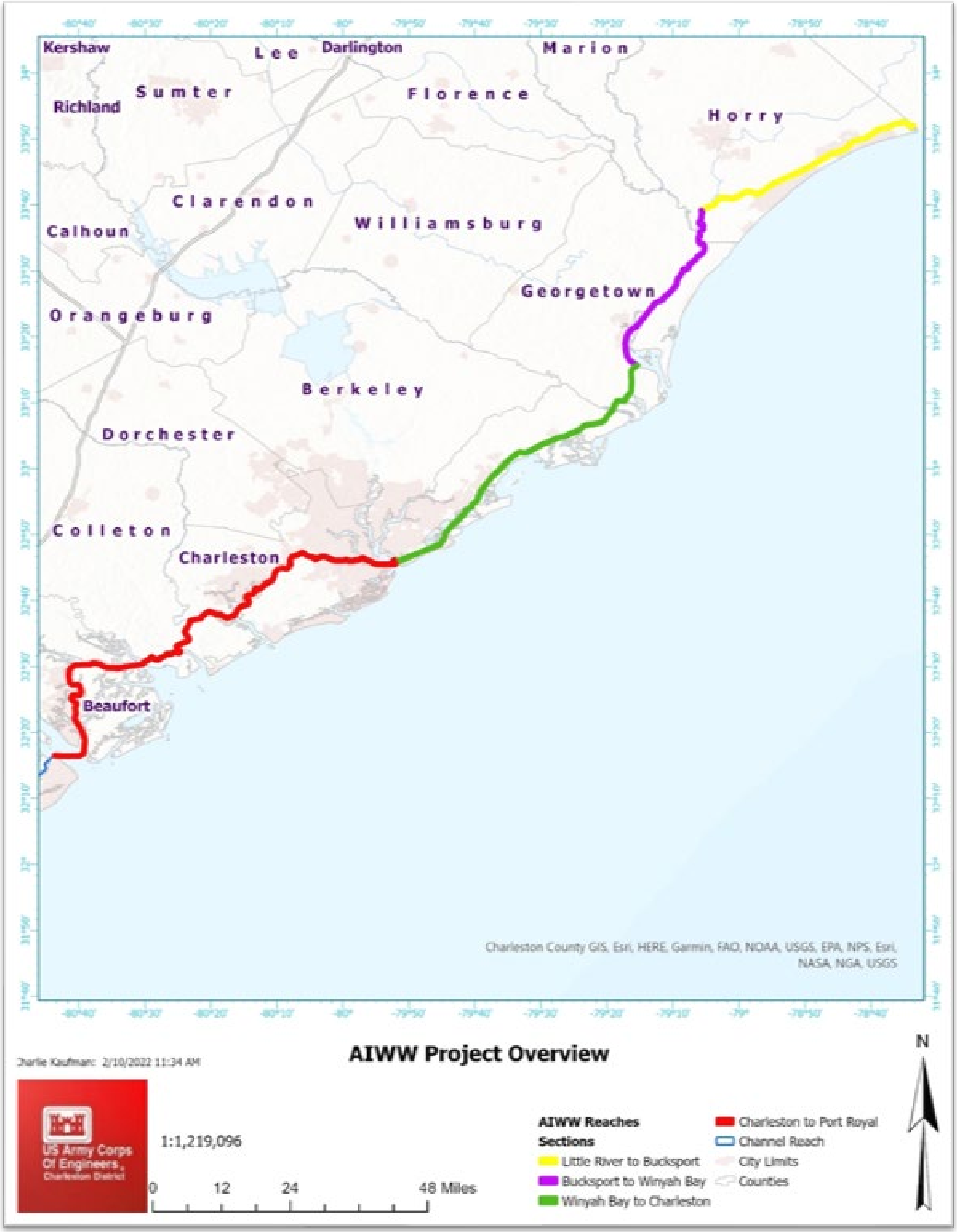


Figure 1. General Location Map for the AIWW in South Carolina.

Table 1. Shoaling and Placement Information for the AIWW in South Carolina.

Little River to Bucksport								
Stations	0+00	to	1930+00					
Mileage	36.55	miles						
Shoal Identifier	**Alternate Identifier**	**Start Station**	**End Station**	**Dredge Frequency (months)**	**Estimated Quantity (cy)**	**Upland DMMAs**	**In-water DMMAs**	**Beneficial Use Options**
Day Marker 22A	22A	1085+00	1100+00	48	10000	1152 L-B	None	Haul Out
Unidentified	N/A	N/A	N/A	As Needed, primarily based on extreme events	As Needed	55, 64, 92, 110, 179, 200, 214, 320, 389, 444, 487, 536, 563, 688, 745, 810, 892, 1002, 1046, 1092, 1152, 1255, 1302, 1390, 1430, 1480, 1610, 1750, 1860 L-B	None	Haul Out
Bucksport to Winyah Bay								
Stations	1930+00	to	3691+00					
Mileage	33.35	miles						
Shoal Identifier	**Alternate Identifier**	**Start Station**	**End Station**	**Dredge Frequency (months)**	**Estimated Quantity (cy)**	**Upland DMMAs**	**In-water DMMAs**	**Beneficial Use Options**
Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	None	None	N/A
Winyah Bay to Charleston								
Stations	3691+00	to	6510+00					
Mileage	53.39	miles						
Shoal Identifier	**Alternate Identifier**	**Start Station**	**End Station**	**Dredge Frequency (months)**	**Estimated Quantity (cy)**	**Upland DMMAs**	**In-water DMMAs**	**Beneficial Use Options**
Unidentified	N/A	N/A	N/A	As Needed, primarily based on extreme events	As Needed	775N, 716N, 697N W-C	None	Not pursued at this time
South Island Ferry	N/A	3698+00	3744+00	36	100,000	1511N, 1505N, 1500N, 1496N, 1450N, 1421N, 1370N W-C	None	Not pursued at this time
Minim Creek	Minim Creek to North Santee	3956+00	3997+35	36	100,000	1270N, 1229N, 1190N W-C	None	Not pursued at this time
Little Crow Island	Minim Creek to North Santee	3997+35	4050+00	36	140,000	1270N, 1229N, 1190N W-C	None	Not pursued at this time
North Santee River	Minim Creek to North Santee	4053+00	4066+00	36	25,000	1229N, 1190N, 1156N W-C	None	Not pursued at this time
Four Mile Creek	N/A	4084+00	4109+00	48	50,000	1156N, 1103N, 1058N, 1027N W-C	None	Not pursued at this time
South Santee River	N/A	4195+00	4216+00	48	22,000	1058N, 1027N W-C	None	Not pursued at this time
Jeremy Creek	Jeremy Creek Turning Basin	00+45	42+77.95	24	200,000	562N, 488N W-C	None	Not pursued at this time
Mathews Cut	N/A	4723+18	4926+00	36	730,000	488N, 402N, 364N, 341N, 310N, 225N, 204N W-C	None	Not pursued at this time
Awendaw Creek	N/A	5000+000	5020+00	36	45,000	225N, 204N W-C	None	Not pursued at this time
Graham Creek	N/A	5179+00	5244+00	36	180,000	106N, 78N, 55N, 39N, 19N, 13N, 41S W-C	None	Not pursued at this time
Capers Island	N/A	5730+00	5758+00	48	75,000	612S, 645S W-C	None	Not pursued at this time
Dewees Island	N/A	5896+00	5957+00	48	245,000	612S, 645S, 690S W-C	810S W-C (Dewees Inlet)	Not pursued at this time
Breach Inlet	N/A	6163+00	6341+00	24	500,000	970S, 1006S, 1028S, 1056S, 1088S, 1110S, 1207S W-C	810S W-C (Dewees Inlet)	Isle of Palms and Sullivans Island Beach and Nearshore
Charleston to Port Royal								
Stations	6510+00	to	11282+08					
Mileage	90.38	miles						
Shoal Identifier	**Alternate Identifier**	**Start Station**	**End Station**	**Dredge Frequency (months)**	**Estimated Quantity (cy)**	**Upland DMMAs**	**In-water DMMAs**	**Beneficial Use Options**
Unidentified	N/A	N/A	N/A	As Needed, primarily based on extreme events	As Needed	104, 395, 540, 580 C-P	None	Not pursued at this time
Rantowles	Grimball Gates	7390+00	7424+00	48	50,000	532 C-P	None	Haul Out
Upper Dawho River	Dawho River 1	8274+00	8381+00	Recently realigned	Recently realigned	1590 C-P	1440 C-P (North Edisto River)	Not pursued at this time
Lower Dawho River	Dawho River 2	8391+00	8431+00	24	45,000	1590 C-P	1440 C-P (North Edisto River)	Not pursued at this time
Watts Cut	N/A	8511+00	8670+00	24	490,000	1668, 1717, 1743, 1764, 1789, 1820, 1835 C-P	None	Not pursued at this time
Fenwick Cut	N/A	9042+00	9064+00	36	21,000	2160, 2237 C-P	None	Not pursued at this time
Rock Creek	N/A	9270+00	9294+00	48	Recently realigned	2461 C-P	None	Not pursued at this time
Ashepoo Coosaw Cutoff	Ashepoo Coosaw Cut	9306+00	9392+00	24	360,000	2461, 2508, 2536, 2564 C-P	None	Not pursued at this time
Brickyard Creek	N/A	10065+00	10083+00	48	Recently realigned	None	None	Not pursued at this time

3.0 Description of Federal Action

The proposed action involves hydraulic cutterhead dredging of the Federal navigation channel to its authorized depth of 12 feet and width of 90 feet, with placement of dredged material in existing upland and in-water placement areas and new beneficial use placement.

The majority of sediments dredged from the waterway would be transported via pipeline to 90 existing upland disposal areas located adjacent to the channel and two existing in-water disposal areas. The Dewees Inlet in-water placement site is approximately 15.1 acres in size and 80 feet deep. The N. Edisto River in-water placement site is approximately 20.4 acres in size and 26 feet deep. Use of the N. Edisto River in-water placement site requires that no material may be discharged at depths above 20 feet mean low low water (MLLW). Use of either in-water placement site is based on tides and the currents ability to transport the dredged material offshore.

Beneficial use placement is proposed along the nearshore and beach areas of Sullivan's Island and Isle of Palms. Material for placement would be dredged from the waterway or extracted from 5 existing upland placement sites and piped to the beneficial use locations. Sediments removed from upland placement areas would be tested to ensure compatibility with beach sands. See Table 1 above and Appendix A for additional information on shoaling and placement area locations and quantities including beneficial use placement.

Other Associated Activities:
Channel realignment refers to rerouting the Federal channel to follow the natural thalweg or deepest location to reduce dredging requirements. Any future channel realignments would be coordinated with Federal and state agencies prior to implementation.

Maintenance strategies typically involve stabilization measures intended to maintain the integrity of dikes within the placement areas and to minimize erosion and improve slope stability along the shoreline. Stabilization methods are dependent on the location and timing of the maintenance but could include revetments and/or living shorelines, as appropriate. See Appendix B for information on Living Shorelines.

4.0 Project Purpose

The purpose of the project is to ensure safe and efficient navigation for commercial and recreational vessels. Incorporating beneficial use projects can reduce the financial cost of dredged material placement while providing opportunities to increase shoreline resilience, improve and maintain habitat for sea turtles, shorebirds, and invertebrates, and protect coastal marsh resources from the effects of sea level rise.

Appendix A:

Shoaling and Placement Locations

ATLANTIC INTRACOASTAL WATERWAY

The AIWW in South Carolina includes 210 miles of federal channel, 12 ft MLLW deep and not less than 90 ft wide, beginning at the North Carolina – South Carolina state line above Little River Inlet and extending to Port Royal Sound near Hilton Head, as well as upland, in-water and beneficial use placement areas.

Shoaling and Upland/In-water Placement Areas

Maintenance Dredging will be performed using a hydraulic cutterhead dredge. Hydraulic dredging utilizes suction to remove sediments from the channel bed and the material is transported hydraulically via a pipeline to the upland and open water placement sites. Figure1 depicts an overview of the AIWW in South Carolina and Figures 2 through 11 depict shoaling and upland/in-water placement areas.

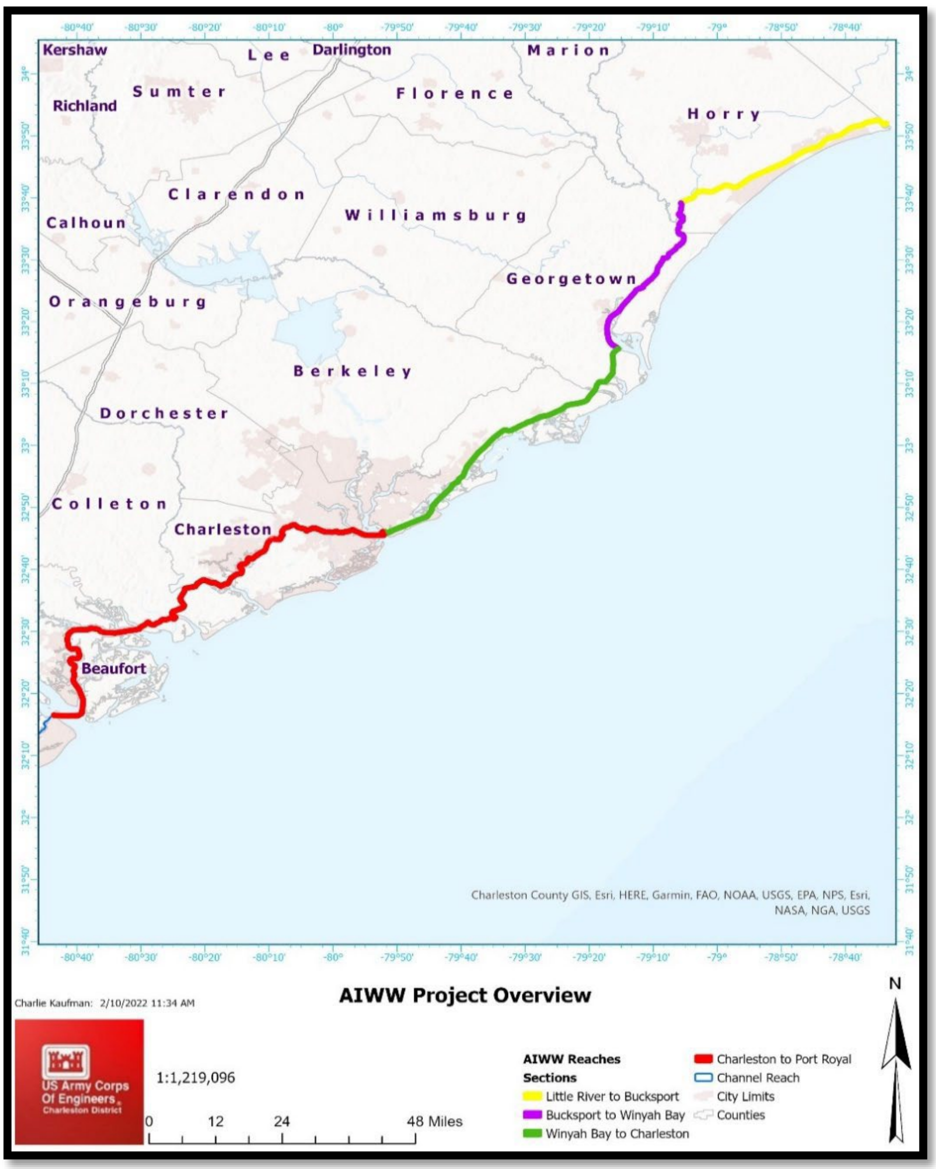


Figure 1. Overview of the Atlantic Intracoastal Waterway in SC

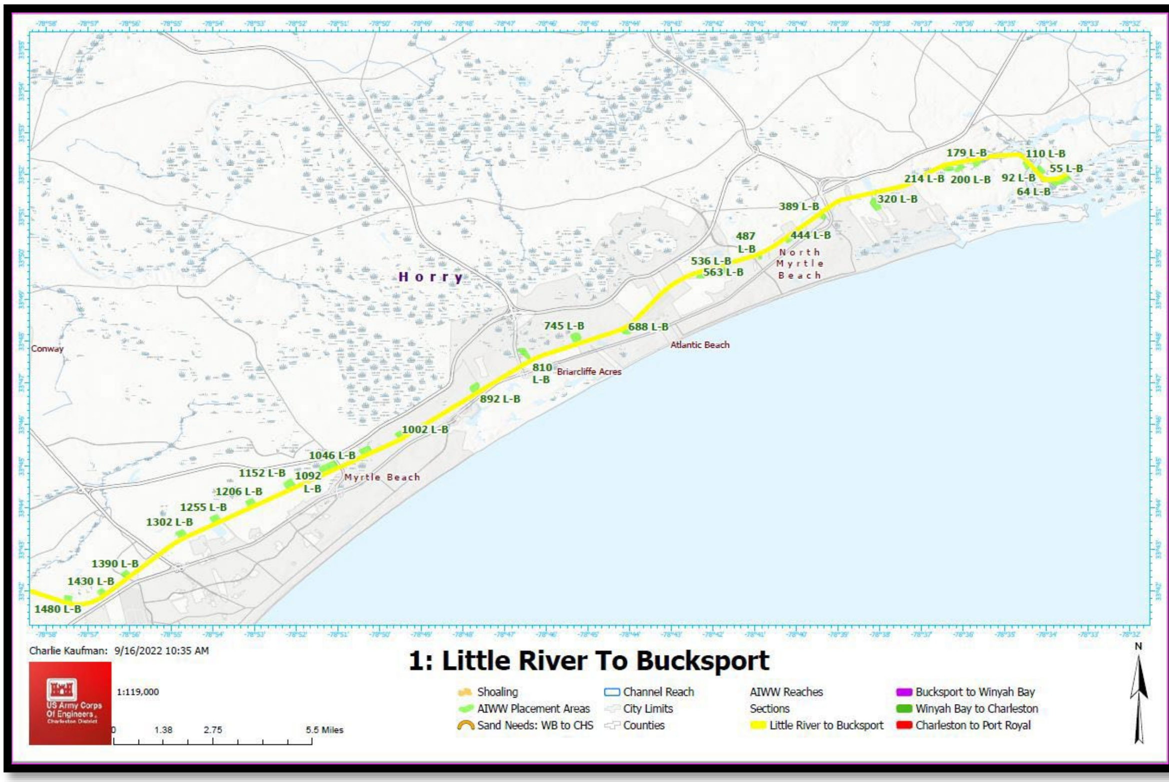


Figure 2. Little River to Bucksport Reach Part 1

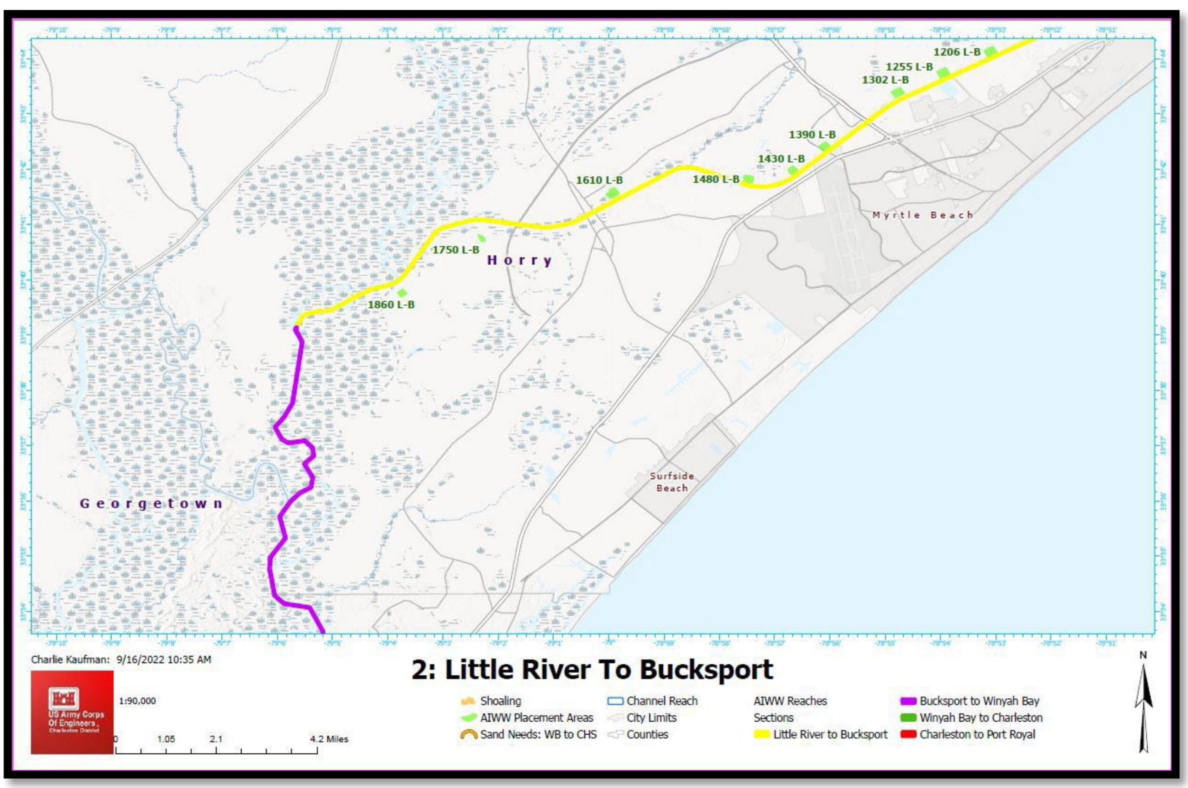


Figure 3. Little River to Bucksport Reach Part 2

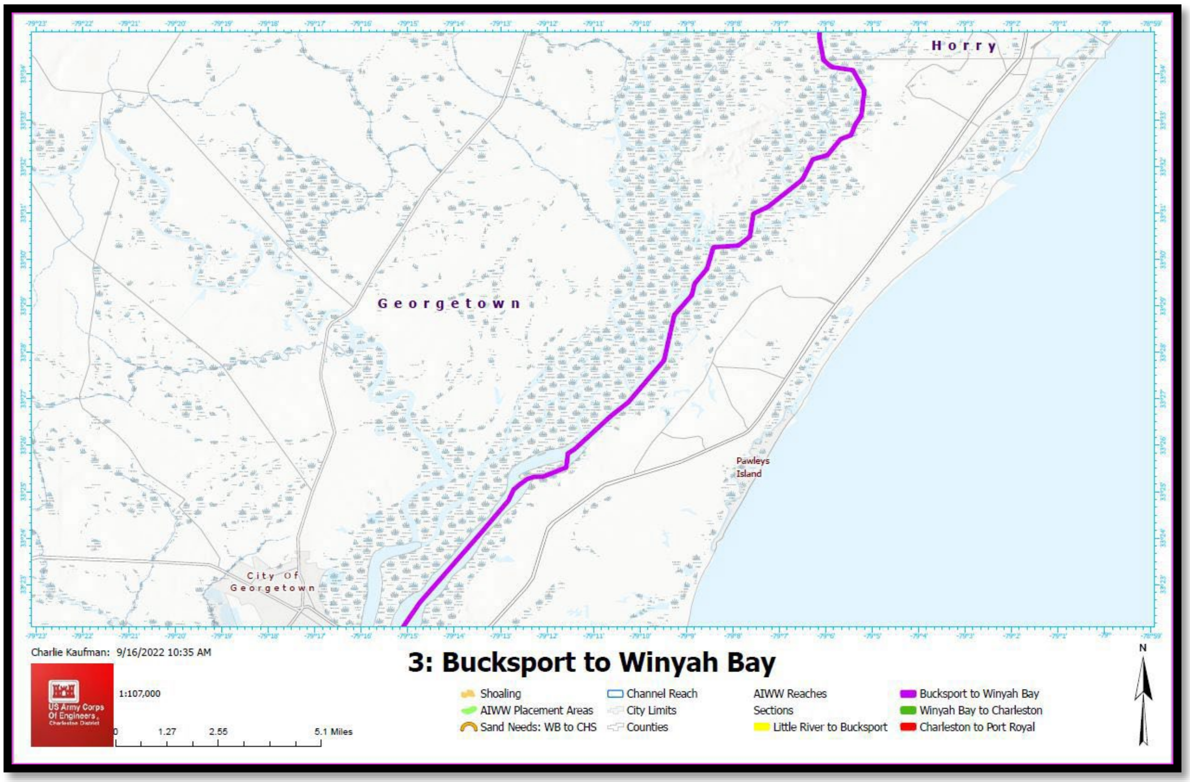


Figure 4. Bucksport to Winyah Bay Part 1

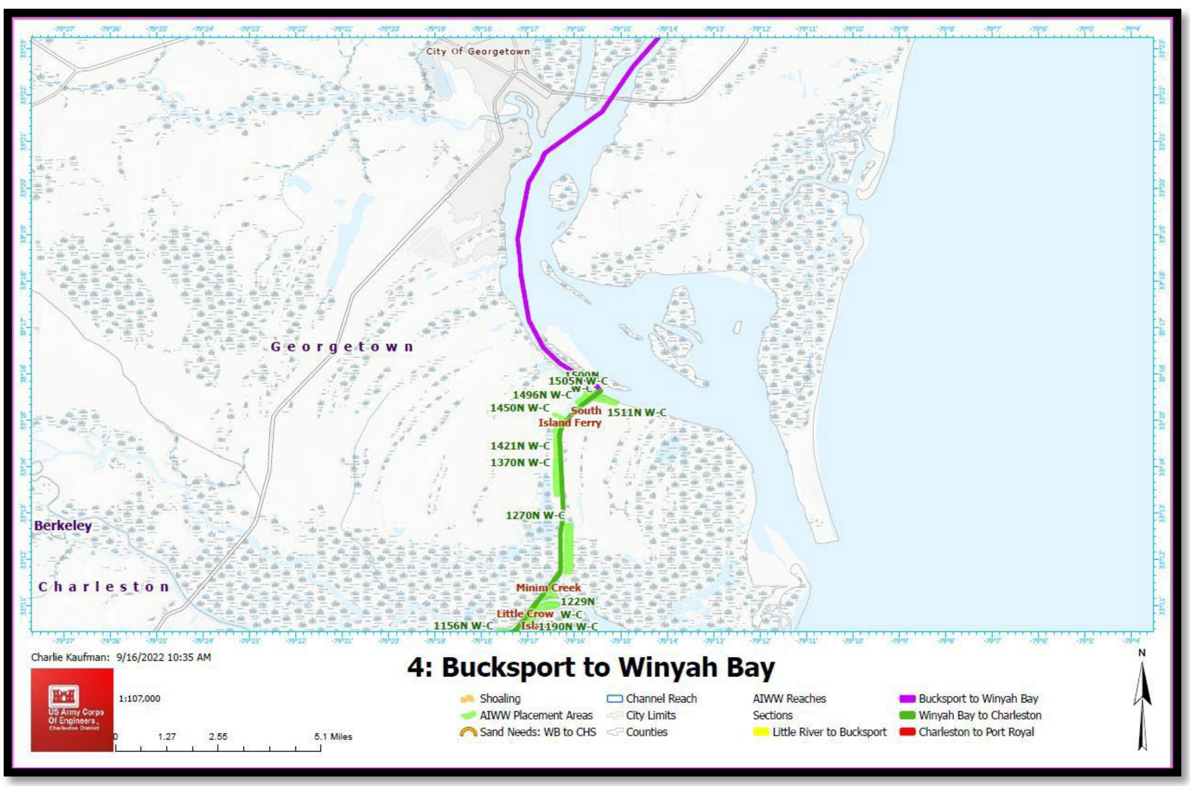


Figure 5. Bucksport to Winyah Bay Part 2

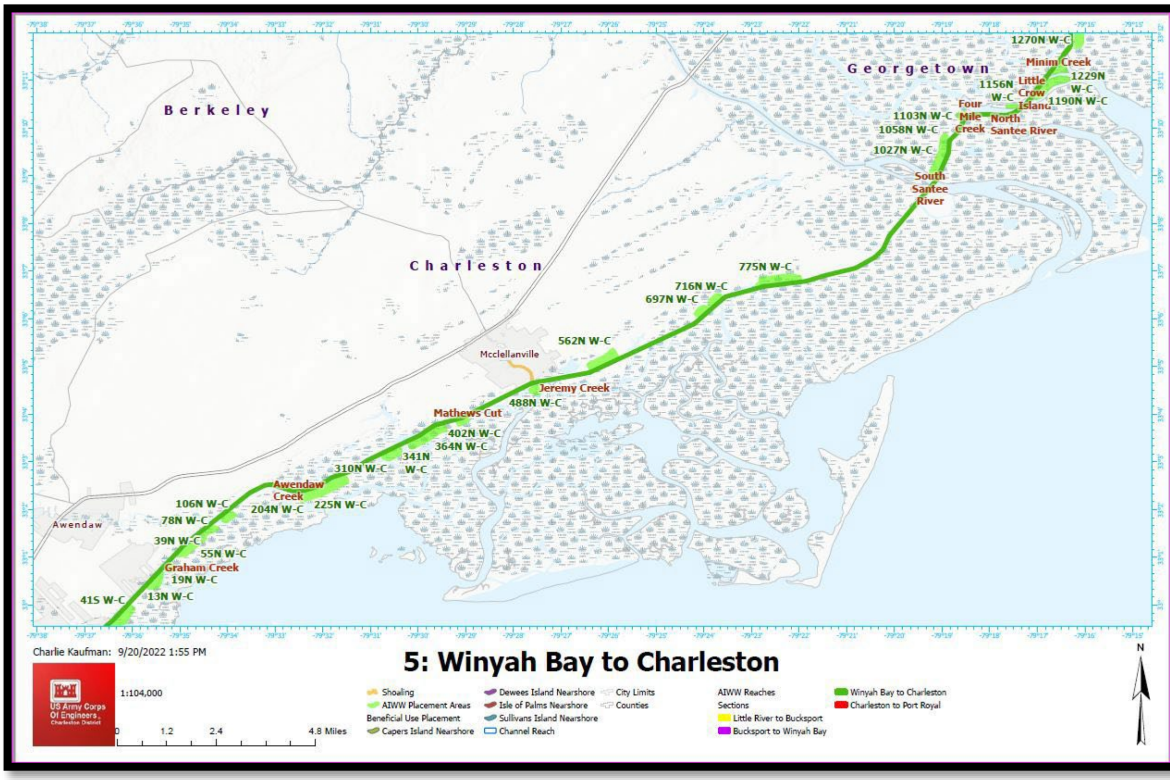


Figure 6. Winyah Bay to Charleston Part 1

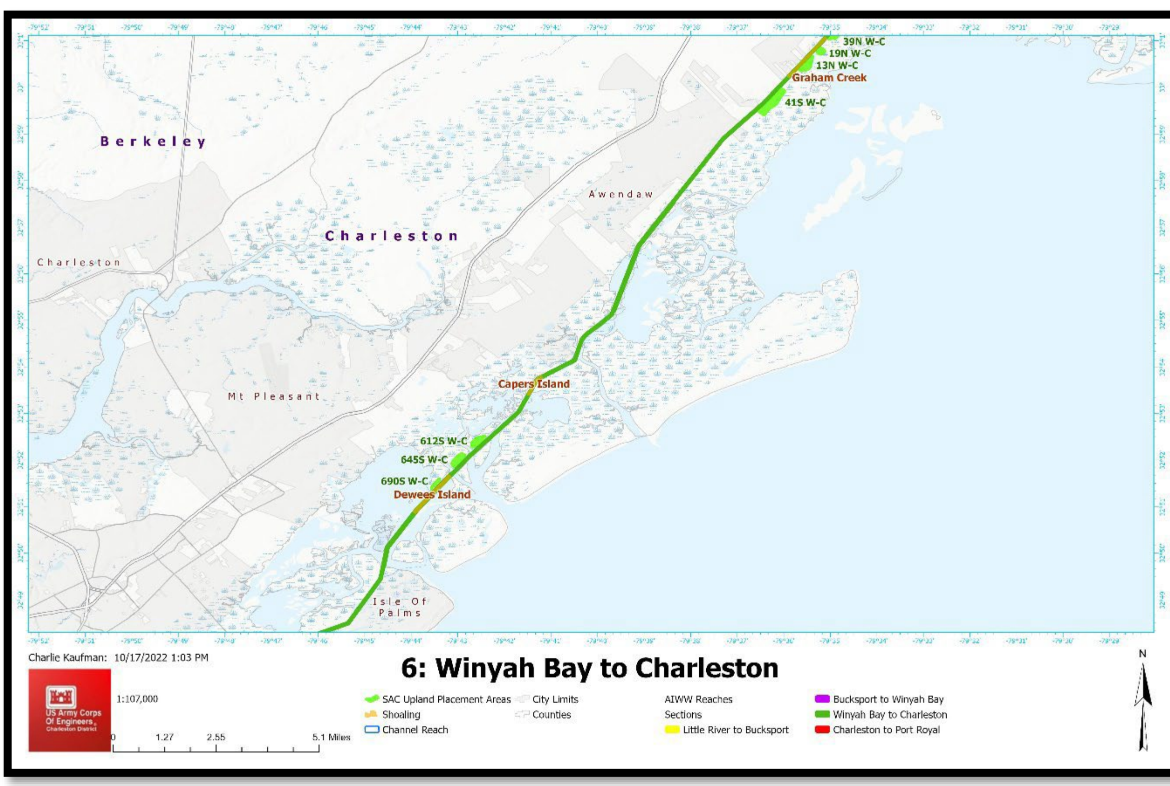


Figure 7. Winyah Bay to Charleston Part 2

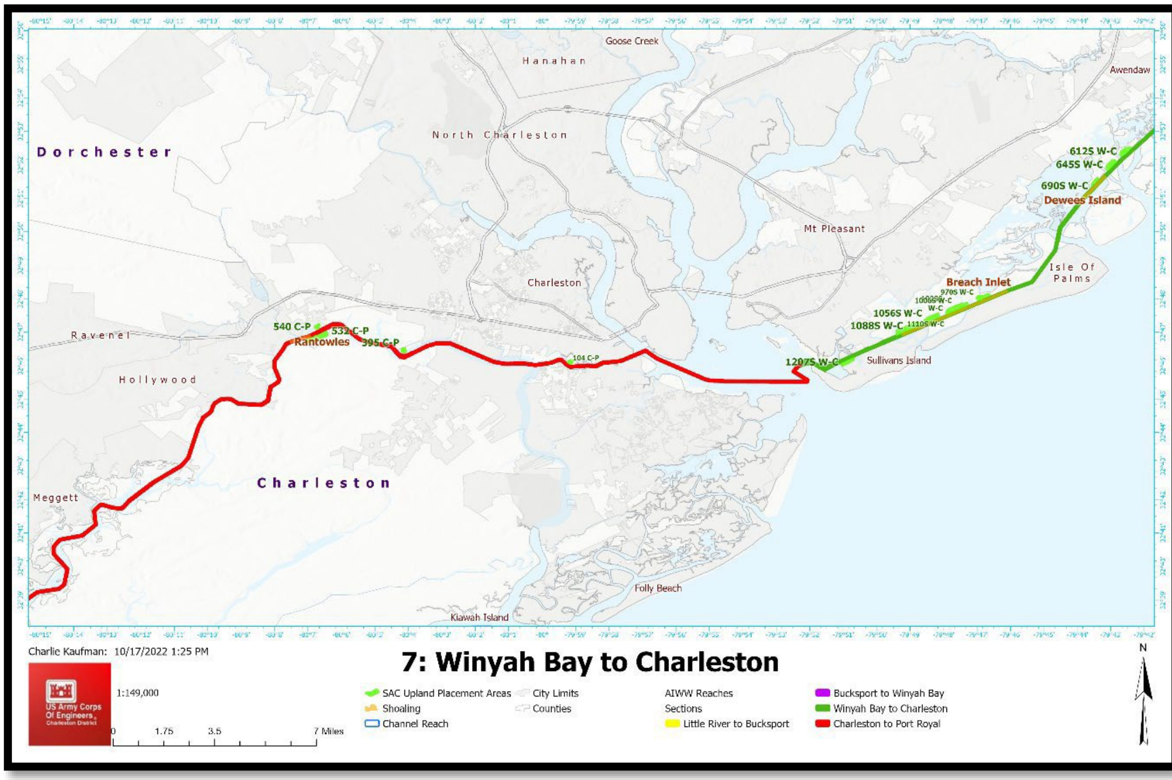


Figure 8. Winyah Bay to Charleston Part 3

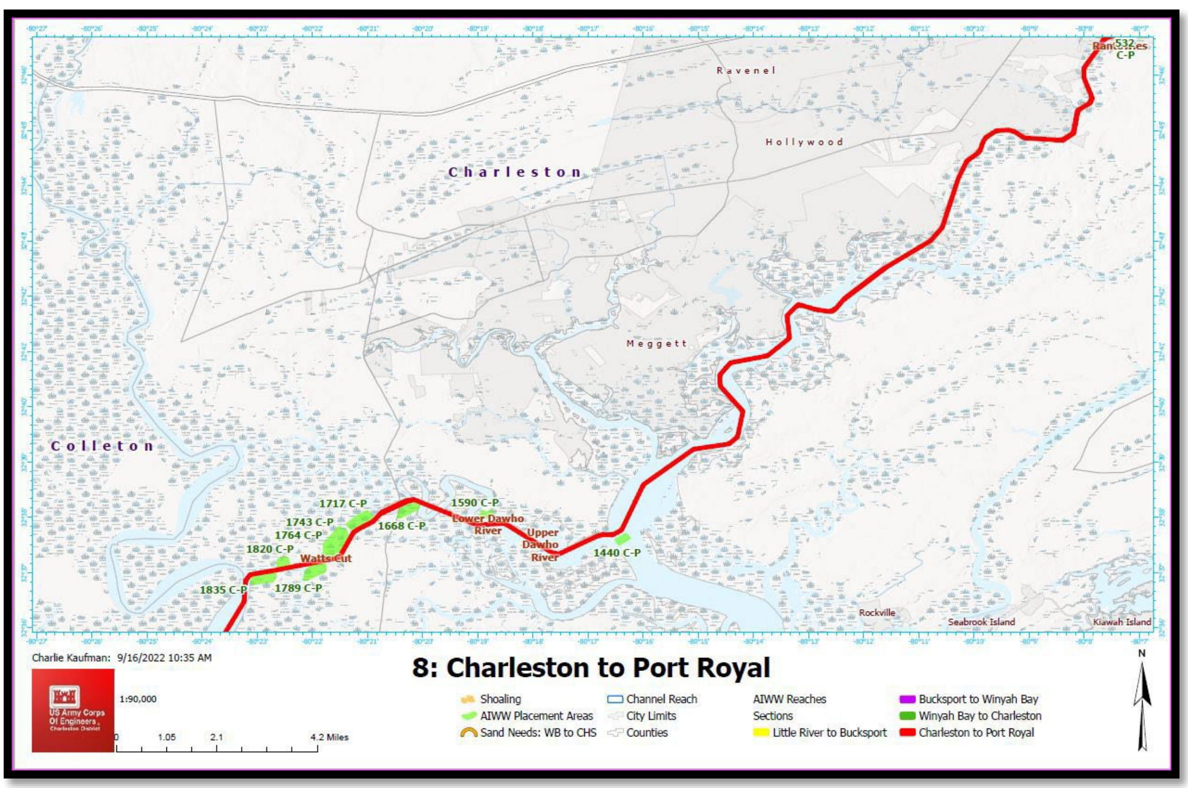


Figure 9. Port Royal to Charleston Part 1

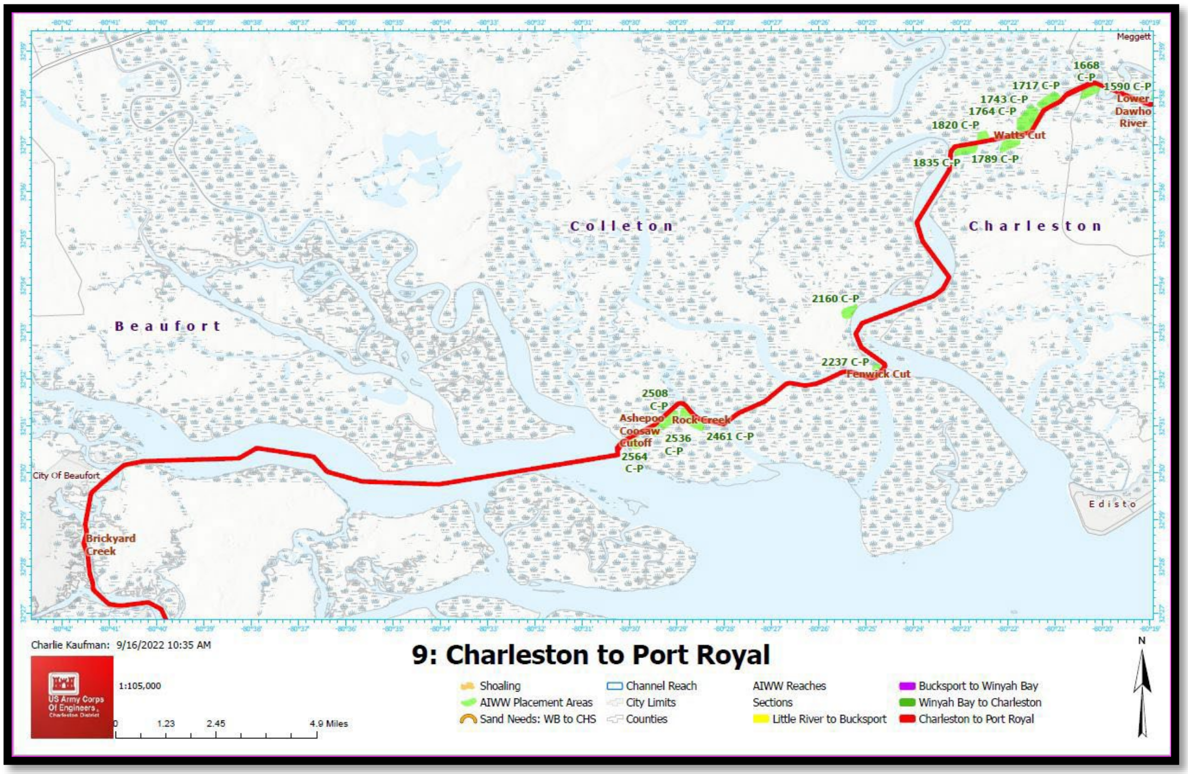


Figure 10. Charleston to Port Royal Part 2

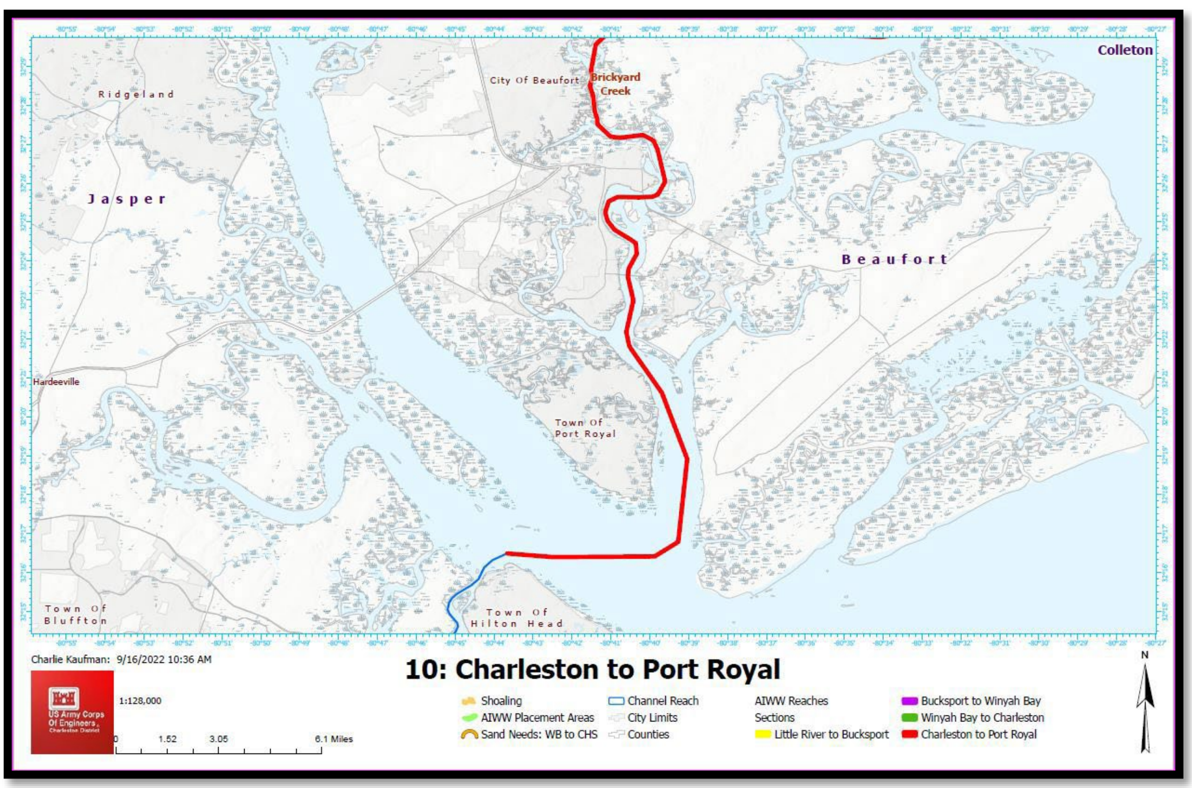


Figure 11. Charleston to Port Royal Part 3

DESCRIPTION AND LOCATIONS OF BENEFICIAL USE PLACEMENT OPTIONS

USACE proposes to place dredged material on the beach and nearshore areas of Sullivans Island and Isle of Palms (see Figures 12 and 13). Materials used for beneficial use placement could be dredged directly from the waterway or extracted from existing upland placement areas (rehandling). Materials dredged directly from the waterway would utilize hydraulic cutterhead dredge with pipelines to transport the dredged materials to the beach and nearshore areas. A composite sample from 5 in-water sediment samples in the Breach Inlet shoal is 42% sand and 58% fines. However, subsamples A and B show over 85% sands. These areas would be targeted for beneficial use until material becomes too silty at which time remaining material would go upland. Breach Inlet sandy shoal material may be placed on the beach at Sullivan's Island or Isle of Palms, or in the nearshore at Sullivan's Island or Isle of Palms. Placement options would depend on the conditions of the beaches at the time of dredging, budget, and potential cost sharing opportunities. Beach placement would include earthmoving equipment on the beach. Placement in the surf zone may require minimal land-based equipment while relying heavily on nature to organize the sediment. Placement in the nearshore would involve no land-based equipment and entirely rely on nature to move and organize the sediments.

In order to increase capacity at upland placement areas, beach quality material could be excavated from up to 5 sites: 1006S W-C, 1028S W-C, 1056S W-C, 1088S W-C, and 1110S W-C (see Figure 14). Sediment testing is currently underway which will identify and delineate the areas with high sand content. This testing is physical testing for grain size only. Chemical testing from in-situ testing is presumed to be sufficient. This material would then be placed in the Sullivan's Island placement area and the Isle of Palms placement area depending on how much material is available. Nearshore placement typically occurs from about the 8' MLLW contour landward. Through the natural processes of sand migration, this material would migrate up onto the beach. Placement options would depend on the conditions of the beaches at the time of dredging, budget, and potential cost sharing opportunities. Beach placement would include earthmoving equipment on the beach. Placement in the surf zone may require minimal land-based equipment while relying heavily on nature to organize the sediment. Placement in the nearshore would involve no land-based equipment and entirely rely on nature to move and organize the sediments. USACE is coordinating with the local governments and their consultants on what areas need the material the most and what quantities are appropriate.

Rehandling may be accomplished by methods deemed appropriate by the contract bidders. Potential options include but are not limited to 1) excavation of material using traditional land-based equipment, loading material onto barges, hydraulic pump out to the nearshore; 2) excavation of material via small hydraulic cutterhead dredge inside of placement areas with pipeline transportation to the nearshore. Water from the AIWW would need to be pumped into the barge for option 1 to turn the material back into a slurry to be discharged into the nearshore. Likewise, for option 2, water would need to be pumped from the AIWW into the placement area in order for the sand to be hydraulically pumped by the dredge.

Shapefiles shown on maps are enlarged to include beach, intertidal, and nearshore zones so that this EA effort covers all areas where beaches may erode, accrete, and shift; as well as flexible opportunities for beneficial use that take into consideration variable material types and available budgets.

Figure 12: Sullivan's Island Placement

2/14/2023

Beneficial Use Placement

Isle of Palms Placement

Sullivan's Island Placement

World Imagery

Low Resolution 15m Imagery

High Resolution 60cm Imagery

High Resolution 30cm Imagery

Citations

2.4m Resolution Metadata

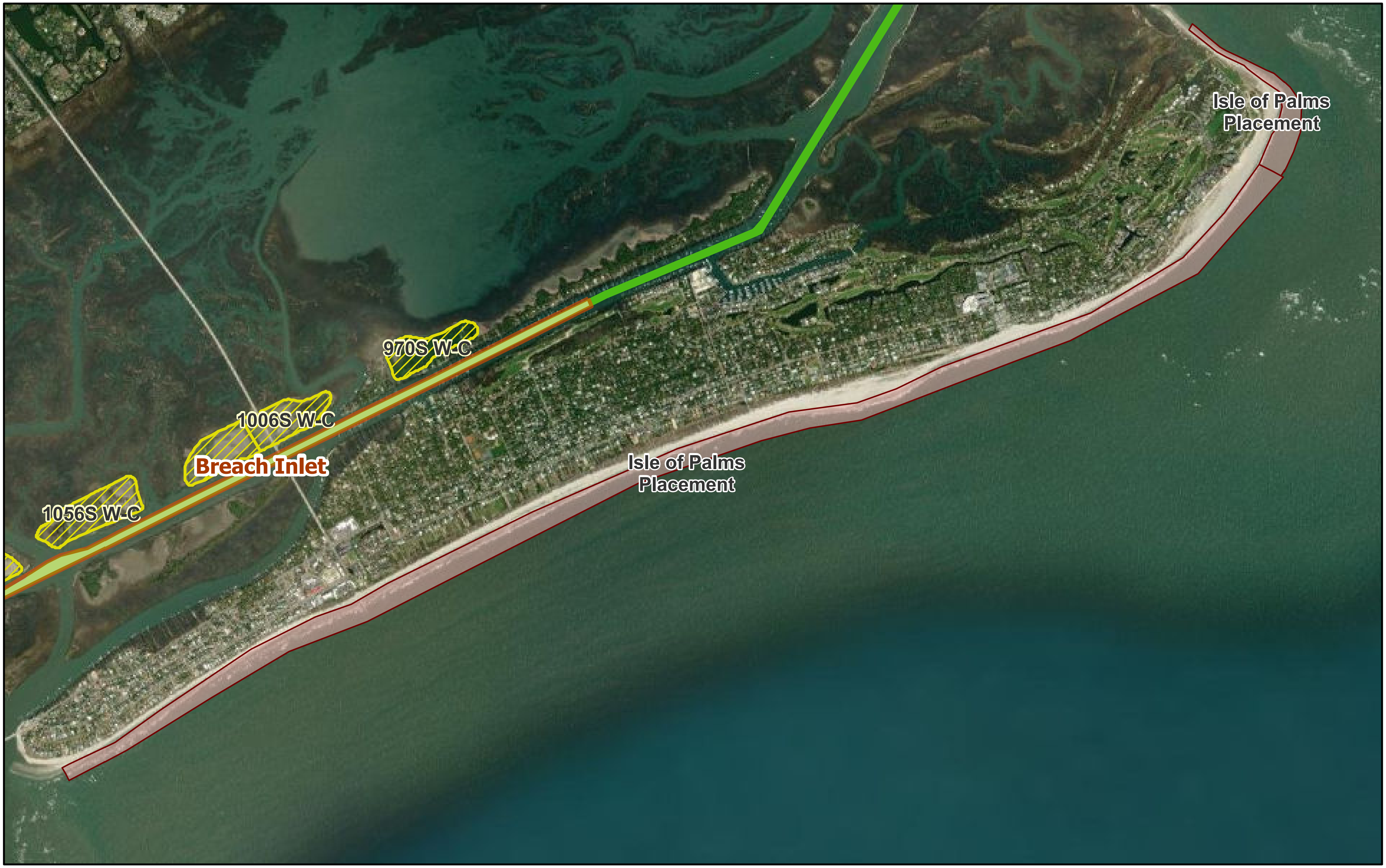
Maxar

1:13,128

0 0.07 0.15 0.3 mi

0 0.15 0.3 0.6 km

Figure 13: Isle of Palms Placement



2/14/2023

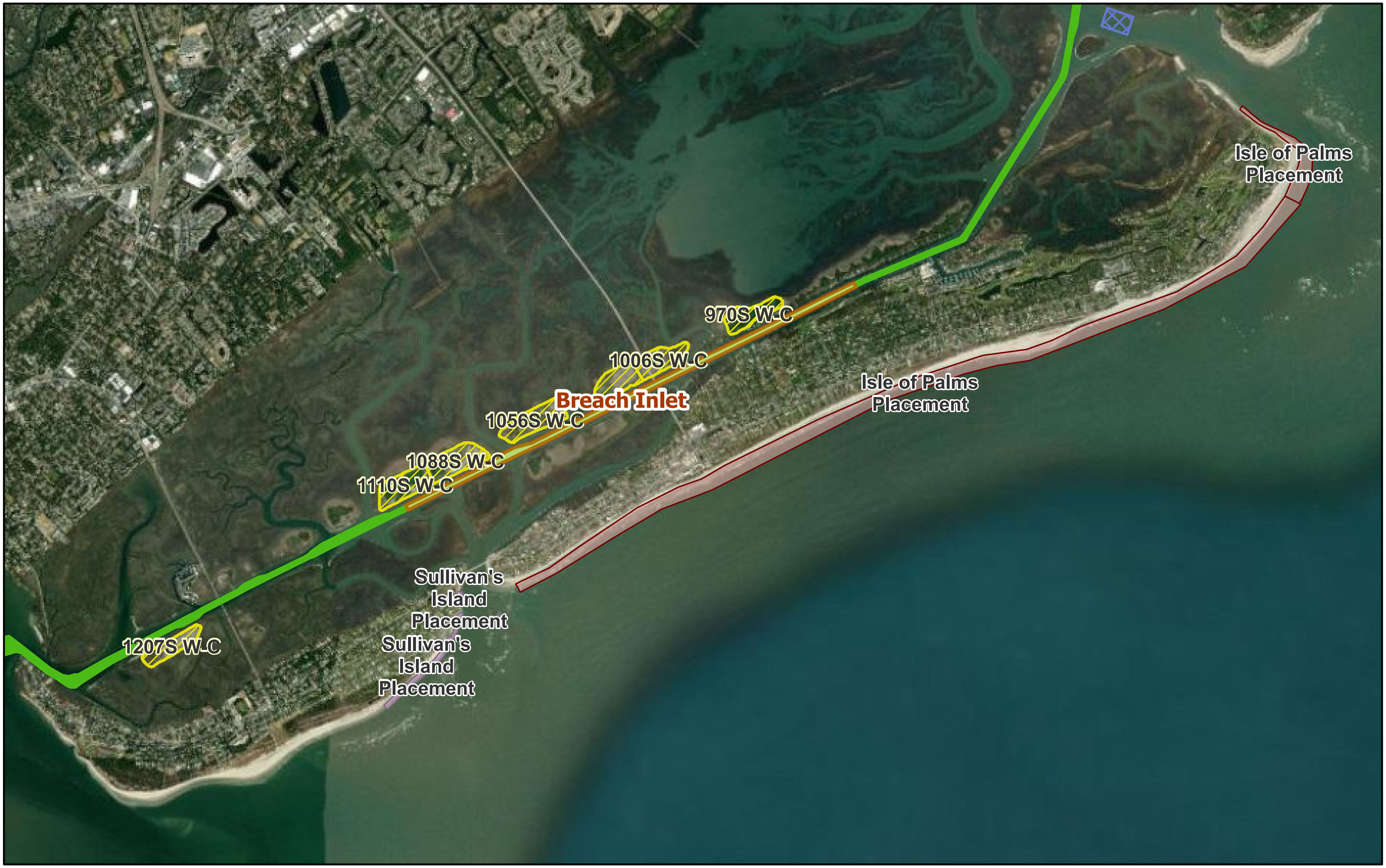
Beneficial Use Placement
Isle of Palms Placement
Shoaling
SAC Upland Placement Areas
AIWW Reaches
Winyah Bay to Charleston

World Imagery
Low Resolution 15m Imagery
High Resolution 60cm Imagery

1:45,000
0 0.33 0.65 1.3 mi
0 0.5 1 2 km

Maxar

Figure 14: Breach Inlet Overview



2/14/2023

Beneficial Use Placement

810S W-C Dewees Inlet

Isle of Palms Placement

Sullivan's Island Placement

Shoaling

SAC Upland Placement Areas

AIWW Reaches

Winyah Bay to Charleston

World Imagery

Low Resolution 15m Imagery

1:70,000

0 0.5 1 2 mi

0 0.75 1.5 3 km

Earthstar Geographics

Appendix B:

Living Shorelines

LIVING SHORELINES

South Carolina Code of Regulations R.30-12.Q refers to living shorelines as a shoreline stabilization approach used in intertidal wetland environments that maintains, restores, and/or enhances natural estuarine process through the strategic placement of native vegetation and/or use of green infrastructure. As such, living shorelines in coastal South Carolina are usually constructed as sills parallel to the shoreline at the marsh-water interface, or more specifically between the low and high tide lines, to stabilize estuarine shorelines (see Figure 1). Along the AIWW, living shoreline sills would align upland placement areas to absorb wave energy and trap sediments behind the sill. This would stabilize the shoreline of the AIWW and reduce undercutting of upland placement areas, which can lead to breaches in dikes and losses of dredged material back into the waterway.

Living shoreline techniques commonly practiced in South Carolina incorporate natural materials such as native marsh vegetation, coir logs, and oysters shells or other materials that promote the formation of oyster reefs, including oyster castles or manufactured wire reefs (e.g., concrete-coated crab traps) (SCDNR 2019). The living shoreline sills along the AIWW would use materials such as those listed above that would attract native oysters (*Crassostrea virginica*) to build shellfish reefs, rather than choir logs or vegetation. Oyster recruitment to suitable substrate is high in South Carolina waters from April to September. Because oysters thrive in the intertidal zone in South Carolina they are extremely suitable for providing vertical relief and trapping sediments to stabilize shorelines at the marsh-water interface (SCDNR 2019).

The typical height of oyster reef-based living shoreline sills is 1-2 feet, depending on the materials used and vertical growth of the living reef over time (SCDNR 2019). The specific technique and materials for the living shoreline sills at a particular location in the AIWW would be based on site attributes for suitability, including the energy level from waves and currents, salinity, width and slope of the bank, sediment firmness, and sediment composition.

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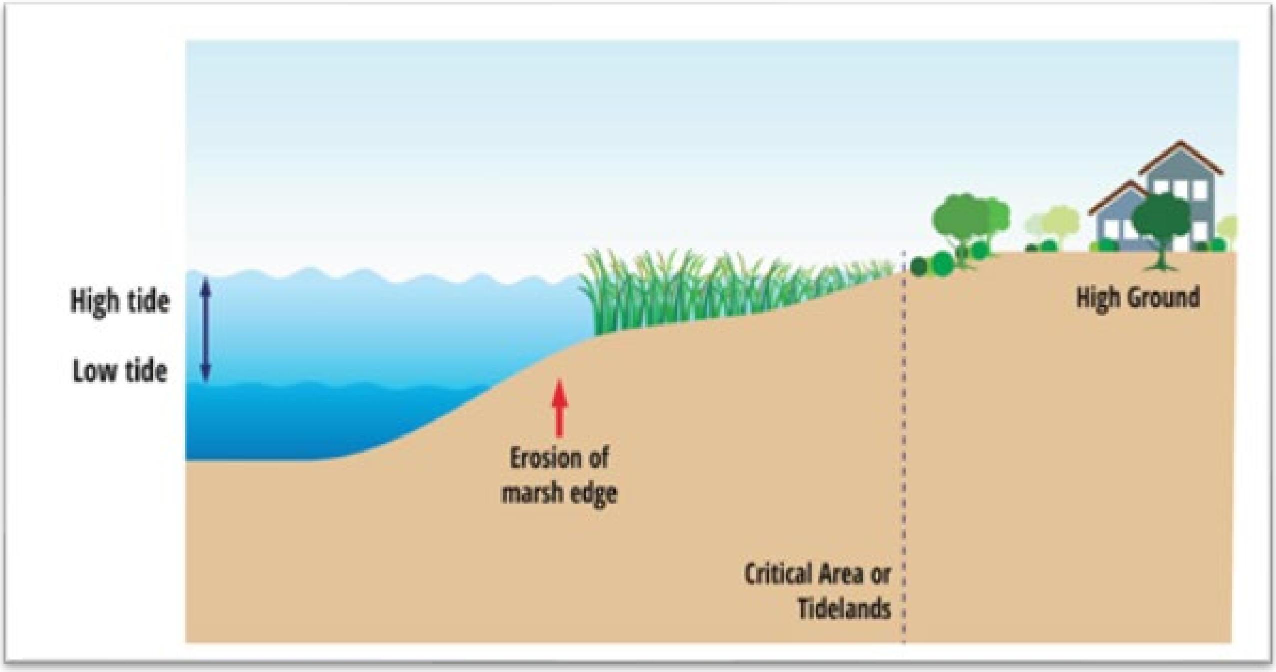

Figure 1. Profile of a typical South Carolina estuarine shoreline. The red arrow indicates the area of erosion concern where living shorelines sills would typically be placed in coastal South Carolina to reduce loss of the marsh edge. Along the AIWW, the area shown as "High Ground" in the figure is where upland areas would be found. Source: SCDNR 2019

Living shorelines constructed in the AIWW would meet the definition and project standards for living shorelines found in sections R.30-1D(31) and R.30-12.Q of state regulations S.C. Code Sections 48-39-10 et seq. Construction of typical reef-based living shorelines in South Carolina is considered low-impact. Heavy equipment is not generally used. Construction would likely occur from the water-side with small, shallow boats to reach the intertidal zone to avoid damage to the marsh during construction. While unlikely, any lost marsh vegetation due to construction would be replaced. Construction is limited to times of low tide for proper placement. Some sediment disturbance is typical but has not required the use of devices or treatments to reduce water quality impacts. Sedimentation in the AIWW and any turbidity plumes would be short-term and quickly dispersed. Some minor disturbance to micro and macro benthic fauna could occur. Fish, wading birds, and marine mammals would have limited access to the marsh edge temporarily during construction, yet the oyster reef-based living shorelines could provide habitat benefits once the construction is complete.

Because the sills would be placed above the low tide line and in close proximity to the shoreline, they are not expected to interfere with navigation in the AIWW, although signage would likely be required. The potential for impacts to cultural resources would be minimal since the living shoreline materials are placed on the surface of the bank and no sediment excavation is involved. Areas of known buried cultural resources along the AIWW would be avoided to the greatest extent practicable.

As with other AIWW maintenance measures, the living shorelines sills would be routinely inspected and repaired as needed. Some natural adaptation of the living shorelines to sea level rise is expected over time with respect to sediment capture, vertical growth of the oyster reef structure and marsh to keep pace with the intertidal zone as it shifts. However, inland migration of the reefs and marsh could only occur until it reaches the raised dikes of the upland placement area.

Appendix C:

Programmatic Essential Fish Habitat Consultation

Programmatic Essential Fish Habitat Consultation for United States Army Corps of Engineers Activities and Projects Regularly Undertaken in South Carolina

Prepared in Collaboration by:

National Marine Fisheries Service, Southeast Regional Office, Habitat Conservation Division
331 Fort Johnson Road, Charleston, South Carolina 29412

With and for:

United States Army Corps of Engineers, South Atlantic Division, Charleston District
69A Hagood Ave, Charleston, South Carolina 29403

Issued by: Date:

______________________________ March 3, 2023

Virginia M. Fay
Assistant Regional Administrator
Habitat Conservation Division
National Marine Fisheries Service,
Southeast Region

Accepted by: Date:

______________________________ ____________

ANDREW C. JOHANNES
Lieutenant Colonel, EN
Commander, U.S. Army Engineer District, Charleston

Table of Contents

1. Introduction

Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires federal action agencies such as the U.S. Army Corps of Engineers (USACE) to consult with the National Oceanic and Atmospheric Administration/National Marine Fisheries Service (NMFS) for any action they authorize, fund or undertake that may adversely affect Essential Fish Habitat (EFH). A programmatic consultation is often appropriate for funding programs, large-scale planning efforts, and other instances where sufficient information is available to address all reasonably foreseeable adverse effects on EFH of an entire program, parts of a program, or a number of similar individual actions occurring within a given geographic area. The outcome of a programmatic consultation, at minimum, should result in equal or greater protection to EFH than would have been realized through the otherwise required individual project level EFH consultation. The programmatic consultation process consolidates effort and time upfront while realizing the time saving and coordination benefits later.

This Programmatic EFH Consultation, in partnership with the USACE, Charleston District (Charleston District) covers certain Charleston District civil works activities and projects regularly undertaken in South Carolina. This document provides an assessment of the potential effects of dredging, dredged material transportation and dredged material placement activities, including beneficial uses, of federal operations and maintenance dredging projects in the action area, and issues conservation recommendations for those effects. This Programmatic EFH Consultation will reduce the number of individual EFH consultations while satisfying EFH consultation requirements of the MSA.

1.1 Background Statutory and Regulatory Information

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104- 267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a federal Fisheries Management Plan (FMP). Section 305(b)(2) of the MSA requires federal agencies to consult with NMFS on any actions they authorize, fund or undertake that may adversely affect EFH. An adverse effect to EFH is any direct or indirect effect that reduces the quality and/or quantity of the designated habitat. NMFS provides advice and recommendations to the federal agency to avoid, minimize, or mitigate for these adverse effects. Conservation Recommendations, such as Best Management Practices, address all reasonably foreseeable adverse impacts on EFH by the proposed action(s).

1.2 Programmatic Consultation Process

The EFH Coordination, Consultation, and Recommendations (50 CFR §§ 600.5– 600.930) outline the process for federal agencies, the NMFS, and the Fishery Management Councils (Councils) to satisfy the EFH consultation requirement under MSA Section 305(b)(2)-(4)). Based on the EFH regulations at 50 CFR § 600.920(j), the programmatic consultation is an effective and efficient method to consult on a large number of minimal impact projects the Charleston District routinely authorizes, and to develop programmatic conservation recommendations that will address reasonably foreseeable adverse impacts to EFH. The scope of the programmatic consultation remains limited to those activity types that will not have a substantial adverse effect both individually and cumulatively on EFH. Activities not specifically covered by the programmatic consultation will have to be addressed through individual consultation.

The *Programmatic Essential Fish Habitat Consultation for United States Army Corps of Engineers Activities and Projects Regularly Undertaken in South Carolina* between the NMFS and the Charleston District, hereinafter referred to as the Programmatic EFH Consultation, addresses numerous in-water and near-shore activities conducted by the Charleston District.

Through this Programmatic EFH Consultation, NMFS has determined certain Charleston District civil works projects and activities, both individually and cumulatively, will not have a substantial adverse effect on EFH; these projects and activities are described herein. Activities and projects not explicitly included in this Programmatic EFH Consultation will be considered separately as an individual consultation. Through the implementation of this programmatic consultation, if NMFS or the USACE determines that other projects and activities may be considered for inclusion in future revisions of the Programmatic EFH Consultation, these projects and activities will be considered jointly, but with NMFS making the final determination on whether programmatic consultation is appropriate. Through the implementation of this programmatic consultation, there will be increased and more productive engagement between staff from both agencies and increased efficiencies in allowing projects to move forward in a timely manner.

2. Action Area and Proposed Actions

2.1 Description of Action Area

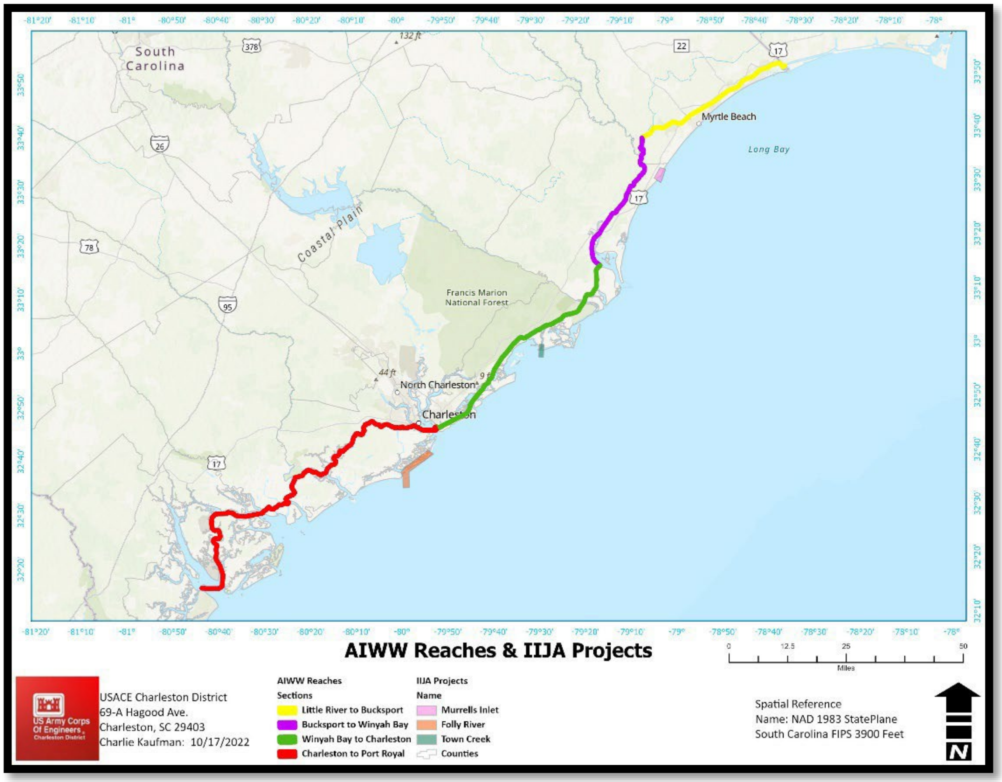

Figure 1. Overview of Navigation Projects under the Programmatic EFH Consultation

Charleston District dredging activities under this programmatic consultation would occur in areas designated EFH for various life stages of fish species managed by the Councils and NMFS and in areas that support prey species and anadromous fish. USACE conducts several kinds of routine and repetitive activities and projects that typically result in predictable effects. The geographic scope of this programmatic consultation includes tidally influenced areas designated EFH in South Carolina as provided below. Specifically, the geographic scope encompasses estuarine/inshore and wetland areas, as well as marine/coastal ocean areas such as nearshore waters adjacent to coastal beaches and the Atlantic Intracoastal Waterway (Figure 1).

2.2 Proposed Actions

USACE has been responsible for the development and maintenance of navigable waterways in the U.S. since the 1800s. The USACE provides safe, reliable, efficient, and environmentally sustainable waterborne transportation systems (channels, harbors, and waterways) for the movement of commerce, national security needs, and recreation. For more details on the USACE navigation dredging program and dredged equipment and dredged material management including placement and habitat development, please refer to USACE Engineering Manual (EM) 1110-2-5025 (Dredging and Dredged Material Management).

2.2.1 Navigation Dredging
This action includes Congressionally authorized and federally-sponsored (i.e., federally-funded or partially federally-funded) dredging for maintenance of Charleston District coastal navigation channels (including Murrells Inlet, Town Creek (McClellanville), Folly River, and the Atlantic Intracoastal Waterway (from the North Carolina state line to Port Royal Sound, South Carolina).

See Appendix A for detailed descriptions of authorized dredging projects covered under this Programmatic EFH Consultation.

2.2.2 Transportation of Dredged Material
This action includes transportation of dredged material via modified hopper dredge, or pump out pipeline. Specifically, the transportation of material from the dredging of navigation channels covered under this Programmatic EFH Consultation includes transportation for: (a) placement alongside or downdrift of the channel being dredged; (b) open water placement in an approved nearshore disposal site; (c) a confined (diked) placement; and/or (d) beneficial uses of dredged material including beach or nearshore placement and habitat restoration.

2.2.3 Navigation Dredged Material Placement
After both dredging and transportation of dredged material, the material is typically placed into a predetermined area for disposal or to serve a beneficial use. This action includes the placement of material from the dredging of navigation channels: (a) alongside or downdrift of the channel being dredged; (b) open water placement area; (c) in a confined (diked) placement area; and/or (d) in beneficial use locations as provided under Section 2.2.4.

2.2.4 Beneficial Use Placement
This action includes the placement of sand in the nearshore or beach area to nourish the littoral zone and/or habitat restoration projects. Sand sources for these placement actions may include dredged navigation channels, and/or nearshore deposition basin areas (see Appendix A for approved areas). Current federal beach, nearshore, and habitat restoration projects covered under this Programmatic EFH Consultation include:

- Charleston District Beach Placement Projects
  Folly Beach, Garden City Beach, Huntington Beach State Park, Bird Key

- Charleston District Nearshore Placement Projects
  Folly Beach, Lighthouse Island (Cape Romain),

- Ecosystem Restoration Placement Projects
  Bird Key

See Appendix A for additional details regarding these beneficial use projects.

2.2.5 Emergency Dredging
This action includes emergency dredging activities following an unforeseen event for the purpose of maintaining existing navigation channels, or to address a national security concern. The emergency may result from a natural disaster such as a flood event, storm or hurricane or

from a navigation related catastrophe (e.g., a vessel collision with a bridge). USACE is authorized to conduct emergency response actions under the Flood Control and Coastal Emergency Act (Public Law 84-99) or the Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288).

2.2.6 Minor Channel Modifications

This action includes dredging and disposal activities for minor modifications to existing navigation channels that are within the discretionary authority of USACE (i.e., additional Congressional authorization is not required). Consistent with USACE Engineering Regulations and the budget process, certain navigation channel modifications are funded as maintenance activities. These modifications include channel realignments, turn or bend modifications, advanced maintenance opportunities, and overdepth dredging.

This action does NOT include navigation channel improvements beyond the scope of maintenance dredging or maintenance modifications of channels and turning basins to depths or widths not previously authorized throughout the project area. Maintenance dredging is defined as maintaining channels at specified depths and widths, including overdepth and advanced maintenance dredging. Channel improvements involve dredging to increase channel dimensions (length, depth or width) beyond dimensions previously authorized or permitted. Channel improvements are not within the scope of this Programmatic EFH Consultation and will be consulted on individually, as appropriate.

3. Essential Fish Habitat

The MSA requires fishery management councils and NMFS to identify, describe, map, and conserve EFH for each fish species managed under its jurisdiction. EFH is defined in the MSA as “those waters and substrate necessary to fish [and shellfish] for spawning, breeding, feeding or growth to maturity.” This broad definition of EFH has led the South Atlantic Fishery Management Council (SAFMC) and the NMFS to identify EFH in most, if not all areas in the South Atlantic Bight, ranging from offshore pelagic areas (Gulf Stream) to all tidally influenced wetlands. This Programmatic EFH Consultation will focus on federally managed species and designated EFH germane to dredging and dredging related projects in South Carolina. Specific plans, amendments, descriptions of EFH and other information can be found at http://safmc.net/, http://www.mafmc.org/, and https://www.fisheries.noaa.gov. Spatial representations of EFH are available at http://safmc.net/ within the SAFMC Atlas and https://www.habitat.noaa.gov/apps/efhmapper/.

3.1 Federally Managed Species

Federally managed species that have a potential to be adversely affected by one or more USACE dredging and dredging related projects in South Carolina are listed in Table 1. Please refer to the relevant FMP available online for detailed descriptions of the federally managed species and their distribution.

Table 1. Federally managed species occurring in South Carolina tidally influenced waters that may be adversely affected by federal navigation activities.

Common Name	Scientific Name	Management Plan Agency	Fishery Management Plan (FMP)
White Shrimp	*Lytopenaeus setiferus*	SAFMC	Shrimp
Brown Shrimp	*Farfantepenaeus aztecus*	SAFMC	Shrimp
Gag Grouper	*Mycteroperca microlepis*	SAFMC	Snapper Grouper
Gray Snapper	*Lutjanus griseus*	SAFMC	Snapper Grouper
Lane Snapper	*Lutjanus synagris*	SAFMC	Snapper Grouper
Black Sea Bass	*Centropristis striata*	SAFMC	Snapper Grouper
Spanish Mackerel	*Scomberomorus maculatus*	SAFMC	Coastal Migratory Pelagic
King Mackerel	*Scomberomorus cavalla*	SAFMC	Coastal Migratory Pelagic
Summer Flounder	*Paralichthys dentatus*	MAFMC	Summer Flounder
Bluefish	*Pomatomus saltatrix*	MAFMC	Bluefish
Scalloped Hammerhead Shark	*Sphyrna lewini*	NMFS	Highly Migratory Species
Bonnethead Shark	*Sphyma tiburo*	NMFS	Highly Migratory Species
Bull Shark	*Carcharhinus leucas*	NMFS	Highly Migratory Species
Sandbar Shark	*Carcharhinus plumbeus*	NMFS	Highly Migratory Species
Finetooth Shark	*Carcharhinus isodon*	NMFS	Highly Migratory Species
Dusky Shark	*Carcharhinus obscures*	NMFS	Highly Migratory Species
Blacktip Shark	*Carcharhinus limbatus*	NMFS	Highly Migratory Species
Atlantic Sharpnose	*Rhyzoprionodon terranovae*	NMFS	Highly Migratory Species
Lemon Shark	*Negaprion brevirostris*	NMFS	Highly Migratory Species

3.2 Essential Fish Habitat in Project Areas

As noted earlier, complete EFH descriptions are available on Councils and NMFS websites. The following section provides only a brief discussion of EFH with specific and direct relevance to Charleston District dredging and dredging related projects in South Carolina. *Users Guide to Essential Fish Habitat Designations by the South Atlantic Fishery Management Council* provides a useful summary and clarifications to designations and is available at https://safmc.net/documents/2022/05/efh-user-guide.pdf/. Additional information on EFH descriptions for species identified by NMFS or the MAFMC can be found at the EFH Mapper (https://www.habitat.noaa.gov/apps/efhmapper/). This section is not an exhaustive or complete description of EFH and should not be treated as such.

Essential fish habitats identified by the SAFMC, MAFMC, and NMFS and likely to be within the project areas covered by this Programmatic EFH Consultation are listed below.

Estuarine Areas

- Estuarine Emergent Wetlands (Salt Marsh and Brackish Marsh)
- Intertidal Non-vegetated Flats
- Estuarine Water Column
- Soft Bottom/Subtidal
- Estuarine Scrub/Shrub

Tidally Influenced Areas

- Tidal Creeks

Marine Areas

- Marine Water Column
- Offshore Marine Habitats: Spawning Grounds

HAPCs

- Coastal Inlets
- Oyster Reefs/Shell Banks

3.2.1 Estuarine Emergent Wetlands (Salt Marsh and Brackish Marsh)

Salt marshes are transitional areas between land and water, occurring along the intertidal estuarine shorelines where salinity ranges from near ocean strength to near fresh in upriver marshes. The estuarine wetland is described as tidal wetlands in low-wave-energy environments, where the salinity is greater than 0.5 parts per thousand and is variable owing to evaporation and the mixing of seawater and freshwater (SAFMC Habitat Plan 1998). Estuarine emergent marshes protect shorelines from erosion, produce detritus, filter overland runoff, and function as a vital nursery area for various fish and many other species. Estuarine emergent wetlands are characterized by the presence of erect, rooted, herbaceous hydrophytes dominated by salt-tolerant perennial plants.

The structure and function of a salt marsh are influenced by tide, salinity, nutrients, and temperature. Estuarine intertidal marshes, as well as the network of tidal creeks that salt marshes drain into, provide refuge, forage, and nursery habitat for Council- and NMFS-managed species, other non- managed fishes, shellfish, invertebrates, as well as endangered and threatened species. Estuaries provide major sources of nutrients, nekton, prey fish, and detritus to other ecosystems, which is primarily facilitated by water movement. The cross-habitat transfer of energy and carbon from donor to recipient habitats plays a vital role in shaping food webs and productivity in recipient systems, particularly those supporting additional managed species, such as coastal migratory pelagics (i.e., mackerels), highly migratory pelagics (i.e., sharks), and species in the snapper grouper complex (Polis et al. 1997). Additionally, salt marsh estuaries provide commercial and economic value to people; it is estimated that 95 percent of finfish and shellfish species harvested commercially in the U.S. are wetland-dependent, thus could be considered estuarine- dependent (SAFMC Habitat Plan 1998)

3.2.2 Intertidal Non-vegetated Flats

Intertidal flats are the unvegetated bottoms of estuaries and sounds that lie between the high and low tide lines. Intertidal flats occur along shorelines, and can emerge in areas unconnected to dry land. Intertidal flats are most extensive where tidal range is greatest, such as near inlets. Sediment composition on intertidal shorelines tends to shift from coarser, sandy sediment on higher portions of the shoreline, with greater wave energy, to finer, muddier sediments in the lower portion of the shoreline, with relatively less wave energy (Peterson and Peterson 1979).

Intertidal flats play an important role in the ecological function of South Atlantic estuarine ecosystems, particularly in primary production, secondary production, and water quality. Although intertidal flats are usually classified as unvegetated, there is actually an extremely productive microalgae community occupying the surface sediments (SAFMC Habitat Plan 1998). Non-vegetative flats serve various functions for many species' life stages such as: feeding grounds, refuge, and nursery areas for many mobile species, as well as the microalgal community that can function as a nutrient (nitrogen and phosphorus) stabilizer between the substrate and water column. The benthic community of an intertidal flat can include polychaetes, decapods, bivalves, and gastropods. This resident benthos is preyed upon by mobile predators that move onto the flats with the flood tide. Primary production of this community can equal or exceed phytoplankton primary production in the water column, and can represent a significant portion of overall estuarine primary productivity (SAFMC Habitat Plan 1998).

Intertidal flats provide the following ecological functions: (1) nursery grounds for early stages of development of many benthically-oriented estuarine dependent species; (2) refuges and feeding grounds for a variety of forage species and juvenile fishes; (3) significant trophic support to fish and shellfish, including oysters and clams (Page and Lastra 2003); (4) stabilization of sediments via the production of exopolymers (Yallop et al. 2000) and (5) modulation of sedimentary nutrient fluxes (Cerco and Seitzinger 1997). Intertidal flats also provide habitat for a large and diverse community of infauna and epifauna, which in turn may become prey for transient fish species utilizing the intertidal flat. A wide variety of important fishes and invertebrates utilize these unvegetated flats as nurseries including the commercially important paralichthid flounders, many members of the drum family including red drum, spotted seatrout, the mullets, gray snapper, the blue crab, and penaeid shrimps (Peterson and Peterson 1979).

3.2.3 Estuarine Water Column

This habitat traditionally comprises four salinity categories: oligohaline (less than eight parts per thousand); mesohaline (eight to 18 parts per thousand); polyhaline waters (18 to 30 parts per thousand), and euhaline water (>30 parts per thousand) around inlets. Saline environments have moving boundaries, but are generally maintained by sea water transported through inlets by tide and wind mixing with fresh water supplied by land runoff. Particulate materials settle from these mixing waters and accumulate as bottom sediments. Coarser-grained sediments, saline waters, and migrating organisms are introduced from the ocean, while finer grained sediments, nutrients, organic matter, and fresh water are input from rivers and tidal creeks. The sea water component stabilizes the system, with its abundant supply of inorganic chemicals and its relatively conservative temperatures.

The aquatic organisms that flourish in estuaries rely on flow and water movement to: (1) deliver the nutrients and physical water conditions for appropriate food and nursery area development at the opportune time; (2) keep eggs and larvae of pelagic spawners in suspension to enhance survival; (3) transport and distribute eggs, larvae, and juveniles to the appropriate nursery area for optimum food availability and protection from predators; and (4) distribute sediment and affect structures that serve as habitats (i.e., shell bottom, soft bottom) for many fish species. Many fish and shellfish species occupy the estuarine water column at some point in their life cycle. Meroplankton (organisms that spend only part of their life cycle in the plankton), in particular, rely on the corridor function of the water column to transport them to favorable nursery areas.

3.2.4 Soft Bottom/Subtidal

Soft bottom habitat is unconsolidated, unvegetated sediment that occurs in freshwater, estuarine, and marine systems. Soft bottom habitat can be characterized by its geomorphology (the shape and size of the system), sediment type, water depth, hydrography (riverine, intertidal, or subtidal), and/or salinity regime (SAFMC Habitat Plan 1998). The physical and chemical composition of all soft bottom is determined by the underlying geology, basin morphology, and associated physical processes (Riggs et al. 1996). It is important to understand the physical and chemical properties of soft bottom habitat since these affect the benthic organisms that inhabit these areas and, in turn, their value as fish habitat.

Soft bottom habitats are used to some extent by most coastal fishes, especially for planktivores, like the anchovy and menhaden, who feed on benthic microalgae and organisms suspended in the water column by wave action. Many rays, drums, sturgeon, flounder, and crabs forage in soft bottom sediments for invertebrates. Smaller sharks, drums, and sea trout prey on the smaller fish and larger invertebrates in estuarine soft bottom habitat. Additionally, these environments along with intertidal mudflats, provide essential refuge from predators for young and juvenile fishes at low tide when these areas are still submerged, but too shallow for larger predators. The species associated with soft bottom subtidal habitats provide a spectrum of ecosystem services, most widespread are the nutrient cyclers. Polychaete worms, for example, are the most abundant invertebrate in subtidal environments in terms of species and overall abundance, and are constantly exposed to the nutrients and/or other materials present in the sediments. These epibenthic filter feeders maximize their exposure to these materials within the water column as they not only process a large amount of water during feeding, but being an interstitial species, they are in intimate contact with these sediments for their entire lives. These worms are a crucial part of many predators' diets, and act as a nutrient cycler or transfer to other trophic levels. For these reasons, polychaetes have long been an obvious choice to act as representative species in the analysis of the health of benthic communities (Dean 2008).

3.2.5 Estuarine Scrub/Shrub

The class of scrub/shrub wetland includes areas dominated by woody vegetation less than 6 meters (20 feet) tall, and include true shrubs, young trees, and trees and shrubs that are small or stunted because of environmental conditions. Scrub and shrub wetland fall under all water regimes except those subtidal. These wetlands may represent a successional stage leading to a palustrine forested wetland, or they may be relatively stable communities as standalone scrub/shrub habitat.

The physical environment of the habitat affects the types and distribution of plants occurring in each community type. Salinity and tidal regime are the two most important environmental factors influencing plant compositions and distribution in these estuarine communities (SCDNR 2015). At the less saline end of the estuarine zone (salinity around 0.5 parts per thousand), a mixture of freshwater and brackish plant species is common in the low and high marsh zones. As salinity rises to 10 parts per thousand in the lower marsh zone, species diversity decreases and is typically dominated by smooth cordgrass, which becomes an important component of the salt marsh. This middle area near the marsh-upland border typically is characterized by a canopy of herbaceous shrubs and a mixture of brackish and salt flat species such as: groundsel tree, sea myrtle, marsh elder, sea oxeye, salt grass, glasswort, and sea lavender (SCDNR 2015).

3.2.6 Tidal Creeks

Small tidal creeks begin in upland areas and drain into progressively larger creeks, forming an interconnecting network. These tidal creeks increase in size until they join a tidal river, sound, bay, or harbor, eventually reaching the ocean. Tidal creeks provide critical nursery areas for many species of fish and invertebrates with ample amounts of food and protection, making them ideal nursery grounds (SCDNR 2012). Many Council- and NMFS-managed species including shrimp and snapper-grouper species have cyclic life cycles, where they enter the tidal creeks during their post-larval or young juvenile stage, mature for several months during a maturation season, and then move to progressively deeper water. When the high tide floods the beds of the marsh and tidal creeks, these animals have access to nutrient-rich marsh mud, while the dense growth of cord grass restricts entry of large predators (SCDNR 2012). On the outgoing tide, larger predators such as drums or seatrout wait at the mouths of the creeks feeding on the smaller organisms flushed out of the tidal creeks, providing a valuable food source to Council- and NMFS-managed species.

3.2.7 Marine Water Column

Specific habitats in the water column can best be defined in terms of gradients and discontinuities in temperature, salinity, density, nutrients, etc. These structural components of the water column environment are not static, but change both in time and space. Therefore, there are numerous potentially distinct water column habitats for a broad array of species and life-stages. The water column serves as habitat for many marine fish and shellfish. Most marine fish and shellfish broadcast spawn pelagic eggs and thus, most species utilize the water column during some portion of their early life history (e.g., egg, larvae, and juvenile stages). White and brown shrimp, for example, spawn offshore, and shrimp larvae remain in coastal waters until they immigrate into low salinity tidal creeks using tidal currents. The marine water column is also home to a variety of adult fishes, specifically from the snapper-grouper complex, highly migratory species, and coastal migratory pelagics. These fishes utilize the marine water column for a majority of their adult lives. Many snapper and grouper species form spawning aggregations (i.e., gag grouper) along live/hard bottom areas and within the marine water column. The larvae of many snapper-grouper species remain in the water column for up to 60 days before they are transported into inshore nursery areas via tidal and wind driven currents.

3.2.8 Offshore Marine Habitats: Spawning Grounds

Essential fish habitat is identified as necessary to fish for spawning, feeding, or growth to maturity, hence their importance in ensuring viability of fish populations. These habitats can be characterized by the physical, chemical, and biological properties of their waters and substrata. Penaeid shrimp and snapper-grouper fishes produce large numbers of small-sized pelagic eggs, which also become pelagic planktonic larvae. The distribution of spawning adults, i.e., mature adults with ripe gonads, provides a direct indication of spawning grounds. The distribution of fish/shrimp eggs and larvae in the water column can be a powerful indicator of offshore spawning grounds. Penaeid shrimp, specifically brown and white shrimp, spawn in offshore coastal waters over muddy bottom; eggs typically hatch within 24 to 48 hours, and larvae go through their initial larvae stages at these spawning grounds. Once they reach their post-larvae stage, approximately 15 to 20 days after hatching, the young shrimp will immigrate inshore to estuarine nursery habitats. The value of offshore marine spawning grounds is measured by the high density of eggs and post-larvae produced in these habitats, which will contribute to the recruitment of the adult population. Similarly, adult snapper-grouper species also spawn offshore along the outer continental shelf, typically along reefs and hard-bottom. Some snapper-grouper species, such as gag grouper, form spawning aggregations in deep water over rocky bottom, wrecks, and structured habitats; the fertilized eggs typically hatch at or around these spawning locations in less than 72 hours. The larvae stages of most Council- and NMFS-managed snapper-grouper fishes remain pelagic over these offshore reefs or offshore spawning grounds, and are eventually transported by the Gulf Stream as well as tidal and wind driven currents to salt marsh nursery locations where they will grow to maturity and eventually emigrate back offshore to mature and spawn.

3.2.9 Habitat Areas of Particular Concern (HAPC)

Habitat Areas of Particular Concern (HAPC) are a subset of EFH considered rare (rarity), particularly ecologically important, susceptible to anthropogenic degradation, or located in environmentally challenged or stressed areas. HAPCs may include areas used for migration, reproduction, and development, which can include intertidal, estuarine, and marine habitats. The MSA does not provide any additional regulatory protection to HAPCs; however, if HAPCs are potentially adversely affected, additional inquiries and conservation guidance may be provided (NMFS 2008).

a. Coastal Inlets

Coastal inlets include the throat of the inlet as well as shoal complexes associated with the inlets. Shoals formed by waters moving landward through the inlet are referred to as flood tidal shoals, and shoals formed by waters moving water ward through the inlet are referred to as ebb tidal shoals. Coastal inlets meet the criteria for HAPC for penaeid shrimp, species in the snapper-grouper management unit, coastal migratory pelagics, as well as highly migratory species.

b. Oyster Reefs/Shell Bars

Oyster reefs and shell banks provide extremely unique benthic habitats with both intertidal and subtidal populations in the tidal creeks and estuaries of the South Atlantic (SAFMC Habitat Plan 1998). Not only does the larger reef or bank structure provide habitat for fish and invertebrates, but the interstitial spaces among the shell also provide microhabitats for smaller species. Oyster reefs and shell bars provide refuge, benthic-pelagic coupling, and erosion reduction. This ecosystem service largely results from the increase in structural complexity in shellfish habitat compared to surrounding areas (particularly soft sediments); areas typically associated with high structural complexity are characterized as "nursery areas", which refer to places where both juvenile invertebrate and fishes are protected from predators. These areas are critically important for juvenile Penaeid shrimp and juvenile snapper-grouper fishes in the South Atlantic region. Shell bottom protects oyster spat and other juvenile bivalves, finfish and crustaceans from predators, as well as wave action, tide swings, and storm surges.

The three major types of shellfish habitat (reefs, aggregations, and accumulations) differ in their combinations of habitat characteristics. However, all shellfish habitats have three major features in common that are the basis for their ecological value for managed species and as a critical fisheries habitat: hard substrate (for settlement/refuge/prey), complex vertical structure (for settlement/refuge/prey), and food (feeding sites for larger predators). While oyster reefs are the most recognized shell bottom habitat, shell hash concentrations on tidal creek bottoms provide important nursery habitat for young fish. For example, the preferred habitat of juvenile drum species in South Carolina is high marsh areas with shell hash and mud bottoms. Perhaps the most fundamental characteristic of shellfish habitat is hard substrate. The shells provide attachment surfaces for algae and sessile invertebrates, such as polychaetes (e.g., sabellids, serpulids), hydroids, bryozoans, and sponges, which in turn provide substrate for other organisms. All three types of shellfish habitats (i.e., reefs, aggregations, and accumulations) provide suitable substrate for other shellfish and many other species that require hard substrate on which to grow.

4. Adverse Impacts to Essential Fish Habitat Due to Navigation Activities

This section addresses potential adverse impacts to EFH and federally managed species occurring in the project area resulting from Charleston District navigation project activities, focusing on hydraulic cutter head suction and hopper dredges, which are the main dredge operations associated with the proposed actions covered by this Programmatic EFH Consultation (see Section 2). The physical impact of dredging is partly dependent on the method of dredging, the amount and grade of deposits, and overspill from the hopper. The dominant impacts of dredging are habitat loss and alteration, along with the physical removal of substratum and the organisms that utilize that substrate. This section will also focus on the environmental implications, stressors, and responses exhibited by fishes due to navigation actions.

4.1 Purpose and Overview

Navigation projects rely heavily on dredging, typically aimed at maintaining or increasing the depth of navigation channels, anchorages, or berthing areas to ensure smooth and safe passage of vessels. Descriptions of dredging and fill related activities and proposed actions covered under this Programmatic EFH Consultation are provided in Section 2.

4.2 Adverse Impacts to EFH and Federally Managed Species

Charleston District navigation activities that may adversely impact EFH include the excavation and maintenance of channels, the transportation of dredged material to disposal facilities, and the placement of dredged material. Potentially harmful activities associated with dredging vessel operations include, but are not limited to: discharge or spillage of fuel, oil, grease, paints, solvents, trash, and dredged material; grounding/sinking/prop scaring in ecologically and environmentally sensitive locations; exacerbation of shoreline erosion due to wakes.

Stressors caused by dredging and material placement include:	**The stressors associated with dredging vessel operations include:**
1. Suspended Sediments and Turbidity	1. Discharge of pollutants
2. Sedimentation	2. Grounding, Sinking, or Prop Scaring
3. Dissolved Oxygen Reduction	3. Shoreline Erosion
4. Decreased Water Quality / Contaminants	
5. Impingement and Entrainment	
6. Channel Blockage	
7. Noise Pollution	
8. Changes in Salinity	
9. Habitat Removal and Degradation	
10. Habitat Conversion	

4.3 Adverse Impacts

The following sections describe environmental impacts commonly associated with dredge activities, as well as general impacts to federally managed species, their prey, and EFH.

4.3.1 Suspended Sediments and Turbidity

Suspended sediments occur when settled bottom sediments become suspended and mixed into the water column after a disturbance or motion of the water. Suspended matter can include sediments (clay and silt) and organic matter (plankton and other microscopic organisms). Suspended matter consequently interferes with the passage of light through the water and increases turbidity, the degree to which water loses its transparency. Suspended sediments occur naturally in muddy-bottom areas by storms, freshets, or tidal flows (Wilber and Clarke 2001); however, dredging-related activities usually result in prolonged exposure to suspended sediments over a large area.

Typically, elevated particles and turbid water tend to be localized in the immediate vicinity of the cutter head and decrease with increasing distance from the dredge site. The cutter head dredge produces the least amount of suspended sediments, which usually occur along the bottom portion of the water column, while hopper dredges (without overflow) produce more suspended particles near surface waters. Studies have indicated elevated sediment levels up to 1,100 feet from a dredge excavation site (Blair et al. 1990), but concentrations immediately decreased to 10 parts per million within one hour (Neff 1985). Suspended sediments have also been associated with decreased dissolved oxygen levels and impacts to water quality which also put fish at greater risk for being adversely impacted (see Sections 4.3.3 and 4.3.4).

Many coastal and estuarine-dependent species produce pelagic, free-floating eggs, while some anadromous fishes produce demersal eggs. Demersal eggs are more likely to come into contact with suspended sediments within the water column, where they can become subject to burial by accumulated deposited sediments and/or entrainment by suction dredges. Cairns (1968) documented direct effects to fish larvae and eggs by suspended sediments, which include: the abrasion of egg and larval surficial membranes (gills or the epidermis); reduced light availability; resuspension and absorption of contaminants reintroduced into the water column; interference with feeding; and delayed larvae development. As South Carolina estuaries serve as nursery grounds for larval and juvenile stages of fishes, dredging activities occurring during documented spawning times and during periods of ingress or egress would be more likely to cause adverse impacts. Suspended sediments have been documented to affect the hatch successfulness of eggs, percent survival of larvae post-exposure, and increase the time between fertilization and hatching. The eggs and larvae of non-salmonid estuarine fishes exhibit some of the most sensitive responses to suspended sediment exposures of all the taxa and life history stages (Wilber and Clarke 2001). Suspended sediments, especially when fine-grained, decrease the quality and quantity of incident light levels, resulting in a decline in photosynthetic productivity. The increased turbidity reduces visual acuity in fishes, which leads to an array of behavioral, physiological, reproductive, and feeding changes (Wenger et al. 2016). Foraging patterns and success are commonly studied behavioral responses of estuarine fishes to suspended sediments and turbidity; if persistent, decreased feeding success in juveniles may hinder survival, recruitment, year-class strength, and overall physical condition. For adult fishes, the most commonly observed behaviors to elevated levels of suspended sediments are avoidance, changes in foraging patterns, and success rate (Wenger et al. 2016).

4.3.2 Sedimentation

The physical removal of substratum and associated biota, resuspension into the water column, and animal burial due to the subsequent deposition (i.e., sedimentation) of material are the most direct effects of dredging projects. Recent studies suggest the initial sedimentation of material released during the outwash stage of dredging does not actually disperse; rather, it behaves more like a density current where the sediment particles are held together during the initial phase of sedimentation. This in turn effects the immediate area a few hundred meters around the dredge operation rather than dispersing and settling further distances from the dredge site (Newell et al. 1998). Sedimentation can pose major impacts to areas with sedentary species, such as oysters, where small amounts of silt may be enough to cause high rates of mortality. Heavy sedimentation on oyster reefs can cause direct oyster mortality, loss of foraging habitat, loss of shelter functions for other reef fishes and crustaceans when sediments fill the interstitial spaces between oyster shells (Wilber and Clarke 2001). Some documented examples of lethal and sublethal effects of sedimentation on fishes and associated EFH include: decreased feeding ability; decreased growth rates; avoidance and displacement; prolonged egg development and survival;, as well as decreased primary and secondary productivity (Kjelland et al. 2015).

Sedimentation has also been shown to inhibit foraging ability in benthic-feeding fishes (Bellwood and Fulton 2008). Lowe et al. (2015) investigated the impacts of increased sedimentation and subsequent turbidity on juvenile snapper in a shallow estuary, and demonstrated that foraging success had a significant decline following short-term turbidity pulses. Chronic exposure (30 days) to levels resembling that of storm conditions can cause acute effects on fish growth and health, including significant weight loss, increased mortality, presence of gill lesions, and hypoxic behaviors (gulping at surface, lethargy, and increased ventilation). Lowe et al. (2015) found a higher occurrence of gill lesions and fish mortality in estuaries characterized by increasing sedimentation, lower water clarities, frequent levels of disturbance, and increasing urbanization. The most visible turbidity plumes observed by Goodwin and Michaelis (1984) were produced by the discharge of material with high sand content into unconfined placement areas during times of strong tidal currents. The least visible turbidity plumes were produced by the discharge of material with high silt and clay content into areas enclosed by floating turbidity barriers during times of weak tidal currents. Beach nourishment from hopper dredge unloading operations also produced plumes of low visibility (Goodwin and Michaelis 1984). Primary plumes were observed to be directly produced by dredging and placement operations, while secondary plumes were produced indirectly by resuspension of previously deposited material; but if the fill material is compatible with native material, nearshore communities should not be adversely affected by raised turbidity levels. Because the ecological impacts of sedimentation and turbidity on oyster reefs and benthic-feeding fishes and snappers can be severe in South Carolina estuaries, dredging-induced sedimentation and turbidity should be minimized, as practicable.

4.3.3 Dissolved Oxygen Reduction

Dredging induced reductions of the concentration of dissolved oxygen (DO), or hypoxia, is a direct consequence of the suspension of anoxic sediments around a dredge site, resulting in the creation of both chemical and biological oxygen demands. DO is a function of the: (1) sediments suspended into the water column (Lunz and LaSalle 1986); (2) the oxygen demand of the sediment; and (3) the duration of the resuspension (Wilber and Clarke 2001). Sediments found along South Carolina estuaries and the AIWW are dominated by silts and clays, which are anoxic below the upper few centimeters (Stickney and Perlmutter 1975). DO in the AIWW is lowest typically during the summer months. Resuspension of anoxic sediments into the water column should be minimized, especially during the summer months.

4.3.4 Decreased Water Quality/Contaminants

The release of naturally occurring particles such as nutrients, sulfides, and iron, as well as industrial related particles (i.e., metals, organohalogens, and pesticides) by the suspension of sediments during a dredge event does occur. Contaminants entering aquatic systems from agricultural, industrial, and municipal activities typically accumulate in bottom sediments (Winger et al. 2000). Most metals and other compounds are generally not readily available in a soluble form within the water column, but can be associated with organic matter and clays

(Windom 1972, 1976). Contaminants entering aquatic systems bind to the suspended particulate matter and these become incorporated into the sediments (Winger et al. 2000). Contaminated sediments containing harmful metals or other compounds have a greater impact on fish health than suspended sediments alone, since the disturbance of these sediments through dredging has the potential to increase bioavailability. These contaminants also pose a risk to wildlife inhabiting disposal areas upon transferring the sediments, and have the ability to enter multiple levels within the food chain (top-level consumers, primary consumers, producers, and decomposers).

Assessing the level of contamination in sediments is a key step in determining its suitability for beneficial uses. In general, the more contaminated the material, the greater the constraints on reuse. Highly contaminated material is not suitable for reuse unless its potential risk for biomagnification is low. Proper assessment of sediment contamination for dredging activities is critical to minimizing potential adverse impacts. A full characterization of sediment contamination should be conducted to assess any potential exposure and impacts to fishes and habitats.

4.3.5 Impingement and Entrainment

Hydraulic entrainment is the direct uptake/removal of aquatic organisms by the suction field generated at the drag head or cutter head (Reine et al. 1998). Both demersal and pelagic fish eggs, larvae, and small juveniles are highly susceptible to entrainment by suction dredges due to their inability to escape the suction area around the intake pipe (McNair and Banks 1986). They may be picked up directly with the sediment being drawn in or in the vicinity of the surrounding water column near the suction field. Depending on species and time of year, free-floating eggs and young juveniles migrate in and out of inshore waters at various depths within the water column, becoming more or less prone to entrainment. If dredge operations occur during migration periods and/or work is confined to narrow-channel habitats, the potential for entrainment may increase, especially for bottom dwelling fishes, larval oysters, and post-larval white and brown shrimp (Van Dolah et al. 1984). Several studies have indicated that eggs are more vulnerable to entrainment than adults, experiencing damage and mortality more than double that of adults (Wenger et al. 2016). Even though the volume of water entrained by dredges is small in comparison to other sources, if a dredge is in close vicinity to spawning or nursery locations, entrainment rates of eggs and larval fish could be detrimental. The entrainment rates of eggs and larval due to dredging represent a small proportion of the total larval production, but when eggs and larvae are sucked up by hydraulic dredges, they experience a high mortality rate in comparison to other life stages (Harvey and Lisle 1998).

4.3.6 Channel Blockage

This refers to the physical presence of the dredging equipment and sediment disposal pipelines. Channel blockage is suspected to have a minimal effect on the distribution and movement of juvenile and adult organisms. While placement of equipment has little effect on smaller, coastal fishes, it is particularly important to anadromous fishes. The time of year, i.e., environmental windows, should be considered for these animals with regards to channel blockage, as practicable.

4.3.7 Noise Pollution

Dredging projects do not produce intense sounds compared to that of pile-driving or other in-water construction, but rather lower levels of continuous sound at frequencies generally below one kHz. When dredging involves the demolition of rock, the sound generated is louder compared to the soft sediment dredging typically done. Based on the existing literature, underwater noise can affect fish in a number of ways, including behavioral responses, masking, physiological stress, hearing loss or damage, impairment of lateral line functions, and particle motion-based effects on eggs and larvae (Popper et al. 2014; Wenger et al. 2016). Evidence suggests fish possessing a swim bladder may be more affected by dredge noises than fish without a swim bladder (Popper et al. 2014). Fishes that have a swim bladder used for hearing are more likely affected by the continuous noise produced by dredge operations, compared to those without a swim bladder. Fish possessing a swim bladder do show some temporary hearing loss and behavioral effects such as avoidance and site aversion (Popper et al. 2014). Although dredging may not produce sound levels that can be lethal to fish, dredging noises may mask natural sounds used by fish to locate prey or suitable habitat, thus effecting foraging ability, spawning aggregations, or optimal habitat utilization.

4.3.8 Changes in Salinity

When a channel is dredged, the increased depth can result in higher salinity farther upriver, a type of habitat conversion (see section 4.3.10). The intrusion of salt water further into the estuary or in the river system could impact fish assemblages. Higher salinities tend to occur once a channel is dredged, and thus become less desirable or suitable for species that have a lower salinity tolerance or preference. This can lead to shifts in fish communities, abundance in a small area, increased competition, and could result in negative shifts within food-web dynamics (Güt and Curran 2017). However, given the scope of the activities considered herein, change in salinity is not considered a major threat for the activities covered by the Programmatic EFH Consultation.

4.3.9 Habitat Removal and Degradation

In the AIWW, the frequency of maintenance dredging is not expected to be significantly different than what has occurred in past maintenance events. Stickney and Perlmutter (1975) documented rapid community recovery of benthic organisms post dredging, as well as no to very little change in sediment composition between dredging events in the AIWW. The existing navigation channel side-slopes are not expected to change with any maintenance dredging event and, therefore, shellfish harvest areas adjacent to the channel should not be impacted. These shellfish areas are important essential fish habitats and nursery areas, especially for juvenile gray snapper and gag grouper. Maintenance dredging along the AIWW has been shown to completely displace infauna communities, but both species diversity and composition returned to their pre-dredging levels within a month of post-dredge operations (Stickney and Perlmutter 1974). Given the highly variable nature of most estuarine and marine benthic assemblages on the southeastern coast of the U.S., disturbances by maintenance dredging and placement activities usually represent relatively minor and short-lived impacts, consistent with the ecological disturbance theory.

4.3.10 Habitat Conversion

Habitat conversion is a form of habitat destruction, characterized by the conversion of one naturally functioning aquatic system at the expense of creating another. Habitat conversion typically occurs with the conversion of: shallow subtidal to deeper subtidal habitats; intertidal to subtidal or upland habitats; and salt marsh or oyster beds to mud flats. These habitat conversions can cause a ripple of changes to estuarine circulation, salinity, sediments, and can directly influence the distribution of estuarine and nearshore marine biota. New dredging work poses the risk of converting intertidal habitats to subtidal habitats, while maintenance dredging poses the risk of converting shallow subtidal habitats to deeper subtidal habitats (SAFMC Habitat Plan 1998). Additionally, beach placement and similar beneficial reuse projects pose the risk of converting historical subtidal beach into intertidal beach if too much sand is deposited along the beach at once or in a manner that disrupts the beach slope. The ecological characteristics of the beach fauna and flora are very much determined by morphodynamic beach characteristics such as grain size and beach slope; very similar to the construction of hard structures to manage beach erosion (i.e., rock jetties), beach placement puts a severe pressure on the biota living on, in, and around these sandy beaches (Eede 2013). Past the initial disturbance of beach placement, benthic and infaunal communities can be further disrupted and altered if the beach face is converted into intertidal or even subtidal habitats.

Upland placement methods have the potential to convert salt marsh or oyster bottom to mud flats if sediments are not disposed of in a confined manner. Intertidal conversions pose the risk of impacting plant and animal assemblages unique to tidal regimes, substrate, light, and exposure (i.e., air and water exposure). The loss of intertidal habitat, which provides essential refugia and nursery functions for most managed fishes, represents potential reductions in coastal habitat carrying-capacity and connectivity (Peterson et al. 2003). The deepening of shallow sub-tidal habitat can cause multiple losses to habitat integrity including: reduction in photosynthetic ability within the water column; reductions in primary and secondary productivity; increase the likelihood of benthic hypoxia; and alterations to localized benthic-pelagic coupling which effects both federally and state managed species. Particular care should be given to the design and implementation of beneficial reuse projects to ensure that habitat conversions are avoided in order to minimize adverse impacts.

4.3.11 Discharge of Pollutants

Every year, diesel, petrol, oil, and other toxic chemicals are accidentally discharged into marine waters during vessel operations. Major oil spills can occur when vessels collide, run aground, or occur when oil cargoes are transferred. Oils discharged into the marine area can have serious implications on: megafauna; fishes; micro-organisms that break down these oils; estuarine dwelling organisms; as well as the contamination of shellfish beds. The accidental release of oil into seawater introduces PAHs, which are typically sequestered in bottom sediments. Once bottom sediments are disturbed, the petroleum components (usually PAHs) are reintroduced into the water column, becoming available for consumption or come into contact with a variety of organisms. The discharge of these and other pollutants has been linked with dysfunctions in reproductive success, endocrine disruption, post larval growth, and embryonic development of fish (Collier et al. 2013).

4.3.12 Grounding, Sinking, or Prop Scaring

Ship grounding is the impact of a ship on the seabed, usually a result of accidental "running aground," where the depth of the ship passage is not sufficient to completely submerge the ship's hull. Grounding can also result from vision impairment, current and tide swings, waves, wind, and speed of the vessel. Other forms of vessel to seabed interaction including boat sinking and prop scaring. Sinking occurs when the majority of a ship's hull is submerged or the vessel capsizes. Prop scaring is the result of vessels traveling in areas too shallow for the vessel operation, and the propellers leave permanent scars on the seabed floor. In areas where habitats are susceptible to disturbances, ship to substrate interaction can lead to a reduction in habitat productivity, reduction in the number of organisms in that locality, habitat destruction, and direct organism mortality (IMO 2018).

4.3.13 Shoreline Erosion

Vessels moving at fast speeds through coastal passages can create a large wake, which in turn can impact the estuarine environment. Shoreline erosion is particularly associated with large vessels or fast ferries, which are much faster than conventional vessels (e.g., dredging vessels). Faster speeds produce a longer-period wake, which disturbs the seabed at greater depths than conventional shipping. Ship wakes can become the major source of energy in coastal systems where the level of background energy is low and pose a greater risk to shoreline erosion. This is the case for enclosed basins such as estuaries, coastal lagoons, embayments, and intracoastal waterways. This can result in changes to the coastline habitat and the composition of the communities that live there by altering the shape of the shoreline, resulting in accelerated coastal erosion. Coastal erosion can lead to a range of detrimental effects including economic impacts due to property destruction, habitat destruction and degradation, and ecological impacts resulting from loss in biodiversity (associated with habitat removal and degradation 4.3.9 and habitat conversion 4.3.10).

5. Programmatic EFH Consultation Conservation Recommendations for Navigation Activities

This Programmatic EFH Consultation is for the Charleston District's navigation projects and minor new work associated with navigation projects and activities. During the formulation of the programmatic consultation process, the Charleston District coordinated the activity categories with NMFS. In addition, the Charleston District requested NMFS to provide conservation recommendations that would help conserve EFH by avoiding and minimizing adverse effects to EFH. The Charleston District has generally accepted these conservation recommendations described here in Section 5 of this Programmatic EFH Consultation, but will still undertake project-specific review in accordance with Appendix B. To comply with this Programmatic EFH Consultation, the Charleston District will implement all applicable conservation recommendations described within the category that contains that activity, unless otherwise documented in accordance with Appendix B. In addition to these conservation recommendations, the Charleston District may propose additional measures that would result in reduced adverse effects to EFH, but may not substitute new measures for the conservation recommendations linked to each activity as described in this Programmatic EFH Consultation unless otherwise documented in accordance with Appendix B. If NMFS notifies the Charleston District (in accordance with Appendix B) that NMFS' Southeast Regional Office, Habitat Conservation Division (SERO HCD) does not concur with the Charleston District's determination that the project is consistent with the Programmatic EFH Consultation, the Charleston District will conduct additional coordination with SERO HCD and a separate individual EFH consultation may be required.

Conservation recommendations, such as Best Management Practices (BMPs), will address all reasonably foreseeable adverse impacts on EFH by similar individual actions occurring within a given geographic area. Therefore, this section lists BMPs focusing on avoidance and minimization strategies to avoid adverse impacts to EFH most applicable to navigation activities and does not include BMPs that would be applicable only to new dredging projects. The BMPs provided below are commonly recommended for navigation activities and can be traced back to Non-Fishing Impacts to EFH and Recommended Conservation Measures Guide (NOAA Fisheries 2003), the National Park Service Beach Nourishment Guidance (Dalles et. al 2012), and the SAFMC beach dredging and renourishment policy (2015; can be found at http://safmc.net/).

5.1. Time of Year Recommendations

Time of Year (TOY) restrictions are recommendations providing the optimal time periods for federal projects to perform dredge and disposal activities. These TOY recommendations are a type of environmental time window routinely recommended by resource agencies to further protect sensitive biological resources, habitats, and organisms from potentially detrimental effects of dredging and disposal operations. Annually, around 80 percent of all USACE civil works navigation projects implement environmental windows, including the Charleston District (Reine et al. 1998). TOY recommendations can be categorized on the likelihood of effects to fish and other species based on entrainment, turbidity, sedimentation, physical disturbance, dissolved oxygen, and migration patterns, as well as effects to: oysters, shellfish, crab, lobster, shrimp, and submerged aquatic vegetation, Potential detrimental impacts to federally managed species and anadromous fishes are the common reasons for a District to consider TOY recommendations. TOY recommendations for South Carolina are provided in Table 2 using current literature and available fisheries independent data from SCDNR and GADNR, as well as additional information provided by the National Centers for Coastal Ocean Science (NCCOS) (Wickliffe et al. 2019). The TOY recommendations were designed to reflect major ingress and egress times, as well as vulnerable life stages of managed species present in EFH. Seasonal conservation measures for fisheries during coastal development activities in the Carolinas and surrounding areas are available through NCCOS (Wickliffe et al. 2019).

All Charleston District navigation activities should be timed and located in ways that avoid and minimize potential adverse impacts to NOAA-trust resources, as practicable (Table 2). The TOY recommendations for discouraging navigation dredging of coastal inlets and AIWW and sediment transport is from March through October, and encouraging navigation actions to occur during November through February. Due to the large amount of ingressing larval stages in March through May, the NMFS recommends avoiding dredging and related navigation actions in coastal inlets and the AIWW, as practicable, especially in areas with marine emergent wetlands (i.e., intertidal marshes) to avoid larval entrainment. Ideally, but only as practicable, navigation actions would be restricted through the summer to allow for the growth of larvae and juvenile life stages until October 15, when the majority of animals reach maturity and egress out of the estuary to offshore waters. To the maximum extent practicable, activities should be conducted when species are not present in the project area, or are present in low densities. For this reason, the NMFS recommends conducting in-water work from October 15 until March 15 as practicable, if located in areas where managed species persist; however, the time between March 15 and April 15 can be used to conduct navigation activities when the TOY cannot be accommodated. Ideally, and as practicable, navigation work should occur before April 15 to allow recovery of the benthos used by susceptible life stages throughout the spring and summer, ahead of the fall egress.

Table 2. Time of Year recommendations for navigation activities. Using the current literature, the NCCOS Tech Memo, and SCDNR and GADNR Fisheries Independent Data, ingress and egress times, as well as fish presence for each of the following managed species present in inlets and estuarine EFH located with navigation activities were estimated by life stage. Neonatal and juvenile Bull shark presence is pulled from Streich and Peterson (2011). Life stages are designated with the following abbreviations in order: E – egg; L – larvae; P –post larvae; N – neonate; J – juvenile; S – sub-adult; A – adult. Young of year (YOY) indicate young juveniles less than a year old.

Species	Month											
	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
White Shrimp	J	J	L, P	L,P	P	P, J	J	J	J	J	J	J
Brown Shrimp		L,P	L,P	P	P	J	J	J				
Gag Grouper			P	P	P, J	P, J	J	J	J	J		
Gray Snapper									L, P	P, J	P, J	P, J
Black Sea Bass			P	P	P	P, J	P, J	P, J	J	J		
Spanish Mackerel						L, P, A	P, J	P, J	P, J	J, A		
Summer Flounder	L	L, J	J,A	J,A	J,A	J,A	J,A	J,A	J,A	L,J, A	L, J	L, J
Bull shark	A	A	A	A	N,J,S, A	N,J,S, A	N, J, S, A	N,J,S, A	YOY, J,S, A	YOY, J, S	A	A
Sandbar Shark						N, J, A	N, J	N, J	N, J	J		
Scalloped Hammerhead					N, J, A	N, J, A	N, J, A	YOY, J	YOY, J	YOY, J	YO Y, J	
Lemon Shark					N, J, S, A	N, J, S, A	YO Y, J, S, A	YOY, J, S, A	YOY, J, S, A	YOY, J, S, A		
Location												
Coastal Ocean/Inlets*												
AIWW												

*-timed to allow recovery of benthos ahead of fall egress

Legend			
Species Occurrence		Time of Year Recommendations	
Ingress		Preferred Time for In-Water Work	
Present		Consider avoiding In-Water when practicable	
Egress		Avoid In-Water Work when practicable	

5.2. Dredging

5.2.1. Potential Adverse Impacts

The environmental effects of dredging in or adjacent to designated EFH areas can include: (1) direct removal and burial of organisms; (2) turbidity and siltation effects, including light attenuation; (3) contaminant release and uptake including nutrients, metals, and organics; (4) suspended sediments; (5) sedimentation; (6) alteration to hydrodynamic regimes and physical habitat; and (7) habitat degradation and/or conversion.

5.2.2. Recommended Best Management Practices

1. Avoid new dredging to the maximum extent practicable.
2. If minor new work is deemed necessary as part of navigation activities, then dredging area and volume should be reduced to the maximum extent practicable that will still accomplish the stated project purpose; areas that are within the project area, but are deeper than the target dredge depth should be avoided.
3. Incorporate adequate control measures to minimize turbidity plumes. Hydraulic dredging techniques should be the preferred method in areas with fine sediments to reduce turbidity plumes.
4. Equipment to avoid and minimize impacts to species should be used during dredging activities. These include, but are not limited to, sea turtle deflector dragheads and floating pipelines. Inflow screening baskets should be installed to monitor the intake and overflow of the dredge.
5. Avoid placing dredging pipelines and accessory equipment close to oyster aggregations, estuarine/salt marshes, and other high value habitat areas.
6. Implement time-of-year recommendation (i.e., environmental windows), as practicable, to further avoid impacts to habitat during species critical life history stages. Perform dredging during the time frame when impacts due to entrainment of federally managed species or their prey are least likely to be entrained, as practicable. Dredging should be avoided in areas with oyster aggregations.
7. For maintenance dredging, sources of erosion in tidally influenced areas should be identified that may be contributing to excessive siltation and sedimentation and the need for maintenance dredging. Techniques or programs should be implemented that reduce erosion and sedimentation.

For unavoidable adverse impacts to EFH, the Charleston District will consider measures to minimize, mitigate, or offset such effects of the activity on EFH, as appropriate.

5.3. Placement of Dredged Material

5.3.1. Potential Adverse Impacts

The placement of dredged material can adversely affect EFH by: (1) impacting or destroying benthic communities; (2) habitat removal and degradation; (3) creating turbidity plumes; (4) introducing contaminants and/or nutrients; and (5) burial of organisms.

5.3.2. Recommended Best Management Practices

1. All available options for placement of dredged materials, including placement sites and methods used should be thoroughly investigated. Placement areas should be properly sited, managed, and monitored to avoid adverse impacts associated with dredge material placement.
2. Placement of dredge material in EFH should meet or exceed applicable state and/or federal water quality standards for such placement.
3. Direct and indirect impacts of open-water disposal of dredged material on EFH should be assessed during navigation project reviews. If necessary (e.g., the project occurs outside TOY recommendation), physical and biological monitoring programs to gauge whether actual results of open-water placement are within the predicted ranges should be conducted.
4. The areal extent of any placement site in EFH should be avoided or, if identified as a beneficial use, minimized.
5. Dredge placement sites should be appropriately considered, using the volumes of proposed dredged material prior to dredging so placement sites will adequately contain dredge material.
6. Beneficial uses of uncontaminated sediments should be considered whenever practicable; materials that contribute to habitat restoration and enhancement should be prioritized.
7. When practicable, placement of dredge material should be avoided outside the TOY recommendations (Section 5.1) when direct burial or sedimentation to EFH, federally managed species or their prey are most likely to be impacted.
8. Placement of material into undiked tracts, regardless if Geotubes or similar structures are used, should include Best Management Practices to minimize the likelihood of impacts occurring outside placement areas from the dredged material and from any dike construction.
9. Pipelines between the dredges and placement sites should pass through the least amount of EFH, as practicable, and avoid oyster beds.

For unavoidable adverse impacts to EFH, the Charleston District will consider measures to minimize, mitigate or offset such effects of the activity on EFH, as appropriate.

5.4. Dredging Vessel Operations and Transportation of Dredged Material

5.4.1. Potential Adverse Impacts

The routine operation and maintenance of navigable waterways introduces dredging vessels more frequently to the surrounding environment. The use of large dredge vessels increases the likelihood of encounters with the surrounding habitat and organisms, including dredging vessel groundings, modification of water circulation (breakwaters, channels, and fill), dredging vessel wake generation, pier lighting, anchor and prop scouring, and the discharge of contaminants and debris. Direct impacts include permanent or temporary loss of productive forage habitat resulting from minor channel realignment and maintenance dredging, turbidity-related impacts due to both dredging and placement of dredged material, and reduced water quality from resuspension of contaminated sediments. Dredging vessel discharges, engine operations, bottom paint sloughing, boat wash-downs, painting and other vessel maintenance activities can deliver debris, nutrients, and contaminants to waterways and may degrade water quality and contaminate sediments if gone unnoticed.

5.4.2. Recommended Best Management Practices

1. For unavoidable adverse impacts to EFH, compensatory mitigation may be required to replace the loss of wetland, stream, and/or other aquatic resource functions and area.
2. Include low-wake vessel technology, appropriate routes, and best management practices for wave attenuation structures as part of the design process. Dredging vessels should be operated at sufficiently low speeds to reduce wake energy, and no-wake zones should be designated near sensitive habitats.
3. The discharge of contaminated bilge water and sewage is illegal and strictly prohibited.
4. Prevent oil contamination of bilge water. Do not drain oil into the bilge. Use containment troughs underneath the engine to capture any drips or spills and oil absorbent pads, socks or pillows to soak up oil and fuel. Keep the bilge area of the dredging vessel as clean and dry as possible fixing all fuel and oil leaks as they occur. Inspect fuel lines and hoses for chaffing, wear, and general deterioration and secure and prevent hoses from chaffing. Clean bilge areas after engine maintenance.

5.5. Beneficial Use - Beach and Nearshore Placement

This section lists BMPs focusing on avoidance and minimization strategies to avoid adverse impacts to EFH most applicable to federal navigation project beach and nearshore placement activities and does not include BMPs that would be applicable only to new beach nourishment projects.

5.5.1. Potential Adverse Impacts

The implementation of restoration/enhancement activities may have localized and temporary adverse impacts on EFH. Possible impacts can include: (1) localized nonpoint source pollution such as influx of sediment or nutrients; (2) interference with spawning and migration periods; (3) temporary or permanent removal of feeding opportunities; and (4) animal burial or smothering.

5.5.2. Recommended Best Management Practices

1. Use material consisting solely of natural sediment and shell material, containing no construction debris, toxic material or other foreign matter.
2. Use material similar in color and grain size distribution (sand grain frequency, mean and median grain size and sorting coefficient) to the native material in the project area. Ideally, sediment used for beach placement should be indistinguishable from native site sediment in terms of color, shape, size, mineralogy, compaction, organic content, and sorting. Sediment for nearshore placement should also be of similar color, shape, size, mineralogy, compaction, organic content, and sorting to any nearby beach sites.
3. Beach placement projects should use fill material with a composite grain size distribution similar to that of the native beach material. Ideally, the median size of the dredged sediment should not be less than the median of the native material and the spread of sizes in the dredge distribution should not exceed that of the native sediment.
4. Avoid beach and nearshore placement in areas containing sensitive marine benthic habitats adjacent to the beach (e.g., spawning and feeding sites, hard bottom, and cobble/gravel substrate).
5. When practicable, conduct beach and nearshore placement following the TOY recommendations (Section 5.1), when productivity for benthic infauna is at a minimum; this may minimize the impacts for some beach sites.
6. Slope of the beach after placement of dredged material should mimic the natural beach profile.
7. The overall volume of fill material to be added to the beach in any fill episode should not exceed 50 percent of the estimated annual net sediment transport for the beach in order to minimize the magnitude of the disturbance to the ecosystem and to prevent large-scale alterations of the local coastal processes.
8. If heavy equipment is used on the beach for placement activities, it should not leave ruts. Storage of heavy equipment and pipe on the beach should be avoided to the extent possible, using staging areas off of the beach wherever available.
9. When practicable, placement episodes should only be conducted after the ecosystem has fully recovered for a duration of at least one year, preferably two or three, in order to avoid permanent perturbations to the system; and disturbances should be episodic and their ecological impacts should not overlap between placement episodes (i.e., a placement episode should not take place before the impacts from the previous fill event have completely abated).
10. A during-construction monitoring plan as deemed necessary for a specific project, designed with appropriate methodology to adequately detect and document both direct and indirect project impacts. Monitoring plans, if deemed necessary, should follow the Before-After-Control-Impact (BACI) sampling framework.
11. A post-construction monitoring plan as deemed necessary for biological, physical and water resources designed with appropriate methodology to adequately detect and document both direct and indirect project impacts. Monitoring plans, if deemed necessary, should follow the BACI sampling framework.

6. Programmatic Consultation Procedures

For a given navigation project, the Charleston District must first determine whether EFH may be present and whether the activity is covered under this programmatic consultation. The Programmatic EFH Consultation will serve as a fundamental tool between NMFS and the Charleston District to review activities that conform to all conditions described. This programmatic consultation will be adaptive, accountable, and credible as a conservation tool. As such, additional categories of activities and/or stressors may be added and/or removed based on best available scientific information. The scope of the Programmatic EFH Consultation remains limited to those activity and project types that will not have a substantial adverse effect both individually and cumulatively on EFH. The review and consultation procedures are further described in the following section.

6.1 Annual Meeting

Following the implementation of this Programmatic EFH Consultation, the Charleston District and SERO HCD will meet annually, in-person or virtually. The Charleston District and SERO HCD may subsequently agree to meet less often if both agencies agree the programmatic consultation is functioning as intended and if less frequent meetings will not undermine the goals of the Programmatic EFH Consultation. At the meeting, the Charleston District and SERO HCD will:

• discuss the annual tracking of covered projects;

• evaluate and discuss the continued effectiveness of the programmatic consultation;

• account for any new information or technology;

• ensure the activities authorized by the programmatic consultation continue to minimize adverse effects to EFH; and/or

• update the procedures, covered actions, or best management practices, if necessary.

6.2 Project Verification Requirements

After implementation of this Programmatic EFH Consultation, the Charleston District will not need to initiate individual EFH consultation for covered navigation projects (Section 2). For each project proposed under this Programmatic EFH Consultation, the Charleston District will provide all of the required project-specific information to SERO HCD. This will serve as a record of the activity to take place and account for cumulative effects of those activities funded or authorized by the Charleston District. The Charleston District will track and analyze the activities on an annual basis, as noted below, and will review the results with SERO HCD.

6.2.1 Initial Screening Process

6.2.1.1. The Charleston District will screen the project for the presence of EFH/EFH-HAPC and/or federally managed species (Section 3).

6.2.1.2. If EFH may be present within the project action area, then the Charleston District will review the Programmatic EFH Consultation to determine whether the project conforms to the activity description and the specified criteria and limitations.

6.2.2 Impact Determination and Consultation Type

Once there is sufficient information on the project design, the Charleston District will make an EFH determination on the project effects using the following standards.

6.2.2.1. If the action does not adversely affect EFH temporally or spatially, the Charleston District will determine that an action covered by this Programmatic EFH Consultation will not adversely affect EFH, and no EFH consultation is required. It is not necessary to notify SERO HCD or seek NMFS' concurrence with the determination if there is no adverse effect to EFH.

6.2.2.2. If the action may adversely affect EFH, then the Charleston District will initiate programmatic consultation with SERO HCD in accordance with Appendix B. An adverse effect may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystems components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from an action occurring within or outside EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

6.2.3 Projects using Programmatic EFH Consultation process

6.2.3.1. The Charleston District will send the verification form (Appendix B) to SERO HCD for each project covered under the Programmatic EFH Consultation, with complete project information.

6.2.3.2. Within 15 calendar days of receipt of the verification form (Appendix B), SERO HCD will notify the Charleston District (via execution of Part III of the verification form) whether SERO HCD concurs with the Charleston District's determination that a given project is consistent with the Programmatic EFH Consultation. If the 15th calendar falls on a weekend, the deadline shall be the next business day. The Charleston District will ensure that any project using the Programmatic EFH Consultation incorporates all applicable EFH best management practices, unless otherwise documented in accordance with Appendix B.

6.3 Annual Report

The Charleston District will provide an annual summary of the activities carried out under this Programmatic EFH Consultation for the purpose of determining the effectiveness of the programmatic consultation and calculating aggregate effects. The Charleston District will provide the compiled information to SERO HCD for the previous calendar year of activities, each year that the Programmatic EFH Consultation is in effect. The reporting period ends December 31each year and the Annual Report will be due 90 days later.

The Annual Reporting Spreadsheet and description of results will be sent electronically to:

National Marine Fisheries Service SERO
Habitat Conservation Division
Attn: Cindy Cooksey
331 Fort Johnson Road
Charleston, South Carolina 29412
Cynthia.Cooksey@noaa.gov and nmfs.ser.hcdconsultations@noaa.gov

6.4 Revisions and Withdrawal

The Charleston District and SERO HCD will discuss the need for revisions at the annual meetings, as noted above. Revisions may be needed to account for new information or technology or to better streamline the coordination process. SERO HCD and the Charleston District may revise this document (e.g., restricting or expanding its scope) at any time by agreement of both agencies. At any time, NMFS or the Charleston District may withdraw from this Programmatic EFH Consultation by providing written 15-day notice. NMFS and the Charleston District are encouraged, but not required, to attempt to address any issues via proposed revisions before withdrawing from the Programmatic EFH Consultation.

6.5 Supplemental Consultation

Pursuant to 50 CFR § 600.920(a)(l), the Charleston District must reinitiate EFH consultation with SERO HCD if the proposed action considered under this Programmatic EFH Consultation is substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects NMFS trust resources. In addition, if SERO HCD receives new or additional information that fall outside the scope of this Programmatic EFH Consultation, SERO HCD may request an additional consultation.

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Appendix A: Project and Activity Descriptions

Project and Activity Descriptions

1 Atlantic Intracoastal Waterway.

The AIWW project includes 210 miles of federal channel, 12 ft MLLW deep and not less than 90 ft wide, beginning at the North Carolina – South Carolina state line above Little River Inlet and extending to Port Royal Sound near Hilton Head, as well as upland, and in-water placement areas (Table 1). Maintenance Dredging will be performed using a hydraulic cutterhead dredge. Hydraulic dredging utilizes suction to remove sediments from the channel bed. The cutterhead is a rotating tool mounted in front of the suction head that dislodges and excavates the sediments. The material will be transported hydraulically via a pipeline to the placement sites. Figure1 depicts an overview of the AIWW in South Carolina and Figures 2 through 11 depict shoaling and placement areas.

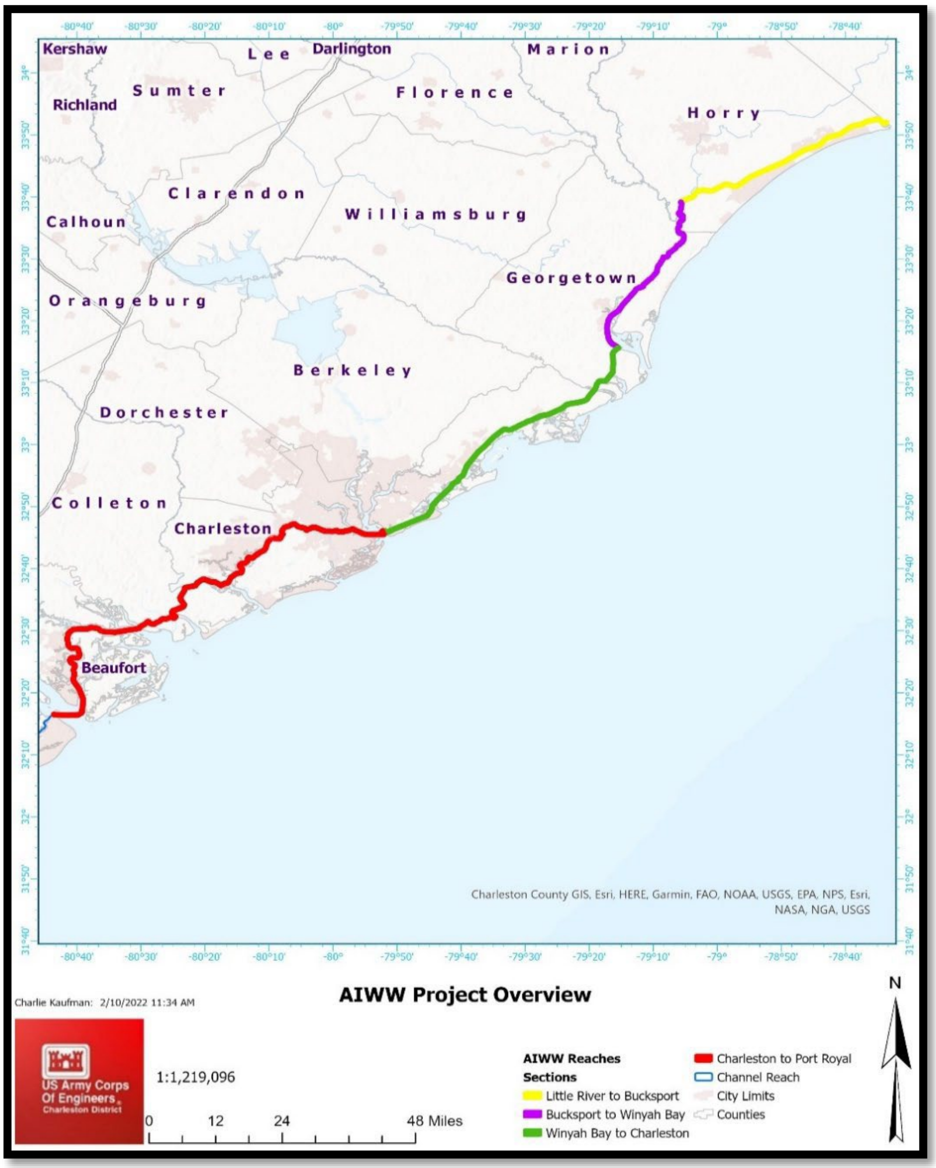

Figure 1. Overview of the Atlantic Intracoastal Waterway in SC

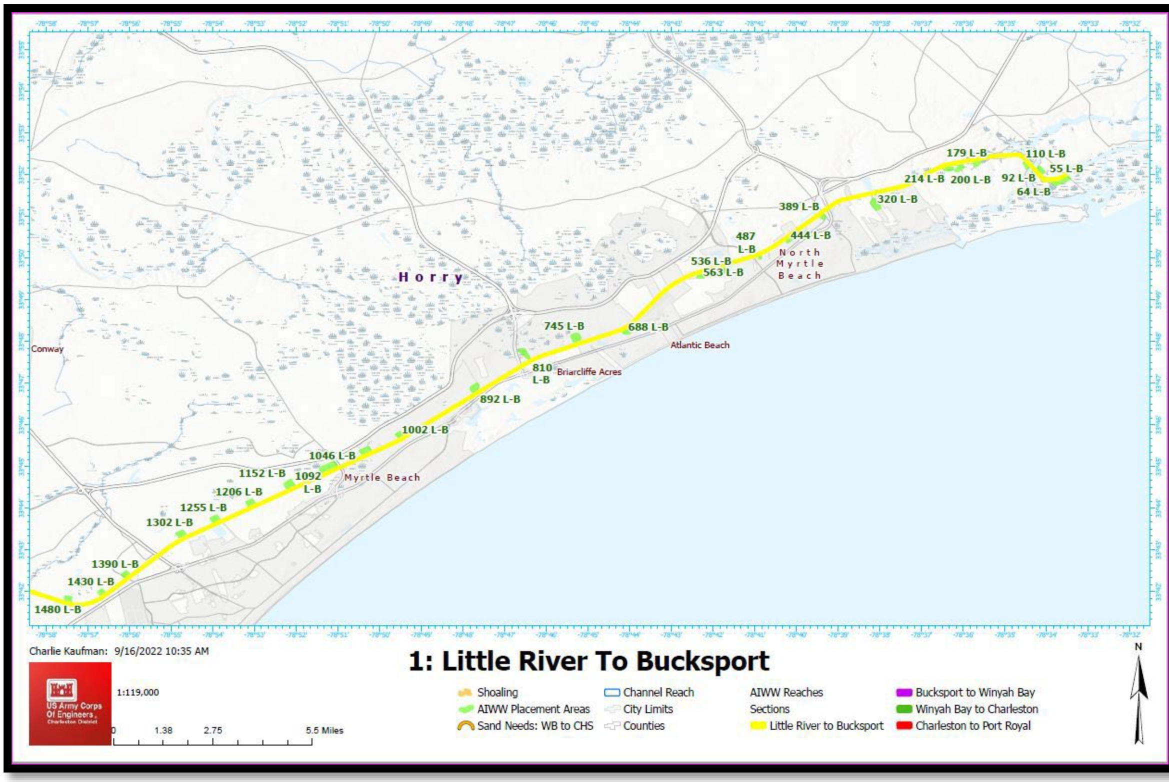

Figure 2. Little River to Bucksport Reach Part 1

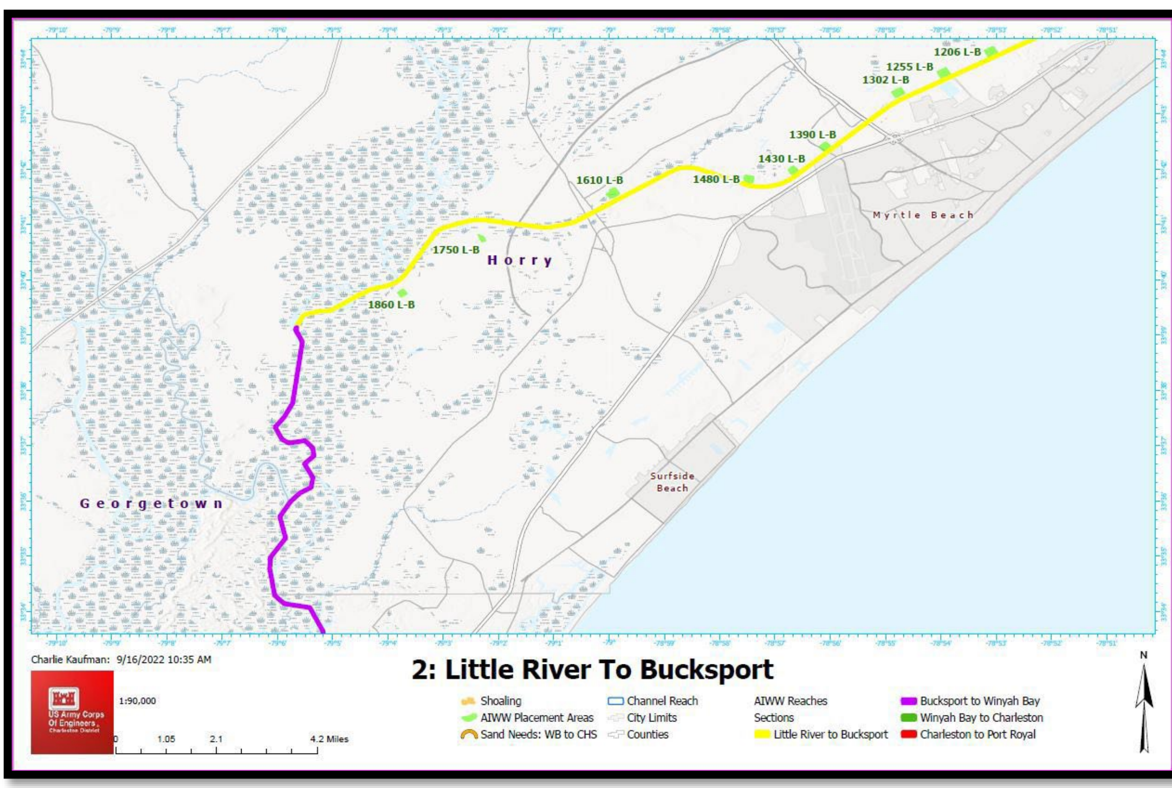

Figure 3. Little River to Bucksport Reach Part 2

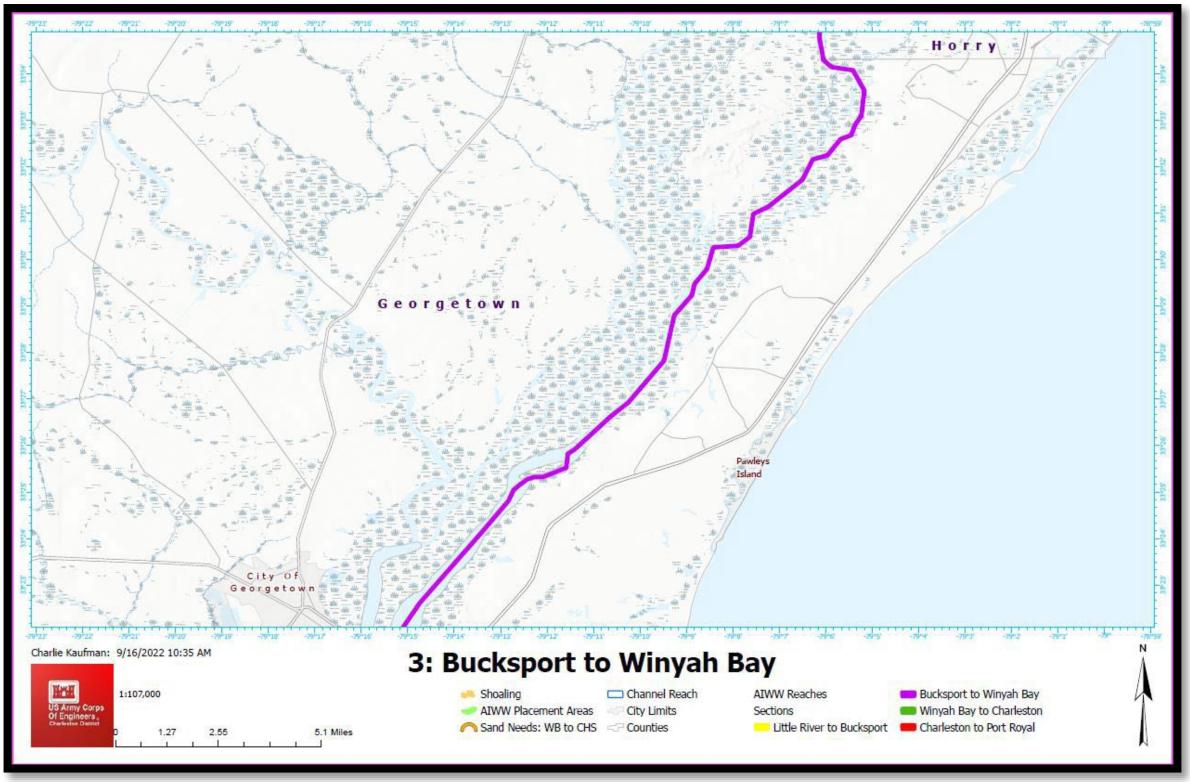

Figure 4. Bucksport to Winyah Bay Part 1

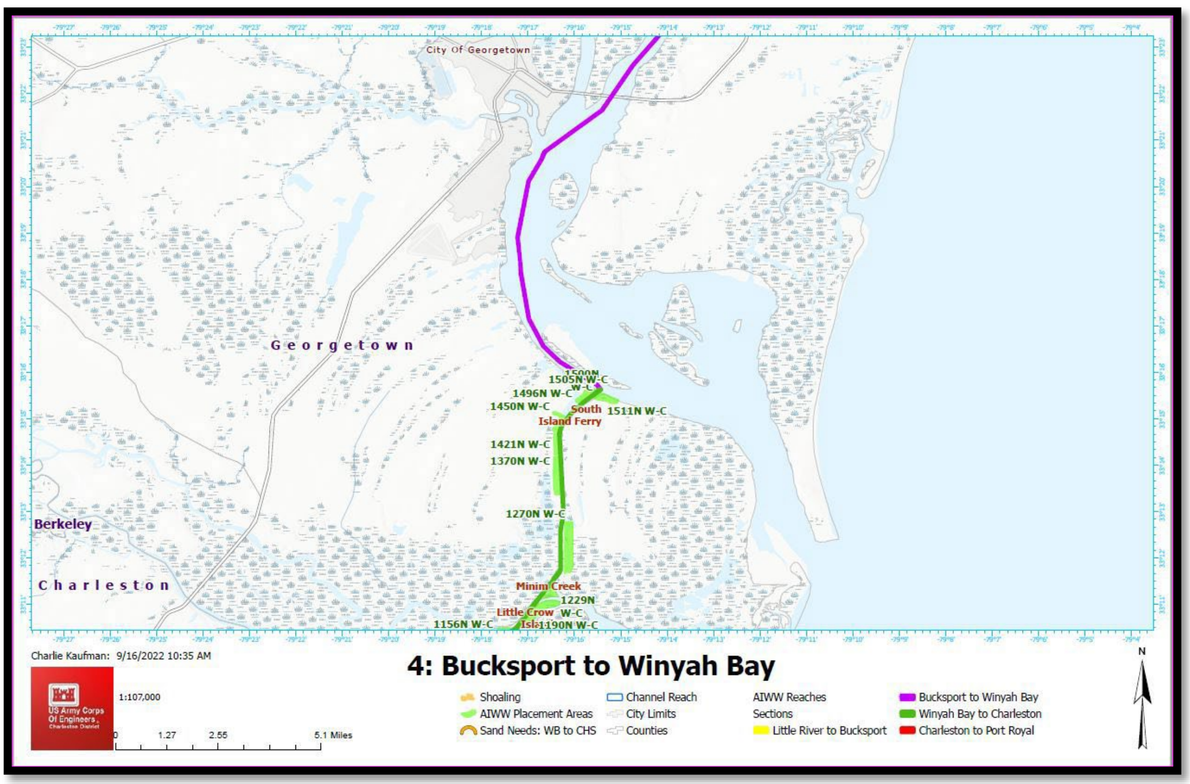

Figure 5. Bucksport to Winyah Bay Part 2

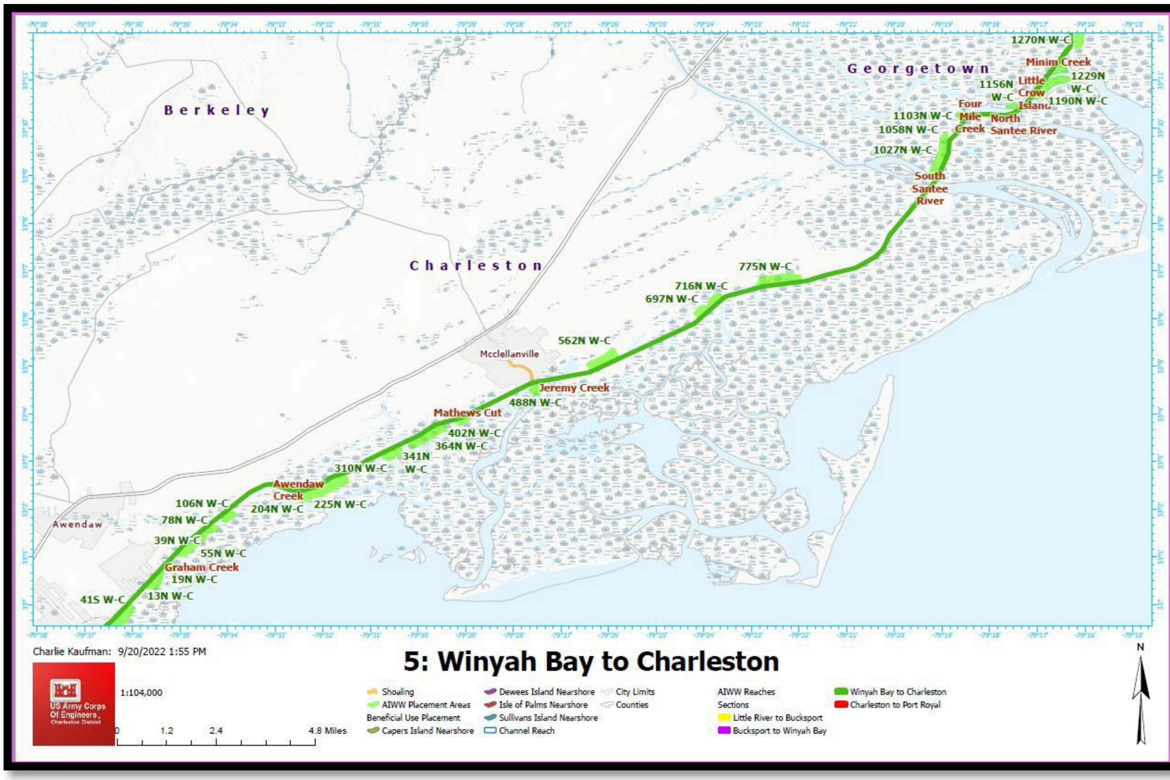

Figure 6. Winyah Bay to Charleston Part 1

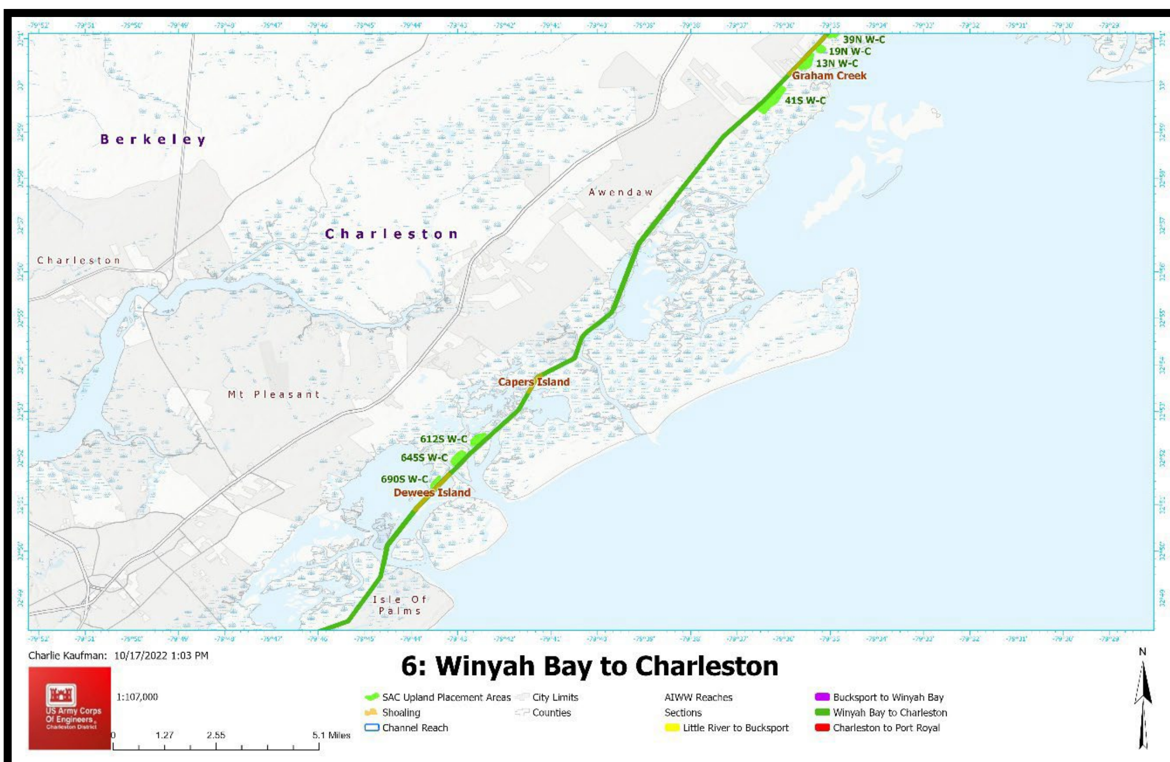

Figure 7. Winyah Bay to Charleston Part 2

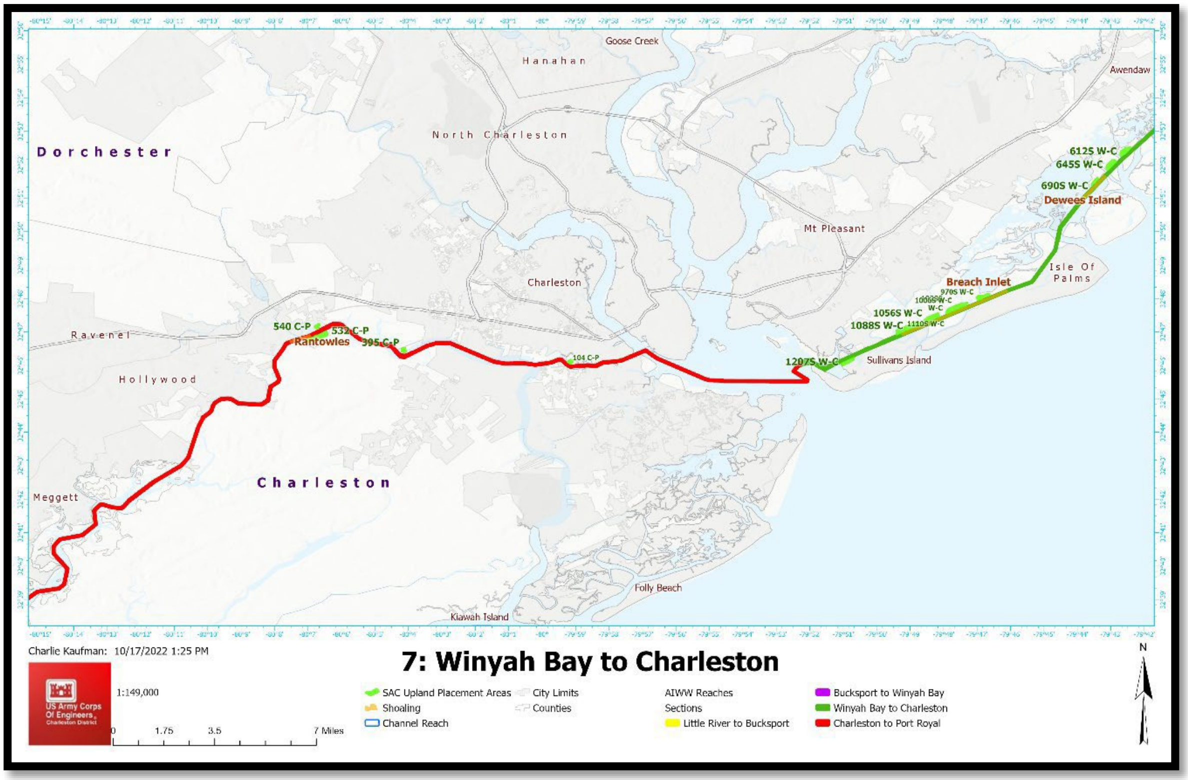

Figure 8. Winyah Bay to Charleston Part 3

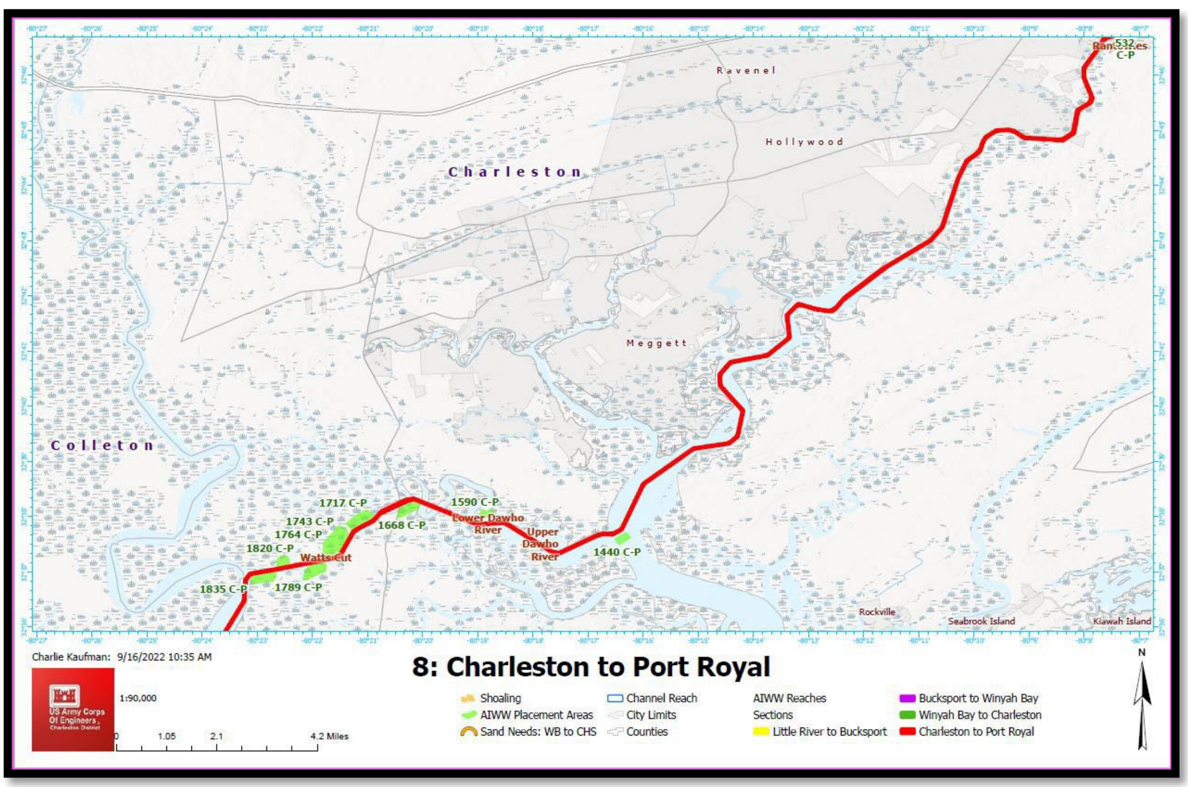

Figure 9. Port Royal to Charleston Part 1

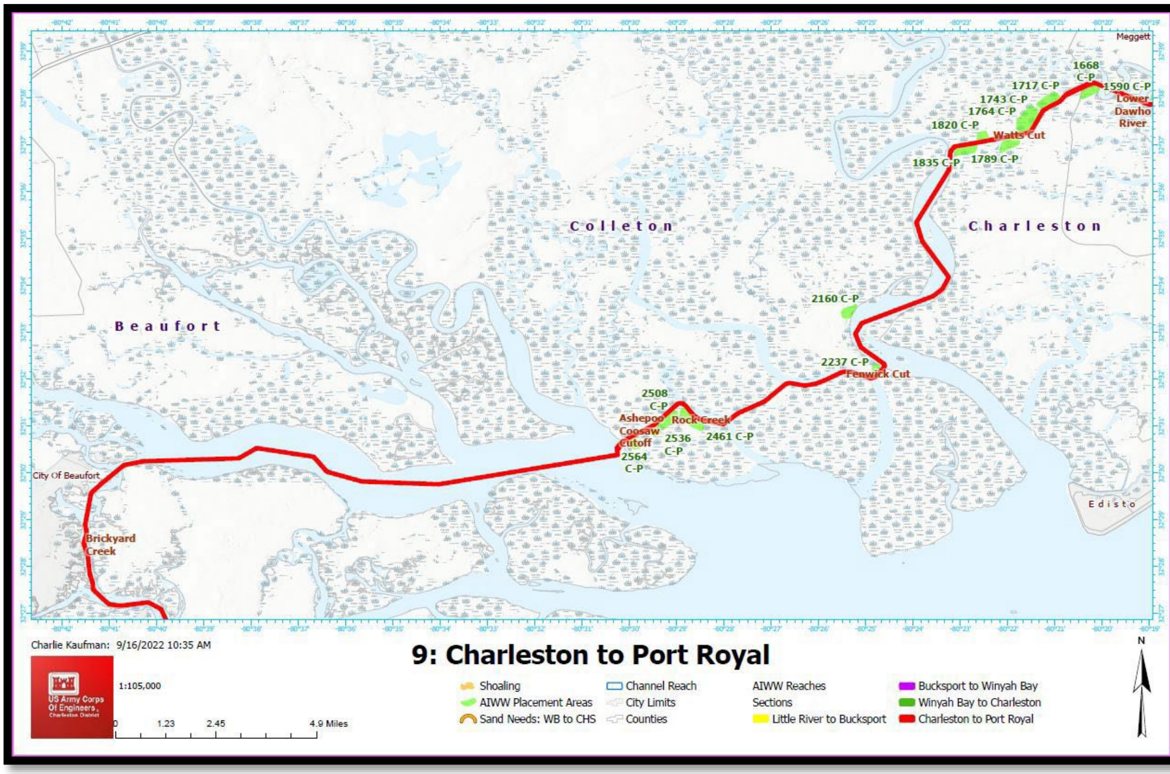

Figure 10. Charleston to Port Royal Part 2

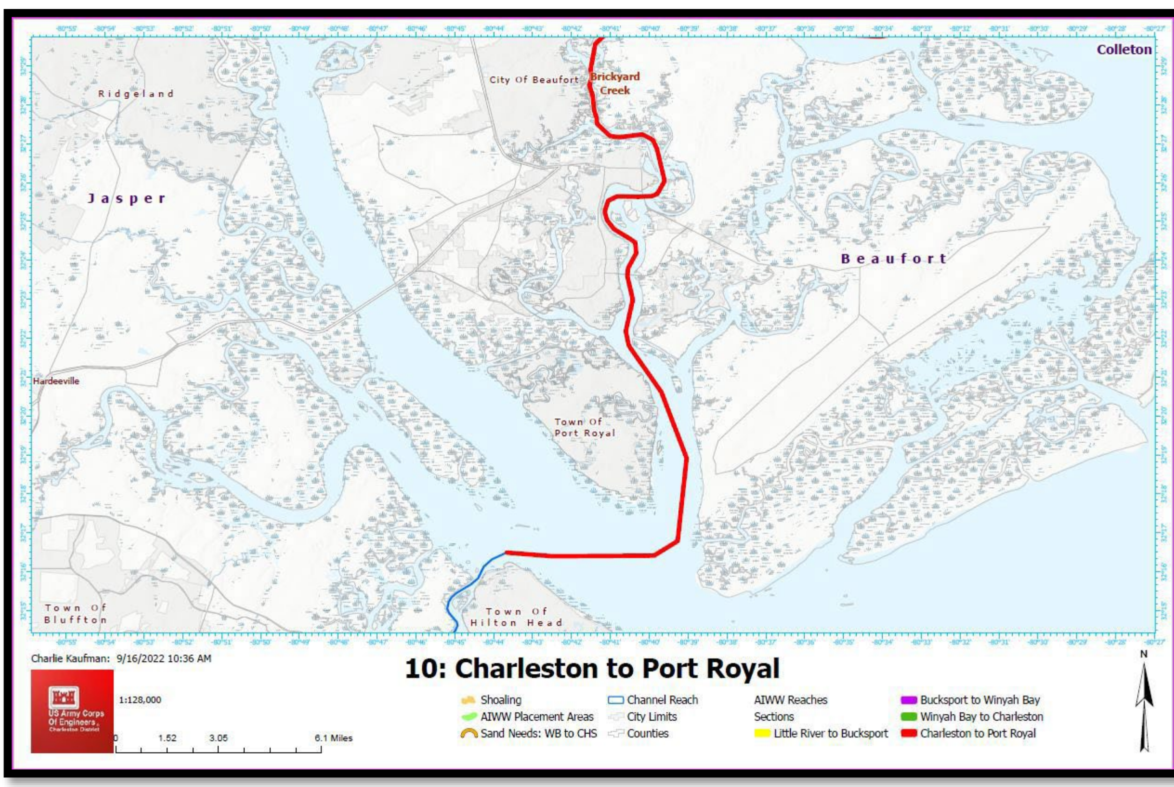

Figure 11. Charleston to Port Royal Part 3

Table 1. AIWW Shoaling and Placement Information

Little River to Bucksport								
Stations	0+00	to	1930+00					
Mileage	36.55	miles						
Shoal Identifier	**Alternate Identifier**	**Start Station**	**End Station**	**Dredge Frequency (months)**	**Estimated Quantity (cy)**	**Upland DMMAs**	**In-water DMMAs**	**Beneficial Use Options**
Day Marker 22A	22A	1085+00	1100+00	48	10000	1152 L-B	None	Haul Out
Unidentified	N/A	N/A	N/A	As Needed, primarily based on extreme events	As Needed	55, 64, 92, 110, 179, 200, 214, 320, 389, 444, 487, 536, 563, 688, 745, 810, 892, 1002, 1046, 1092, 1152, 1255, 1302, 1390, 1430, 1480, 1610, 1750, 1860 L-B	None	Haul Out
Bucksport to Winyah Bay								
Stations	1930+00	to	3691+00					
Mileage	33.35	miles						
Shoal Identifier	**Alternate Identifier**	**Start Station**	**End Station**	**Dredge Frequency (months)**	**Estimated Quantity (cy)**	**Upland DMMAs**	**In-water DMMAs**	**Beneficial Use Options**
Not Applicable	Not Applicable	N/A	N/A	N/A	N/A	None	None	N/A
Winyah Bay to Charleston								
Stations	3691+00	to	6510+00					
Mileage	53.39	miles						
Shoal Identifier	**Alternate Identifier**	**Start Station**	**End Station**	**Dredge Frequency (months)**	**Estimated Quantity (cy)**	**Upland DMMAs**	**In-water DMMAs**	**Beneficial Use Options**
Unidentified	N/A	N/A	N/A	As Needed, primarily based on extreme events	As Needed	775N, 716N, 697N W-C	None	Not pursued at this time
South Island Ferry	N/A	3698+00	3744+00	36	100,000	1511N, 1505N, 1500N, 1496N, 1450N, 1421N, 1370N W-C	None	Not pursued at this time
Minim Creek	Minim Creek to North Santee	3956+00	3997+35	36	100,000	1270N, 1229N, 1190N W-C	None	Not pursued at this time
Little Crow Island	Minim Creek to North Santee	3997+35	4050+00	36	140,000	1270N, 1229N, 1190N W-C	None	Not pursued at this time
North Santee River	Minim Creek to North Santee	4053+00	4066+00	36	25,000	1229N, 1190N, 1156N W-C	None	Not pursued at this time
Four Mile Creek	N/A	4084+00	4109+00	48	50,000	1156N, 1103N, 1058N, 1027N W-C	None	Not pursued at this time
South Santee River	N/A	4195+00	4216+00	48	22,000	1058N, 1027N W-C	None	Not pursued at this time
Jeremy Creek	Jeremy Creek Turning Basin	00+45	42+77.95	24	200,000	562N, 488N W-C	None	Not pursued at this time
Mathews Cut	N/A	4723+18	4926+00	36	730,000	488N, 402N, 364N, 341N, 310N, 225N, 204N W-C	None	Not pursued at this time
Awendaw Creek	N/A	5000+000	5020+00	36	45,000	225N, 204N W-C	None	Not pursued at this time
Graham Creek	N/A	5179+00	5244+00	36	180,000	106N, 78N, 55N, 39N, 19N, 13N, 41S W-C	None	Not pursued at this time
Capers Island	N/A	5730+00	5758+00	48	75,000	612S, 645S W-C	None	Not pursued at this time
Dewees Island	N/A	5896+00	5957+00	48	245,000	612S, 645S, 690S W-C	810S W-C (Dewees Inlet)	Not pursued at this time
Breach Inlet	N/A	6163+00	6341+00	24	500,000	970S, 1006S, 1028S, 1056S, 1088S, 1110S, 1207S W-C	810S W-C (Dewees Inlet)	Not pursued at this time
Charleston to Port Royal								
Stations	6510+00	to	11282+08					
Mileage	90.38	miles						
Shoal Identifier	**Alternate Identifier**	**Start Station**	**End Station**	**Dredge Frequency (months)**	**Estimated Quantity (cy)**	**Upland DMMAs**	**In-water DMMAs**	**Beneficial Use Options**
Unidentified	N/A	N/A	N/A	As Needed, primarily based on extreme events	As Needed	104, 395, 540, 580 C-P	None	Not pursued at this time
Rantowles	Grimball Gates	7390+00	7424+00	48	50,000	532 C-P	None	Haul Out
Upper Dawho River	Dawho River 1	8274+00	8381+00	Recently realigned	Recently realigned	1590 C-P	1440 C-P (North Edisto River)	Not pursued at this time
Lower Dawho River	Dawho River 2	8391+00	8431+00	24	45,000	1590 C-P	1440 C-P (North Edisto River)	Not pursued at this time
Watts Cut	N/A	8511+00	8670+00	24	490,000	1668, 1717, 1743, 1764, 1789, 1820, 1835 C-P	None	Not pursued at this time
Fenwick Cut	N/A	9042+00	9064+00	36	21,000	2160, 2237 C-P	None	Not pursued at this time
Rock Creek	N/A	9270+00	9294+00	48	Recently realigned	2461 C-P	None	Not pursued at this time
Ashepoo Coosaw Cutoff	Ashepoo Coosaw Cut	9306+00	9392+00	24	360,000	2461, 2508, 2536, 2564 C-P	None	Not pursued at this time
Brickyard Creek	N/A	10065+00	10083+00	48	Recently realigned	None	None	Not pursued at this time

2 Murrell's Inlet

Murrell's Inlet project (Figure 12) is located on the Atlantic Coast between the south end of Garden City Beach and the north end of Huntington Beach State Park in Georgetown County. The action area includes the federal entrance channel at the inlet located between the south end of Garden City Beach and the north end of Huntington Beach State Park and extending approximately 3000 ft landward from the -12 ft ocean contour, Main Creek extending approximately 3 miles north/northeast from the entrance channel, a 14.9-acre deposition basin located north and adjacent to the entrance channel, an auxiliary channel extending approximately 1000 ft northwest from the entrance channel, and dredge material placement along the shorelines of Huntington Beach State Park and Garden City Beach and along the beach area at the landward terminus of the south jetty. The authorized project dimensions include a 12 ft MLLW deep by 300 ft wide entrance channel and a 10 ft MLLW deep by 90 ft wide inner channel. Maintenance dredging will be performed using a hydraulic cutterhead dredge. The material will be transported hydraulically via a pipeline to the placement sites.

Table 2. Murrells Inlet Project Shoaling and Placement Information

Reaches	Channel Reaches	Shoaling (Cubic yards per event)	Frequency of Dredging (years)	Placement Location	Dredge Type	Sediment Type
Entrance Channel	25+00 to 40+00	300,000	5-7 (or as funding permits)	Front Beach, Jetty	Pipeline Dredge	Beach Compatible Sand
Auxiliary Channel	00+00 to 10+00	15,000	5-7 (or as funding permits)	Front Beach, Jetty	Pipeline Dredge	Beach Compatible Sand
Deposition Basin	Entire (14.9 acres)	600,000	5-7 (or as funding permits)	Front Beach, Jetty	Pipeline Dredge	Beach Compatible Sand
Inner Shoal A	42+00 to 68+00	50,000	5-7 (or as funding permits)	Front Beach, Jetty	Pipeline Dredge	Beach Compatible Sand
Inner Shoal B	145+00 to 155+00	50,000	5-7 (or as funding permits)	Front Beach, Jetty	Pipeline Dredge	Beach Compatible Sand
Inner Shoal C	186+00 to 197+00	50,000	5-7 (or as funding permits)	Front Beach, Jetty	Pipeline Dredge	Beach Compatible Sand

Figure 12. Shoaling and Placement Locations for Murrells Inlet.

3 Town Creek

The Town Creek project (Figure 13) is located on the Atlantic Coast between Bulls Bay and Sandy Point near McClellanville, South Carolina. The action area includes an entrance channel approximately 12 ft MLLW deep and 100 ft wide across the ocean bar and approximately 4 miles long from the Atlantic Ocean to the mouth of Five Fathom Creek, and a channel 10 ft MLLW deep and 80 ft wide through Five Fathom Creek and Town Creek to the AIWW, a distance of approximately 6.2 miles. Dredging would be accomplished through sidecast dredge with placement adjacent to the channel or modified hopper dredge for transport and placement along the Lighthouse Island nearshore. Sidecast dredging involves removal of sediments from the channel using drag arms with discharge by pumping the dredged material directly overboard through an elevated discharge boom. A modified (small) hopper dredge is a ship equipped with trailing suction pipes, dredge pumps, and a hopper. The trailing suction pipes are equipped with a drag head that moves over the ocean floor or channel bed to suction sediments and create a slurry. The dredge pumps are used to hydraulically transport the slurry to the hopper for storage and excess water is then allowed to drain from the hopper. Once the hopper is full, the material can be discharged from the bow of the ship using a nozzle, pumped via floating or underwater pipes to a placement area, or deposited through doors located in the bottom of the dredging vessel. Unlike traditional hopper dredge equipment, the modified hopper dredge equipment has small dragheads (2-feet by 2-feet to 2-feet by 3-feet), small openings (5-inch by 5-inch to 5-inch by 8-inch, small suction intake pipe diameters (10-14 inches), and limited draghead suction. Additional activities could include realignment of the entrance channel for the purpose of following deep water and reducing dredging amounts.

Table 3. Town Creek Project Shoaling and Placement Information

Reaches	Channel Reaches	Shoaling (Cubic yards per event)	Frequency of Dredging (years)	Placement Location	Dredge Type	Sediment Type
Entrance Channel (Outer Shoal)	36+00 to 46+00	21,000	5 (or as funding permits)	Nearshore (Lighthouse Island)	Sidecast or modified hopper dredge	Beach Compatible Sand
Entrance Channel (Inner Shoal)	75+94 to 97+14	25,000	5 (or as funding permits)	Nearshore (Lighthouse Island)	Sidecast or modified hopper dredge	Beach Compatible Sand
Entrance Channel Advanced Maintenance	78+00 to 88+00	50,000	5 (or as funding permits)	Nearshore (Lighthouse Island)	Sidecast or modified hopper dredge	Beach Compatible Sand

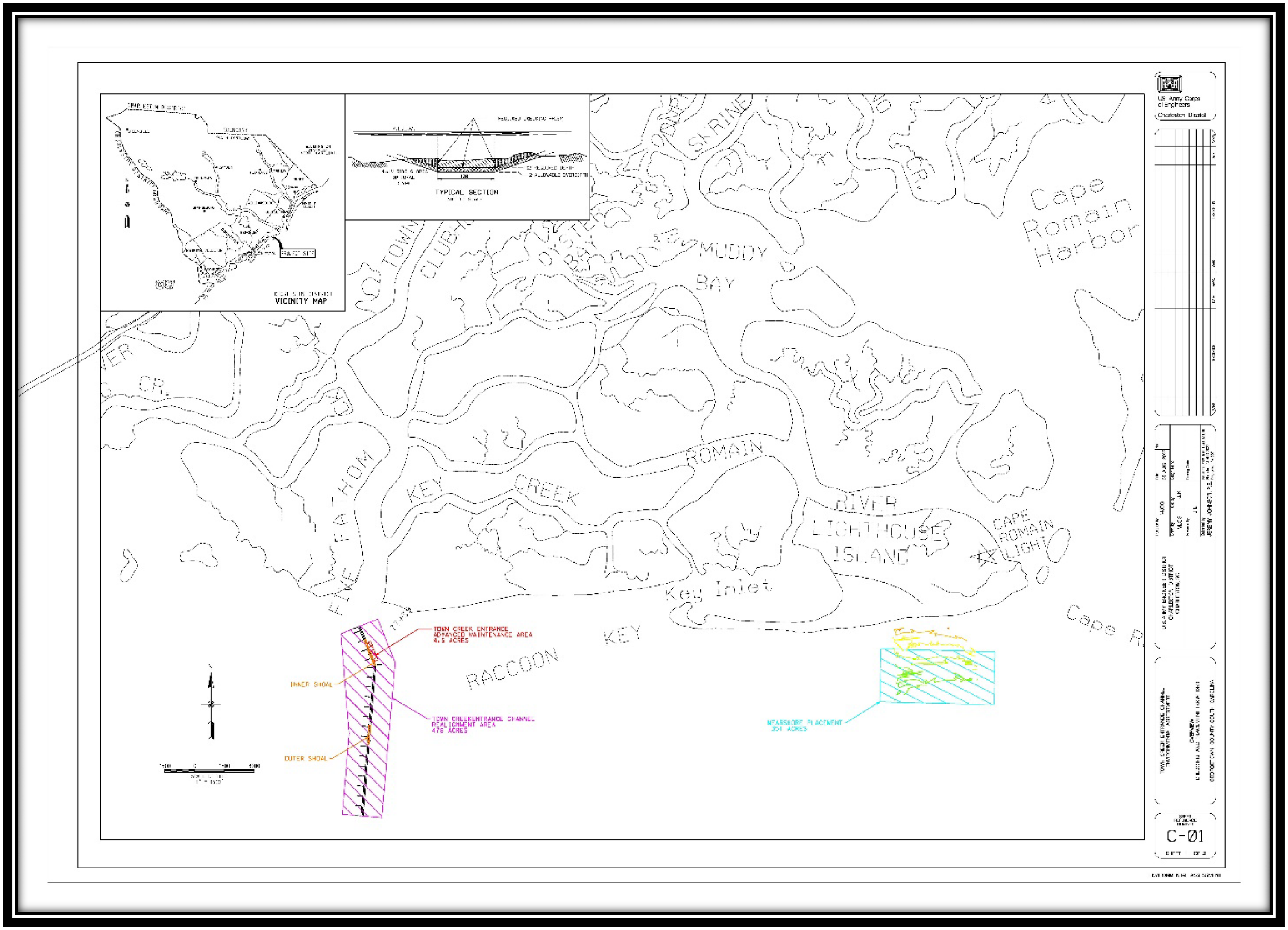

Figure 13. Shoaling and Placement Locations for Town Creek.

4 Folly River

The Folly River project (Figure 14) is located between Kiawah Island and Folly Beach. The action area includes the Stono Inlet entrance channel extending waterward approximately 3 miles from the 11 ft contour, the Folly River channel extending downstream approximately 3 miles from Highway 171 to its confluence with the Stono River, the Folly Creek channel extending downstream approximately 3 miles from Highway 171 to its confluence with the Folly River, as well as placement along the beach and nearshore of Folly Beach, and on Bird Key. The authorized dimensions include the 11 ft MLLW deep by 100 ft wide Stono River entrance channel, and a 9 ft MLLW deep by 80 ft wide Folly River channel and Folly Creek channel.

Dredging equipment used would be dependent on the placement location and equipment availability, and may include hydraulic cutterhead pipeline dredge, sidecaster dredge and/or the modified hopper dredge. The suitability of dredge materials will determine the potential placement locations which include Bird Key Island, Folly Beach, sidecast placement in the Stono channel, or nearshore placement for Folly Beach. Additional activities could include realignment of the entrance channel for the purpose of following deep water and reducing dredging amounts.

Table 4. Folly River Project Shoaling and Placement Information

Reaches	Channel Reaches	Shoaling (Cubic yards per event)	Frequency of Dredging (years)	Placement Location	Dredge Type	Sediment Type
Folly River	103+00 to 303+68	400,000	3	Front Beach, Nearshore, Bird Key	Pipeline Dredge	Beach Compatible Sand
Stono River Entrance South Approach	0+00 to 105+00	300,000	2	Front Beach, Nearshore, Bird Key	Modified Hopper Dredge, Pipeline Dredge, Sidecast	Beach Compatible Sand
Stono River Entrance (East Approach)	0+00 to 58+00	300,000	2	Front Beach, Nearshore, Bird Key	Modified Hopper Dredge, Pipeline Dredge, Sidecast	Beach Compatible Sand

Figure 14. Shoaling and Placement Locations for Folly River.

Appendix B. Programmatic Essential Fish Habitat Consultation for United States Army Corps of Engineers Activities and Projects Regularly Undertaken in South Carolina - Verification Form

Programmatic Essential Fish Habitat Consultation for United States Army Corps of Engineers Activities and Projects Regularly Undertaken in South Carolina - Verification Form

This form will be filled out by the United States Army Corps of Engineers, Charleston District (Charleston District) for activities and projects regularly undertaken in the tidally-influenced waters of South Carolina using the Programmatic Essential Fish Habitat (EFH) Consultation with NOAA's National Marine Fisheries Service, Southeast Regional Office, Habitat Conservation Division (SERO HCD). Upon obtaining sufficient information, the Charleston District will submit the form to SERO HCD for their review and response. After receiving a response from SERO HCD, the Charleston District will keep the completed form(s) for reporting purposes.

In addition to the information required below, the Charleston District must also provide a list of all recommended management practices that will not be adhered to (with justification provided). This list may use the same numbers as the recommended management practices listed in Section 5.

PART I.

Project Activity Type

☐ 1. Dredging
☐ 2. Placement of Dredged Material
☐ 3. Transportation of Dredged Material
☐ 4. Beneficial Use - Beach and Nearshore Placement

USACE Charleston District Project Information

Waterway Name:	
Latitude (e.g., 42.6258):	
Longitude (e.g., -70.6461):	
Work Description:	
Total area of impact to EFH (in acres), broken down by individual types of EFH:	
Programmatic EFH Consultation Appendix A Project Reference Number:	

Part II.

USACE's Determination of Effects to Essential Fish Habitat

The Charleston District will select the appropriate determination:

☐ The activity complies with all elements of the Programmatic EFH Consultation, including all Programmatic EFH Consultation recommended best management practices, and adverse effects to EFH will not be substantial.

☐ The activity does not comply with all of the elements of the Programmatic EFH Consultation, including some Programmatic EFH Consultation recommended best management practices. However, the justification below demonstrates that the adverse effects to EFH are not substantial. This does not apply to Programmatic EFH Consultation recommended best management practices that are not applicable to the project.

Justification for Not Incorporating All EFH conservation measures

If the project does not comply with all of the applicable Programmatic EFH Conservation measures and the Charleston District has still determined that the effects of a project on EFH are not substantial and the project is otherwise consistent with the Programmatic EFH Consultation, provide justification below and identify which conservation measures, provided in the Programmatic EFH Consultation as BMPs, are not included:

____

____

____

____

____

____

____

USACE, Charleston District preparer:

______________________ ______________________

Name Signature

____

Date

Part III.

SERO HCD Determination (To be filled out by NMFS SERO HCD)

After receiving the Verification Form, SERO HCD will contact the Charleston District with any concerns.

☐ SERO HCD concurs with the Charleston District's determination that the proposed project is consistent with the Programmatic EFH Consultation (without the need for justification).

☐ SERO HCD concurs with the Charleston District's determination that the proposed project is consistent with the Programmatic EFH Consultation, with justification described above.

☐ SERO HCD does not concur with the Charleston District's determination that the project is consistent with the Programmatic EFH Consultation. The Charleston District must conduct additional coordination with SERO HCD and a separate individual EFH consultation may be required.

SERO HCD reviewer:

______________________________	______________________________
Name	Signature

____

Date

Appendix D:

Sediment Sampling and Analysis

DRAFT

Sediment Sampling and Analysis Atlantic Intracoastal Waterway, SC

Contract No. W912HP-21-F-0002

Submitted to:
U.S. Army Corps of Engineers, Charleston District
69-A Hagood Avenue
Charleston, South Carolina 29403

Submitted by:
ANAMAR Environmental Consulting, Inc.
2106 NW 67th Place
Gainesville, Florida 32653

ANAMAR
Environmental Consulting, Inc.

July 2021

ANAMAR Environmental Consulting, Inc.

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APPENDICES

All appendices are provided in electronic format only and are included on the accompanying disc.

LIST OF ACRONYMS, ABBREVIATIONS, AND INITIALISMS

AET	apparent effects threshold
AIWW	Atlantic Intracoastal Waterway
ASTM	American Society for Testing and Materials
CCV	continuing calibration verification
CFR	Code of Federal Regulations
CMC	criteria maximum concentration
CQAR	Chemical Quality Assurance Report
DQCR	Daily Quality Control Report
EPA, USEPA	U.S. Environmental Protection Agency
ERL	effects range-low
GNSS	Global Navigation Satellite System
GPS	global positioning system
HMW	high molecular weight
HSP/APP	Health and Safety Plan/Accident Prevention Plan
ICP, ICP/MD	inductively coupled plasma; inductively coupled plasma/mass spectrometry
ITM	Inland Testing Manual (*Evaluation of Dredged Material for Discharge in Waters of the U.S. – Testing Manual*. EPA and USACE 1998)
LMW	low molecular weight
MB	method blank
MDL	method detection limit
MLW	mean low water
MRL	method reporting limit
NELAC	National Environmental Laboratory Accreditation Conference
NOAA	National Oceanic and Atmospheric Administration
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
SAP	Sampling and Analysis Plan
SCDHEC	South Carolina Department of Health and Environmental Control
SOW	Scope of Work
TEF	toxicity equivalency factor (TEF)
TEL	threshold effects level
TEQ	toxic equivalent
TOC	total organic carbon
TPH	total petroleum hydrocarbon
USACE	U.S. Army Corps of Engineers
USCS	Unified Soil Classification System

EXECUTIVE SUMMARY

This report details the field sampling, analysis, and results of sediment testing and analysis in support of maintenance dredging operations along the Atlantic Intracoastal Waterway (AIWW). Field operations took place from May 3 through May 7, 2021, and consisted of sediment and water sample collection for physical, sediment chemistry, and elutriate chemistry analysis.

Sampling Approach

The project area is divided into three geographic regions along the full span of the AIWW project area: Little River (near Myrtle Beach) to Winyah Bay (near Georgetown), Winyah Bay to Charleston, and Charleston to Port Royal (near Beaufort). The field sample collection effort involved collection of sediment grab samples from 58 sampling locations and site water from two locations. Sampling locations were selected by USACE based on shoaling depths according to recent bathymetric surveys and were distributed to provide adequate representation for each geographic area along the AIWW.

Twenty composite samples were analyzed. Two to six sediment subsamples were combined into each composite sample for physical, sediment chemistry, and elutriate chemistry analysis. All project sediment subsamples were collected by grab sampler.

Sediment Physical Results

Physical analysis was conducted for all project sediment composites and subsamples.

Little River to Winyah Bay

The three samples were collected in the Little River to Winyah Bay. All three samples were predominately sand ranging from 96.7% to 98.9%.

Winyah Bay to Charleston

Ten samples were collected from south of Georgetown to Mt. Pleasant. Two of the samples, WC-11 and WC-12, were predominately sand with 93.2% and 61.8%, respectively. The rest of the samples from this area were predominately fine-grained with silt and clay ranging from 57.8% to 98.8%.

Charleston to Port Royal

Seven samples were collected from Charleston to Port Royal. Two of the samples, CP-14 and CP-18, were predominately sand with 64.4% to 94.5%, respectively. The rest of the samples from this area were predominately fine-grained with silt and clay ranging from 50.6% to 94.8%.

Sediment Chemistry Results

Full sediment chemistry analyses were performed on project composite samples LB-1 through LB-3 and CP-16. Limited sediment chemistry analyses (metals and PAHs only) were performed on the rest of the composite samples.

TOC and Total Solids

TOC concentrations ranged from <0.13% in sample LB-3 to 6.4% in sample CP-17. The results for TOC tended to follow the grain size characteristics, with TOC concentrations increasing with the proportion of silts and clays in the sediment.

Total solids ranged from 21.1% in sample WC-13 to 82.5% in sample LB-2. The results for total solids also tended to follow the grain size characteristics, with percent total solids increasing with the proportion of sand.

Metals and Tributyltin

Metals were analyzed in all twenty composite samples. Most metals were detected in concentrations greater than the MRL in all sediment samples, with the exception of mercury, selenium, and silver which were not detected above the MRL in any composite. Arsenic, copper, and nickel were detected in concentrations above the TEL and (or) ERL in some samples, as summarized below.

- Arsenic: WC-4, WC-5, WC-6, WC-7, WC-8, WC-9, WC-10, WC-12, WC-13, CP-15, CP-16, CP-17, CP-19, CP-20
- Copper: WC-10, WC-13
- Nickel: WC-10, WC-13

Tributyltin was analyzed in four composite samples (LB-1, LB-2, LB-3, and CP-16) and was not detected in concentrations greater that the TEL and (or) ERL in any sample tested.

PAHs

PAHs were analyzed in all 20 composite samples. The MDLs and MRLs in some samples were elevated due to samples requiring dilution prior to being analyzed. Naphthalene was detected in concentrations above the TEL and (or) ERL in some samples, as summarized below.

- Naphthalene: LB-1, LB-2

Pesticides

Pesticides were analyzed in four composite samples (LB-1, LB-2, LB-3, and CP-16). Methoxychlor was detected in concentrations greater than the MRL in samples LB-3 and CP-16. No other pesticides were detected in concentrations greater than the MRL in any sample. Total pesticides ranged from 1.9 µg/kg to 6.1 µg/kg.

PCBs

PCBs and Aroclors were analyzed in four composite samples (LB-1, LB-2, LB-3, and CP-16). None of the 26 congeners or seven Aroclors were detected above the MDL in any of the samples tested (U-qualified). Total NOAA PCBs in sample CP-16 exceeded the TEL and ERL.

Dioxins and Furans

Dioxins and furans were analyzed in four composite samples (LB-1, LB-2, LB-3, and CP-16). Total TEQs ranged from 0.189 ng/kg to 0.517 ng/kg in samples LB-1, LB-2, and LB-3. The total TEQ for sample CP-16 was 6.43 ng/kg, which exceeded the TEL and AET.

Elutriate and Site Water Chemistry

Full elutriate chemistry analyses were performed on project composite samples LB-1 through LB-3 and CP-16 and two site water samples. Limited elutriate chemistry analyses (metals and PAHs only) were performed on the rest of the composite samples.

Metals, TOC, and Total Suspended Solids

Total and dissolved metals were analyzed in all 20 composite elutriate samples and two site water samples. For all of the metals tested except mercury, the MRLs for the elutriate samples were elevated above the target detection limits and laboratory reporting limits in Table 2-6 of the SAP/QAPP due to matrix interference.

Total and/or dissolved antimony, arsenic, copper, chromium, lead, nickel, and zinc were detected in concentrations greater than the MRLs in some or all elutriate samples. Metals were detected in concentrations above the TEL and (or) ERL in some samples, as summarized below.

- Total Arsenic – WC-5, WC-6, WC-8
- Dissolved Copper – LB-3
- Total Copper – LB-3, WC-10, WC-11, WC-13

TOC was analyzed in all 20 composite elutriate samples and two site water samples. TOC concentrations ranged from 1.1 to 21 mg/L.

TSS was analyzed in all 20 composite elutriate samples and two site water samples. TSS concentrations ranged from 19 to 290 mg/L.

PAHs

Total and dissolved PAHs were analyzed in all 20 composite elutriate samples and two site water samples. None of the PAHs were detected in concentrations greater than the MRL in any elutriate or site water samples; all results were U or J-qualified. Total PAHs ranged from 1.1 µg/L to 5.1 µg/L. There are no screening criteria for PAHs to compare sample results against.

Tributyltin

Total and dissolved tributyltin were analyzed in four composite elutriate samples (LB-1, LB-2, LB-3, and CP-16) and two site water samples. Tributyltin was detected in concentrations greater than the MDL in any elutriate or site water samples; all results were U-qualified.

Pesticides

Total and dissolved pesticides were analyzed in four composite elutriate samples (LB-1, LB-2, LB-3, and CP-16) and two site water samples. None of the pesticides were detected in concentrations greater than the MRL in any elutriate or site water samples; all results were U- or J-qualified. None of the pesticides were detected in concentrations greater than the CMC in any elutriate or site water samples. Total pesticides ranged from 0.063 µg/L to 0.067 µg/L.

PCBs

Total and dissolved PCBs and Aroclors were analyzed in four composite elutriate samples (LB-1, LB-2, LB-3, and CP-16) and two site water samples. None of the PCBs were detected in concentrations greater than the MRL in any elutriate or site water samples; all results were U- or J-qualified. Total EPA Region 4 PCBs for all samples were 15 ng/L. Total NOAA PCBs ranged from 20 ng/L to 21 ng/L. There are no screening criteria for PCBs or Aroclors to compare sample results against.

Dioxins and Furans

Total and dissolved dioxins were analyzed in four composite elutriate samples (LB-1, LB-2, LB-3, and CP-16) and two site water samples. None of the individual congeners were detected in concentrations greater than the MRL except for OCDD total in CP-16. All of the other results were U- or J-qualified. The total TEQ was calculated as the sum of the individual congener TEQs and ranged from 0.309 pg/L in sample LB-2 Dissolved to 1.47 pg/L in sample CP-16 Total. There are no screening criteria to compare results against.

1 INTRODUCTION

1.1 Project Area Description

The U.S. Army Corps of Engineers, Charleston District (USACE) is responsible for performing maintenance dredging on the Atlantic Intracoastal Waterway (AIWW) between the North Carolina—South Carolina border and Port Royal Sound. The authorized project depth in the AIWW is -12 feet mean low water (MLW) with 1 foot of allowable overdepth dredging. The dredged material generated from channel maintenance is disposed of in numerous, small upland confined disposal areas along the entire length of the AIWW and two open-water disposal areas. USACE periodically samples and analyzes the dredge material by collecting sediment samples from within the AIWW channel to monitor the chemical and physical characteristics of the dredged material being disposed of in the various disposal areas. This report summarizes the results from the sampling and analysis effort involving collection of sediment and elutriate samples from various locations within the AIWW federal navigation channel in Beaufort, Colleton, Charleston, Georgetown, and Horry counties, South Carolina. Map 1 provides an overview of the project area and the sampling locations.

1.2 Objectives

The objective of this sediment evaluation is to determine compliance with the *Evaluation of Dredged Material for Discharge in Waters of the U.S. – Testing Manual* (ITM) (EPA and USACE 1998) and the South Carolina Department of Health and Environmental Control (SCDHEC) quality control requirements. Specific objectives are to:

- Provide a detailed Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP) for approval before sampling and analysis work begins.
- Collect the required number and volume of sediment samples from the project area that are representative of proposed dredge material and with sufficient positioning accuracy to ensure that samples are collected from within the dredging prism.
- Conduct sediment and elutriate analyses following the testing requirements set forth in the SAP/QAPP.
- Provide a report to USACE that describes the field sampling effort and presents the results of the physical/chemical analysis of sediment, elutriates, and site water. The report should provide the basis for a scientific recommendation regarding the management of these dredge materials.

Deliverables for this work include:

- Draft and Final SAP/QAPP
- Health and Safety Plan/Accident Prevention Plan (HSP/APP)
- Draft and Final Sediment Testing Report
- Laboratory data reports
- Chemical Quality Assurance Report (CQAR)
- Field paperwork to include the Daily Quality Control Reports (DQCRs)
- Photos of samples

ANAMAR coordinated and directed operations for this project and worked closely with USACE to develop a sampling and analysis scheme, schedule, and deliverables. ANAMAR also reviewed all data and produced this report summarizing the results of the physical and chemical testing of project sediment, elutriate, and site water samples. Exhibits 1-1 and 1-2 indicate the principal users of data, the subcontractors, and their respective areas of responsibility associated with this evaluation.

Exhibit 1-1. Principal Data Users and Decisions Associated with This Project

Agency or Company	Area(s) of Responsibility
U.S. Army Corps of Engineers, Charleston District	Provide contracting support; provide technical input regarding the scope of work (SOW) and project deliverables
South Carolina Department of Health and Environmental Control, Bureau of Water	Issue water quality certification of dredged sediment for upland disposal per Section 401 of the Clean Water Act

Exhibit 1-2. Prime and Subcontractors and Responsibilities Associated with This Report

Company and Contact Information	Area(s) of Responsibility
Prime Contractor: ANAMAR Environmental Consulting, Inc Project Manager: Michelle Rau 2106 NW 67th Place, Suite 5 Gainesville, FL 32653 Phone: 352-318-5773 mrau@anamarinc..com	Prepare project deliverables, lead the field sampling effort, coordinate with the labs, manage the project
Vessel Operator: Athena Technologies Project Manager: Adam Freeze 1293 Graham Farm Road McClellanville, SC 29458 Phone: 843-887-3800 Email: adam_freeze@athenatechnologies.com	Provide vessel for sampling; provide crew to captain vessel and operate sampling equipment
Chemistry Laboratory: TestAmerica Project Manager: Carrie Gamber 301 Alpha Drive Pittsburgh, PA 15238 Phone: 412-963-2428 E-mail: Carrie.Gamber@testamericainc.com	Laboratory sample preparation and chemical analysis of sediment, site water, and elutriates; sample holding and archiving
Geotechnical Laboratory: Terracon Project Manager: Chris Martin, Sr. 8001 Baymeadows Way Jacksonville, FL 32256 Phone: 904-900-6494 Email: crmartin2@terracon.com	Laboratory sample preparation and physical analysis of sediment; sample holding and archiving

2 MATERIALS AND METHODS

2.1 Project Design and Rationale

A SAP/QAPP was prepared by ANAMAR and approved by USACE (Appendix A). The SAP/QAPP details the sampling design and rationale, analyses to be performed, and reporting requirements. The project area is divided into three geographic regions along the full span of the AIWW project area: Little River (near Myrtle Beach) to Winyah Bay (near Georgetown), Winyah Bay to Charleston, and Charleston to Port Royal (near Beaufort). The field sample collection efforts involved collection of sediment grab samples from 58 sampling locations and site water from two locations. Sampling locations were selected by USACE based on shoaling depths according to recent bathymetric surveys and were distributed to provide adequate representation for each geographic area along the AIWW.

Twenty composite samples were analyzed. Two to six sediment subsamples were combined into each composite sample for physical, sediment chemistry, and elutriate chemistry analysis. The sample IDs, compositing scheme, and general analytical requirements are summarized in Exhibit 2-1. Summaries of field sampling materials and methods and specific analytes of interest are provided in Exhibits 2-2 and 2-3, respectively. Coordinates of the sampled locations are provided in Tables 1 and 2, and the locations are shown in Maps 1 through 4.

Exhibit 2-1. Dredging Units, Volumes, Project Depths, and Rankings

Sample ID	Composite ID	Analytical Requirements (for composite samples)
Little River to Winyah Bay		
AIWW21-LB-1A	AIWW21-LB-1	**Physical plus full suite of chemical**
AIWW21-LB-1B		
AIWW21-LB-2A	AIWW21-LB-2	**Physical plus full suite of chemical**
AIWW21-LB-2B		
AIWW21-LB-3A	AIWW21-LB-3	**Physical plus full suite of chemical**
AIWW21-LB-3B		
Winyah Bay to Charleston		
AIWW21-WC-4A	AIWW21-WC-4	Physical plus metals and PAHs
AIWW21-WC-4B		
AIWW21-WC-4C		
AIWW21-WC-4D		
AIWW21-WC-4E		
AIWW21-WC-5A	AIWW21-WC-5	Physical plus metals and PAHs
AIWW21-WC-5B		
AIWW21-WC-5C		
AIWW21-WC-6A	AIWW21-WC-6	Physical plus metals and PAHs
AIWW21-WC-6B		
AIWW21-WC-7A	AIWW21-WC-7	Physical plus metals and PAHs
AIWW21-WC-7B		
AIWW21-WC-7C		
AIWW21-WC-8A	AIWW21-WC-8	Physical plus metals and PAHs
AIWW21-WC-8B		

Sample ID	Composite ID	Analytical Requirements (for composite samples)
AIWW21-WC-9A	AIWW21-WC-9	Physical plus metals and PAHs
AIWW21-WC-9B		
AIWW21-WC-9C		
AIWW21-WC-9D		
AIWW21-WC-9E		
AIWW21-WC-10A	AIWW21-WC-10	Physical plus metals and PAHs
AIWW21-WC-10B		
AIWW21-WC-11A	AIWW21-WC-11	Physical plus metals and PAHs
AIWW21-WC-11B		
AIWW21-WC-12A	AIWW21-WC-12	Physical plus metals and PAHs
AIWW21-WC-12B		
AIWW21-WC-12C		
AIWW21-WC-12D		
AIWW21-WC-12E		
AIWW21-WC-12F		
AIWW21-WC-13A	AIWW21-WC-13	Physical plus metals and PAHs
AIWW21-WC-13B		
Charleston to Port Royal		
AIWW21-CP-14A	AIWW21-CP-14	Physical plus metals and PAHs
AIWW21-CP-14B		
AIWW21-CP-15A	AIWW21-CP-15	Physical plus metals and PAHs
AIWW21-CP-15B		
AIWW21-CP-15C		
AIWW21-CP-16A	AIWW21-CP-16	**Physical plus full suite of chemical**
AIWW21-CP-16B		
AIWW21-CP-17A	AIWW21-CP-17	Physical plus metals and PAHs
AIWW21-CP-17B		
AIWW21-CP-17C		
AIWW21-CP-17D		
AIWW21-CP-17E		
AIWW21-CP-18A	AIWW21-CP-18	Physical plus metals and PAHs
AIWW21-CP-18B		
AIWW21-CP-19A	AIWW21-CP-19	Physical plus metals and PAHs
AIWW21-CP-19B		
AIWW21-CP-20A	AIWW21-CP-20	Physical plus metals and PAHs
AIWW21-CP-20B		
AIWW21-CP-20C		
AIWW21-CP-20D		
AIWW21-SW-1* (North)	N/A	See Exhibit 2-3
AIWW21-SW-2* (South)	N/A	See Exhibit 2-3

Note: All subsamples were also analyzed for physicals (grain size only)

* Two site water (SW) sample locations were chosen in the field for background water chemistry and elutriate generation. SW-1 was located near McClellanville and SW-2 was located near Charleston.

Exhibit 2-2. Summary of Field Sampling Materials and Methods

FIELD SAMPLE COLLECTION:
- 20 project sediment composites (composed of 2 to 6 samples each [*N* = 58])
- 2 site water samples for water chemistry and elutriate preparation

SAMPLING GEAR:
- Grab sediment samples collected with modified Petersen grab sampler
- Site water collected with pneumatic stainless steel pump

VESSEL:
- S/V *Artemis* (30-foot pontoon barge)
- 21-foot Parker

PRESERVATION:
- Sediment chemistry and water samples were kept at or below 4°C
- Water samples in various containers, with or without stabilizing agents, were kept at or below 4°C
- Holding-time requirements were analyte- and test-specific

IN SITU WATER COLUMN MEASUREMENTS:
- YSI multiprobe meter
- Hach 2100P turbidimeter

Exhibit 2-3. Analytical Scheme

	Sample	Subsamples	AIWW21-LB Composites	AIWW21-WC Composites	AIWW21-CP-16	AIWW21-CP Composites (except CP-16)	Site Water Samples
Physical Analysis	Hydrometer Grain Size	--	Y	Y	Y	Y	--
	Grain Size without hydrometer	Y	--	--	--	--	--
	Specific Gravity	--	Y	Y	Y	Y	--
	Total Solids	--	Y	Y	Y	Y	--
	Atterberg Limits	--	Y	Y	Y	Y	--
	Settling Rates	--	Y	Y	Y	Y	--
Sediment Chemistry	TOC	--	Y	Y	Y	Y	
	Metals	--	Y	Y	Y	Y	--
	PAHs	--	Y	Y	Y	Y	--
	Pesticides	--	Y	--	Y	--	--
	PCBs (Congeners and Aroclors)	--	Y	--	Y	--	--
	Dioxins	--	Y	--	Y	--	--
	Butyltins	--	Y	--	Y	--	--
Elutriate/Water Chemistry*	TOC	--	Y	Y	Y	Y	Y
	Total Suspended Solids (only on total elutriates, not dissolved fraction)	--	Y	Y	Y	Y	Y
	Metals	--	Y	Y	Y	Y	Y
	PAHS	--	Y	Y	Y	Y	Y
	Pesticides	--	Y	--	Y	--	Y
	PCBs (Congeners and Aroclors)	--	Y	--	Y	--	Y
	Dioxins	--	Y	--	Y	--	Y
	Butyltins	--	Y	--	Y	--	Y

* Elutriates were prepared using the modified elutriate preparation method. Elutriates and background site water chemistry samples were analyzed for total and dissolved fractions.

2.2 Sample Collection Techniques

2.2.1 Field Effort

Mobilization, field sampling, and shipping took place from May 3 through May 10, 2021. Field personnel consisted of scientists from ANAMAR and Athena Technologies. Athena provided two vessels for the sampling effort: the S/V *Artemis* and a 21-foot Parker. The Parker was the primary sampling vessel for sediment grab sampling operations. The S/V *Artemis* was used for collection of background site water chemistry samples and water for elutriate generation. Given the distance between groups of sampling locations, the team mobilized from different boat ramps each day. Samples were stored on ice in coolers until they could be shipped to the laboratories for preparation and analysis. Exhibit 2-4 is a summary of the field mobilization, sampling, and shipping efforts. For more details, refer to the sampling logs and DQCRs in Appendix B.

Exhibit 2-4. Field Sampling Activities

Date	General Activity
3-May-2021	• Mobilize to Athena headquarters in McClellanville, SC • Organize sampling kits, load equipment into vehicles/boat • Review sampling plan and logistics with team
4-May-2021	• Mobilize to boat ramp in Myrtle Beach, SC • Collect samples AIWW21-LB-1, 2, 3 (Myrtle Beach area)
5-May-2021	• Mobilize to boat ramp in Georgetown, SC • Collect samples AIWW21-WC-4 through 13 (Georgetown to Mt Pleasant)
6-May-2021	• Mobilize to boat ramp in Charleston, SC • Collect samples AIWW21-CP-14 through 20 (Charleston to Beaufort) • Second team: Collect site water for background chemistry analysis and elutriate generation for all samples north of Charleston Harbor • Prepare for next day shipment
7-May-2021	• Ice samples and pack coolers for first shipment • Collect site water for background chemistry analysis and elutriate generation for all samples south of Charleston Harbor • Clean and pack up equipment
8-May-2021	• Ice and pack remaining samples for transport back to Gainesville • First shipment of samples arrives at laboratory • Travel back to Gainesville
10-May-2021	• Ice and pack coolers for second shipment
11-May-2021	• Second shipment of samples arrives at laboratory

2.2.2 Site Positioning

Sampling station locations were chosen by USACE to coincide with the dredging prism and were based on the most recent data from a bathymetric survey. Stations sampled are shown in Maps 1 through 4.

Target coordinates were uploaded to a Panasonic Toughbook computer and associated TKO Global Navigation Satellite System (GNSS) on Athena's vessels as well as on a Garmin Montana hand-held GPS (used as a backup unit). Uploaded coordinates in both GPS units were reviewed and compared with the original coordinates to verify positioning prior to field sampling. All samples were taken within 50 feet of the target station. Navigation and positioning of the vessel was handled by a U.S. Coast Guard-certified captain under direction of the ANAMAR project manager or field team leader.

Coordinates of each station were recorded in the field. Tables 1 and 2 summarize field data as recorded on field sheets during sampling.

2.2.3 Decontamination Procedures

All equipment contacting sediment or water samples was cleaned and decontaminated as described below. Work surfaces on the sampling vessel were cleaned before the sampling day began and before leaving each station. All equipment contacting sediment or water samples was decontaminated between composite samples to prevent cross-contamination. Disposable nitrile gloves used at a given sampling station were replaced with new gloves prior to sampling at the next station.

Decontamination Procedures

- Wash and scrub using site water or tap water to remove gross contamination
- Wash/scrub with Liquinox detergent
- Rinse with site water
- Rinse with deionized water
- Rinse 2 times with pesticide-grade isopropanol
- Rinse 2 times with pesticide-grade hexane
- Rinse 3 times with deionized water
- Equipment not being used immediately was air-dried and stored wrapped in new, clean aluminum foil

Any derived waste was contained and disposed of in accordance with federal, state, and local laws.

2.2.4 Water Column Measurements

A YSI multiprobe meter and a Hach 2100P turbidimeter were used to measure water column parameters at the two site water stations. Meters were calibrated each day prior to use according to manufacturer's instructions. An end-of-day reading was also taken to document that the instrument remained calibrated within acceptance criteria. Measured water column parameters and associated data consisted of

- Time of reading
- Depth of measurement (feet)
- Water temperature (°C)
- pH (units)
- Salinity (parts per thousand [ppt])
- Conductivity (mS/cm)
- Dissolved oxygen (mg/L and percent saturation)
- Turbidity (NTU, near-surface only)

A turbidity reading was not taken at station AIWW21-SW1 because the meter was not working properly. Water depth measurements, tidal cycle, and weather observations were recorded on water sampling logs and are summarized in Table 2. Water column measurements and instrument calibration logs are in Appendix B.

2.2.5 Sediment Sampling with Grab Sampler

Grab samples were collected with a custom stainless steel Petersen-style grab sampler (8.8-gallon capacity). Excess water was allowed to drain from the sampler prior to placing the sediment in the bin. When the volume of sediment required for analysis was collected, a photograph of the material was taken and notes on the sample's appearance and characteristics were recorded on a project-specific field log. Using decontaminated stainless steel utensils (e.g., spoons, scrapers) and disposable nitrile gloves, the sample was placed in pre-cleaned, labeled Teflon® bags and stored on ice. Upon return to the marina, the iced sample coolers were transferred to a refrigerated truck for preservation at or below 4°C.

Table 1 provides additional information on grab sampling. Copies of the field logs for grab sampling are provided in Appendix B.

2.2.6 Water Sampling

Site water for elutriate preparation was collected from two stations using a stainless steel and Teflon® pneumatic pump attached to a Nitrile®-lined hose. All equipment contacting sampled water was decontaminated prior to use. The suction hose was lowered through the water column. A stainless steel weight was attached to the end of the hose with stainless steel cable to allow the hose to hang approximately 3 feet above the sediment surface. Another section of Viton® hose was attached to the discharge nozzle of the pump. Pressurized air was allowed to enter the pump, which drove a diaphragm that pushed water through the tubing. An air-pressure valve was used to adjust flow.

Site water was containerized in decontaminated containers for elutriate chemical analysis. Using the same pump, an additional amount was collected from each station and was containerized in pre-cleaned, pre-preserved glass and plastic bottles provided by the laboratory. The pump and tubing were flushed with approximately 10 pump and tubing volumes of site water prior to collecting sample at each station.

All water samples were placed in ice-filled coolers for storage at or below 4°C. Water sampling locations are shown on the overview map. Water sampling dates and times, station coordinates, and related information are included in Table 2. Copies of water sampling logs are in Appendix B.

2.2.7 Sample Processing and Shipping

All compositing and homogenization activities were conducted by ANAMAR and Athena personnel as samples were collected in the field in accordance with the scheme presented in Subsection 2.1. Following compositing and homogenizing, appropriate volumes of each composite were divided and placed in method-specific, pre-cleaned, pre-labeled containers provided by the laboratory (for chemical analysis) or plastic bags (for physical analysis). Once composited, the samples were placed in coolers on ice.

The first set of samples was shipped from Athena headquarters in McClellanville, SC, to the Eurofins TestAmerica lab in Pittsburgh, PA, on May 7, 2021, for next day delivery. The second set of samples was shipped from ANAMAR headquarters in Gainesville, FL, to Eurofins

TestAmerica lab in Pittsburgh, PA, on May 10, 2021, for next-day delivery. The physical samples were delivered by ANAMAR personnel to Terracon in Jacksonville, FL, on May 12, 2021. From the time of collection to the time the samples arrived at the laboratory, sediment and site water chemistry samples were stored in coolers on ice. Ice was refreshed regularly, as needed, to ensure proper preservation.

Chain-of-custody records for each laboratory were completed to reflect the final sample names and to identify the analyses and analytical methods required. These chain-of-custody forms accompanied the samples during shipment to the laboratories. Copies of final signed chain-of-custody forms are included in the laboratory reports (Appendices C and D).

2.3 Physical and Chemical Analytical Procedures

2.3.1 Physical Procedures

Terracon performed physical analyses of all sediment samples. ANAMAR performed quality assurance/quality control (QA/QC) on sediment physical data and presented the data in summary tables.

2.3.1.1 Grain Size Distribution

Gradation tests were performed in general accordance with methods ASTM D-422 and ASTM D-1140. Each representative sample was air-dried and dry-prepped in accordance with method ASTM D-421, and results of the sieve analysis of material larger than a #10 sieve (2.00-mm mesh size) were determined. The minus #10 sieve material was then soaked in a dispersing agent. Following the soaking period, the sample was placed in a mechanical stirring apparatus and then in a sedimentation cylinder where hydrometer readings were taken over a 24-hour period. After the final hydrometer reading was taken, the sample was washed over a #200 sieve (0.075-mm mesh size), placed in an oven, and dried to a constant weight. After drying, the sample was sieved over a nest of sieves to determine the gradation of the material greater than #200 sieve size. Cumulative frequency percentages were graphed and presented by Terracon on USACE Form 2087 (Appendix C). ANAMAR tabulated and graphed the grain size distribution by sample and composite.

2.3.1.2 Atterberg Limits

Tests for liquid and plastic limits for the composites and the reference were performed in general accordance with ASTM D-4318, wet method, as follows. The minus #40 sieved material was mixed with a small amount of water and placed in a liquid limit device. A groove was cut using a flat grooving tool and the liquid limit was determined by the number of drops of the cup. When the number of drops was in the desired range, a moisture sample was obtained and placed in a 230°C oven and dried to a constant weight. This was repeated until three determinations had been obtained: one between 15 and 25 blows, one between 20 and 30 blows, and one between 25 and 35 blows. The reported value is the intersecting value at 25 blows when all three are plotted.

The plastic limit was determined by slowly air-drying a small sample left over from the liquid limit determination. The sample was rolled and air-dried until the thread became crumbly and lacked cohesion. When this point was reached, the sample was laced in a tare and weighed, and then placed in an oven and dried to a constant weight. The moisture content is the plastic limit.

2.3.1.3 Specific Gravity

Specific gravity was determined for the composites and the reference in general accordance with method ASTM D-854. Each sample was placed in a mechanical stirring device and deionized water was added to form a slurry. The slurry was then transferred to a pycnometer and was de-aired by applying a vacuum. After vacuuming, the pycnometer with sample was allowed to reach thermal equilibrium. The water level was adjusted to a calibration mark and the pycnometer with sample was weighed. After the pycnometer with sample weight was recorded, the sample was emptied into a drying container and placed in an oven until a constant dry mass of sediment solids was obtained.

2.3.2 Chemical Analytical Procedures

Eurofins TestAmerica performed all chemical analyses of sediment, water, and elutriate, samples in accordance with published procedures. Analytical methods, preparation methods, target detection limits, and laboratory reporting limits for sediment, water, and tissue analyses are provided in Subsection 13.3 of the QAPP (Appendix A). Elutriates were generated using the modified elutriate preparation procedure described in *Environmental Effects of Dredging, Technical Notes EEDP-04-2* (USACE 1985). ANAMAR performed QA/QC on these data and presented the data in summary tables. Complete laboratory reports are provided in Appendix D. Exhibit 2-5 provides a summary of analytical methods.

Exhibit 2-5. Summary of Methods and Equipment Used during Sediment and Elutriate Analysis

EPA Method	Instrument/ Procedure	Methodology Summary
and 6020 (trace metals)	ICP and ICP/MS for trace metals	Inductively coupled plasma (ICP) with or without mass spectrometry (MS) is applicable to the determination of sub-µg/L concentrations of a large number of elements in water samples and in waste extracts or digests. Acid digestion prior to filtration and analysis is required for aqueous samples, sediments, and tissues for which total (acid-leachable) elements are required.
7470 (mercury in water)	Mercury Analyzer Cold Vapor Atomic Absorption (water)	Method 7470 is a cold-vapor atomic absorption procedure approved for determining the concentration of mercury in mobility-procedure extracts and aqueous wastes. All samples are subjected to an appropriate dissolution step before analysis.
7471 (mercury in sediment and tissues)	Mercury Analyzer Cold Vapor Atomic Absorption	Method 7471 is approved for measuring total mercury (organic and inorganic) in sediments and tissues. All samples are subjected to an appropriate dissolution step before analysis. If this dissolution procedure is not sufficient to dissolve a specific matrix type or sample, this method is not applicable for that matrix.
8081 (pesticides)	Gas Chromatograph	Method 8081 is used to determine the concentrations of various organochlorine pesticides in extracts from solid and liquid matrices using fused-silica, open-tubular capillary columns with electron capture detectors (ECD) or electrolytic conductivity detectors (ELCD). The compounds that can be run by this method may be determined by a single- or a dual-column analysis system.

EPA Method	Instrument/ Procedure	Methodology Summary
8082 (PCB congeners)	Gas Chromatograph	Method 8082 is used to determine the concentrations of PCBs as individual PCB congeners in extracts from solid, tissue, and aqueous matrices using open-tubular capillary columns with ECD or ELCD. The target compounds may be determined by a single- or dual-column analysis system.
8270 E (PAHs)	Gas Chromatograph/ Mass Spectrometer	This method is used to determine the concentration of semi-volatile/PAH organic compounds in extracts prepared from many types of solid matrices and water samples. Direct injection of a sample may be used in limited applications.
8290 -Dioxins and Furans	High Resolution Mass Spectroscopy (HR/MS)	This method uses HR/MS to prepare and analyze sediment samples for dioxins and furans.
EPA 9060	Total Organic Carbon (TOC) Analyzer	Method EPA 9060 is used to determine the concentration of organic carbon in sediment by catalytic combustion or wet chemical oxidation. The carbon dioxide formed from this procedure is measured and is proportional to the TOC in the sample.
Krone et al. (1989)	Grignard Reaction/Gas Chromatograph/ Flame Photometric	This method refers to the Grignard reaction, gas chromatograph, and flame photometric detection of di-n-butyltin, n-butyltin, and tri-n-butyltin cations in sediment, elutriates, and tissues. All samples are subjected to an extraction phase prior to analysis, and the concentration is determined using standard organic protocols.
SM2540D (Total Suspended Solids)	Electronic scale and oven	Elutriate or site water is filtered through a glass fiber filter and heated to 105º C until dried. The filter is then weighed on an electronic scale. The difference between the initial reading prior to filtration and the post filtration mass is used to determine the total suspended solids.

2.4 Data Reduction and Applicable Technical Quality Standards

Raw field and laboratory data were summarized and compiled into tables. Maps 1 through 4 are used to associate the results spatially with respect to sampling locations.

2.4.1 Sediment Chemistry

Laboratory analytical results for sediment samples are compared to published sediment screening values as appropriate. These levels are the threshold effects level (TEL) and the effects range low (ERL). The TEL represents the concentration below which adverse effects are expected to occur only rarely. The ERL is the value at which toxicity may begin to be observed in sensitive species (Buchman 2008). Dioxin and furan results are compared to the TEL and the apparent effects threshold (AET). These comparisons are for reference use only and are not intended for regulatory decision-making.

2.4.2 Elutriate and Site Water Chemistry

Results of elutriate and water sample analyses were compared to the latest published water quality criteria of criteria maximum concentration (CMC [synonymous with 'acute']) established for both the U.S. Environmental Protection Agency (EPA) and the state of South Carolina. The CMC is an estimate of the highest concentration of a pollutant in saltwater to which an aquatic community can be exposed briefly without resulting in an unacceptable effect (USEPA 2015, Buchman 2008). Where applicable, the South Carolina criteria are either equal to or slightly higher than the national criteria.

2.5 Reporting Limits

The sediment chemical concentration, MDL, and method reporting limit (MRL) were reported on a dry weight basis. The chemical concentration, MDL, and MRL for water and elutriates were reported as a liquid. The MDL refers to the minimum concentration of a given analyte that can be measured and reported with a 99% confidence level that the analyte concentration is greater than zero (40 CFR Part 136 Appendix B). The MRL refers to the minimum concentration at which the laboratory will report analytical chemistry data with confidence in quantitative accuracy of a given datum. Common laboratory procedures for defining an MRL include assigning it to a fixed factor above the MDL or by using the lowest calibration standard. MRLs are often adjusted by the laboratory for sample-specific parameters such as sample weight, percent solids, or dilution.

3 RESULTS AND DISCUSSION

3.1 Field Data

Conditions during the May 3 through 10, 2021, field effort were acceptable for sampling. A summary of the grab sample collection is provided in Table 1. Water column parameters were recorded at two site water locations and are summarized in Table 2. At site water station, SW-1, a turbidity reading could not be collected due to issues with the meter.

3.2 Sediment Physical Results

Physical analysis was conducted for all project sediment composites and subsamples. Map 5 depicts grain size distributions of the composite samples along the AIWW project area. Exhibit 3-1 summarizes grain size distribution and Unified Soil Classification System (USCS) soil classifications. Complete results of physical testing for subsamples and composite samples are presented in Tables 3 and 4. The laboratory report of physical analytical results using USACE Form 2087 is provided in Appendix C.

Exhibit 3-1. Percent Grain Size Distribution, USCS Classification, and Total Solids

Project Area	Composite ID: AIWW21-	Grain Size Distribution[1] (percent by weight)			USCS Soil Class[2]	Total Solids (%)
		Gravel	Total Sand	Silt & Clay		
Little River to Winyah Bay	LB-1	0.6	96.7	2.7	SP	77.4
	LB-2	0.0	98.7	1.3	SP	82.5
	LB-3	0.0	98.9	1.1	SP	79.8
Winyah Bay to Charleston	WC-4	0.0	42.2	57.8	CH	32.9
	WC-5	0.0	5.3	94.7	CH	25.2
	WC-6	0.0	9.6	90.4	CH	31.1
	WC-7	0.0	10.2	89.8	CH	28.4
	WC-8	0.0	1.7	98.3	CH	24.8
	WC-9	0.0	2.9	97.1	MH	26.6
	WC-10	0.0	1.2	98.8	MH	21.4
	WC-11	0.0	93.2	6.8	SP-SM	70.7
	WC-12	0.0	61.8	38.2	SC	38.5
	WC-13	0.0	8.1	91.9	MH	21.1
Charleston to Port Royal	CP-14	0.0	94.5	5.5	SP-SM	75.0
	CP-15	0.0	49.4	50.6	CH	39.2
	CP-16	0.0	15.8	84.2	MH	30.0
	CP-17	0.0	5.2	94.8	CH	22.7
	CP-18	0.3	64.4	35.3	SC	45.0
	CP-19	0.0	42.0	58.0	CH	45.1
	CP-20	0.0	8.5	91.5	CH	26.3

[1] Particle sizes: gravel ≥4.750 mm, sand = 0.075–4.749 mm, silt & clay <0.075 mm.

[2] USCS classes defined: CH = clay of high plasticity; MH = silt of high plasticity, elastic silt; SC = clayey sand; SM = silty sand; SP = poorly graded sand.

See Tables 3 and 4 for complete physical analysis and total solids results for sediment composites.

Little River to Winyah Bay

The three samples collected in the Little River to Winyah Bay area are generally described as poorly graded sand (SP) with mostly medium- to fine-grained quartz, trace silt, and trace clay. Sand ranged from 96.7% to 98.9%, and silt/clay ranged from 1.1% to 2.7%.

Winyah Bay to Charleston

Ten samples were collected from south of Georgetown to Mt. Pleasant. Two of the samples, WC-11 and WC-12, were predominately sand with 61.8% to 93.2%, respectively. The rest of the samples from this reach were predominately fine-grained material with silt and clay ranging from 57.8% to 98.8%.

Samples WC-4 through WC-8, collected from Mt. Pleasant to south of McClellanville, are generally described as fat clay (CH) with some silt and trace medium to fine-grained quartz sand. Samples WC-9 and WC-10, collected near McClellanville, and sample WC-13, collected south of Georgetown, are generally described as elastic silt (MH) with some clay and trace medium- to fine-grained quartz sand. Samples WC-11 and WC-12, collected from north of McClellanville, are generally described as poorly graded sand/silty sand (SP-SM) or clayey sand (SC), respectively.

Charleston to Port Royal

Seven samples were collected from Charleston to Port Royal. Two of the samples, CP-14 and CP-18, were predominately sand with 64.4% to 94.5%, respectively. The rest of the samples from this area were predominately fine-grained material with silt and clay ranging from 50.6% to 94.8%.

Samples CP-14 and CP-18 are generally described as poorly graded sand/silty sand (SP-SM) or clayey sand (SC), respectively. Samples CP-15 and CP-19 are generally described as sandy fat clay (CH) with some medium- to fine-grained quartz sand. Sample CP-16 is generally described as elastic silt (MH) with some clay and little medium- to fine-grained quartz sand. Samples CP-17 and CP-20 are generally described as fat clay (CH) with little silt and few medium- to fine-grained quartz sand.

3.3 Sediment Chemistry

Analytical results for sediment chemistry are presented in Tables 5 through 9. Full sediment chemistry analyses were performed on project composite samples LB-1 through LB-3 and CP-16. Limited sediment chemistry (metals and PAHs only) analyses were performed on the rest of the composite samples. Analytical results were compared to published sediment screening criteria (i.e., TEL, ERL, AET), which are defined in Section 2.4.1. The laboratory report of sediment chemistry results is provided in Appendix D.

3.3.1 Total Organic Carbon and Total Solids

TOC concentrations ranged from <0.13% in sample LB-3 to 6.4% in sample CP-17. The results for TOC tended to follow the grain-size characteristics, with TOC concentrations increasing with the proportion of silts and clays in the sediment.

Total solids ranged from 21.1% in sample WC-13 to 82.5% in sample LB-2. The results for total solids also tended to follow the grain-size characteristics, with percent total solids increasing with the proportion of sand (Exhibit 3-1). In the five samples with >90% sand (LB-1, LB-2, LB-3, WC-11, and CP-14), total solids ranged from 70.7% to 82.5%. The rest of the samples had percent fines (sand and clay) ranging from 35.3% to 98.8%, and total solids in those samples ranged from 21.1% to 45.1%. Table 5 has complete results for TOC and total solids, including the laboratory MDLs and MRLs.

The relatively low total solids in several of the samples contributed to some of the MDL/MRLs being elevated above the target detection limits and laboratory reporting limits provided in Table 2-5 in the SAP/QAPP. A general discussion of elevated detection limits is provided in Section 4.4.4.3 for PAHs in sediment.

3.3.2 Metals and Tributyltin

Metals were analyzed in all 20 composite samples. Most metals were detected in concentrations greater than the MRL in all sediment samples, with the exception of mercury, selenium, and silver which were not detected above the MRL in any composite. Arsenic, copper, and nickel were detected in concentrations above the TEL and (or) ERL in some samples, as summarized below and in Exhibit 3-2. Table 5 has complete results, including the laboratory MDLs and MRLs.

Little River to Winyah Bay (LB-1 through LB-3)

None of the metals analyzed were detected in concentrations greater that the TEL and (or) ERL in any sample. Tributyltin was not detected in concentrations greater that the TEL and (or) ERL in any sample tested.

Winyah Bay to Charleston (WC-4 through WC-13)

Arsenic was detected in concentrations greater that the TEL and (or) ERL in all samples except WC-11. Copper and nickel were detected in concentrations greater that the TEL and (or) ERL in samples WC-10 and WC-13.

Charleston to Port Royal (CP-14 through CP-20)

Arsenic was detected in concentrations greater that the TEL and (or) ERL in all samples except CP-14 and CP-18. One composite sample (CP-16) was analyzed for tributyltin. Tributyltin was not detected in concentrations greater that the TEL and (or) ERL in that sample.

Exhibit 3-2. Summary of Analytical Results for Metals in Sediment Composites

Analyte	Concentrations (mg/kg)																					
	LB-1	LB-2	LB-3	WC-4	WC-5	WC-6	WC-7	WC-8	WC-9	WC-10	WC-11	WC-12	WC-13	CP-14	CP-15	CP-16	CP-17	CP-18	CP-19	CP-20	TEL	ERL
Antimony	ND	ND	ND	0.12	0.13	0.11	0.12	0.17	0.13	0.19	ND	0.10	0.26	ND	0.087	0.10	0.15	0.057	0.060	0.11	x	x
Arsenic	0.79	0.43	0.094	**18**	**21**	**18**	**20**	**25**	**22**	**23**	1.9	**9.7**	**22**	0.92	**11**	**15**	**20**	7.0	**9.3**	**16**	7.24	8.2
Cadmium	0.032	0.011	ND	0.11	0.049	0.047	0.042	0.051	0.056	0.054	ND	0.039	0.079	0.011	0.098	0.14	0.21	0.081	0.090	0.16	0.676	1.2
Chromium	3.5	1.3	0.68	33	42	40	38	45	43	478	4.0	22	48	2.8	26	36	51	18	24	41	52.3	81
Copper	0.84	0.13	ND	9.9	12	11	12	14	15	**19**	0.91	8.2	**21**	0.46	6.2	8.9	12	3.7	4.4	8.4	18.7	34
Lead	1.8	1.3	0.48	13	17	17	17	19	19	21	1.7	10	23	1.3	10	14	22	7.0	9.1	16	30.24	46.7
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	0.043	ND	ND	0.031	0.065	ND	ND	0.039	0.060	ND	ND	0.048	0.13	0.15
Nickel	0.88	0.18	0.12	9.9	13	12	12	15	14	**16**	1.5	7.4	**17**	0.78	7.2	10	14	4.7	5.8	11	15.9	20.9
Selenium	ND	ND	ND	0.49	0.48	0.41	0.46	0.61	0.59	0.69	ND	0.34	0.72	ND	0.39	0.57	0.84	0.30	0.31	0.59	x	x
Silver	ND	ND	ND	0.047	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.074	ND	ND	ND	0.73	1
Zinc	10	1.5	0.71	42	53	51	51	58	58	67	7.7	31	83	2.3	31	44	65	21	29	49	124	150

Non-detect (ND) = The analyte was not detected at or above the MDL.
x = No TEL or ERL published for that parameter.
Bolded values exceed the TEL and (or) ERL.
See Table 5 for complete metals results for sediment composites.

3.3.3 PAHs

PAHs were analyzed in all 20 composite samples. Table 6 has complete results, including the laboratory MDLs and MRLs. As mentioned in Section 3.3.1 and in Table 2.6 of the SAP/QAPP, the MDLs/MRLs for several samples were elevated above the target detection limit and laboratory reporting limit of 3.3 µg/kg. Refer to Section 4.4.4.3 for a discussion of the elevated detection limits due to matrix interferences and low total solids content.

Little River to Winyah Bay (LB-1 through LB-3)

In sample LB-1, all PAH analytes were detected in concentrations greater than the MDL, and the concentration of naphthalene exceeded the TEL. In sample LB-2, nine of the PAH analytes were detected in concentrations greater than the MDL, and the concentration of naphthalene exceeded the TEL. In sample LB-3, one of the PAH analytes (naphthalene) was detected in concentrations greater than the MDL. The MDLs for these samples met the target detection limit of 3.3 µg/kg provided in the SAP/QAP. The results are summarized in Exhibit 3-3.

Exhibit 3-3. Summary of Analytical Results for PAHs in Sediment Composites – Little River to Winyah Bay

Analyte	Concentrations (µg/kg)				
	LB-1	LB-2	LB-3	TEL	ERL
1-Methylnaphthalene^LMW	3.1	2.9	<0.94	x	x
2-Methylnaphthalene^LMW	5.8	6.2	<0.99	20.2	70
Acenaphthene^LMW	3.1	2.3	<1.2	6.71	16
Acenaphthylene	1.0	<0.87	<0.90	5.87	44
Anthracene^LMW	1.6	<1.0	<1.1	46.9	85.3
Benzo(a)anthracene^HMW	11	<1.8	<1.9	74.8	261
Benzo(a)pyrene^HMW	16	<1.7	<1.8	88.8	430
Benzo(b)fluoranthene	22	1.9	<1.0	x	x
Benzo(g,h,i)perylene	18	<0.86	<0.89	x	x
Benzo(k)fluoranthene	7.8	<1.2	<1.2	x	x
Chrysene^HMW	17	<2.2	<2.3	108	384
Dibenzo(a,h)anthracene^HMW	4.0	<2.5	<2.6	6.22	63.4
Fluoranthene^HMW	33	4.8	<1.1	113	600
Fluorene^LMW	2.1	1.6	<0.81	21.2	19
Indeno(1,2,3-cd)pyrene	15	<2.0	<2.1	x	x
Naphthalene^LMW	**47**	**56**	6.4	34.6	160
Phenanthrene^LMW	16	5.7	<1.1	86.7	240
Pyrene^HMW	25	3.9	<0.98	153	665
Total LMW PAHs	79	76	13	312	552
Total HMW PAHs	106	17	11	655	1700
Total PAHs	249	99	29	1684	4022

"<" less-than symbol indicates the analyte concentration was less than the MDL (U-qualified; value indicates the MDL)

x = No TEL or ERL published for that parameter.

Bolded values exceed the TEL and (or) ERL.

HMW = high molecular weight; LMW = low molecular weight

See Table 6 for complete PAH results for sediment composites.

Winyah Bay to Charleston (WC-4 through WC-13)

With the exception of naphthalene in sample WC-4, none of the PAHs were detected above the MRL in any sample (U or J-qualified). However, the MDLs and MRLs in these samples were elevated above the target detection limit and laboratory reporting limit of 3.3 µg/kg due to samples being diluted prior to being analyzed. See Section 4.4.4.3 for more information. In some samples, a few PAH analytes (acenaphthene, acenaphthylene, and dibenzo(a,h)anthracene) had U-qualified results with an MDL that exceeded the TEL and (or) ERL. The results are summarized in Exhibit 3-4.

Exhibit 3-4. Summary of Analytical Results for PAHs in Sediment Composites – Winyah Bay to Charleston

Analyte	Concentrations (µg/kg)											
	WC-4	WC-5	WC-6	WC-7	WC-8	WC-9	WC-10	WC-11	WC-12	WC-13	TEL	ERL
1-Methylnaphthalene^{LMW}	<4.6	<5.9	<4.8	<5.3	<6.1	<5.6	<7.1	<2.1	<4.0	<7.2	x	x
2-Methylnaphthalene^{LMW}	<4.8	<6.3	<5.1	<5.6	<6.4	<5.9	<7.4	<2.2	<4.2	<7.5	20.2	70
Acenaphthene^{LMW}	<5.8	<7.5	<6.1	<6.7	<7.7	<7.1	<8.9	<2.7	<5.0	<9.1	6.71	16
Acenaphthylene	<4.4	<5.7	<4.7	<5.1	<5.8	<5.4	<6.8	<2.0	<3.8	<6.9	5.87	44
Anthracene^{LMW}	<5.2	<6.8	<5.5	<6.0	<6.9	<6.4	<8.0	<2.4	<4.5	<8.2	46.9	85.3
Benzo(a)anthracene^{HMW}	<9.1	<12	<9.6	<11	<12	<11	<14	<4.2	<7.8	<14	74.8	261
Benzo(a)pyrene^{HMW}	<8.8	<11	<9.2	<10	<12	<11	<13	<4.0	<7.5	<14	88.8	430
Benzo(b)fluoranthene	<5.0	<6.4	<5.2	<5.7	<6.6	<6.1	<7.6	<2.3	<4.3	<7.7	x	x
Benzo(g,h,i)perylene	<4.4	<5.6	<4.6	<5.0	<5.8	<5.3	<6.7	<2.0	<3.7	<6.8	x	x
Benzo(k)fluoranthene	<6.1	<7.8	<6.4	<7.0	<8.0	<7.4	<9.3	<2.8	<5.2	<9.4	x	x
Chrysene^{HMW}	<11	<14	<12	<13	<15	<14	<17	<5.2	<9.6	<17	108	384
Dibenzo(a,h)anthracene^{HMW}	<13	<17	<14	<15	<17	<16	20	<6.0	<11	<20	6.22	63.4
Fluoranthene^{HMW}	7.7	<6.9	<5.6	<6.2	<7.0	<6.5	9.9	<2.5	<4.6	<8.3	113	600
Fluorene^{LMW}	<4.0	<5.1	<4.2	<4.6	<5.2	<4.9	<6.1	<1.8	<3.4	<6.2	21.2	19
Indeno(1,2,3-cd)pyrene	<10	<13	<11	<12	<13	<12	<15	<4.6	<8.6	<16	x	x
Naphthalene^{LMW}	23	24	11	22	18	<4.8	<6.0	<1.8	<3.4	<6.1	34.6	160
Phenanthrene^{LMW}	<5.4	<7.0	<5.7	<6.3	<7.2	<6.6	<8.3	<2.5	<4.7	<8.4	86.7	240
Pyrene^{HMW}	5.8	<6.2	<5.0	<5.5	<6.3	<5.9	9.2	<2.2	<4.1	<7.5	153	665
Total LMW PAHs	79	63	42	57	58	41	52	16	29	53	312	552
Total HMW PAHs	106	67	55	61	69	64	83	24	45	81	655	1700
Total PAHs	249	168	130	152	166	142	180	53	99	180	1684	4022

"<" less-than symbol indicates the analyte concentration was less than the MDL (U-qualified; value indicates the MDL)

x = No TEL or ERL published for that parameter.

Underlined values – MDL exceeds the TEL and (or) ERL.

See Table 6 for complete PAH results for sediment composites.

Charleston to Port Royal (CP-14 through CP-20)

None of the PAHs were detected above the MRL in any sample. All results were U- or J-qualified. However, the MDLs and MRLs in some of the samples were elevated above the target detection limit and laboratory reporting limit of 3.3 µg/kg due samples being diluted prior to being analyzed. See Section 4.4.4.3 for more information. In some samples, dibenzo(a,h)anthracene had U-qualified results with an MDL that exceeded the TEL and (or) ERL. The results are summarized in Exhibit 3-5.

Exhibit 3-5. Summary of Analytical Results for PAHs in Sediment Composites – Charleston to Port Royal

Analyte	Concentrations (µg/kg)								
	CP-14	CP-15	CP-16	CP-17	CP-18	CP-19	CP-20	TEL	ERL
1-Methylnaphthalene^{LMW}	<2.0	<3.8	<5.1	<6.7	<3.4	<3.3	<5.8	x	x
2-Methylnaphthalene^{LMW}	<2.1	<4.0	<5.3	<7.0	<3.5	<3.5	<6.1	20.2	70
Acenaphthene^{LMW}	<2.5	<4.8	<6.4	<8.4	<4.2	<4.2	<7.3	6.71	16
Acenaphthylene	<1.9	<3.7	<4.9	<6.4	<3.2	<3.2	<5.5	5.87	44
Anthracene^{LMW}	<2.3	<4.3	<5.7	<7.6	<3.8	<3.8	<6.6	46.9	85.3
Benzo(a)anthracene^{HMW}	<4.0	<7.6	12	<13	<6.6	<6.6	<11	74.8	261
Benzo(a)pyrene^{HMW}	<3.8	<7.3	<9.6	<13	<6.4	<6.3	<11	88.8	430
Benzo(b)fluoranthene	<2.2	<4.1	<5.5	<7.2	<3.6	<3.6	<6.2	x	x
Benzo(g,h,i)perylene	<1.9	<3.6	<4.8	<6.3	<3.2	<3.2	<5.5	x	x
Benzo(k)fluoranthene	<2.6	<5.0	<6.6	<8.8	<4.4	<4.4	<7.6	x	x
Chrysene^{HMW}	<4.9	<9.3	<12	<16	<8.2	<8.1	<14	108	384
Dibenzo(a,h)anthracene^{HMW}	<5.6	<11	<14	<19	<9.4	<9.4	<16	6.22	63.4
Fluoranthene^{HMW}	4.4	4.9	19	<7.7	<3.9	<3.9	<6.7	113	600
Fluorene^{LMW}	<1.7	<3.3	<4.4	<5.7	<2.9	<2.9	<5.0	21.2	19
Indeno(1,2,3-cd)pyrene	<4.4	<8.3	<11	<15	<7.3	<7.3	<13	x	x
Naphthalene^{LMW}	<1.7	<3.3	<4.3	<5.7	<2.9	<2.8	<4.9	34.6	160
Phenanthrene^{LMW}	3.4	<4.5	5.9	<7.8	<3.9	<3.9	<6.8	86.7	240
Pyrene^{HMW}	3.9	6.3	17	<6.9	<3.5	<3.5	<6.0	153	665
Total LMW PAHs	16	28	37	49	25	24	43	312	552
Total HMW PAHs	27	46	84	76	38	38	65	655	1700
Total PAHs	55	99	154	168	84	84	145	1684	4022

"<" less-than symbol indicates the analyte concentration was less than the MDL (U-qualified; value indicates the MDL)

x = No TEL or ERL published for that parameter.

Underlined values – MDL exceeds the TEL and (or) ERL.

See Table 6 for complete PAH results for sediment composites.

3.3.4 Pesticides

Pesticides were analyzed in four composite samples (LB-1, LB-2, LB-3, and CP-16). Methoxychlor was detected in concentrations greater than the MRL in samples LB-3 and CP-16. No other pesticides were detected in concentrations greater than the MRL in any sample.

The reported MDL and MRL exceeded some of the target detection limits shown in Table 13-3 of the SAP/QAPP or screening criteria as noted below.

- In sample CP-16, the MDL exceeded the target detection limit for toxaphene.
- The MDL and MRL exceeded the TEL for toxaphene for all samples.
- The MRL exceeded the ERL for technical chlordane for all samples except LB-2.

All other results met the target detection limits or screening criteria. Total pesticides ranged from 1.9 µg/kg to 6.1 µg/kg. There are no published sediment screening criteria (i.e., TEL, ERL) for total pesticides. Complete results are provided in Table 7, including the laboratory MDLs and MRLs.

3.3.5 PCBs and Aroclors

PCBs and Aroclors were analyzed in four composite samples (LB-1, LB-2, LB-3, and CP-16). None of the 26 congeners or seven Aroclors were detected above the MDL in any of the samples tested (U-qualified). Total NOAA PCBs in sample CP-16 exceeded the TEL and ERL.

The MDLs met the SAP/QAPP target detection limit for all PCB congeners (1 µg/kg) and Aroclors (3.3 µg/kg) for samples LB-1, LB-2, and LB-3. The MDL slightly exceeded the SAP/QAPP target detection limit of 1 µg/kg for a few PCB congeners (PCB-77, PCB-169, and PCB-183) for sample CP-16. Complete results are provided in Table 8, including the laboratory MDLs and MRLs. Refer to Section 4.4.5.3 for a discussion of the low total solids and its effects on the detection limits.

3.3.6 Dioxins

Dioxins and furans were analyzed in composite samples LB-1, LB-2, LB-3, and CP-16. The toxic equivalent (TEQ) of each congener was calculated using the toxicity equivalency factor (TEF) multiplied by either the determined concentration of the dioxin/furan congener or the MRL if the result was below the MRL. The total TEQ was calculated as the sum of the individual congener TEQs. Total TEQs ranged from 0.189 ng/kg to 0.517 ng/kg in samples LB-1, LB-2, and LB-3. The total TEQ for sample CP-16 was 6.43 ng/kg which exceeded the TEL and AET. Complete results are provided in Table 9, including the laboratory MDLs and MRLs.

3.4 Elutriate and Water Chemistry

Analytical results for elutriates generated from the composite samples and the site water samples are presented in Tables 10 through 14. All sediment samples were prepared using the modified elutriate preparation methods described in *Interim Guidance for Predicting Quality of Effluent Discharged from Confined Dredged Material Disposal Areas—General* (USACE 1985). This preparation resulted in total and dissolved fractions for each sediment sample that were analyzed for each test shown in Table 2-6 of the SAP/QAPP. In addition, two site water samples from the project area were analyzed to determine background levels. Results for elutriate and water samples are compared to the CMC and South Carolina water quality criteria, which are addressed below as screening criteria and are defined in Section 2.4.2. The water and elutriate chemistry laboratory case narrative and data are provided in Appendix D.

3.4.1 Total Organic Carbon and Total Suspended Solids

TOC concentrations in the elutriate samples for both the total and dissolved fractions ranged from 1.1 mg/L to 21 mg/L. Total suspended solids ranged from 19 mg/L to 290 mg/L. Table 10 has complete results for TOC and total solids, including the laboratory MDLs and MRLs.

3.4.2 Metals and Tributyltin

Total and dissolved metals were analyzed in all 20 composite elutriate samples and two site water samples. For all the metals except mercury, the MRLs for the elutriate samples were elevated above the target detection limits and laboratory reporting limits in Table 2-6 of the SAP/QAPP due to matrix interference. However, the MDLs for most metals, except chromium, copper, selenium, and zinc, met the target detection limits. See Section 4.5.1.1 for more information. The results are summarized in Exhibit 3-6. Table 10 has complete results, including the laboratory MDLs and MRLs.

Little River to Winyah Bay (LB-1 through LB-3)

Total and dissolved arsenic, copper, lead, nickel, and zinc were detected in concentrations greater than the MRLs in some or all elutriate samples. With the exception of total and dissolved copper in sample LB-3, none of the total or dissolved results for metals were detected in concentrations greater than the CMC in any sample. In sample LB-3, total copper (5.2 µg/L) and dissolved copper (4.8 µg/L) exceeded the CMC (4.8 µg/L).

Exhibit 3-6. Summary of Analytical Results for Metals in Sediment Elutriates and Site Water – Little River to Winyah Bay

Analyte	Concentrations (µg/L)								
	SW-1	LB-1 T	LB-1 D	LB-2 T	LB-2 D	LB-3 T	LB-3 D	SC CMC	CMC
Antimony	<0.38	<0.76	<0.76	<0.76	<0.76	<0.76	<0.76	x	x
Arsenic	3.9	1.1	0.95	1.0	0.91	1.6	1.3	69	69
Cadmium	0.24	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	43	40
Chromium	2.5	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	1100	1100
Copper	3.7	2.5	1.4	2.8	4.2	**5.2**	**4.8**	5.8	4.8
Lead	1.3	0.36	0.28	0.27	0.27	0.45	<0.26	220	210
Mercury	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	2.1	1.8
Nickel	1.7	1.3	0.93	1.3	0.85	2.7	1.3	75	74
Selenium	<1.5	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	290	290
Silver	0.18	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	2.3	1.9
Zinc	4.5	13	7.3	11	<6.4	28	<6.4	95	90

T = total fraction; D = dissolved fraction

"<" less-than symbol indicates the analyte concentration was less than the MDL (U-qualified; value indicates the MDL)

Bolded values exceed the CMC.

x = No TEL or ERL published for that parameter.

See Table 10 for complete results.

Winyah Bay to Charleston (WC-4 through WC-13)

Total and/or dissolved arsenic, copper, chromium, lead, nickel, and zinc were detected in concentrations greater than the MRLs in some or all of the elutriate samples. The results are summarized in Exhibit 3-7. Table 10 has complete results, including the laboratory MDLs and MRLs. The following samples exceeded the SC CMC and/or the CMC.

- WC-5, 6, and 8 – Total Arsenic
- WC-10, 11, and 13 – Total Copper

Charleston to Port Royal (CP-14 through CP-20)

Total and/or dissolved arsenic, copper, chromium, lead, nickel, and zinc were detected in concentrations greater than the MRLs in some or all of the elutriate samples. None of the sample results exceeded the SC CMC and/or the CMC. The results are summarized in Exhibit 3-8. Table 10 has complete results, including the laboratory MDLs and MRLs.

Exhibit 3-7. Summary of Analytical Results for Metals in Sediment Elutriates and Site Water –Winyah Bay to Charleston

Analyte	Concentrations (µg/L)																					
	SW-1	WC-4 T	WC-4 D	WC-5 T	WC-5 D	WC-6 T	WC-6 D	WC-7 T	WC-7 D	WC-8 T	WC-8 D	WC-9 T	WC-9 D	WC-10 T	WC-10 D	WC-11 T	WC-11 D	WC-12 T	WC-12 D	WC-13 T	WC-13 D	SC CMC	CMC
Antimony	<0.38	1.2	1.2	1.3	1.2	1.1	1.3	0.89	<0.76	1.0	<0.76	<0.76	<0.76	1.2	0.76	<0.76	<0.76	<0.76	<0.76	0.81	<0.76	x	x
Arsenic	3.9	26	21	**80**	52	**70**	48	58	38	**91**	62	46	28	63	33	1.7	1.4	3.7	3.4	21	8.5	69	69
Cadmium	0.24	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	43	40
Chromium	2.5	3.5	<3.1	<3.1	<3.1	<3.1	<3.1	4.2	<3.1	4.9	<3.1	<3.1	<3.1	7.5	<3.1	<3.1	<3.1	<3.1	<3.1	14	<3.1	1100	1100
Copper	3.7	3.1	3.7	2.8	4.2	2.0	3.5	2.6	3.2	2.8	2.6	3.0	2.5	**4.8**	2.1	2.2	**5.4**	1.9	2.3	**7.8**	2.1	5.8	4.8
Lead	1.3	1.4	<0.26	0.80	<0.26	0.34	<0.26	0.89	<0.26	1.4	<0.26	2.3	<0.26	2.4	<0.26	0.51	<0.26	0.77	<0.26	6.0	<0.26	220	210
Mercury	<0.13	0.16	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	2.1	1.8
Nickel	1.7	3.3	1.2	2.6	0.99	1.4	<0.67	2.4	1.1	3.0	1.5	2.3	1.3	4.3	2.0	1.0	0.97	1.6	1.1	7.9	2.7	75	74
Selenium	<1.5	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	290	290
Silver	0.18	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	<0.35	2.3	1.9
Zinc	4.5	14	<6.4	42	<6.4	15	<6.4	16	<6.4	22	<6.4	6.4	<6.4	30	<6.4	<6.4	<6.4	8.1	<6.4	28	<6.4	95	90

T = total fraction; D = dissolved fraction
"<" less-than symbol indicates the analyte concentration was less than the MDL (U-qualified; value indicates the MDL)
Bolded values exceed the CMC and or SC CMC.
x = No TEL or ERL published for that parameter.
See Table 10 for complete results.

Exhibit 3-8. Summary of Analytical Results for Metals in Sediment Elutriates and Site Water – Charleston to Port Royal

Analyte	Concentrations (µg/L)																
	SW-2	CP-14 T	CP-14 D	CP-15 T	CP-15 D	CP-16 T	CP-16 D	CP-17 T	CP-17 D	CP-18 T	CP-18 D	CP-19 T	CP-19 D	CP-20 T	CP-20 D	SC CMC	CMC
Antimony	<0.38	<0.76	<0.76	1.1	<0.76	<0.76	<0.76	<0.76	<0.76	<0.76	<0.76	<0.76	<0.76	0.80	0.44	x	x
Arsenic	2.8	1.9	1.6	9.4	8.0	19	9.3	30	20	5.2	4.5	6.5	5.8	68	40	69	69
Cadmium	<0.22	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	<0.43	43	40
Chromium	3.8	<3.1	<3.1	<3.1	<3.1	11	<3.1	3.2	<3.1	<3.1	<3.1	<3.1	<3.1	13	<3.1	1100	1100
Copper	3.6	2.0	2.3	2.2	2.6	3.6	1.8	1.9	<1.3	1.4	1.3	1.3	1.9	4.6	0.69	5.8	4.8
Lead	6.1	0.57	<0.26	1.2	<0.26	4.1	<0.26	1.0	<0.26	0.40	<0.26	0.41	<0.26	3.5	0.14	220	210
Mercury	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	<0.13	2.1	1.8
Nickel	7.3	1.2	0.70	2.2	1.2	4.1	0.89	3.0	2.1	1.2	0.75	1.2	<0.67	4.4	0.97	75	74
Selenium	<1.5	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	2.0	<3.0	290	290
Silver	<0.18	<0.18	<0.18	<0.18	<0.18	0.42	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	2.3	1.9
Zinc	23	16	<6.4	11	<6.4	19	<6.4	14	<6.4	7.8	<6.4	8.7	6.9	17	<3.2	95	90

T = total fraction; D = dissolved fraction
"<" less-than symbol indicates the analyte concentration was less than the MDL (U-qualified; value indicates the MDL)
x = No TEL or ERL published for that parameter.
See Table 10 for complete results.

3.4.3 PAHs

Total and dissolved PAHs were analyzed in all 20 composite elutriate samples and two site water samples. The MDLs and MRLs for the elutriate and site water samples met the target detection limit and laboratory reporting limits in Table 2-6 of the SAP/QAPP. Table 11 has complete results, including the laboratory MDLs and MRLs.

None of the PAHs were detected in concentrations greater than the MDL in any elutriate or site water samples; all results were U-qualified. Total PAHs ranged from 1.1 µg/L to 5.1 µg/L. There are no screening criteria for PAHs to compare sample results against.

3.4.4 Pesticides

Total and dissolved pesticides were analyzed in four composite elutriate samples (LB-1, LB-2, LB-3, and CP-16) and two site water samples. The MDLs and MRLs for the elutriate and site water samples met the target detection limit and laboratory reporting limits in Table 2-6 of the SAP/QAPP. Table 12 has complete results, including the laboratory MDLs and MRLs.

With the exception of methoxyclor in SW-1, none of the pesticides were detected in concentrations greater than the MRL in any elutriate or site water samples; all results were U- or J-qualified. None of the pesticides were detected in concentrations greater than the CMC in any elutriate or site water samples. Total pesticides ranged from 0.063 µg/L to 0.067 µg/L.

3.4.5 PCB Congeners and Aroclors

Total and dissolved PCBs and Aroclors were analyzed in four composite elutriate samples (LB-1, LB-2, LB-3, and CP-16) and two site water samples. The MDLs and MRLs for the elutriate and site water samples met the target detection limit and laboratory reporting limits in Table 2-6 of the SAP/QAPP. Table 13 has complete results, including the laboratory MDLs and MRLs.

With the exception of PCB 18 in SW-2, none of the PCBs were detected in concentrations greater than the MRL in any elutriate or site water samples; all results were U- or J-qualified. Total EPA Region 4 PCBs for all samples were 15 ng/L. Total NOAA PCBs ranged from 20 ng/L to 21 ng/L. There are no screening criteria for PCBs or Aroclors to compare sample results against.

3.4.6 Dioxins

Total and dissolved dioxins were analyzed in four composite elutriate samples (LB-1, LB-2, LB-3, and CP-16) and two site water samples. The TEQ of each congener was calculated using the TEF (USEPA 2010) multiplied by either the determined concentration of the dioxin/furan congener or the MRL if the result was below the MRL. None of the individual congeners were detected in concentrations greater than the MRL except OCDD total and HpCDD total in CP-16. All the other results were U- or J-qualified. The total TEQ was calculated as the sum of the individual congener TEQs and ranged from 0.309 pg/L in sample LB-2 Dissolved to 1.47 pg/L in sample CP-16 Total. There are no screening criteria to compare results against. Complete results are provided in Table 14, including the laboratory MDLs and MRLs.

4 QUALITY ASSURANCE/QUALITY CONTROL

4.1 Field Sampling

Field sampling took place May 3 through 10, 2021. There were no issues associated with field sample collection, and all sampling and compositing activities conformed to methods outlined in the SAP/QAPP.

4.2 Sample Receipt

4.2.1 Terracon

Sediment samples were delivered to Terracon on May 12, 2021, in good condition and consistent with the chain-of-custody form.

4.2.2 Eurofins TestAmerica

Sediment samples and site water for background analysis and elutriate preparation were received at Eurofins TestAmerica on May 8 and 11, 2021, in good condition and consistent with the accompanying chain-of-custody form.

All analyses were performed consistent with Eurofins TestAmerica QA program. This laboratory data report contains analytical results for samples designated for Tier IV validation deliverables, including summary forms and all associated raw data for each analysis (Appendix D). When appropriate to the method, method blank results have been reported for each analytical test.

4.3 Physical Analysis

All physical analyses were performed by Terracon. Terracon met all standard laboratory quality control during testing.

4.4 Sediment Chemistry

4.4.1 Total Metals

No quality control anomalies associated with the analysis of these samples were observed.

4.4.2 Organotins

4.4.2.1 Matrix Spikes

Batch quality control only is available for this project for tributyltin. Matrix spikes were not performed for the project samples.

No other quality control anomalies associated with the analysis of these samples were observed.

4.4.3 Pesticides

4.4.3.1 Matrix Spike Recoveries

Spikes for this project were below 70% recovery. This indicates a likely matrix interference in the sample. The overall impact on the results should be low since the sample results are either non-detects or below the target detection limits.

4.4.3.2 Calibration Verification Standards

Several continuing calibration standards (CCVs) had slight exceedances greater than 15% difference from the target. The overall impact should be low since the affected sample results were non-detects. In addition, several exceedances were corrected with CCVs that were analyzed later in the run.

No other quality control anomalies associated with the analysis of these samples were observed.

4.4.4 Polynuclear Aromatic Hydrocarbons

4.4.4.1 Matrix Spikes

Batch quality control only is available for this project for PAHs. Matrix spikes were not performed for the project samples.

4.4.4.2 Calibration Verification Standards

Several CCVs had slight exceedances between 15% and 20% differences but were within the lab acceptance criteria. The overall impact should be low since the exceedances were less than 5% different from the target concentration.

4.4.4.3 Elevated Detection Limits

Following preparation, the laboratory noted that the samples were viscous with a greenish tint. Based on the nature of the samples, the laboratory had to dilute the samples for analysis which resulted in elevated detection limits above the target detection limits provided in the SAP/QAPP. In addition, low total solids concentrations in the samples further elevated the detection limit and reporting limit following dry weight calculations.

No other quality control anomalies associated with the analysis of these samples were observed.

4.4.5 PCBs

4.4.5.1 Matrix Spikes

One spike for PCB was outside acceptance criteria, indicating a potential matrix interference. The overall impact is low since all results are below detection.

4.4.5.2 Calibration Verification Exceptions

Several CCVs had slight exceedances outside 15% differences but were within the lab acceptance criteria. The overall impact should be low since the exceedances were less than 5% different from the target concentration.

4.4.5.3 Elevated Detection Limits and Total PCB Concentrations

Due to low total solids content, the dry weight calculations for sample CP-16 had detection limits that were elevated above the target detection limit. In addition, the total NOAA PCB concentration was found to exceed the TEL and ERL. Since all results are below the method detection limit and the exceedance is due solely to low total solids, the overall impact is low, and the usability of the results should not be affected.

4.4.6 Dioxins and Furans by EPA Method 8290

No quality control anomalies associated with the analysis of these samples were observed.

4.5 Site Water and Elutriate Chemistry

4.5.1 Total Metals

4.5.1.1 Sample Dilutions and Elevated Detection Limits

Sample elutriates were analyzed at a dilution factor of 2 due to high sodium concentrations in the sample. The dilution required for analysis resulted in elevated detection limits for copper, chromium, selenium, and zinc above the target detection limit in the SAP. The laboratory staff attempted to re-analyze the samples without dilution but were not able to meet analytical criteria.

No quality control anomalies associated with the analysis of these samples were observed.

4.5.2 Organotins

4.5.2.1 Matrix Spikes

Batch quality control only is available for this project for tributyltin. Matrix spikes were not performed for the project samples.

No other quality control anomalies associated with the analysis of these samples were observed.

4.5.3 Organochlorine Pesticides by EPA Method 8081

4.5.3.1 Matrix Spikes

Batch quality control only is available for this project for pesticides. Matrix spikes were not performed for the project samples.

4.5.3.2 Calibration Verification Standards

Several CCVs had slight exceedances greater than 15% difference from the target. The overall impact should be low since the affected sample results were non-detects. In addition, several exceedances were corrected with CCVs that were analyzed later in the run.

No other quality control anomalies associated with the analysis of these samples were observed.

4.5.4 Polynuclear Aromatic Hydrocarbons by EPA Method 8270

4.5.4.1 Matrix Spikes

Batch quality control only is available for this project for PAHs. Matrix spikes were not performed for the project samples.

4.5.4.2 Calibration Verification Standards

Several CCVs had slight exceedances between 15% and 20% differences but were within the lab acceptance criteria. The overall impact should be low since the exceedances were less than 5% different from the target concentration.

No other quality control anomalies associated with the analysis of these samples were observed.

4.5.5 PCB Aroclors and Congeners by EPA Method 8082

4.5.5.1 Matrix Spikes

Batch quality control only is available for this project for PCBs. Matrix spikes were not performed for the project samples.

4.5.5.2 Calibration Verification Exceptions

Several CCVs had slight exceedances outside 15% differences but were within the lab acceptance criteria. The overall impact should be low since the exceedances were less than 5% different from the target concentration.

4.5.5.3 Surrogates

Several PCB Aroclors had surrogates at 18% to 29% indicating a probable matrix interference in the sample. All other samples for congeners and Aroclors were within the acceptance criteria. Since all Aroclors were reported as non-detects below the target detection limit, the overall impact is low.

No other quality control anomalies associated with the analysis of these samples were observed.

4.5.6 Dioxins and Furans by EPA Method 8290

No quality control anomalies associated with the analysis of these samples were observed.

5 REFERENCES

ANAMAR Environmental Consulting, Inc. 2021. *Sampling and Analysis Plan/Quality Assurance Project Plan for the Sediment Sampling and Analysis, Atlantic Intracoastal Waterway, South Carolina.* Submitted to USACE Charleston District. April 2021.

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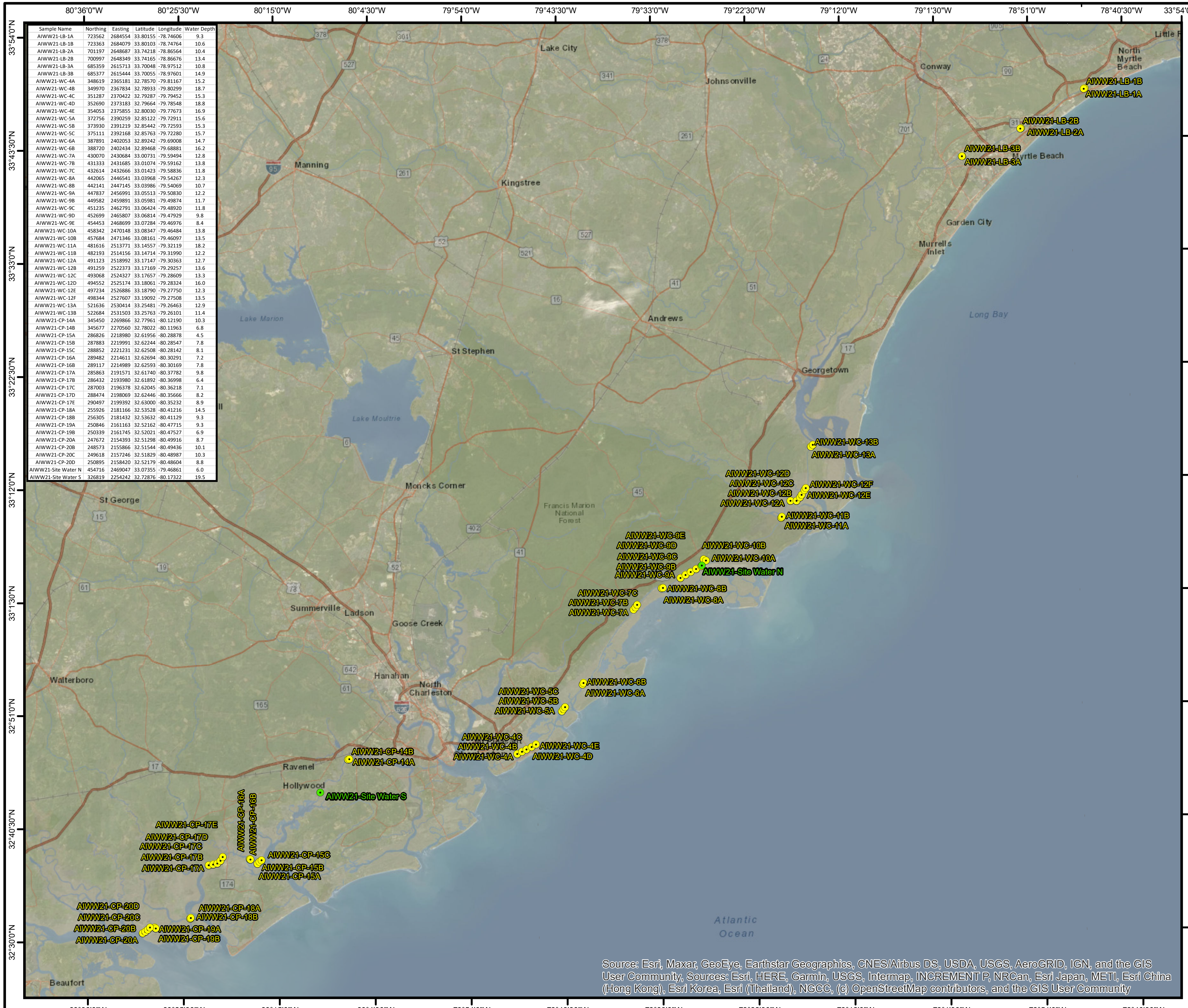
MAPS

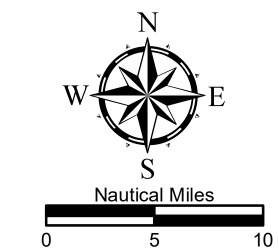
Map 1
AIWW Navigation Channel Overview

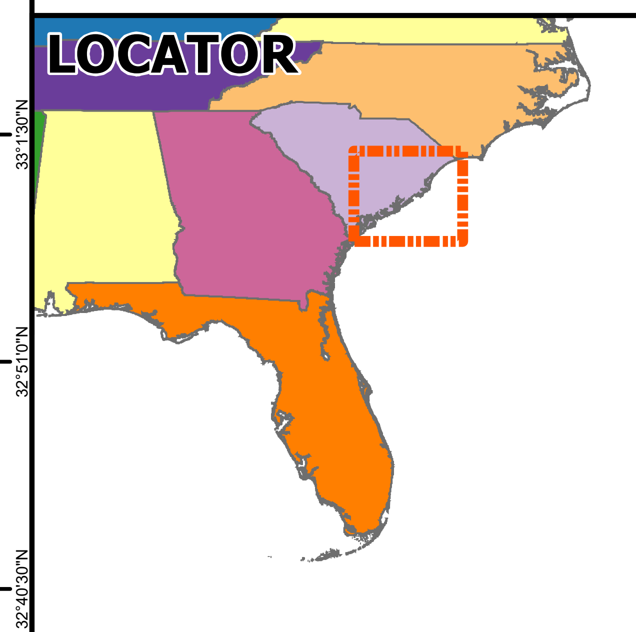


Sample Name	Northing	Easting	Latitude	Longitude	Water Depth
AIWW21-LB-1A	723562	2684554	33.80155	-78.74606	9.3
AIWW21-LB-1B	723363	2684079	33.80103	-78.74764	10.6
AIWW21-LB-2A	701197	2648687	33.74218	-78.86564	10.4
AIWW21-LB-2B	700997	2648349	33.74165	-78.86676	13.4
AIWW21-LB-3A	685359	2615713	33.70048	-78.97512	10.8
AIWW21-LB-3B	685377	2615444	33.70055	-78.97601	14.9
AIWW21-WC-4A	348619	2365181	32.78570	-79.81167	15.2
AIWW21-WC-4B	349970	2367834	32.78933	-79.80299	18.7
AIWW21-WC-4C	351287	2370422	32.79287	-79.79452	15.3
AIWW21-WC-4D	352690	2373183	32.79664	-79.78548	18.8
AIWW21-WC-4E	354053	2375855	32.80030	-79.77673	16.9
AIWW21-WC-5A	372756	2390259	32.85122	-79.72911	15.6
AIWW21-WC-5B	373930	2391219	32.85442	-79.72593	15.3
AIWW21-WC-5C	375111	2392168	32.85763	-79.72280	15.7
AIWW21-WC-6A	387891	2402053	32.89242	-79.69008	14.7
AIWW21-WC-6B	388720	2402434	32.89468	-79.68881	16.2
AIWW21-WC-7A	430070	2430684	33.00731	-79.59494	12.8
AIWW21-WC-7B	431333	2431685	33.01074	-79.59162	13.8
AIWW21-WC-7C	432614	2432666	33.01423	-79.58836	11.8
AIWW21-WC-8A	442065	2446541	33.03968	-79.54267	12.3
AIWW21-WC-8B	442141	2447145	33.03986	-79.54069	10.7
AIWW21-WC-9A	447837	2456991	33.05513	-79.50830	12.2
AIWW21-WC-9B	449582	2459891	33.05981	-79.49874	11.7
AIWW21-WC-9C	451235	2462791	33.06424	-79.48920	11.8
AIWW21-WC-9D	452699	2465807	33.06814	-79.47929	9.8
AIWW21-WC-9E	454453	2468699	33.07284	-79.46976	8.4
AIWW21-WC-10A	458342	2470148	33.08347	-79.46484	13.8
AIWW21-WC-10B	457684	2471346	33.08161	-79.46097	13.5
AIWW21-WC-11A	481616	2513771	33.14557	-79.32119	18.2
AIWW21-WC-11B	482193	2514156	33.14714	-79.31990	12.2
AIWW21-WC-12A	491123	2518992	33.17147	-79.30363	12.7
AIWW21-WC-12B	491259	2522373	33.17169	-79.29257	13.6
AIWW21-WC-12C	493068	2524327	33.17657	-79.28609	13.3
AIWW21-WC-12D	494552	2525174	33.18061	-79.28324	16.0
AIWW21-WC-12E	497234	2526886	33.18790	-79.27750	12.3
AIWW21-WC-12F	498344	2527607	33.19092	-79.27508	13.5
AIWW21-WC-13A	521636	2530414	33.25481	-79.26463	12.9
AIWW21-WC-13B	522684	2531503	33.25763	-79.26101	11.4
AIWW21-CP-14A	345450	2269866	32.77961	-80.12190	10.3
AIWW21-CP-14B	345677	2270560	32.78022	-80.11963	6.8
AIWW21-CP-15A	286826	2218980	32.61956	-80.28878	4.5
AIWW21-CP-15B	287883	2219991	32.62244	-80.28547	7.8
AIWW21-CP-15C	288852	2221231	32.62508	-80.28142	8.1
AIWW21-CP-16A	289482	2214611	32.62694	-80.30291	7.2
AIWW21-CP-16B	289117	2214989	32.62593	-80.30169	7.8
AIWW21-CP-17A	285863	2191571	32.61740	-80.37782	9.8
AIWW21-CP-17B	286432	2193980	32.61892	-80.36998	6.4
AIWW21-CP-17C	287003	2196378	32.62045	-80.36218	7.1
AIWW21-CP-17D	288474	2198069	32.62446	-80.35666	8.2
AIWW21-CP-17E	290497	2199392	32.63000	-80.35232	8.9
AIWW21-CP-18A	255926	2181166	32.53528	-80.41216	14.5
AIWW21-CP-18B	256305	2181432	32.53632	-80.41129	9.3
AIWW21-CP-19A	250846	2161163	32.52162	-80.47715	9.3
AIWW21-CP-19B	250339	2161745	32.52021	-80.47527	6.9
AIWW21-CP-20A	247672	2154393	32.51298	-80.49916	8.7
AIWW21-CP-20B	248573	2155866	32.51544	-80.49436	10.1
AIWW21-CP-20C	249618	2157246	32.51829	-80.48987	10.3
AIWW21-CP-20D	250895	2158420	32.52179	-80.48604	8.8
AIWW21-Site Water N	454716	2469047	33.07355	-79.46861	6.0
AIWW21-Site Water S	326819	2254242	32.72876	-80.17322	19.5

Legend

- Sampled Location
- Site Water





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Environmental Consulting, Inc.

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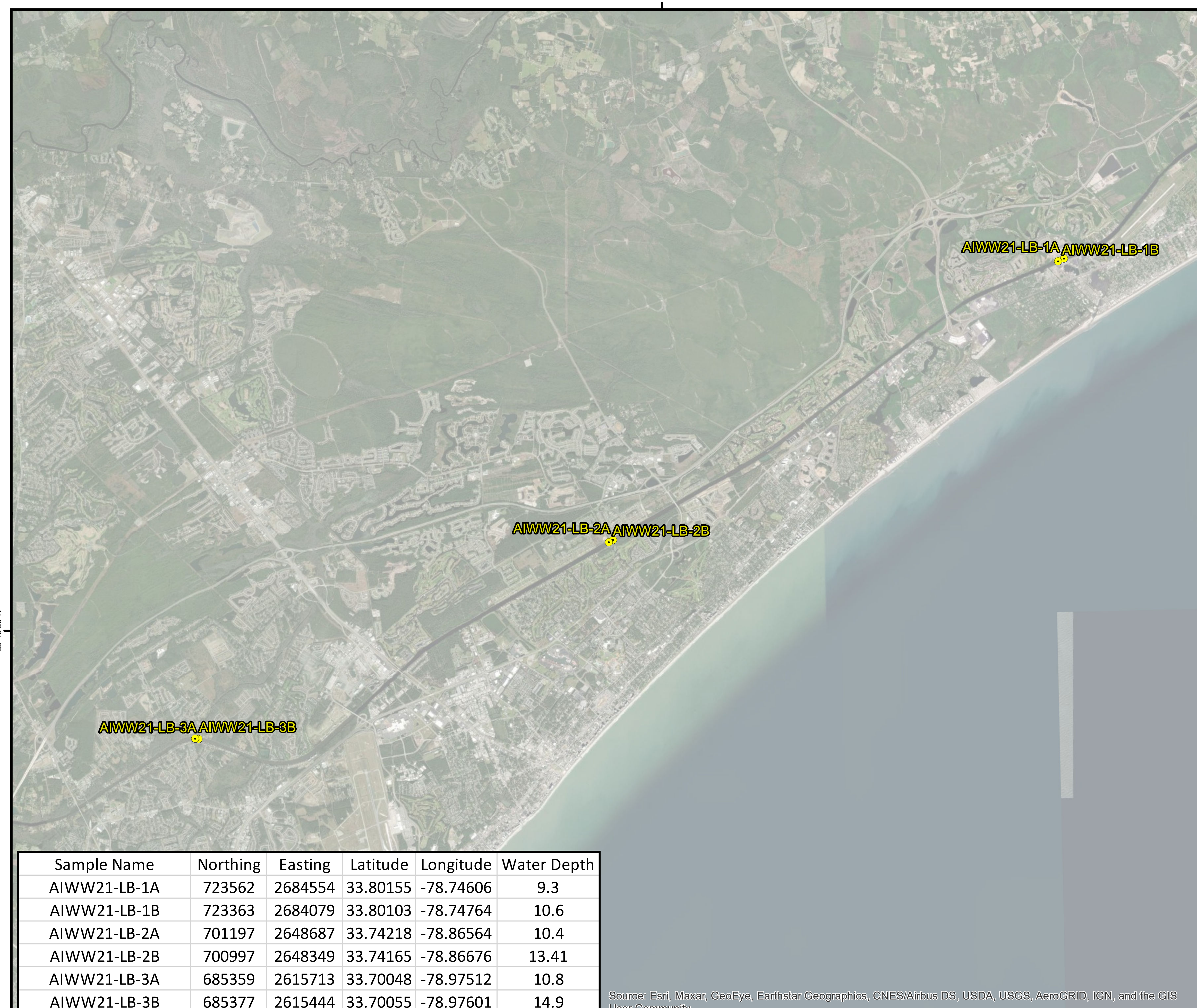
Data sources: ANAMAR, USACE, NOAA.

Map 2
AIWW Navigation Channel
Little River to Winyah Bay
LB-1 to LB-3



Sample Name	Northing	Easting	Latitude	Longitude	Water Depth
AIWW21-LB-1A	723562	2684554	33.80155	-78.74606	9.3
AIWW21-LB-1B	723363	2684079	33.80103	-78.74764	10.6
AIWW21-LB-2A	701197	2648687	33.74218	-78.86564	10.4
AIWW21-LB-2B	700997	2648349	33.74165	-78.86676	13.41
AIWW21-LB-3A	685359	2615713	33.70048	-78.97512	10.8
AIWW21-LB-3B	685377	2615444	33.70055	-78.97601	14.9

Legend

Sampled Location

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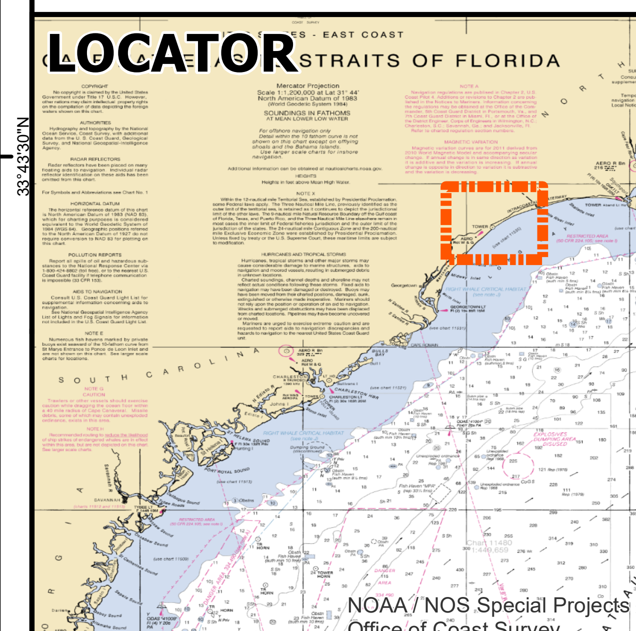
LOCATOR



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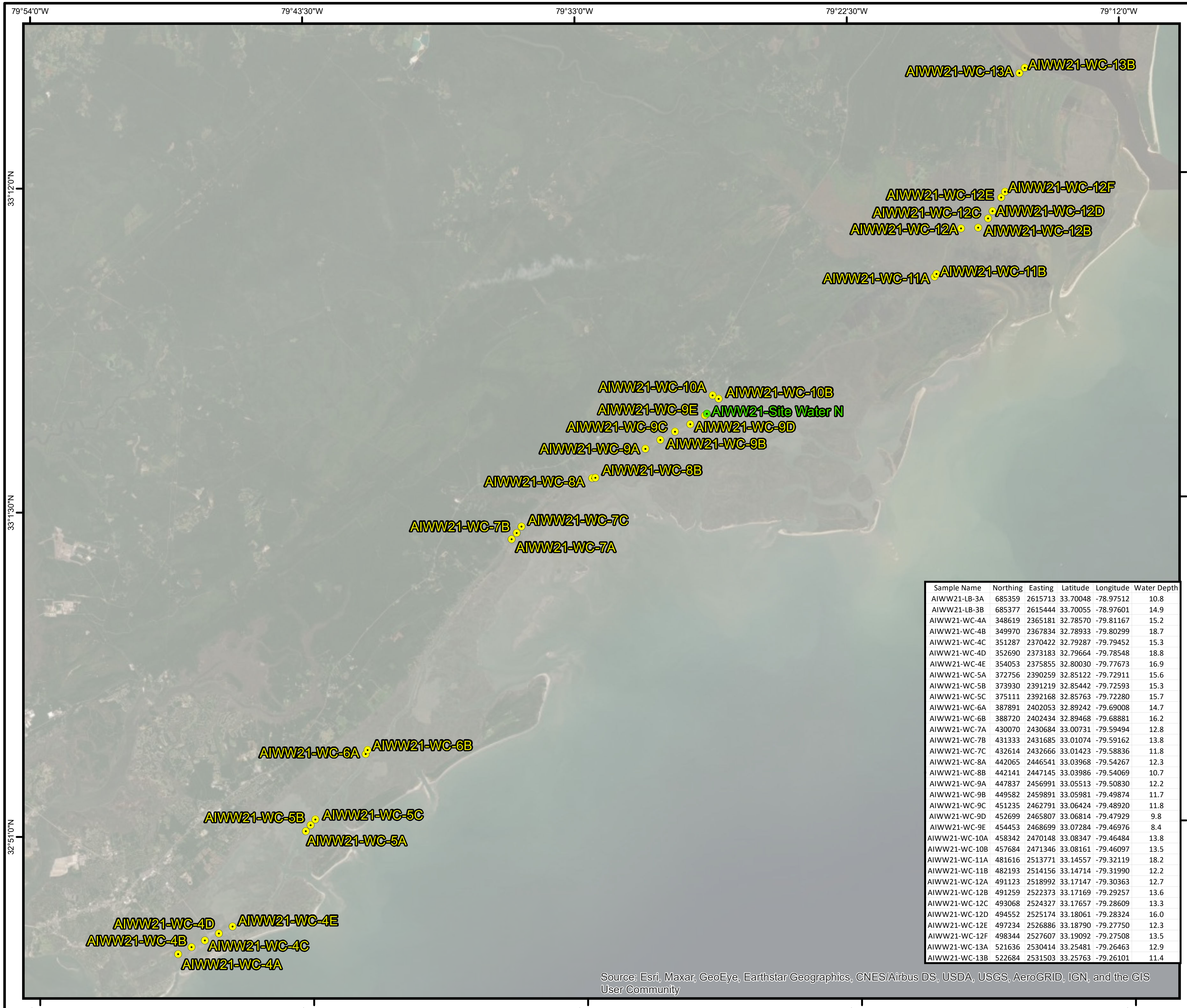
Data sources: ANAMAR, USACE, NOAA.

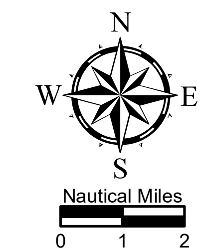
Map 3
AIWW Navigation Channel
Winyah Bay to Charleston
WC-4 through WC-13



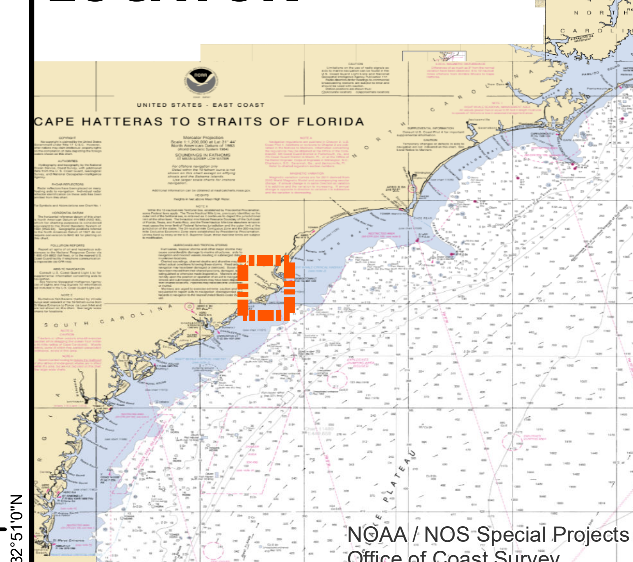
Sample Name	Northing	Easting	Latitude	Longitude	Water Depth
AIWW21-LB-3A	685359	2615713	33.70048	-78.97512	10.8
AIWW21-LB-3B	685377	2615444	33.70055	-78.97601	14.9
AIWW21-WC-4A	348619	2365181	32.78570	-79.81167	15.2
AIWW21-WC-4B	349970	2367834	32.78933	-79.80299	18.7
AIWW21-WC-4C	351287	2370422	32.79287	-79.79452	15.3
AIWW21-WC-4D	352690	2373183	32.79664	-79.78548	18.8
AIWW21-WC-4E	354053	2375855	32.80030	-79.77673	16.9
AIWW21-WC-5A	372756	2390259	32.85122	-79.72911	15.6
AIWW21-WC-5B	373930	2391219	32.85442	-79.72593	15.3
AIWW21-WC-5C	375111	2392168	32.85763	-79.72280	15.7
AIWW21-WC-6A	387891	2402053	32.89242	-79.69008	14.7
AIWW21-WC-6B	388720	2402434	32.89468	-79.68881	16.2
AIWW21-WC-7A	430070	2430684	33.00731	-79.59494	12.8
AIWW21-WC-7B	431333	2431685	33.01074	-79.59162	13.8
AIWW21-WC-7C	432614	2432666	33.01423	-79.58836	11.8
AIWW21-WC-8A	442065	2446541	33.03968	-79.54267	12.3
AIWW21-WC-8B	442141	2447145	33.03986	-79.54069	10.7
AIWW21-WC-9A	447837	2456991	33.05513	-79.50830	12.2
AIWW21-WC-9B	449582	2459891	33.05981	-79.49874	11.7
AIWW21-WC-9C	451235	2462791	33.06424	-79.48920	11.8
AIWW21-WC-9D	452699	2465807	33.06814	-79.47929	9.8
AIWW21-WC-9E	454453	2468699	33.07284	-79.46976	8.4
AIWW21-WC-10A	458342	2470148	33.08347	-79.46484	13.8
AIWW21-WC-10B	457684	2471346	33.08161	-79.46097	13.5
AIWW21-WC-11A	481616	2513771	33.14557	-79.32119	18.2
AIWW21-WC-11B	482193	2514156	33.14714	-79.31990	12.2
AIWW21-WC-12A	491123	2518992	33.17147	-79.30363	12.7
AIWW21-WC-12B	491259	2522373	33.17169	-79.29257	13.6
AIWW21-WC-12C	493068	2524327	33.17657	-79.28609	13.3
AIWW21-WC-12D	494552	2525174	33.18061	-79.28324	16.0
AIWW21-WC-12E	497234	2526886	33.18790	-79.27750	12.3
AIWW21-WC-12F	498344	2527607	33.19092	-79.27508	13.5
AIWW21-WC-13A	521636	2530414	33.25481	-79.26463	12.9
AIWW21-WC-13B	522684	2531503	33.25763	-79.26101	11.4

Legend

- Sampled Location
- Site Water



LOCATOR



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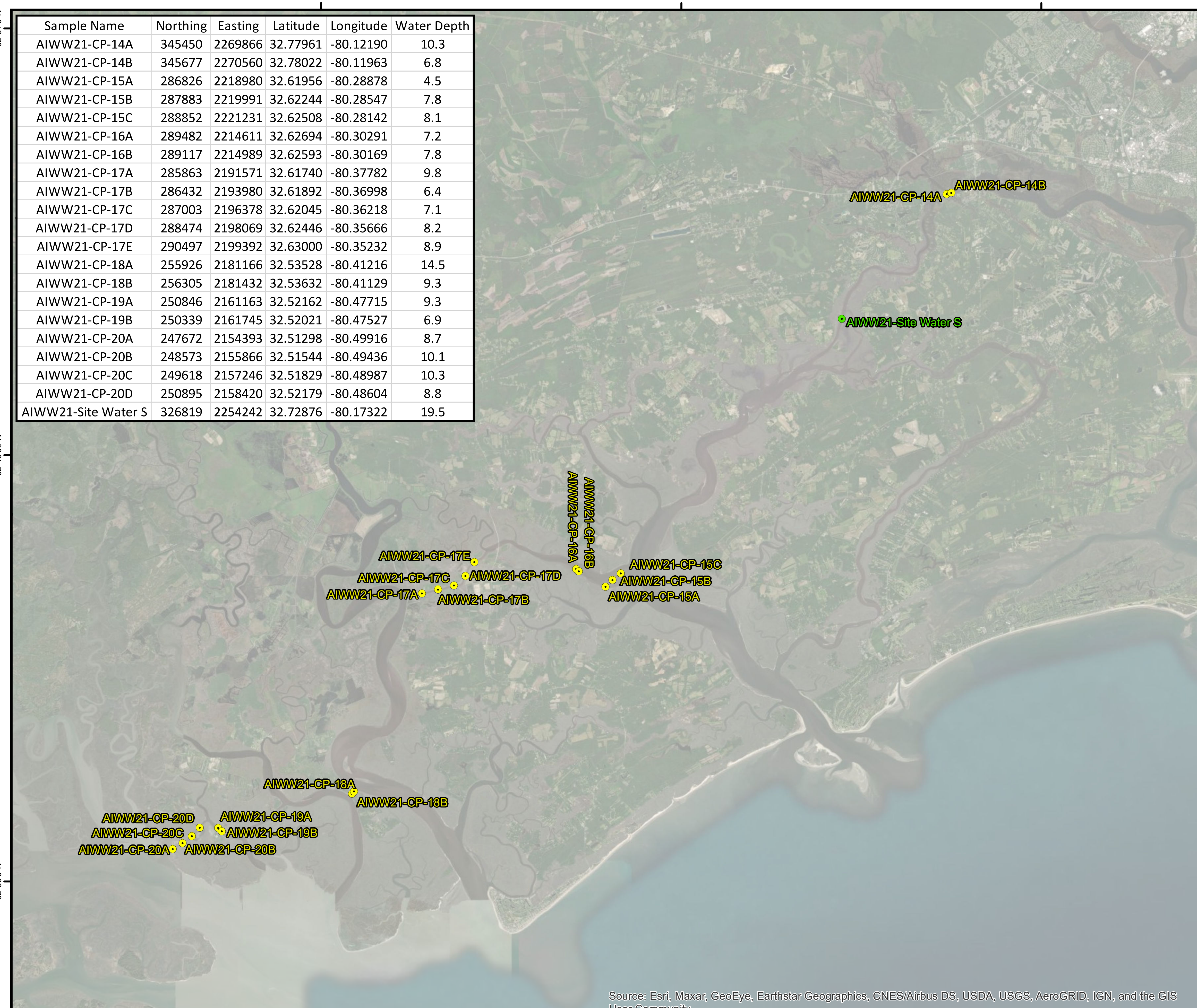
Q:\GIS PROJECTS\21-0003 AIWW 404\Maps\Actual\Map3.mxd
Data sources: ANAMAR, USACE, NOAA.

Map 4
AIWW Navigation Channel Charleston to Port Royal CP-14 through CP-20

Sample Name	Northing	Easting	Latitude	Longitude	Water Depth
AIWW21-CP-14A	345450	2269866	32.77961	-80.12190	10.3
AIWW21-CP-14B	345677	2270560	32.78022	-80.11963	6.8
AIWW21-CP-15A	286826	2218980	32.61956	-80.28878	4.5
AIWW21-CP-15B	287883	2219991	32.62244	-80.28547	7.8
AIWW21-CP-15C	288852	2221231	32.62508	-80.28142	8.1
AIWW21-CP-16A	289482	2214611	32.62694	-80.30291	7.2
AIWW21-CP-16B	289117	2214989	32.62593	-80.30169	7.8
AIWW21-CP-17A	285863	2191571	32.61740	-80.37782	9.8
AIWW21-CP-17B	286432	2193980	32.61892	-80.36998	6.4
AIWW21-CP-17C	287003	2196378	32.62045	-80.36218	7.1
AIWW21-CP-17D	288474	2198069	32.62446	-80.35666	8.2
AIWW21-CP-17E	290497	2199392	32.63000	-80.35232	8.9
AIWW21-CP-18A	255926	2181166	32.53528	-80.41216	14.5
AIWW21-CP-18B	256305	2181432	32.53632	-80.41129	9.3
AIWW21-CP-19A	250846	2161163	32.52162	-80.47715	9.3
AIWW21-CP-19B	250339	2161745	32.52021	-80.47527	6.9
AIWW21-CP-20A	247672	2154393	32.51298	-80.49916	8.7
AIWW21-CP-20B	248573	2155866	32.51544	-80.49436	10.1
AIWW21-CP-20C	249618	2157246	32.51829	-80.48987	10.3
AIWW21-CP-20D	250895	2158420	32.52179	-80.48604	8.8
AIWW21-Site Water S	326819	2254242	32.72876	-80.17322	19.5



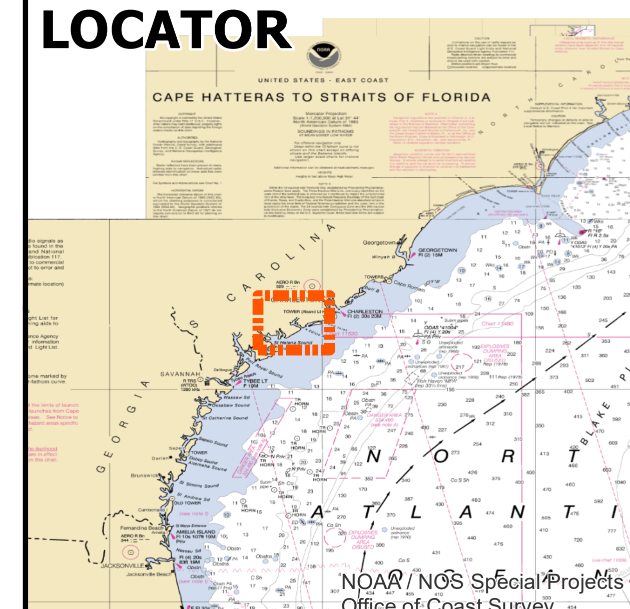
Legend

- Sampled Location
- Site Water

N W E S

Nautical Miles
0 1 2

LOCATOR



NOAA / NOS Special Projects / Office of Coast Survey

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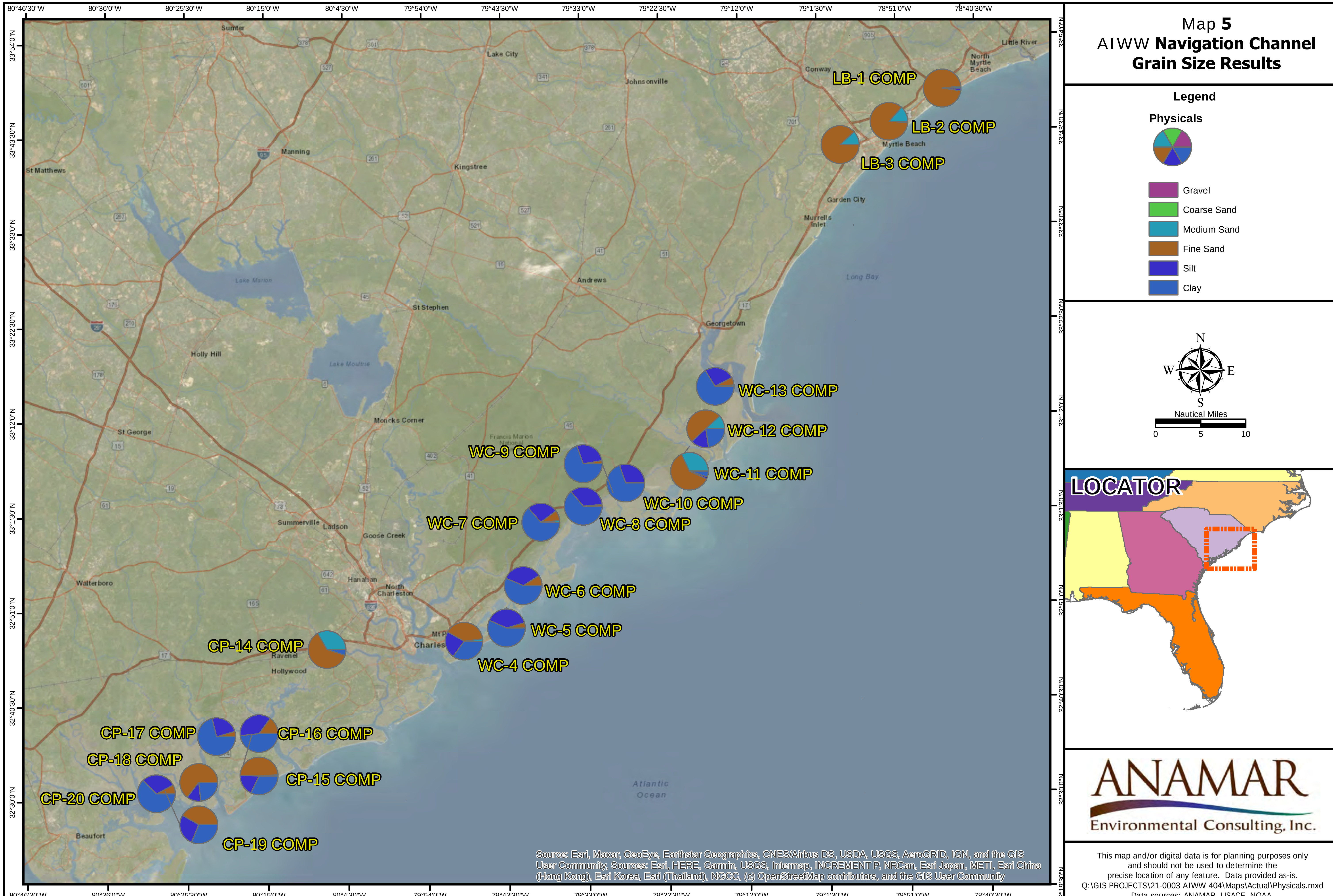
Q:\GIS PROJECTS\21-0003 AIWW 404\Maps\Actual\Map4.mxd
Data sources: ANAMAR, USACE, NOAA.


Map 5
AIWW Navigation Channel Grain Size Results
Legend
Physicals
Gravel
Coarse Sand
Medium Sand
Fine Sand
Silt
Clay
N
S
E
W
Nautical Miles
0
5
10
LOCATOR
ANAMAR
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Q:\GIS PROJECTS\21-0003 AIWW 404\Maps\Actual\Physicals.mxd
Data sources: ANAMAR, USACE, NOAA.
LB-1 COMP
LB-2 COMP
LB-3 COMP
WC-13 COMP
WC-12 COMP
WC-11 COMP
WC-10 COMP
WC-9 COMP
WC-8 COMP
WC-7 COMP
WC-6 COMP
WC-5 COMP
WC-4 COMP
CP-14 COMP
CP-15 COMP
CP-16 COMP
CP-17 COMP
CP-18 COMP
CP-19 COMP
CP-20 COMP
Sumter
Lake City
Johnsonville
Conway
Little River
North Myrtle Beach
Myrtle Beach
Garden City
Murrells Inlet
Manning
Kingstree
St Matthews
Lake Marion
Lake Moultrie
Andrews
St Stephen
Georgetown
Long Bay
Holly Hill
St George
Moncks Corner
Francis Marion National
Summerville
Ladson
Goose Creek
Hanahan
North Charleston
Walterboro
Ravenel
Hollywood
Beaufort
Atlantic Ocean
80°46'30"W
80°36'0"W
80°25'30"W
80°15'0"W
80°4'30"W
79°54'0"W
79°43'30"W
79°33'0"W
79°22'30"W
79°12'0"W
79°1'30"W
78°51'0"W
78°40'30"W
33°54'0"N
33°43'30"N
33°33'0"N
33°22'30"N
33°12'0"N
33°1'30"N
32°51'0"N
32°40'30"N
32°30'0"N
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

TABLES

TABLES

Acronyms and Qualifiers in Tables

Grain Size Definitions

Gravel	Particles ≥4.750 mm
Sand	Particles 0.075–4.749 mm
Silt	Particles 0.005–0.074 mm
Clay	Particles <0.005 mm

Unified Soil Classification System (USCS) classes

CH	Clay of high plasticity, elastic silt
CL	Clay
SC	Clayey sand
SM	Silty sand
SP	Poorly-graded sand
MH	Silt of high plasticity, elastic silt
ML	Silt of low plasticity
OH	Organic clay, organic silt

American Association of State Highway and Transportation Officials (AASHTO) subgroups

A-1-b	≤50% passing #40 sieve and ≤25% passing #200 sieve
A-2-4	≤35% passing #200 sieve and fraction passing #40 sieve has liquid limit of ≤ 40 and plasticity index of ≤10
A-2-7	≤35% passing #200 sieve and fraction passing #40 sieve has liquid limit of ≤41 and plasticity index of ≤11
A-7-5	≥36% passing #200 sieve and fraction passing #40 sieve has liquid limit of ≥41 and plasticity index of ≥11 and ≤ liquid limit – 30
A-7-6	≥36% passing #200 sieve and fraction passing #40 sieve has liquid limit of ≥41 and plasticity index of ≥11 and > liquid limit – 30
(#)	Group index values beginning at 0 (good soils for roadway subgrade use) with increasing values signifying increasingly poor quality soils for roadway subgrade use

Metals Data Qualifiers

B	Compound was found in the blank and sample.
J	The result is an estimated value.
U	The analyte was analyzed but was not detected (ND) at or above the MDL.

Organics Data Qualifiers

*	LCS and/or LCSD is outside acceptance limits, low biased.
F1	MS and/or MSD recovery exceeds control limits.
F2	MS/MSD RPD exceeds control limits
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an
p	The %RPD between the primary and confirmation column/detector is >40%. The lower valu
S1	Surrogate recovery exceeds control limits, low biased.

Dioxin/Furan Data Qualifiers

B	Compound was found in the blank and sample.
I	Value is an estimated maximum possible concentration for the associated compound.
J	Result is less than the MRL but greater than or equal to the MDL and the concentration is a

Acronyms and Symbols Used in the Data Tables

AET	apparent effects threshold
CCC	criterion continuous concentration
CMC	criteria maximum concentration
ERL	effects range-low
FDA	U.S. Food and Drug Administration
HMW	high molecular weight PAHs (NOAA 1989)
LL	liquid limit
LMW	low molecular weight PAHs (NOAA 1989)
MDL	method detection limit
MLLW	mean lower low water
MRL	method reporting limit
NAD 83	North American Datum of 1983
ND	non-detect
NOAA	National Oceanic and Atmospheric Administration PCB congeners (see SERIM Table 5-6 for list)
PI	plasticity index
PL	plastic limit
TEF	toxicity equivalence factor
TEL	threshold effects level
TEQ	toxic equivalency quotient
x	no values published for that parameter
–	no qualifier needed or no test conducted for that analyte or parameter

Acronyms and Symbols Used in the Sediment Chemistry Data Tables

Bolded Values = Result greater than or equal to the TEL, ERL and/or AET.

Acronyms and Symbols Used in the Elutriate Chemistry Data Tables

Bolded Values = Result greater than or equal to the CCC and/or CMC.

TABLE 1

Grab Sample and Field Data Summary

Area	Composite ID	Subsample ID	Date	Sampling Start & End (EDT)	Sediment Elevation* (ft, MLLW)	Latitude (°N, NAD 83)	Longitude (°W, NAD 83)
Little River to Winyah Bay	AIWW21-LB-1	AIWW21-LB-1A	5/4/21	1300-1310	-5.2	33.8015	-78.7461
		AIWW21-LB-1B	5/4/21	1315-1325	-6.4	33.8010	-78.7477
	AIWW21-LB-2	AIWW21-LB-2A	5/4/21	1200-1210	-6.8	33.7422	-78.8656
		AIWW21-LB-2B	5/4/21	1220-1230	-9.7	33.7416	-78.8668
	AIWW21-LB-3	AIWW21-LB-3A	5/4/21	1040-1050	-8.7	33.7005	-78.9751
		AIWW21-LB-3B	5/4/21	1100-1110	-12.4	33.7005	-78.9760
Winyah Bay to Charleston	AIWW21-WC-4	AIWW21-WC-4A	5/5/21	1705-1710	-10.9	32.7857	-79.8116
		AIWW21-WC-4B	5/5/21	1715-1720	-14.6	32.7894	-79.8029
		AIWW21-WC-4C	5/5/21	1720-1725	-11.3	32.7929	-79.7944
		AIWW21-WC-4D	5/5/21	1725-1730	-14.8	32.7967	-79.7854
		AIWW21-WC-4E	5/5/21	1735-1745	-13.1	32.8003	-79.7767
	AIWW21-WC-5	AIWW21-WC-5A	5/5/21	1615-1620	-11.8	32.8512	-79.7292
		AIWW21-WC-5B	5/5/21	1610-1615	-10.4	32.8544	-79.7259
		AIWW21-WC-5C	5/5/21	1600-1610	-10.8	32.8576	-79.7228
	AIWW21-WC-6	AIWW21-WC-6A	5/5/21	1545-1555	-9.8	32.8924	-79.6901
		AIWW21-WC-6B	5/5/21	1530-1540	-11.3	32.8947	-79.6887
	AIWW21-WC-7	AIWW21-WC-7A	5/5/21	1455-1500	-8.0	33.0073	-79.5950
		AIWW21-WC-7B	5/5/21	1450-1455	-9.0	33.0107	-79.5917
		AIWW21-WC-7C	5/5/21	1440-1445	-7.1	33.0142	-79.5883
Winyah Bay to Charleston	AIWW21-WC-8	AIWW21-WC-8A	5/5/21	1350-1355	-8.0	33.0398	-79.5428
		AIWW21-WC-8B	5/5/21	1345-1350	-6.4	33.0399	-79.5408
	AIWW21-WC-9	AIWW21-WC-9A	5/5/21	1320-1325	-8.3	33.0551	-79.5084
		AIWW21-WC-9B	5/5/21	1315-1320	-7.9	33.0598	-79.4989
		AIWW21-WC-9C	5/5/21	1305-1315	-8.2	33.0642	-79.4894
		AIWW21-WC-9D	5/5/21	1250-1300	-6.4	33.0682	-79.4794
		AIWW21-WC-9E	5/5/21	1235-1245	-5.1	33.0729	-79.4697
	AIWW21-WC-10	AIWW21-WC-10A	5/5/21	1850-1855	-11.6	33.0835	-79.4649
		AIWW21-WC-10B	5/5/21	1840-1845	-11.0	33.0816	-79.4610
	AIWW21-WC-11	AIWW21-WC-11A	5/5/21	1145-1155	-16.8	33.1456	-79.3212
		AIWW21-WC-11B	5/5/21	1130-1140	-11.3	33.1472	-79.3199

TABLE 1 (*continued*)
Grab Sample Summary and Field Data

Area	Composite ID	Subsample ID	Date	Sampling Start & End (EDT)	Sediment Elevation* (ft, MLLW)	Latitude (°N, NAD 83)	Longitude (°W, NAD 83)
Winyah Bay to Charleston	**AIWW21-WC-12**	**AIWW21-WC-12A**	5/5/21	1050-1055	-12.3	33.1715	-79.3036
		AIWW21-WC-12B	5/5/21	1045-1050	-13.3	33.1717	-79.2924
		AIWW21-WC-12C	5/5/21	1035-1040	-13.1	33.1766	-79.2861
		AIWW21-WC-12D	5/5/21	1025-1030	-15.9	33.1806	-79.2833
		AIWW21-WC-12E	5/5/21	1015-1020	-12.1	33.1879	-79.2775
		AIWW21-WC-12F	5/5/21	1010-1015	-13.4	33.1909	-79.2751
	AIWW21-WC-13	**AIWW21-WC-13A**	5/5/21	0925-0935	-12.7	33.2548	-79.2647
		AIWW21-WC-13B	5/5/21	0940-0950	-11.3	33.2576	-79.2611
Charleston to Port Royal	**AIWW21-CP-14**	**AIWW21-CP-14A**	5/6/21	1310-1315	-6.7	32.7796	-80.1218
		AIWW21-CP-14B	5/6/21	1315-1330	-3.2	32.7802	-80.1196
	AIWW21-CP-15	**AIWW21-CP-15A**	5/6/21	1205-1210	-2.5	32.6195	-80.2889
		AIWW21-CP-15B	5/6/21	1210-1215	-5.6	32.6224	-80.2855
		AIWW21-CP-15C	5/6/21	1215-1230	-5.7	32.6252	-80.2813
	AIWW21-CP-16	**AIWW21-CP-16A**	5/6/21	1130-1135	-7.2	32.6270	-80.3030
		AIWW21-CP-16B	5/6/21	1140-1200	-6.3	32.6260	-80.3017
	AIWW21-CP-17	**AIWW21-CP-17A**	5/6/21	1035-1040	-9.3	32.6175	-80.3777
		AIWW21-CP-17B	5/6/21	1040-1045	-5.8	32.6190	-80.3699
		AIWW21-CP-17C	5/6/21	1050-1055	-6.5	32.6205	-80.3622
		AIWW21-CP-17D	5/6/21	1055-1100	-7.5	32.6245	-80.3566
		AIWW21-CP-17E	5/6/21	1100-1115	-8.1	32.6300	-80.3523
	AIWW21-CP-18	**AIWW21-CP-18A**	5/6/21	1000-1005	-14.1	32.5353	-80.4122
		AIWW21-CP-18B	5/6/21	1005-1020	-8.9	32.5363	-80.4113
	AIWW21-CP-19	**AIWW21-CP-19A**	5/6/21	0925-0930	-8.6	32.5216	-80.4769
		AIWW21-CP-19B	5/6/21	0935-0945	-6.4	32.5202	-80.4752
	AIWW21-CP-20	**AIWW21-CP-20A**	5/6/21	0840-0845	-7.6	32.5130	-80.4991
		AIWW21-CP-20B	5/6/21	0850-0855	-9.2	32.5155	-80.4944
		AIWW21-CP-20C	5/6/21	0900-0905	-9.4	32.5185	-80.4896
		AIWW21-CP-20D	5/6/21	0905-0920	-8.1	32.5218	-80.4860

***** feet mean lower low water calculated from water depth (measured by lead line) and tide height using data from the NOAA water level station (#8665530, Charleston, Cooper River Entrance).

Source: ANAMAR Environmental Consulting, Inc.

ANAMAR Environmental Consulting, Inc.

TABLE 2
Site Water Sample Summary Including Water Column Measurements

	Little River to North of Charleston			South of Charleston to Port Royal		
Sample ID:	**AIWW21-SW-1**			**AIWW21-SW-2**		
Date	5/6/21			5/7/21		
Sampling Start/End Times (EDT)	1145-1330			0947-1006		
Depth of Water (feet)	6.0			19.6		
Time of Measurement (EDT)	1140	1142	1144	0952	1002	1004
Depth of Measurement (feet)	0.5	2.5	5.0	1	8	16.5
Water Temperature (°C)	25.4	25.3	25.3	24.9	24.9	24.9
pH (units)	7.41	7.44	7.45	7.67	7.71	7.73
Salinity (ppt)	33.70	33.71	33.70	27.97	27.95	27.95
Sp. Conductivity (µS/cm)	51332	51327	51312	43441	43410	43408
Dissolved Oxygen (mg/L)	5.48	5.30	5.22	5.94	5.38	5.41
Dissolved Oxygen (%)	80.2	77.3	77.3	83.3	76.2	76.6
Turbidity (NTU)	--	--	--	8.22	--	--
Easting[1]	2469047			2254241		
Northing[1]	454716			326819		
Sampling Method	Pneumatic pump			Pneumatic pump		
Field Description of Sample	Olive in color; some suspended materials, no odor observed			Yellow in color; some suspended materials, no odor observed		
Weather/Tidal Cycle	Low-slack tide with 0-5 knot winds from the NE, calm seas, sunny skies			Mid-outgoing tide with 5-10 knot winds from the W, calm seas, sunny skies		
General Conditions and Observations	Approx. 400' SW of channel marker 37; turbidity appeared to be less than 10 NTUs based on visual estimation.					

[1] Coordinates were recorded in the field and were referenced to North American Datum of 1983, State Plane Coordinate System, SC (Zone 3900), US Survey Feet.
– = No reading taken

Source: ANAMAR Environmental Consulting, Inc.

TABLE 3
Results of Physical Analyses for Sediment Subsamples

		Little River to Winyah Bay						Winyah Bay to Charleston				
Subsample ID: AIWW21-		**LB-1A**	**LB-1B**	**LB-2A**	**LB-2B**	**LB-3A**	**LB-3B**	**WC-4A**	**AWC-4B**	**WC-4C**	**WC-4D**	**WC-4E**
Sediment Description		Sand, poorly-graded, mostly medium to fine-grained quartz, trace coarse to fine sand-size shell fragments, trace silt, brown	Sand, poorly-graded, mostly medium to fine-grained quartz, trace coarse to fine sand-size shell fragments, trace silt, brown	Sand, poorly-graded, mostly medium to fine-grained quartz, trace coarse to fine sand-size shell fragments, trace silt, brown	Sand, poorly-graded, mostly medium to fine-grained quartz, trace coarse to fine sand-size shell fragments, trace fine gravel-size shell fragments, trace silt, brown	Sand, poorly-graded, mostly medium to fine-grained quartz, trace silt, brown	Sand, poorly-graded, mostly medium to fine-grained quartz, trace fine gravel-size shell fragments, trace silt, brown	Silty sand, mostly medium to fine-grained quartz, little silt, brown	Silty sand, mostly medium to fine-grained quartz, little silt, brown	Sandy elastic silt, some medium to fine-grained quartz sand, trace coarse to fine sand-size shell fragments, trace fine gravel-size shell fragments, trace fibrous organic matter, gray	Elastic silt, few medium to fine-grained quartz sand, trace coarse to fine sand-size shell fragments, trace fine gravel-size shell fragments, gray	Elastic silt, trace medium to fine-grained quartz sand, trace coarse to fine sand-size shell fragments, trace fine gravel-size shell fragments, trace fibrous organics, gray
% Gravel		0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.3	0.8	0.2
% Coarse Sand		0.2	0.1	0.1	0.2	0.2	0.0	0.0	0.0	0.6	2.2	0.2
% Medium Sand		1.7	1.3	14.2	3.5	26.9	7.8	0.2	0.2	1.1	1.5	0.5
% Fine Sand		97.1	98.4	85.6	94.7	72.2	91.3	87.1	86.1	32.0	9.3	2.6
% Sand (total)		99.0	99.8	99.9	98.4	99.3	99.1	87.3	86.3	33.7	13.0	3.3
% Silt & Clay (combined)		1.0	0.2	0.1	1.4	0.7	0.8	12.7	13.7	66.0	86.2	96.5
USCS Classification		SP	SP	SP	SP	SP	SP	SM	SM	MH or CH	MH or CH	MH
% Passing Sieve Size	**Metric Equivalent (mm)**											
1 inch	**25.4**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.75 inch	**19.1**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.375 inch	**9.5**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
#4	**4.75**	100.0	100.0	100.0	99.8	100.0	99.9	100.0	100.0	99.7	99.2	99.8
#10	**2.00**	99.8	99.9	99.9	99.6	99.8	99.9	100.0	100.0	99.1	97.0	99.6
#20	**0.85**	99.4	99.4	99.4	99.1	95.8	98.4	99.9	99.9	98.3	96.2	99.4
#40	**0.425**	98.1	98.6	85.7	96.1	72.9	92.1	99.8	99.8	98.0	95.5	99.1
#60	**0.250**	92.5	93.3	34.0	71.5	24.6	60.0	99.3	99.3	97.3	94.8	98.9
#100	**0.149**	17.1	14.3	2.3	10.6	1.6	5.9	93.0	95.1	94.6	93.9	98.3
#200	**0.075**	1.0	0.2	0.1	1.4	0.7	0.8	12.7	13.7	66.0	86.2	96.5

TABLE 3 (*continued*)
Results of Physical Analyses for Sediment Subsamples

		Winyah Bay to Charleston									
Subsample ID: AIWW21-		**WC-5A**	**WC-5B**	**WC-5C**	**WC-6A**	**WC-6B**	**WC-7A**	**WC-7B**	**WC-7C**	**WC-8A**	**WC-8B**
Sediment Description		Elastic silt, few medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt, trace medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt with sand, little medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt with sand, little medium to fine-grained quartz sand, trace coarse to fine sand-size shell fragments, trace fibrous organic matter, gray	Elastic silt, few medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt, trace medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt with sand, little medium to fine-grained quartz sand, trace coarse to fine sand-size shell fragment, trace fine gravel-size shell fragments, trace fibrous organic matter, gray	Sandy elastic silt, some medium to fine-grained quartz sand, trace coarse to fine sand-size shell fragments, trace fibrous organic matter, gray	Elastic silt, trace medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt, trace medium to fine-grained quartz sand, trace fibrous organic matter, gray
% Gravel		0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
% Coarse Sand		0.0	0.0	0.0	0.1	0.0	0.0	0.2	0.2	0.0	0.0
% Medium Sand		1.0	0.6	0.8	0.8	0.4	0.2	3.8	1.5	0.2	0.2
% Fine Sand		4.6	2.8	15.6	14.3	6.1	1.3	17.0	32.0	3.4	3.3
% Sand (total)		5.6	3.4	16.4	15.2	6.5	1.5	21.0	33.7	3.6	3.5
% Silt & Clay (combined)		94.4	96.6	83.6	84.8	93.5	98.5	78.8	66.3	96.4	96.5
USCS Classification		MH or CH	MH or CH	MH or CH	MH or CH	MH or CH	MH or CH	MH or CH	MH or CH	MH or CH	MH or CH
% Passing Sieve Size	**Metric Equivalent (mm)**										
1 inch	**25.4**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.75 inch	**19.1**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.375 inch	**9.5**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
#4	**4.75**	100.0	100.0	100.0	100.0	100.0	100.0	99.8	100.0	100.0	100.0
#10	**2.00**	100.0	100.0	100.0	99.9	100.0	100.0	99.6	99.8	100.0	100.0
#20	**0.85**	99.6	99.7	99.6	99.6	99.8	100.0	98.4	99.2	99.9	100.0
#40	**0.425**	99.0	99.4	99.2	99.1	99.6	99.8	95.8	98.3	99.8	99.8
#60	**0.250**	98.1	99.2	98.5	98.4	99.3	99.7	91.6	96.6	99.5	99.7
#100	**0.149**	97.0	98.6	96.8	95.9	98.4	99.5	83.9	90.0	98.9	99.1
#200	**0.075**	94.4	96.6	83.6	84.8	93.5	98.5	78.8	66.3	96.4	96.5

TABLE 3 (*continued*)
Results of Physical Analyses for Sediment Subsamples

		Winyah Bay to Charleston								
Subsample ID: AIWW21-		**WC-9A**	**WC-9B**	**WC-9C**	**WC-9D**	**WC-9E**	**WC-10A**	**WC-10B**	**WC-11A**	**WC-11B**
Sediment Description		Elastic silt, trace medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt, trace medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt, trace medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt, few medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt, trace medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt, trace fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt, trace medium to fine-grained quartz sand, trace fibrous organic matter, gray	Sand, poorly-graded, mostly medium to fine-grained quartz, trace coarse to fine sand-size shell fragments, trace silt, brown	Sand, poorly-graded with silt, mostly medium to fine-grained quartz, few silt, trace coarse to fine sand-size shell fragments, brown
% Gravel		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Coarse Sand		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
% Medium Sand		0.3	0.1	0.2	0.6	0.0	0.0	0.2	67.5	23.5
% Fine Sand		2.7	2.1	2.4	6.4	2.0	0.5	1.9	30.8	71.3
% Sand (total)		3.0	2.2	2.6	7.0	2.0	0.5	2.1	98.4	94.9
% Silt & Clay (combined)		97.0	97.8	97.4	93.0	98.0	99.5	97.9	1.6	5.1
USCS Classification		MH	MH	MH	MH	MH	MH	MH	SP	SP-SM
% Passing Sieve Size	**Metric Equivalent (mm)**									
1 inch	**25.4**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.75 inch	**19.1**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.375 inch	**9.5**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
#4	**4.75**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
#10	**2.00**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9
#20	**0.85**	99.8	100.0	99.9	99.9	100.0	100.0	99.9	92.8	97.3
#40	**0.425**	99.7	99.9	99.8	99.4	100.0	100.0	99.8	32.4	76.4
#60	**0.250**	99.5	99.8	99.6	98.9	99.8	100.0	99.6	4.6	31.1
#100	**0.149**	98.9	99.4	99.2	97.7	99.5	99.8	99.2	2.2	7.2
#200	**0.075**	97.0	97.8	97.4	93.0	98.0	99.5	97.9	1.6	5.1

TABLE 3 (*continued*)
Results of Physical Analyses for Sediment Subsamples

Subsample ID: AIWW21-		Winyah Bay to Charleston								Charleston to Port Royal	
		WC-12A	WC-12B	WC-12C	WC-12D	WC-12E	WC-12F	WC-13A	WC-13B	CP-14A	CP-14B
Sediment Description		Silty sand, mostly medium to fine-grained quartz, little silt, trace coarse to fine sand-size shell fragments, brown	Silty sand, mostly medium to fine-grained quartz, little silt, few coarse to fine sand-size shell fragments, trace fine gravel-size shell fragments, brown	Sand, poorly-graded, mostly medium to fine-grained quartz, trace coarse to fine sand-size shell fragments, trace silt, brown	Elastic silt, few medium to finer-grained quartz sand, trace fibrous organic matter, gray	Silty sand, mostly medium to fine-grained quartz, little silt, trace coarse to fine sand-size shell fragments, trace fine gravel-size shell fragments, brown	Sandy elastic silt, some medium to fine-grained quartz sand, trace coarse to fine sand-size shell fragments, trace fibrous organic matter, gray	Elastic silt, trace medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt, few medium to fine-grained quartz sand, trace fibrous organic matter, gray	Sand, poorly-graded with silt, mostly medium to fine-grained quartz, few silt, brown	Sand, poorly-graded, mostly medium to fine-grained quartz, trace coarse to fine sand-size shell fragments, trace fine gravel-size shell fragments, brown
% Gravel		0.0	0.9	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.3
% Coarse Sand		0.1	0.4	0.8	0.0	1.0	0.1	0.0	0.0	0.0	0.6
% Medium Sand		1.8	9.7	47.9	1.7	8.9	1.8	0.3	0.3	1.3	59.9
% Fine Sand		85.6	62.8	46.8	5.7	61.5	34.5	2.6	9.3	92.0	37.4
% Sand (total)		87.5	72.9	95.5	7.4	71.4	36.4	2.9	9.6	93.3	97.9
% Silt & Clay (combined)		12.5	26.2	4.5	92.6	28.2	63.6	97.1	90.4	6.7	1.8
USCS Classification		SM or SC	SM or SC	SP	MH	SM	MH	MH	MH	SP-SM	SP
% Passing Sieve Size	**Metric Equivalent (mm)**										
1 inch	**25.4**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.75 inch	**19.1**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.375 inch	**9.5**	100.0	99.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
#4	**4.75**	100.0	99.1	100.0	100.0	99.6	100.0	100.0	100.0	100.0	99.7
#10	**2.00**	99.9	98.7	99.2	100.0	98.6	99.9	100.0	100.0	100.0	99.1
#20	**0.85**	99.6	97.6	83.5	99.7	96.0	98.9	99.9	99.9	99.9	86.9
#40	**0.425**	98.1	89.0	51.3	98.3	89.7	98.1	99.7	99.7	98.7	39.2
#60	**0.250**	86.7	57.0	18.2	96.1	78.5	96.0	99.4	99.3	87.6	10.2
#100	**0.149**	38.8	34.1	6.3	94.4	45.5	82.9	98.9	98.2	28.4	2.4
#200	**0.075**	12.5	26.2	4.5	92.6	28.2	63.6	97.1	90.4	6.7	1.8

TABLE 3 (*continued*)
Results of Physical Analyses for Sediment Subsamples

Subsample ID: AIWW21-		Charleston to Port Royal									
		CP-15A	CP-15B	CP-15C	CP-16A	CP-16B	CP-17A	CP-17B	CP-17C	CP-17D	CP-17E
Sediment Description		Elastic silt, trace medium to fine-grained quartz sand, trace fibrous organic matter, gray	Silty sand, mostly medium to fine-grained quartz, some silt, trace coarse to fine sand-size shell fragments, brown	Silty sand, mostly medium to fine-grained quartz, some silt, gray	Elastic silt, few medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt with sand, little medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt, trace medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt, trace medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt, trace medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt, trace medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt, trace medium to fine-grained quartz sand, trace fibrous organic matter, gray
% Gravel		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Coarse Sand		0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
% Medium Sand		0.3	0.7	1.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2
% Fine Sand		4.2	61.8	52.0	9.3	15.2	1.0	1.0	3.3	2.5	1.2
% Sand (total)		4.5	62.6	53.2	9.5	15.4	1.2	1.1	3.5	2.8	1.4
% Silt & Clay (combined)		95.5	37.4	46.8	90.5	84.6	98.8	98.9	96.5	97.2	98.6
USCS Classification		MH	SM	SM	MH	MH	MH or CH	MH or CH	MH or CH	MH or CH	MH or CH
% Passing Sieve Size	**Metric Equivalent (mm)**										
1 inch	**25.4**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.75 inch	**19.1**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.375 inch	**9.5**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
#4	**4.75**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
#10	**2.00**	100.0	99.9	100.0	100.0	100.0	100.0	100.0	100.0	99.9	100.0
#20	**0.85**	99.9	99.6	99.7	100.0	99.9	100.0	100.0	99.9	99.9	100.0
#40	**0.425**	99.7	99.2	98.8	99.8	99.8	99.8	99.9	99.8	99.7	99.8
#60	**0.250**	99.6	98.3	96.3	99.6	99.6	99.7	99.8	99.6	99.4	99.7
#100	**0.149**	99.1	85.8	67.8	99.0	99.2	99.5	99.6	98.9	98.8	99.4
#200	**0.075**	95.5	37.4	46.8	90.5	84.6	98.8	98.9	96.5	97.2	98.6

TABLE 3 (*continued*)
Results of Physical Analyses for Sediment Subsamples

Subsample ID: AIWW21-		Charleston to Port Royal							
		CP-18A	CP-18B	CP-19A	CP-19B	CP-20A	CP-20B	CP-20C	CP-20D
Sediment Description		Sandy elastic silt, some medium to fine-grained quartz sand, trace fibrous organic matter, gray	Silty sand, mostly medium to fine-grained quartz, some silt, gray	Sandy elastic silt, some medium to fine-grained quartz sand, trace fibrous organic matter, gray	Sandy elastic silt, some medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt, trace medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt, trace medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt, trace medium to fine-grained quartz sand, trace fibrous organic matter, gray	Elastic silt, few medium to fine-grained quartz sand, trace fibrous organic matter, gray
% Gravel		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Coarse Sand		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Medium Sand		0.2	0.3	0.2	0.2	0.2	0.3	0.1	0.1
% Fine Sand		48.1	68.6	34.4	36.0	1.8	3.3	1.3	5.7
% Sand (total)		48.3	68.9	34.6	36.2	2.0	3.6	1.4	5.8
% Silt & Clay (combined)		51.7	31.1	65.4	63.8	98.0	96.4	98.6	94.2
USCS Classification		MH	SM	MH or CH	MH or CH	MH or CH	MH or CH	MH or CH	MH or CH
% Passing Sieve Size	**Metric Equivalent (mm)**								
1 inch	**25.4**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.75 inch	**19.1**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.375 inch	**9.5**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
#4	**4.75**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
#10	**2.00**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
#20	**0.85**	99.9	100.0	99.9	99.9	100.0	99.9	100.0	100.0
#40	**0.425**	99.8	99.7	99.8	99.8	99.8	99.7	99.9	99.9
#60	**0.250**	99.3	98.5	99.6	99.6	99.6	99.5	99.8	99.7
#100	**0.149**	66.1	59.3	96.8	98.8	99.2	98.6	99.5	98.6
#200	**0.075**	51.7	31.1	65.4	63.8	98.0	96.4	98.6	94.2

See Appendix C for grain size distribution graphs and laboratory triplicate results.
Grain sizes and USCS classifications are defined at the front of the tables section.

Source: Terracon Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 4

Results of Physical Analyses for Composited Sediment Samples

Composite ID: AIWW21-		Little River to Winyah Bay			Winyah Bay to Charleston						
		LB-1	**LB-2**	**LB-3**	**WC-4**	**WC-5**	**WC-6**	**WC-7**	**WC-8**	**WC-9**	**WC-10**
Sediment Description		Sand, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace clay, trace small roots, brown	Sand, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace clay, trace coarse to fine sand-size shell fragments, brown	Sand, poorly-graded, mostly medium to fine-grained quartz, trace silt, trace clay, brown	Sandy fat clay, some medium to fine-grained quartz sand, little silt, trace coarse to fine sand-size shell fragments, gray	Fat clay, some silt, few medium to fine-grained quartz sand, gray	Fat clay, some silt, few medium to fine-grained quartz sand, gray	Fat clay, little silt, few medium to fine-grained quartz sand, gray	Fat clay, some silt, trace medium to fine-grained quartz sand, gray	Elastic silt, some clay, trace medium to fine-grained quartz sand, gray	Elastic silt, some clay, trace medium to fine-grained quartz sand, gray
% Gravel		0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Coarse Sand		0.4	0.2	0.2	0.5	0.0	0.0	0.0	0.0	0.0	0.0
% Medium Sand		1.7	13.4	11.6	2.0	0.8	0.5	1.5	0.3	0.4	0.3
% Fine Sand		94.6	85.1	87.1	39.7	4.5	9.1	8.7	1.4	2.5	0.9
% Sand (total)		96.7	98.7	98.9	42.2	5.3	9.6	10.2	1.7	2.9	1.2
% Silt		2.3	1.0	0.8	23.1	38.5	34.3	26.2	34.6	28.1	30.0
% Clay		0.4	0.3	0.3	34.7	56.2	56.1	63.6	63.7	69.0	68.8
% Silt & Clay (combined)		2.7	1.3	1.1	57.8	94.7	90.4	89.8	98.3	97.1	98.8
USCS Classification		SP	SP	SP	CH	CH	CH	CH	CH	MH	MH
Specific Gravity		2.661	2.655	2.622	2.612	2.610	2.670	2.626	2.602	2.603	2.608
Settling Rates (g/L)		2000	2222	2083	781	775	781	794	794	758	709
Atterberg Limits	**PL**	NP	NP	NP	33	45	47	45	58	59	69
	LL	NP	NP	NP	90	175	159	157	183	161	184
	PI	NP	NP	NP	57	130	112	112	125	102	115
% Passing Sieve Size	**Metric Equivalent (mm)**										
1 inch	**25.4**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.75 inch	**19.1**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.375 inch	**9.5**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
#4	**4.75**	99.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
#10	**2.00**	99.0	99.8	99.8	99.5	100.0	100.0	100.0	100.0	100.0	100.0
#20	**0.85**	98.4	99.1	97.6	98.3	99.7	99.7	99.4	99.9	99.7	99.8
#40	**0.425**	97.3	86.4	88.2	97.5	99.2	99.5	98.5	99.7	99.6	99.7
#60	**0.250**	91.9	40.7	51.9	96.8	99.1	99.1	97.2	99.3	99.2	99.5
#100	**0.149**	16.5	4.2	5.7	94.2	98.5	97.8	93.8	98.8	98.8	99.4
#200	**0.075**	2.7	1.3	1.1	57.8	94.7	90.4	89.8	98.3	97.1	98.8
Hydrometer Readings (% less than the following sizes)		0.4 @ 0.0365 mm	0.3 @ 0.0366 mm	0.3 @ 0.0369 mm	56.8 @ 0.0319 mm	94.0 @ 0.0312 mm	90.3 @ 0.0307 mm	89.3 @ 0.0313 mm	98.2 @ 0.0316 mm	94.7 @ 0.0314 mm	96.7 @ 0.0322 mm
		0.4 @ 0.0231 mm	0.3 @ 0.0231 mm	0.3 @ 0.0234 mm	52.1 @ 0.0205 mm	88.9 @ 0.0200 mm	85.3 @ 0.0196 mm	84.2 @ 0.0200 mm	92.6 @ 0.0202 mm	92.9 @ 0.0200 mm	92.6 @ 0.0205 mm
		0.4 @ 0.0133 mm	0.3 @ 0.0133 mm	0.3 @ 0.0135 mm	47.4 @ 0.0120 mm	76.8 @ 0.0118 mm	77.0 @ 0.0115 mm	75.7 @ 0.0118 mm	83.2 @ 0.0119 mm	85.9 @ 0.0117 mm	88.4 @ 0.0119 mm
		0.4 @ 0.0094 mm	0.3 @ 0.0094 mm	0.3 @ 0.0095 mm	41.6 @ 0.0086 mm	68.1 @ 0.0085 mm	67.1 @ 0.0083 mm	68.9 @ 0.0084 mm	75.8 @ 0.0085 mm	78.8 @ 0.0084 mm	80.1 @ 0.0085 mm
		0.4 @ 0.0067 mm	0.3 @ 0.0067 mm	0.3 @ 0.0067 mm	36.9 @ 0.0062 mm	59.5 @ 0.0061 mm	58.8 @ 0.0060 mm	65.5 @ 0.0060 mm	64.5 @ 0.0061 mm	71.7 @ 0.0060 mm	71.7 @ 0.0061 mm
		0.4 @ 0.0033 mm	0.3 @ 0.0033 mm	0.3 @ 0.0033 mm	31.0 @ 0.0031 mm	52.6 @ 0.0030 mm	52.2 @ 0.0030 mm	57.0 @ 0.0030 mm	60.8 @ 0.0030 mm	64.6 @ 0.0030 mm	65.5 @ 0.0030 mm
		0.4 @ 0.0014 mm	0.3 @ 0.0014 mm	0.3 @ 0.0014 mm	26.3 @ 0.0013 mm	45.7 @ 0.0013 mm	43.9 @ 0.0013 mm	48.5 @ 0.0013 mm	53.3 @ 0.0013 mm	55.7 @ 0.0013 mm	55.1 @ 0.0013 mm

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TABLE 4 (*continued*)
Results of Physical Analyses for Composited Sediment Samples

		Winyah Bay to Charleston			Charleston to Port Royal						
Composite ID: AIWW21-		**WC-11**	**WC-12**	**WC-13**	**CP-14**	**CP-15**	**CP-16**	**CP-17**	**CP-18**	**CP-19**	**CP-20**
Sediment Description		Sand, poorly-graded with clay, mostly medium to fine-grained quartz, few clay, trace coarse to fine sand-size shell fragments, trace silt, brown	Clayey sand, mostly medium to fine-grained quartz, little clay, little silt, trace fibrous organic matter, gray	Elastic silt, few medium to fine-grained quartz sand, trace coarse to fine sand-size shell fragments, trace fibrous organic matter, gray	Sand, poorly-graded with clay, mostly medium to fine-grained quartz sand, few clay, trace silt, brown	Sandy fat clay, some medium to fine-grained quartz sand, little silt, trace coarse to fine sand-size shell fragments, trace fibrous organic matter, gray	Elastic silt with sand, some clay, little medium to fine-grained quartz, trace fibrous organic matter, gray	Fat clay, little silt, few medium to fine-grained quartz sand, trace coarse to fine sand-size shell fragments, trace fibrous organic matter, gray	Clayey sand, mostly medium to fine-grained quartz, little clay, little silt, trace coarse to fine sand-size shell fragments, trace fine gravel-size shell fragments, trace fibrous organic matter, gray	Sandy fat clay, some medium to fine-grained quartz sand, little silt, trace coarse to fine sand-size shell fragments, trace fibrous organic matter, gray	Fat clay, little silt, few medium to fine-grained quartz sand, trace fibrous organic matter, gray
% Gravel		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0
% Coarse Sand		0.1	0.1	0.3	0.5	0.1	0.2	0.2	0.1	0.1	0.0
% Medium Sand		31.9	11.8	1.2	33.0	1.2	0.7	0.6	0.5	0.4	0.9
% Fine Sand		61.2	49.9	6.6	61.0	48.1	14.9	4.4	63.8	41.5	7.6
% Sand (total)		93.2	61.8	8.1	94.5	49.4	15.8	5.2	64.4	42.0	8.5
% Silt		1.8	15.7	26.0	0.5	18.5	36.4	24.2	12.2	26.9	29.5
% Clay		5.0	22.5	65.9	5.0	32.1	47.8	70.6	23.1	31.1	62.0
% Silt & Clay (combined)		6.8	38.2	91.9	5.5	50.6	84.2	94.8	35.3	58.0	91.5
USCS Classification		SP-SM	SC	MH	SP-SM	CH	MH	CH	SC	CH	CH
Specific Gravity		2.641	2.631	2.619	2.665	2.614	2.610	2.625	2.639	2.607	2.602
Settling Rates (g/L)		1471	877	787	1754	820	909	568	917	855	730
Atterberg Limits	**PL**	NP	26	82	NP	32	57	62	27	27	51
	LL	NP	64	207	NP	79	141	223	62	78	173
	PI	NP	38	125	NP	47	84	161	35	51	122
% Passing Sieve Size	**Metric Equivalent (mm)**										
1 inch	**25.4**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.75 inch	**19.1**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.375 inch	**9.5**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
#4	**4.75**	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.7	100.0	100.0
#10	**2.00**	99.9	99.9	99.7	99.5	99.9	99.8	99.8	99.6	99.9	100.0
#20	**0.85**	97.0	97.1	99.7	93.4	99.4	99.5	99.5	99.4	99.6	99.6
#40	**0.425**	68.0	88.1	98.5	66.5	98.7	99.1	99.2	99.1	99.5	99.1
#60	**0.250**	30.3	70.1	97.3	44.1	97.0	98.4	98.8	97.1	99.2	98.9
#100	**0.149**	10.2	46.9	95.3	11.9	80.8	95.9	97.7	56.2	95.7	97.3
#200	**0.075**	6.8	38.2	91.9	5.5	50.6	84.2	94.8	35.3	58.0	91.5
Hydrometer Readings (% less than the following sizes)		6.1 @ 0.0357 mm	35.0 @ 0.0329 mm	91.3 @ 0.0325 mm	5.0 @ 0.0357 mm	46.3 @ 0.0326 mm	70.2 @ 0.0319 mm	91.5 @ 0.0324 mm	33.2 @ 0.0330 mm	44.4 @ 0.0327 mm	86.3 @ 0.0320 mm
		5.0 @ 0.0227 mm	31.4 @ 0.0211 mm	87.0 @ 0.0207 mm	5.0 @ 0.0226 mm	44.2 @ 0.0208 mm	64.4 @ 0.0205 mm	89.4 @ 0.0205 mm	30.5 @ 0.0211 mm	40.3 @ 0.0210 mm	79.3 @ 0.0206 mm
		5.0 @ 0.0131 mm	29.6 @ 0.0122 mm	82.7 @ 0.0120 mm	5.0 @ 0.0130 mm	39.8 @ 0.0121 mm	60.1 @ 0.0120 mm	81.2 @ 0.0120 mm	27.8 @ 0.0123 mm	38.3 @ 0.0122 mm	72.3 @ 0.0120 mm
		5.0 @ 0.0093 mm	25.9 @ 0.0088 mm	78.4 @ 0.0086 mm	5.0 @ 0.0092 mm	36.5 @ 0.0087 mm	55.8 @ 0.0085 mm	79.1 @ 0.0085 mm	26.0 @ 0.0088 mm	35.2 @ 0.0087 mm	67.0 @ 0.0086 mm
		5.0 @ 0.0066 mm	23.2 @ 0.0063 mm	69.8 @ 0.0061 mm	5.0 @ 0.0065 mm	33.3 @ 0.0062 mm	50.0 @ 0.0061 mm	72.9 @ 0.0061 mm	23.4 @ 0.0062 mm	32.1 @ 0.0062 mm	63.5 @ 0.0061 mm
		5.0 @ 0.0032 mm	22.3 @ 0.0031 mm	61.2 @ 0.0030 mm	5.0 @ 0.0032 mm	31.1 @ 0.0031 mm	45.6 @ 0.0030 mm	68.7 @ 0.0030 mm	22.5 @ 0.0031 mm	30.0 @ 0.0031 mm	58.2 @ 0.0030 mm
		3.8 @ 0.0013 mm	18.6 @ 0.0013 mm	52.6 @ 0.0013 mm	3.8 @ 0.0013 mm	26.7 @ 0.0013 mm	39.8 @ 0.0013 mm	56.3 @ 0.0013 mm	18.9 @ 0.0013 mm	24.9 @ 0.0013 mm	47.7 @ 0.0013 mm

See Appendix C for grain size distribution graphs and laboratory triplicate results.
Grain sizes and soil classifications are defined at the front of the tables section.

Source: Terracon
Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 5

Analytical Results for Dry Weight Metals, TOC, Total Solids, and Tributyltin in Sediment Samples

				Little River to Winyah Bay												Winyah Bay to Charleston											
	Sample ID:			AIWW21-LB-1				AIWW21-LB-2				AIWW21-LB-3				AIWW21-WC-4				AIWW21-WC-5				AIWW21-WC-6			
Analyte	Maximum Conc. mg/kg	TEL mg/kg	ERL mg/kg	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL
Metals																											
Antimony	0.26	x	x	ND	U	0.028	0.13	ND	U	0.026	0.12	ND	U	0.027	0.12	0.12	J	0.067	0.30	0.13	J	0.086	0.39	0.11	J	0.070	0.32
Arsenic	**25**	7.24	8.2	0.79	--	0.020	0.063	0.43	--	0.019	0.060	0.094	--	0.020	0.062	**18**	--	0.049	0.15	**21**	--	0.062	0.20	**18**	--	0.051	0.16
Cadmium	0.21	0.676	1.2	0.032	J	0.011	0.063	0.011	J	0.010	0.060	ND	U	0.011	0.062	0.11	J	0.026	0.15	0.049	J	0.033	0.20	0.047	J	0.027	0.16
Chromium	51	52.3	81	3.5	B	0.053	0.13	1.3	B	0.050	0.12	0.68	B	0.052	0.12	33	B	0.13	0.30	42	B	0.16	0.39	40	B	0.13	0.32
Copper	**21**	18.7	34	0.84	--	0.13	0.19	0.13	J	0.12	0.18	ND	U	0.13	0.19	9.9	--	0.31	0.46	12	--	0.40	0.59	11	--	0.33	0.48
Lead	23	30.24	46.7	1.8	--	0.063	0.063	1.3	--	0.060	0.060	0.48	--	0.062	0.062	13	--	0.15	0.15	17	--	0.20	0.20	17	--	0.16	0.16
Mercury	0.065	0.13	0.15	ND	U	0.013	0.02	ND	U	0.012	0.019	ND	U	0.013	0.020	ND	U	0.032	0.049	ND	U	0.041	0.064	ND	U	0.034	0.053
Nickel	**17**	15.9	20.9	0.88	--	0.060	0.063	0.18	--	0.056	0.060	0.12	--	0.058	0.062	9.9	--	0.14	0.15	13	--	0.18	0.20	12	--	0.15	0.16
Selenium	0.84	x	x	ND	U	0.077	0.32	ND	U	0.073	0.30	ND	U	0.076	0.31	0.49	J	0.19	0.76	0.48	J	0.24	0.98	0.41	J	0.19	0.79
Silver	0.074	0.730	1	ND	U	0.018	0.063	ND	U	0.017	0.060	ND	U	0.017	0.062	0.047	J	0.043	0.15	ND	U	0.055	0.20	ND	U	0.045	0.16
Zinc	83	124	150	10	--	0.31	0.32	1.5	--	0.29	0.30	0.71	--	0.30	0.31	42	--	0.73	0.76	53	--	0.94	0.98	51	--	0.77	0.79
Others																											
Analyte	Maximum Conc. %	TEL %	ERL %	Result %	Qualifier	MDL	MRL	Result %	Qualifier	MDL	MRL	Result %	Qualifier	MDL	MRL	Result %	Qualifier	MDL	MRL	Result %	Qualifier	MDL	MRL	Result %	Qualifier	MDL	MRL
Carbon, Total Organic	6.4	x	x	0.16	--	0.096	0.13	0.13	--	0.090	0.12	ND	U	0.094	0.13	2.60	--	0.23	0.30	3.6	--	0.30	0.40	2.9	--	0.24	0.32
Total Solids	82.5	x	x	77.4				82.5				79.8				32.9				25.2				31.1			
Analyte	Maximum Conc. µg/kg	TEL µg/kg	ERL µg/kg	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL
Tributyltin	ND	x	x	ND	U	1.9	1.9	ND	U	1.8	1.8	ND	U	1.8	1.8												

TABLE 5 (*continued*)
Analytical Results for Dry Weight Metals, TOC, Total Solids, and Tributyltin in Sediment Samples

	Winyah Bay to Charleston																											
Sample ID:	AIWW21-WC-7				AIWW21-WC-8				AIWW21-WC-9				AIWW21-WC-10				AIWW21-WC-11				AIWW21-WC-12				AIWW21-WC-13			
Analyte	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL
Metals																												
Antimony	0.12	J	0.076	0.35	0.17	J	0.087	0.40	0.13	J	0.082	0.37	0.19	J	0.10	0.46	ND	U	0.030	0.14	0.10	J	0.057	0.26	0.26	J	0.10	0.46
Arsenic	**20**	--	0.055	0.17	**25**	--	0.064	0.20	**22**	--	0.060	0.19	**23**	--	0.074	0.23	1.9	--	0.022	0.069	**9.7**	--	0.041	0.13	**22**	--	0.074	0.23
Cadmium	0.042	J	0.029	0.17	0.051	J	0.034	0.20	0.056	J	0.032	0.19	0.054	J	0.039	0.23	ND	U	0.012	0.069	0.039	J	0.022	0.13	0.079	J	0.039	0.23
Chromium	38	B	0.15	0.35	45	B	0.17	0.40	43	B	0.16	0.37	47	B	0.19	0.46	4.0	B	0.058	0.14	22	B	0.11	0.26	48	B	0.19	0.46
Copper	12	--	0.36	0.52	14	--	0.41	0.60	15	--	0.38	0.56	**19**	--	0.48	0.70	0.91	--	0.14	0.21	8.2	--	0.27	0.39	**21**	--	0.48	0.69
Lead	17	--	0.17	0.17	19	--	0.20	0.20	19	--	0.19	0.19	21	--	0.23	0.23	1.7	--	0.069	0.069	10	--	0.13	0.13	23	--	0.23	0.23
Mercury	ND	U	0.037	0.058	ND	U	0.042	0.066	0.043	J	0.038	0.059	ND	U	0.049	0.076	ND	U	0.014	0.022	0.031	J	0.027	0.042	0.065	J	0.050	0.078
Nickel	12	--	0.16	0.17	15	--	0.19	0.20	14	--	0.18	0.19	**16**	--	0.22	0.23	1.5	--	0.065	0.069	7.4	--	0.12	0.13	**17**	--	0.22	0.23
Selenium	0.46	J	0.21	0.87	0.61	J	0.24	0.99	0.59	J	0.23	0.93	0.69	J	0.28	1.2	ND	U	0.084	0.34	0.34	J	0.16	0.65	0.72	J	0.28	1.2
Silver	ND	U	0.049	0.17	ND	U	0.056	0.20	ND	U	0.052	0.19	ND	U	0.065	0.23	ND	U	0.019	0.069	ND	U	0.036	0.13	ND	U	0.065	0.23
Zinc	51	--	0.84	0.87	58	--	0.96	0.99	58	--	0.90	0.93	67	--	1.1	1.2	7.7	--	0.33	0.34	31	--	0.62	0.65	83	--	1.1	1.2
Others																												
Analyte	Result %	Qualifier	MDL	MRL	Result %	Qualifier	MDL	MRL	Result %	Qualifier	MDL	MRL	Result %	Qualifier	MDL	MRL	Result %	Qualifier	MDL	MRL	Result %	Qualifier	MDL	MRL	Result %	Qualifier	MDL	MRL
Carbon, Total Organic	3.4	--	0.26	0.35	3.9	--	0.30	0.40	4.5	--	0.28	0.38	4.5	--	0.35	0.47	0.26	--	0.11	0.14	2.3	--	0.19	0.26	5.5	--	0.35	0.47
Total Solids	28.4				24.8				26.6				21.4				70.7				38.5				21.1			
Analyte	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL
Tri-n-butyltin Cation																												

TABLE 5 (*continued*)
Analytical Results for Dry Weight Metals, TOC, Total Solids, and Tributyltin in Sediment Samples

Charleston to Port Royal

Sample ID:	AIWW21-CP-14				AIWW21-CP-15				AIWW21-CP-16				AIWW21-CP-17			
Analyte	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL
Metals																
Antimony	ND	U	0.029	0.13	0.087	J	0.056	0.25	0.10	J	0.073	0.33	0.15	J	0.096	0.44
Arsenic	0.92	--	0.021	0.065	**11**	--	0.040	0.13	**15**	--	0.053	0.17	**20**	--	0.070	0.22
Cadmium	0.011	J	0.011	0.065	0.098	J	0.021	0.13	0.14	J	0.028	0.17	0.21	J	0.037	0.22
Chromium	2.8	B	0.055	0.13	26	B	0.11	0.25	36	B	0.14	0.33	51	B	0.18	0.44
Copper	0.46	--	0.13	0.20	6.2	--	0.26	0.38	8.9	--	0.34	0.50	12	--	0.45	0.65
Lead	1.3	--	0.065	0.065	10	--	0.13	0.13	14	--	0.17	0.17	22	--	0.22	0.22
Mercury	ND	U	0.014	0.021	ND	U	0.026	0.040	0.039	J	0.035	0.055	0.060	J	0.045	0.070
Nickel	0.78	--	0.061	0.065	7.2	--	0.12	0.13	10	--	0.16	0.17	14	--	0.20	0.22
Selenium	ND	U	0.080	0.33	0.39	J	0.15	0.63	0.57	J	0.20	0.83	0.84	J	0.27	1.1
Silver	ND	U	0.018	0.065	ND	U	0.035	0.13	ND	U	0.046	0.17	0.074	J	0.061	0.22
Zinc	2.3	--	0.32	0.33	31	--	0.61	0.63	44	--	0.80	0.83	65	--	1.0	1.1
Others																
Analyte	Result %	Qualifier	MDL	MRL	Result %	Qualifier	MDL	MRL	Result %	Qualifier	MDL	MRL	Result %	Qualifier	MDL	MRL
Carbon, Total Organic	0.31	--	0.1	0.13	2.5	--	0.19	0.26	5.7	--	0.25	0.33	6.4	--	0.33	0.44
Total Solids	75.0				39.2				30.0				22.7			
Analyte	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL
Tri-n-butyltin Cation									ND	U	5.0	5.0				

Sample ID:	AIWW21-CP-18				AIWW21-CP-19				AIWW21-CP-20			
Analyte	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL
Metals												
Antimony	0.057	J	0.049	0.22	0.060	J	0.048	0.22	0.11	J	0.082	0.37
Arsenic	7.0	--	0.036	0.11	**9.3**	--	0.035	0.11	**16**	--	0.059	0.19
Cadmium	0.081	J	0.019	0.11	0.090	J	0.019	0.11	0.16	J	0.032	0.19
Chromium	18	B	0.093	0.22	24	B	0.092	0.22	41	B	0.16	0.37
Copper	3.7	--	0.23	0.33	4.4	--	0.23	0.33	8.4	--	0.38	0.56
Lead	7.0	--	0.11	0.11	9.1	--	0.11	0.11	16	--	0.19	0.19
Mercury	ND	U	0.023	0.036	ND	U	0.023	0.035	0.048	J	0.039	0.061
Nickel	4.7	--	0.10	0.11	5.8	--	0.10	0.11	11	--	0.17	0.19
Selenium	0.30	J	0.14	0.56	0.31	J	0.13	0.55	0.59	J	0.23	0.93
Silver	ND	U	0.031	0.11	ND	U	0.031	0.11	ND	U	0.052	0.19
Zinc	21	--	0.54	0.56	29	--	0.53	0.55	49	--	0.90	0.93
Others												
Analyte	Result %	Qualifier	MDL	MRL	Result %	Qualifier	MDL	MRL	Result %	Qualifier	MDL	MRL
Carbon, Total Organic	1.8	--	0.17	0.22	2.0	--	0.17	0.22	4.9	--	0.28	0.38
Total Solids	45.0				45.1				26.3			
Analyte	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL
Tri-n-butyltin Cation												

Bolded values meet or exceed the TEL and (or) ERL.
Non-detect (ND) = The analyte was not detected at or above the MDL.
Acronyms and qualifiers are defined at the front of the tables section.

Sources: Results from Eurofins TestAmerica; TEL and ERL values from Buchman (2008).
Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 6
Analytical Results for Dry Weight PAHs in Sediment Samples

Analyte	Maximum Conc. µg/kg	TEL µg/kg	ERL µg/kg	Little River to Winyah Bay												Winyah Bay to Charleston											
			Sample ID:	AIWW21-LB-1				AIWW21-LB-2				AIWW21-LB-3				AIWW21-WC-4				AIWW21-WC-5				AIWW21-WC-6			
				Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL
1-Methylnaphthalene[LMW]	<7.2	x	x	3.1	J	0.97	4.3	2.9	J	0.91	4.0	ND	U	0.94	4.1	ND	U	4.6	20	ND	U	5.9	26	ND	U	4.8	21
2-Methylnaphthalene[LMW]	<7.5	20.2	70	5.8	--	1.0	4.3	6.2	--	0.95	4.0	ND	U	0.99	4.1	ND	U	4.8	20	ND	U	6.3	26	ND	U	5.1	21
Acenaphthene[LMW]	<9.1	6.71	16	3.1	J	1.2	4.3	2.3	J	1.1	4.0	ND	U	1.2	4.1	ND	U	5.8	20	ND	U	7.5	26	ND	U	6.1	21
Acenaphthylene	<6.9	5.87	44	1.0	J	0.93	4.3	ND	U	0.87	4.0	ND	U	0.90	4.1	ND	U	4.4	20	ND	U	5.7	26	ND	U	4.7	21
Anthracene[LMW]	<8.2	46.9	85.3	1.6	J	1.1	4.3	ND	U	1.0	4.0	ND	U	1.1	4.1	ND	U	5.2	20	ND	U	6.8	26	ND	U	5.5	21
Benzo(a)anthracene[HMW]	<14	74.8	261	11	--	1.9	4.3	ND	U	1.8	4.0	ND	U	1.9	4.1	ND	U	9.1	20	ND	U	12	26	ND	U	9.6	21
Benzo(a)pyrene[HMW]	<16	88.8	430	16	--	1.8	4.3	ND	U	1.7	4.0	ND	U	1.8	4.1	ND	U	8.8	20	ND	U	11	26	ND	U	9.2	21
Benzo(b)fluoranthene	22	x	x	22	--	1.0	4.3	1.9	J	0.98	4.0	ND	U	1.0	4.1	ND	U	5.0	20	ND	U	6.4	26	ND	U	5.2	21
Benzo(g,h,i)perylene	18	x	x	18	--	0.91	4.3	ND	U	0.86	4.0	ND	U	0.89	4.1	ND	U	4.4	20	ND	U	5.6	26	ND	U	4.6	21
Benzo(k)fluoranthene	<9.4	x	x	7.8	--	1.3	4.3	ND	U	1.2	4.0	ND	U	1.2	4.1	ND	U	6.1	20	ND	U	7.8	26	ND	U	6.4	21
Chrysene[HMW]	17	108	384	17	--	2.3	4.3	ND	U	2.2	4.0	ND	U	2.3	4.1	ND	U	11	20	ND	U	14	26	ND	U	12	21
Dibenzo(a,h)anthracene[HMW]	<20	6.22	63.4	4.0	J	2.7	4.3	ND	U	2.5	4.0	ND	U	2.6	4.1	ND	U	13	20	ND	U	17	26	ND	U	14	21
Fluoranthene[HMW]	33	113	600	33	--	1.1	4.3	4.8	--	1.0	4.0	ND	U	1.1	4.1	7.7	J	5.3	20	ND	U	6.9	26	ND	U	5.6	21
Fluorene[LMW]	<6.2	21.2	19	2.1	J	0.83	4.3	1.6	J	0.78	4.0	ND	U	0.81	4.1	ND	U	4.0	20	ND	U	5.1	26	ND	U	4.2	21
Indeno(1,2,3-cd)pyrene	<16	x	x	15	--	2.1	4.3	ND	U	2.0	4.0	ND	U	2.1	4.1	ND	U	10	20	ND	U	13	26	ND	U	11	21
Naphthalene[LMW]	**56**	34.6	160	**47**	--	0.83	4.3	**56**	--	0.77	4.0	6.4	--	0.80	4.1	23	--	3.9	20	24	J	5.1	26	11	J	4.1	21
Phenanthrene[LMW]	16	86.7	240	16	--	1.1	4.3	5.7	--	1.1	4.0	ND	U	1.1	4.1	ND	U	5.4	20	ND	U	7.0	26	ND	U	5.7	21
Pyrene[HMW]	25	153	665	25	--	1.0	4.3	3.9	J	0.94	4.0	ND	U	0.98	4.1	5.8	J	4.8	20	ND	U	6.2	26	ND	U	5.0	21
Total LMW PAHs	79	312	552	79				76				13				53				63				42			
Total HMW PAHs	106	655	1700	106				17				11				55				67				55			
Total PAHs	249	1684	4022	249				99				29				138				168				130			

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TABLE 6 (*continued*)
Analytical Results for Dry Weight PAHs in Sediment Samples

Sample ID:	Winyah Bay to Charleston																											
	AIWW21-WC-7				AIWW21-WC-8				AIWW21-WC-9				AIWW21-WC-10				AIWW21-WC-11				AIWW21-WC-12				AIWW21-WC-13			
Analyte	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL
1-Methylnaphthalene^{LMW}	ND	U	5.3	23	ND	U	6.1	27	ND	U	5.6	25	ND	U	7.1	31	ND	U	2.1	9.4	ND	U	4.0	17	ND	U	7.2	32
2-Methylnaphthalene^{LMW}	ND	U	5.6	23	ND	U	6.4	27	ND	U	5.9	25	ND	U	7.4	31	ND	U	2.2	9.4	ND	U	4.2	17	ND	U	7.5	32
Acenaphthene^{LMW}	ND	U	6.7	23	ND	U	7.7	27	ND	U	7.1	25	ND	U	8.9	31	ND	U	2.7	9.4	ND	U	5.0	17	ND	U	9.1	32
Acenaphthylene	ND	U	5.1	23	ND	U	5.8	27	ND	U	5.4	25	ND	U	6.8	31	ND	U	2.0	9.4	ND	U	3.8	17	ND	U	6.9	32
Anthracene^{LMW}	ND	U	6.0	23	ND	U	6.9	27	ND	U	6.4	25	ND	U	8.0	31	ND	U	2.4	9.4	ND	U	4.5	17	ND	U	8.2	32
Benzo(a)anthracene^{HMW}	ND	U	11	23	ND	U	12	27	ND	U	11	25	ND	U	14	31	ND	U	4.2	9.4	ND	U	7.8	17	ND	U	14	32
Benzo(a)pyrene^{HMW}	ND	U	10	23	ND	U	12	27	ND	U	11	25	ND	U	13	31	ND	U	4.0	9.4	ND	U	7.5	17	ND	U	14	32
Benzo(b)fluoranthene	ND	U	5.7	23	ND	U	6.6	27	ND	U	6.1	25	ND	U	7.6	31	ND	U	2.3	9.4	ND	U	4.3	17	ND	U	7.7	32
Benzo(g,h,i)perylene	ND	U	5.0	23	ND	U	5.8	27	ND	U	5.3	25	ND	U	6.7	31	ND	U	2.0	9.4	ND	U	3.7	17	ND	U	6.8	32
Benzo(k)fluoranthene	ND	U	7.0	23	ND	U	8.0	27	ND	U	7.4	25	ND	U	9.3	31	ND	U	2.8	9.4	ND	U	5.2	17	ND	U	9.4	32
Chrysene^{HMW}	ND	U	13	23	ND	U	15	27	ND	U	14	25	ND	U	17	31	ND	U	5.2	9.4	ND	U	9.6	17	ND	U	17	32
Dibenzo(a,h)anthracene^{HMW}	ND	U	15	23	ND	U	17	27	ND	U	16	25	ND	U	20	31	ND	U	6.0	9.4	ND	U	11	17	ND	U	20	32
Fluoranthene^{HMW}	ND	U	6.2	23	ND	U	7.0	27	ND	U	6.5	25	9.9	J	8.2	31	ND	U	2.5	9.4	ND	U	4.6	17	ND	U	8.3	32
Fluorene^{LMW}	ND	U	4.6	23	ND	U	5.2	27	ND	U	4.9	25	ND	U	6.1	31	ND	U	1.8	9.4	ND	U	3.4	17	ND	U	6.2	32
Indeno(1,2,3-cd)pyrene	ND	U	12	23	ND	U	13	27	ND	U	12	25	ND	U	15	31	ND	U	4.6	9.4	ND	U	8.6	17	ND	U	16	32
Naphthalene^{LMW}	22	J	4.5	23	18	J	5.2	27	ND	U	4.8	25	ND	U	6.0	31	ND	U	1.8	9.4	ND	U	3.4	17	ND	U	6.1	32
Phenanthrene^{LMW}	ND	U	6.3	23	ND	U	7.2	27	ND	U	6.6	25	ND	U	8.3	31	ND	U	2.5	9.4	ND	U	4.7	17	ND	U	8.4	32
Pyrene^{HMW}	ND	U	5.5	23	ND	U	6.3	27	ND	U	5.9	25	9.2	J	7.3	31	ND	U	2.2	9.4	ND	U	4.1	17	ND	U	7.5	32
Total LMW PAHs	57				58				41				52				16				29				53			
Total HMW PAHs	61				69				64				83				24				45				81			
Total PAHs	152				166				142				180				53				99				180			

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TABLE 6 (*continued*)
Analytical Results for Dry Weight PAHs in Sediment Samples

	Charleston to Port Royal																											
Sample ID:	**AIWW21-CP-14**				**AIWW21-CP-15**				**AIWW21-CP-16**				**AIWW21-CP-17**				**AIWW21-CP-18**				**AIWW21-CP-19**				**AIWW21-CP-20**			
Analyte	**Result µg/kg**	**Qualifier**	**MDL**	**MRL**	**Result µg/kg**	**Qualifier**	**MDL**	**MRL**	**Result µg/kg**	**Qualifier**	**MDL**	**MRL**	**Result µg/kg**	**Qualifier**	**MDL**	**MRL**	**Result µg/kg**	**Qualifier**	**MDL**	**MRL**	**Result µg/kg**	**Qualifier**	**MDL**	**MRL**	**Result µg/kg**	**Qualifier**	**MDL**	**MRL**
1-Methylnaphthalene[LMW]	ND	U	2.0	8.9	ND	U	3.8	17	ND	U	5.1	22	ND	U	6.7	29	ND	U	3.4	15	ND	U	3.3	15	ND	U	5.8	25
2-Methylnaphthalene[LMW]	ND	U	2.1	8.9	ND	U	4.0	17	ND	U	5.3	22	ND	U	7.0	29	ND	U	3.5	15	ND	U	3.5	15	ND	U	6.1	25
Acenaphthene[LMW]	ND	U	2.5	8.9	ND	U	4.8	17	ND	U	6.4	22	ND	U	8.4	29	ND	U	4.2	15	ND	U	4.2	15	ND	U	7.3	25
Acenaphthylene	ND	U	1.9	8.9	ND	U	3.7	17	ND	U	4.9	22	ND	U	6.4	29	ND	U	3.2	15	ND	U	3.2	15	ND	U	5.5	25
Anthracene[LMW]	ND	U	2.3	8.9	ND	U	4.3	17	ND	U	5.7	22	ND	U	7.6	29	ND	U	3.8	15	ND	U	3.8	15	ND	U	6.6	25
Benzo(a)anthracene[HMW]	ND	U	4.0	8.9	ND	U	7.6	17	12	J	10	22	ND	U	13	29	ND	U	6.6	15	ND	U	6.6	15	ND	U	11	25
Benzo(a)pyrene[HMW]	ND	U	3.8	8.9	ND	U	7.3	17	ND	U	9.6	22	ND	U	13	29	ND	U	6.4	15	ND	U	6.3	15	ND	U	11	25
Benzo(b)fluoranthene	ND	U	2.2	8.9	ND	U	4.1	17	ND	U	5.5	22	ND	U	7.2	29	ND	U	3.6	15	ND	U	3.6	15	ND	U	6.2	25
Benzo(g,h,i)perylene	ND	U	1.9	8.9	ND	U	3.6	17	ND	U	4.8	22	ND	U	6.3	29	ND	U	3.2	15	ND	U	3.2	15	ND	U	5.5	25
Benzo(k)fluoranthene	ND	U	2.6	8.9	ND	U	5.0	17	ND	U	6.6	22	ND	U	8.8	29	ND	U	4.4	15	ND	U	4.4	15	ND	U	7.6	25
Chrysene[HMW]	ND	U	4.9	8.9	ND	U	9.3	17	ND	U	12	22	ND	U	16	29	ND	U	8.2	15	ND	U	8.1	15	ND	U	14	25
Dibenzo(a,h)anthracene[HMW]	ND	U	5.6	8.9	ND	U	11	17	ND	U	14	22	ND	U	19	29	ND	U	9.4	15	ND	U	9.4	15	ND	U	16	25
Fluoranthene[HMW]	4.4	J	2.3	8.9	4.9	J	4.4	17	19	J	5.8	22	ND	U	7.7	29	ND	U	3.9	15	ND	U	3.9	15	ND	U	6.7	25
Fluorene[LMW]	ND	U	1.7	8.9	ND	U	3.3	17	ND	U	4.4	22	ND	U	5.7	29	ND	U	2.9	15	ND	U	2.9	15	ND	U	5.0	25
Indeno(1,2,3-cd)pyrene	ND	U	4.4	8.9	ND	U	8.3	17	ND	U	11	22	ND	U	15	29	ND	U	7.3	15	ND	U	7.3	15	ND	U	13	25
Naphthalene[LMW]	ND	U	1.7	8.9	ND	U	3.3	17	ND	U	4.3	22	ND	U	5.7	29	ND	U	2.9	15	ND	U	2.8	15	ND	U	4.9	25
Phenanthrene[LMW]	3.4	J	2.4	8.9	ND	U	4.5	17	5.9	J	5.9	22	ND	U	7.8	29	ND	U	3.9	15	ND	U	3.9	15	ND	U	6.8	25
Pyrene[HMW]	3.9	J	2.1	8.9	6.3	J	4.0	17	17	J	5.3	22	ND	U	6.9	29	ND	U	3.5	15	ND	U	3.5	15	ND	U	6.0	25
Total LMW PAHs	16				28				37				49				25				24				43			
Total HMW PAHs	27				46				84				76				38				38				65			
Total PAHs	55				99				154				168				84				84				145			

LMW Low molecular weight PAHs (NOAA 1989).

HMW High molecular weight PAHs (NOAA 1989).

Bolded values meet or exceed the TEL and (or) ERL.

Underlined values represent U-qualified results having an MDL that meets or exceeds the TEL and (or) ERL.

Non-detect (ND) = The analyte was not detected at or above the MDL. Non-detect results use the MDL for calculating the total PAHs. (J-qualified results use the value reported by the laboratory for calculating total PAHs.)

Acronyms and qualifiers are defined at the front of the tables section.

Sources: Results from Eurofins TestAmerica; TEL and ERL values from Buchman (2008).
Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 7
Analytical Results for Dry Weight Pesticides in Sediment Samples

			Sample ID:	Little River to Winyah Bay												Charleston to Port Royal			
				AIWW21-LB-1				AIWW21-LB-2				AIWW21-LB-3				AIWW21-CP-16			
Analyte	Maximum Conc. µg/kg	TEL µg/kg	ERL µg/kg	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL
Aldrin	ND	x	x	ND	U	0.017	0.054	ND	U	0.015	0.050	ND	U	0.016	0.052	ND	U	0.043	0.14
Chlordane (technical)	ND	2.26	0.5	ND	U	0.23	0.54	ND	U	0.21	0.50	ND	U	0.22	0.52	ND	U	0.59	1.4
α (cis)-Chlordane	ND	x	x	ND	U	0.013	0.054	ND	U	0.012	0.050	ND	U	0.013	0.052	ND	U	0.034	0.14
γ (trans)-Chlordane	0.053	x	x	ND	U	0.012	0.054	ND	U	0.012	0.050	ND	U	0.012	0.052	0.053	J p	0.032	0.14
Oxychlordane	0.039	x	x	ND	U	0.0095	0.054	ND	U	0.0088	0.050	ND	U	0.0092	0.052	0.039	J	0.024	0.14
cis-Nonachlor	ND	x	x	ND	U	0.017	0.054	ND	U	0.016	0.050	ND	U	0.017	0.052	ND	U	0.044	0.14
trans-Nonachlor	ND	x	x	ND	U	0.013	0.054	ND	U	0.012	0.050	ND	U	0.013	0.052	ND	U	0.033	0.14
o,p' (2,4')-DDD	ND	x	x	ND	U	0.0095	0.054	ND	U	0.0088	0.050	ND	U	0.0092	0.052	ND	U	0.024	0.14
p,p' (4,4')-DDD	0.18	1.22	2	ND	U	0.023	0.054	ND	U	0.021	0.050	ND	U	0.022	0.052	0.18	p	0.059	0.14
o,p' (2,4')-DDE	ND	x	x	ND	U	0.014	0.054	ND	U	0.013	0.050	ND	U	0.013	0.052	ND	U	0.035	0.14
p,p' (4,4')-DDE	0.32	2.07	2.2	ND	U	0.011	0.054	ND	U	0.010	0.050	ND	U	0.011	0.052	0.32	--	0.028	0.14
o,p' (2,4')-DDT	ND	x	x	ND	U	0.021	0.054	ND	U	0.019	0.050	ND	U	0.020	0.052	ND	U	0.054	0.14
p,p' (4,4')-DDT	ND	1.19	1	ND	U	0.038	0.054	ND	U	0.036	0.050	ND	U	0.037	0.052	ND	U	0.098	0.14
Dieldrin	ND	0.715	0.02	ND	U	0.013	0.054	ND	U	0.012	0.050	ND	U	0.013	0.052	ND	U	0.034	0.14
Endosulfan I	ND	x	x	ND	U	0.015	0.054	ND	U	0.014	0.050	ND	U	0.014	0.052	ND	U	0.037	0.14
Endosulfan II	ND	x	x	ND	U	0.012	0.054	ND	U	0.011	0.050	ND	U	0.011	0.052	ND	U	0.030	0.14
Endrin	0.072	x	x	0.020	J p	0.010	0.054	ND	U	0.0093	0.050	ND	U	0.0097	0.052	0.072	J p	0.026	0.14
Endrin Aldehyde	0.12	x	x	ND	U	0.019	0.054	ND	U	0.018	0.050	ND	U	0.019	0.052	0.12	J p	0.049	0.14
Endrin Ketone	ND	x	x	ND	U	0.0074	0.054	ND	U	0.0069	0.050	ND	U	0.0072	0.052	ND	U	0.019	0.14
Heptachlor	ND	x	x	ND	U	0.017	0.054	ND	U	0.016	0.050	ND	U	0.016	0.052	ND	U	0.043	0.14
Heptachlor Epoxide	ND	x	x	ND	U	0.014	0.054	ND	U	0.013	0.050	ND	U	0.013	0.052	ND	U	0.035	0.14
α-BHC	ND	x	x	ND	U	0.013	0.054	ND	U	0.012	0.050	ND	U	0.013	0.052	ND	U	0.034	0.14
β-BHC	ND	x	x	ND	U	0.015	0.054	ND	U	0.014	0.050	ND	U	0.014	0.052	ND	U	0.038	0.14
δ-BHC	ND	x	x	ND	U	0.017	0.054	ND	U	0.016	0.050	ND	U	0.016	0.052	ND	U	0.043	0.14
γ-BHC (Lindane)	ND	0.32	x	ND	U	0.014	0.054	ND	U	0.013	0.050	ND	U	0.013	0.052	ND	U	0.035	0.14
Methoxychlor	0.32	x	x	ND	U	0.021	0.054	ND	U	0.019	0.050	0.30	--	0.020	0.052	0.32	--	0.053	0.14
Mirex®	ND	x	x	ND	U	0.010	0.054	ND	U	0.0093	0.050	ND	U	0.0097	0.052	ND	U	0.026	0.14
Toxaphene	ND	0.1	x	ND	U	1.5	2.1	ND	U	1.3	2.0	ND	U	1.4	2.1	ND	U	3.7	5.5
Chlorinated Pesticides, Total	6.1	x	x	2.1				1.9				2.3				6.1			

Underlined values represent U-qualified results having an MDL that meets or exceeds the TEL and (or) ERL.
Non-detect (ND) = The analyte was not detected at or above the MDL. Non-detect results use the MDL for calculating total pesticides. (J-qualified results use the value reported by the laboratory for calculating total pesticides.)
Acronyms and qualifiers are defined at the front of the tables section.

Sources: Results from Eurofins TestAmerica; TEL and ERL values from Buchman (2008).
Compiled by: ANAMAR Environmental Consulting, Inc.

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TABLE 8

Analytical Results for Dry Weight PCBs and Aroclors in Sediment Samples

				Little River to Winyah Bay												Charleston to Port Royal			
			Sample ID:	AIWW21-LB-1				AIWW21-LB-2				AIWW21-LB-3				AIWW21-CP-16			
Analyte	Maximum Conc. µg/kg	TEL µg/kg	ERL µg/kg	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL
PCB 8[NOAA]	ND	x	x	ND	U	0.23	0.65	ND	U	0.22	0.61	ND	U	0.22	0.60	ND	U	0.59	1.6
PCB 18[NOAA]	ND	x	x	ND	U	0.40	0.65	ND	U	0.37	0.61	ND	U	0.37	0.60	ND	U	1.0	1.6
PCB 28[NOAA]	ND	x	x	ND	U	0.34	0.65	ND	U	0.32	0.61	ND	U	0.32	0.60	ND	U	0.87	1.6
PCB 44[NOAA]	ND	x	x	ND	U	0.25	0.65	ND	U	0.24	0.61	ND	U	0.24	0.60	ND	U	0.64	1.6
PCB 49	ND	x	x	ND	U	0.28	0.65	ND	U	0.26	0.61	ND	U	0.26	0.60	ND	U	0.71	1.6
PCB 52[NOAA]	ND	x	x	ND	U	0.26	0.65	ND	U	0.24	0.61	ND	U	0.24	0.60	ND	U	0.66	1.6
PCB 66[NOAA]	ND	x	x	ND	U	0.23	0.65	ND	U	0.21	0.61	ND	U	0.21	0.60	ND	U	0.57	1.6
PCB 77	ND	x	x	ND	U	0.56	0.65	ND	U	0.52	0.61	ND	U	0.52	0.60	ND	U	1.4	1.6
PCB 87	ND	x	x	ND	U	0.36	0.65	ND	U	0.34	0.61	ND	U	0.34	0.60	ND	U	0.91	1.6
PCB 101[NOAA]	ND	x	x	ND	U	0.18	0.65	ND	U	0.17	0.61	ND	U	0.17	0.60	ND	U	0.45	1.6
PCB 105[NOAA]	ND	x	x	ND	U	0.18	0.65	ND	U	0.17	0.61	ND	U	0.17	0.60	ND	U	0.45	1.6
PCB 118[NOAA]	ND	x	x	ND	U	0.19	0.65	ND	U	0.18	0.61	ND	U	0.18	0.60	ND	U	0.48	1.6
PCB 126	ND	x	x	ND	U	0.41	0.65	ND	U	0.38	0.61	ND	U	0.38	0.60	ND	U	1.0	1.6
PCB 128[NOAA]	ND	x	x	ND	U	0.24	0.65	ND	U	0.23	0.61	ND	U	0.22	0.60	ND	U	0.61	1.6
PCB 138[NOAA]	ND	x	x	ND	U	0.26	0.65	ND	U	0.24	0.61	ND	U	0.24	0.60	ND	U	0.66	1.6
PCB 153[NOAA]	ND	x	x	ND	U	0.15	0.65	ND	U	0.14	0.61	ND	U	0.14	0.60	ND	U	0.38	1.6
PCB 156	ND	x	x	ND	U	0.35	0.65	ND	U	0.33	0.61	ND	U	0.32	0.60	ND	U	0.88	1.6
PCB 169	ND	x	x	ND	U	0.44	0.65	ND	U	0.42	0.61	ND	U	0.42	0.60	ND	U	1.1	1.6
PCB 170[NOAA]	ND	x	x	ND	U	0.32	0.65	ND	U	0.30	0.61	ND	U	0.30	0.60	ND	U	0.82	1.6
PCB 180[NOAA]	ND	x	x	ND	U	0.31	0.65	ND	U	0.29	0.61	ND	U	0.29	0.60	ND	U	0.77	1.6
PCB 183	ND	x	x	ND	U	0.42	0.65	ND	U	0.40	0.61	ND	U	0.40	0.60	ND	U	1.1	1.6
PCB 184	ND	x	x	ND	U	0.36	0.65	ND	U	0.33	0.61	ND	U	0.33	0.60	ND	U	0.90	1.6
PCB 187[NOAA]	ND	x	x	ND	U	0.16	0.65	ND	U	0.15	0.61	ND	U	0.15	0.60	ND	U	0.42	1.6
PCB 195[NOAA]	ND	x	x	ND	U	0.34	0.65	ND	U	0.31	0.61	ND	U	0.31	0.60	ND	U	0.85	1.6
PCB 206[NOAA]	ND	x	x	ND	U	0.29	0.65	ND	U	0.27	0.61	ND	U	0.27	0.60	ND	U	0.74	1.6
PCB 209[NOAA]	ND	x	x	ND	U	0.40	0.65	ND	U	0.37	0.61	ND	U	0.37	0.60	ND	U	1.0	1.6
Total EPA Region 4 PCBs	20	21.6	22.7	7.9				7.4				7.4				20			
Total NOAA PCBs	**25**	21.6	22.7	9.7				9.1				9.0				**25**			
PCB-1016	ND	x	x	ND	U	0.17	0.53	ND	U	0.16	0.50	ND	U	0.17	0.52	ND	U	0.45	1.4
PCB-1221	ND	x	x	ND	U	0.19	0.53	ND	U	0.18	0.50	ND	U	0.18	0.52	ND	U	0.49	1.4
PCB-1232	ND	x	x	ND	U	0.13	0.53	ND	U	0.12	0.50	ND	U	0.13	0.52	ND	U	0.34	1.4
PCB-1242	ND	x	x	ND	U	0.078	0.53	ND	U	0.073	0.50	ND	U	0.076	0.52	ND	U	0.20	1.4
PCB-1248	ND	x	x	ND	U	0.13	0.53	ND	U	0.12	0.50	ND	U	0.13	0.52	ND	U	0.34	1.4
PCB-1254	ND	63.3	x	ND	U	0.16	0.53	ND	U	0.15	0.50	ND	U	0.16	0.52	ND	U	0.42	1.4
PCB-1260	ND	x	x	ND	U	0.15	0.53	ND	U	0.14	0.50	ND	U	0.15	0.52	ND	U	0.40	1.4

[NOAA] National Oceanic and Atmospheric Administration PCB congeners (NOAA 1989, Table 5-6 of SERIM).

Bolded values meet or exceed the TEL and (or) ERL.

For calculating total EPA Region 4 PCBs and total NOAA PCBs, U-qualified results use the MDL and J-qualified results use the value reported by the laboratory (See SERIM Section 7.3 for details).

Data qualifiers and acronyms are defined at the front of the tables section.

Sources: Results from Eurofins TestAmerica; TEL and ERL values from Buchman (2008)
Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 9
Analytical Results for Dry Weight Dioxins and Furans in Sediment Samples

					Little River to Winyah Bay															Charleston to Port Royal				
				Sample ID:	AIWW21-LB-1					AIWW21-LB-2					AIWW21-LB-3					AIWW21-CP-16				
Analyte	Maximum Conc. ng/kg	TEL ng/kg	AET ng/kg	TEF ng/kg	Result ng/kg	Qualifier	MDL	MRL	TEQ	Result ng/kg	Qualifier	MDL	MRL	TEQ	Result ng/kg	Qualifier	MDL	MRL	TEQ	Result ng/kg	Qualifier	MDL	MRL	TEQ
2,3,7,8-TCDD	0.39	x	x	1	0.078	J	0.010	1.3	0.078	ND	U	0.0080	1.1	0.0080	0.073	J	0.017	1.3	0.073	0.39	J I	0.035	3.3	0.39
1,2,3,7,8-PeCDD	2.4	x	x	1	0.13	J I	0.013	6.6	0.13	0.092	J I	0.013	5.6	0.092	0.25	J I	0.016	6.3	0.25	2.4	J	0.083	17	2.4
1,2,3,6,7,8-HxCDD	5.3	x	x	0.1	0.33	J I B	0.015	6.6	0.033	ND	U	0.0064	5.6	0.00064	ND	U	0.012	6.3	0.0012	5.3	J B	0.23	17	0.53
1,2,3,4,7,8-HxCDD	3.9	x	x	0.1	0.14	J I B	0.014	6.6	0.014	0.072	J I B	0.0068	5.6	0.0072	ND	U	0.012	6.3	0.0012	3.9	J I B	0.23	17	0.39
1,2,3,7,8,9-HxCDD	8.9	x	x	0.1	0.58	J B	0.014	6.6	0.058	0.20	J I B	0.0055	5.6	0.020	0.19	J I B	0.0094	6.3	0.019	8.9	J B	0.21	17	0.89
1,2,3,4,6,7,8-HpCDD	110	x	x	0.01	8.9	B	0.050	6.6	0.089	1.6	J I B	0.0091	5.6	0.016	1.7	J I B	0.016	6.3	0.017	110	B	0.28	17	1.1
OCDD	920	x	x	0.0003	130	B	0.035	13	0.039	39	B	0.016	11	0.0117	40	B	0.017	13	0.012	920	B	0.11	33	0.276
2,3,7,8-TCDF	0.0096	x	x	0.1	0.0096	J I B	0.0063	1.3	0.00096	ND	U	0.0064	1.1	0.00064	ND	U	0.014	1.3	0.0014	ND	U	0.019	3.3	0.0019
1,2,3,7,8-PeCDF	0.29	x	x	0.03	0.12	J I B	0.0050	6.6	0.0036	0.051	J I B	0.0047	5.6	0.00153	0.29	J B	0.012	6.3	0.0087	ND	U	0.031	17	0.00093
2,3,4,7,8-PeCDF	0.85	x	x	0.3	0.066	J I	0.0041	6.6	0.0198	0.061	J I	0.0039	5.6	0.0183	0.058	J I	0.0096	6.3	0.0174	0.85	J I	0.024	17	0.255
1,2,3,6,7,8-HxCDF	0.15	x	x	0.1	0.15	J B	0.0048	6.6	0.015	0.032	J I B	0.0032	5.6	0.0032	0.11	J I B	0.0078	6.3	0.011	ND	U	0.016	17	0.0016
1,2,3,7,8,9-HxCDF	0.41	x	x	0.1	0.053	J I B	0.0051	6.6	0.0053	0.043	J I B	0.0030	5.6	0.0043	0.11	J I B	0.0070	6.3	0.011	0.41	J B	0.017	17	0.041
1,2,3,4,7,8-HxCDF	0.53	x	x	0.1	0.095	J I B	0.0044	6.6	0.0095	ND	U	0.0032	5.6	0.00032	0.25	J I B	0.0076	6.3	0.025	0.53	J I B	0.016	17	0.053
2,3,4,6,7,8-HxCDF	0.78	x	x	0.1	0.10	J B	0.0044	6.6	0.010	0.039	J I B	0.0030	5.6	0.0039	ND	U	0.0075	6.3	0.00075	0.78	J B	0.015	17	0.078
1,2,3,4,6,7,8-HpCDF	2.0	x	x	0.01	1.0	J I B	0.0050	6.6	0.010	0.082	J I B	0.0030	5.6	0.00082	0.21	J I B	0.0079	6.3	0.0021	2.0	J B	0.043	17	0.020
1,2,3,4,7,8,9-HpCDF	0.42	x	x	0.01	0.11	J I B	0.0054	6.6	0.0011	0.049	J B	0.0034	5.6	0.00049	0.091	J B	0.0088	6.3	0.00091	0.42	J I B	0.044	17	0.0042
OCDF	3.7	x	x	0.0003	1.7	J I B	0.0064	13	0.00051	0.26	J I B	0.0036	11	7.8E-05	0.31	J I B	0.011	13	9.3E-05	3.7	J I B	0.014	33	0.00111
Total TEQs[1]	**6.43**	0.85	3.6	x					0.517					0.189					0.452					**6.43**
TCDD, Total	26	x	x	x	3.2	I B	0.010	1.3		ND	U	0.008	1.1		1.5	B	0.017	1.3		26	I B	0.035	3.3	
PeCDD, Total	60	x	x	x	3.5	J I B	0.013	6.6		0.40	J I B	0.013	5.6		1.1	J I B	0.016	6.3		60	I B	0.083	17	
HxCDD, Total	280	x	x	x	16	I B	0.014	6.6		1.4	J I B	0.0062	5.6		3.4	J I B	0.011	6.3		280	I B	0.23	17	
HpCDD, Total	410	x	x	x	25	B	0.050	6.6		3.6	J I B	0.0091	5.6		5.5	J I B	0.016	6.3		410	B	0.28	17	
TCDF, Total	3.9	x	x	x	0.18	J I B	0.0063	1.3		0.28	J B	0.0064	1.1		0.71	J I B	0.014	1.3		3.9	I B	0.019	3.3	
PeCDF, Total	2.7	x	x	x	1.2	J I B	0.0046	6.6		0.38	J I B	0.0043	5.6		0.60	J I B	0.011	6.3		2.7	J I B	0.027	17	
HxCDF, Total	4.5	x	x	x	1.3	J I B	0.0047	6.6		0.18	J I B	0.0031	5.6		0.59	J I B	0.0075	6.3		4.5	J I B	0.016	17	
HpCDF, Total	5.5	x	x	x	2.3	J I B	0.0052	6.6		0.20	J I B	0.0032	5.6		0.38	J I B	0.0084	6.3		5.5	J I B	0.043	17	

[1] Total TEQs are calculated using the MDL when the result is given as ND (Non-detect). J-qualified results use the value reported by the laboratory for calculating total TEQs. These values are multiplied by the TEF prior to summing.

Bolded values meet or exceed the AET and (or) TEL.

Data qualifiers and acronyms are defined at the front of the tables section.

Sources: Results from Eurofins TestAmerica; TEL and AET values from Buchman (2008); and TEF values from Van den Berg et al. (2006)
Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 10
Analytical Results for Metals, TOC, Total Suspended Solids and Tributyltin in Site Water and Elutriates Generated from Sediment Samples

				Little River to Charleston				Little River to Winyah Bay																							
			Sample ID:	AIWW21-SW-1				AIWW21-LB-1 (Total)				AIWW21-LB-1 (Dissolved)				AIWW21-LB-2 (Total)				AIWW21-LB-2 (Dissolved)				AIWW21-LB-3 (Total)				AIWW21-LB-3 (Dissolved)			
Analyte	Maximum Conc. µg/L	SC CMC µg/L	CMC µg/L	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
Metals																															
Antimony	1.3	x	x	ND	U	0.38	2.0	ND	U	0.76	4.0	ND	U	0.76	4.0	ND	U	0.76	4.0	ND	U	0.76	4.0	ND	U	0.76	4.0	ND	U	0.76	4.0
Arsenic	**91**	69	69	3.9	--	0.31	1.0	1.1	J	0.63	2.0	0.95	J	0.63	2.0	1.0	J	0.63	2.0	0.91	J	0.63	2.0	1.6	J	0.63	2.0	1.3	J	0.63	2.0
Cadmium	0.24	43	40	0.24	J	0.22	1.0	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0
Chromium	14	1100	1100	2.5	--	1.5	2.0	ND	U	3.1	4.0	ND	U	3.1	4.0	ND	U	3.1	4.0	ND	U	3.1	4.0	ND	U	3.1	4.0	ND	U	3.1	4.0
Copper	**7.8**	5.8	4.8	3.7	--	0.63	2.0	2.5	J	1.3	4.0	1.4	J	1.3	4.0	2.8	J	1.3	4.0	4.2	--	1.3	4.0	**5.2**	--	1.3	4.0	**4.8**	--	1.3	4.0
Lead	6.1	220	210	1.3	--	0.13	1.0	0.36	J	0.26	2.0	0.28	J	0.26	2.0	0.27	J	0.26	2.0	ND	U	0.26	2.0	0.45	J	0.26	2.0	ND	U	0.26	2.0
Mercury	0.16	2.1	1.8	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20
Nickel	7.9	75	74	1.7	--	0.34	1.0	1.3	J	0.67	2.0	0.93	J	0.67	2.0	1.3	J	0.67	2.0	0.85	J	0.67	2.0	2.7	--	0.67	2.0	1.3	J	0.67	2.0
Selenium	2.0	290	290	ND	U	1.5	5.0	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10
Silver	0.42	2.3	1.9	0.18	J	0.18	1.0	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0
Zinc	30	95	90	4.5	J	3.2	5.0	13	--	6.4	10	7.3	J	6.4	10	11	--	6.4	10	ND	U	6.4	10	28	--	6.4	10	ND	U	6.4	10
Others																															
Analyte	Maximum Conc. mg/L	SC CMC mg/L	CMC mg/L	Result mg/L	Qualifier	MDL	MRL	Result mg/L	Qualifier	MDL	MRL	Result mg/L	Qualifier	MDL	MRL	Result mg/L	Qualifier	MDL	MRL	Result mg/L	Qualifier	MDL	MRL	Result mg/L	Qualifier	MDL	MRL	Result mg/L	Qualifier	MDL	MRL
Total Organic Carbon	21	x	x	1.1	F1	0.51	1.0	1.1	--	0.51	1.0	1.3	--	0.51	1.0	1.1	--	0.51	1.0	1.2	--	0.51	1.0	1.1	--	0.51	1.0	1.2	--	0.51	1.0
Total Suspended Solids	290	x	x	59	--	1.0	1.0	19	--	1.0	1.0					19	--	0.50	0.50					23	--	0.50	0.50				
Analyte	Maximum Conc. µg/L	SC CMC µg/L	CMC µg/L	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
Tributyltin	ND	0.37	0.42	ND	U	0.043	0.043	ND	U	0.043	0.043	ND	U	0.043	0.043	ND	U	0.043	0.043	ND	U	0.043	0.043	ND	U	0.043	0.043	ND	U	0.043	0.043

TABLE 10 (*continued*)
Analytical Results for Metals, TOC, TSS, and Tributyltin in Site Water and Elutriates Generated from Sediment

Winyah Bay to Charleston

Sample ID:	AIWW21-WC-4 (Total)				AIWW21-WC-4 (Dissolved)				AIWW21-WC-5 (Total)				AIWW21-WC-5 (Dissolved)			
Analyte	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**
Metals																
Antimony	1.2	J	0.76	4.0	1.2	J	0.76	4.0	1.3	J	0.76	4.0	1.2	J	0.76	4.0
Arsenic	26	--	0.63	2.0	21	--	0.63	2.0	**80**	--	0.63	2.0	52	--	0.63	2.0
Cadmium	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0
Chromium	3.5	J	3.1	4.0	ND	U	3.1	4.0	ND	U	3.1	4.0	ND	U	3.1	4.0
Copper	3.1	J	1.3	4.0	3.7	J	1.3	4.0	2.8	J	1.3	4.0	4.2	--	1.3	4.0
Lead	1.4	J	0.26	2.0	ND	U	0.26	2.0	0.80	J	0.26	2.0	ND	U	0.26	2.0
Mercury	0.16	J	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20
Nickel	3.3	--	0.67	2.0	1.2	J	0.67	2.0	2.6	--	0.67	2.0	0.99	J	0.67	2.0
Selenium	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10
Silver	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0
Zinc	14	--	6.4	10	ND	U	6.4	10	42	--	6.4	10	ND	U	6.4	10
Others																
Analyte	**Result mg/L**	**Qualifier**	**MDL**	**MRL**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**
Total Organic Carbon	4.3	--	0.51	1.0	4.1	--	0.51	1.0	4.1	--	0.51	1.0	3.8	--	0.51	1.0
Total Suspended Solids	110	--	2.5	2.5					100	--	2.5	2.5				
Analyte	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**
Tributyltin																

Sample ID:	AIWW21-WC-6 (Total)				AIWW21-WC-6 (Dissolved)				AIWW21-WC-7 (Total)				AIWW21-WC-7 (Dissolved)			
Analyte	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**
Metals																
Antimony	1.1	J	0.76	4.0	1.3	J	0.76	4.0	0.89	J	0.76	4.0	ND	U	0.76	4.0
Arsenic	**70**	--	0.63	2.0	48	--	0.63	2.0	58	--	0.63	2.0	38	--	0.63	2.0
Cadmium	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0
Chromium	ND	U	3.1	4.0	ND	U	3.1	4.0	4.2	--	3.1	4.0	ND	U	3.1	4.0
Copper	2.0	J	1.3	4.0	3.5	J	1.3	4.0	2.6	J	1.3	4.0	3.2	J	1.3	4.0
Lead	0.34	J	0.26	2.0	ND	U	0.26	2.0	0.89	J	0.26	2.0	ND	U	0.26	2.0
Mercury	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20
Nickel	1.4	J	0.67	2.0	ND	U	0.67	2.0	2.4	--	0.67	2.0	1.1	J	0.67	2.0
Selenium	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10
Silver	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0
Zinc	15	--	6.4	10	ND	U	6.4	10	16	--	6.4	10	ND	U	6.4	10
Others																
Analyte	**Result mg/L**	**Qualifier**	**MDL**	**MRL**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**
Total Organic Carbon	3.8	--	0.51	1.0	3.6	--	0.51	1.0	5.4	--	0.51	1.0	4.6	--	0.51	1.0
Total Suspended Solids	73	--	2.5	2.5					95	--	2.5	2.5				
Analyte	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**
Tributyltin																

TABLE 10 (*continued*)
Analytical Results for Metals, TOC, TSS, and Tributyltin in Site Water and Elutriates Generated from Sediment

	Winyah Bay to Charleston																							
Sample ID:	AIWW21-WC-8 (Total)				AIWW21-WC-8 (Dissolved)				AIWW21-WC-9 (Total)				AIWW21-WC-9 (Dissolved)				AIWW21-WC-10 (Total)				AIWW21-WC-10 (Dissolved)			
Analyte	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
Metals																								
Antimony	1.0	J	0.76	4.0	ND	U	0.76	4.0	ND	U	0.76	4.0	ND	U	0.76	4.0	1.2	J	0.76	4.0	0.76	J	0.76	4.0
Arsenic	**91**	--	0.63	2.0	62	--	0.63	2.0	46	--	0.63	2.0	28	--	0.63	2.0	63	--	0.63	2.0	33	--	0.63	2.0
Cadmium	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0
Chromium	4.9	--	3.1	4.0	ND	U	3.1	4.0	ND	U	3.1	4.0	ND	U	3.1	4.0	7.5	--	3.1	4.0	ND	U	3.1	4.0
Copper	2.8	J	1.3	4.0	2.6	J	1.3	4.0	3.0	J	1.3	4.0	2.5	J	1.3	4.0	**4.8**	--	1.3	4.0	2.1	J	1.3	4.0
Lead	1.4	J	0.26	2.0	ND	U	0.26	2.0	2.3	--	0.26	2.0	ND	U	0.26	2.0	2.4	--	0.26	2.0	ND	U	0.26	2.0
Mercury	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20
Nickel	3.0	--	0.67	2.0	1.5	J	0.67	2.0	2.3	--	0.67	2.0	1.3	J	0.67	2.0	4.3	--	0.67	2.0	2.0	--	0.67	2.0
Selenium	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10
Silver	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0
Zinc	22	--	6.4	10	ND	U	6.4	10	6.4	J	6.4	10	ND	U	6.4	10	30	--	6.4	10	ND	U	6.4	10
Others																								
Analyte	Result mg/L	Qualifier	MDL	MRL	Result mg/L	Qualifier	MDL	MRL	Result mg/L	Qualifier	MDL	MRL	Result mg/L	Qualifier	MDL	MRL	Result mg/L	Qualifier	MDL	MRL	Result mg/L	Qualifier	MDL	MRL
Total Organic Carbon	10	--	0.51	1.0	8.9	--	0.51	1.0	9.2	--	0.51	1.0	7.7	--	0.51	1.0	13	--	0.51	1.0	11	--	0.51	1.0
Total Suspended Solids	130	--	2.5	2.5					100	--	2.5	2.5					120	--	2.5	2.5				
Analyte	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
Tributyltin																								

TABLE 10 (*continued*)
Analytical Results for Metals, TOC, TSS, and Tributyltin in Site Water and Elutriates Generated from Sediment

	Winyah Bay to Charleston																							
Sample ID:	AIWW21-WC-11 (Total)				AIWW21-WC-11 (Dissolved)				AIWW21-WC-12 (Total)				AIWW21-WC-12 (Dissolved)				AIWW21-WC-13 (Total)				AIWW21-WC-13 (Dissolved)			
Analyte	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
Metals																								
Antimony	ND	U	0.76	4.0	ND	U	0.76	4.0	ND	U	0.76	4.0	ND	U	0.76	4.0	0.81	J	0.76	4.0	ND	U	0.76	4.0
Arsenic	1.7	J	0.63	2.0	1.4	J	0.63	2.0	3.7	--	0.63	2.0	3.4	--	0.63	2.0	21	--	0.63	2.0	8.5	--	0.63	2.0
Cadmium	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0
Chromium	ND	U	3.1	4.0	ND	U	3.1	4.0	ND	U	3.1	4.0	ND	U	3.1	4.0	14	--	3.1	4.0	ND	U	3.1	4.0
Copper	2.2	J	1.3	4.0	**5.4**	--	1.3	4.0	1.9	J	1.3	4.0	2.3	J	1.3	4.0	**7.8**	--	1.3	4.0	2.1	J	1.3	4.0
Lead	0.51	J	0.26	2.0	ND	U	0.26	2.0	0.77	J	0.26	2.0	ND	U	0.26	2.0	6.0	--	0.26	2.0	ND	U	0.26	2.0
Mercury	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20
Nickel	1.0	J	0.67	2.0	0.97	J	0.67	2.0	1.6	J	0.67	2.0	1.1	J	0.67	2.0	7.9	--	0.67	2.0	2.7	--	0.67	2.0
Selenium	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10
Silver	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0
Zinc	ND	U	6.4	10	ND	U	6.4	10	8.1	J	6.4	10	ND	U	6.4	10	28	--	6.4	10	ND	U	6.4	10
Others																								
Analyte	Result mg/L	Qualifier	MDL	MRL	Result mg/L	Qualifier	MDL	MRL	Result mg/L	Qualifier	MDL	MRL	Result mg/L	Qualifier	MDL	MRL	Result mg/L	Qualifier	MDL	MRL	Result mg/L	Qualifier	MDL	MRL
Total Organic Carbon	1.5	--	0.51	1.0	1.4	--	0.51	1.0	2.5	--	0.51	1.0	2.5	--	0.51	1.0	21	--	0.51	1.0	19	--	0.51	1.0
Total Suspended Solids	20	--	0.50	0.50					18	--	0.50	0.50					290	--	5.0	5.0				
Analyte	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
Tributyltin																								

TABLE 10 (*continued*)
Analytical Results for Metals, TOC, TSS, and Tributyltin in Site Water and Elutriates Generated from Sediment

Sample ID:	Charleston to Port Royal				Charleston to Port Royal																							
	AIWW21-SW-2				AIWW21-CP-14 (Total)				AIWW21-CP-14 (Dissolved)				AIWW21-CP-15 (Total)				AIWW21-CP-15 (Dissolved)				AIWW21-CP-16 (Total)				AIWW21-CP-16 (Dissolved)			
Analyte	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
Metals																												
Antimony	ND	U	0.38	2.0	ND	U	0.76	4.0	ND	U	0.76	4.0	1.1	J	0.76	4.0	ND	U	0.76	4.0	ND	U	0.76	4.0	ND	U	0.76	4.0
Arsenic	2.8	--	0.31	1.0	1.9	J	0.63	2.0	1.6	J	0.63	2.0	9.4	--	0.63	2.0	8.0	--	0.63	2.0	19	--	0.63	2.0	9.3	--	0.63	2.0
Cadmium	ND	U	0.22	1.0	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0
Chromium	3.8	--	1.5	2.0	ND	U	3.1	4.0	ND	U	3.1	4.0	ND	U	3.1	4.0	ND	U	3.1	4.0	11	--	3.1	4.0	ND	U	3.1	4.0
Copper	3.6	--	0.63	2.0	2.0	J	1.3	4.0	2.3	J	1.3	4.0	2.2	J	1.3	4.0	2.6	J	1.3	4.0	3.6	J	1.3	4.0	1.8	J	1.3	4.0
Lead	6.1	--	0.13	1.0	0.57	J	0.26	2.0	ND	U	0.26	2.0	1.2	J	0.26	2.0	ND	U	0.26	2.0	4.1	--	0.26	2.0	ND	U	0.26	2.0
Mercury	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20
Nickel	7.3	--	0.34	1.0	1.2	J	0.67	2.0	0.70	J	0.67	2.0	2.2	--	0.67	2.0	1.2	J	0.67	2.0	4.1	--	0.67	2.0	0.89	J	0.67	2.0
Selenium	ND	U	1.5	5.0	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10
Silver	ND	U	0.18	1.0	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0	0.42	J B	0.35	2.0	ND	U	0.35	2.0
Zinc	23	--	3.2	5.0	16	--	6.4	10	ND	U	6.4	10	11	--	6.4	10	ND	U	6.4	10	19	--	6.4	10	ND	U	6.4	10
Others																												
Analyte	**Result mg/L**	**Qualifier**	**MDL**	**MRL**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**
Total Organic Carbon	1.5	--	0.51	1.0	1.5	--	0.51	1.0	1.7	--	0.51	1.0	4.0	--	0.51	1.0	3.8	--	0.51	1.0	3.6	--	0.51	1.0	3.6	--	0.51	1.0
Total Suspended Solids	36	--	1.0	1.0	210	--	5.0	5.0					190	--	5.0	5.0					240	--	5.0	5.0				
Analyte	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**
Tributyltin	ND	U	0.042	0.042																	ND	U	0.043	0.043	ND	U	0.045	0.045

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TABLE 10 (*continued*)
Analytical Results for Metals, TOC, TSS, and Tributyltin in Site Water and Elutriates Generated from Sediment

	Charleston to Port Royal																															
Sample ID:	**AIWW21-CP-17 (Total)**				**AIWW21-CP-17 (Dissolved)**				**AIWW21-CP-18 (Total)**				**AIWW21-CP-18 (Dissolved)**				**AIWW21-CP-19 (Total)**				**AIWW21-CP-19 (Dissolved)**				**AIWW21-CP-20 (Total)**				**AIWW21-CP-20 (Dissolved)**			
Analyte	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**
Metals																																
Antimony	ND	U	0.76	4.0	ND	U	0.76	4.0	ND	U	0.76	4.0	ND	U	0.76	4.0	ND	U	0.76	4.0	ND	U	0.76	4.0	0.80	J	0.38	2.0	0.44	J	0.38	2.0
Arsenic	30	--	0.63	2.0	20	--	0.63	2.0	5.2	--	0.63	2.0	4.5	--	0.63	2.0	6.5	--	0.63	2.0	5.8	--	0.63	2.0	68	--	0.31	1.0	40	--	0.31	1.0
Cadmium	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.43	2.0	ND	U	0.22	1.0	ND	U	0.22	1.0
Chromium	3.2	J	3.1	4.0	ND	U	3.1	4.0	ND	U	3.1	4.0	ND	U	3.1	4.0	ND	U	3.1	4.0	ND	U	3.1	4.0	13	--	1.5	2.0	ND	U	1.5	2.0
Copper	1.9	J	1.3	4.0	ND	U	1.3	4.0	1.4	J	1.3	4.0	1.3	J	1.3	4.0	1.3	J	1.3	4.0	1.9	J	1.3	4.0	4.6	--	0.63	2.0	0.69	J	0.63	2.0
Lead	1.0	J	0.26	2.0	ND	U	0.26	2.0	0.40	J	0.26	2.0	ND	U	0.26	2.0	0.41	J	0.26	2.0	ND	U	0.26	2.0	3.5	--	0.13	1.0	0.14	J	0.13	1.0
Mercury	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20	ND	U	0.13	0.20
Nickel	3.0	--	0.67	2.0	2.1	--	0.67	2.0	1.2	J	0.67	2.0	0.75	J	0.67	2.0	1.2	J	0.67	2.0	ND	U	0.67	2.0	4.4	--	0.34	1.0	0.97	J	0.34	1.0
Selenium	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10	ND	U	3.0	10	2.0	J	1.5	5.0	ND	U	1.5	5.0
Silver	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.35	2.0	ND	U	0.18	1.0	ND	U	0.18	1.0
Zinc	14	--	6.4	10	ND	U	6.4	10	7.8	J	6.4	10	ND	U	6.4	10	8.7	J	6.4	10	6.9	J	6.4	10	17	--	3.2	5.0	ND	U	3.2	5.0
Others																																
Analyte	**Result mg/L**	**Qualifier**	**MDL**	**MRL**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**	**Result mg/L**	**Qualifier**	**MDL**	**MRL**
Total Organic Carbon	15	--	0.51	1.0	13	--	0.51	1.0	4.6	--	0.51	1.0	4.5	--	0.51	1.0	3	--	0.51	1.0	3	--	0.51	1.0	11	--	0.51	1.0	9.5	--	0.51	1.0
Total Suspended Solids	220	--	5.0	5.0					19	--	0.63	0.63					23	--	0.63	0.63					280	--	5.0	5.0				
Analyte	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**
Tributyltin																																

Bolded values meet or exceed the SC CMC and/or CMC.
Non-detect (ND) = The analyte was not detected at or above the MDL.
Data qualifiers and acronyms are defined at the front of the tables section.

Sources: Results from Eurofins TestAmerica; CMC values taken from USEPA (2015), SC CMC values from SCDHEC (2014).
Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 11
Analytical Results for PAHs in Site Water and Elutriates Generated from Sediment Samples

				Little River to Charleston				Little River to Winyah Bay																							
			Sample ID:	AIWW21-SW-1				AIWW21-LB-1 (Total)				AIWW21-LB-1 (Dissolved)				AIWW21-LB-2 (Total)				AIWW21-LB-2 (Dissolved)				AIWW21-LB-3 (Total)				AIWW21-LB-3 (Dissolved)			
Analyte	Maximum Conc. µg/L	SC CMC µg/L	CMC µg/L	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
1-Methylnaphthalene^{LMW}	ND	x	x	ND	U	0.054	0.18	ND	U	0.052	0.18	ND	U	0.052	0.18	ND	U	0.052	0.18	ND	U	0.052	0.18	ND	U	0.052	0.18	ND	U	0.052	0.18
2-Methylnaphthalene^{LMW}	ND	x	x	ND	U	0.060	0.18	ND	U	0.057	0.18	ND	U	0.057	0.18	ND	U	0.057	0.18	ND	U	0.057	0.18	ND	U	0.057	0.18	ND	U	0.057	0.18
Acenaphthene^{LMW}	ND	x	x	ND	U	0.063	0.18	ND	U	0.060	0.18	ND	U	0.06	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18
Acenaphthylene	ND	x	x	ND	U	0.063	0.18	ND	U	0.060	0.18	ND	U	0.06	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18
Anthracene^{LMW}	ND	x	x	ND	U	0.047	0.18	ND	U	0.045	0.18	ND	U	0.045	0.18	ND	U	0.045	0.18	ND	U	0.045	0.18	ND	U	0.045	0.18	ND	U	0.045	0.18
Benzo(a)anthracene^{HMW}	ND	x	x	ND	U	0.072	0.18	ND	U	0.069	0.18	ND	U	0.069	0.18	ND	U	0.069	0.18	ND	U	0.069	0.18	ND	U	0.069	0.18	ND	U	0.069	0.18
Benzo(a)pyrene^{HMW}	ND	x	x	ND	U	0.051	0.18	ND	U	0.049	0.18	ND	U	0.049	0.18	ND	U	0.049	0.18	ND	U	0.049	0.18	ND	U	0.049	0.18	ND	U	0.049	0.18
Benzo(b)fluoranthene	ND	x	x	ND	U	0.093	0.18	ND	U	0.09	0.18	ND	U	0.090	0.18	ND	U	0.090	0.18	ND	U	0.090	0.18	ND	U	0.090	0.18	ND	U	0.090	0.18
Benzo(g,h,i)perylene	ND	x	x	ND	U	0.066	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18
Benzo(k)fluoranthene	ND	x	x	ND	U	0.085	0.18	ND	U	0.081	0.18	ND	U	0.081	0.18	ND	U	0.081	0.18	ND	U	0.081	0.18	ND	U	0.081	0.18	ND	U	0.081	0.18
Chrysene^{HMW}	ND	x	x	ND	U	0.078	0.18	ND	U	0.075	0.18	ND	U	0.075	0.18	ND	U	0.075	0.18	ND	U	0.075	0.18	ND	U	0.075	0.18	ND	U	0.075	0.18
Dibenzo(a,h)anthracene^{HMW}	ND	x	x	ND	U	0.069	0.18	ND	U	0.067	0.18	ND	U	0.067	0.18	ND	U	0.067	0.18	ND	U	0.067	0.18	ND	U	0.067	0.18	ND	U	0.067	0.18
Fluoranthene^{HMW}	ND	x	x	ND	U	0.058	0.18	ND	U	0.056	0.18	ND	U	0.056	0.18	ND	U	0.056	0.18	ND	U	0.056	0.18	ND	U	0.056	0.18	ND	U	0.056	0.18
Fluorene^{LMW}	0.064	x	x	ND	U	0.066	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18
Indeno(1,2,3-cd)pyrene	ND	x	x	ND	U	0.082	0.18	ND	U	0.079	0.18	ND	U	0.079	0.18	ND	U	0.079	0.18	ND	U	0.079	0.18	ND	U	0.079	0.18	ND	U	0.079	0.18
Naphthalene^{LMW}	0.058	x	x	ND	U	0.057	0.18	ND	U	0.055	0.18	ND	U	0.055	0.18	ND	U	0.055	0.18	ND	U	0.055	0.18	ND	U	0.055	0.18	ND	U	0.055	0.18
Phenanthrene^{LMW}	0.075	x	x	ND	U	0.053	0.18	ND	U	0.051	0.18	ND	U	0.051	0.18	ND	U	0.051	0.18	ND	U	0.051	0.18	ND	U	0.051	0.18	ND	U	0.051	0.18
Pyrene^{HMW}	ND	x	x	ND	U	0.052	0.18	ND	U	0.050	0.18	ND	U	0.050	0.18	ND	U	0.050	0.18	ND	U	0.050	0.18	ND	U	0.050	0.18	ND	U	0.050	0.18
Total LMW PAHs	1.7	x	x	0.40				0.38				0.38				0.38				0.38				0.38				0.38			
Total HMW PAHs	1.65	x	x	0.38				0.37				0.37				0.37				0.37				0.37				0.37			
Total PAHs	5.1	x	x	1.2				1.1				1.1				1.1				1.1				1.1				1.1			

TABLE 11 (*continued*)
Analytical Results for PAHs in Site Water and Elutriates Generated from Sediment Samples

Sample ID:	Winyah Bay to Charleston																															
	AIWW21-WC-4 (Total)				AIWW21-WC-4 (Dissolved)				AIWW21-WC-5 (Total)				AIWW21-WC-5 (Dissolved)				AIWW21-WC-6 (Total)				AIWW21-WC-6 (Dissolved)				AIWW21-WC-7 (Total)				AIWW21-WC-7 (Dissolved)			
Analyte	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
1-Methylnaphthalene[LMW]	ND	U	0.056	0.19	ND	U	0.052	0.18	ND	U	0.054	0.18	ND	U	0.052	0.18	ND	U	0.052	0.18	ND	U	0.052	0.18	ND	U	0.054	0.18	ND	U	0.052	0.18
2-Methylnaphthalene[LMW]	ND	U	0.062	0.19	ND	U	0.057	0.18	ND	U	0.060	0.18	ND	U	0.057	0.18	ND	U	0.057	0.18	ND	U	0.057	0.18	ND	U	0.060	0.18	ND	U	0.057	0.18
Acenaphthene[LMW]	ND	U	0.065	0.19	ND	U	0.060	0.18	ND	U	0.063	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.063	0.18	ND	U	0.060	0.18
Acenaphthylene	ND	U	0.065	0.19	ND	U	0.060	0.18	ND	U	0.063	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.063	0.18	ND	U	0.060	0.18
Anthracene[LMW]	ND	U	0.049	0.19	ND	U	0.045	0.18	ND	U	0.047	0.18	ND	U	0.045	0.18	ND	U	0.045	0.18	ND	U	0.045	0.18	ND	U	0.047	0.18	ND	U	0.045	0.18
Benzo(a)anthracene[HMW]	ND	U	0.075	0.19	ND	U	0.069	0.18	ND	U	0.072	0.18	ND	U	0.069	0.18	ND	U	0.069	0.18	ND	U	0.069	0.18	ND	U	0.072	0.18	ND	U	0.069	0.18
Benzo(a)pyrene[HMW]	ND	U	0.053	0.19	ND	U	0.049	0.18	ND	U	0.051	0.18	ND	U	0.049	0.18	ND	U	0.049	0.18	ND	U	0.049	0.18	ND	U	0.051	0.18	ND	U	0.049	0.18
Benzo(b)fluoranthene	ND	U	0.097	0.19	ND	U	0.090	0.18	ND	U	0.093	0.18	ND	U	0.090	0.18	ND	U	0.090	0.18	ND	U	0.090	0.18	ND	U	0.093	0.18	ND	U	0.090	0.18
Benzo(g,h,i)perylene	ND	U	0.069	0.19	ND	U	0.064	0.18	ND	U	0.066	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.066	0.18	ND	U	0.064	0.18
Benzo(k)fluoranthene	ND	U	0.088	0.19	ND	U	0.081	0.18	ND	U	0.085	0.18	ND	U	0.081	0.18	ND	U	0.081	0.18	ND	U	0.081	0.18	ND	U	0.085	0.18	ND	U	0.081	0.18
Chrysene[HMW]	ND	U	0.081	0.19	ND	U	0.075	0.18	ND	U	0.078	0.18	ND	U	0.075	0.18	ND	U	0.075	0.18	ND	U	0.075	0.18	ND	U	0.078	0.18	ND	U	0.075	0.18
Dibenzo(a,h)anthracene[HMW]	ND	U	0.072	0.19	ND	U	0.067	0.18	ND	U	0.069	0.18	ND	U	0.067	0.18	ND	U	0.067	0.18	ND	U	0.067	0.18	ND	U	0.069	0.18	ND	U	0.067	0.18
Fluoranthene[HMW]	ND	U	0.060	0.19	ND	U	0.056	0.18	ND	U	0.058	0.18	ND	U	0.056	0.18	ND	U	0.056	0.18	ND	U	0.056	0.18	ND	U	0.058	0.18	ND	U	0.056	0.18
Fluorene[LMW]	ND	U	0.069	0.19	ND	U	0.064	0.18	ND	U	0.066	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.066	0.18	ND	U	0.064	0.18
Indeno(1,2,3-cd)pyrene	ND	U	0.085	0.19	ND	U	0.079	0.18	ND	U	0.082	0.18	ND	U	0.079	0.18	ND	U	0.079	0.18	ND	U	0.079	0.18	ND	U	0.082	0.18	ND	U	0.079	0.18
Naphthalene[LMW]	ND	U	0.059	0.19	ND	U	0.055	0.18	ND	U	0.057	0.18	ND	U	0.055	0.18	ND	U	0.055	0.18	ND	U	0.055	0.18	ND	U	0.057	0.18	ND	U	0.055	0.18
Phenanthrene[LMW]	ND	U	0.055	0.19	ND	U	0.051	0.18	ND	U	0.053	0.18	ND	U	0.051	0.18	0.075	J	0.051	0.18	ND	U	0.051	0.18	ND	U	0.053	0.18	ND	U	0.051	0.18
Pyrene[HMW]	ND	U	0.054	0.19	ND	U	0.050	0.18	ND	U	0.052	0.18	ND	U	0.050	0.18	ND	U	0.050	0.18	ND	U	0.050	0.18	ND	U	0.052	0.18	ND	U	0.050	0.18
Total LMW PAHs	0.42				0.38				0.40				0.38				0.62				0.38				0.40				0.38			
Total HMW PAHs	0.40				0.37				0.38				0.37				0.37				0.37				0.38				0.37			
Total PAHs	1.2				1.1				1.2				1.1				1.1				1.1				1.2				1.1			

TABLE 11 (*continued*)
Analytical Results for PAHs in Site Water and Elutriates Generated from Sediment Samples

	Winyah Bay to Charleston																							
Sample ID:	AIWW21-WC-8 (Total)				AIWW21-WC-8 (Dissolved)				AIWW21-WC-9 (Total)				AIWW21-WC-9 (Dissolved)				AIWW21-WC-10 (Total)				AIWW21-WC-10 (Dissolved)			
Analyte	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
1-Methylnaphthalene^{LMW}	ND	U	0.054	0.18	ND	U	0.052	0.18	ND	U	0.052	0.18	ND	U	0.052	0.18	ND	U	0.052	0.18	ND	U	0.052	0.18
2-Methylnaphthalene^{LMW}	ND	U	0.060	0.18	ND	U	0.057	0.18	ND	U	0.057	0.18	ND	U	0.057	0.18	ND	U	0.057	0.18	ND	U	0.057	0.18
Acenaphthene^{LMW}	ND	U	0.063	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18
Acenaphthylene	ND	U	0.063	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18
Anthracene^{LMW}	ND	U	0.047	0.18	ND	U	0.045	0.18	ND	U	0.045	0.18	ND	U	0.045	0.18	ND	U	0.045	0.18	ND	U	0.045	0.18
Benzo(a)anthracene^{HMW}	ND	U	0.072	0.18	ND	U	0.069	0.18	ND	U	0.069	0.18	ND	U	0.069	0.18	ND	U	0.069	0.18	ND	U	0.069	0.18
Benzo(a)pyrene^{HMW}	ND	U	0.051	0.18	ND	U	0.049	0.18	ND	U	0.049	0.18	ND	U	0.049	0.18	ND	U	0.049	0.18	ND	U	0.049	0.18
Benzo(b)fluoranthene	ND	U	0.093	0.18	ND	U	0.090	0.18	ND	U	0.090	0.18	ND	U	0.090	0.18	ND	U	0.090	0.18	ND	U	0.090	0.18
Benzo(g,h,i)perylene	ND	U	0.066	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18
Benzo(k)fluoranthene	ND	U	0.085	0.18	ND	U	0.081	0.18	ND	U	0.081	0.18	ND	U	0.081	0.18	ND	U	0.081	0.18	ND	U	0.081	0.18
Chrysene^{HMW}	ND	U	0.078	0.18	ND	U	0.075	0.18	ND	U	0.075	0.18	ND	U	0.075	0.18	ND	U	0.075	0.18	ND	U	0.075	0.18
Dibenzo(a,h)anthracene^{HMW}	ND	U	0.069	0.18	ND	U	0.067	0.18	ND	U	0.067	0.18	ND	U	0.067	0.18	ND	U	0.067	0.18	ND	U	0.067	0.18
Fluoranthene^{HMW}	ND	U	0.058	0.18	ND	U	0.056	0.18	ND	U	0.056	0.18	ND	U	0.056	0.18	ND	U	0.056	0.18	ND	U	0.056	0.18
Fluorene^{LMW}	ND	U	0.066	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18
Indeno(1,2,3-cd)pyrene	ND	U	0.082	0.18	ND	U	0.079	0.18	ND	U	0.079	0.18	ND	U	0.079	0.18	ND	U	0.079	0.18	ND	U	0.079	0.18
Naphthalene^{LMW}	ND	U	0.057	0.18	ND	U	0.055	0.18	ND	U	0.055	0.18	0.058	J	0.055	0.18	ND	U	0.055	0.18	ND	U	0.055	0.18
Phenanthrene^{LMW}	ND	U	0.053	0.18	ND	U	0.051	0.18	ND	U	0.051	0.18	ND	U	0.051	0.18	ND	U	0.051	0.18	ND	U	0.051	0.18
Pyrene^{HMW}	ND	U	0.052	0.18	ND	U	0.050	0.18	ND	U	0.050	0.18	ND	U	0.050	0.18	ND	U	0.050	0.18	ND	U	0.050	0.18
Total LMW PAHs	0.40				0.38				0.38				0.39				0.38				0.38			
Total HMW PAHs	0.38				0.37				0.37				0.37				0.37				0.37			
Total PAHs	1.2				1.1				1.1				1.1				1.1				1.1			

TABLE 11 (*continued*)
Analytical Results for PAHs in Site Water and Elutriates Generated from Sediment Samples

	Winyah Bay to Charleston																							
Sample ID:	AIWW21-WC-11 (Total)				AIWW21-WC-11 (Dissolved)				AIWW21-WC-12 (Total)				AIWW21-WC-12 (Dissolved)				AIWW21-WC-13 (Total)				AIWW21-WC-13 (Dissolved)			
Analyte	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
1-Methylnaphthalene^{LMW}	ND	U	0.052	0.18	ND	U	0.052	0.18	ND	U	0.054	0.18	ND	U	0.052	0.18	ND	U	0.23	0.79	ND	U	0.052	0.18
2-Methylnaphthalene^{LMW}	ND	U	0.057	0.18	ND	U	0.057	0.18	ND	U	0.06	0.18	ND	U	0.057	0.18	ND	U	0.26	0.79	ND	U	0.057	0.18
Acenaphthene^{LMW}	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.063	0.18	ND	U	0.060	0.18	ND	U	0.27	0.79	ND	U	0.060	0.18
Acenaphthylene	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.063	0.18	ND	U	0.060	0.18	ND	U	0.27	0.79	ND	U	0.060	0.18
Anthracene^{LMW}	ND	U	0.045	0.18	ND	U	0.045	0.18	ND	U	0.047	0.18	ND	U	0.045	0.18	ND	U	0.20	0.79	ND	U	0.045	0.18
Benzo(a)anthracene^{HMW}	ND	U	0.069	0.18	ND	U	0.069	0.18	ND	U	0.072	0.18	ND	U	0.069	0.18	ND	U	0.31	0.79	ND	U	0.069	0.18
Benzo(a)pyrene^{HMW}	ND	U	0.049	0.18	ND	U	0.049	0.18	ND	U	0.051	0.18	ND	U	0.049	0.18	ND	U	0.22	0.79	ND	U	0.049	0.18
Benzo(b)fluoranthene	ND	U	0.090	0.18	ND	U	0.090	0.18	ND	U	0.093	0.18	ND	U	0.090	0.18	ND	U	0.40	0.79	ND	U	0.090	0.18
Benzo(g,h,i)perylene	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.066	0.18	ND	U	0.064	0.18	ND	U	0.29	0.79	ND	U	0.064	0.18
Benzo(k)fluoranthene	ND	U	0.081	0.18	ND	U	0.081	0.18	ND	U	0.085	0.18	ND	U	0.081	0.18	ND	U	0.37	0.79	ND	U	0.081	0.18
Chrysene^{HMW}	ND	U	0.075	0.18	ND	U	0.075	0.18	ND	U	0.078	0.18	ND	U	0.075	0.18	ND	U	0.34	0.79	ND	U	0.075	0.18
Dibenzo(a,h)anthracene^{HMW}	ND	U	0.067	0.18	ND	U	0.067	0.18	ND	U	0.069	0.18	ND	U	0.067	0.18	ND	U	0.30	0.79	ND	U	0.067	0.18
Fluoranthene^{HMW}	ND	U	0.056	0.18	ND	U	0.056	0.18	ND	U	0.058	0.18	ND	U	0.056	0.18	ND	U	0.25	0.79	ND	U	0.056	0.18
Fluorene^{LMW}	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.066	0.18	ND	U	0.064	0.18	ND	U	0.29	0.79	ND	U	0.064	0.18
Indeno(1,2,3-cd)pyrene	ND	U	0.079	0.18	ND	U	0.079	0.18	ND	U	0.082	0.18	ND	U	0.079	0.18	ND	U	0.35	0.79	ND	U	0.079	0.18
Naphthalene^{LMW}	ND	U	0.055	0.18	ND	U	0.055	0.18	ND	U	0.057	0.18	ND	U	0.055	0.18	ND	U	0.25	0.79	ND	U	0.055	0.18
Phenanthrene^{LMW}	ND	U	0.051	0.18	0.059	J	0.051	0.18	ND	U	0.053	0.18	ND	U	0.051	0.18	ND	U	0.23	0.79	0.065	J	0.051	0.18
Pyrene^{HMW}	ND	U	0.050	0.18	ND	U	0.050	0.18	ND	U	0.052	0.18	ND	U	0.050	0.18	ND	U	0.23	0.79	ND	U	0.050	0.18
Total LMW PAHs	0.38				0.39				0.40				0.38				1.7				0.40			
Total HMW PAHs	0.37				0.37				0.38				0.37				1.65				0.37			
Total PAHs	1.1				1.1				1.2				1.1				5.1				1.1			

TABLE 11 (*continued*)
Analytical Results for PAHs in Site Water and Elutriates Generated from Sediment Samples

	Charleston to Port Royal				Charleston to Port Royal																							
Sample ID:	AIWW21-SW-2				AIWW21-CP-14 (Total)				AIWW21-CP-14 (Dissolved)				AIWW21-CP-15 (Total)				AIWW21-CP-15 (Dissolved)				AIWW21-CP-16 (Total)				AIWW21-CP-16 (Dissolved)			
Analyte	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
1-Methylnaphthalene^{LMW}	ND	U	0.052	0.18	ND	U	0.052	0.18	ND	U	0.052	0.18	ND	U	0.054	0.18	ND	U	0.052	0.18	ND	U	0.052	0.18	ND	U	0.052	0.18
2-Methylnaphthalene^{LMW}	ND	U	0.057	0.18	ND	U	0.057	0.18	ND	U	0.057	0.18	ND	U	0.060	0.18	ND	U	0.057	0.18	ND	U	0.057	0.18	ND	U	0.057	0.18
Acenaphthene^{LMW}	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.063	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18
Acenaphthylene	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.063	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18
Anthracene^{LMW}	ND	U	0.045	0.18	ND	U	0.045	0.18	ND	U	0.045	0.18	ND	U	0.047	0.18	ND	U	0.045	0.18	ND	U	0.045	0.18	ND	U	0.045	0.18
Benzo(a)anthracene^{HMW}	ND	U	0.069	0.18	ND	U	0.069	0.18	ND	U	0.069	0.18	ND	U	0.072	0.18	ND	U	0.069	0.18	ND	U	0.069	0.18	ND	U	0.069	0.18
Benzo(a)pyrene^{HMW}	ND	U	0.049	0.18	ND	U	0.049	0.18	ND	U	0.049	0.18	ND	U	0.051	0.18	ND	U	0.049	0.18	ND	U	0.049	0.18	ND	U	0.049	0.18
Benzo(b)fluoranthene	ND	U	0.090	0.18	ND	U	0.090	0.18	ND	U	0.090	0.18	ND	U	0.093	0.18	ND	U	0.090	0.18	ND	U	0.090	0.18	ND	U	0.090	0.18
Benzo(g,h,i)perylene	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.066	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18
Benzo(k)fluoranthene	ND	U	0.081	0.18	ND	U	0.081	0.18	ND	U	0.081	0.18	ND	U	0.085	0.18	ND	U	0.081	0.18	ND	U	0.081	0.18	ND	U	0.081	0.18
Chrysene^{HMW}	ND	U	0.075	0.18	ND	U	0.075	0.18	ND	U	0.075	0.18	ND	U	0.078	0.18	ND	U	0.075	0.18	ND	U	0.075	0.18	ND	U	0.075	0.18
Dibenzo(a,h)anthracene^{HMW}	ND	U	0.067	0.18	ND	U	0.067	0.18	ND	U	0.067	0.18	ND	U	0.069	0.18	ND	U	0.067	0.18	ND	U	0.067	0.18	ND	U	0.067	0.18
Fluoranthene^{HMW}	ND	U	0.056	0.18	ND	U	0.056	0.18	ND	U	0.056	0.18	ND	U	0.058	0.18	ND	U	0.056	0.18	ND	U	0.056	0.18	ND	U	0.056	0.18
Fluorene^{LMW}	0.064	J	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.066	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18
Indeno(1,2,3-cd)pyrene	ND	U	0.079	0.18	ND	U	0.079	0.18	ND	U	0.079	0.18	ND	U	0.082	0.18	ND	U	0.079	0.18	ND	U	0.079	0.18	ND	U	0.079	0.18
Naphthalene^{LMW}	ND	U	0.055	0.18	ND	U	0.055	0.18	ND	U	0.055	0.18	ND	U	0.057	0.18	ND	U	0.055	0.18	ND	U	0.055	0.18	ND	U	0.055	0.18
Phenanthrene^{LMW}	ND	U	0.051	0.18	ND	U	0.051	0.18	ND	U	0.051	0.18	0.060	J	0.053	0.18	0.055	J	0.051	0.18	ND	U	0.051	0.18	ND	U	0.051	0.18
Pyrene^{HMW}	ND	U	0.050	0.18	ND	U	0.050	0.18	ND	U	0.050	0.18	ND	U	0.052	0.18	ND	U	0.050	0.18	ND	U	0.050	0.18	ND	U	0.050	0.18
Total LMW PAHs	0.38				0.38				0.38				0.41				0.39				0.38				0.38			
Total HMW PAHs	0.37				0.37				0.37				0.38				0.37				0.37				0.37			
Total PAHs	1.1				1.1				1.1				1.2				1.1				1.1				1.1			

TABLE 11 (*continued*)
Analytical Results for PAHs in Site Water and Elutriates Generated from Sediment Samples

Charleston to Port Royal

Sample ID:	AIWW21-CP-17 (Total)				AIWW21-CP-17 (Dissolved)				AIWW21-CP-18 (Total)				AIWW21-CP-18 (Dissolved)			
Analyte	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
1-Methylnaphthalene[LMW]	ND	U	0.054	0.18	ND	U	0.052	0.18	ND	U	0.052	0.18	ND	U	0.052	0.18
2-Methylnaphthalene[LMW]	ND	U	0.060	0.18	ND	U	0.057	0.18	ND	U	0.057	0.18	ND	U	0.057	0.18
Acenaphthene[LMW]	ND	U	0.063	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18
Acenaphthylene	ND	U	0.063	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18
Anthracene[LMW]	ND	U	0.047	0.18	ND	U	0.045	0.18	ND	U	0.045	0.18	ND	U	0.045	0.18
Benzo(a)anthracene[HMW]	ND	U	0.072	0.18	ND	U	0.069	0.18	ND	U	0.069	0.18	ND	U	0.069	0.18
Benzo(a)pyrene[HMW]	ND	U	0.051	0.18	ND	U	0.049	0.18	ND	U	0.049	0.18	ND	U	0.049	0.18
Benzo(b)fluoranthene	ND	U	0.093	0.18	ND	U	0.090	0.18	ND	U	0.090	0.18	ND	U	0.090	0.18
Benzo(g,h,i)perylene	ND	U	0.066	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18
Benzo(k)fluoranthene	ND	U	0.085	0.18	ND	U	0.081	0.18	ND	U	0.081	0.18	ND	U	0.081	0.18
Chrysene[HMW]	ND	U	0.078	0.18	ND	U	0.075	0.18	ND	U	0.075	0.18	ND	U	0.075	0.18
Dibenzo(a,h)anthracene[HMW]	ND	U	0.069	0.18	ND	U	0.067	0.18	ND	U	0.067	0.18	ND	U	0.067	0.18
Fluoranthene[HMW]	ND	U	0.058	0.18	ND	U	0.056	0.18	ND	U	0.056	0.18	ND	U	0.056	0.18
Fluorene[LMW]	ND	U	0.066	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18
Indeno(1,2,3-cd)pyrene	ND	U	0.082	0.18	ND	U	0.079	0.18	ND	U	0.079	0.18	ND	U	0.079	0.18
Naphthalene[LMW]	ND	U	0.057	0.18	ND	U	0.055	0.18	ND	U	0.055	0.18	ND	U	0.055	0.18
Phenanthrene[LMW]	ND	U	0.053	0.18	ND	U	0.051	0.18	0.051	J	0.051	0.18	ND	U	0.051	0.18
Pyrene[HMW]	ND	U	0.052	0.18	ND	U	0.050	0.18	ND	U	0.050	0.18	ND	U	0.050	0.18
Total LMW PAHs	0.40				0.38				0.38				0.38			
Total HMW PAHs	0.38				0.37				0.37				0.37			
Total PAHs	1.2				1.1				1.1				1.1			

Sample ID:	AIWW21-CP-19 (Total)				AIWW21-CP-19 (Dissolved)				AIWW21-CP-20 (Total)				AIWW21-CP-20 (Dissolved)			
Analyte	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
1-Methylnaphthalene[LMW]	ND	U	0.052	0.18	ND	U	0.052	0.18	ND	U	0.052	0.18	ND	U	0.052	0.18
2-Methylnaphthalene[LMW]	ND	U	0.057	0.18	ND	U	0.057	0.18	ND	U	0.057	0.18	ND	U	0.057	0.18
Acenaphthene[LMW]	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18
Acenaphthylene	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18	ND	U	0.060	0.18
Anthracene[LMW]	ND	U	0.045	0.18	ND	U	0.045	0.18	ND	U	0.045	0.18	ND	U	0.045	0.18
Benzo(a)anthracene[HMW]	ND	U	0.069	0.18	ND	U	0.069	0.18	ND	U	0.069	0.18	ND	U	0.069	0.18
Benzo(a)pyrene[HMW]	ND	U	0.049	0.18	ND	U	0.049	0.18	ND	U	0.049	0.18	ND	U	0.049	0.18
Benzo(b)fluoranthene	ND	U	0.090	0.18	ND	U	0.090	0.18	ND	U	0.090	0.18	ND	U	0.090	0.18
Benzo(g,h,i)perylene	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18
Benzo(k)fluoranthene	ND	U	0.081	0.18	ND	U	0.081	0.18	ND	U	0.081	0.18	ND	U	0.081	0.18
Chrysene[HMW]	ND	U	0.075	0.18	ND	U	0.075	0.18	ND	U	0.075	0.18	ND	U	0.075	0.18
Dibenzo(a,h)anthracene[HMW]	ND	U	0.067	0.18	ND	U	0.067	0.18	ND	U	0.067	0.18	ND	U	0.067	0.18
Fluoranthene[HMW]	ND	U	0.056	0.18	ND	U	0.056	0.18	ND	U	0.056	0.18	ND	U	0.056	0.18
Fluorene[LMW]	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18	ND	U	0.064	0.18
Indeno(1,2,3-cd)pyrene	ND	U	0.079	0.18	ND	U	0.079	0.18	ND	U	0.079	0.18	ND	U	0.079	0.18
Naphthalene[LMW]	ND	U	0.055	0.18	ND	U	0.055	0.18	ND	U	0.055	0.18	ND	U	0.055	0.18
Phenanthrene[LMW]	ND	U	0.051	0.18	0.051	J	0.051	0.18	0.052	J	0.051	0.18	0.064	J	0.051	0.18
Pyrene[HMW]	ND	U	0.050	0.18	ND	U	0.050	0.18	ND	U	0.050	0.18	ND	U	0.050	0.18
Total LMW PAHs	0.38				0.38				0.38				0.40			
Total HMW PAHs	0.37				0.37				0.37				0.37			
Total PAHs	1.1				1.1				1.1				1.1			

LMW Low molecular weight PAHs (NOAA 1989).
HMW High molecular weight PAHs (NOAA 1989).
Non-detect (ND) = The analyte was not detected at or above the MDL. Non-detect results use the MDL for calculating the total PAHs. (J-qualified results use the value reported by the laboratory for calculating total PAHs.)
Data qualifiers and acronyms are defined at the front of the tables section.

Sources: Results from Eurofins TestAmerica; There are no applicable CMC values in USEPA (2015).
Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 12

Analytical Results for Pesticides in Site Water and Elutriates Generated from Sediment Samples

				Little River to Charleston				Little River to Winyah Bay															
			Sample ID:	AIWW21-SW-1				AIWW21-LB-1 (Total)				AIWW21-LB-1 (Dissolved)				AIWW21-LB-2 (Total)				AIWW21-LB-2 (Dissolved)			
Analyte	Maximum Conc. µg/L	SC CMC µg/L	CMC µg/L	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
Aldrin	0.00051	1.3	1.3	0.00051	J p	0.00035	0.0013	ND	U	0.00034	0.0012	ND	U	0.00034	0.0012	ND	U	0.00034	0.0012	ND	U	0.00034	0.0012
Chlordane (technical)	ND	0.09	0.09	ND	U	0.0070	0.012	ND	U	0.0068	0.012	ND	U	0.0069	0.012	ND	U	0.0068	0.012	ND	U	0.0068	0.012
α (cis)-Chlordane	ND	x	x	ND	U	0.00036	0.0013	ND	U	0.00035	0.0012	ND	U	0.00035	0.0012	ND	U	0.00035	0.0012	ND	U	0.00035	0.0012
γ (trans)-Chlordane	ND	x	x	ND	U	0.00040	0.0013	ND	U	0.00039	0.0012	ND	U	0.00039	0.0012	ND	U	0.00039	0.0012	ND	U	0.00039	0.0012
Oxychlordane	0.0039	x	x	0.00033	J p	0.00020	0.017	ND	U	0.00020	0.016	ND	U	0.00020	0.016	ND	U	0.00020	0.016	ND	U	0.00020	0.016
cis-Nonachlor	ND	x	x	ND	U	0.00049	0.0013	ND	U	0.00048	0.0012	ND	U	0.00048	0.0012	ND	U	0.00048	0.0012	ND	U	0.00048	0.0012
trans-Nonachlor	ND	x	x	ND	U	0.00018	0.0013	ND	U	0.00018	0.0012	ND	U	0.00018	0.0012	ND	U	0.00018	0.0012	ND	U	0.00018	0.0012
o,p' (2,4')-DDD	ND	x	x	ND	U	0.00080	0.0013	ND	U	0.00078	0.0012	ND	U	0.00079	0.0012	ND	U	0.00078	0.0012	ND	U	0.00078	0.0012
p,p' (4,4')-DDD	ND	x	x	ND	U	0.00052	0.0013	ND	U	0.00050	0.0012	ND	U	0.00051	0.0012	ND	U	0.00050	0.0012	ND	U	0.00050	0.0012
o,p' (2,4')-DDE	ND	x	x	ND	U	0.00052	0.0013	ND	U	0.00050	0.0012	ND	U	0.00051	0.0012	ND	U	0.00050	0.0012	ND	U	0.00050	0.0012
p,p' (4,4')-DDE	ND	x	x	ND	U	0.00029	0.0013	ND	U	0.00028	0.0012	ND	U	0.00028	0.0012	ND	U	0.00028	0.0012	ND	U	0.00028	0.0012
o,p' (2,4')-DDT	ND	x	x	ND	U	0.00052	0.0013	ND	U	0.00051	0.0012	ND	U	0.00051	0.0012	ND	U	0.00051	0.0012	ND	U	0.00051	0.0012
p,p' (4,4')-DDT	ND	0.13	0.13	ND	U	0.00029	0.0013	ND	U	0.00028	0.0012	ND	U	0.00028	0.0012	ND	U	0.00028	0.0012	ND	U	0.00028	0.0012
Dieldrin	ND	0.71	0.71	ND	U	0.00027	0.0013	ND	U	0.00026	0.0012	ND	U	0.00026	0.0012	ND	U	0.00026	0.0012	ND	U	0.00026	0.0012
Endosulfan I	ND	0.034	0.034	ND	U	0.00067	0.0013	ND	U	0.00065	0.0012	ND	U	0.00065	0.0012	ND	U	0.00065	0.0012	ND	U	0.00065	0.0012
Endosulfan II	ND	0.034	0.034	ND	U	0.00031	0.0013	ND	U	0.00030	0.0012	ND	U	0.00030	0.0012	ND	U	0.00030	0.0012	ND	U	0.00030	0.0012
Endrin	ND	0.037	0.037	ND	U	0.00022	0.0013	ND	U	0.00022	0.0012	ND	U	0.00022	0.0012	ND	U	0.00022	0.0012	ND	U	0.00022	0.0012
Endrin Aldehyde	ND	x	x	ND	U	0.00050	0.0013	ND	U	0.00049	0.0012	ND	U	0.00049	0.0012	ND	U	0.00049	0.0012	ND	U	0.00049	0.0012
Endrin Ketone	ND	x	x	ND	U	0.00038	0.0013	ND	U	0.00037	0.0012	ND	U	0.00038	0.0012	ND	U	0.00037	0.0012	ND	U	0.00037	0.0012
Heptachlor	ND	0.053	0.053	ND	U	0.00044	0.0013	ND	U	0.00043	0.0012	ND	U	0.00043	0.0012	ND	U	0.00043	0.0012	ND	U	0.00043	0.0012
Heptachlor Epoxide	ND	0.053	0.053	ND	U	0.00033	0.0013	ND	U	0.00032	0.0012	ND	U	0.00032	0.0012	ND	U	0.00032	0.0012	ND	U	0.00032	0.0012
α-BHC	ND	x	x	ND	U	0.00023	0.0013	ND	U	0.00022	0.0012	ND	U	0.00023	0.0012	ND	U	0.00022	0.0012	ND	U	0.00022	0.0012
β-BHC	ND	x	x	ND	U	0.00036	0.0013	ND	U	0.00035	0.0012	ND	U	0.00035	0.0012	ND	U	0.00035	0.0012	ND	U	0.00035	0.0012
δ-BHC	ND	x	x	ND	U	0.00062	0.0013	ND	U	0.00061	0.0012	ND	U	0.00061	0.0012	ND	U	0.00061	0.0012	ND	U	0.00061	0.0012
γ-BHC (Lindane)	ND	0.16	0.16	ND	U	0.00028	0.0013	ND	U	0.00028	0.0012	ND	U	0.00028	0.0012	ND	U	0.00028	0.0012	ND	U	0.00028	0.0012
Methoxychlor	0.0022	x	x	0.0022	--	0.00075	0.0013	ND	U	0.00073	0.0012	ND	U	0.00074	0.0012	ND	U	0.00073	0.0012	ND	U	0.00073	0.0012
Mirex®	ND	x	x	ND	U	0.00020	0.0013	ND	U	0.00020	0.0012	ND	U	0.00020	0.0012	ND	U	0.00020	0.0012	ND	U	0.00020	0.0012
Toxaphene	ND	0.21	0.21	ND	U	0.048	0.097	ND	U	0.046	0.094	ND	U	0.047	0.095	ND	U	0.046	0.094	ND	U	0.046	0.094
Pesticides, Total Chlorinated	0.067	x	x	0.067				0.063				0.064				0.063				0.063			

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TABLE 12 (*continued*)
Analytical Results for Pesticides in Site Water and Elutriates Generated from Sample Sediments

	Little River to Winyah Bay								Charleston to Port Royal				Charleston to Port Royal							
Sample ID:	AIWW21-LB-3 (Total)				AIWW21-LB-3 (Dissolved)				AIWW21-SW-2				AIWW21-CP-16 (Total)				AIWW21-CP-16 (Dissolved)			
Analyte	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
Aldrin	ND	U	0.00034	0.0012	ND	U	0.00034	0.0012	0.00035	J p	0.00034	0.0012	ND	U	0.00035	0.0013	ND	U	0.00034	0.0012
Chlordane (technical)	ND	U	0.0068	0.012	ND	U	0.0068	0.012	ND	U	0.0068	0.012	ND	U	0.0072	0.012	ND	U	0.0069	0.012
α (cis)-Chlordane	ND	U	0.00035	0.0012	ND	U	0.00035	0.0012	ND	U	0.00035	0.0012	ND	U	0.00036	0.0013	ND	U	0.00035	0.0012
γ (trans)-Chlordane	ND	U	0.00039	0.0012	ND	U	0.00039	0.0012	ND	U	0.00039	0.0012	ND	U	0.00040	0.0013	ND	U	0.00039	0.0012
Oxychlordane	ND	U	0.00020	0.016	ND	U	0.00020	0.016	0.0039	J	0.00020	0.016	ND	U	0.00021	0.017	ND	U	0.00020	0.016
cis-Nonachlor	ND	U	0.00048	0.0012	ND	U	0.00048	0.0012	ND	U	0.00048	0.0012	ND	U	0.00050	0.0013	ND	U	0.00048	0.0012
trans-Nonachlor	ND	U	0.00018	0.0012	ND	U	0.00018	0.0012	ND	U	0.00018	0.0012	ND	U	0.00019	0.0013	ND	U	0.00018	0.0012
o,p' (2,4')-DDD	ND	U	0.00078	0.0012	ND	U	0.00078	0.0012	ND	U	0.00078	0.0012	ND	U	0.00082	0.0013	ND	U	0.00079	0.0012
p,p' (4,4')-DDD	ND	U	0.00050	0.0012	ND	U	0.00050	0.0012	ND	U	0.00050	0.0012	ND	U	0.00053	0.0013	ND	U	0.00051	0.0012
o,p' (2,4')-DDE	ND	U	0.00050	0.0012	ND	U	0.00050	0.0012	ND	U	0.00050	0.0012	ND	U	0.00053	0.0013	ND	U	0.00051	0.0012
p,p' (4,4')-DDE	ND	U	0.00028	0.0012	ND	U	0.00028	0.0012	ND	U	0.00028	0.0012	ND	U	0.00029	0.0013	ND	U	0.00028	0.0012
o,p' (2,4')-DDT	ND	U	0.00051	0.0012	ND	U	0.00051	0.0012	ND	U	0.00051	0.0012	ND	U	0.00053	0.0013	ND	U	0.00051	0.0012
p,p' (4,4')-DDT	ND	U	0.00028	0.0012	ND	U	0.00028	0.0012	ND	U	0.00028	0.0012	ND	U	0.00029	0.0013	ND	U	0.00028	0.0012
Dieldrin	ND	U	0.00026	0.0012	ND	U	0.00026	0.0012	ND	U	0.00026	0.0012	ND	U	0.00027	0.0013	ND	U	0.00026	0.0012
Endosulfan I	ND	U	0.00065	0.0012	ND	U	0.00065	0.0012	ND	U	0.00065	0.0012	ND	U	0.00068	0.0013	ND	U	0.00065	0.0012
Endosulfan II	ND	U	0.00030	0.0012	ND	U	0.00030	0.0012	ND	U	0.00030	0.0012	ND	U	0.00031	0.0013	ND	U	0.00030	0.0012
Endrin	ND	U	0.00022	0.0012	ND	U	0.00022	0.0012	ND	U	0.00022	0.0012	ND	U	0.00023	0.0013	ND	U	0.00022	0.0012
Endrin Aldehyde	ND	U	0.00049	0.0012	ND	U	0.00049	0.0012	ND	U	0.00049	0.0012	ND	U	0.00051	0.0013	ND	U	0.00049	0.0012
Endrin Ketone	ND	U	0.00037	0.0012	ND	U	0.00037	0.0012	ND	U	0.00037	0.0012	ND	U	0.00039	0.0013	ND	U	0.00038	0.0012
Heptachlor	ND	U	0.00043	0.0012	ND	U	0.00043	0.0012	ND	U	0.00043	0.0012	ND	U	0.00045	0.0013	ND	U	0.00043	0.0012
Heptachlor Epoxide	ND	U	0.00032	0.0012	ND	U	0.00032	0.0012	ND	U	0.00032	0.0012	ND	U	0.00034	0.0013	ND	U	0.00032	0.0012
α-BHC	ND	U	0.00022	0.0012	ND	U	0.00022	0.0012	ND	U	0.00022	0.0012	ND	U	0.00024	0.0013	ND	U	0.00023	0.0012
β-BHC	ND	U	0.00035	0.0012	ND	U	0.00035	0.0012	ND	U	0.00035	0.0012	ND	U	0.00036	0.0013	ND	U	0.00035	0.0012
δ-BHC	ND	U	0.00061	0.0012	ND	U	0.00061	0.0012	ND	U	0.00061	0.0012	ND	U	0.00064	0.0013	ND	U	0.00061	0.0012
γ-BHC (Lindane)	ND	U	0.00028	0.0012	ND	U	0.00028	0.0012	ND	U	0.00028	0.0012	ND	U	0.00029	0.0013	ND	U	0.00028	0.0012
Methoxychlor	ND	U	0.00073	0.0012	ND	U	0.00073	0.0012	ND	U	0.00073	0.0012	ND	U	0.00077	0.0013	ND	U	0.00074	0.0012
Mirex®	ND	U	0.00020	0.0012	ND	U	0.00020	0.0012	ND	U	0.00020	0.0012	ND	U	0.00021	0.0013	ND	U	0.00020	0.0012
Toxaphene	ND	U	0.046	0.094	ND	U	0.046	0.094	ND	U	0.046	0.094	ND	U	0.049	0.099	ND	U	0.047	0.095
Pesticides, Total Chlorinated	0.063				0.063				0.067				0.067				0.064			

Non-detect (ND) = The analyte was not detected at or above the MDL. Non-detect results use the MDL for calculating total pesticides. (J-qualified results use the value reported by the laboratory for calculating total pesticides.)
Data qualifiers and acronyms are defined at the front of the tables section.

Sources: Results from Eurofins TestAmerica; CMC values from USEPA (2015), SC CMC values from SCDHEC (2014).
Compiled by: ANAMAR Environmental Consulting, Inc.

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TABLE 13

Analytical Results for PCBs and Aroclors in Site Water and Elutriates Generated from Sediment Samples

				Little River to Charleston				Little River to Winyah Bay															
			Sample ID:	AIWW21-SW-1				AIWW21-LB-1 (Total)				AIWW21-LB-1 (Dissolved)				AIWW21-LB-2 (Total)				AIWW21-LB-2 (Dissolved)			
Analyte	Maximum Conc. ng/L	SC CMC ng/L	CMC ng/L	Result ng/L	Qualifier	MDL	MRL	Result ng/L	Qualifier	MDL	MRL	Result ng/L	Qualifier	MDL	MRL	Result ng/L	Qualifier	MDL	MRL	Result ng/L	Qualifier	MDL	MRL
PCB 8[NOAA]	ND	x	x	ND	U	0.38	0.95	ND	U	0.38	0.94	ND	U	0.38	0.94	ND	U	0.38	0.94	ND	U	0.38	0.94
PCB 18[NOAA]	0.98	x	x	ND	U	0.60	0.95	ND	U	0.59	0.94	ND	U	0.59	0.94	ND	U	0.59	0.94	ND	U	0.59	0.94
PCB 28[NOAA]	0.74	x	x	0.74	J	0.47	0.95	ND	U	0.46	0.94	ND	U	0.46	0.94	ND	U	0.46	0.94	ND	U	0.46	0.94
PCB 44[NOAA]	ND	x	x	ND	U	0.69	0.95	ND	U	0.68	0.94	ND	U	0.68	0.94	ND	U	0.68	0.94	ND	U	0.68	0.94
PCB 49	ND	x	x	ND	U	0.32	0.95	ND	U	0.32	0.94	ND	U	0.32	0.94	ND	U	0.32	0.94	ND	U	0.32	0.94
PCB 52[NOAA]	0.54	x	x	0.54	J p	0.44	0.95	ND	U	0.44	0.94	ND	U	0.44	0.94	ND	U	0.44	0.94	ND	U	0.44	0.94
PCB 66[NOAA]	ND	x	x	ND	U	0.57	0.95	ND	U	0.56	0.94	ND	U	0.56	0.94	ND	U	0.56	0.94	ND	U	0.56	0.94
PCB 77	ND	x	x	ND	U	0.67	0.95	ND	U	0.66	0.94	ND	U	0.66	0.94	ND	U	0.66	0.94	ND	U	0.66	0.94
PCB 87	ND	x	x	ND	U	0.54	0.95	ND	U	0.53	0.94	ND	U	0.53	0.94	ND	U	0.53	0.94	ND	U	0.53	0.94
PCB 101[NOAA]	ND	x	x	ND	U	0.56	0.95	ND	U	0.56	0.94	ND	U	0.56	0.94	ND	U	0.56	0.94	ND	U	0.56	0.94
PCB 105[NOAA]	ND	x	x	ND	U	0.47	0.95	ND	U	0.47	0.94	ND	U	0.47	0.94	ND	U	0.47	0.94	ND	U	0.47	0.94
PCB 118[NOAA]	ND	x	x	ND	U	0.70	0.95	ND	U	0.69	0.94	ND	U	0.69	0.94	ND	U	0.69	0.94	ND	U	0.69	0.94
PCB 126	ND	x	x	ND	U	0.69	0.95	ND	U	0.68	0.94	ND	U	0.68	0.94	ND	U	0.68	0.94	ND	U	0.68	0.94
PCB 128[NOAA]	ND	x	x	ND	U	0.52	0.95	ND	U	0.52	0.94	ND	U	0.52	0.94	ND	U	0.52	0.94	ND	U	0.52	0.94
PCB 138[NOAA]	0.63	x	x	ND	U	0.47	0.95	ND	U	0.47	0.94	ND	U	0.47	0.94	ND	U	0.47	0.94	ND	U	0.47	0.94
PCB 153[NOAA]	0.66	x	x	ND	U	0.50	0.95	ND	U	0.50	0.94	ND	U	0.50	0.94	ND	U	0.50	0.94	ND	U	0.50	0.94
PCB 156	ND	x	x	ND	U	0.63	0.95	ND	U	0.62	0.94	ND	U	0.62	0.94	ND	U	0.62	0.94	ND	U	0.62	0.94
PCB 169	ND	x	x	ND	U	0.66	0.95	ND	U	0.65	0.94	ND	U	0.65	0.94	ND	U	0.65	0.94	ND	U	0.65	0.94
PCB 170[NOAA]	ND	x	x	ND	U	0.32	0.95	ND	U	0.32	0.94	ND	U	0.32	0.94	ND	U	0.32	0.94	ND	U	0.32	0.94
PCB 180[NOAA]	ND	x	x	ND	U	0.66	0.95	ND	U	0.65	0.94	ND	U	0.65	0.94	ND	U	0.65	0.94	ND	U	0.65	0.94
PCB 183	ND	x	x	ND	U	0.61	0.95	ND	U	0.60	0.94	ND	U	0.60	0.94	ND	U	0.60	0.94	ND	U	0.60	0.94
PCB 184	ND	x	x	ND	U	0.60	0.95	ND	U	0.60	0.94	ND	U	0.60	0.94	ND	U	0.60	0.94	ND	U	0.60	0.94
PCB 187[NOAA]	ND	x	x	ND	U	0.61	0.95	ND	U	0.60	0.94	ND	U	0.60	0.94	ND	U	0.60	0.94	ND	U	0.60	0.94
PCB 195[NOAA]	ND	x	x	ND	U	0.75	0.95	ND	U	0.74	0.94	ND	U	0.74	0.94	ND	U	0.74	0.94	ND	U	0.74	0.94
PCB 206[NOAA]	ND	x	x	ND	U	0.83	0.95	ND	U	0.83	0.94	ND	U	0.83	0.94	ND	U	0.83	0.94	ND	U	0.83	0.94
PCB 209[NOAA]	ND	x	x	ND	U	0.79	0.95	ND	U	0.78	0.94	ND	U	0.78	0.94	ND	U	0.78	0.94	ND	U	0.78	0.94
Total EPA Region 4 PCBs	15	x	x	15				15				15				15				15			
Total NOAA PCBs	21	x	x	21				20				20				20				20			
Analyte	Maximum Conc. ng/L	SC CMC µg/L	CMC µg/L	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL
PCB-1016	ND	x	x	ND	U	0.0046	0.0097	ND	U	0.0045	0.0094	ND	U	0.0045	0.0095	ND	U	0.0045	0.0094	ND	U	0.0045	0.0094
PCB-1221	ND	x	x	ND	U	0.0056	0.0097	ND	U	0.0054	0.0094	ND	U	0.0054	0.0095	ND	U	0.0054	0.0094	ND	U	0.0054	0.0094
PCB-1232	ND	x	x	ND	U	0.0051	0.0097	ND	U	0.0049	0.0094	ND	U	0.005	0.0095	ND	U	0.0049	0.0094	ND	U	0.0049	0.0094
PCB-1242	ND	x	x	ND	U	0.0035	0.0097	ND	U	0.0034	0.0094	ND	U	0.0034	0.0095	ND	U	0.0034	0.0094	ND	U	0.0034	0.0094
PCB-1248	ND	x	x	ND	U	0.0029	0.0097	ND	U	0.0028	0.0094	ND	U	0.0028	0.0095	ND	U	0.0028	0.0094	ND	U	0.0028	0.0094
PCB-1254	ND	x	x	ND	U	0.0044	0.0097	ND	U	0.0043	0.0094	ND	U	0.0043	0.0095	ND	U	0.0043	0.0094	ND	U	0.0043	0.0094
PCB-1260	ND	x	x	ND	U	0.0038	0.0097	ND	U	0.0037	0.0094	ND	U	0.0037	0.0095	ND	U	0.0037	0.0094	ND	U	0.0037	0.0094

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TABLE 13 (*continued*)
Analytical Results for PCBs in Site Water and Elutriates Generated from Sediment Samples

	Little River to Winyah Bay								Charleston to Port Royal				Charleston to Port Royal							
Sample ID:	**AIWW21-LB-3 (Total)**				**AIWW21-LB-3 (Dissolved)**				**AIWW21-SW-2**				**AIWW21-CP-16 (Total)**				**AIWW21-CP-16 (Dissolved)**			
Analyte	**Result ng/L**	**Qualifier**	**MDL**	**MRL**	**Result ng/L**	**Qualifier**	**MDL**	**MRL**	**Result ng/L**	**Qualifier**	**MDL**	**MRL**	**Result ng/L**	**Qualifier**	**MDL**	**MRL**	**Result ng/L**	**Qualifier**	**MDL**	**MRL**
PCB 8[NOAA]	ND	U	0.38	0.94	ND	U	0.38	0.94	ND	U	0.38	0.95	ND	U	0.38	0.95	ND	U	0.38	0.95
PCB 18[NOAA]	ND	U	0.59	0.94	ND	U	0.59	0.94	0.98	--	0.60	0.95	ND	U	0.60	0.95	ND	U	0.60	0.95
PCB 28[NOAA]	ND	U	0.46	0.94	ND	U	0.46	0.94	ND	U	0.47	0.95	ND	U	0.47	0.95	ND	U	0.47	0.95
PCB 44[NOAA]	ND	U	0.68	0.94	ND	U	0.68	0.94	ND	U	0.69	0.95	ND	U	0.69	0.95	ND	U	0.69	0.95
PCB 49	ND	U	0.32	0.94	ND	U	0.32	0.94	ND	U	0.32	0.95	ND	U	0.32	0.95	ND	U	0.32	0.95
PCB 52[NOAA]	ND	U	0.44	0.94	ND	U	0.44	0.94	0.49	J p	0.44	0.95	ND	U	0.44	0.95	ND	U	0.44	0.95
PCB 66[NOAA]	ND	U	0.56	0.94	ND	U	0.56	0.94	ND	U	0.57	0.95	ND	U	0.57	0.95	ND	U	0.57	0.95
PCB 77	ND	U	0.66	0.94	ND	U	0.66	0.94	ND	U	0.67	0.95	ND	U	0.67	0.95	ND	U	0.67	0.95
PCB 87	ND	U	0.53	0.94	ND	U	0.53	0.94	ND	U	0.54	0.95	ND	U	0.54	0.95	ND	U	0.54	0.95
PCB 101[NOAA]	ND	U	0.56	0.94	ND	U	0.56	0.94	ND	U	0.56	0.95	ND	U	0.56	0.95	ND	U	0.56	0.95
PCB 105[NOAA]	ND	U	0.47	0.94	ND	U	0.47	0.94	ND	U	0.47	0.95	ND	U	0.47	0.95	ND	U	0.47	0.95
PCB 118[NOAA]	ND	U	0.69	0.94	ND	U	0.69	0.94	ND	U	0.70	0.95	ND	U	0.70	0.95	ND	U	0.70	0.95
PCB 126	ND	U	0.68	0.94	ND	U	0.68	0.94	ND	U	0.69	0.95	ND	U	0.69	0.95	ND	U	0.69	0.95
PCB 128[NOAA]	ND	U	0.52	0.94	ND	U	0.52	0.94	ND	U	0.52	0.95	ND	U	0.52	0.95	ND	U	0.52	0.95
PCB 138[NOAA]	ND	U	0.47	0.94	ND	U	0.47	0.94	0.63	J p	0.47	0.95	ND	U	0.47	0.95	ND	U	0.47	0.95
PCB 153[NOAA]	ND	U	0.50	0.94	ND	U	0.50	0.94	0.66	J p	0.50	0.95	ND	U	0.50	0.95	ND	U	0.50	0.95
PCB 156	ND	U	0.62	0.94	ND	U	0.62	0.94	ND	U	0.63	0.95	ND	U	0.63	0.95	ND	U	0.63	0.95
PCB 169	ND	U	0.65	0.94	ND	U	0.65	0.94	ND	U	0.66	0.95	ND	U	0.66	0.95	ND	U	0.66	0.95
PCB 170[NOAA]	ND	U	0.32	0.94	ND	U	0.32	0.94	ND	U	0.32	0.95	ND	U	0.32	0.95	ND	U	0.32	0.95
PCB 180[NOAA]	ND	U	0.65	0.94	ND	U	0.65	0.94	ND	U	0.66	0.95	ND	U	0.60	0.95	ND	U	0.66	0.95
PCB 183	ND	U	0.60	0.94	ND	U	0.60	0.94	ND	U	0.61	0.95	ND	U	0.61	0.95	ND	U	0.61	0.95
PCB 184	ND	U	0.60	0.94	ND	U	0.60	0.94	ND	U	0.60	0.95	ND	U	0.60	0.95	ND	U	0.66	0.95
PCB 187[NOAA]	ND	U	0.60	0.94	ND	U	0.60	0.94	ND	U	0.61	0.95	ND	U	0.61	0.95	ND	U	0.61	0.95
PCB 195[NOAA]	ND	U	0.74	0.94	ND	U	0.74	0.94	ND	U	0.75	0.95	ND	U	0.75	0.95	ND	U	0.75	0.95
PCB 206[NOAA]	ND	U	0.83	0.94	ND	U	0.83	0.94	ND	U	0.83	0.95	ND	U	0.83	0.95	ND	U	0.83	0.95
PCB 209[NOAA]	ND	U	0.78	0.94	ND	U	0.78	0.94	ND	U	0.79	0.95	ND	U	0.79	0.95	ND	U	0.79	0.95
Total EPA Region 4 PCBs	15				15				16				15				15			
Total NOAA PCBs	20				20				22				21				21			
Analyte	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**	**Result µg/L**	**Qualifier**	**MDL**	**MRL**
PCB-1016	ND	U	0.0045	0.0094	ND	U	0.0045	0.0094	ND	U	0.0045	0.0094	ND	U	0.0047	0.0099	ND	U	0.0045	0.0095
PCB-1221	ND	U	0.0054	0.0094	ND	U	0.0054	0.0094	ND	U	0.0054	0.0094	ND	U	0.0057	0.0099	ND	U	0.0054	0.0095
PCB-1232	ND	U	0.0049	0.0094	ND	U	0.0049	0.0094	ND	U	0.0049	0.0094	ND	U	0.0052	0.0099	ND	U	0.0050	0.0095
PCB-1242	ND	U	0.0034	0.0094	ND	U	0.0034	0.0094	ND	U	0.0034	0.0094	ND	U	0.0035	0.0099	ND	U	0.0034	0.0095
PCB-1248	ND	U	0.0028	0.0094	ND	U	0.0028	0.0094	ND	U	0.0028	0.0094	ND	U	0.0030	0.0099	ND	U	0.0028	0.0095
PCB-1254	ND	U	0.0043	0.0094	ND	U	0.0043	0.0094	ND	U	0.0043	0.0094	ND	U	0.0045	0.0099	ND	U	0.0043	0.0095
PCB-1260	ND	U	0.0037	0.0094	ND	U	0.0037	0.0094	ND	U	0.0037	0.0094	ND	U	0.0039	0.0099	ND	U	0.0037	0.0095

Non-detect (ND) results use the MDL for calculating total EPA Region 4 and total NOAA PCBs. (J-qualified results use the value reported by the laboratory for calculating total EPA Region 4 and total NOAA PCBs.)
[NOAA] National Oceanic and Atmospheric Administration PCB congeners (see SERIM Table 5-6 for list).
Data qualifiers and acronyms are defined at the front of the tables section.
Sources: Results from Eurofins TestAmerica; There are no applicable CMC values in USEPA (2015). Compiled by: ANAMAR Environmental Consulting, Inc.

ANAMAR Environmental Consulting, Inc.

TABLE 14

Analytical Results for Dioxins and Furans in Site Water and Elutriates Generated from Sediment Samples

					Little River to Charleston					Little River to Winyah Bay																			
				Sample ID:	AIWW21-SW-1					AIWW21-LB-1 (Total)					AIWW21-LB-1 (Dissolved)					AIWW21-LB-2 (Total)					AIWW21-LB-2 (Dissolved)				
Analyte	Maximum Conc. pg/L	SC CMC pg/L	CMC pg/L	TEF pg/L	Result pg/L	Qualifier	MDL	MRL	TEQ	Result pg/L	Qualifier	MDL	MRL	TEQ	Result pg/L	Qualifier	MDL	MRL	TEQ	Result pg/L	Qualifier	MDL	MRL	TEQ	Result pg/L	Qualifier	MDL	MRL	TEQ
2,3,7,8-TCDD	0.60	x	x	1	ND	U	0.079	4.8	0.079	ND	U	0.063	4.7	0.063	ND	U	0.060	4.7	0.060	ND	U	0.056	4.7	0.056	ND	U	0.046	4.7	0.046
1,2,3,7,8-PeCDD	0.76	x	x	1	ND	U	0.15	24	0.15	ND	U	0.25	23	0.25	0.76	J B	0.11	23	0.76	ND	U	0.26	23	0.26	ND	U	0.14	23	0.14
1,2,3,4,7,8-HxCDD	0.25	x	x	0.1	0.44	J I B	0.06	24	0.044	ND	U	0.054	23	0.0054	ND	U	0.057	23	0.0057	ND	U	0.032	23	0.0032	ND	U	0.028	23	0.0028
1,2,3,6,7,8-HxCDD	0.88	x	x	0.1	0.34	J I B	0.055	24	0.034	0.51	J I B	0.054	23	0.051	ND	U	0.060	23	0.006	0.09	J I B	0.033	23	0.0090	ND	U	0.028	23	0.0028
1,2,3,7,8,9-HxCDD	1.3	x	x	0.1	ND	U	0.063	24	0.0063	ND	U	0.054	23	0.0054	ND	U	0.057	23	0.0057	0.37	J I B	0.032	23	0.037	ND	U	0.028	23	0.0028
1,2,3,4,6,7,8-HpCDD	13	x	x	0.01	4.7	J I B	0.18	24	0.047	2.7	J B	0.055	23	0.027	0.97	J I B	0.038	23	0.0097	1.8	J I B	0.032	23	0.018	0.59	J I B	0.028	23	0.0059
OCDD	250	x	x	0.0003	82	J B	0.062	110	0.025	44	J B	0.14	100	0.013	3.7	J B	0.051	100	0.0011	32	J B	0.13	100	0.0096	3.0	J B	0.026	100	0.0009
2,3,7,8-TCDF	0.34	x	x	0.1	ND	U	0.17	4.8	0.017	0.27	J	0.072	4.7	0.027	0.34	J I	0.067	4.7	0.034	ND	U	0.043	4.7	0.0043	ND	U	0.036	4.7	0.0036
1,2,3,7,8-PeCDF	0.69	x	x	0.03	0.69	J I B	0.076	24	0.021	ND	U	0.20	23	0.006	0.35	J I B	0.056	23	0.011	0.35	J I B	0.067	23	0.011	0.38	J I B	0.14	23	0.011
2,3,4,7,8-PeCDF	0.72	x	x	0.3	0.35	J I	0.064	24	0.105	ND	U	0.16	23	0.048	0.54	J I B	0.045	23	0.162	ND	U	0.053	23	0.016	ND	U	0.12	23	0.036
1,2,3,4,7,8-HxCDF	0.25	x	x	0.1	ND	U	0.037	24	0.0037	0.20	J I B	0.025	23	0.020	0.11	J I B	0.026	23	0.011	ND	U	0.020	23	0.0020	0.091	J I B	0.018	23	0.0091
1,2,3,6,7,8-HxCDF	0.49	x	x	0.1	ND	U	0.039	24	0.0039	0.49	J B	0.024	23	0.049	0.16	J B	0.026	23	0.016	ND	U	0.021	23	0.0021	0.23	J I B	0.019	23	0.023
1,2,3,7,8,9-HxCDF	0.71	x	x	0.1	0.23	J I B	0.038	24	0.023	0.43	J I B	0.029	23	0.043	0.20	J I B	0.028	23	0.020	ND	U	0.024	23	0.0024	0.20	J B	0.021	23	0.020
2,3,4,6,7,8-HxCDF	0.51	x	x	0.1	ND	U	0.041	24	0.0041	0.14	J I B	0.024	23	0.014	0.26	J I B	0.024	23	0.026	ND	U	0.020	23	0.0020	ND	U	0.018	23	0.0018
1,2,3,4,6,7,8-HpCDF	0.66	x	x	0.01	0.40	J B	0.038	24	0.004	0.61	J I B	0.024	23	0.0061	ND	U	0.026	23	0.0003	0.30	J I B	0.020	23	0.0030	ND	U	0.018	23	0.0002
1,2,3,4,7,8,9-HpCDF	0.34	x	x	0.01	ND	U	0.047	24	0.0005	0.26	J I B	0.027	23	0.0026	ND	U	0.027	23	0.0003	ND	U	0.022	23	0.0002	0.25	J I B	0.019	23	0.0025
OCDF	1.6	x	x	0.0003	0.49	J I B	0.049	48	0.0001	1.3	J B	0.040	47	0.0004	0.31	J B	0.030	47	9E-05	0.81	J I B	0.023	47	0.0002	0.15	J I B	0.042	47	5E-05
Total TEQs	1.47	x	x	--					0.567					0.631					1.13					0.435					0.309
TCDD, Total	3.5	x	x	--	ND	U	0.079	4.8		3.5	J I B	0.063	4.7		ND	U	0.060	4.7		1.2	J I B	0.056	4.7		1.2	J I B	0.046	4.7	
PeCDD, Total	4.9	x	x	--	0.83	J I B	0.15	24		ND	U	0.25	23		2.6	J I B	0.11	23		ND	U	0.26	23		ND	U	0.14	23	
HxCDD, Total	23	x	x	--	9.3	J I B	0.059	24		5.7	J I B	0.054	23		2.7	J I B	0.058	23		3.5	J I B	0.032	23		2.6	J I B	0.028	23	
HpCDD, Total	43	x	x	--	17	J I B	0.18	24		8.3	J B	0.055	23		1.7	J I B	0.038	23		3.8	J I B	0.032	23		0.59	J I B	0.028	23	
TCDF, Total	2.0	x	x	--	2.0	J I B	0.17	4.8		0.55	J I B	0.072	4.7		1.4	J I B	0.067	4.7		0.49	J I B	0.043	4.7		0.29	J I B	0.036	4.7	
PeCDF, Total	2.2	x	x	--	2.2	J I B	0.07	24		ND	U	0.20	23		1.2	J I B	0.050	23		1.3	J I B	0.060	23		0.38	J I B	0.13	23	
HxCDF, Total	1.4	x	x	--	0.62	J I B	0.039	24		1.4	J I B	0.026	23		0.73	J I B	0.026	23		0.30	J I B	0.021	23		0.53	J I B	0.019	23	
HpCDF, Total	1.5	x	x	--	0.40	J B	0.042	24		1.1	J I B	0.025	23		ND	U	0.027	23		0.30	J I B	0.021	23		0.25	J I B	0.019	23	

TABLE 14 *(continued)*

Analytical Results for Dioxins and Furans in Site Water and Elutriates Generated from Sediment Samples

	Little River to Winyah Bay										Charleston to Port Royal					Charleston to Port Royal									
Sample ID:	AIWW21-LB-3 (Total)					AIWW21-LB-3 (Dissolved)					AIWW21-SW-2					AIWW21-CP-16 (Total)					AIWW21-CP-16 (Dissolved)				
Analyte	Result pg/L	Qualifier	MDL	MRL	TEQ	Result pg/L	Qualifier	MDL	MRL	TEQ	Result pg/L	Qualifier	MDL	MRL	TEQ	Result pg/L	Qualifier	MDL	MRL	TEQ	Result pg/L	Qualifier	MDL	MRL	TEQ
2,3,7,8-TCDD	ND	U	0.054	4.7	0.054	ND	U	0.060	4.7	0.060	ND	U	0.079	4.7	0.079	0.60	J I B	0.058	4.7	0.60	ND	U	0.068	4.7	0.068
1,2,3,7,8-PeCDD	0.65	J I B	0.065	23	0.65	ND	U	0.076	23	0.076	ND	U	0.068	23	0.068	ND	U	0.14	24	0.14	ND	U	0.15	23	0.15
1,2,3,4,7,8-HxCDD	ND	U	0.044	23	0.0044	ND	U	0.045	23	0.0045	ND	U	0.070	23	0.0070	ND	U	0.074	24	0.0074	ND	U	0.021	23	0.0021
1,2,3,6,7,8-HxCDD	ND	U	0.045	23	0.0045	0.33	J I B	0.046	23	0.033	ND	U	0.066	23	0.0066	0.88	J B	0.072	24	0.088	ND	U	0.022	23	0.0022
1,2,3,7,8,9-HxCDD	ND	U	0.046	23	0.0046	ND	U	0.048	23	0.0048	ND	U	0.066	23	0.0066	1.3	J I B	0.077	24	0.13	0.23	J I B	0.022	23	0.023
1,2,3,4,6,7,8-HpCDD	4.4	J I B	0.063	23	0.044	1.0	J I B	0.047	23	0.010	3.1	J I B	0.047	23	0.031	13	J B	0.16	24	0.13	2.2	J I B	0.020	23	0.022
OCDD	78	J B	0.16	100	0.023	3.2	J I B	0.045	100	0.00096	24	J B	0.066	100	0.0072	250	B	0.15	100	0.075	17	J B	0.077	100	0.0051
2,3,7,8-TCDF	ND	U	0.042	4.7	0.0042	ND	U	0.069	4.7	0.0069	0.9	J B	0.065	4.7	0.090	ND	U	0.044	4.7	0.0044	0.23	J I	0.026	4.7	0.023
1,2,3,7,8-PeCDF	0.53	J I B	0.079	23	0.016	ND	U	0.70	23	0.021	ND	U	0.067	23	0.0020	0.69	J B	0.054	24	0.021	0.35	J B	0.081	23	0.011
2,3,4,7,8-PeCDF	0.33	J I B	0.068	23	0.099	ND	U	0.57	23	0.17	ND	U	0.058	23	0.0174	0.40	J I B	0.043	24	0.12	0.72	J I B	0.072	23	0.22
1,2,3,4,7,8-HxCDF	ND	U	0.021	23	0.0021	ND	U	0.022	23	0.0022	0.25	J I B	0.033	23	0.025	0.19	J B	0.025	24	0.019	ND	U	0.016	23	0.0016
1,2,3,6,7,8-HxCDF	0.23	J I B	0.021	23	0.023	ND	U	0.022	23	0.0022	0.19	J I B	0.032	23	0.019	ND	U	0.024	24	0.0024	0.29	J B	0.016	23	0.029
1,2,3,7,8,9-HxCDF	ND	U	0.024	23	0.0024	ND	U	0.026	23	0.0026	0.36	J I B	0.029	23	0.036	0.71	J I B	0.025	24	0.071	0.079	J I B	0.018	23	0.0079
2,3,4,6,7,8-HxCDF	0.35	J I B	0.02	23	0.035	ND	U	0.020	23	0.0020	0.28	J I B	0.031	23	0.028	0.51	J I B	0.021	24	0.051	0.36	J B	0.015	23	0.036
1,2,3,4,6,7,8-HpCDF	0.21	J I B	0.039	23	0.0021	0.14	J I B	0.020	23	0.0014	ND	U	0.030	23	0.0003	0.66	J I B	0.013	24	0.0066	0.48	J I B	0.015	23	0.0048
1,2,3,4,7,8,9-HpCDF	0.21	J I B	0.044	23	0.0021	ND	U	0.023	23	0.00023	ND	U	0.033	23	0.0003	0.34	J I B	0.016	24	0.0034	ND	U	0.016	23	0.0002
OCDF	0.54	J I B	0.022	47	0.00016	ND	U	0.058	47	1.7E-05	0.37	J I B	0.038	47	0.0001	1.6	J B	0.021	47	0.0005	0.72	J I B	0.052	47	0.0002
Total TEQs					0.971					0.399					0.424					1.47					0.602
TCDD, Total	1.0	J I B	0.054	4.7		1.2	J I B	0.060	4.7		0.51	J I B	0.079	4.7		2.3	J I B	0.058	4.7		ND	U	0.068	4.7	
PeCDD, Total	4.9	J I B	0.065	23		2.8	J I B	0.076	23		0.53	J I B	0.068	23		1.3	J I B	0.14	24		0.67	J I B	0.15	23	
HxCDD, Total	4.8	J I B	0.045	23		1.4	J I B	0.046	23		5.4	J I B	0.067	23		23	J I B	0.074	24		3.8	J I B	0.022	23	
HpCDD, Total	10	J I B	0.063	23		1.5	J I B	0.047	23		9.6	J I B	0.047	23		43	B	0.16	24		6.2	J I B	0.020	23	
TCDF, Total	0.38	J I B	0.042	4.7		0.21	J I B	0.069	4.7		1.7	J I B	0.065	4.7		1.1	J I B	0.044	4.7		1.4	J I B	0.026	4.7	
PeCDF, Total	1.6	J I B	0.073	23		ND	U	0.63	23		ND	U	0.067	23		1.8	J I B	0.049	24		1.2	J I B	0.077	23	
HxCDF, Total	0.70	J I B	0.021	23		ND	U	0.026	23		1.1	J I B	0.031	23		1.4	J I B	0.024	24		0.79	J I B	0.016	23	
HpCDF, Total	0.71	J I B	0.041	23		0.14	J I B	0.022	23		ND	U	0.033	23		1.5	J I B	0.015	24		0.76	J I B	0.015	23	

Non-detect (ND) results use the MDL for calculating total TEQs. (J-qualified results use the value reported by the laboratory for calculating total TEQs.) These values are multiplied by the TEF prior to summing.
Data qualifiers and acronyms are defined at the front of the tables section.

Sources: Results from Eurofins TestAmerica; TEF values from Van den Berg et al. (2006). (There are no federal CMC values for these dioxins and furans [USEPA (2015), Buchman 2008].)
Compiled by: ANAMAR Environmental Consulting, Inc.

NOTE:

Appendices are provided in electronic format only and can be found on the accompanying disc.

Appendix E:

401 Water Quality Certification Documents

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

Albert G. Randall, M.D., M.P.H.
Commissioner

Sims-Aycock Buildings
2600 Bull Street, Columbia, SC 29201

September 18, 1978

William W. Brown
Colonel, Corps of Engineers
Department of the Army
P.O. Box 919
Charleston, S.C. 29402

Re: Water Quality Certification
for Federal Projects

Dear Colonel Brown:

This letter is the result of the Clean Water Act of 1977, requiring Section 401 Water Quality Certification of Federal projects. Per your letter of July 11, 1978, this Agency is issuing water quality for the following projects. Some of these projects are being certified conditionally:

There is reasonable assurance that the proposed projects will be conducted in a manner consistent with the Certification requirements of Section 401 of the Federal Water Pollution Control Act Amendments of 1972, PL 92-500. In accordance with the provision of Section 401, we certify these projects, with any conditions noted in this certification, is consistent with applicable provisions of Sections 301, 302, 303, 306, and 307 of the Federal Water Pollution Control Act of 1972.

Maintenance Dredging - Adams Creek - Charleston County - P/N 75-4A-048

Conditions: The proposed activity should be restricted to the closed shellfishing season, May 15 - September 1.

Beach Nourishment - Hunting Island Beach - Beaufort County - P/N 78-2R-238

Conditions: None

Maintenance Dredging - Town Creek - Charleston County - P/N 75-4A-053

Conditions: The proposed activity should be conducted during the closed shellfishing season, May 15 - September 1.

Maintenance Dredging - Goose Creek - Charleston County - P/N 76-4A-162

Conditions: None

Maintenance Dredging - Charleston Harbor Entrance Channel - Charleston County
P/N 74-4A-281

Conditions: None

Maintenance Dredging - Charleston Harbor & Shipyard River - Charleston County
P/N 74-4e-266

Conditions: None

Maintenance Dredging - Georgetown Harbor - Georgetown County - P/N 74-4A-282

Conditions: None

Maintenance Dredging - Port Royal Harbor - Beaufort County - P/N 74-4A-326

Conditions: None

Maintenance Dredging - Atlantic Intracoastal Waterway (Little River, S.C. to Beaufort, S.C.) - P/N 74-4A-032

Conditions: Certain areas of the AIWW may be open to shellfishing. Therefore, before dredging takes place, this Agency shall be given a thirty (30) day notice. If possible those open waters should be dredged during the closed shellfishing season May 15 - September 1.

Murrells Inlet Navigation Project - Murrells Inlet - Georgetown County - P/N 76-5A-437

Conditions: Efforts are now being made to open this area to shellfishing. This Agency needs to be notified of all construction activities in order to evaluate the construction activity on these waters.

Maintenance Dredging - Little River Inlet - Horry County - P/N 74-4A-327

Conditions: None

Little River Navigation Project - Little River - Horry County - P/N 76-5A-146

Conditions: This Agency shall be notified thirty days in advance of all future dredging activities.

Should you have any questions concerning any of the above certifications, please advise.

Sincerely,

Robert G. Gross

Robert G. Gross, P.E., Director
Industrial & Agricultural Wastewater Division
Bureau of Wastewater & Stream Quality Control

RGG/CWS/jk

CC: Luke Hause - DHEC, Shellfish Division

THE STATE OF SOUTH CAROLINA

SANKP 18 February 1975

Refer to: P/N 74-4A-032
(Maintenance Dredging - Atlantic Intracoastal Waterway (AIWW), from Little River, South Carolina, to Beaufort, South Carolina)

TO WHOM IT MAY CONCERN:

The Charleston District, Corps of Engineers, Charleston, South Carolina, proposes to perform annual maintenance dredging in the Atlantic Intracoastal Waterway (AIWW) from Little River to Beaufort, South Carolina. A general map of the waterway is attached. Dredging will be performed pursuant to the following laws:

1. Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500).

2. The National Environmental Policy Act of 1969 (42 U.S.C. 4321-4347).

3. The Fish and Wildlife Act of 1956 (16 U.S.C. 472a et seq), the Migratory Marine Game - Fish Act (16 U.S.C. 760c - 760g) and the Fish and Wildlife Coordination Act (16 U.S.C. 661-666c).

4. The National Historic Preservation Act of 1966 (80 Stat. 915, 16 U.S.C. 470).

5. Sections 307 (c) (1) and (2) of the Coastal Zone Management Act of 1972 (16 U.S.C. 1456 (c) (1) and (2), 86 Stat. 1280).

6. Section 102(a) of the Marine Protection, Research and Sanctuaries Act of 1972.

PROJECT DESCRIPTION:

The project provides for a channel 12-feet deep at mean low water (MLW) and 90-feet wide, from Little River, South Carolina, to and including Port Royal Sound near Port Royal, South Carolina, with a branch channel of the same dimensions to McClellanville, South Carolina. The project as currently constructed was authorized by the River and Harbor Act of 26 August 1937.

The proposed maintenance dredging is for removal of material in quantities ranging from about 500,000 cubic yards to in excess of two million cubic yards per maintenance effort. The average annual quantity removed over the last 34 years is 1,059,000 cubic yards. Recurring shoals are characteristic in several reaches, however, shoaling may occur at any [illegible] between the above-described million cubic yards per [illegible] is 1,059,000 cubic yards. [illegible] removed over the last 34 years is 1,059,000 cubic yards. [illegible] are characteristic in several reaches, however, shoaling may occur at any location within the 210 miles of waterway between the above-described points, and dredging may be in progress at any time throughout the year. The dredged material consists of silt or sand, or combinations thereof. The work will be performed by hydraulic pipeline dredge and the dredged material will be deposited in disposal areas adjacent to the waterway. Generally, a 1000-foot wide easement is provided on one side or the other throughout the length of the waterway for the disposal of dredged material.

Continued use of disposal areas previously used is proposed, if practical. However, conditions may necessitate the use of any area under easement as a disposal area. Dredged material will be deposited in diked disposal areas except in locations where dike construction is infeasible. In those locations, the material will be deposited in open water. General information on the three distinct reaches of the portion of the AIWW in Charleston District is shown in Table 1.

1055

18 February 1975

SANKP
Refer to: P/N 75-4A-032
(Maintenance Dredging - Atlantic Intracoastal Waterway (AIWW), from Little River, South Carolina, to Beaufort, South Carolina)

TABLE 1

Reach	Disposal Area	34 Yr. Record Av. Cu. Yds. Removed Per Yr.	Type of Dredged Material	Frequency of Dredging Annually*	Frequency of Dredging Biennially or Less Frequently*
Little River to Winyah Bay	Gov't. Easement Adjacent to [illegible]	139,000	Sand		Mi. 342.0 - Mi. 366.[illegible]

Little River to Winyah Bay	Gov't. [illegible] Adjacent to Area Dredged				
Winyah Bay to Charleston	"	713,000	Silty Sand	Mi. 410.9 - Mi. 412.7 Mi. 415.4 - Mi. 420.4	Mi. 439.2 - Mi. 442.[illegible]
Charleston to Port Royal	"	207,000	Silty Sand	Mi. 467.7 - Mi. 476.2	Mi. 485.[illegible] Mi. 488.[illegible]

*NOTE: Areas not shown as dredged have been or probably will be dredged at a frequency [illegible] than that shown above.

Large scale drawings of dredging locations and disposal area locations are available for inspection in the Charleston District Office, Charleston, South Carolina. Land development immediately adjacent to the disposal areas vary. Heavy concentrations of populations and commercial activities are found from Little River to Myrtle Beach and around Charleston. For the most part, the remaining waterway is located in undeveloped relatively remote tidal marshland. There is no significant amount of private dredging in subject area.

Designation of the proposed disposal sites for dredged material associated with this Federal project shall be made through the application of guidelines promulgated by the Administrator, Environmental Protection Agency, in conjunction with the Secretary of the Army. If these guidelines alone prohibit the designation of the proposed disposal sites, any potential impairment to the maintenance of navigation, including any economic impact on navigation and anchorage which would result from the failure to use the disposal sites, will also be considered.

A list of Federal, State and local agencies with whom these activities are being coordinated is attached.

A draft Environmental Impact Statement (EIS) related to the maintenance of the AIWW is being prepared by the Charleston District and is scheduled for release by mid-1975. The EIS will be distributed to all interested parties and coordinated with appropriate Federal, State and local agencies.

18 February 1975

SANKP
Refer to: P/N 75-4A-032
(Maintenance Dredging - Atlantic Intracoastal Waterway (AIWW), from Little River, South Carolina, to Beaufort, South Carolina)

This public notice is being distributed to all known interested persons in order to assist in developing facts on which a decision may be made by the Corps of Engineers with respect to the disposal of dredged material in navigable or ocean waters. For accuracy and completeness of record, all data in support of or in opposition to the proposed work shall be submitted in writing to the District Engineer, within the limiting date established hereinafter for requesting public hearings, setting forth sufficient detail to support convictions. Any person who has an interest which may be affected by the disposal of dredged material may request a public hearing. The request must be submitted in writing to the District Engineer within thirty (30) days of the date of this notice and must clearly set forth the interest which may be affected and the manner in which the interest may be affected by this activity. All submissions shall be made to the U. S. Army Engineer District, Charleston, P. O. Box 919, Charleston, South Carolina 29402, in time to be received on or before

12 O'CLOCK NOON, FRIDAY, 21 MARCH 1975

HARRY S. WILSON, JR.
Colonel, Corps of Engineers
District Engineer

27 MAY 1975

STATE OF SOUTH CAROLINA
DIVISION OF GENERAL SERVICES
BUDGET AND CONTROL BOARD
300 GERVAIS STREET
COLUMBIA, S. C. 29201

FURMAN E. McEACHERN, JR.
DIRECTOR
PHONE: (803) 758-2226

May 21, 1975

Col. Harry S. Wilson, Jr.
District Engineer
Corps of Engineers
P. O. Box 919
Charleston, South Carolina 29402

Attention: Mr. Kenneth H. Fagg, Chief, Permits & Statistics Branch
Mr. John E. Romanosky, Chief, Operations Division

Re: Application by: Corps of Engineers
P. O. Box 919
Charleston, South Carolina 29402
P/N 74-4A-032 5

Gentlemen:

This will acknowledge receipt of the Notice dated February 18, 1975, concerning the permit application made by the above applicant.

The above referenced permit application has been circulated among the necessary State agencies for their comments and recommendations, as is the policy of the State of South Carolina, and the South Carolina State Budget and Control Board has approved a State permit for the work as proposed in your Public Notice. The conditions of this permit as well as the plans as outlined in the Public Notice must be strictly complied with by the applicant. So long as the applicant does comply and the proposed work does not in any way affect the title of the State to the Tidelands, Submerged Lands, Rivers, Streams, Lakes and Waters (all areas lying below the high water mark) and the rights of the public therein, no legal action by the State of South Carolina would be necessary.

Inasmuch as the State permit must be signed by the applicant, I request that the State permit be signed at the time the Federal permit is signed. Please send me a signed State permit along with a copy of the Federal permit, when issued, citing the State permit in the Federal permit.

Very truly yours,

Paul H. Infinger, Attorney
Division of General Services

PHI/mkm

: TH CAROLINA STATE B...
:D CONTROL BOARD

PERMIT NO. 74-4A-032

): Corps of Engineers
P. O. Box 919
Charleston, South Carolina 29402

WHEREAS, The State of South Carolina has title to the Submerged Lands, (the area below the usual low water mark), the Tidelands, (the area between the usual high water mark and the usual low water mark), and the Waters of the State, and;

WHEREAS, The State of South Carolina has title to the beds of the rivers, streams and lakes, (the area below the usual high water mark), and the Waters of the State, and;

WHEREAS, The State of South Carolina has title to the waters of the tidelands, submerged lands, rivers, streams and lakes, the beds of which have been acquired in fee or easement by the Federal government of the United States, and;

WHEREAS, The South Carolina State Budget and Control Board has determined that it is necessary in the interest of the State to require a permit for any construction or excavation below the usual high water mark of the Waters of the State.

NOW, THEREFORE, IT IS ORDERED:

1. That this permit authorizes you to proceed with the project in accordance with your application for a permit from the Corps of Engineers. This permit grants you the right to proceed in accordance with the plans and specifications shown on the said application dated February 18, 1975.

Provided, However:

1. That this permit is issued subject to the issuance of a permit by the Corps of Engineers. This permit shall be cited in the Corps permit.

2. That the permittee shall sign acceptance of the terms and conditions of this permit.

3. That the construction shall be modified or removed upon demand made by the State.

4. That the work applied for shall not block or obstruct navigation or the flow of any waters.

5. That no spoil, dredged material, or any other fill material shall be placed below the high water mark.

6. That no State owned or public property shall be appropriated to private use.

7. That no obstructions, fill, structures, or other construction shall be placed upon or infringe on any State or Federal owned property or easement, nor shall such work obstruct or block any navigable stream.

8. That the permittee shall follow all construction plans as specified in the application and public notice as distributed by the Corps of Engineers in P/N 74-4A-032.

9. That should a required Federal permit not be issued for the proposed work, this permit shall be null and void.

P/N 74-4A 032

And it is so ordered this 21st. day of May. 1975.

Furman E. McEachern, Jr.
Director, Division of General Services
South Carolina State Budget and Control Board

Columbia, S. C.

Permittee hereby accepts the terms and conditions of this permit:

Date:

ATTEST:

Paul H. Infinger, Attorney
Division of General Services

Columbia, S. C.

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[illegible] alternative [illegible] because environmental impacts and [illegible] of the increased cost of [illegible] of finding a shallow draft pipeline dredge [illegible] this alternative was rejected. in the rough inlet environment, [illegible]

b. No action. The no-action alternative requires the discontinuation of maintenance dredging until the authorized project has been constructed. This alternative would require residents of the area to forego approximately $1.7 million annually in net benefits. [illegible] boats would have to move to the nearest improved harbor at Georgetown, 22 road miles to the south. Lives and property would be endangered because of the lack of a harbor of refuge. The benefits of the proposed dredging significantly outweigh the adverse impacts, so this alternative was rejected.

6. In the evaluation of the alternatives to the maintenance dredging of Murrells Inlet, the following points were considered pertinent:

a. Environmental. None of the alternatives have significant permanent adverse environmental effects. Although adverse environmental impacts would be localized and temporary in nature, the magnitude of these impacts would be greatest under the recommended plan because of the deposition of dredged material within the inlet.

b. Engineering feasibility. The recommended method of dredging is the most practical method of dredging this shallow inlet. The alternative of using a pipeline dredge is of only marginal practicality in Murrells Inlet.

c. Economic. The recommended method of dredging is the least costly method of maintaining a navigable channel. The economic benefit to the area is more than sufficient to justify the cost of the dredging operation.

d. Social well-being. Although none of the alternatives would have a significant effect on social well-being, the recommended method of dredging has the greatest potential in this area. The assurance of a navigable channel by the most economical means available would contribute to the security and health of fishermen and will provide increased recreational opportunities.

7. I find that the proposed action is based on thorough analysis and evaluation of practicable alternative courses of action for achieving the stated objectives; that wherever adverse effects are found to be involved, they cannot be avoided by following reasonable alternative courses of action which would achieve the project purposes; that where the proposed action had an adverse effect, this effect is either

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outweighed by other considerations of
ameliorated or ... and that
national policy, statutes, and administrative directives ... by the
on balance, the total public interest ...
implementation of the recommendation.

18 March 75
Date

HARRY S. WILSON, JR.
Colonel, Corps of Engineers
District Engineer

1976

JOINT PUBLIC NOTICE

DEPARTMENT OF THE ARMY
Charleston District, Corps of Engineers
P. O. Box 919
Charleston, South Carolina 29402
and
THE SOUTH CAROLINA COASTAL COUNCIL

RECEIVED
MAR 07 1979
COASTAL PLANNING

5 March 1979

SACCO-P
Refer to: P/N 79-2R-061

TO WHOM IT MAY CONCERN:

The Charleston District, Corps of Engineers, proposes to perform the work described herein with due consideration and review being given to the relevant provisions of the following laws:

1. Federal Water Pollution Control Act Amendments of 1972 (PL 92-500).

2. The Clean Water Act of 1977 (PL 95-217).

3. The National Historic Preservation Act of 1966 (80 Stat. 915, 16 U.S.C. 470).

4. The Endangered Species Act of 1973 (PL 93-205).

The operation and maintenance of the Atlantic Intracoastal Waterway (AIWW) involves many different Corps activities. The impacts associated with these activities are generally beneficial, e.g., the improvements to commercial navigation, the increase in recreational opportunities, and the creation of valuable insular habitat. Other impacts due to the erosion of channel sides, the dredging operation and the disposal of dredged material range from insignificant to adverse in their effects on the environment. The wide range of impacts was discussed in the Final Environmental Impact Statement (April 1976) for this project. This 404 Public Notice deals with and solicits comments on only the small part of the total project: the disposal of dredged or fill materials into waters of the United States.

In addition to the Environmental Impact Statement, a public notice (P/N 74-4A-032) was issued on 18 February 1975 which provided an opportunity for comments and hearings on many aspects of the project under the provisions of:

1. Federal Water Pollution Control Act Amendments of 1972 (PL 92-500).

2. The National Environmental Policy Act of 1969 (42 U.S.C. 4321-4347).

3. The Fish and Wildlife Act of 1956 (16 U.S.C. 742a et seq.), the Migratory Marine Game - Fish Act (16 U.S.C. 760c - 760g), and the Fish and Wildlife Coordination Act (16 U.S.C. 661-666c).

4. The Coastal Zone Management Act of 1972, as amended (PL 94-370).

5. The Marine Protection, Research and Sanctuaries Act of 1972 (PL 92-532).

Since the 18 February 1975 notice was issued, the Environmental Protection Agency has revised their Section 404 guidelines for specifying disposal sites. The purpose of the present public notice is to provide an additional opportunity for public review and comment on the impacts of the disposal of dredged or fill material into waters of the United States, through the application of current Environmental Protection Agency guidelines.

ANSWERED

SACCO-P
Refer to: P/N .9-2R-001

In order to give all interested parties an opportunity to express their views

N O T I C E

is hereby given that written statements regarding the proposed disposal of dredged or fill material will be reviewed at this office until

12 O'CLOCK NOON, WEDNESDAY, 4 APRIL 1979

from those interested in the proposal disposal and whose interests may be affected by said disposal.

The Atlantic Intracoastal Waterway (AIWW) Navigation Project provides for a channel 12-feet deep at mean low water (MLW) and 90-feet wide, from Little River, South Carolina, to and including Port Royal Sound near Port Royal, South Carolina, with a branch channel of the same dimensions to McC[illegible]anville, South Carolina. The project as currently constructed was authorized by the River and Harbor Act of 26 August 1937.

The proposed disposal and the associated impacts are described in the attached 404(b) assessment. Large scale drawings of the disposal areas are located in the Charleston District Office, 334 Meeting Street, Charleston, South Carolina.

Designation of the currently used disposal sites for dredged material associated with this Federal project has been made through the application of guidelines promulgated by the Administrator, Environmental Protection Agency (EPA), in conjunction with the Secretary of the Army. The attached 404(b) evaluation formalizes and makes public the process by which the designation was made. After a review of the 404(b) evaluation, if it is determined that the guidelines alone prohibit the continued designation of the disposal sites, any potential impairment to the maintenance of navigation, including any economic impact on navigation and anchorage which would result from the failure to use the disposal sites, will also be considered.

The South Carolina Department of Health and Environmental Control has certified that there is reasonable assurance that the continued operation and maintenance of the Atlantic Intracoastal Waterway (AIWW), including the disposal of dredged material, will be conducted in a manner consistent with the certification requirements of Section 401 of the Federal Water Pollution Control Act Amendments of 1972, PL 92-500, provided that a 30-day notice is given to the South Carolina Department of Health and Environmental Control. If possible, areas open to shellfishing are to be dredged during the closed shellfishing season, as recommended by the South Carolina Department of Health and Environmental Control.

The South Carolina Coastal Zone Management program has not yet been approved by the Department of Commerce; however, the continued use of existing disposal areas appears consistent, to the maximum extent practicable, with draft versions of the South Carolina program. The 404 public notice for this project is a joint notice with the South Carolina Coastal Council. After the review period, the Council will send comments and recommendations to the Charleston District.

The District Engineer has consulted the latest version of the National Register of Historic Places for the presence or absence of registered properties, or properties listed as being eligible for inclusion therein, and the disposal areas are not included as registered properties or properties listed as being eligible for inclusion in the Register. A cultural resource reconnaissance is being conducted to determine if any aspect of the continued operation and maintenance will disturb unknown cultural resources. Such disturbance in the previously used disposal areas is highly unlikely.

South Carolina Coastal Coun[illegible]

James M. Waddell, Jr.
Chairman

W. Wayne [illegible]
Executive Director

April 12, 1979

Colonel William W. Brown
Corps of Engineers
Charleston District
Post Office Box 919
Charleston, SC 29402

Dear Col. Brown:

The staff of the South Carolina Coastal Council has reviewed public notice [illegible] for the maintenance dredging of the Atlantic Intracoastal Waterway. We [illegible] [illegible] posed work, however, we recommend that all dikes be inspected for rehabilitation prior to use to [illegible] the probability of dike failure and the resulting environmental damage. We also recommend that weirs be situated on the waterway side of disposal sites in those areas determined to be environmentally sensitive by the S. C. Wildlife and Marine Resources Department.

Sincerely,

[illegible]
Permit Administrator

[illegible]

AN EVALUATION OF THE EFFECTS OF THE DISCHARGE OF DREDGED OR FILL MATERIAL INTO WATERS OF THE UNITED STATES: ATLANTIC INTRACOASTAL WATERWAY, WINYAH BAY TO PORT ROYAL SOUND, SOUTH CAROLINA

Group VI, Open Water Disposal at Sewee Bay, Dewees Inlet and the North Edisto River

1. Project Description

a. General.

(1) The disposal areas in Group VI are alike in that (a) they are all unconfined open water sites, (b) they have all been used on previous occasions, and (c) they are removed from major sources of pollution.

(2) Discharge of dredged material by pipeline into Group VI waters is an action which falls under the jurisdiction of Section 404 and which requires a 404(b) evaluation.

b. Description of the proposed discharge of dredged or fill material into waters of the United States.

(1) General characteristics of the material.

Disposal Area	General Characteristics
Sewee Bay	Sand, shell, silt
Dewees Inlet	Sand, silt
North Edisto River	Silt

(2) Quantities of material proposed for discharge:

Sewee Bay	400,000 c.y. every 8 to 10 yrs.
Dewees Inlet	15,000 c.y. every 3 yrs.
North Edisto River	40,000 c.y. every yr.

(3) Source of material. The shoals adjacent to the open water disposal areas are shown in sheets 1-5.

c. Description of the proposed disposal sites for dredged or fill material.

(1) Location. Open water disposal areas in Sewee Bay, Dewees Inlet and the North Edisto River are shown in sheets 1-5.

(2) Types of disposal sites. Open Water. Sewee Bay is a shallow body with little fresh water inflow. It is subject to tidal flushing through a dendritic system of creeks which connects Sewee Bay with nearby Bull Bay and the Atlantic Ocean. Both Dewees Inlet and the disposal area on the North Edisto River have tidal flows of high velocity, are little influenced by any fresh water inflow, and empty directly into the Atlantic Ocean.

(3) Method of discharge. Pipeline discharge directly into open water.

(4) When will disposal occur?

Sewee Bay - once in 10 years
Dewees Inlet - once in 3 years
North Edisto River - annually

(5) Projected life of disposal areas. Not applicable. The areas were selected because of their strong flushing action and in hopes that all or most of the material would be carried to the ocean or assimilated by the large estaurine system. Such an area does not have a finite capacity, but will be used until unacceptable adverse effects are discernible.

(6) Bathymetry.

(a) Sewee Bay is a shallow area which appears to be open water at high tide. At low tide, however, a substantial portion of its bottom is exposed and some of the smaller channels are empty. A number of channels, accessible either from the AIWW or from Bulls Bay to the east are relatively deep (3-10 ft.). Water currents are moderately strong in the area and result from tidal action. Mean tidal range for Sewee Bay is 5 feet.

(b) Dewees Inlet is a short, deep channel joining Hamlin, Copahee and Bullyard Sounds with the Atlantic Ocean. Depths range from 29 to 41 feet in the area where open water disposal is proposed. Currents are strong and result from tidal action.

(c) The North Edisto River is also a relatively short, deep channel which joins Wadmalaw Sound and the Dahoo River at its mouth. Depths range from 20 to 45 feet in the channel where disposal is proposed. Currents are relatively strong and result from tidal action.

2. Physical Effects. (40 CFR 230.4-1(a)).

a. Potential destruction of wetlands-effects on 40 CFR 230.4-1(a)(1)(i-vi).

(1) Sewee Bay has little vegetation and is not one of the highly productive wetlands, such as the nearby pure stands of <u>Spartina alterniflora</u>. The area does, however, provide general aquatic habitat and contribute to the flood chain. Based on a recent study by the South Carolina Wildlife and Marine Resources Department, a major portion of the fine grained material is expected to be flushed away from the points of discharge. This material is expected to be assimilated by the large estaurine system or to be transported into the Atlantic Ocean. The area which requires dredging is currently being dredged once every 10 years, and the SCWMRD study of the most recent application of material in Sewee Bay indicates that changes due to the disposal were short-term and isolated to a few areas. It is possible, however, that a gradual buildup could occur over many such applications (one every ten years) such that portions of the existing mud flats nearest the points of discharge are no longer regularly inundated. Such raised areas would no longer provide intertidal habitat. Current sedimentation and flushing patterns would probably be altered in the areas near the raised discharge points. Because of the size of the bay, the large number of channels and the strong tidal nature of flushing, however, the characteristic features of the bay, such as salinity, frequency of inundation, substrate type and surrounding vegetation, should not be significantly altered.

b. Impact on water column (40 CFR 230.4-1(a)(2)) In the vicinity of the dredge, turbidity is increased for a short period. There are no significant physical impacts in the water columns of these three areas, other than the short-term increase in turbidity.

(1) Reduction in light transmission: No significant impact. The effect is localized and of short duration.

(2) Aesthetic values. No significant impact.

(3) Direct destructive effects on nektonic and planktonic populations. No significant effects. The effect is localized and of short duration.

c. The covering of benthic communities is considered significant only if there is some alternation of community structure or function.

(1) Permanent effects. The study of one application at Sewee Bay indicated that there were no permanent effects on benthic communities, although at two sites recovery was more prolonged than at the others. The spreading of material over a wide area, good flushing, resistance of species present to the deposition of dredged material, rapid recolonization, and the similarity of dredged material to the disposal area sediment were all cited as reasons for the localized and temporary nature of the effects on benthic communities. At North Edisto River, there were no effects on benthic communities that could be attributed to disposal of dredged material. Because of the similar nature of Dewees Inlet, no significant effects on benthic communities are expected.

(2) Changes in community structure and substrate composition. See 2.c(1) above. No significant effects.

d. Other effects. No other significant effects.

3. Chemical-Biological Interactive Effects (40 CFR 230.4-1(b)).

a. Does the material meet the exclusion criteria?

(1) Sewee Bay - Yes. The material being discharged into Sewee Bay is substantially the same as the substrate in the area receiving the material. Bulk chemical analyses and the absence of major pollution discharges provide reasonable assurances that the materials are not contaminated.

(2) Dewees Inlet and North Edisto River - No. Although the absence of major pollutant discharges and the bulk chemical analyses provide reasonable assurances that the material is not contaminated, the substrate of both channels is well scoured and does not contain the same material as the dredged site. This lack of similarity in no manner increases the likelihood of adverse chemical-biological effects. In fact, the scouring action is a characteristic looked for to minimize the impacts of open water disposal.

b. Water column effects. No significant effects: The material is not contaminated. The chemical constituents in the sediments are present in the same low levels as the rest of the AIWW.

c. Effects on benthos. See 3.a & b above. No significant effects.

4. Description of site comparison between dredged sites and disposal areas. A comparison in Dewees Inlet and the North Edisto River is not appropriate because the material is rapidly flushed away. In Sewee Bay, the substrate at the discharge points is similar to the dredged site and was noted in the SCW&MRD study as one of the reasons for rapid recovery of biological communities affected by the disposal operation.

5. Review Applicable Water Quality Standards. No violations of State or Federal water quality standards is anticipated. See 3.a and b.

6. Selection of Disposal Sites (40 CFR 230.5) for Dredged or Fill Material. Comments on previous public notices and EIS's indicate that most Federal and State agencies favor open water in well flushed sites when upland or previously diked sites are not available. The three sites chosen for open water disposal were selected as a result of annual interagency coordination meetings.

a. Need for the proposed activity. Without periodic dredging, the present use of the waterway by commercial, State, Federal and recreational vessels would not be possible.

b. Alternatives considered.

(1) The only area adjacent to Sewee Bay is part of a National Wildlife Refuge. No upland area is available within reasonable pumping distance of the shoal area at Dewees Inlet. Upland area could possibly be obtained by condemnation of farmland near the North Edisto River; however, the discharge into the fast-moving river has fewer adverse impacts.

(2) There are no existing diked areas within practicable pumping distance.

(3) Ocean disposal. The great expense associated with the Environmental Protection Agency's requirements for approval of new ocean disposal areas and the great expense of the required bioassays preclude the use of this method in the few areas of the AIWW where ocean disposal might be practical.

(4) A variety of uses of dredged material has been examined to determine if removal of the material from existing diked sites is feasible. Although several uses have been identified, they are not economically practical when costs for removal, transportation, special treatment, etc. are included.

c. Objectives to be considered in discharge determination. (40 CFR 230.5(a)).

(1) Impacts on chemical, physical, and biological integrity of aquatic ecosystem (40 CFR 230.5(a)(1). No significant impacts. The adverse impacts anticipated at Sewee Bay are temporary in nature, except for the possible accumulation of heavier particles due to their deposition once every 10 years. No significant adverse impacts are anticipated at Dewees Inlet and the North Edisto River. See 2.a-d and 3.a-c.

(2) Impact on food chain. No significant impacts. See 2.a-d and 3.a-c.

(3) Impact on diversity of plant and animal species. No significant impacts. The SCW&MRD study indicates that the changes in diversity due to the disposal of dredged material are temporary for Sewee Bay and undiscernible for the North Edisto River.

(4) Impact on movement into and out of feeding, spawning, breeding, and nursery areas. No significant impact.

(5) Impacts on wetland areas having significant functions of water quality maintenance. No significant impacts. Even if the once-in-ten-years disposal in Sewee Bay results in a local impact due to gradual accumulation of the heavier particles, this impact will not significantly reduce the wetlands function in water quality maintenance. See 2.a.

(6) Impacts on areas that serve to retain natural high waters or flood waters. Not applicable.

(7) Methods to reduce turbidity. The methods usually used to minimize turbidity in open water are not applicable in these cases. The primary intent at all three areas is to have as much material flushed away from the point of discharge in order to avoid the physical impacts of filling and smothering of benthic communities.

(8) Methods to minimize degradation of aesthetic, recreational, and economic values. Recreation and economic values are improved -- not degraded -- by the proposed maintenance of the AIWW. The only degradation of aesthetic values might be the temporary turbidity; however, turbidity levels are often high under natural conditions, and this cannot be considered significant.

(9) Threatened and endangered species. No threatened or endangered species are adversely affected by the discharge from Group VI areas.

(10) Investigate other measures that avoid degradation of aesthetic, recreational, and economic values of navigable waters. See 6.b and 6.c(8) above.

d. Impacts on water uses at proposed disposal sites (40 CFR 230.5(b)(1-10).

(1) Municipal water supply intakes. No impact.

(2) Shellfish. Sewee Bay has several areas that are open for public shellfish gathering or are under lease from the State of South Carolina to private concerns.

(3) Fisheries. No significant impact.

(4) Wildlife. No significant impact.

(5) Recreation activities. Improved by AIWW maintenance.

(6) Threatened and endangered species. No adverse impacts.

(7) Benthic life. See 2.a and 2.c. Impacts that might result from future dredging in Sewee Bay are expected to be similar to the results in the 1979 SCW&MRD study: Generally, the effects will be local and temporary, and where impacts do occur, they will not significantly affect the community structure or diversity of the bay as a whole. No significant effects due to disposal of dredged material are expected in the North Edisto River or in Dewees Inlet.

(8) Wetlands. No significant impact. Vegetated wetlands will not be covered or their functions impaired. The effects on non-vegetated wetlands have been described in previous sections.

(9) Submerged vegetation. No significant impact.

(10) Size of disposal area. In all three areas, the rapid dispersion of the dredged material over a wide area was cited by the SCW&MRD study as one of the factors that limited the effects to short-term and localized impacts. To this end, the disposal area in Sewee Bay was not minimized, but was spread over as wide an area having adequate flushing as possible. In the North Edisto River and in Dewees Inlet, the high velocities will also spread the material over a wide area.

(11) Coastal Zone Management programs (40 CFR 230.3(e)). South Carolina does not yet have an approved Coastal Zone Management program; however, the continued use of existing diked areas appears consistent with draft versions of the S.C. program. The 404 public notice for this project is a joint notice with the S.C. Coastal Council. After the review period, the Council will send comments and recommendations to the Charleston District.

e. Considerations to minimize harmful effects (40 CFR 230.5(c)(1-7)).

(1) Water quality effects. No significant harmful effects. See 2.b, 3.a and 3.b.

(2) Alternatives to open water disposal. The three open water areas were chosen because, with proper conditions, their use would have fewer harmful effects than would disposal in wetlands or disposal on nearby upland sites. See 6.b.

(3) Investigate physical characteristics of alternative disposal sites. The upland areas near Sewee Bay are part of a National Wildlife Refuge, and lands are mostly in cropland or forest. There are no upland areas available within practicable pumping distance of the shoal near Dewees Inlet. Uplands near the North Edisto are also in croplands and forest. Wetland areas (<u>Spartina alterniflora</u>) are available as alternative disposal areas at all three sites. Other open water areas near the shoal area were considered; however, the selected sites had the best and most direct flushing action towards the ocean.

(4) Ocean dumping. Not practicable. See 6.b.

(5) Covering contaminated dredged material. Not applicable. See 3.a.

(6) Methods to minimize the effect of runoff from confined areas on the aquatic environment. Not applicable.

(7) Coordinate potential monitoring activities at disposal sites with EPA. EPA was present at the annual interagency coordination meetings on the selection of disposal areas. The monitoring of the open water areas by SCW&MRD was decided at one of these meetings.

7. Contamination of fill material. Not applicable.

8. Determination of mixing zone. A mixing zone was not calculated because (a) there were no contaminants in the sediments which warranted concern and (b) every effort had already been made to maximize the dispersion area and to increase the speed with which dispersion takes place.

9. Conclusions and determinations. Summarized for all groups at end of 404(b) evaluation.

10. Findings. Summarized for all groups at end of 404(b) evaluation.

CONCLUSIONS AND DETERMINATIONS

The conclusions and determinations which follow were made after a review of the impacts and alternatives for all areas in Groups I-VI.

1. Feasible alternatives to the proposed discharge have been considered, and none that are practicable will have less adverse impact on the open water and wetland ecosystem.

2. The proposed actions were selected from the feasible alternatives after adequate coordination with the public and State and Federal agencies.

3. There are no unacceptable environmental impacts on the open water and wetland ecosystem as a result of the discharge of dredged or fill material.

4. The discharge of the dredged or fill material will be accomplished in a manner that will minimize, to the extent practicable, adverse environmental effects on the open water and wetland ecosystem.

FINDINGS

Based on the above evaluation and determinations, the proposed discharge of dredged material for the Atlantic Intracoastal Waterway, Winyah Bay to Coosaw River, has been specified through the application of Section 404(b) guidelines. Based on this document, the project EIS and other project documents available to me, I find that the proposed disposal is in the best overall public interest.

5 March 1979
DATE

William W. Brown
WILLIAM W. BROWN
Colonel, Corps of Engineers
District Engineer