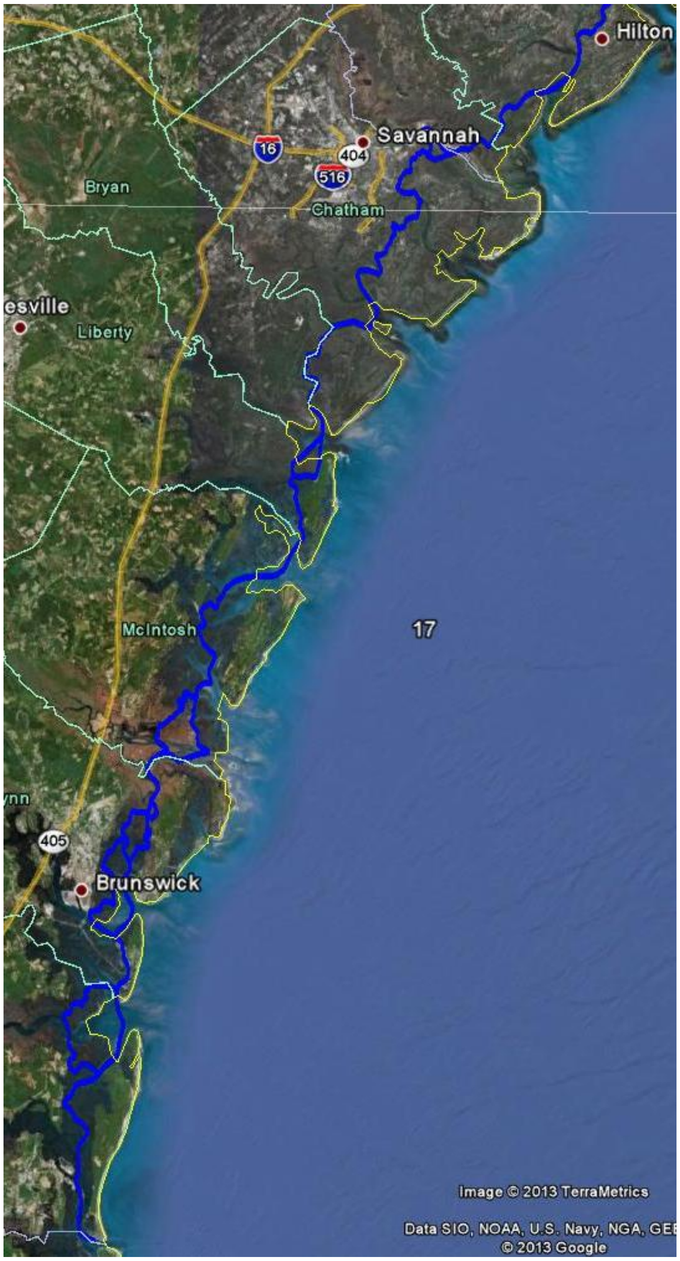
Draft Dredged Material Management Plan
Atlantic Intracoastal Waterway
Port Royal Sound, South Carolina to Cumberland Sound, Georgia
November 2015

Appendix F: Essential Fish Habitat Assessment



US Army Corps of Engineers®
South Atlantic Division
Savannah District

ESSENTIAL FISH HABITAT ASSESSMENT

DREDGED MATERIAL MANAGEMENT PLAN FOR THE ATLANTIC INTRACOASTAL WATERWAY PORT ROYAL SOUND, SOUTH CAROLINA TO CUMBERLAND SOUND, GEORGIA

FINAL REPORT

October 2013

Prepared for

US Army Corps of Engineers
Savannah District
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by

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EXECUTIVE SUMMARY

Dial Cordy and Associates Inc. was contracted by the U.S. Army Corps of Engineers to prepare this Essential Fish Habitat Assessment (EFH) report as part of the Dredged Material Management Plan (DMMP) for the Atlantic Intracoastal Waterway (AIWW). The Planning Guidance Notebook (ER1105-2-100) requires that all federally maintained navigation projects must demonstrate that there is sufficient dredged material placement capacity for a minimum of 20 years. This study serves as a baseline evaluation of managed fish species and their habitats that occur within the project area.

The National Marine Fisheries Service and its affiliate, the South Atlantic Fishery Management Council, oversee managed species and their respective EFHs found in the project's area. EFH for a given species may include multiple habitats to support reproduction, juvenile and adult development, feeding, protection, and shelter during species' various life stages. This EFH assessment describes the habitats and managed fishery resources that would potentially be present and adversely affected from dredging operations of the AIWW project area. EFHs found within the potential project area include estuarine emergent marshes, intertidal flats, oyster reefs and shell banks, and the estuarine and marine water columns. The project may have adverse effects on brown shrimp (*Farfantepenaeus aztecus*), pink shrimp (*Farfantepenaeus duorarum*), white shrimp (*Lytopenanaeus setiferus*), gray (*Lutjanus griseus*) and lane snapper (*L. synagris*), cobia (*Rachycentron canadum*), Spanish mackerel (*Scomberomorus maculatus*), bluefish (*Pomatomus saltatrix*), summer flounder (*Paralichthys dentatus*), and 11 shark species.

Additional direct effects would include entrainment by dredging equipment and indirect effects would include potential behavior changes from dredging activities and foraging difficulty from temporarily increased turbidity levels. Species that have greater mobility or tendencies toward migratory behavior are likely to be less directly affected. However, demersal species and smaller individuals (including larval forms), may encounter localized population reductions.

This EFH assessment focuses on the direct and indirect effects of dredging along the AIWW within the project limits. Maintenance dredging along the AIWW project area for the DMMP would have some immediate adverse impacts on EFH. However, the magnitude and short and long-term impacts of the proposed dredging would vary depending on location, time of the year, type of placement (ocean, confined and open water), frequency of use of placement sites and the elevation to which the dredged material accumulates. By implementing best management construction/ operation practices, and adhering to dredging windows, direct and indirect effects on managed species and their habitats would be minimized.

The Corps is proposing mitigation for impacts to estuarine emergent wetlands (saltmarsh) in accordance with the Mitigation Rule (33 CFR Parts 325 and 332) and believes that no additional mitigation for loss of EFH would be required. The Corps believes that implementing the proposed 20-year DMMP would not cause significant adverse impacts to EFH or EFH species. Impacts are expected to be minor on an individual project and cumulative effects basis.

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1.0 INTRODUCTION

Dial Cordy and Associates Inc. (DC&A) was contracted by the U.S. Army Corps of Engineers, Savannah District (District), to prepare a Section 404 (b)(1) essential fish habitat (EFH) assessment for the Dredged material Management Plan (DMMP) for the Atlantic Intracoastal Waterway (AIWW). The DMMP covers Chatham, Bryan, Liberty, McIntosh, Glynn, and Camden Counties, Georgia and portions of Beaufort County, South Carolina. This draft report will assist the District in meeting compliance requirements related to the National Environmental Policy Act of 1969, as amended (NEPA); Section 404 (b)(1) of the Clean Water Act of 1972; and the Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. 1801-1882, as amended.

2.0 PROJECT OVERVIEW AND PURPOSE

The US Army Corps of Engineers, Savannah District is responsible for maintenance of the federally authorized 12-foot-deep and 150-foot-wide inland navigation channel known as the Atlantic Intracoastal Waterway Project which extends between Port Royal Sound/Hilton Head Island (AIWW Mile 552) and the Cumberland Sound/Florida state line (AIWW Mile 713).

There are 36 defined reaches within the 161-mile AIWW portion maintained by the Savannah District. Located adjacent to these reaches are a series of salt marsh tracts for which the Corps of Engineers holds disposal easements (Figures 1-6). Prior use of these tracts for placement of dredged sediments has resulted in wetland impacts that exceeded predictions in an EIS prepared in 1976 for maintenance of the AIWW. Savannah District is preparing an Environmental Assessment (EA) that will address the impacts of implementing a new 20-year DMMP. The DMMP would require the development of new dredged material placement methods and obtaining the necessary environmental approvals to use them.

The District's DMMP outlines a long-term 20-year maintenance plan for the AIWW within Savannah District which identifies and evaluates problems associated with the maintenance of the AIWW. Based on the analysis of studies and collaboration with other agencies, the District developed a maintenance scheme that allows continued use of the waterway and minimizes adverse environmental impacts.

Currently, the majority of the maintenance sediment is deposited in mostly undiked marsh areas adjacent to the waterway - a practice no longer acceptable to the Georgia Department of Natural Resources, Coastal Resources Division (GADNR) and the South Carolina Department of Natural Resources (SCDNR). The District needed to develop and identify the best plan for long-term maintenance dredging, and determine where to place maintenance dredging materials and how best to mitigate for damages to salt marshes that may result from implementing the DMMP. This EFH report is a support document to the District's DMMP and the action within each of the 36 reaches.


HILTON HEAD ISLAND
SAV-1
555
560
565
570
575
Beaufort County
DAUFUSKIE ISLAND
CALIBOGUE SOUND
Tract 3
SAV-2
SAV-3
SAV-4
Tract 2
Jasper County
SAV-5
Tract 1 (14B)
14B
Jones-Oysterbed Island
TYBEE ISLAND
Chatham County
Tract 1-A-1
SAV-6
Jasper
Bryan
Chatham
Liberty
Long
McIntosh
Glynn
Camden
Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community
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SAVANNAH, GEORGIA
FIGURE 1
SAVANNAH DISTRICT AIWW OVERVIEW
HILTON HEAD ISLAND, SC (AIWW MILE 552) TO
TYBEE ISLAND, GA (AIWW MILE 575)
Legend
Dredge Material Disposal Sites
AIWW Stationing
AIWW Channel
Date: December 2012
Created by: Piper Bazemore
(SAS-EN-GS)
1 in = 1 Mile
0 0.5 1 2 Miles

Figure 1


SAV-5
Jasper County
TYBEE ISLAND
Tract 575 (14B)
14B
Jones-Oysterbed Island
Tract 1-A-1
SAV-6
Tract 1A
Tract 2A
Tract 2B
Tract 3A
SAV-7
Tract 4B
Tract 4A
WHITEMARSH ISLAND
580
Tract 5A
WILMINGTON ISLAND
SAV-8
Tract 5B
Tract 7B
Tract 7A
Tract 105E
Tract 301E
Tract 8A
585
Tract 9A
Tract 10C
Tract 9B
WASSAW SOUND
SAV-9
Chatham County
590
Tract 11L
Tract 11H
Tract 11A
Tract 11C
Tract 11B
Tract 11F
Tract 400E-2
Tract 400E-1
SKIDAWAY ISLAND
WASSAW ISLAND
SAV-10
Tract 13A
Tract 14A
Tract 14B
595
SAV-11
600
OSSABAW SOUND
Tract 15B
Tract 15A
SAV-12
605
SAV-13
Bryan County
Jasper
Bryan
Chatham
Liberty
Long
McIntosh
Glynn
Camden
Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community
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FIGURE 2
SAVANNAH DISTRICT AIWW OVERVIEW
TYBEE ISLAND, GA (AIWW MILE 575) TO
OSSABAW SOUND, GA (AIWW MILE 605)
Legend
Dredge Material Disposal Sites
AIWW Stationing
AIWW Channel
Date: December 2012
Created by: Piper Bazemore
(SAS-EN-GS)
1 in = 1 Mile
0 0.5 1 2 Miles

Figure 2

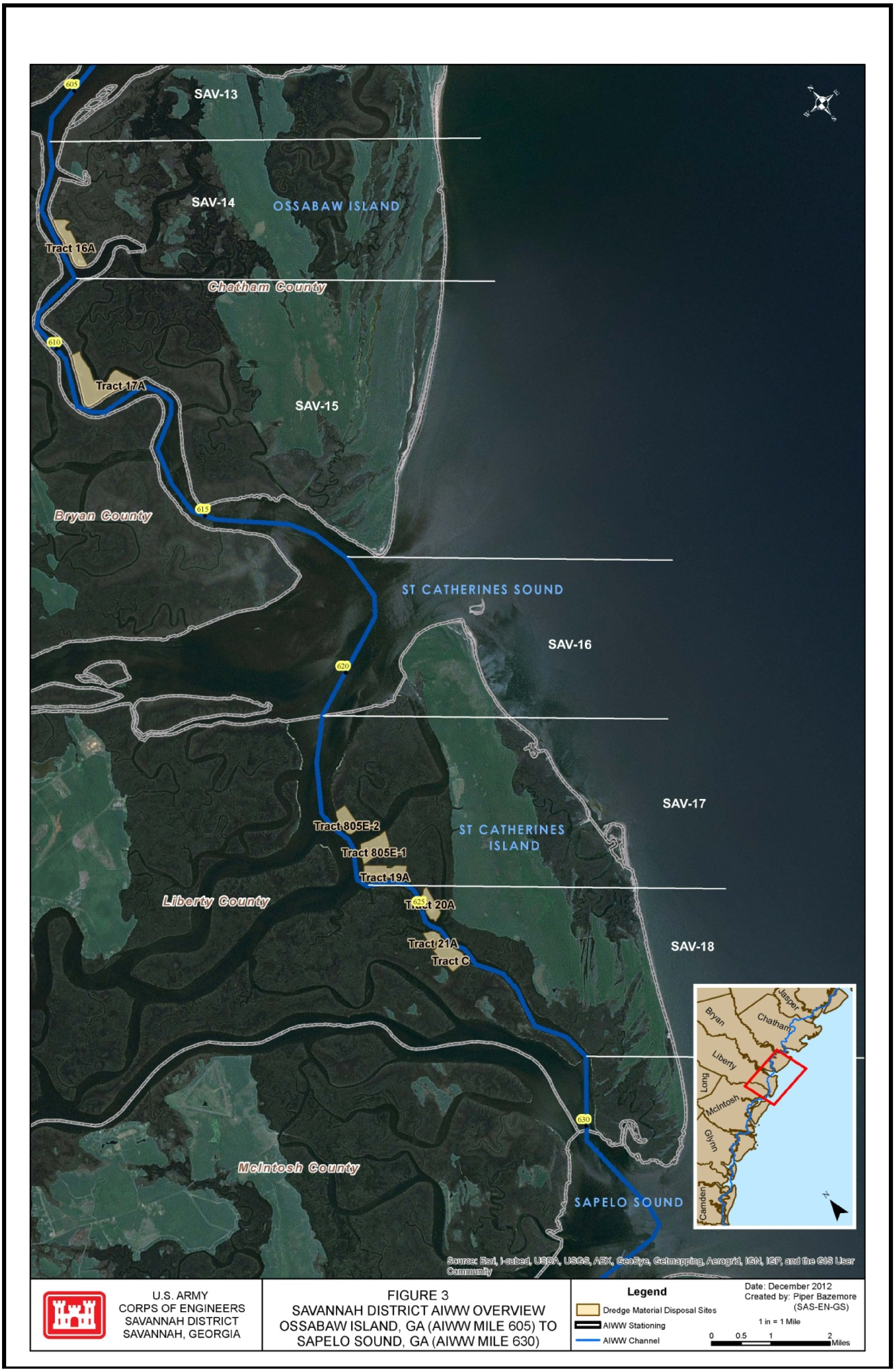
SAV-13
SAV-14
OSSABAW ISLAND
Tract 16A
Chatham County
Tract 17A
SAV-15
Bryan County
ST CATHERINES SOUND
SAV-16
SAV-17
Tract 805E-2
Tract 805E-1
Tract 19A
ST CATHERINES ISLAND
Tract 20A
Liberty County
Tract 21A
Tract C
SAV-18
McIntosh County
SAPELO SOUND
605
610
615
620
625
630
Jasper
Bryan
Chatham
Liberty
Long
McIntosh
Glynn
Camden
Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community
U.S. ARMY CORPS OF ENGINEERS SAVANNAH DISTRICT SAVANNAH, GEORGIA
FIGURE 3
SAVANNAH DISTRICT AIWW OVERVIEW OSSABAW ISLAND, GA (AIWW MILE 605) TO SAPELO SOUND, GA (AIWW MILE 630)
Legend
Dredge Material Disposal Sites
AIWW Stationing
AIWW Channel
Date: December 2012
Created by: Piper Bazemore (SAS-EN-GS)
1 in = 1 Mile
0 0.5 1 2 Miles

Figure 3


Liberty County
SAPELO SOUND
630
635
640
645
650
655
BLACKBEARD ISLAND
SAV-19
SAV-20
SAV-21
SAPELO ISLAND
SAV-22
SAV-23
SAV-24
DOBOY SOUND
SAV-25
SAV-26
WOLF ISLAND
SAV-27
ALTAMAHA SOUND
SAV-28
McIntosh County
DARIEN
Tract 24A
Tract 25C
Tract 25D
Tract 25BA
Tract 25E
Tract 26A
Tract 27A
Tract 27B
Tract 28A
Dumping Area 28
Tract 29A
Tract 29D
Tract 29B
Tract 29C
Tract 30A
Tract 30B
Tract 31B
Tract 31A
Dumping Area 32
Dumping Area 34
Tract 34A
Jasper
Chatham
Bryan
Liberty
Long
McIntosh
Glynn
Camden
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SAVANNAH, GEORGIA
FIGURE 4
SAVANNAH DISTRICT AIWW OVERVIEW
SAPELO SOUND, GA (AIWW MILE 630) TO
ALTAMAHA SOUND, GA (AIWW MILE 655)
Legend
Dredge Material Disposal Sites
AIWW Stationing
AIWW Channel
Date: December 2012
Created by: Piper Bazemore
(SAS-EN-GS)
1 in = 1 Mile
0 0.5 1 2 Miles

Figure 4


Bird Island Disposal Area
JEKYLL ISLAND
Tract 52B
Dumping Area 52
Tract 52A
Tract 52C
52A
Tract 53A
Glynn County
Tract 1500E
SAV-33
SAV-34
ST ANDREW SOUND
Umbrella Cut
Tract COE 1
Tract COE 3
Dover Cut
LITTLE CUMBERLAND ISLAND
Tract COE 2
Tract COE 4
SAV-35
CUMBERLAND ISLAND
Camden County
Tract 1700I
680
685
690
695
700
705
Jasper
Bryan
Chatham
Liberty
Long
McIntosh
Glynn
Camden
Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community
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FIGURE 5
SAVANNAH DISTRICT AIWW OVERVIEW
JEKYLL ISLAND, GA (AIWW MILE 680) TO
CUMBERLAND ISLAND, GA (AIWW MILE 705)
Legend
Dredge Material Disposal Sites
AIWW Stationing
AIWW Channel
Date: December 2012
Created by: Piper Bazemore
(SAS-EN-GS)
1 in = 1 Mile
0 0.5 1 2 Miles

Figure 5


CUMBERLAND ISLAND
700
705
710
Tract 1700L
SAV-36
Tract CP2 Parcel #6
Tract CP1 Parcel #5
Tract CP3 Parel #7
Tract B Parcel # 4
CUMBERLAND SOUND
Camden County
ST MARYS
Nassau County
Duval County
Jasper
Bryan
Chatham
Liberty
Long
McIntosh
Glynn
Camden
Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, and the GIS User Community
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FIGURE 6
SAVANNAH DISTRICT AIWW OVERVIEW
CUMBERLAND ISLAND, GA (AIWW MILE 700) TO
CUMBERLAND SOUND, GA (AIWW MILE 710)
Legend
Dredge Material Disposal Sites
AIWW Stationing
AIWW Channel
Date: December 2012
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(SAS-EN-GS)
1 in = 1 Mile
0 0.5 1 2 Miles

Figure 6

2.1 Placement Alternatives Considered

The USACE has identified placement options for all reaches of the AIWW that would require maintenance over the next 20 years. These options would meet the dredged material placement requirements of the project while minimizing impacts to the aquatic environment and addressing the requests of the State resource agency (USACE 2012a).

In view of the adverse effects of undiked placement into tidal marshes and the comments and concerns of the GADNR and SCDNR, the following five conclusions can be reached relative to the consideration of placement alternatives for Savannah District's portion of the AIWW.

1. The long term, continued discharge of dredged material into undiked tidal wetlands is not a viable alternative in either state.

2. GADNR and SCDNR would prefer that open water placement of dredged material be discontinued. However, GADNR have indicated that they would consider this alternative if the material is clean sand (at least 80%).

3. The construction of high ground diked placement areas in the vicinity of some of the high shoaling areas would be a preferred method of placement versus the existing practice of undiked placement into wetlands.

4. The placement of some of the material from the AIWW into an approved or new ODMDS is a viable alternative.

5. The use of existing diked placement areas is a preferred alternative whenever possible.

With the above stipulations taken into consideration, the following placement alternatives were developed for the 35 reaches of the AIWW within Savannah District that may require maintenance dredging to provide a 20-year DMMP.

Placement options under consideration for the 20-year DMMP for the AIWW included:

1. Use of existing diked placement areas where available. Implementation of this alternative where possible eliminates the need to discharge dredged material into undiked disposal tracts along various reaches of the waterway. The DMMP utilizes existing diked placement areas to the maximum extent practicable.

2. Beneficial use of suitable material (beach nourishment). However, considering the small amount of material that would be available for beach nourishment, this option is probably not economically practicable when considering placement costs and the costs to obtain required environmental clearances.

3. Construction of new, high ground, diked placement areas. Implementation of this alternative would reduce the use of the undiked placement areas located in tidal marsh along the AIWW. Several potential sites were located where diked placement areas could be constructed. However, when the total costs (land acquisition, site preparation and dike construction, costs to pump dredged material to the site, site maintenance, environmental clearances, mitigation etc.) were considered along with potential impacts to wildlife habitat, this alternative was eliminated.

4. Construction of diked placement areas within the existing disposal easements. Implementation of this alternative would reduce the placement of dredged material into undiked placement areas in tidal marsh. However, this alternative would have significant adverse impacts on tidal marsh. Many of the disposal tracts have large expanses of functioning tidal marsh. Large amounts of functioning marsh would be enclosed within the dikes since most of the easement would require diking to provide sufficient capacity for the dredged material. Based on observations of the impacts of undiked placement on tidal marsh, implementation of this alternative would have even greater adverse impacts on the aquatic ecosystem. After considering the adverse impacts to tidal marsh and the associated mitigation costs, this alternative was eliminated from consideration.

5. Ocean dumping of dredged material into the existing ODMDS sites for the Savannah Harbor and Brunswick Harbor projects and designation of two new ODMDSs near Sapelo Sound and Altamaha Sound. The dredged material would be placed onto barges by bucket dredge. The material would be unloaded onto an ocean-going dump scow which would take it to the designated ODMDS. Although this "triple handling" of the dredged material greatly increases costs when compared to other dredging and placement methods, it also eliminates other costs such as dike construction and maintenance, wetland mitigation, etc. This placement method also totally removes the dredged material from both the channel and the aquatic ecosystem. There are several shallow draft hopper dredges which could possibly be used in lieu of the bucket dredge. If available and practical to use within the Savannah District's portion of the AIWW, this type of dredged would allow the material to be taken directly to the ODMDS in lieu of having to use the barges and dump scows.

6. Use of existing open water placement sites within the State of Georgia. GADNR have indicated it would consider continued use of some of the existing open water placement sites provided the material is at least 80% sand. Three reaches (Hells Gate, Altamaha Sound and Buttermilk Sound) were identified where at least some of the maintenance material would meet that criterion. However, some of the material in those reaches would not meet the 80% sand requirement. Consequently, the suitable material to be removed from three reaches would be placed in existing open water placement sites. Material not meeting this criterion would be placed on existing dredged material deposits within the current disposal easements for that reach of the waterway. Some of the material would be used to fill geo-tubes (or some other similar technology) which in turn would serve as the containment dikes to keep the material confined to existing deposits within the disposal tract.

2.2 Proposed Action

Based on the preceding discussion of alternatives, the following placement alternatives are proposed for the future maintenance requirements of the AIWW within Savannah District. The alternative discussion includes information on the amount of material that would have to be dredged and the type of material that is removed. Due to the bulking factor involved with dredged material, the amount of storage capacity required is generally one a-and-a-half to two times the amount of the material that is removed during maintenance dredging.

In summary, the following three placement alternatives are proposed in the DMMP for the portion of the AIWW within the Savannah District:

1. <u>Use of existing diked placement areas where available</u>.
This method of placement is proposed for the following reaches of the AIWW within Savannah District:

Reach SAV-1 Port Royal to Ramshorn Creek (DMCA 14-B)
Reach SAV-2 Ramshorn Creek (DMCA 14-B)
Reach SAV-3 New River (DMCA 14-B)
Reach SAV-4 Walls Cut (DMCA 14-B)
Reach SAV-5 Fields Cut (DMCA 14-B)
Reach SAV-6 Elba/McQueens Cut (DMCA 14-B)
Reach SAV-7 St. Augustine Creek (DMCA 14-B)
Reach SAV-8 Wilmington River (DMCA 14-B and diked area within Tract 9-A)
Reach SAV-9 Skidaway River (Diked area within Tract 9-A)
Reach SAV-10 Skidaway Narrows (Diked area within Tract 9-A)
Reach SAV-11 Burnside River to Hells Gate (Diked area within Tract 9-A)
Reach SAV-30 Mackay River (Andrews Island DMCA)
Reach SAV-31 Frederica River (Andrews Island DMCA)
Reach SAV-32 St. Simons Sound (Andrews Island DMCA)
Reach SAV-35 Cumberland River to Cumberland Sound (Kings Bay Crab Island DMCA)

2. <u>Ocean placement of dredged material</u>.
Much of the maintenance material that would be dredged from the AIWW in the future would be placed into USEPA approved ODMDSs. Ocean placement would involve use of two existing ODMDSs (Savannah Harbor and Brunswick Harbor) and the establishment of two new ODMDSs off Sapelo Sound and Altamaha Sound. Establishment of the two new ODMDSs and use of the existing ODMDSs for the Savannah Harbor and Brunswick Harbor Projects for material from the AIWW would require site designation studies and USEPA approval per the requirements of Section 103 of the Marine Protection, Research and Sanctuaries Act. Ocean placement of dredged material is proposed for the following reaches of the AIWW:

Reach SAV-13 Hells Gate to Florida Passage (Savannah Harbor ODMDS)
Reach SAV-14 Florida Passage (ODMDS Sapelo Sound)
Reach SAV-15 Bear River (ODMDS Sapelo Sound)
Reach SAV-16 St. Catherines Sound to North Newport River (ODMDS Sapelo Sound)
Reach SAV-17 North Newport River (ODMDS Sapelo Sound)
Reach SAV-18 Johnson Creek (ODMDS Sapelo Sound)
Reach SAV-19 Sapelo Sound to Front River (ODMDS Sapelo Sound)
Reach SAV-20 Front River (ODMDS Sapelo Sound)
Reach SAV-21 Creighton Narrows (ODMDS Sapelo Sound)
Reach SAV-22 Old Teakettle Creek (ODMDS Sapelo Sound)
Reach SAV-23 Doboy Sound (ODMDS Altamaha Sound)
Reach SAV-24 North River (ODMDS Altamaha Sound)
Reach SAV-25 Rockdedundy River (ODMDS Altamaha Sound)
Reach SAV-26 South River (ODMDS Altamaha Sound)
Reach SAV-27 Little Mud River (ODMDS Altamaha Sound)
Reach SAV-28 Altamaha Sound (ODMDS Altamaha Sound)
Reach SAV-33 Jekyll Creek (ODMDS Brunswick Harbor)

Reach SAV-34 Jekyll Creek to Cumberland River (ODMDS Brunswick Harbor)

3. Open Water Placement in Conjunction with Confined Placement.
This method of placement is proposed for the following reaches of the AIWW within Savannah District:

Reach SAV-12 Hells Gate (Open water north and south of Raccoon Key, Tracts 15-A and 15-B)
ReachSAV-29 Buttermilk Sound (Open Water Sites 34 and 44, Tract 42-B)

Proposed placement methods by operational reach are as follows:

Operational Reach SAV-1 Port Royal to Ramshorn Creek (mile 552-568.5)
No previous maintenance dredging has been required in this reach of the AIWW, and no maintenance is anticipated to be required during the 20-year life of the DMMP. If maintenance is required in this reach of the waterway, the material would be placed in existing DMCA 14-B.

Operational Reach SAV-2 Ramshorn Creek (mile 568.5-569.9)
Approximately 49,000 cubic yards (CY) of material (sand) would be removed during the 20-year life of the DMMP. This reach of the water way is projected to require 66,000 CY of storage capacity.

The preferred method for placement of dredged material from this reach of the AIWW is to use existing DMCA 14-B which is designated to receive material from Savannah Harbor and the AIWW. Although the costs of adding sufficient booster pumps to move the material approximately seven miles or taking the material to DMCA 14-B by barge would be great, it would be cheaper than building a DMCA in SC Tract 3 (especially considering the wetland mitigation costs for impacts in SC Tract 3).

Operational Reach SAV-3 New River (AIWW Mile 569.9-572.2)
Maintenance dredging has not been required in this reach of the AIWW. If the need arises to conduct maintenance dredging in New River, the material could be deposited into existing DMCA 14-B which is designated to receive dredged material from Savannah Harbor and the AIWW.

Operational Reach SAV-4 Walls Cut (AIWW Mile 572.2-572.6)
It is estimated that Walls Cut will have to be dredged once (22,000 CY of sand) during the 20-year life of the DMMP which would require 35,000 CY of storage capacity. SC Tract 2 is designated to receive dredged material form Walls Cut, however, this disposal tract has not been used in many years. SC Tract 2 is located on Turtle Island which is a South Carolina Department of Natural Resources Wildlife Management Area.

Maintenance was last performed in 2001, and the material was last placed in existing DMCA 14-B. This is the preferred method of dredged material placement for this reach of the AIWW for future maintenance.

Operational Reach SAV-5 Fields Cut-AIWW Mile 572.6-575.3)
It is estimated that approximately 298,000 CY of storage capacity would be required during the 20-year life of the DMMP to handle the estimated 232,000 cubic yards of maintenance material (fine silt).

Tract 1 was designated to receive dredged material from this reach of the AIWW. Approximately 172 acres of Tract 1 were included within the dikes of DMCA 14-B. Future maintenance material would be placed in DMCA 14-B. No further dredged material would be placed into the remainder of SC Tract 1 which is diked on the front side (Fields Cut).

Operational Reach SAV-6 Elba Cut-McQueens Cut (AIWW Mile 575.3-577.4)
Estimates indicate that about 298,000 CY of storage capacity would be required to handle the 199,000 cubic yards of maintenance material (fine silt) for the 20-year life of the DMMP.
Most of the material removed from this section of the AIWW has been placed into Tract 1-A-1. Future maintenance material would be placed into DMCA 14-B which is designated to receive dredged material from Savannah Harbor and the AIWW.

Operational Reach SAV-7 St.Augustine Creek (AIWW Mile 577.4-578.2)
It is estimated that about 1,190,000 cubic yards of dredged material (mud and silt) would be removed during the 20-year life of the DMMP. Approximately 1,785,000 CY of storage capacity would be required to handle this material. In the past, maintenance material from this reach of the AIWW has been placed in either Tract 2-A or Tracts 2-B/3-A. All future maintenance material would be placed in DMCA14-B.

Operational Reach SAV-8 Wilmington River (AIWW Mile 578.2-585.0)
Approximately 345,000 CY of storage capacity would be needed to meet the requirements since about 230,000 cubic yards of material (mud and silt) would be removed during the 20-year life of the DMMP.

Some sections of the Wilmington River (especially the upper portion) have high maintenance requirements. Consequently, substantial amounts of maintenance material have been placed into Tracts 2-A, 2-B/3-A, 5-A, 7-A, and 9-A. Placement of dredged material into undiked Tracts 2-A, 5-A, 7-A and the undiked portion of Tract 9-A would be discontinued. Tracts 2-B/3A were fully diked to form one 155.4-acre DMCA. However, no maintenance dredging has been conducted in the Wilmington River since 1989, and the dike has apparently gone into disrepair. The dike around 2-B/3-A would be repaired and this site used for future maintenance of the Wilmington River. Initial estimates indicate that this site could provide approximately 2.5 million CY of dredged material placement capacity if the site is constructed with 10-foot dikes.

Tracts 2-B and 3-A have been totally impacted by dredged material placement as evidenced by field studies conducted in 1983 and 2011. Tidal wetlands in these two tracts have also been degraded by being diked which removed them from tidal influence. Tidal wetlands (about 96 acres) are still evident in these areas, and a 29-acre freshwater wetland has formed in Tract 3-A. Consequently, restoring the dike around Tracts 2-B/3-A will result in impacts to these wetlands.

Costs of restoring and maintaining the dikes around Tract 3-A and mitigating for loss of tidal wetlands within the dikes make this option more expensive, with greater environmental impact than sending the material from the northern portion of this reach to DMCA 14-B. Therefore, the preferred plan for this reach is to use DMCA 14-B.

In addition to DMCA 14-B which can be used for maintenance of most of the Wilmington River, some placement capacity will be required for the anticipated shoaling in the lower Wilmington River. The preferred placement option for the lower section of the Wilmington River is to use the diked containment area in Tract 9-A. A small (26-acre) DMCA has already been constructed in Tract 9-A. It is used by a local vessel repair business to maintain depths at their facilities. As a requirement for their use of the disposal tract, this business must maintain 130,000 CY of capacity within the DMCA for use by the Government, if required.

Operational Reach SAV-9 Skidaway River (AIWW Mile 585.0-591.0)
This reach of the AIWW within Savannah District has not required maintenance. If any future maintenance dredging is required, the material could be placed into the diked area in Tract 9-A previously discussed.

Operational Reach SAV-10 Skidaway Narrows (Mile 591.0-594.0)
No maintenance dredging has been required for this reach of the AIWW. If any future maintenance dredging is required, the material could be placed into the diked area in Tract 9-A previously discussed.

Operational Reach SAV-11 Burnside River to Hells Gate (AIWW Mile 594.0 to 600.8)
This reach of the AIWW has not required maintenance dredging. If any future maintenance dredging is required, the material could be placed into the diked area in Tract 9-A previously discussed.

Operational Reach SAV-12 Hells Gate (AIWW Mile 600.8 to 602.4)
Hells Gate is a major shoaling area, and it is estimated that 1,566,495 CY of storage capacity will be required for the 20-year life of the DMMP to provide sufficient capacity for the estimated maintenance dredging quantity (785,000 cubic yards). Hells Gate was last dredged in 2009. The material removed from Hells Gate has been discharged into undiked tracts 15-A and 15-B while some of the material was discharged into open water placement sites on the north and south sides of Raccoon Key. Both tracts 15-A and 15-B showed additional marsh impacts during the field surveys for the 2011 study versus those observed in the 1983 study. The need for open water placement on the north and south sides of Raccoon Key was previously identified based on damage to finger streams that was occurring in Tract 15-A.

Dredged material from this reach of the AIWW can vary from silt and clay to sand. For future maintenance dredging, some of the material (sand) could be discharged into the open water sites on the north and south sides of Raccoon Key as has been the practice. However, the river bottoms and the estuarine water column are essential fish habitat that must be considered in evaluating the impacts of open water placement. Sediment sampling and grain size analysis would be required before each dredging cycle to ascertain how much of the material would be suitable for open water placement. The State of Georgia has indicated that the material would have to be at least 80% sand before they would consider it suitable for open water placement.
Placement of the material unsuitable for open water placement would involve confining it on the existing deposits within Tracts 15-A and 15-B. Instead of constructing traditional earthen dikes within the placement area, the material would be placed in geo-tubes (or other similar technology) which would serve as the confining structure. This would reduce the amount of additional marsh that would be impacted by the construction of traditional dikes in the disposal tracts.

If the use of geo-tubes proves infeasible, the unsuitable material would be placed in the existing ODMDS for Savannah Harbor provided the material was determined to be suitable for ocean placement per the stipulations of the Section 103 Guidelines.

Operational Reach SAV-13 Hells Gate to Florida Passage (AIWW Mile 602.4-605.9)
No maintenance of this reach of the AIWW has been required. If maintenance is required over the 20-year life of the DMMP, the material would be placed in the Savannah Harbor ODMDS or disposed of in accordance with the procedures prescribed for the Florida passage described below.

Operational Reach-14 Florida Passage (AIWW Mile 605.9 to 608.5)
It is estimated that approximately 732,000 CY of storage requirement would be required for this reach of the waterway for the 20-year life of the DMMP. Approximately 366,000 cubic yards of material (mud and silt) would be removed during this time.

This reach of the waterway was last dredged in 2009, and the material was discharged into undiked disposal Tract 16-A. This is the only time this tract has been used since the 1983 report. Consequently the amount of the tract that was observed during the field studies for the 2011 report to have been impacted by dredged material placement (13.3%) is very similar to that observed (11.7%) during the field work for the 1983 study.

The preferred placement alternative is to place the material into a new ODMDS located offshore of Sapelo Sound. The establishment of a new ODMDS at this location would require site designation studies per the requirements of Section 103 of the Marine Protection, Research and Sanctuaries Act (MPRSA) and site designation approval by the US Environmental Protection Agency (USEPA).

Operational Reach SAV-15 Bear River (AIWW Mile 608.5-617.5)
The 20-year storage requirement for this reach of the AIWW is 99,000 CY (dredging requirements-about 50,000 cubic yards of mud and silt). Past maintenance dredging and placement involves placing the material into undiked Tract 17-A. Tract 17-A has been used only once since completion of the 1983 study, and the field work for the 2011 study suggests marsh recovery has occurred in this tract. The 2011 study indicates that about 8 acres of this 244-acre tract have been impacted by dredged material placement compared to 24 acres observed in the 1983 study. Material removed from Bear River would be handled in the same manner as that discussed for the Florida Passage above, i.e., placed into the ODMDS to be established off Sapelo Sound.

Operational Reach SAV-16 St. Catherines Sound (AIWW Mile 617.5-620.5)
Maintenance dredging has not been required for this reach of the AIWW. If maintenance is required in this reach during the 20-year life of the DMMP, the material would be placed in the new ODMDS off Sapelo Sound.

Operational Reach SAV-17 North Newport River (AIWW Mile 620.5-623.9)
Maintenance dredging has not been required in the North Newport River. If maintenance dredging is required in this reach of the AIWW in the future, the material would be placed in the new ODMDS off Sapelo Sound.

Operational Reach SAV-18 Johnson Creek (Mile 623.9-629.3)
In the past, dredged material from Johnson Creek has been deposited into either Tract 19-A (97.8 acres) or Tract 20-A (71.9 acres). This reach of the AIWW has not required maintenance dredging since 1973. Consequently, the field surveys for the 2011 report indicate that some marsh recovery is occurring in these tracts.

Although maintenance dredging has not been required in Johnson Creek since 1973, it is estimated that about 106,500 CY of dredged material placement capacity could be needed for the 20-year life of the DMMP to handle the 71,000 cubic yards of mud and silt that would be removed. The preferred alternative is to place the material from Johnson Creek in the new ODMDS off Sapelo Sound.

Operational Reach SAV-19 Sapelo Sound-Front River (AIWW Mile 629.3-639)
This reach of the AIWW has not required maintenance dredging. If maintenance dredging is required in the future, the material would be placed in the new ODMDS that would be established off Sapelo Sound.

Operational Reach SAV-20 Front River (AIWW Mile 639-640)
This reach of the AIWW has not required maintenance dredging. If maintenance dredging is required in the future, the material would be placed into the new ODMDS off Sapelo Sound.

Operational Reach SAV-21 Creighton Narrows (AIWW Mile 640-642.9)
This reach of the AIWW has not been dredged since 1999, however, it is anticipated that the 20-year storage capacity to meet project needs is about 3,999,000 CY. About 2,000,000 cubic yards of material (silts and clays) would be removed during the 20-year life of the DMMP. Four disposal tracts have been used to deposit dredged material. These disposal tracts are Tract 24-A (128.6 acres), Tract 25-A (104.2 acres), Tract 25-C (133.8 acres), and Tract 25-E (43.13 acres). The preferred placement alternative is to place the maintenance material from this reach of the waterway into the new ODMDS off Sapelo Sound.

Operational Reach SAV-22 Old Teakettle Creek (AIWW Mile 642.9-648.2)
This reach of the AIWW has not required maintenance dredging. If maintenance dredging is required, the material would be disposed of at the new ODMDS off Sapelo Sound.

Operational Reach SAV-23 Doboy Sound (AIWW Mile 648.2-649.5)
This reach of the AIWW has not been dredged since 1978. When it has been dredged, the material has placed into an open water placement area adjacent to Commodore Island. Although the material has some sand, it also contains silts and clays. If maintenance is required in Doboy Sound in the future, the material would be placed into a new ODMDS off Altamaha Sound.

Operational Reach SAV-24 North River Crossing (AIWW Mile 649.5-651.4)
Maintenance dredging has not been conducted in the North River Crossing since 1980. In the past, material has been deposited into undiked tracts 29-A, 29-B, and 29-C. For purposes of the DMMP, it is estimated that about 478,000 CY of storage capacity will be required to handle about 290,000 cubic yards of material (mud). If future maintenance is required, the material would be deposited into the new ODMDS off Altamaha Sound.

Operational Reach SAV-25 Rockdedundy River (AIWW Mile 651.4-652.7)
Maintenance dredging was last performed in the Rockdedundy River in 1996. Material dredged from this portion of the AIWW has been placed in either undiked Tracts 29-B or 30-A. It is estimated that approximately 258,000 CY of storage would be required for the 20-year life of the DMMP to handle about 130,000 cubic yards of dredged material (mud). Future maintenance material from this portion of the AIWW would be deposited into the new ODMDS off Altamaha Sound.

Operational Reach SAV-26 South River (AIWW Mile 652.7-653.5)
This reach of the AIWW was last dredged in 1999. The material has normally been placed in undiked Tracts 29-C or 30-A. Approximately 1,098,000 CY of storage capacity would be needed to meet the requirements of the DMMP. Future maintenance material (about 550,000 cubic yards of mud and silt) from the South River would be placed into the new ODMDS off Altamaha Sound.

Operational Reach SAV-27 Little Mud River (AIWW Mile 653.5-656.4)
Little Mud River has required extensive maintenance having been dredged 19 times between 1963 and 2001. It is estimated that about 9,168,000 CY of storage capacity would be required for the 20-year life of the DMMP to handle about 4,584,000 cubic yards of mud and silt. In the past, material has been discharged Tracts 30-A, 30-B, or 32-A. The preferred alternative is to place future maintenance material from Little Mud River into the new ODMDS off Altamaha Sound.

Operational Reach SAV-28 Altamaha Sound (AIWW Mile 656.4-660.1)
This reach of the AIWW was last dredged in 2009. It is estimated that about 3,600,000 CY of dredged material storage capacity would be required to meet the requirements of the 20-year DMMP. The maintenance material to be removed (about 1,800,000 cubic yards) varies from silt to sand. In the past, dredged material has been placed into Tracts 34-A and 36-A. Open water sites 32 and 34 have also been used to dispose of the course grained sediments. The preferred alternative is to place future maintenance material from this reach into the new ODMDS off Altamaha Sound.

Operational Reach SAV-29 Buttermilk Sound (AIWW Mile 660.1-664.5)
Buttermilk Sound has been dredged 22 times between 1952 and 2009. The dredged material has been placed into undiked tracts 42-C, 42-B, 43-A, 43-B, 44-A and 44-B as well as open water placement sites located adjacent to Tracts 42-C, 43-A, 43-B and downstream of Tract 42-B. It is estimated that about 6,417,000 CY of storage capacity will be needed to satisfy the requirements of the 20-year DMMP. The maintenance material (about 3,200,000 cubic yards) to be removed varies from silt to sand.

The DMMP provides for the continued use of the open water sites for coarse grain material. The material that is unsuitable for open water placement would be placed in geo-tubes to provide a confined placement area in Tract 42-B. The intent is to confine the newly placed dredged material to the portions of these tracts already impacted by placement activities in the past. If this method of placement proves infeasible, the material would be placed into the new ODMDS off of Altamaha Sound.

Operational Reach SAV-30 Mackay River (AIWW Mile 664.5-674.0)
This reach of the AIWW has not required maintenance dredging. If dredging is required in Mackay River, the material would be placed into the DMCA (Andrews Island) designated for the maintenance of Brunswick Harbor.

Operational Reach SAV-31 Frederica River (AIWW Mile 674-677)
No maintenance dredging has been required for this reach of the AIWW. If maintenance is necessary, the material would be placed into the existing Andrews Island DMCA.

Operational Reach SAV-32 St. Simon Sound (AIWW Mile 677-680.9)
Maintenance dredging St. Simon Sound has been conducted on two occasions in 1963 and 1969, and no future maintenance dredging in St. Simon Sound is anticipated to be necessary. However, should maintenance dredging be required in St. Simon Sound, the material would be placed into the existing Andrews Island DMCA.

Operational Reach SAV-33 Jekyll Creek (AIWW Mile 680.9-685.9)
It is estimated that approximately 15,971,000 CY of dredged material storage capacity would be required to maintain Jekyll Creek for the 20-year life of the DMMP. The maintenance material to be removed (about 8,000,000 cubic yards) is predominantly silts and clays. In the past, most of the dredged material from Jekyll Creek has been discharged into undiked Tracts 52-A (115.7 acres) and 52-B (95 acres) which have been completely impacted by this activity although most of these tracts remain tidal wetlands. Tract 53-A (180.4 acres) has also been used. In addition to impacts to marsh within the disposal tracts, past dredged material placement into Tracts 52-A and 52-B has been characterized by material running through the placement areas and back into Jekyll Creek.

A thorough alternatives analysis was conducted for this reach of the AIWW in regards to the construction of a DMCA within Tracts 52-A and 52-B. There have been dike stability problems with past attempts to partially dike these sites. There has also been opposition expressed to constructing DMCAs in Tracts 52-A and 52-B based on aesthetic impacts to the viewshed of the nearby Jekyll Island National Historic District. There is insufficient high ground in the vicinity of Jekyll Creek to construct a DMCA large enough to handle the anticipated 20-year volume of material in this reach. Based on these previous studies, the preferred alternative is to deposit dredged material from Jekyll Creek into the existing ODMDS for the Brunswick Harbor Navigation Project.

Operational Reach SAV-34 Jekyll Creek to Cumberland River (AIWW Mile 685.9-692)
This section of the AIWW has not required maintenance dredging, and there are no designated placement areas for this reach. Should this reach require dredging in the future, the material would be placed into the existing ODMDS for the Brunswick Navigation project.

Operational Reach SAV-35 Cumberland River to Cumberland Sound (AIWW Mile 692-707)
This reach of the AIWW was dredged in 1965, 1995, and 2001. The Corps has an agreement with the US Navy to use their DMCA (Tract 1700-L or Crab Island) for any future maintenance requirements for this reach of the AIWW.

Operational Reach SAV-36 Cumberland River to Cumberland Sound (AIWW Mile 707-713)
This reach of the AIWW is maintained by the US Navy as part of the channel for the Naval Submarine Base Kings Bay.

Alternate Route Around St. Andrews Sound. Maintenance of the alternate route around St. Andrews Sound is not included in the DMMP.

3.0 ESSENTIAL FISH HABITAT OVERVIEW

The Magnuson-Stevens Act's final rule, mandating the management of fishery resources and their habitats, was released on 17 January 2002. The National Marine Fisheries Service (NMFS) and its affiliate, the South Atlantic Fishery Management Council (SAFMC), oversee managed species and their respective EFHs found in the project area. The EFH for a given species can include multiple habitats to support reproduction, juvenile and adult development, feeding, protection, and shelter during species' various life stages. This EFH assessment describes the habitat(s) and managed fishery resource(s) that would potentially be present within the potential project footprint. If any activities could potentially affect EFHs, then applicable federal permitting agencies must consult with the NMFS to ensure the potential action considers the effects on managed species/habitats and supports the management of sustainable marine fisheries.

Essential fish habitats in estuarine areas that are managed by the SAFMC and likely reside within the project area are listed in Table 1 (NMFS 2008).

Table 1 Project's essential fish habitat categories.

Essential Fish Habitats	Potential Presence	Potential Effects
	Within Project Area	On-site Dredging or Filling
Estuarine Emergent Wetlands	☑	☑
Intertidal Flats	☑	☑
Estuarine Water Column	☑	☑
Oyster Reefs/Shell Bars	☑	
Marine Water Column	☑	☑

4.0 ESSENTIAL FISH HABITATS IN PROJECT AREA

4.1 Estuarine Emergent Marshes

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. A coastal marsh is typically characterized by its vegetation. Depending on marsh salinity and other environmental variables, marsh vegetation may include the following: smooth cordgrass (*Spartina alterniflora*), black needlerush (*Juncus roemerianus*), saltmeadow grass (*Spartina patens)*, big cordgrass

(*Spartina cynosuroides*), saltworts (*Salicornia* sp.), salt grass (*Distichlis spicata*), salt-marsh aster (*Aster tenuifolius*), sea lavender (*Limonium* sp.), bulrush (*Scirpus* sp.), sawgrass (*Cladium jamaicense*), and narrowleaf cattail (*Typha angustifolia*). Communities comprising these and other vegetation types provide critical functions, such as refugia and forage for various fish. However, most juvenile managed fish found in the riparian salt/brackish marsh nurseries are spawned offshore and transported into the estuary through tidal inlets. Many commercial and managed species such as shrimp and summer flounder (*Paralichthys dentatus*) inhabit the tidal salt marsh edge, while adult spotted seatrout (*Cynoscion nebulosus*), flounder, and red drum (*Sciaenops ocellatus*) forage the grass line for shrimp and other prey. Nursery areas can include soft bottom areas surrounded by salt/brackish marsh as well. Hence, the estuarine marshes are essential habitat to many managed species and serve multiple functions to various fish life-stages (Street et al. 2005). This salt/brackish marsh EFH is found along the AIWW throughout the project length.

4.2 Intertidal Flats

The distribution and individual characteristics of intertidal flats are dynamic features of an estuarine system. An intertidal flat's shape and size varies by changing erosion and depositional rates influenced by tide ranges, coastal geology, freshwater inflow, weather patterns, and anthropogenic factors. Intertidal flat locations with minor tide variations are primarily influenced by wind and waves unless located near a tidal inlet or river mouth discharge. Tidal flats within systems of larger tidal fluctuations are principally formed and fashioned by the area's tidal action. Sediment size interacting with wind, wave, and tidal forces shape and manage intertidal flat development and movement. As the distance from an inlet increases, the intertidal flats' substrates become finer and more susceptible to wind fetch influences (SAFMC 1998).

Intertidal flats serve various functions for many species' life stages, as described in Table 2. Estuarine flats serve as a feeding ground, refuge, and nursery area 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 tidally influenced, constantly changing EFH provides feeding grounds for predators, refuge and feeding grounds for juvenile and forage fish species, as well as nursery grounds for estuarine-dependant benthic species (SAFMC 1998).

Table 2 Common fish and shellfish species utilizing intertidal flats.

Common Name	Scientific Name	Function	Life Stage Use(s)
Atlantic menhaden	*Brevoortia tyrannus*	Refuge	Juvenile
Bay anchovy	*Anchoa mitchilli*	Refuge	Juvenile, Adult
Inshore lizardfish	*Synodus foetens*	Forage	Juvenile, Adult
Atlantic silverside	*Menidia menidia*	Refuge	Juvenile, Adult
Black sea bass	*Centropristis striata*	Refuge	Juvenile
Pinfish	*Lagodon rhomboides*	Refuge, Forage	Juvenile, Adult
Summer flounder	*Paralichthys dentatus*	Refuge, Forage	Post-larval, Juvenile, Adult
Blue crab	*Callinectes sapidus*	Refuge, Forage	Juvenile, Adult
Brown shrimp	*Farfantepenaeus aztecus*	Refuge, Forage	Post-larval, Juvenile, Adult
Hard clam	*Mercenaria mercenaria*	Forage	Post-larval, Juvenile, Adult

Source: SAFMC 1998

Species that move from a pelagic larval to a benthic juvenile existence make use of flats during development. These flats can provide a comparatively low energy area with tidal phases that allow species the use of shallow water habitat as well as relatively deeper water within small spatial areas. Species such as summer flounder, red drum, spotted seatrout, striped mullet (*Mugil cephalus*), gray snapper, blue crab (*Callinectes sapidus*), and shrimp use this EFH as a nursery. These flats also serve as refuge areas for species avoiding predators, which use the tidal cycles to gain access to estuarine feeding grounds. Table 2 describes examples of common estuarine fish and shellfish species and their function/life stage uses of intertidal flats (SAFMC 1998). In addition, these habitats are important for both migration routes and foraging for managed species such as red drum. Frequently, nursery areas can include unvegetated soft bottom areas surrounded by salt/brackish emergent marsh (Street et al. 2005). This intertidal flat EFH is found within the AIWW project area.

4.3 Estuarine Water Column

The transient boundaries of the estuarine water column are variable due to wind- and tide- driven inlet sea water mixing with upland freshwater sources and land surface runoff. With these mixing attributes, salinity levels vary within this estuarine EFH. Typically, the salinity groups include four ranges: oligohaline [< 8 parts per thousand (ppt)], mesohaline (8 to 18 ppt), polyhaline (18 to 30 ppt), and euryhaline (>30 ppt). The salt water tidal action and freshwater inflows are primary factors in estuarine circulation and nutrient/waste removal. Strong wind events and freshwater tributaries can increase turbidity, reducing light penetration, and adversely effecting submerged vegetation and phytoplankton photosynthesis. Freshwater rivers and stream inflows provide this EFH organic matter, nutrients, and finer grained sediments; whereas, ocean-driven tides provide coarser sediments and a transport mechanism for estuarine-dependent species. The ocean waters within this EFH act as a temperature stabilizer offsetting seasonal temperature extremes that would reduce productivity and diversity in the shallow upstream waters. Salinity, temperature, dissolved organic matter, dissolved inorganic nitrogen, and oxygen are components normally used to characterize the estuarine water column. Other descriptors, such as adjacent structures (shoals, channels, and marshes), water depth, available fetch, and turbidity are used to further describe this EFH. The estuarine water column provides both migrating and residential species of varying life stages the opportunity to survive in a productive, active, unpredictable, and at times strenuous environment. As the transport medium for nutrients and organisms between the ocean and the upstream rivers and inland freshwater systems, the estuarine water column is as essential a habitat as any marsh, seagrass bed, or reef (SAFMC 1998).

4.4 Oyster Reefs/Shell Bars

Oyster reefs and shell banks provide extremely unique benthic habitats. 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. Sponges, gastropods, polychaete worms, and decapod crustaceans are common residents of oyster reefs (Livingston 1990), and such reefs also provide excellent refugia for juvenile shrimps. Given that, the areas are important foraging grounds for many managed fish species. Oyster reefs and shell banks also provide habitat diversity by protecting benthic substrates on the lee sides of the reefs/banks. Oyster reefs and shell banks form breakers, where calmer, less turbid waters exist on their shoreward sides, especially where vessels are operating or where prevailing winds drive waves and currents onshore.

4.5 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 within species.

The continental shelf of the southeastern U.S., extending from the Dry Tortugas to Cape Hatteras, encompasses an area in excess of 100,000 km2 (Menzel, 1993). The Florida Current/Gulf Stream is the region associated with this EFH assessment, and flows along the shelf edge. In the Southern region, this boundary current dominants the physics of the entire shelf (Lee et al., 1992, 1994). In the northern region, additional physical processes are important and the shelf environment can be subdivided into three oceanographic zones (Atkinson et al., 1985, Menzel 1993). The outer shelf (40-75 m) is influenced primarily by the Gulf Stream and secondarily by winds and tides. On the mid-shelf (20-40 m), the water column is almost equally affected by the Gulf Stream, winds and tides. Inner shelf waters (0-20 m) are influenced by freshwater runoff, winds, tides and bottom friction.

The water column from Dry Tortugas to Cape Hatteras 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, juvenile stages). Larvae of shrimp, lobsters, crabs, and larvae of reef, demersal and pelagic fishes are found in the water column (e.g. Fahay 1975; Powels and Stender, 1976; Leis, 1991; Yeung and McGowan 1991, Criales and McGowan 1994). Problems with species-level identifications prohibits an exact accounting of the number of fishes whose larvae inhabit the water column, but the number of families represented in ichthyoplankton collections range from 40 to 91 depending on location, season and sampling method.

There are large number of fishes that inhabit the water column as adults. Pelagic fishes in the region include numerous clupeoids, exocoetids, carangids, *Rachycentron*, *Pomatomus*, coryphaenids, sphyraenids and scombroids (Schwartz, 1989). Some pelagic species are associated with particular benthic habitats (e.g. *Seriola, Sphyraena*), while other species are truly pelagic (e.g. *Thunnus, Makaira*). Adult meso- and bathypelagic species inhabit the water column in the Gulf Stream and adjacent Sargasso Sea (Backus et al., 1977).

5.0 HABITAT AREAS OF PARTICULAR CONCERN IN PROJECT AREA

Habitat Areas of Particular Concern (HAPC) are EFHs that are considered atypical, 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. HAPCs can include intertidal and estuarine habitats. The Magnuson-Stevens Act does not provide any additional regulatory protection to HAPCs. However, if HAPCs are potentially adversely affected, additional inquiries and conservation guidance may result during the NMFS EFH consultation (NMFS 2008).

The SAFMC has designated coastal inlets and state-designated overwintering areas of Georgia and South Carolina as HAPCs for white, brown and pink shrimp. The Atlantic States Marine Fisheries Commission considers Georgia and South Carolina's coastal inlets HAPCs for red drum. Also, oyster/shell bottom and coastal inlets of Georgia and South Carolina are considered HAPCs for the species of the snapper-grouper complex. Finally, HAPCs for the migratory pelagic species of king mackerel (*Scomberomorus cavalla*), Spanish mackerel (*S. maculatus*), and cobia (*Rachycentron canadum*) include any Atlantic coast estuary with high numbers of these species (SAFMC 1998, NMFS 2008). State-designated areas of Importance of Managed Species including Primary Nursery Areas (PNA) are also considered HAPCs. Categories of EFH and associated habitats, and the potential impacts are provided in Table 3.

Table 3 Categories of Essential Fish Habitat in the project vicinity and potential impacts.

	Potential Presence		**Potential Impacts**	
Essential Fish Habitat Category	**In/Near Project Vicinity**	**Project Impact Area**	**Dredge Operation**	**Sediment Placement Activities**
Estuarine Areas				
Estuarine Emergent Wetlands	Yes	No	No	No
Intertidal Flats	Yes	No	No	No
Estuarine Water Column	Yes	Yes	Minor and Temporary	Minor and Temporary
Oyster Reefs & Shell Banks	Yes	No	No	No
Marine Areas				
Water Column	Yes	Yes	No	Temporary

6.0 MANAGED SPECIES AND ESSENTIAL FISH HABITAT USE

6.1 Penaeid Shrimp and Relevant EFH

White, brown and pink shrimp (penaeids) are managed by the SAFMC via South Atlantic Fisheries Management Plan (SAFMP) (SAFMC 2004). The more common South Carolina/Georgia species is white shrimp; which are regionally referred to as green shrimp, green-tailed shrimp, or southern shrimp. Brown shrimp are referred to as green lake shrimp, red-tail shrimp, and also summer shrimp. Pink shrimp are sometimes referred to as northern shrimp or deepwater prawn. These and other managed species that may be found in the project area are listed in Table 4.

Table 4 Potential managed species within the project area.

Common Name [1]	Scientific Name	Management Plan Agency [2]	Fishery Management Plan (FMP) [4]	Life Stage in EFH [3]	Marine Water Column
Brown shrimp	*Farfantepenaeus aztecus*	SAFMC	Shrimp	P,J,A	L, A
White shrimp	*Lytopenaeus setiferus*	SAFMC	Shrimp	P,J,S	L, A
Pink shrimp	*Farfantepenaeus duorarum*	SAFMC	Shrimp	P, J, S	L, A
(HAPC FOR SHRIMPS: Tidal inlets, state-designated nursery and overwintering habitats) [5]					
Gray snapper	*Lutjanus griseus*	SAFMC	Snapper Grouper	P,J,A	
Lane snapper	*Lutjanus synagris*	SAFMC	Snapper Grouper	J	
(HAPC FOR SNAPPERS: Oyster/shell habitat, state-designated nursery areas, coastal inlets) [5]					
Cobia	*Rachycentron canadum*	SAFMC	CMP	L,P,J,A	A
Spanish mackerel	*Scomberomorus maculatus*	SAFMC	CMP	J	A
Bluefish	*Pomatomus saltatrix*	MAFMC	Bluefish	J,A	
Summer flounder	*Paralichthys dentatus*	MAFMC	Summer Flounder	L,J,A	
Atlantic sharpnose shark	*Rhizoprionodon terraenovae*	NMFS	HMS	J	A
Blacknose shark	*Carcharhinus acronotus*	NMFS	HMS	J	A
Bonnethead shark	*Sphyma tiburo*	NMFS	HMS	J	A
Bull shark	*Carcharhinus leucas*	NMFS	HMS	J	A
Dusky shark	*Carcharinus obscures*	NMFS	HMS	J	A
Finetooth shark	*Carcharhinus isodon*	NMFS	HMS	J,A	A
Lemon shark	*Negaprion brevirostris*	NMFS	HMS	J,A	A
Sandbar shark	*Carcharhinus plumbeus*	NMFS	HMS	J	A
Sand tiger shark	*Odontaspis Taurus*	NMFS	HMS	N	A
Scalloped hammerhead	*Sphyrma lewini*	NMFS	HMS	J	A
Spinner shark	*Charcharhinus brevipinna*	NMFS	HMS	J,A	A

Notes:
1. These EFH species were based on species lists from SAFMC 2008.
2. Fishery Management Plan (FMP) Agencies: SAFMC = South Atlantic Management Council; MAFMC = Mid-Atlantic Fishery Management Council; NMFS = National Marine Fisheries Service.
3. Life stages include: E = Eggs, L = Larvae, N = Neonate, P = Post-Larvae, J = Juveniles, S = Sub-Adults, A = Adults
4 Fishery Management Plans: CMP = Coastal Migratory Pelagics; HMS = Highly Migratory Species.
5. HAPC = Habitat Areas of Particular Concern; if not listed for certain fishery management plans, appropriate HAPC for respective species is not found in the project area or vicinity.

Environmental conditions are believed to primarily control shrimp population sizes even though fishing reduces the populations over the season. Shrimping is not thought to affect successive year totals, unless the reproduction stock is affected by environmental circumstances. Each species, due to their migratory nature and reproductive capability, are able to recover from a low population from one year to the next. The loss or degradation of salt marsh nursery habitat for juvenile white and brown shrimp is one of the most serious threats [North Carolina Department of Environment and Natural Resources (NCDENR) 2006] to southeastern United States stocks. All coastal inlets and respective nursery habitats are of particular importance to shrimp.

The brown and white shrimp species' lifecycles are similar in that adults reproduce offshore and eggs are hatched into free-swimming larvae. Both species undergo 11 larval stages to produce post-larvae. Within the estuary, post-larval shrimp grow rapidly; however, the rate is salinity- and temperature-dependent (SAFMC 2004). These shrimp species utilize related habitats with minor differences in substrate and salinity partiality. Once reaching a sub-adult size of three to five inches, the shrimp migrate seaward. Juvenile and adult shrimp are omnivores, feeding mostly at night on benthic organisms, algae, and detritus. Daytime feeding may occur in turbid waters rich in mysids, amphipods, polychaetes, and various types of organic debris (SAFMC 2004, NCDENR 2006). As with brown shrimp, pink shrimp eggs are also demersal. Records suggest a larval period of 15 to 25 days. The mechanism by which postlarvae are brought from spawning areas to inside the estuaries is not well-known. Postlarvae move into estuaries during late spring and early summer. In the South Atlantic, the nursery areas utilized within the estuaries are primarily dominated by the marsh grass *Spartina alterniflora*

Shrimp have separate sexes (dioecious); females grow larger and are able to reproduce in less than 12 months and can expel between 500,000 and 1,000,000 eggs in a single event. Adult brown shrimp spawn in deep ocean waters over the continental shelf, while white shrimp remain nearshore. Larvae and post-larvae depend on ocean currents for transportation through inlets into estuarine nursery grounds. River mouths and inlet entrances are particularly important to estuarine shrimp recruitment. The majority of estuarine shrimp are found in close proximity to shallow wetland systems. White shrimp may use freshwater submerged vegetation to some degree. However, brown shrimp primarily utilize estuarine submerged vegetation because of salinity inclinations. The use of oyster beds by white and brown shrimp occurs, and is considered crucial in the absence of submerged vegetation (NCDENR 2006). In North Carolina sounds/estuaries, juveniles and adult phases of pink shrimp appear in June and July; whereas, in the southern portion of their range this occurs in April and May. Pink shrimp leave Florida estuaries within two to six months after having arrived as postlarvae. Smaller pink shrimp may remain in the estuary during winter. Pink shrimp that survive the winter grow rapidly during late winter and early spring before migrating to the ocean.

White Shrimp

White shrimp are found along the Atlantic coast from New York to Florida. Spawning along the south Atlantic coast occurs from March to November, while May and June are reported as peak months. Spawning takes place in water ≥ 30 feet deep and within five miles of shore where they prefer salinities of ≥ 27 ppt (Muncy 1984). The increase in bottom water temperature in the spring is thought to trigger spawning. After the demersal eggs hatch, the planktonic post-larvae live offshore for approximately 15 to 20 days. During the second post-larval stage, they move inshore on tidal currents and enter estuaries two to three weeks after hatching. Shallow muddy bottoms in low to moderate salinities are the optimum nursery areas for these benthic juvenile white shrimp. During this stage, the diet consists of zooplankton and phytoplankton. By June or July, the juveniles move to deeper creeks, rivers, and sounds. It has been documented that juvenile white shrimp tend to migrate further upstream than do juvenile brown shrimp; as far as 130 miles in nearby northeast Florida (Pérez-Fartante 1969). Juveniles prefer to inhabit shallow estuarine areas with a muddy, loose peat, and sandy mud substrate with moderate salinities. Juvenile white shrimp are benthic omnivores (e.g. fecal pellets, detritus, chitin, bryozoans, sponges, corals, algae, and annelids) and feed primarily at night. White shrimp usually become sexually mature at age one during the calendar year after they hatch. The emigration of sexually mature adults to offshore waters is influenced primarily by body size, age, and environmental conditions. Studies have shown that a decrease in water temperature in estuaries triggers emigration in the south Atlantic (Muncy 1984). During fall and early winter, the south-migrating white shrimp provide a valuable fishery in southern North Carolina, South Carolina, and Georgia. White shrimp are omnivores preferring soft muddy bottoms in areas of expansive brackish marshes (SAFMC 2004, NCDENR 2006). The life span of white shrimp usually does not extend beyond one year [National Oceanic and Atmospheric Administration (NOAA) 2009a].

Brown Shrimp

Brown shrimp occur from Massachusetts to the Florida Keys and west into the Gulf of Mexico. They support an important commercial fishery along the south Atlantic coast, primarily in North and South Carolina. This species spawns in deep ocean waters during late winter or early spring. Larvae migrate from offshore to inshore areas as post-larvae (peak migration from February through April), frequently at night on incoming tides. Carried by currents and tides into estuaries, the larvae develop into post-larvae within 10 to 17 days. Once in the estuaries, post-larvae seek out the soft silty/muddy substrate common to vegetated and non-vegetated, shallow, estuarine environments. This environment yields an abundance of detritus, algae, and microorganisms that comprise their diet at this developmental stage. Post-larvae have been collected in salinities ranging from zero to 69 ppt with maximum growth reported between 18 degrees centigrade (°C) and 25°C, peaking at 32°C. Maximum growth, survival, and efficiency of food utilization have been reported at 26°C (Lassuy 1983). Juveniles develop in four to six weeks, continuing into rapid sub-adult development depending on salinities and temperatures. The density of post-larvae and juveniles is highest among emergent marsh and submerged aquatic vegetation (Howe et al. 1999, Howe and Wallace 2000), followed by tidal creeks, inner marsh, shallow non-vegetated water, and oyster reefs. The diet of juveniles consists primarily of detritus, algae, polychaetes, amphipods, nematodes, ostracods, chironomid larvae, and mysids (Lassuy 1983). Emigration of sub-adults from the shallow estuarine areas to deeper, open water takes place between May through August, with June and July reported as peak months. The stimulus behind emigration appears to be a combination of increased tidal height and water velocities associated with new and full moons. As individuals increase in size, they move to deeper and saltier waters of the inlets until exiting to the ocean in late fall. After exiting the estuaries, adults seek out deeper (60-foot) offshore waters. Brown shrimp are omnivores and prefer muddy and peat bottoms, but can be found on sand, silt, or clay mixed shell hash bottoms (SAFMC 2004, NCDENR 2006). Adults reach maturity in offshore waters within the first year of life at 5.5 to 5.7 inches long. They have a maximum life span of 18 months (NOAA 2009b).

Pink Shrimp

Pink shrimp occur on the Atlantic Coast from Chesapeake Bay south to the Florida Keys and are most abundant in water depths of 11-37 m. Pink shrimp reach sexual maturity at about 85 mm total length. Spawning occurs during the early part of the summer at depths of 3.7 to 15.8 m. During the larval stages, development is dependent on food availability, water temperature and quality of habitat. Depending on the environmental conditions, the larval period can last from 15-25 days. Post-larval movement from the spawning areas to estuaries are not well known, although some literature suggests that wind conditions and current movements assist in transport from the estuaries to offshore habitats. Migration offshore occurs during May/June off the Georgia coast (SAFMC 2009c).

6.1.1 Penaeid Shrimp EFH in the Project Area

Of the shrimp EFH listed (NMFS 2008), those that exist within the project area include the estuarine emergent wetlands; intertidal flats/unvegetated bottoms; estuarine water column; and the marine water column. These EFHs provide transport, refuge, and feeding/developmental areas for post-larval, juvenile, and sub-adult penaeid shrimp. Tidal inlets and state-designated nursery areas are considered HAPCs for white, pink and brown shrimp species.

Potential shrimp EFHs within the project footprint would include the AIWW salt marsh, intertidal mud flats, estuarine water column, and the marine water column.

6.2 Snapper/Grouper Species Complex and Relevant EFH

6.2.1 Snapper/Grouper

The project area is designated as EFH for two species of snapper in the Lutjanidae family. EFH for lane and gray snappers ranges from shallow estuarine areas (e.g., vegetated sand bottom, mangroves, jetties, pilings, bays, channels, and mud bottom) to offshore areas (e.g., hard and live bottom, coral reefs, and rocky bottom) as deep as 1,300 feet (Allen 1985, Bortone and Williams 1986). Like most snappers, these species participate in group spawning, which indicates either an offshore migration or a tendency for larger, mature individuals to take residency in deeper, offshore waters. Both the eggs and larvae of these snappers are pelagic (Richards et al. 1994). After an unspecified period of time in the water column, the planktivorous larvae move inshore and become demersal juveniles. The diet of these newly settled juveniles consists of benthic crustaceans and fish. Juveniles inhabit a variety of shallow, estuarine areas including vegetated sand bottom, bays, mangroves, finger coral, and seagrass beds. As adults, most are common to deeper offshore areas such as live and hardbottoms, coral reefs, and rock rubble. However, adult gray and lane snapper also inhabit vegetated sand bottoms with gray snapper less frequently occurring in estuaries and mangroves (Bortone and Williams 1986). Data suggests that adults tend to remain in one area. The diet of adult snappers includes a variety of fish, shrimp, crabs, gastropods, cephalopods, worms, and plankton. All species are of commercial and/or recreational importance (Bortone and Williams 1986).

6.2.2 Snapper/Grouper Complex EFH in Project Area

EFH for the grouper/snapper complex species discussed above include the estuarine water column, intertidal flats, and estuarine marsh. These habitats provide migration, refuge, and feeding/developmental areas for post-larval, juvenile, and/or adults of these species. Furthermore, Georgia and South Carolina tidal inlets, state-designated nursery areas, and oyster/shell bottoms are considered HAPCs for the grouper-snapper complex (NMFS 2008).

6.3 Coastal Migratory Pelagics and Relevant EFH

6.3.1 Spanish Mackerel

The Spanish mackerel is important both commercially and recreationally. The Atlantic States Marine Fisheries Commission (ASFMC) and the SAFMC cooperatively manage Spanish mackerel, a member of the Scombridae family. Spanish mackerel management has resulted in a steady stock abundance increase since 1995; and based on 2002/2003 data, the population is not over-fished. Spanish mackerel are found within the coastal waters of the eastern United States and the Gulf of Mexico. NOAA's Estuarine Living Marine Resource Program, a cooperative effort of the National Ocean Service and NMFS, compiles regional information on estuarine habitat by select marine fish and invertebrates. The accumulated data emphasize the essential nature and extreme importance that estuarine habitats have on Spanish mackerel life stages (NOAA 2009c).

Smaller than its congener the king mackerel (but have been reported to reach three feet in length), the Spanish mackerel's average adult weight is two to three pounds. Spanish mackerel are a fast-growing species, and both sexes are capable of reproduction by the second or third year (SAFMC 2009d, Mercer et.al. 1990). They have a life span of five to eight years (ASMFC 2009a). Spanish mackerel form immense, fast-moving, and surface- feeding schools of comparable-sized individuals. The diet of scombrids consists primarily of fish and, to a lesser extent, penaeid shrimp and cephalopods. The fish that make up the bulk of their diet are small schooling clupeids [e.g., Atlantic menhaden, alewives (*Alosa pseudoharengus*), Atlantic thread herring (*Opisthonema oglinum*), anchovies], atherinids, and to a lesser extent jack mackerels (*Trachurus symmetricus*), snappers, grunts (H*aemulidae* sp.), and half beaks (*Hemiramphidae* sp.) (Collette and Nauen 1983). Shrimp and jellyfish have also been reported in stomach contents (Mercer et.al. 1990).

As ocean temperatures warm, Spanish mackerel seasonally migrate along the western Atlantic coast. With increasing water temperatures, Spanish mackerel move northward from Florida to Rhode Island between late February and July, and return in the fall (Collette and Nauen 1983). Spanish mackerel spawn in groups over the inner continental shelf, and spawning takes place May through September with peaks in July and August. Batch spawning takes place, frequently inshore. Females grow faster and larger than males; and by age two, females may release up to 1.5 million eggs (Mercer et al. 1990). The eggs are pelagic and hatch into planktonic larvae. Larvae grow quickly and may be found inshore at shallow depths less than 30 feet. There are indications of vertical larval migration during night-time hours (Mercer et al. 1990). Juveniles use estuaries as nursery areas but most remain in nearshore ocean waters. The continental shelf, tidal estuaries, and coastal waters are all habitats for adult Spanish mackerel. However, adults spend most of their life in the open ocean; but can be found over deep reefs, grass beds, and estuarine shallows (ASMFC 2009a). Their distribution is considered primarily dependant on water salinity and temperature (ASMFC 2009a, ASMFC 2009b, and Mercer et al.1990).

6.3.2 Cobia

Cobia are fished both commercially and recreationally; however, the commercial harvest is mostly incidental in both the hook and line, and net fisheries. The recreational harvest is primarily through charter boats, party boats, and fishers fishing from piers and jetties. Cobia, a member of the Rachycentridae family is managed by the SAFMC (SAFMC 2009b, NMFS 2008). Cobia, sometimes referred to as "crabeater," is found worldwide in a circum-tropical distribution (SAFMC

2009b, University of Florida 2009) in tropical, subtropical, and warm temperate waters where they inhabit estuarine and shelf waters depending on their life stage.

Cobia are prominent in warm, seasonal waters from Chesapeake Bay south through the Gulf of Mexico; and migrate from tropical waters in the winter to warm temperate waters in the spring, summer, and fall. Tagging studies have documented a north-south, spring-fall migration along the southeast United States and an inshore-offshore, spring-fall migration off South Carolina (Ditty and Shaw 1992). As a migratory pelagic fish, cobia are found around offshore reefs and over the continental shelf; preferring structures, platforms, and flotsam. Cobia also inhabit inshore inlets and bays near piers, piles, and inshore structure (University of Florida 2009, Fish4Fun 2009). Mills (2000) indicated their association with pilings, wrecks, and other forms of vertical relief (e.g. oil and gas platforms) and their preference for shade from these structures.

Males and females reach sexual maturity at ages two and three, respectively (SAFMC 1983, University of Florida 2009); though females grow faster than males. Sexual maturity is attained by males at an approximate 21-inch length during the second year and at an approximate 28-inch length for females during their third year (Shaffer and Nakamura 1989). Based on past collections of gravid females, spawning takes place from mid May extending through the end of August off South Carolina (Shaffer and Nakamura 1989). Eggs and sperm are released into offshore open waters where external fertilization takes place in large spawning aggregations. However, cobia have also been documented to spawn in estuaries and bays. Cobia spawn once every nine to twelve days; spawning 15 to 20 times during the season. Eggs have been collected in the lower Chesapeake Bay inlets, North Carolina estuaries, in coastal waters 66 to 161 feet deep, and near the edge of the Florida Current, and the Gulf Stream (Ditty and Shaw 1992). Ditty and Shaw (1992) suggested that cobia spawn during the day since all the embryos they examined were at similar stages of development. After 24 to 36 hours following fertilization, larvae emerge and move inshore to lower salinities.

Eyes and mouths develop approximately five days after hatching, allowing active feeding. By day 30, the juveniles take on an adult appearance. Cobia are voracious predators that forage primarily near the bottom, but on occasion do take some prey near the surface. As carnivores, they feed on small fish such as striped mullet, pinfish, Atlantic croakers (*Micropogonias undulatus*), and Atlantic herring (*Clupea harengus*); as well as on crustaceans, benthic invertebrates, and cephalopods. Known as a ravenous feeder, cobia often fully engulf their prey using villiform teeth (bands of small slender teeth located on their jaws, tongue, and roof of mouth). Young cobia seem to require a substantial crustacean diet and appear to do poorly feeding on primarily fish. Cobia will move in schools of 3 to 100 fish hunting shoreline shallows for migratory prey. They will follow or track sharks, turtles, and rays scavenging orts (SAFMC 1983, University of Florida 2009). No predator studies have been conducted, but dolphin (*Coryphaena* sp.) have been known to feed on small cobia (University of Florida 2009).

Cobia exhibit rapid growth, may attain a length of six feet, and are known to live ten years or so (Shaffer and Nakamura 1989). Some cobia documented off North Carolina had maximum ages of 14 years for males and 13 years for females. Adults are large, streamlined, slim- bodied fish with a wide, flattened head, and protruding lower jaw. They are powerful fish averaging 20 to 40 pounds, but can reach up to 130 pounds.

6.3.3 Coastal Pelagic Species EFH in the Project Area

Coastal migratory pelagics depend on estuarine systems for various life stages. Spanish mackerel juveniles depend on estuarine habitats, as do larvae, post-larvae, juvenile, and adult cobia. Estuarine EFHs provide transport, refuge, and feeding grounds, as well as developmental areas. Many important prey species for coastal pelagics are associated with estuarine areas. As the transport medium for nutrients and organisms between the ocean and inland freshwater systems, the estuarine water column is a very important essential habitat, and emergent salt marshes provide important refuge and foraging grounds. Though coastal migratory pelagic species are dependent on estuarine systems for larvae, post-larval, juvenile, and adult developmental success; there is no HAPC for either cobia or Spanish mackerel in the project area.

6.3.4 Highly Migratory Species

Highly migratory species include billfishes, tunas, and sharks. Of these groups, sharks are the most likely to use EFHs in the project area. The Florida Museum of Natural History (FLMNH) provided the following information from biological profiles for managed shark species (FLMNH 2009). The majority of the sharks listed in Table 3 use inshore/estuarine habitats occasionally for foraging, particularly when inlet water temperatures are warmer than those offshore. As implied by their managed species classification, these species are highly migratory; moving north and south along the Atlantic coast during spring and fall, respectively. Schooling behavior is fairly common, sometimes even according to gender. Several of the managed shark species in the project area engage in complex courtship behavior prior to mating. Depending on species, gestation for young takes 8 to 15 months. Young may emerge from either viviparous (live birth) or ovoviviparous (initial emergence from egg in the mother) processes. Some species use inlets and estuaries as nursery grounds. However, the shark's life history stage that is most associated with estuarine EFHs is the juvenile stage. The feeding habits of most shark species possibly using the project area are generalist and opportunist. However, some forage more in the mid and upper water column, while others prefer to forage benthic areas.

6.3.5 Highly Migratory Species EFH in the Project Area

Potential EFH locations for highly migratory species discussed above include inlets, shorelines, coastal waters, and estuary habitats. Sharks may utilize any of the EFHs in the project area, especially for foraging. Their use of tidal areas may be limited based on size of individuals and high tide water depths.

6.4 Other Fish and Relevant EFH

6.4.1 Bluefish Biology and Ecology

Bluefish (*Pomatomus saltatrix*) are one of the most sought-after recreational species along the Atlantic coast. The Bluefish Fishery Management Plan was the first management plan developed jointly by an interstate commission and a regional fishery management council (ASMFC 2009c).

Bluefish may be referred to regionally as choppers, blues, skipjacks and/or taylors (SAFMC 2009a). They are a migratory pelagic species found throughout most temperate coastal regions and along the coast from Maine to Florida.

In summer, bluefish are concentrated in waters from Maine to Cape Hatteras. In winter, they tend to be found offshore from Cape Hatteras to Florida (ASMFC 2009c). As water temperatures rise, the spring migration north begins and spawning commences in the South Atlantic Bight. By summer, bluefish migrate north into the Mid-Atlantic Bight; and a second spawning occurs. The two spawning events result in two distinct size groups that mix during the year making a single genetic stock [Mid-Atlantic Fishery Management Council (MAFMC) 2009, Northeast Fisheries Science Center (NEFSC) 2009a, and ASMFC 2009c]. The limiting factors affecting the migration and distribution of adult bluefish are temperature and the photoperiods. However, temporal distribution of ocean and estuarine populations may differ from year to year. Tides, weather, seasons, and prey may dictate localized migration into inlets and sounds (MAFMC 1990). Bluefish school by relative sizes and can cover tens of square miles of ocean (ASMFC 2009c, ASMFC 2009d).

Bluefish become sexually mature at age two; female sexual development is slower than in males (MAFMC 1990). Bluefish spawn offshore from Massachusetts through Florida in distinct groups referred to by the season, i.e., spring-spawned or summer-spawned. Eggs are externally fertilized, pelagic, and highly buoyant; and are released in open ocean waters, where they hatch within 48 hours (MAFMC 1990). Larvae migrate to the surface at night and then fall as deep as 13 feet during daylight hours. Bluefish larvae are not generally collected inshore and thus, there is not an EFH designation inshore for larvae (NOAA 2009d, ASMFC 2009d). As developing juveniles, bluefish move into coastal sounds and estuaries of the Mid-Atlantic Bight and into the South Atlantic Bight, but to a lesser degree (MAFMC 1990). Juveniles prefer sandy bottom habitats, but will use mud or silty benthic habitats as well as vegetated areas, including marsh grass beds. Along the Atlantic coast, juvenile and adult bluefish are normally found in waters less than 65 feet deep. Adults use both inshore and offshore areas and favor warmer water temperatures. However, adults are not found in the Mid-Atlantic Bight at water temperatures below 14°C. Thermal differences may dictate distributional patterns between the juveniles and adults (MAFMC 1990).

Bluefish are insatiable carnivores and will eat almost anything they can catch and swallow. Bluefish stomach contents have revealed over 70 species of fish including butterfish (*Peprilus triacanthus*), alewife, Atlantic silverside, and spot (*Leiostomus xanthurus*). Bluefish have razor-sharp teeth with a shearing jaw movement allowing consumption of large parts of its prey in single strikes. Bluefish can live up to 12 years (reaching three feet in length), and exceed 30 pounds (MAFMC 1990, ASMFC 2009c).

6.4.2 Bluefish EFH in the Project Area

Migratory pelagic species such as bluefish depend on the estuarine systems during juvenile and adult stages. The project's estuarine EFHs such as the estuarine water column and emergent marshes provide transport, refuge, and feeding/developmental areas.

6.4.3 Summer Flounder

The summer flounder, a species with recreational and commercial importance, is a member of the Bothidae, or lefteye flounder, family. Summer flounder resources are managed under the Summer

Flounder, Scup and Black Sea Bass Fishery Management Plan directed by the MAFMC (NMFS 2008). The summer flounder's range includes shallow estuarine and outer continental shelf waters from Nova Scotia to Florida and the northern Gulf of Mexico (NEFSC 1999). Summer flounder display intense seasonal inshore/offshore migration patterns. From late spring through early fall, summer flounder are concentrated in estuaries and sounds until migrating to the offshore outer continental shelf wintering grounds (NEFSC 1999, ASMFC 2009f). During fall and early winter, offshore spawning occurs and the larvae are carried by wind currents into coastal areas. ost larvae and juvenile development occurs principally within the estuaries and sounds. Most individuals are sexually mature at age two. Growth rates and maximum ages vary substantially between sexes; adult females routinely grow larger and older than males (NEFSC 2009b).

Summer flounder will begin spawning at age two or three. Summer flounder eggs are pelagic, buoyant, and most plentiful between Cape Cod and Cape Hatteras. The eggs are spherical with a transparent rigid shell, and the yolk occupies approximately 95 percent of the egg volume (ASMFC 2009e, ASMFC 2009f). Larval free feeding is initiated once the yolk- sac material is consumed; which is a function of the incubation temperature (NEFSC 1999).

The left-eyed flatfish begin with eyes on both sides of its body; the right eye migrating to the left side in 20 to 32 days post-emergence. Larvae migrate to inshore coastal areas from October to May where they burrow into the sediment and develop into juveniles. Late larval and juvenile summer flounder are active predators, preying on crustaceans, copepods, and polychaetes. Research indicates that appendages of benthic fauna are an important food source for post-larval summer flounders (NEFSC 1999). Burrowing behavior is influenced by predator and prey abundance, salinity, water temperature, tides, and time of day. Juveniles inhabit marsh creeks, mud flats, and seagrass beds; but prefer primarily sandy shell substrates. Juveniles often remain inshore for 18 to 20 months. Males reach maturity at approximately ten inches; while females reach maturity at approximately 11 inches (NEFSC 1999, ASMFC 2009e).

Adults primarily inhabit sandy substrates, but have been documented in seagrass beds, marsh creeks, and sand flats. Summer flounders are quick, opportunistic predators that ambush their prey, making use of a well developed dentition. Their camouflage and bottom positioning allow for efficient predation on small fish and squid; crustaceans make up a large percentage of their diet (ASMFC 2009e, ASMFC 2009f, and NEFSC 1999). Adults are active during daylight hours and normally inhabit shallow, warm, coastal estuarine waters before wintering offshore on the outer continental shelf. Some research suggests that some older individuals may remain offshore year-round (NEFSC 1999).

6.4.4 Summer Flounder EFH in the Project Area

Summer flounders are dependent on the estuarine systems for larval, juvenile, and adult developmental success (NMFS 2008, ASMFC 2009f). The project's tidally influenced estuarine EFHs provide transport, refuge, and feeding/development areas.

7.0 ESSENTIAL FISH HABITAT EFFECTS

7.1 Overview

Maintenance dredging along the AIWW project area for the DMMP would have some immediate adverse impacts on EFH. However, the magnitude and short and long-term impacts of the proposed dredging would vary depending on location, time of the year, type of placement (ocean confined and open water), frequency of use of placement sites and the elevation to which the dredged material accumulates. Implementing best management construction/operation practices, and adhering to dredging windows, direct and indirect effects on managed species and their habitats would be minimized.

There are four best management construction/operation practices proposed for the AIWW DMMP that are the preferred alternatives (USACE 2012a). The first is that for the long term, continued discharge of dredged material into undiked tidal wetlands is not a viable alternative in Georgia. Secondly, Georgia Department of Natural Resources would prefer that open water placement of dredged material be discontinued. However, they have indicated that they would consider this alternative if the material is clean sand (at least 80% sand). The construction of high ground diked placement areas in the vicinity of some of the high shoaling areas would be a preferred method of placement versus the existing practice of undiked placement into wetlands. Lastly, placement of some of the material from the AIWW into an approved or new ODMDS is a viable alternative.

7.2 Specific Essential Fish Habitat Effects

7.2.1 Effects to Estuarine Emergent Wetlands

Estuarine emergent marshes would be directly/indirectly affected during DMMP implementation. These effected EFH wetlands would primarily be comprised of salt/brackish marshes that include cordgrasses, black needlerush, bulrush, and salt marsh aster (USACE 2012b). Not all locations within the scope of the DMMP (161 miles) would be impacted because many reaches (comprising 93 miles) have never been dredged, have not been dredged since the construction of the 12-foot channel in the 1940s, or are not dredged often so impacts would be minimal and short lived. Five of the established disposal tracts are diked which would reduce disturbance within surrounding EFH. Four established undiked disposal tracts would be used for placement with geo-tubes or other similar technology to confine dredged material to areas of existing impact within the tracts.

7.2.2 Effects to Intertidal Flats

Intertidal flats are located along the shoreline of the AIWW. These intertidal and subtidal areas may be temporarily impacted from dredging activities. The EFH intertidal flat ecosystem is especially important due to the area's significant tidal regime. Temporary losses of intertidal habitat would reduce the availability of managed species' foraging habitat. Examples of benthic infauna found within the shallow (8 to 21-foot) areas include Nereidae, Spionidae, Capitellidae, Glyceridae, and Hesionidae.

7.2.3 Effects to the Estuarine Water Column

Water quality concerns are of particular importance within all EFHs, including emergent marsh, and intertidal flats. Effects on the water column would potentially occur during the project dredging, construction, operation, and maintenance activities. Adverse effects resulting from new work dredging would potentially include alterations in current flow patterns, increased turbidity, and reductions in dissolved oxygen. The return response time to background turbidity levels would depend on tides, rainfall, and winds. An increase in turbidity levels, regardless of the source would interfere with the diversity and concentration of phytoplankton and zooplankton; therefore, affecting foraging success and patterns of schooling fish and other grazers that comprise prey for managed species.

However, turbidity from dredging activities would be temporary, and should be somewhat mitigated through the application of best management practices (BMPs) during dredge and fill activities. Observance of appropriate dredging windows and use of approved and managed placement locations would further limit potential adverse dredging effects. Due to the movement of water through the project area, it is difficult to quantify the amount of water column habitat that would be affected by dredging activities.

7.2.4 Effects to Oyster Reefs/Shell Bars

There are only a few known oyster reefs and shell bars that are located along the Districts 36 reaches of the AIWW. Indirect, temporary impacts may occur within those areas during dredging activities. Turbidity within the water column during dredging activities involves fine-grained material which is restricted to the dredging operation area. Concentrations of suspended materials may mean the relative productivity of these reefs may be decreased due to reduced pytoplankton/zooplankton production due to increased turbidity. However, the effects should be short in duration and have minimal effects to oyster reefs.

7.2.5 Effects on Marine Water Column

The water column is an EFH used for foraging and migration by both managed species and prey of managed species. Water quality concerns are of particular importance in the maintenance of this important habitat, which is associated with deep unvegetated habitats. Effects on the marine water column could occur during dredging activities. Adverse effects resulting from dredging could include alterations in current flow patterns, changes in salinity, increases in turbidity, and reductions in dissolved oxygen.

Turbidity from ocean placement of dredged sediments would be temporary, and should be somewhat mitigated through the application of best management practices in accordance with the Site Materials Management Plan for each ODMDS. Observance of appropriate dredging time intervals when dredging would least impact managed species behavior and foraging and use of approved and managed placement locations, would further limit adverse effects.

7.3 Potential Effects on Managed Species

7.3.1 General Effects

The effects on managed species and their habitats are the impacts to estuarine wetlands and intertidal flats along AIWW. Additional direct effects would occur from the mortality and/or injury of individuals through the dredging and filling processes. Fish and invertebrates would be at risk at any life-history stage; eggs, larvae, juveniles, and even adults may be inadvertently killed, disabled, or undergo physiological stress adversely affecting behavior or health. Less motile species, such as juvenile shrimp, benthos, and early developmental stages of fish would be particularly vulnerable, as they could be smothered or entrained.

Although dredge operations may directly impact individuals of managed species, dredging and filling may have more subtle effects. For example, dredging activities may interfere with migration patterns of species that utilize both channel and near shore depths. This is a particular concern for species that travel along shorelines and bulkheads.

Potential indirect effects due to changes in current patterns, tidal flow, turbidity, and dissolved oxygen may occur as a result of the construction, dredging and filling, and subsequent vessel operations. Species may be more or less affected depending on the seasonal timing and length of exposure to these construction/operational activities. Younger individuals and less motile species would be more susceptible to these potential adverse effects.

Effects from sediment plumes should be minimal due to the limited spatial and temporal extents and transient nature of the sediment plume in waters with strong tidal currents. Also, few adult fish have been entrained by dredging operations (McGraw and Armstrong 1988, Reine and Clark 1998); most juvenile and adult fishes again have the ability to migrate away from the dredging activities. Consequently, dredging operations should have minimal effects on juvenile and adult managed and non-managed fish in the area. In addition, the reduction of benthic and infaunal prey and pelagic prey in the immediate area should have little effect on juvenile and adult fishes because they can migrate to, and forage in, adjacent areas that would have not been adversely affected.

7.3.2 Effects to Shrimp Species

EFH-HAPCs for brown, pink and white shrimp include coastal inlets (SAFMC 1998). Over-wintering areas and nursery habitats inside inlets are also important. The project area includes productive estuarine habitats that may be used by brown and white shrimp; such as emergent marsh, unvegetated bottom, and oyster sets. The removal of estuarine habitat (including intertidal flats and marshes) formerly available for shrimp would potentially render the area much less functional for shrimp life stages. Localized turbidity during construction and dredging and potential turbidity, and dissolved oxygen changes following new dredging would potentially have adverse effects on shrimp physiology and behavior. Many individual shrimp of all life-history stages would likely be directly removed from the project area as a result of entrainment in the dredging equipment and dredged material management process. In addition, the food-base of shrimp within the potential project footprint would likely be affected by changes in water quality and hydraulics during dredging activities. However, the food-base would recover somewhat as water quality rebounds following construction and dredging. Individuals would likely forage in adjacent areas that have not been physically affected. Engineered stormwater management systems, spill prevention and counter control measures, operational management systems, and dredging window compliance would minimize the potential adverse effects from dredging and operations.

7.3.3 Effects to Grouper-Snapper Complex Species

The project area includes estuarine resources that may be used by snapper species and their prey. Adult, juvenile, and post-larval snapper may be directly taken through dredging and filling effects. Productive estuarine marshes and benthic habitat, particularly useful for snapper foraging and refuge for young, would be directly lost. The project would potentially cause localized turbidity during dredging, which would potentially be minimized using best management practices so that any effects from suspended materials would be minor and temporary. More developed and mobile life stages would migrate to other suitable area habitats avoiding localized construction, but nearby habitats may still be adversely affected by changes in turbidity and circulation patterns. These factors and any changes in prey fish populations would potentially adversely affect the health and condition of juvenile and adult snapper in the area.

7.3.4 Effects to Coastal Migratory Pelagic Complex Species

Larval, post-larval, juvenile, and adult individuals of the coastal migratory pelagic species complex utilize estuarine habitats in the project area. Estuarine marshes and other inlet habitats are particularly important for feeding and refuge/development. Developmental areas and dredging effected prey species would be affected by the project. Individuals (particularly larvae and juveniles) would likely be incidentally taken during the dredging and filling processes. As noted for other species above, turbidity and other water quality and hydraulic issues may interfere with the health and behavior of managed fish species.

7.3.5 Effects to Highly Migratory Species

Highly migratory species potentially using the project area include sharks, most of which use inshore/inlet areas as juveniles. It is not likely that many individuals of these species would be taken by dredge equipment due to their high motility, but foraging and other behaviors may be altered as a result dredging activities. Indirect effects on these species may result if prey habitat is removed or prey populations decline in the project area. However, these migratory species are likely to move to another area where suitable prey would be found.

7.3.6 Effects to Other Managed Species

Bluefish and summer flounder may be affected by dredging and filling operations. Of the two species, flounder would potentially be more likely affected due to the significant loss of intertidal and tidal marsh EFH. However, direct effects on individuals (particularly juveniles) of both species would be possible. Generally, habitats within the project area would be less attractive to these species following construction as depths would be significantly greater, and prey fish and macroinvertebrate populations associated with intertidal and marsh habitats would be reduced.

8.0 POTENTIAL EFFECTS TO SPECIES ASSOCIATED WITH MANAGED SPECIES

"Associated species" consist of living resources that occur in conjunction with the managed species previously discussed. These living resources would include the primary prey species and other flora and fauna that occupy EFH or nearby habitats, and are depended upon by managed species.

8.1 Invertebrates

Maintenance dredging in the Georgia portion of the AIWW appears to have short-lived impacts on benthic organisms inhabiting the silty-clay sediments (Stickney and Perlmutter, 1974). Complete or near-complete removal of benthos is effected by dredging, although recovery begins within a month following dredging operations. Both diversity and species composition rapidly return to their pre-dredging levels. Since most of the areas to be dredged are composed substantially of silty material, the impacts on benthic infauna at other areas are expected to reflect the above-mentioned phenomena. In areas where overboard placement methods are to be used, the impacts and recovery of benthic organisms are also expected to follow this pattern.

Zooplanktons are primarily filter feeders, and suspended inorganic particles can foul the fine structures associated with the feeding appendages. Zooplankton that feed by ciliary action (e.g., echinoderm larvae) would also be susceptible to mechanical affects of suspended particles (Sullivan and Hancock 1977). Zooplankton mortality is assumed from the physical trauma associated with dredging activities (Reine and Clark 1998), such as changes in water pressure and temperature during the dredging process. Planktonic flora and fauna would be partly restored in the area as tidal and river currents pass through the area.

Benthic fauna most directly affected by dredging and filling would include predominantly invertebrates such as decapod crustaceans, mollusks, non-managed shrimps, polychaetes, and bivalves. In locations outside the project area that are temporarily affected by changes in water quality; adverse effects on the benthic community would be minimal due to the relatively short period of recovery time needed (Culter and Mahadevan 1982, Saloman et al. 1982). Recovery periods would potentially be extended if normal hydraulic and dissolved oxygen levels in the vicinity are significantly affected by dredging activities.

8.2 Fish

Fish species not discussed within the managed species sections would also be incidentally taken or displaced to adjacent habitats during dredging. Examples of species tracked by the SAFMC and the ASMFC would potentially include, but not be limited to Atlantic croaker, Atlantic herring, Atlantic menhaden, spot, spotted seatrout, weakfish (C*ynoscion regalis*), striped bass (*Morone saxatilis*), American eel (*Anguilla rostrata*), red drum (*Sciaenops ocellatus*) and winter flounder (*Pseudopleuronectes americanus*) (ASMFC 2009g). These species would potentially use the project area for migration, foraging, refuge, and/or life stage development.

Demersal eggs, demersal ichthyofauna, and pelagic eggs and larvae would likely be affected during dredging activities due to their comparatively limited motility. In addition, suspended sediments produced by dredging and fill efforts can affect the feeding activity of unmanaged species just as they do managed fish species. However, effects on these fish due to sediment plumes would be minimal due to the limited spatial and temporal extents and transient nature of the sediment plume in waters with strong tidal and riverine currents. The employment of BMPs and dredging only during months when less damage would be done to individuals and eggs/larvae would limit damage to fish and associated species.

In addition to indirect effects from turbidity, adverse effects from food chain disruption would potentially also occur. The larvae of many managed fish species discussed in this document are hatched from planktonic eggs which result in planktonic larvae. The primary source of larval food is microzooplankton; there is a dietary overlap in many species and specialization (Sale 1991). Algae is most likely food for only the youngest larval stages of certain species, or for those larvae that are very small after hatching, and then only for a short time. The algae-eating larvae eventually switch to animal prey items while they are still small. At this time, varying life-history stages of copepods become the dominant food (and to a lesser extent cladocerans, tunicate and gastropod larvae, isopods, amphipods, and other crustaceans).

Larval feeding efficiency depends on many factors such as light intensity, temperature, prey evasiveness, food density, larva experience, and olfaction (Gerking 1994). Larval fish are visual feeders that depend on adequate light levels in the water column, which reduce the reaction distance between larval fish and prey. Suspended sediment and dispersion due to dredging activities would temporarily increase turbidity levels. This would reduce light levels within the water column which may have a short-term negative effect regarding feeding efficiency. In addition, turbidity can affect light scattering which will impede fish predation (Benfield and Minello 1996). However, because the sediment plumes are transient and temporary, and the potential effected area is subject to both river currents and tidal flushing, effects on the overall local populations of non-managed species would be minimal (Sale 1991). Hence, the majority of larval fish mortality would likely be attributed to injury and death during dredging and fill activities.

Similar to larval fish, both juvenile and adult fish are primarily visual feeders. Consequently, the visual effects of turbidity as outlined above would apply. In addition, suspended sediment can impair feeding ability by clogging the gill rakers' inter-raker space or the mucous layers of filter feeding species (Gerking 1994). However, because these fish have the ability to migrate away from the dredging activities, the effects of any turbidity plumes, which are transient and temporary, would be minimal. Also, few adult fish have been entrained by dredging operations (McGraw and Armstrong 1988, Reine and Clark 1998); most juvenile and adult fishes again have the ability to migrate away from the dredging activities. Consequently, dredging operations would have minimal effects on juvenile and adult managed and non-managed fish in the area. In addition, the reduction of benthic and infaunal prey and pelagic prey in the immediate area would have little effect on juvenile and adult fishes because they can migrate to, and forage in, adjacent areas that would have not been adversely affected.

9.0 MITIGATION

The Corps has prepared a mitigation plan in accordance with the 2008 Mitigation Rule (33 CFR Parts 325 and 332) and Section 404 of the Clean Water Act to address adverse impacts to wetlands (mainly salt marsh) that may result from implementing this DMMP. The required amount of mitigation that would be due to the implementation of the preferred plan for the proposed DMMP would be 37.5 acres. Under its proposed mitigation plan for the AIWW DMMP, the Corps would provide funds to a land trust or state resource agency for the purpose of restoration of saltmarsh. As with an in-lieu-fee program, the receiving entity would be responsible for selecting, designing, implementing, and monitoring the restoration sites. The Corps would as a result of this plan transfer its obligation to provide compensatory mitigation to the receiving entity. The amount of funds to be provided by the Corps would be calculated at $10,000 per acre for 37.5 acres of saltmarsh in the impacted portions of three undiked marsh disposal tracts for the expected future impacts if the DMMP is implemented. Funds would be provided in the amount of $375,000.

A separate action, releasing disposal easements on a number of tracts, would not directly mitigate for wetland impacts, but indirectly would encourage restoration of these tracts by a third party in the future.

The Corps believes that the implementation of the proposed DMMP would not cause significant adverse impacts to Essential Fish Habitat or EFH species and that the mitigation described above is sufficient to offset wetland impacts. No mitigation for loss of EFH other than tidal wetlands would be required.

10.0 IMPACTS TO GEOGRAPHICALLY DEFINED HABITAT AREAS OF PARTICULAR CONCERN

10.1 Gray's Reef National Marine Sanctuary (NMS)

Gray's Reef NMS is located approximately 40 nautical miles southeast of Savannah and 17 nautical miles east of Sapelo Island, in about 60 to 70 feet of water. The two new ODMDSs proposed in the DMMP would be located approximately 4-6 miles offshore, 10-15 miles inshore from Gray's Reef. Designation of new ODMDSs would require preparation of a separate Environmental Impact Statement, which would address potential impacts to Gray's Reef NMS. One requirement of US Environmental Protection Agency (USEPA) approval of a new ODMDS is that it not adversely affect a National Marine Sanctuary.

10.2 Sapelo Island National Estuarine Research Reserve (NERR)

Sapelo Island NERR is located on the western side of Sapelo Island and includes 2,100 acres of upland and 4,000 acres of saltmarsh centered on Duplin River. The Reserve is bordered on the west by a portion of the AIWW (Old Teakettle Creek and Doboy Sound reaches) that does not require dredging. No placement sites proposed for use in the DMMP are located in these reaches.

10.3 Artificial Reefs

GADNR lists 5 artificial reefs in the general vicinity of the Savannah and Brunswick ODMDSs and the potential locations of two new ODMDSs proposed in the DMMP. Turbidity plumes may be produced by placement of the dredged sediment within the existing ODMDSs as fine sediments are washed away by littoral processes. Potential effects of the new ODMDSs on artificial reefs would be assessed in the EISs that would be prepared for these sites.

SCDNR lists no artificial reefs near the Savannah District portion of the AIWW in South Carolina.

10.4 State-designated Recreational and Commercial Shellfish Areas

GADNR has designated a number of commercial and recreational shellfish harvest areas within three “growing areas” along the AIWW. Likewise, SCDNR has designated a number of commercial and recreational shellfish harvest areas including culture areas (formerly leases) along the Savannah District portion of the AIWW. The DMMP preferred alternative would not involve placement of dredged material in or near these areas. Minor impacts from dredging operations would be temporary.

11.0 SUMMARY OF EFFECTS ON EFH

The proposed Savannah District AIWW DMMP project would have potential direct and indirect effects on EFH, managed species, and species associated with managed species. During maintenance dredging of the AIWW, some direct and indirect effects will occur with estuarine emergent wetlands, intertidal flats, oyster reefs and shell banks, estuarine water column, and marine water column. However, the USACE would meet or exceed all best management practices during dredging and placement phases so as to reduce or eliminate any impacts to vegetation and water column. Best management practices involve using established diked placement locations or maintaining a site using geo-tubes which are measures that reduce or eliminate any EFH impacts. Placement of dredged material in ODMDSs would have temporary effects on the marine water column. The Corps has developed a mitigation plan that would offset adverse impacts to estuarine emergent wetlands.

Effects from the proposed DMMP on managed species would be dependent on the locations utilized for the placement areas. The deposition of material into diked areas, ODMDSs, or within locations with geo-tubes would reduce direct impacts to managed species and may only effect species during the dredging process.

Species associated with managed species are typically affected only short-term with when maintenance dredging occurs. These species recover within a month so impacts to managed species would only be short term. Indirect dredging impacts such as reduced water quality for activities such as feeding or spawning may also temporarily affect associated species since recovery time for the water column is relatively short.

Based on these effects, the proposed action of implementing the 20-year DMMP is not expected to cause significant adverse impacts to Essential Fish Habitat or EFH species. Impacts are expected to be minor on an individual project and cumulative effects basis.

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