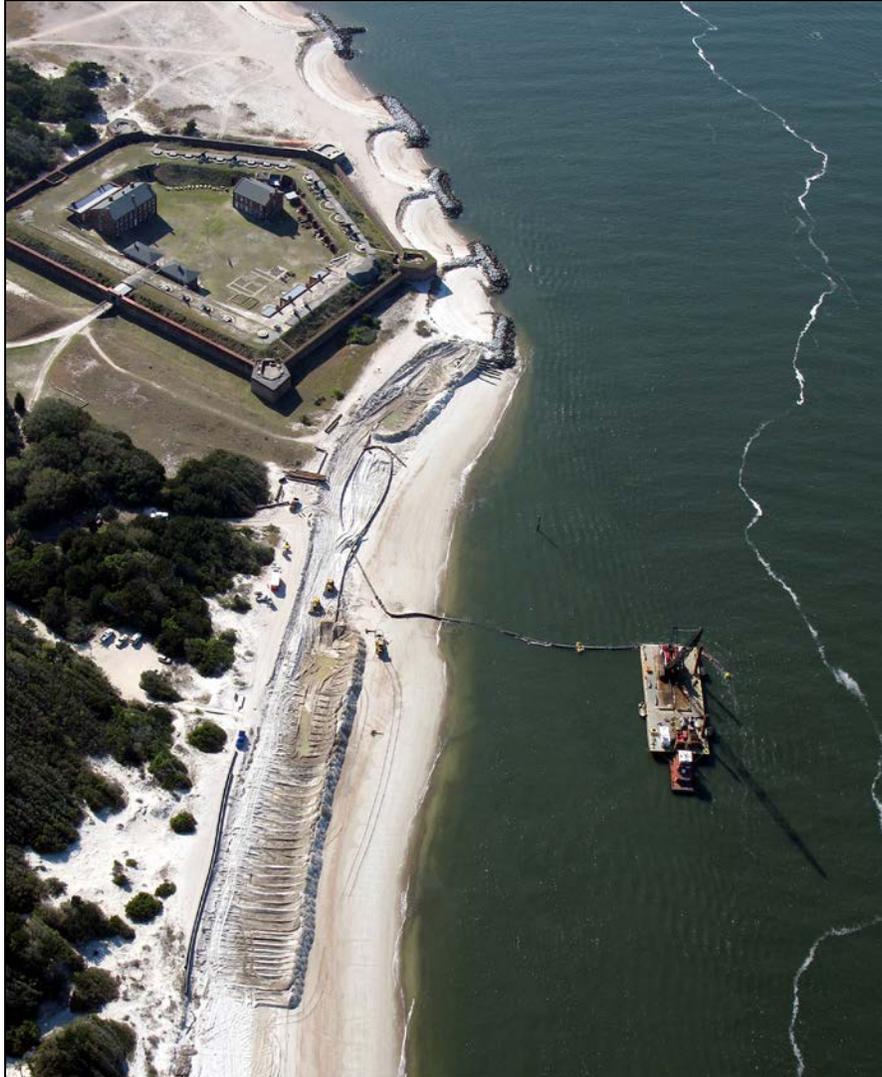


NORTHEAST FLORIDA REGIONAL SEDIMENT MANAGEMENT
Implementation Strategies and Recommendations for
Nassau County and Duval County, Florida



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INTRODUCTION

This Coastal and Hydraulics Engineering Technical Note (CHETN) provides a description of the Regional Sediment Management (RSM) investigations performed by the U.S. Army Corps of Engineers (USACE), Jacksonville District (SAJ), along Florida's northeast coast in Nassau and Duval counties. Provided first is an overview of the study area including previous RSM activities, stakeholder discussions, pertinent studies, and backgrounds of Federal projects. Following the overview, management alternatives and strategies, as well as recommendations for future actions are provided.

RSM is a systems-based approach integrating the management of littoral, estuarine, and riverine sediments to achieve balanced and sustainable solutions to sediment-related needs. RSM objectives for the Northeast Florida study area include beneficially using dredged material, coordinating dredging schedules for navigation and storm damage reduction projects, investigating alternatives to better stabilize beaches, and presenting improvements to the state's inlet management plan. These objectives can be reached by coordinating available Federal authorities, permitting, and funding, and collaborating with stakeholders on the social, cultural, and technical components to promote strategies, reach objectives, and combine resources to meet common goals.

This document reviews northeast Florida RSM accomplishments and future opportunities including the limitations and challenges that remain for accomplishing additional RSM goals. The most successful RSM objective regularly implemented in northeast Florida is beneficial use of dredged material removed from Federal civil works and military navigation channels for shore protection purposes. Beneficial use of navigation maintenance material for shore protection alleviates erosional pressure on vulnerable shorelines and protects upland assets; as a result, renourishment intervals for some shore protection projects can be increased, reducing overall project costs. Coordination with local stakeholders and environmental organizations in northeast Florida has resulted in a partnering opportunity to restore the tidal efficiency of Ft. George River Inlet, an unmaintained inlet, while providing material to a nearby shore protection project. As part of the effort, an RSM study is underway to optimize a dredging footprint that will reestablish inlet efficiency and reduce erosional pressure on the adjacent shoreline of Little Talbot Island State Park. A challenge that often arises when implementing new RSM strategies is the lack of necessary data, including geotechnical, survey, and hydrodynamic data to describe the physical processes of coastal systems. These data are essential to predict outcomes of proposed activities and satisfy concerns of environmental agencies.

STUDY AREA

Nassau and Duval counties are located on the northeast coast of Florida (refer to Figure 1). Duval County is bound to the north by Nassau County, and to the south by St. Johns County, while Nassau County is bound to the south by Duval and to the north by the Florida-Georgia State line (Camden County, Georgia). Duval County contains approximately 15 miles of Atlantic coastal shoreline, while Nassau County contains approximately 13 miles. The study area includes the entire ocean-facing coastlines of Nassau and Duval counties, and includes the following USACE projects:

- Two deep draft Federal harbors (Fernandina and Jacksonville)
- Two deep draft Navy harbors (Kings Bay and Mayport)
- The Atlantic Intracoastal Waterway (AIWW) and the Intracoastal Waterway (IWW)
- Two Federal Shore Protection Projects (SPP) (Nassau and Duval counties), and
- One local Shore Stabilization Project (South Amelia Island)

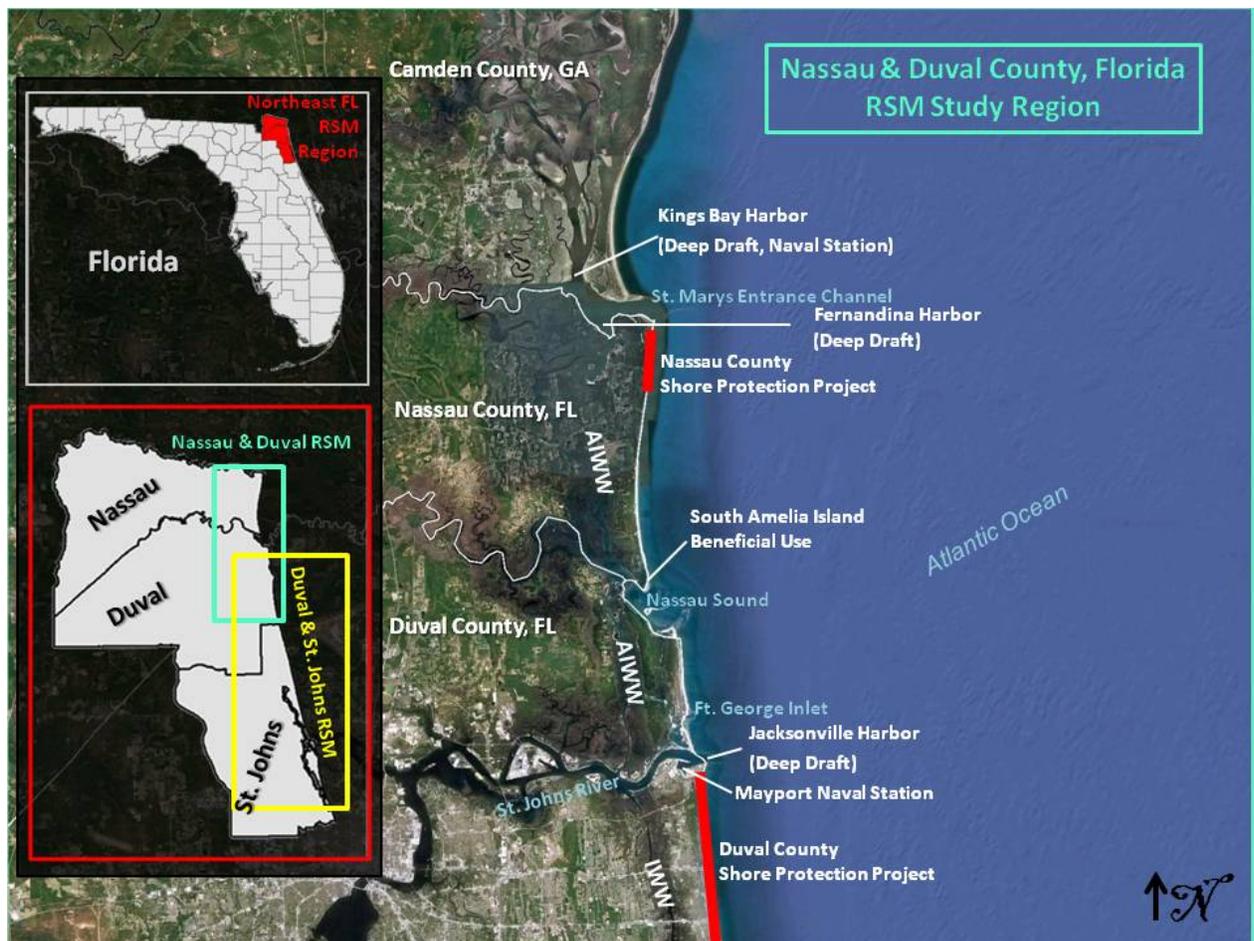


Figure 1. Northeast Florida RSM study area and Federal projects.

The area also includes two unmaintained inlets, Nassau Sound and Ft. George River (FGR), that influence sediment transport behavior, and a local (non-federal) Shore Stabilization Project located at south Amelia Island. It is the proximity of these Federal navigation and SPP projects, and their needs for sediment removal or placement, that make this an ideal area for RSM implementation.

Northeast Florida RSM Strategies and Efforts

Early in the development of the national RSM program, USACE Jacksonville District (SAJ) identified the northeast Florida region, encompassing the study area of this report and St. Johns County, as an ideal location to implement RSM due to the number of navigation and shore protection projects, as well as the numerous aquatic preserves and parks in the region. Roughly defined, RSM beneficial use of dredged material in the study area dates back to at least the early 1960s when beach-compatible material dredged from the St. Johns River (SJR) Entrance Channel was placed on the beaches downdrift of the inlet rather than disposed of offshore or in upland dredge material management areas (DMMAs). Since the early 1990s, other navigation maintenance projects (e.g., Atlantic Intracoastal Waterway [AIWW] Sawpit Creek segment and the St. Marys River Entrance Channel [Kings Bay Entrance Channel] followed suit and placed material on nearby beaches.

In 2000, SAJ organized several workshops with the state of Florida and other stakeholders to identify potential RSM strategies which were later documented in a report by Lynn R. Martin in 2002. The primary recommendations of this report are listed below. Included are subsequent actions implemented, as a result of the recommendations.

- 1) Stabilize the south end of Amelia Island using sand from the Atlantic Intracoastal Waterway (AIWW).
 - Beneficial use of beach quality material from the Operation and Maintenance (O&M) dredging of the AIWW at Sawpit Creek
 - A local (non-federal) beach nourishment project was constructed on the south end of Amelia Island with an offshore sediment source.
- 2) Bypass sand intercepted north of the jetty at Cumberland Island, around the St. Marys River entrance, for placement on the NCSPP.
 - The authorization and initial construction of the Federal Nassau County Shore Protection Project (NCSPP) accomplished the second task. Removing material from the south end of Cumberland Island where it is accreting would require consent from the National Park Service because the island is designated a National Seashore. However, bypassing is indirectly achieved by placing beach quality material from the O&M dredging of the entrance channel on the beaches south of the inlet.

- 3) Backpass sand from the FGR northward to Little Talbot Island and bypass sand at the SJR entrance from north of the jetty to the County SPP (DCSPP).
 - This technical note analyzes the feasibility of using material in the vicinity of FGR Inlet as the sediment source for the DCSPP. Again, bypassing is already indirectly achieved by placing beach quality material from the O&M dredging of the entrance channel on the beaches south of the inlet.
 - Fiscal Year 2014 efforts include coupled hydrodynamic and wave modeling of the FGR and the SJR to test alternative borrow area configurations at the FGR Inlet ebb shoal and determination of the sediment transport nodal point south of the SJR jetties to enhance placement design of dredged material.
- 4) Bypass sand at St. Augustine Inlet, linking navigation and shore protection efforts.
 - The St. Johns County RSM efforts use the St. Johns SPP authority to dredge the St. Augustine Inlet ebb shoal and the federally-authorized navigation channel for sediment sources for the SPP.
- 5) Offload beach quality material onto shoreline areas.
 - Offloading of beach-quality sand from Dredged Material Management Areas (DMMA) to beaches is under investigation as part of the ongoing Nassau/Duval RSM program.
- 6) Demonstrate innovative technologies to maximize placement of beach quality material in the littoral zone.
 - Sediment budgets, numerical models, and RSM concepts/strategies have been continually updated as new innovations improve our ability to estimate sediment transport rates, understand regional dynamics, and predict potential littoral impacts of dredging and coastal structures. The Fiscal Year 2014 RSM Fate of Fines proposal will involve sampling sediment sources and constructed beaches to generate a set of tools/guidelines that may be used to increase the volume of O&M dredged sand that can be placed in the nearshore and on beaches. The effort may also lead to expanded SPP borrow areas if the amount of permissible in-situ fines are increased.

The projects accomplished as a result of recommendations (1) and (2) listed above demonstrate successful RSM implementation. Stability of the southern end of Amelia Island and the local (non-federal) SPP have been achieved by placing material removed from the Sawpit Cuts of the AIWW on the southern beaches of the island. This work prolongs the lifecycle of the local SPP project and protects popular state park land from erosion related to the Nassau Sound tidal currents. Navigation maintenance material removed from the Kings Bay Entrance Channel is consistently placed along the limits of the NCSPP, resulting in an increased renourishment interval for the NCSPP. Actively

bypassing Kings Bay Entrance Channel (KBEC) maintenance material offsets downdrift erosion problems caused by the navigation structures. Additional opportunities for successful RSM implementation within the study area are presented in this report.

Stakeholder Discussions

A cornerstone of RSM implementation is collaboration with stakeholders. In the process of collecting information for Fiscal Year 2012 objectives, stakeholders such as the Florida Department of Environmental Protection (FDEP), Florida Park Service (FPS), and engineering firms representing local sponsors were contacted. FDEP discussions were constructive and conveyed how SAJ authorities, permits, and funding could be combined with stakeholder resources to carry out objectives that are mutually beneficial. SAJ informed FDEP of previous and ongoing SAJ projects that have addressed some of their beach management concerns outlined in the previous workshop, as well as future strategies for the study area. An additional benefit of coordination was that SAJ had the opportunity to provide contributions to the FDEP Strategic Beach Management Plan for the Northeast Atlantic Coast Region, a document that is currently being finalized. The relationships established as a result of RSM efforts provide benefits well beyond this study area, as they prove essential on other projects throughout the state which require coordination with these same agencies.

Building upon Fiscal Year 2012 efforts, discussions with stakeholders in Fiscal Year 2013 resulted in the current RSM strategy implemented in the FGR Inlet vicinity. Letters requesting USACE perform a study of the FGR inlet system have been received from the National Parks Conservation Association and the National Park Service, an initial step toward obtaining authorization and funding under the Section 1135 Continuing Authorities Program (CAP) of the Water Resources and Development Act (WRDA) 2007. Under Section 1135 (Environmental Restoration), CAP projects provide a total project cost of \$5 million, including study and project implementation, which is cost-shared at 65% Federal and 35% non-federal. At this time, a local sponsor commitment is required by letter to USACE. Since CAP authority has not been granted, current studies of the FGR inlet system are executed under RSM funding streams. Leveraging RSM funding to analyze the problem will allow for greater flexibility during project implementation should initiation of a CAP study occur.

Establishing strong relationships and trust between all stakeholders is essential for RSM to be most effective. Previous coordination efforts to place Jacksonville Harbor navigation maintenance material on down drift beaches within the DCSPP and City of Jacksonville-owned Hanna Park served both navigation and SPP interests. However, after several instances of poor material placed on the beaches of Hanna Park and within the DCSPP, the local sponsor, the City of Jacksonville, is averse to using maintenance material to nourish beaches and instead prefers paying the additional cost of using the offshore DCSPP borrow area. Given the concern that the local sponsor has with

navigation maintenance material, greater assurance that only quality material will be used for shore protection activities needs to be provided and proven.

Previous Studies

The latest planning decision documents for Federal Civil Works projects within the study area are listed below followed by a brief description of additional studies pertinent to RSM activities in northeast Florida.

Federal project authorization change documents:

Fernandina Harbor:

“Section 107 Detailed Project Report and Environmental Assessment Fernandina Harbor Nassau County, Florida”, dated September, 1991.

Nassau County Shore Protection Project:

“Nassau County, Florida Shore Protection Project General Reevaluation Report with Final Environmental Assessment”, dated April, 1999, revised September 2004.

Jacksonville Harbor:

“Final Integrated General Reevaluation Report II and Final Supplemental Environmental Impact Statement Jacksonville Harbor, Duval County, Florida,” April, 2014.

Duval County Shore Protection Project:

“Duval County, Florida, From St. Johns River to the Duval – St. Johns County Line, Shore Protection Project Section 934 Study Reevaluation Report with Environmental Assessment,” dated October, 1990.

Additional Studies:

The inlet management plan technical report for the St. Marys River Entrance by Raichle, et al. (1997) includes an extensive study of inlet history, physical processes, natural resources, and inlet management. The primary goals of the study were to determine the relationship between the inlet and the adjacent beaches and to recommend a plan to address the problems caused by the modified inlet to the Amelia Island shoreline.

The “Northeast Florida Regional Sediment Management Review of Sediment Management at the St. Johns and Ft. George River Entrances” by the Committee on Tidal Hydraulics, U.S. Army Corps of Engineers was completed in December 2000. This document reviewed several questions regarding management of the FGR inlet in response to problems identified by stakeholders including FDEP, Florida Department of Transportation (FDOT), Florida Park Service, and SAJ. Management strategies

considered included structural, dredging, and backpassing/bypassing alternatives; inlet relocation; and a no-action alternative. It also was recommended that all agencies develop a common set of goals towards resolution of the inlet stability problem. With these goals in mind, alternatives would be analyzed further, benefit to cost ratios developed for each viable alternative, and ultimately selection of the best alternative for a final recommendation.

Gosselin, Kabling, and Cranston (2002) (from Taylor Engineering, Inc.) studied dredging alternatives for the lower FGR as well as the shoal inside of the north jetty of the SJR Entrance. The study used the hydrodynamic flow model CMS-Flow and the wave model STWAVE to evaluate the dredging alternatives and resulting impacts to the system. The STWAVE model was also used to identify the nodal point south of the SJR south jetty where sediment transport direction reverses to the north from the predominant southerly direction in the area. The Gosselin, Kabling, and Cranston (2002) study identified the nodal point to vary between 1,500 to 3,000 feet south of the SJR south jetty.

The USACE (2007) document titled “Northeast Florida Atlantic Coast Regional Sediment Budget Nassau through Volusia Counties” expanded on the sediment budget developed by Taylor Engineering, Inc. in 2002. The 2002 analysis by Taylor Engineering, Inc. started at the St. Marys River at the Florida-Georgia border (also the northern extent of Nassau County) and extended southward to include the beaches of Amelia Island, Little Talbot Island, Ward’s Bank, and the remainder of Duval County beaches to FDEP range monument R-53. USACE (2007) extended the analysis to include St. Johns County, Flagler County, and Volusia County to the south to coincide with the Northeast Florida region as defined by FDEP.

In 2008, FDEP updated the Strategic Beach Management Plan for the Northeast Atlantic Coast Region which includes the counties of Nassau, Duval, St. Johns, Flagler, and Volusia counties. The document outlays management strategies for the beaches and inlets in the region. The report recommends SAJ (1) study and analyze sand transfer or bypassing activities and their effect on the stability of the FGR inlet; and to (2) incorporate O&M dredged material from the Jacksonville Harbor Federal navigation project into the renourishment of the DCSPP.

The July 2011 RSM document titled “Implementation of Regional Sediment Management through Dredged Material Management Planning” outlined the need to incorporate RSM principles into dredge material management documents for Federal navigation projects such as Jacksonville Harbor. RSM principles have been successfully incorporated into the 2013 Jacksonville Harbor Dredge Material Management Plan (DMMP) as discussed later in this report.

In 2012, USACE published “Quantifying the Potential Economic Benefits of Regional Sediment Management (RSM)” which analyzed the cost benefits to placing material dredged from the Jacksonville Harbor channel cuts along the SJR near the ocean in the nearshore zone rather than directly on the beach or offshore in the Ocean Dredged Material Disposal Site (ODMDS). The study showed that nearshore placement cost 29% less than beach placement and 8% less than placing material in the ODMDS. Also analyzed were the benefits of using sediments from the channel cuts based on extraction and placement costs for an equivalent volume of material taken from offshore borrow areas of the DCSPP. The present value savings afforded to the DCSPP for years 10, 20, 30, 40, and 50 equaled \$19, \$33, \$43, \$49, and \$53 million, respectively.

The 2013 Jacksonville Harbor Dredge Material Management Plan (DMMP) provides an update to the operations and maintenance (O&M) dredging needs for the future 20-year period. In the DMMP, current O&M practices are examined and management plans based on future expectations of dredging requirements are reviewed. The future shoaling estimates provided in the DMMP are the basis for development of management plans for the various Dredge Material Management Areas (DMMAAs) available for disposing dredged material from Jacksonville Harbor.

Sediment

Compatibility

In order for the RSM concept to work, sediments shared between projects must be similar in nature. The material to be dredged from the sediment source must have similar characteristics (grain size, silt content, color, etc.) to the material found historically on the beach if it is going to be used for beach nourishment. In the case of the DCSPP, issues related to the quality and compatibility of material results in objections to placement of O&M material on the beach, and therefore, loss of the material from the active system.

FDEP determines sediment compatibility in their permit process, and places limits on the percent silt (fines passing the #230 U.S. Standard sieve) that can be placed in state waters and on shorelines. Sand with up to 5% fines can be placed for the purpose of beach nourishment (F.A.C. 62B-41.007). Up to 10% fines can be placed if the sand has been dredged for navigation purposes and is being beneficially used by placing it on a beach. Up to 20% fines can be placed in the nearshore.

Dredged material that does not meet FDEP standards for beach placement must be approved for upland storage or offshore disposal. Dredged material intended for ocean disposal is evaluated by USACE for compliance with physical, chemical, and toxicological parameters as set forth by Section 103 of the Marine Protection, Research, and Sanctuaries Act. Concurrence by letter from the U.S. Environmental Protection Agency (USEPA) is required under the Section 103 Act.

Needs and Sources

A Federal SPP is typically formulated using offshore borrow areas as sand sources to address the sediment needs of the project area. RSM efforts seek to supplement SPP needs with opportune sources such as navigation O&M material, especially when cost savings are afforded to both the navigation and shore protection business lines.

Sediment needs in the study area include the authorized Nassau County and Duval County SPPs, as well as a local beach nourishment project on south Amelia Island. The current sediment sources in the project area include locations within navigation projects (e.g., AIWW/Sawpit Creek and the navigation channels of Jacksonville Harbor, Mayport, Kings Bay, and Fernandina Harbor), and separate offshore borrow area sources for both the NCSPP and DCSPP (as identified in project formulation).

A potential source that this study explores is the material in the vicinity of FGR Inlet. Local stakeholders have conveyed considerable interest in this alternative to restore the system and prevent future environmental degradation that could result from inlet closure (refer to the FGR Inlet management section). Additionally, efforts to offload and use beach quality material currently available in the Kings Bay DMMA are under investigation and discussed later in this document.

Sediment Budget

In order to coordinate any projects, the sediment pathways, sources, and sinks within the beach and inlet system must be defined and the existing sediment budget continually updated. A sediment budget analysis in Fiscal Year 2012 resulted in the compilation of all available sediment studies, management plans, and reports in Nassau and Duval counties, as well as information (or lack thereof) north of the Kings Bay Entrance Channel. To avoid the duplication of previous work, an inquiry into SAJ efforts in the early to mid 2000s by previous SAJ RSM points of contacts, Tom Smith and Bradd Schwichtenberg, also was conducted. The analysis, results, and influence on current and future RSM strategies are described further throughout this document.

Once all available information collected in Fiscal Year 2012 was reviewed, the transport rates, beach placements, and removal estimates deemed most accurate were input into the latest version of the Sediment Budget Analysis System (SBAS) to create the current working sediment budget in the study area (refer to Figure 2). This latest version, now integrated as an add-in for ArcGIS 10, provides a better platform to work with the sediment budget and other geospatially referenced data. Ultimately all input values were sourced from the Northeast Florida Atlantic Coast Regional Sediment Budget – Nassau through Volusia Counties (USACE, 2007). It should be noted that these current estimates have many possibilities for error, and they will be refined as more data is collected and studies in this area are continued. It is believed that any errors in the sediment budget will not significantly affect the recommendations provided in this

report. Information north of the Kings Bay Entrance Channel is particularly desirable as the net littoral drift along this region of the coastline is from north to south, and therefore would be where sediment enters the study area. The budget will be used to help understand coastal processes in the study area.

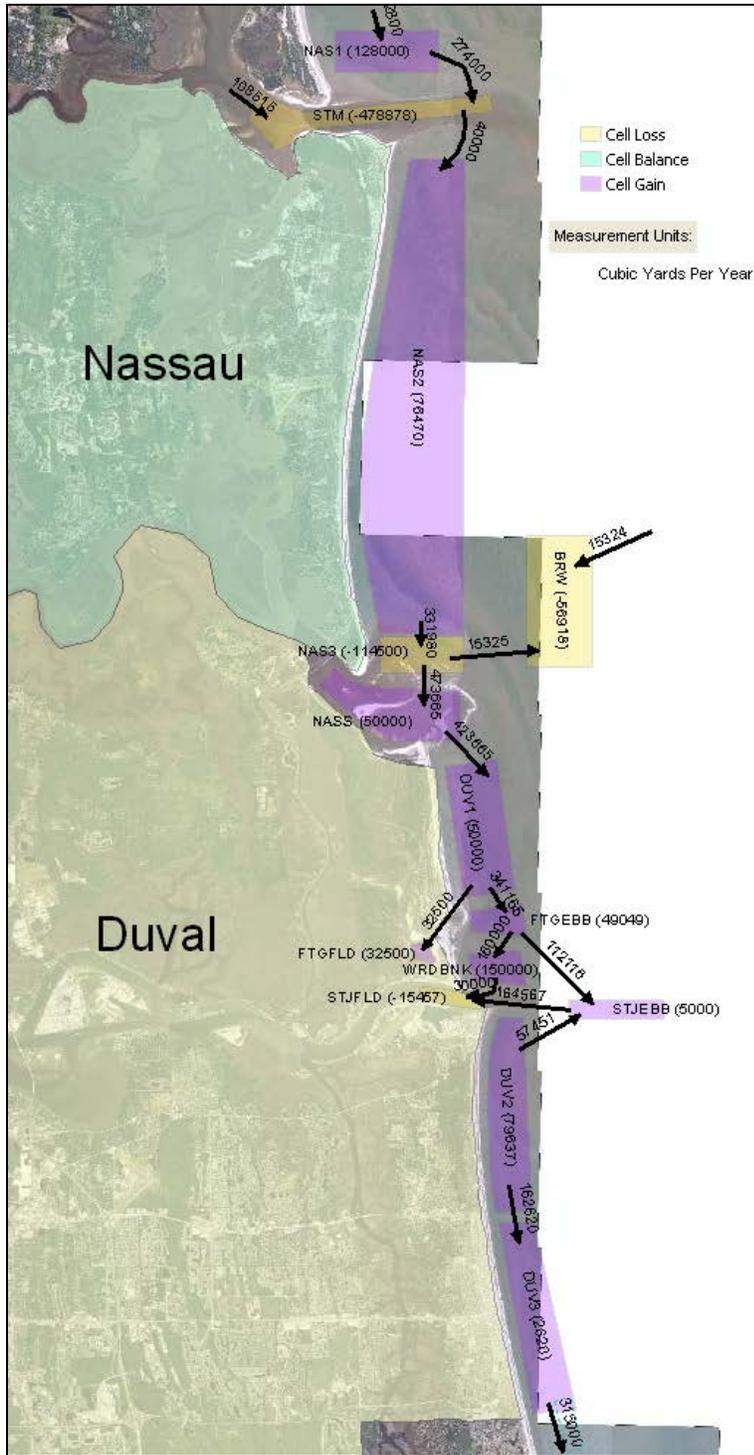


Figure 2. Sediment budget for Nassau and Duval Counties in SBAS.

Northeast Florida Federal Projects

The following section outlines the various Federal projects in the study area, including project authority and permitting. Refer to Figure 1 for locations of the projects and features discussed in this section. The majority of projects require FDEP Joint Coastal Permits – Consolidated Joint Coastal Permits and Sovereign Submerged Lands Authorizations. Permits issued for several projects within the study area cover various dredging and placement sites in their vicinity. Permits that enable the placement of beach quality material back into the system represent an RSM-oriented permit. It is important to note the value provided by having various placement opportunities under one permit to facilitate RSM activities.

For Navy projects, such as Kings Bay and Mayport, additional Department of Army (DA) permits are required. The USACE regulatory divisions do not permit USACE civil works projects, which is why Army permits are not required on other Federal projects described throughout this document. For military navigation O&M, USACE issues a Section 10 permit of the Rivers and Harbors Act of 1899 (33 U.S.C. §403) to dredge material from navigation channels, a Section 404 permit of the Clean Water Act (33 U.S.C. §1344) to discharge beach quality dredged material on the beach or to discharge material in a nearshore disposal area, and a Section 103 Marine Protection, Research, and Sanctuaries Act (MPRSA) permit to transport the dredged material for the purpose of disposal in an approved Ocean Dredged Material Disposal Site (ODMDS). As mentioned previously, concurrence is needed from the USEPA to dispose of the dredged material in ODMDS sites.

Kings Bay Navigation Project

Naval Submarine Base (NSB) Kings Bay is located in Camden County, Georgia adjacent to the town of St. Marys (refer to Figure 1). The Kings Bay navigation channel begins 10.8 miles offshore of the St. Marys River entrance and extends through the Cumberland Sound to the NSB, a total length of 20.8 miles. The two jetties that stabilize the channel were constructed in the 1880s under Civil Works authority associated with the Fernandina Harbor Federal navigation project. Formerly held as Army property, NSB Kings Bay was transferred to the Navy in 1978 to support the Ohio-class Trident submarine. The channel was deepened, widened, and extended farther offshore to support the new mission. In 1986-1987, the channel was deepened and additional project features were added including settling basins (channel wideners) north and south of the channel and a 1,200-foot wide turning basin inside the inlet throat to support home-porting Trident II-missile submarines (Rosati et al., 2013).

Authorization and Funding

Navy dredging is authorized under Section 201 of the 1974 River and Harbor Act. Funding is 100% Navy and is provided from the Commander, Navy Installations Command (CNIC) as one year money, and expires each year. The St. Marys Entrance Channel cuts are also known as the Kings Bay Entrance Channel (KBEC), and the remaining cuts, heading north terminating at the naval base are known as the Kings Bay Inner Channel (KBIC). KBEC is dredged to 46 feet Mean Lower Low Water (MLLW) plus 3 additional feet for advanced maintenance depth over a channel width of 500 feet plus another 2 feet of allowable overdepth dredging for a total maximum depth of -51 feet MLLW (refer to Figure 3). KBIC is dredged to 45 feet MLLW plus 2 feet of allowable over-depth for a total maximum depth of 47 feet MLLW in the Lower Cumberland Sound (LCS). The Kings Bay and Upper Cumberland Sound (KB and UCS) section of KBIC is dredged to 44 feet MLLW plus 2 feet of allowable overdepth for a total maximum depth of 46 feet MLLW.

Permitting

Since the project crosses Florida and Georgia, as well as two different USACE districts, permits from regulatory agencies in both states, as well as two USACE districts are required.

The inner channel requires a DA Permit from the Savannah District, and a Georgia Department of Natural Resources (DNR) permit, which is a letter of concurrence. The Department of the Army Permit No. 200501790 was issued on September 22, 2007, and on January 31, 2013 was requested to extend expiration to August 31, 2014.

The entrance channel requires a DA permit from the Jacksonville District, as well as a MPRSA Section 103 permit, and an FDEP permit. The Department of the Army Permit No. 1992 01854, Section 10/404 was issued on October 17, 2005, and was extended on June 12, 2013 to expire on April 30, 2014. The MPRSA Section 103 was issued on November 1, 2012 to expire on August 23, 2015. FDEP Permit No. 0196204-001-JC was issued on September 22, 2003 and has an expiration of September 22, 2015 per Permit Modification No. 01 96204-013-JN. As described in Permit Modification No. 0196204-012-JN, placement locations for the dredged material depend on its quality and the FDEP requirements. The exact placement locations (beach, nearshore, and offshore) are detailed in the permit. The permit renewal is underway and required before annual O&M activities begin this year.

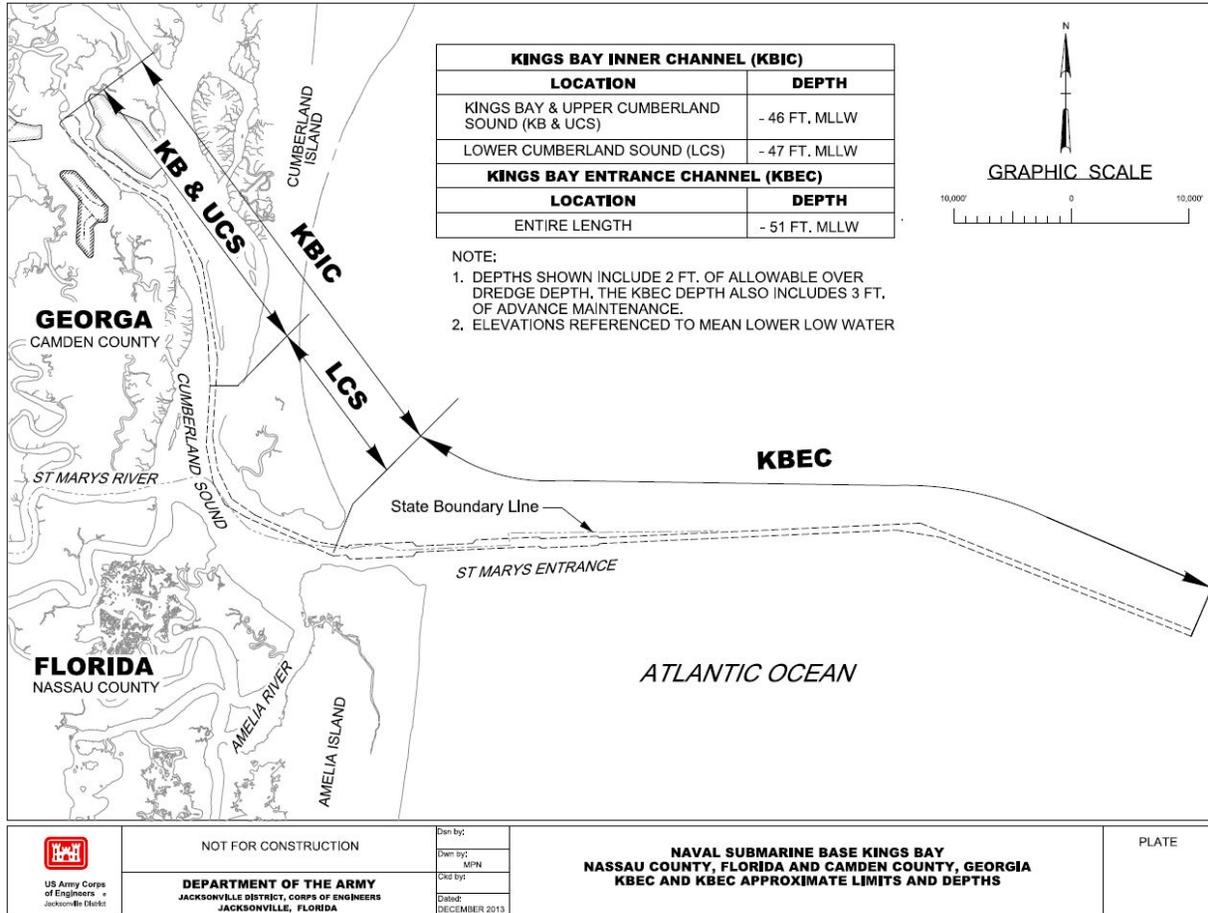


Figure 3. Kings Bay Approximate Limits and Depths.

Dredge Material Management

Both the KBEC and KBIC are typically dredged on an annual basis. Disposal of dredged material from KBIC has been limited to upland DMMA sites located adjacent to the wharf facilities; however, recent efforts have investigated beneficially using the beach/nearshore quality material to save upland storage capacity. A brief history of KBIC dredging is included in Table 1. As seen in Table 1 the estimated annual dredging requirement for KBIC equals 930,000 cubic yards/year (cy/yr). The 2013 KBIC contract specified dredging 1,415,000 cy of material plus an additional 150,000 cy should execution of all contract options occur.

Table 1. Kings Bay Inner Channel dredging events.

FY	Estimated (cy)	Actual (cy)
2006	800,000	1,101,864
2007	760,000	548,094
2008	880,000	523,423
2009	1,100,000	836,768
2010	471,000	314,887
2011*	1,190,000	1,322,525
Total	5,201,000	4,647,561
Annual Volume (cy/yr)	1,040,200	929,512
*Note 150,000 cy estimated in 2011 plans for concurrent US Marine Corps facility dredging were removed from volumes reported.		

Maintenance dredging of KBEC has used several disposal areas dating back to 1978 (refer to Figure 4). Prior to 1970, dredged material was sidecast to the southside of the channel. After 1970, dredged material was disposed offshore in Area #1, and continued until 1988 when Area #2 was designated by the USEPA (refer to Figure 4, Table 2, and Table 3). Reuse of dredged material from KBEC for shore protection purposes dates back to at least 1978-1979 when the St. Marys entrance channel was deepened for naval interest, and 1,000,000 cy of material was placed within two miles south of the south jetty, as seen in Figure 4 and Table 2. The North Beach Disposal Site (NBDS) is still in use today and average annual placement since 1990 equals 107,000 cy/yr. The South Beach Disposal Site (SBDS) was used from 1988 to 1993 and the Nearshore Disposal Site (NDS) was used from 1987 to 1995. Since 1988, all material destined for offshore disposal is placed in Offshore Disposal Area #2. To date, 22,800,000 cy have been placed in Area #2 or an annual volume of 613,000 cy/yr since 1990.

In addition to using the aforementioned disposal areas, the KBEC project also places material along the shoreline fronting Ft. Clinch (refer to inset of Figure 5). Ft. Clinch was built between 1847 and 1869 on the northern tip of Amelia Island, a location military troops have occupied since 1736. The fort initially served Confederate blockade runners during the Civil War, but following its recapture by Union forces in 1862 it served as the base of Union operations for the area. The fort became a state park in 1935 and the Fort Clinch State Park now includes the surrounding 1400+ acres. Strong tidal currents of the St. Marys River Inlet (KBEC) have necessitated construction of shore protection structures that have been rehabilitated to the present day configuration of six T-head groins and the remaining two relict groins, as seen in the Figure 5 inset. Between 1993 and 2012, 739,000 cy have been placed along the Ft. Clinch shoreline, or an average of 39,000 cy per year (refer to Table 2).

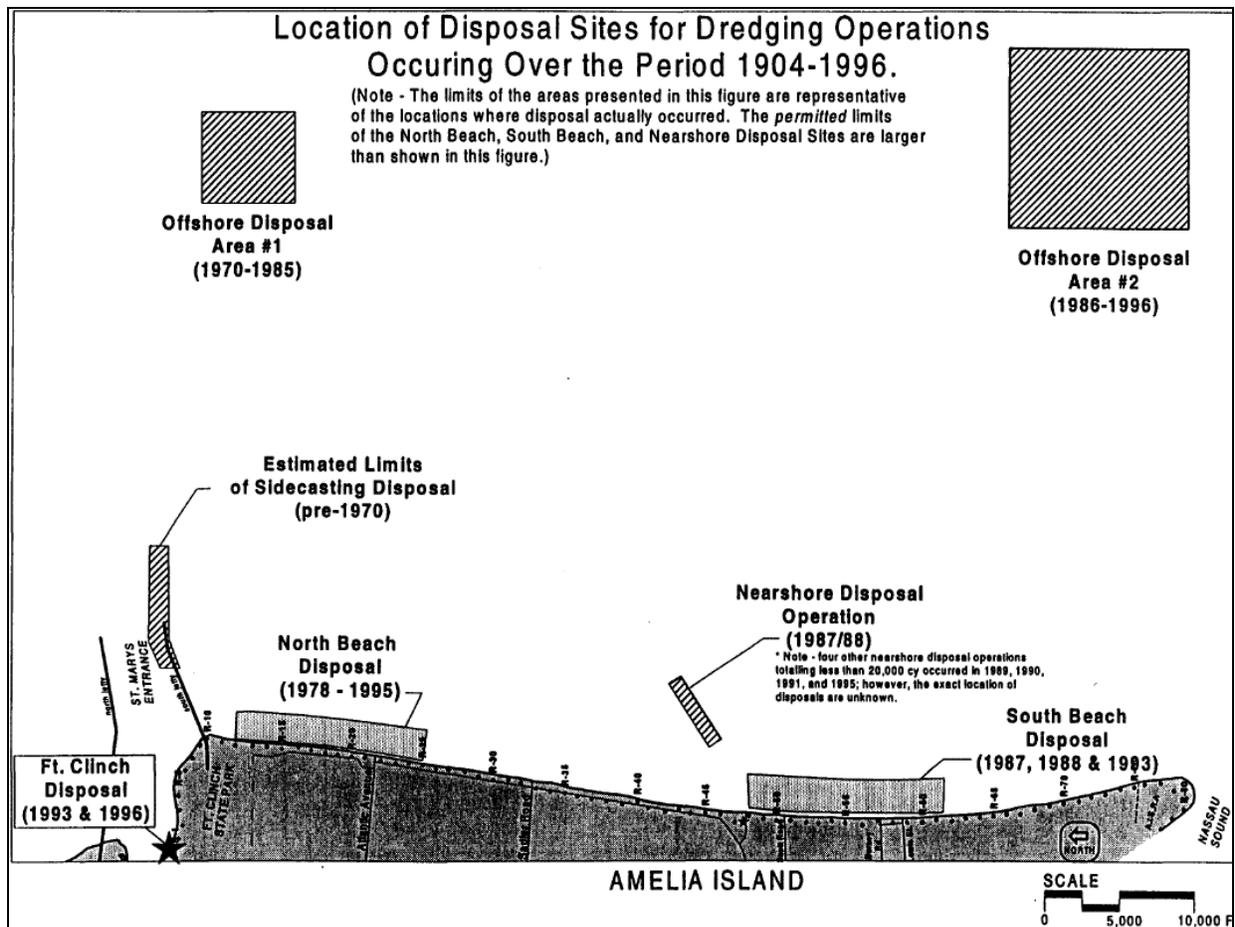


Figure 4. Disposal areas for St. Marys Entrance dredging.
 (Image adopted from Raichle et al. 1997)

In anticipation of KBEC project modifications starting in 1987, a 1986 Memorandum of Understanding (MOU) was negotiated between the State of Florida and the U.S. Navy that required the U.S. Navy to place all beach quality material within three designated Amelia Island sites. The sites included the NBDS, SBDS, and NDS (refer to Figure 6). The MOU required that at 100% Navy expense, 1.4 million cubic yards (Mcy) of the estimated new work material to be placed at the NBDS and the remaining 3.1 Mcy to be placed within the NDS. The state was required to meet an obligation of 50% of the additional cost to place the NDS material within the SBDS for the SBDS to be used. The MOU also provided that up to 100% of future U.S. Navy maintenance material would be placed along the NBDS, the NDS would only be used during emergency maintenance events, and the U.S. Navy would equally share additional costs required to place material in the SBDS versus the NBDS (Raichle et al. 1997).

Table 2. Kings Bay Entrance Channel dredged material placement history by area.

Amelia Island North Beach	
Year	Volume (cy)
1978-79	1,003,300
1982	359,900
1987-88	906,800
1990-91	147,700
1992	193,900
1995	254,200
1998	416,028
1999	402,211
2002	265,185
2003	38,298
2004	243,511
2005	42,092
2007	125,000
2008	60,170
2009	49,128
2011	89,988
2013	121,043
2014	107,634
Total (cy)	4,826,088
1990-2014 Total (cy)	2,556,088
1990-2014 Annual Volume (cy/yr)	106,504

Ft. Clinch Disposal Area	
Year	Volume (cy)
1993	157,600
1996	84,400
2001	55,741
2007	71,312
2009	246,733
2012	123,653
1993-2012 Total (cy)	739,439
1993-2012 Annual Volume (cy/yr)	38,918

Offshore Disposal Area #1	
Year	Volume (cy)
1978-79	552,300
1982	438,100
1983	78,900
1983	621,800
1984	160,900
1987-88	321,100
Total	2,173,100

Amelia Island South Beach	
Year	Volume (cy)
1988	530,000
1988-89	1,080,000
1993	450,100
Total	2,060,100

Nearshore Disposal Area	
Year	Volume (cy)
1987-88	1,618,200*
1990-91	6,700
1995	< 10,000
Total	554,900

*Note total volume placed in NDA, but 1,080,000 cy moved to SBDA in 1988-1989 so 538,200 assumed.

Deepening of the KBEC occurred between 1987 and 1988 and placement of material included all three locations outlined in the 1986 MOU, as well as Offshore Disposal Area 2. The portion placed within the NBDS was fully funded by the U.S. Navy and equaled 907,000 cy of material. With 50% funding from the State of Florida, 530,000 cy were placed in the SBDS (Raichle et al. 1997). During the deepening effort, 1,618,200 cy were also placed in the NDS in water depths of -20 to -35 ft MLW. A portion of the NDS material was later transferred to the SBDS shoreline (R-55 to R-60) using a

cutterhead suction dredge but the actual volume was disputed between USACE, the State of Florida, and local interests. The payment volume for the contractor was 1.083 Mcy, but the volume accounted for by survey equaled 750,000 cy. Olsen Associates, Inc. (2003) attributed the differences to winnowing losses (the loss of fine material, leaving coarse material behind) associated with the large volume of fine material that was observed in the fill material.



Figure 5. Federal projects at the Florida-Georgia border with Ft. Clinch inset.

Table 3. Kings Bay Entrance Channel offshore disposal history at Area 2.

Year	Volume (cy)	Notes
1988	5,456,000	
1988	267,500	Cumberland and St. Marys Entrance
1988	269,400	Cumberland and St. Marys Entrance
1988-91	2,132,100	Five Events: 1988 (720,000 cy), 1989 (152,000, 330,000, and 424,100 cy), 1990-1991 (506,000 cy)
1990-91	17,400	
1990-91	46,400	
1992	929,800	Three events (640,200; 36,000; and 253,600 cy)
1994	769,700	
1995	183,000	
1996	1,109,000	
1997	436,161	
1998	805,376	
1999	810,636	
2001	853,600	
2002	773,600	
2003	769,190	
2004	981,843	
2005	548,039	
2006	368,209	
2007	578,311	
2008	806,473	
2009	1,316,863	Two events (256,477 cy; 1,052,386 cy)
2011	764,906	
2012	537,987	
2013	678,885	
2014	625,000	
Total	22,835,379	
1990-2014 Total	14,710,379	
1990-2014 Annual Volume (cy/yr)	612,932	

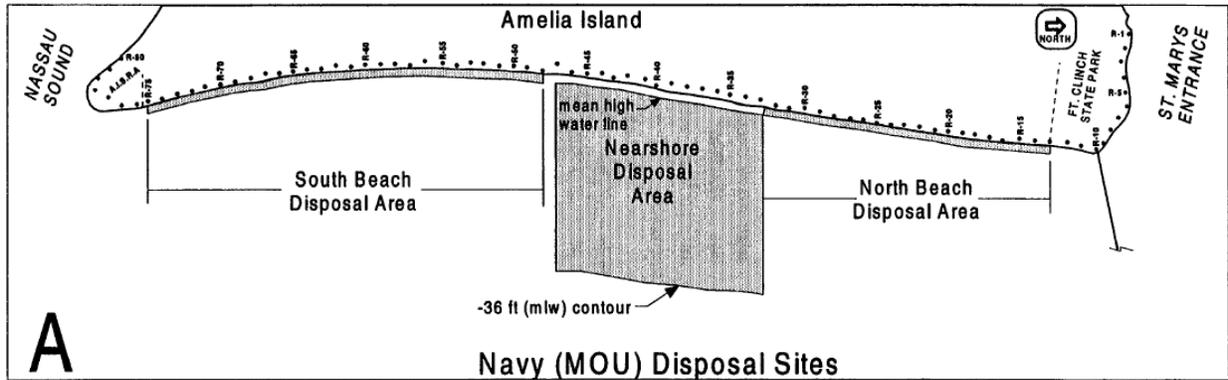


Figure 6. Amelia Island disposal areas under the 1986 State of Florida and U.S. Navy MOU.

Current SAJ annual dredging estimates for KBEC over the 2007 to 2012 period equal 774,000 cy/yr (Bearce 2014). The annual estimate calculated from the disposal history presented in Table 2 and Table 3 is found by summing the annual placement amounts for the North Beach Disposal Area (107,000 cy/yr), the Ft. Clinch Disposal Area (39,000 cy/yr), and the Offshore Disposal Area #2 (613,000 cy/yr) to arrive at 759,000 cy/yr, very close to the amount . Rosati et al. (2013) calculated average annual shoaling rates for the entire KBEC to equal 929,000 cy/yr based on survey comparisons between 2006 and 2012.

Fernandina Harbor

Fernandina Harbor is a relatively small port facility located in northeast corner of Nassau County, Florida, on the Amelia River about 23 miles north of the entrance to Jacksonville Harbor (refer to Figure 1). Access to the Atlantic Ocean is through Cumberland Sound and the inlet between the north shoreline of Amelia Island, Florida, and the south shoreline of Cumberland Island, Georgia (St. Marys/Kings Bay Entrance Channel).

Authorization and Funding

Fernandina Harbor was initially authorized under the Rivers and Harbors Act of 1880 with several modifications occurring since the initial authorization. The last modification in 1991, pursuant to the continuing authority provided by Section 107, Rivers and Harbors Act of 1960, allocated funds to construct the sponsor selected plan from the September 1991 Section 107 Detailed Project Report and Environmental Assessment for Fernandina Harbor. This plan provided for the construction of a 36-foot deep (referenced to Mean Low Water [MLW]) and 400-foot wide inner channel extending west from the entrance channel south to mile 3 at the southern end of the proposed turning basin (refer to Figure 7). The proposed turning basin configuration

includes a bottom width of 1000 feet with a stepped bottom depth of -36 feet MLW in the channel portion and -35 feet MLW in the remaining area west of the channel.

The authorized project is currently inactive. In the past there was cost sharing between the Navy and SAJ when dredging the entrance channel (now exclusively known as KBEC within SAJ) as the authorized project overlapped with Kings Bay. However, since the Navy's needs are deeper than those of Fernandina Harbor, and since material never accretes above the authorized depth for Fernandina Harbor, funding for the KBEC is now 100% Navy, and performed under Navy Authorization with SAJ acting as their agent.

Permitting

Permit Number: 0129228-001-JC was issued on March 13, 2000 with an expiration date of March 13, 2010, which was modified to extend to March 13, 2012. The permit allowed for beach or nearshore placement depending on the material quality.

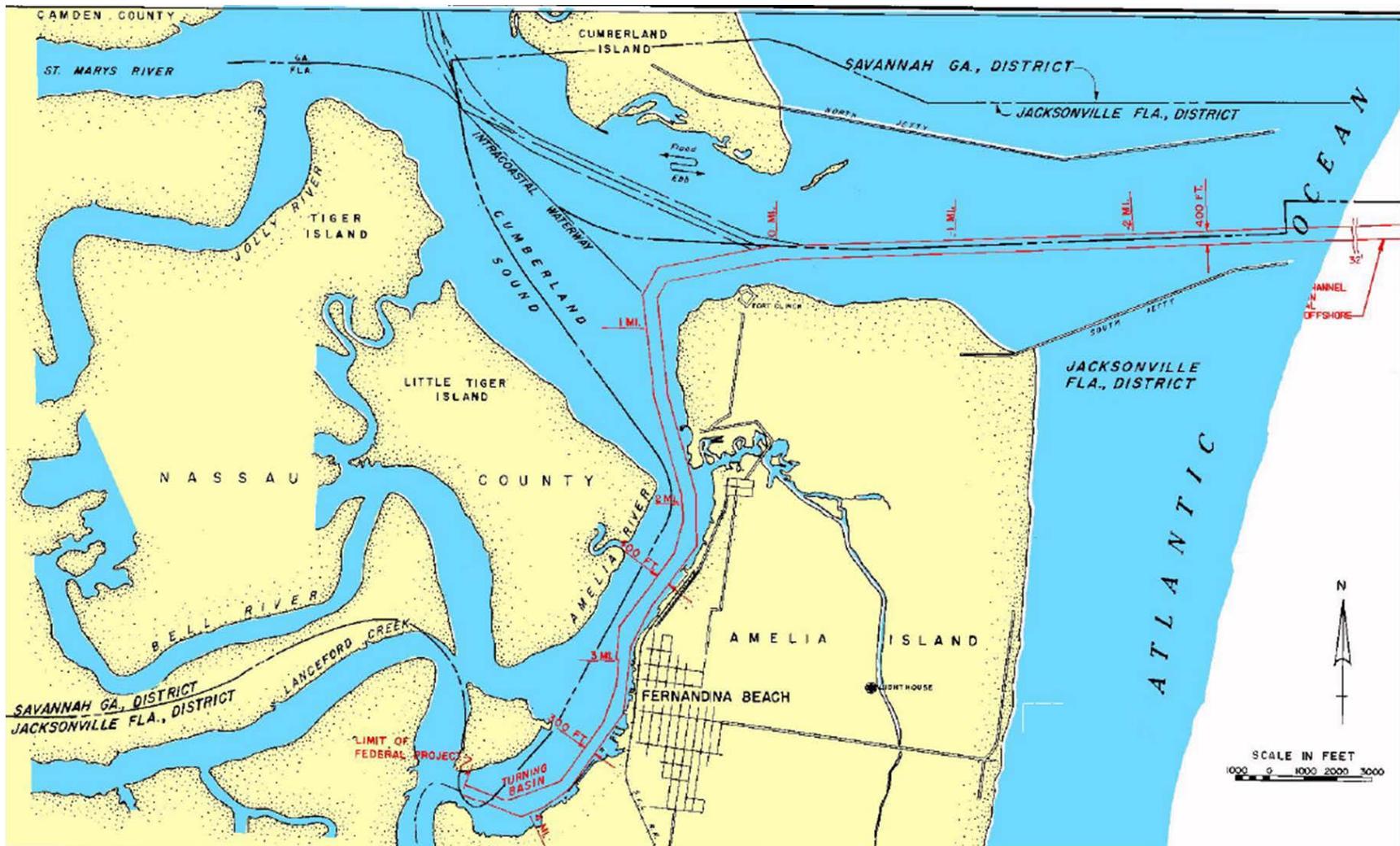


Figure 7. Fernandina Harbor project layout.

Nassau County Shore Protection Project

The Nassau County Shore Protection Project (NCSPP) is located on the northern Amelia Island shoreline extending from the St. Marys River entrance south jetty about 4.3 miles to the south (refer to Figure 1). The project was initially constructed in 2008, however initial Federal assistance for shoreline erosion problems date back to 1964. Following Hurricane Dora in 1964, a stone revetment was constructed at Fort Clinch, Fernandina Beach, and American Beach (from FDEP monument R-13 to R-21). Figure 8 illustrates the location of the revetment. Additional details are contained in USACE (2004).

Authorization and Funding

The Nassau County, Florida, Shore Protection Project (NCSPP) was authorized by Section 3(a)(3) of Public Law 100-676 dated November 17, 1988 (commonly referred to as the 1988 Water Resources Development Act). Section 3(a)(3) authorized a project for beach erosion control for Nassau County (Amelia Island), Florida in accordance with the report of the Chief of Engineers dated May 19, 1986. The authorized project provides for construction of beach erosion control measures along a 4.3-mile reach of Amelia Island, starting from the south jetty of St. Marys Inlet south to Sadler Road. The first 0.7 miles (Ft. Clinch State Park) are authorized for renourishment only, while the remaining 3.6 miles of the study limits are authorized for a 20-foot berm at elevation 13.0 feet above MLW with a 1V:20H slope seaward of the berm out to MLW, and from there a 1V:50H slope to intersection with the existing bottom (USACE, 2004).

During the review and approval process for the 2004 General Reevaluation Report (GRR), the 0.7-mile reach on the Atlantic Coast of Ft. Clinch state park was removed from the recommended plan. This stretch, consisting of the northern most reach of the project (R10-R13), was entirely within a state park and consisted of periodic renourishment only (no design berm) in order to hold the existing shoreline in place to halt erosion. Since there were no storm damage reduction benefits for this reach, it could not be incrementally justified and was therefore removed from the recommended plan. However, this area is periodically nourished with material from the Kings Bay Entrance Channel as discussed previously.

The recommended project area from the 2004 GRR is comprised of the 3.6 miles of Nassau County shoreline located between FDEP monuments R-13 through R-33; starting approximately 0.7 miles south of the south jetty for the St. Marys Entrance Channel and proceeding 3.6 miles to the south terminating near Sadler Rd. The design template berm elevation is +13.0 feet MLW and provides for a pre-project mean high water extension of 40 feet. The design slopes have changed to reflect the natural existing conditions of 1V:15H to MLW and thence 1V:25H to existing ground. The primary sediment source is located immediately south of the St. Marys Entrance Channel, approximately 2 miles from the center of the study area. The 2004 GRR increased the

renourishment interval to every 5 years (from the previously authorized 2-year interval) over the 50-year life of the project. In the 2006 revision of the GRR, advanced nourishment is stated to be 297,000 cy/yr. Olsen Associates Inc. (2003) report that after accounting for all beach placement activities, the annual erosion rate from R-10 to R-25 equals 163,000 cy/yr, far less than the advanced nourishment rate.

Permitting

Permit Number: 0264288-001-JC was issued on September 6, 2007 and has an expiration date of September 6, 2012. It was subsequently extended to September 6, 2014 by Variance Number 0264288-002-EV.

Project History

Initial construction of the NCSPP occurred in 2008. The initial nourishment placed 1,932,000 cy of material along the 3.8 mile length of the project using material from the offshore borrow area located about 12,500 feet offshore within the ebb shoal of the St. Marys River Inlet. The length of time between initial project authorization (1988) and initial project construction in 2008 is due to the large amount of material that the project beaches receive from KBEC maintenance dredging as discussed previously (refer to Table 2), and reformulation of the project features in the General Reevaluation Report of April 1999 (and 2004, 2006 revisions).



Figure 8. Nassau County Shore Protection Project Limits.

Atlantic Intracoastal Waterway and Intracoastal Waterway

The Atlantic Intracoastal Waterway (AIWW) extends from Norfolk, Virginia to the SJR in Florida. At the SJR, the waterway continues on to Miami under the official name of the Intracoastal Waterway (IWW). The change in nomenclature is illustrated in Figure 1. The waterway provides shallow draft navigation, protected from ocean swells, for the majority of the U.S. eastern seaboard.

Authorization and Funding

The Atlantic Intracoastal Waterway (AIWW) between Norfolk, Virginia and the SJR, Florida was first authorized by the United States Congress on March 4, 1913. The original channel dimensions were 7 feet deep and 100 feet wide. Expansion of the channel to its current configuration of 12 feet deep and 90 to 150 feet wide was authorized by Congress on June 20, 1938.

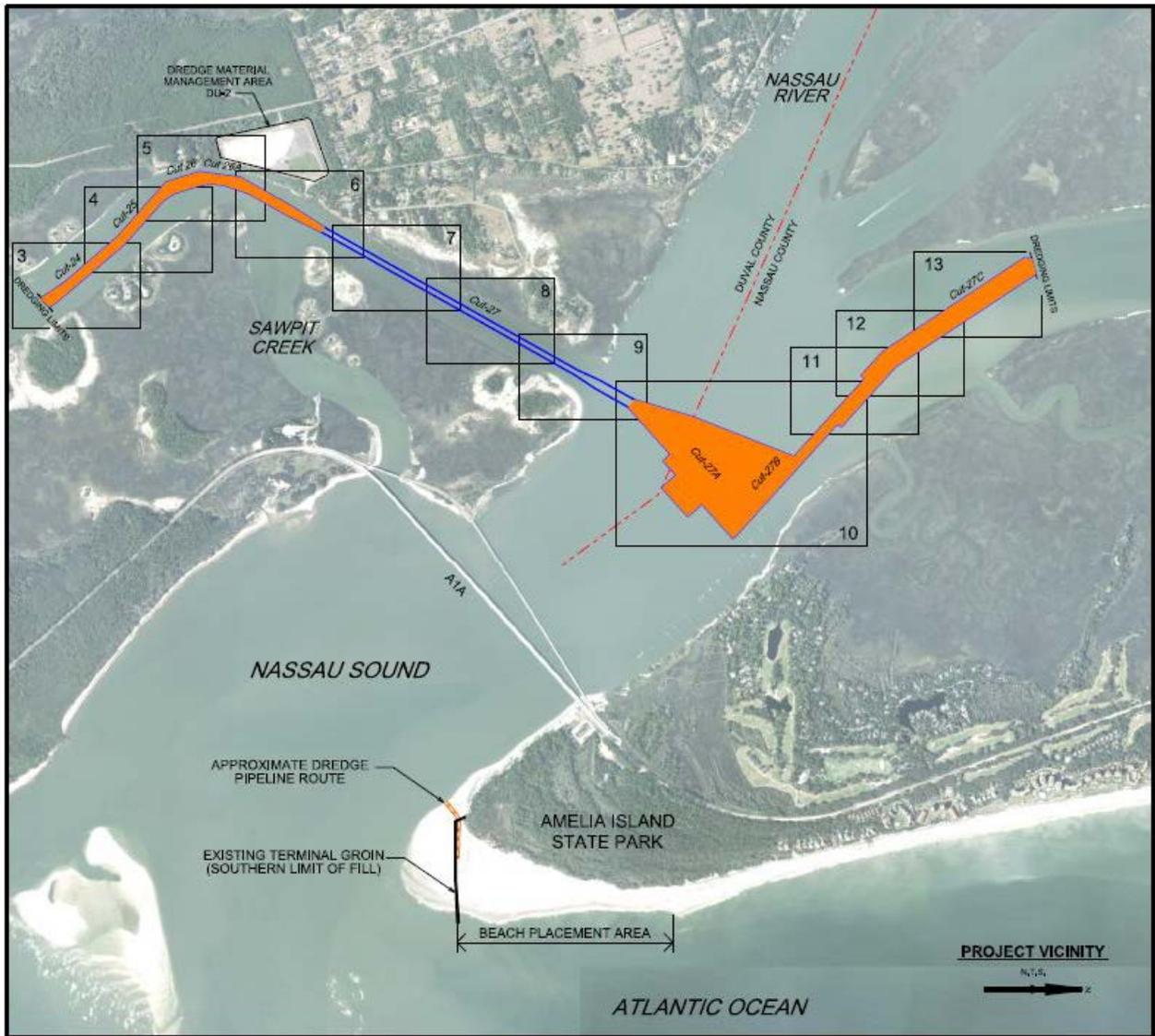
For Nassau and Duval counties, AIWW dredging is typically only required in the vicinity of Sawpit Creek. Sawpit Creek is located within the approximate 21.9 mile long segment of the AIWW stretching from Fernandina Harbor to the SJR (refer to Figure 9). Operation and Maintenance (O&M) funds are typically used for channel maintenance. Recent O&M dredging activities have occurred in 1997, 2001, 2006, and 2013, all of which placed beneficial use material on the beaches of south Amelia Island (R-73.5 to R-77). Placing material on the southern beaches of Amelia Island has prevented erosion along the state park that occupies the area, as well as helped to stabilize the southern end of the local (non-federal) shore protection project.

The 1997 AIWW-Sawpit Creek project removed approximately 418,000 cy and placed about 300,000 cy of the material on southern Amelia Island. Following the 1997 project, all of the material in the 2001 dredging event (309,000 cy) was placed on southern Amelia Island. The project plans from 2006 and 2013 indicate that 300,000 and 578,000 cy of material, respectively, were placed along the same stretch of beach as the previous two events. The 2013 project cuts are presented in Figure 9, though other O&M events in the area, namely the 2006 project, included cuts as far south as the FGR. The permit plate depicting the beach placement area for 2013 is shown in Figure 10. The material not suitable for beach placement (along Cut 27) is placed in the upland DMMA, DU-2, as seen in Figure 9.

Permitting

Permit Number 0307923-001-JC was issued on July 3, 2012 and has an expiration date of July 3, 2022. This RSM-oriented permit consists of the following: periodic maintenance dredging of approximately 300,000 cubic yards of sandy material every three years from cuts 24, 25, 26, 26A, 27 (Sta. 00 to Sta. 15), 27A, 27B and 27C of the Atlantic Intracoastal Waterway (AIWW) and the advanced maintenance areas in Sawpit Creek, the South Amelia River and Nassau Sound. The dredged material is placed on the

beach on the south end of Amelia Island. The AIWW is to be maintained at a width of 90 to 150 feet and to a maximum depth of -14 feet below MLLW, which includes a design depth of 12 feet MLLW, plus 2 feet of allowable overdepth.



■ = AREA TO BE DREDGED (MATERIAL TO BE PLACED ON THE BEACH)

Figure 9. AIWW Sawpit dredging plan, 2011 permit.

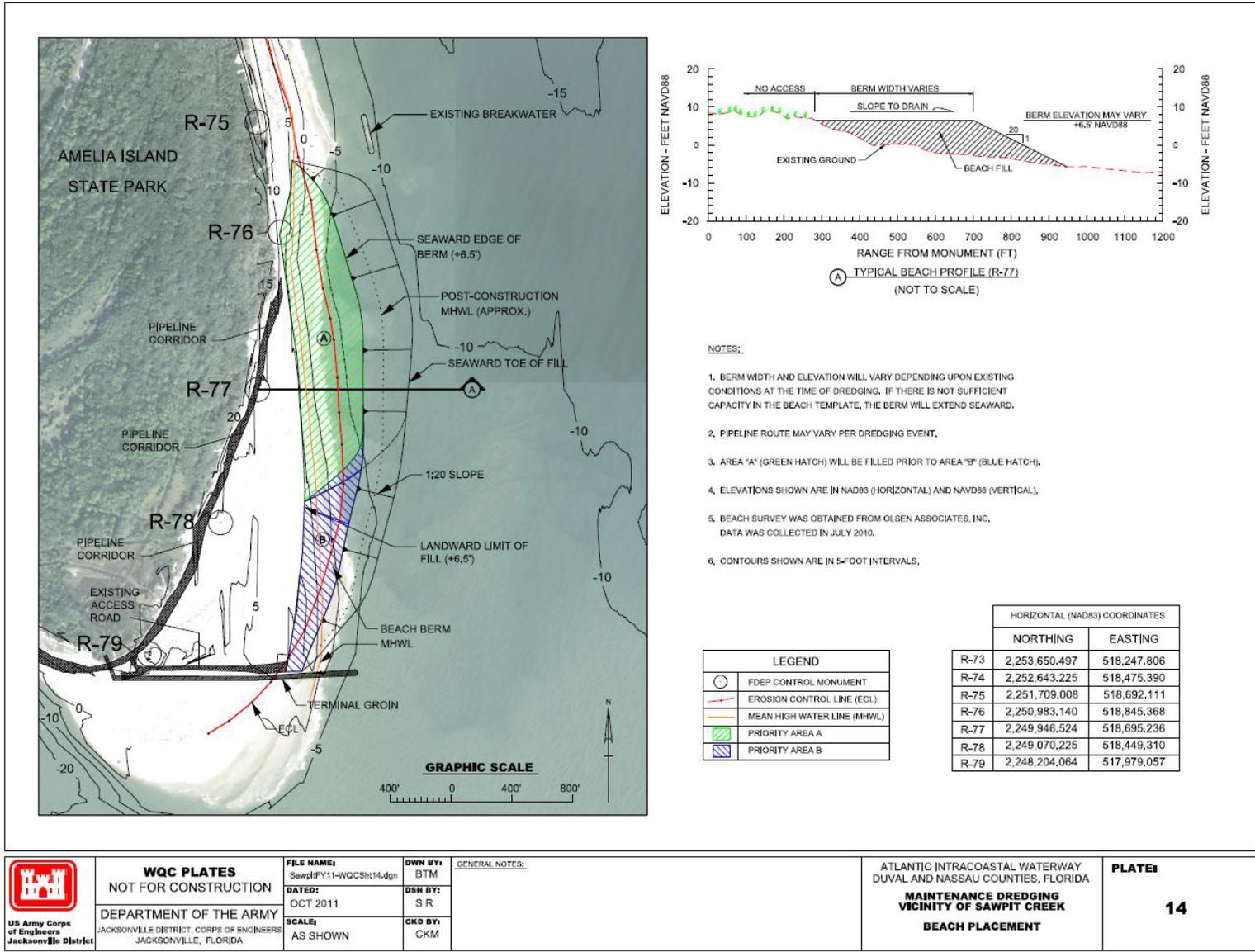


Figure 10. AIWW Sawpit dredging beach placement plan, 2011 permit.

Naval Station Mayport

Naval Station (NS) Mayport is located immediately south of the SJR Inlet about 0.5 miles upstream from the jetty tips (refer to Figure 1). In 1939, the United States selected the current site for a new naval base and originally dredged it to 29 feet relative to MLLW. The dredge spoils were used to create upland support facilities to accommodate naval interests. In 1942 the Naval Station was commissioned to provide maintenance and refueling services to submarines. This mission required deepening of the entrance channel to 42 feet. The present configuration of NS Mayport includes a turning basin, destroyer slip, and small boat basin. In 2012 the basin was deepened to 50 feet to accommodate nuclear aircraft carriers; the entrance was deepened accordingly (Thomas and Dunkin, 2012).

Authorization and Funding

Navy dredging is authorized under Section 201 of the 1974 River and Harbor Act. Funding is 100% Navy and is provided by the Commander, Navy Installations Command (CNIC) as one year money, and expires each year. The SJR Entrance Channel (Bar Cut-3) and the Mayport Entrance Channel, are dredged to -50 feet MLLW with 2 feet of allowable overdepth dredging for a total maximum depth of -52 feet MLLW. There are portions where an additional 2 feet of advance maintenance depth is also provided, bringing the total maximum depth to -54 feet MLLW in these areas. Similar to KBEC and Fernandina Harbor, the St. Johns Entrance Channel is shared between Naval Station Mayport and Jacksonville Harbor. Since the Navy's needs are deeper than those of Jacksonville Harbor, in locations where the projects overlap funding for maintenance is 100% Navy.

Permitting

As mentioned previously, in addition to an FDEP permit, Mayport requires a DA permit for dredging maintenance material, a DA permit for placement of dredged material, and a MPRSA Section 103 permit to transport dredged material for the purpose of disposal in an ODMDS. Following geotechnical analysis and confirmation of beach quality material within Mayport entrance channel cuts, SAJ secured FDEP Permit #303186001, issued May 23, 2012 (and expiring May 23, 2022) for the U.S. Navy. This permit includes authority to place material on the beach and was used for the 2013 O&M placement event. The placement of material south of the jetty in the nearshore zone (refer to Figure 15) was previously evaluated for environmental impacts as required under the National Environmental Policy Act (NEPA), but the FDEP permit does not currently provide for a nearshore placement option.

Jacksonville Harbor

The Jacksonville Harbor Federal navigation project is located in Duval County, Florida (refer to Figure 11). The project includes initial construction and maintenance starting at the mouth of the SJR, extending 27 river miles up-river. The harbor project provides deep draft vessels access to terminal facilities located in the City of Jacksonville. The primary concentration of port facilities for Jacksonville Harbor is between miles 8 and 20 of the Federal navigation project. The current project depth is 42 feet MLLW (plus 2-foot overdepth) from the ocean entrance to NS Mayport and 40 feet MLLW (plus 2-foot overdepth) through river mile 20.

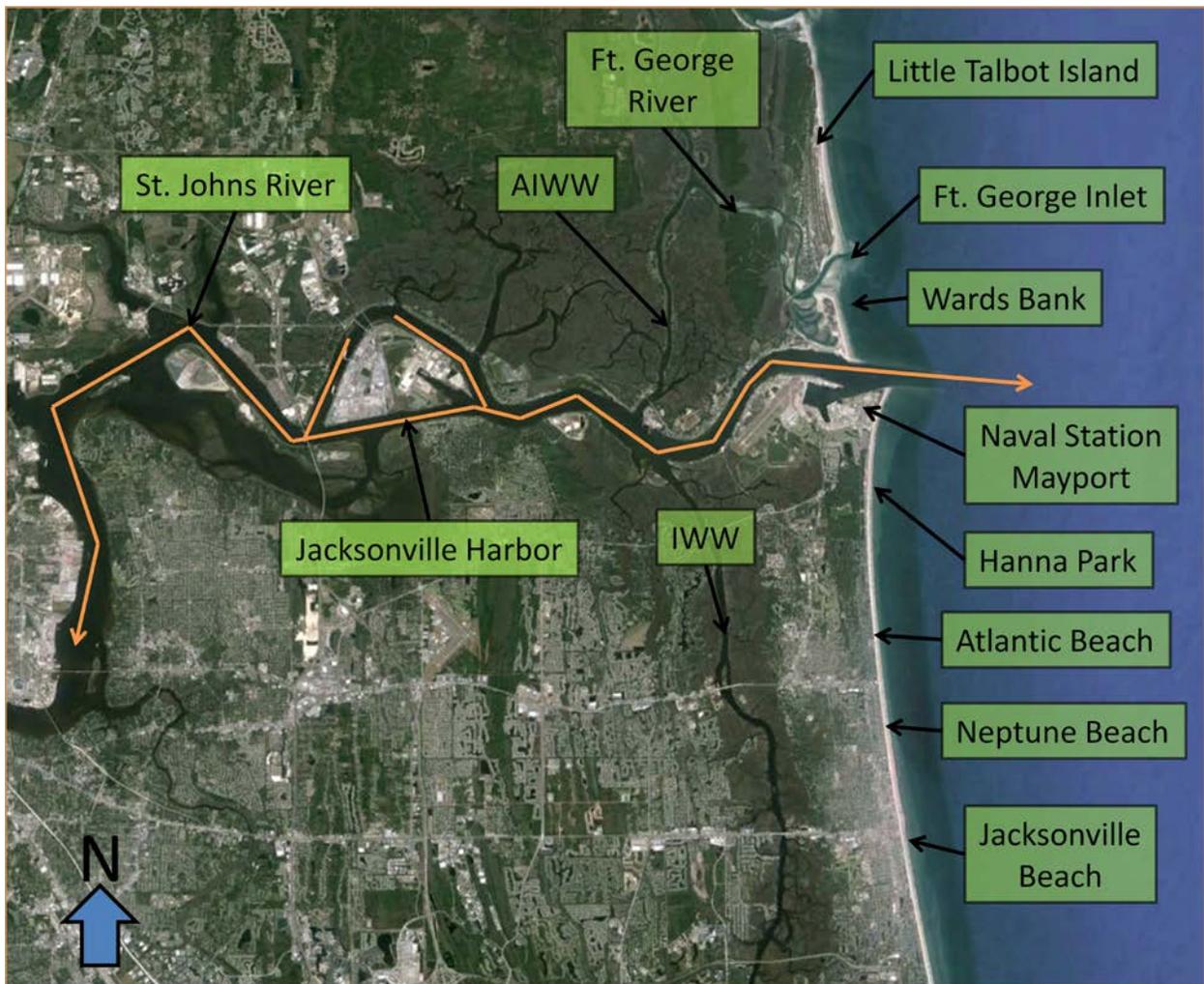


Figure 11. Jacksonville Harbor location map.

Authorization and Funding

Construction dredging completed in 2010 brought upper reaches of the channel (river miles 14.7 to 20) from the previously authorized project depth of 38 feet to current project depths as a result of the authorization granted in Public Law 109-103, Section 129 of the FY 2006 Energy and Water Development Appropriations Act (refer to Figure 12). House Document 214/81/1, October 27 1965 authorizes the maintenance dredging of the channel. Operation and Maintenance (O&M) funds are typically used for channel maintenance while Construction General (CG) funds are used for channel deepening events.

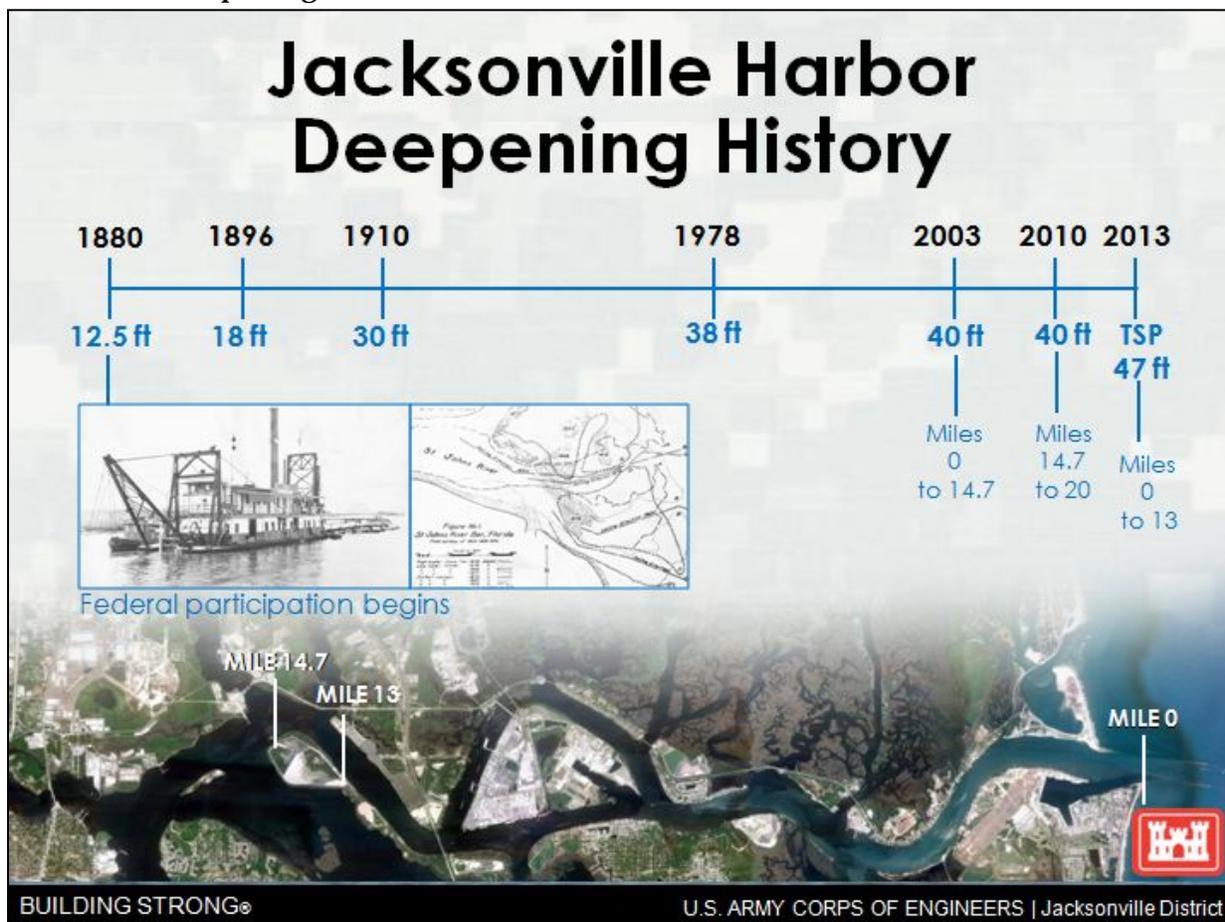


Figure 12. Jacksonville Harbor deepening history.

Permitting

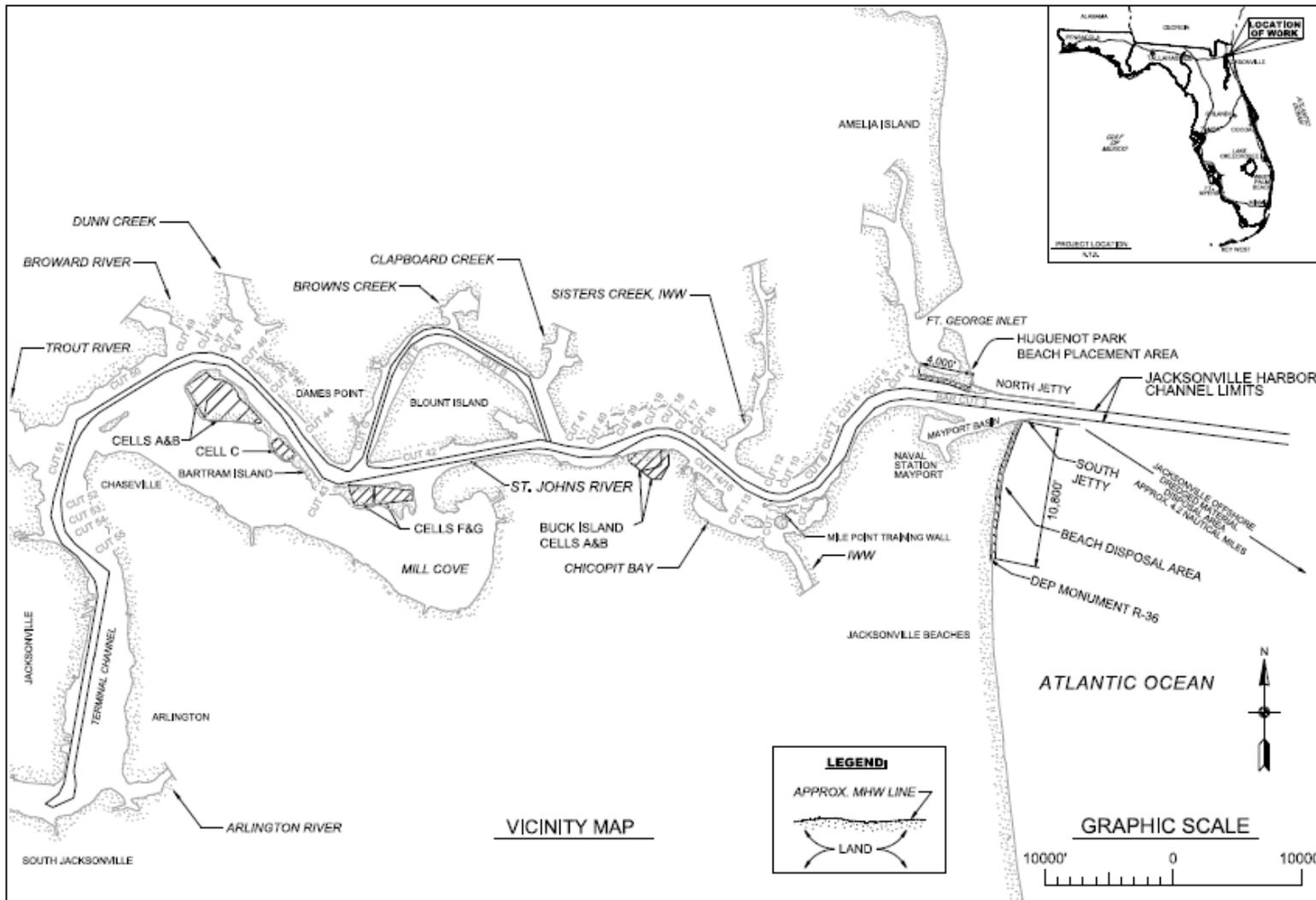
Permit Number: 0303186-001-JC was issued on May 23, 2012 and has an expiration date of May 23, 2022. The project is to dredge approximately 2-3 Mcy of shoal material annually from the Jacksonville Harbor Terminal Channel through Entrance Channel Bar Cut 3, and the West Blount Island Channel. As seen in the permit plates submitted in 2011 (Figure 13), dredged material can be placed in upland disposal areas, including Bartram Island and Buck Island, and/or another operational upland placement area; in

an Ocean Dredged Material Disposal Site (ODMDS); in Huguenot Park; or on the beach south of the inlet.

Dredge Material Management

The latest Jacksonville Harbor DMMP (2013) provides estimates of dredging needs by river section and the plan for disposing the material. As outlined in the DMMP, disposal options for Jacksonville Harbor dredged materials include current and proposed dredge material management areas (DMMA), the ocean dredged material disposal site (ODMDS), the nearshore placement areas, and beach placement areas (refer to Figure 14 and Figure 15). The DMMP classifies beach and nearshore material following the FDEP sand rule (62B-41.007(2)(j), F.A.C.), as discussed previously. Maintenance areas planned for offshore disposal have previously been approved by USACE Regulatory Divisions and USEPA. The material that is not suitable for beach, nearshore, or ODMDS placement and is not hazardous or toxic is considered confined disposal facility (CDF)-only quality. A CDF is an alternate name for a DMMA. Note that although this project currently has NEPA coverage to place material south of the inlet in a designated nearshore placement area and such activity is a stated management objective in the 2013 DMMP, current permit coverage does not provide for such placement activities.

Current annual dredging estimates for the cuts of the Federal navigation channel farthest up-river (including Cut 43 through the Terminal Channel) where sediments are predominantly fine-grained and alluvial, equal 150,000 cy/yr. The DMMP shows that 6,600 cy/yr of material could be placed on the beach or nearshore, 100,050 cy/yr could be placed in the ODMDS, and the remaining volume (43,350 cy/yr) is limited to disposal in a CDF. Although some material can be placed on the beach, in the nearshore, or in the ODMDS, the least-cost disposal option for this section of river has historically been upland DMMA. Areas adjacent to the Federal channel that are maintained by the Jacksonville Port Authority (JAXPORT) are estimated to require 416,000 cy/yr of material that is suitable for the ODMDS. Cuts F and G are restricted to CDF disposal and Federal responsibility is estimated to equal 105,000 cy/yr; non-federal responsibility equals 41,600 cy/yr.



 US Army Corps of Engineers Jacksonville District	PERMIT DRAWING NOT FOR CONSTRUCTION	JACKSONVILLE HARBOR, FLORIDA MAINTENANCE DREDGING WATER QUALITY CERTIFICATE APPLICATION PROJECT LOCATION AND VICINITY MAPS JUNE 2011	PLATE
	DEPARTMENT OF THE ARMY JACKSONVILLE DISTRICT, CORPS OF ENGINEERS JACKSONVILLE, FLORIDA		02 OF 26

Figure 13. Jacksonville Harbor maintenance overview, 2011 permit.

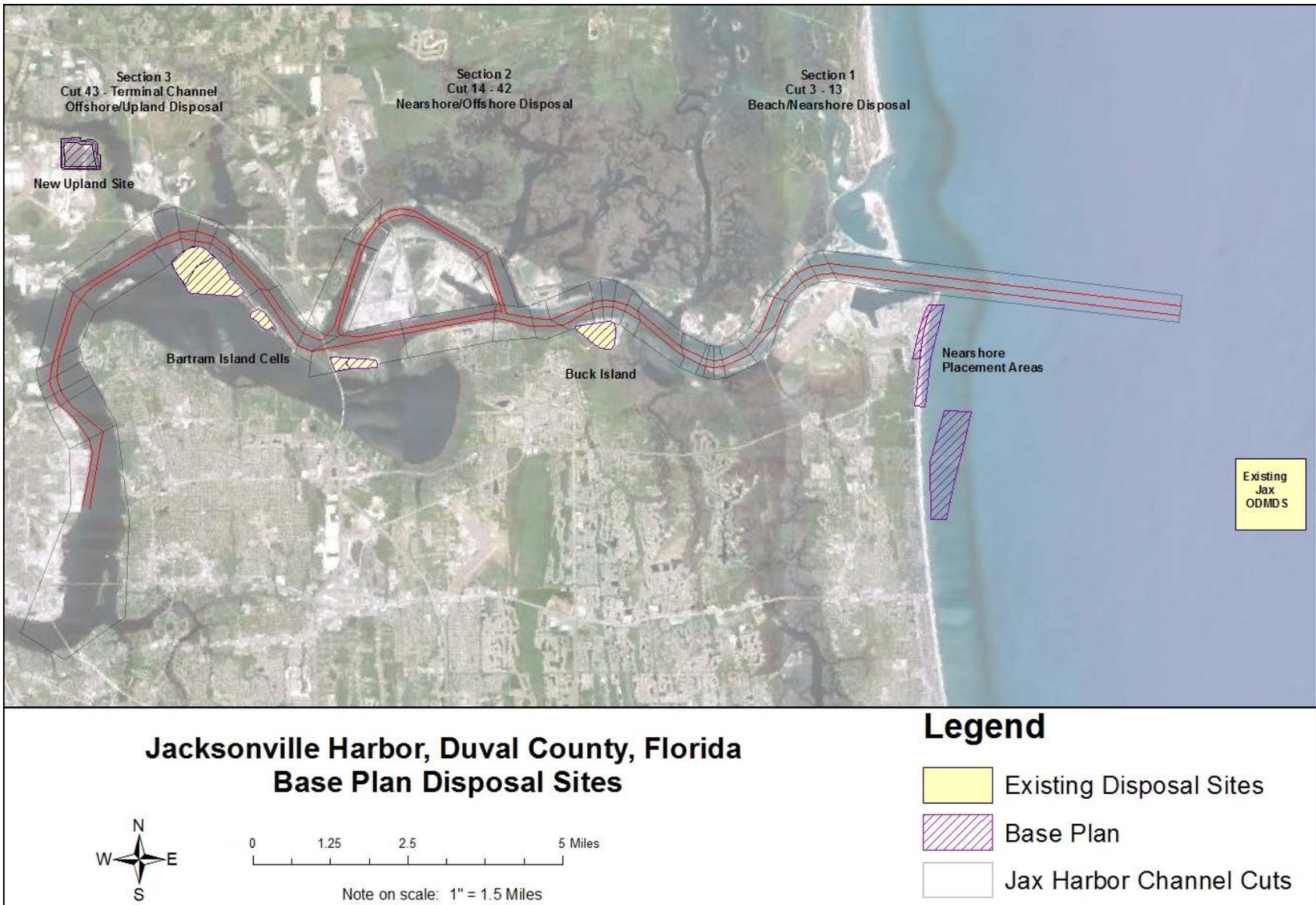


Figure 14. Jacksonville Harbor dredge material disposal areas.

The central cuts of the Jacksonville Harbor project (Cuts 14 to 42) contain sediments eligible for nearshore placement, however, the least-cost option is disposal at the Buck Island DMMA. The Buck Island DMMA is separated into two cells to keep CDF-only material separate from beach, nearshore, and offshore quality material. The DMMP estimates an annual volume of 435,000 cy/yr to be dredged from this section at a frequency of once every two years with placement into Cell A at Buck Island. Buck Island Cell B is planned for use by the local sponsor, JAXPORT, for CDF-only material. The DMMP estimates that 62,400 cy/yr will be removed every 2 years from non-federal portions of Jacksonville Harbor between Cuts 14 to 42 and placed into Cell B.

The cuts closest to the Atlantic Ocean (Bar Cut 3 through Cut 13) contain littoral material that could be suitable for direct placement on the beaches south of the inlet or within the nearshore zone (refer to Figure 15). The proposed nearshore zones include an area for placement by pipe discharge as well as an area farther offshore to the south for placement by split hull hopper dredges or barges. An estimated 185,000 cy/yr of material is the anticipated future dredging requirement from the cuts around the lower reaches of the SJR that could be placed back into the littoral system south of the SJR inlet. A history of placement of navigation maintenance material on the beaches south of the SJR is included in Table 4 in the following section.

The deepening and widening proposed in the latest GRR (discussed in the following section) increases shoaling expectations but is not anticipated to impact the surrounding beaches. Shoaling increase estimates for the upper (Cut 43 to Terminal Channel), middle (Cut 14 to 42), and lower (Cuts 3 to 13) portions of the channel are 5,000 cy/yr, 120,000 cy/yr, and 12,000 cy/yr, respectively. The increase in shoaling was solely based on the increase in channel footprint given the same shoaling rate for a given channel cut. Modeling efforts are underway to refine the shoaling estimates. It should be mentioned that areas of the channel currently determined to be suitable for beach or nearshore placement may need additional assessment if future deepening events impact the buffer zone between beach/nearshore quality material and clay or fine sediment layers. Prior to the deepening event of the SJR entrance by the Navy in 2012, sediment bypassing was believed to be nonexistent, so current plans by the civil works project to deepen the interior channel (i.e., upriver from the Navy channel) are not expected to impact the nearby beaches.

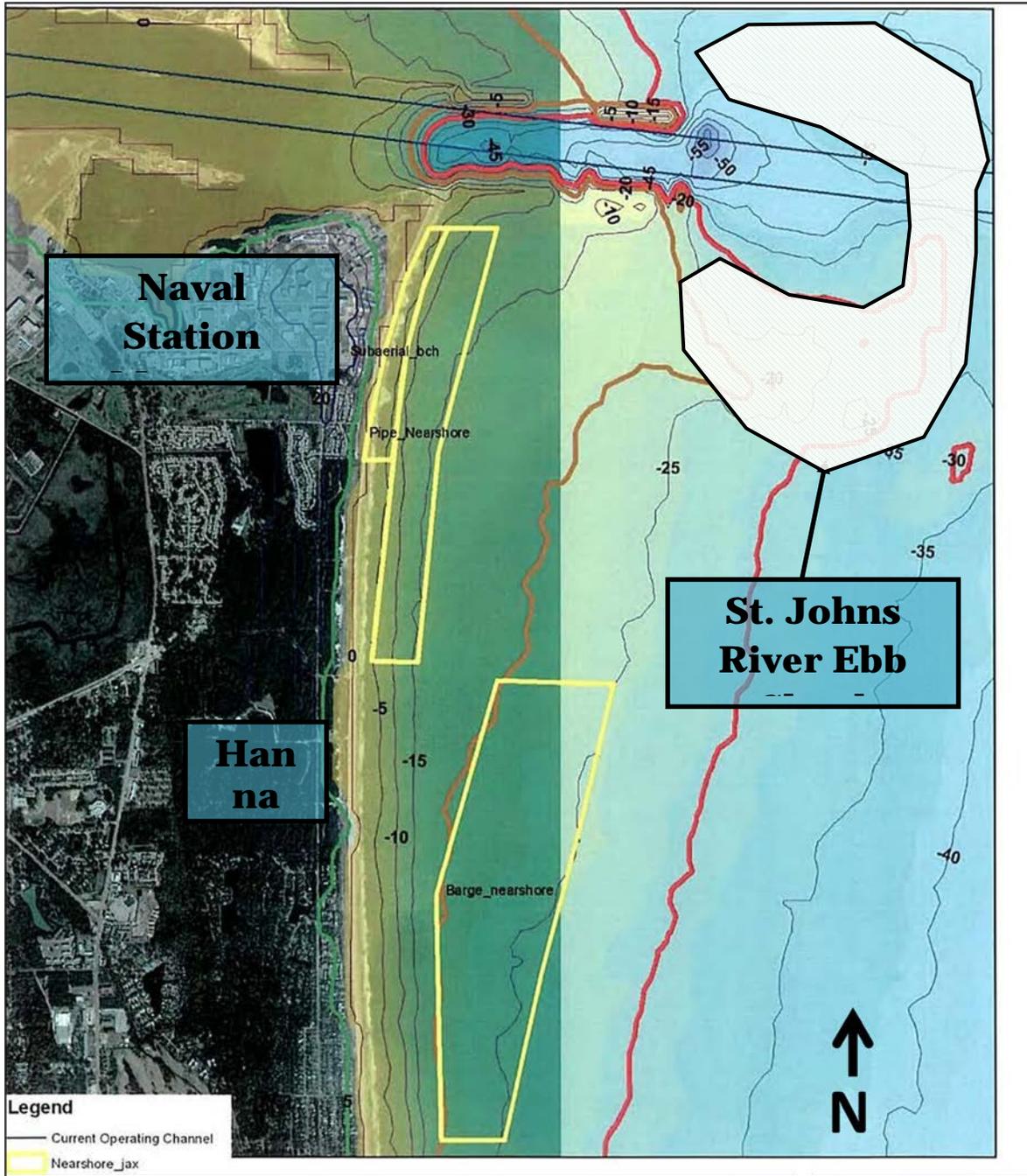


Figure 15. Proposed beach and nearshore placement areas.

Current General Reevaluation Report

A General Reevaluation Report (GRR) for Jacksonville Harbor was completed in 2014, analyzing channel deepening to make Jacksonville Harbor available to larger ships following the expansion of the Panama Canal, known as “post-Panamax” ships. The recommended plan includes deepening the Federal channel to -47 feet MLLW from the entrance channel to approximately River Mile 13, two areas of widening at the Training Wall Reach and St. Johns Bluff Reach, and two turning basins at Blount Island and Brills Cut. A permit application to deepen the channel has not been submitted. However, SAJ has conducted pre-application coordination on the project mitigation plan with FDEP during the National Environmental Policy Act (NEPA) phase, so that once an application is submitted, issues that would otherwise arise during the permitting process should be substantially reduced.

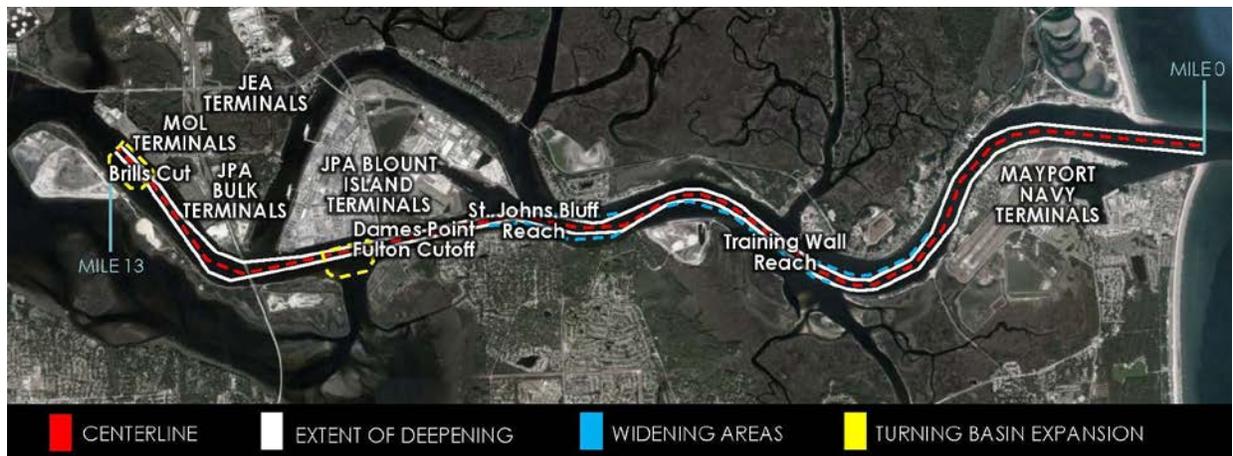


Figure 16. Jacksonville Harbor 2014 GRR recommended plan.

Duval County Shore Protection Project (DCSPP)

The federally-authorized DCSPP consists of beach renourishment along 10 miles of Atlantic coastline, extending from the SJR Entrance Channel south jetty southward to the Duval/St. Johns county line (refer to Figure 17). The project includes (from north to south) the beaches of NS Mayport, Kathryn Abbey Hanna Park, Atlantic Beach, Neptune Beach, and Jacksonville Beach. The primary purpose of this project is to protect upland property from damages due to storm-induced erosion.

Authorization and Funding

The project was authorized in 1965 by Public Law 89-298. The authorized project provides for a protective and recreational beach with a level 60-foot wide berm at 11 feet above MLW along 53,000 feet of shore between the SJR and the Duval - St. Johns county line. Material for the project is dredged from a borrow area located about 7 miles offshore of the project area. Periodic renourishment was authorized for the first 10 years of the life of the project and the average annual renourishment requirement (advanced fill volume) was estimated in the 1975 Duval County SPP General Design Memorandum to equal 260,000 cy/yr. In the recent past, the fill needed for the project has been substantially less-likely due to the equilibration and stabilization of repeated nourishment events and the beneficial use of dredged sand from Jacksonville Harbor. Construction General (CG) funds are used for initial construction and periodic renourishment of the DCSPP.

In 1990, a Reevaluation Report with Environmental Assessment was completed by USACE for the DCSPP. This document was prepared under the authority provided in Section 934 of the 1986 Water Resource Development Act (Public Law 99-662) and recommended extending the project life from 10 years to 50 years beyond initial construction (i.e. the year 2028); changing the Federal cost-share percentage from 58.4% to 61.6%; and extending the design berm from 60 feet to 75 feet. Section 934, however, only provides authority to extend periodic beach nourishment at authorized SPPs for a period of fifty years from project initiation and doesn't include provisions for project changes (such as increasing the design berm to 75 feet) as recommended by the Reevaluation Report. The recommended change to the Federal cost-share, however, is acknowledged in the 1992 Supplement to the Reevaluation Report. In the 2005 Cost Allocation Final Letter Report, the Federal cost-share was increased from 61.6% to 63.6% based on changes in access and ownership since the 1992 Supplement to the Reevaluation Report.

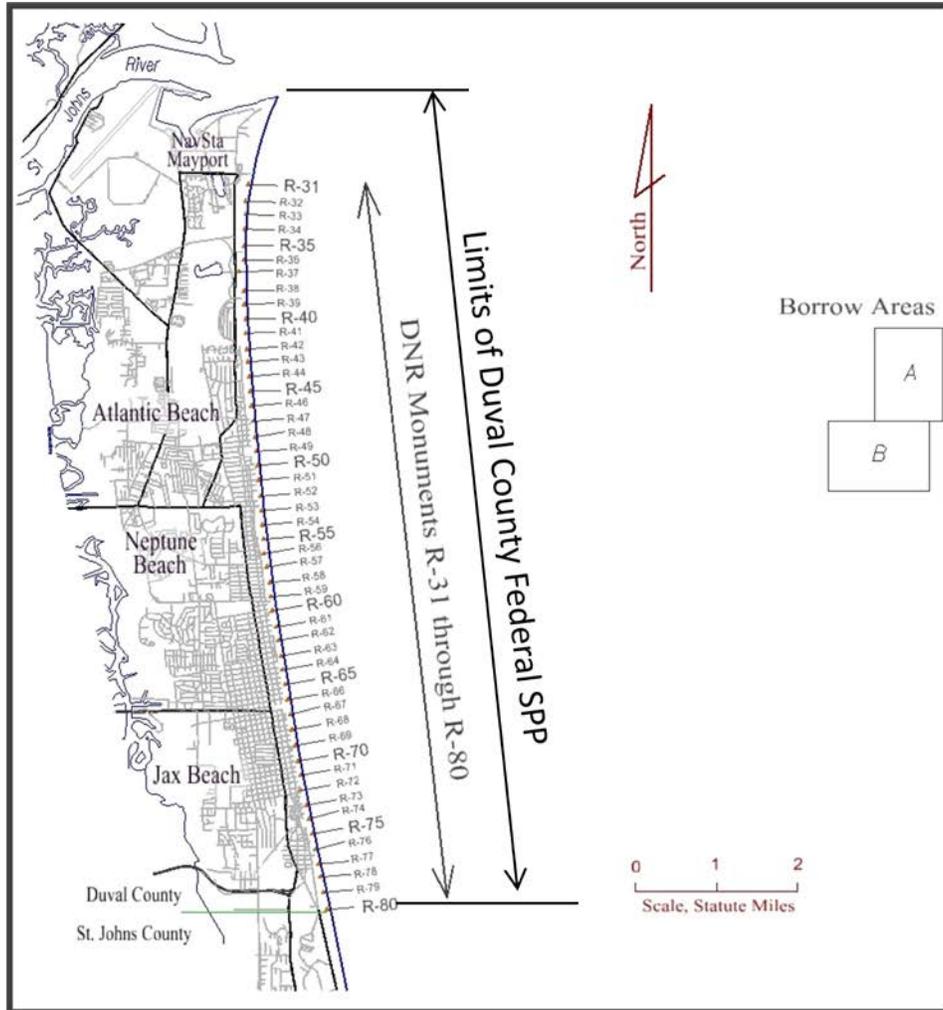


Figure 17. Duval County SPP limits.

Permitting

Placement of material along the DCSPP is currently permitted under FDEP permit number 0228528-001-JC. This is a 10-year permit issued on April 18, 2005 and expiring April 18, 2015. The permit provides for direct beach placement of nourishment material from offshore borrow areas on the shoreline between FDEP monument R-37 and R-80, or from the southern end of Hanna Park to the Duval/St. Johns county line (refer to Figure 17). The FDEP permit was modified January 10, 2011 in order to extend the boundaries of Borrow Area A and increase available borrow area sand volumes from 508,000 cy to 2,330,000 cy. Further development of borrow areas offshore and south of the existing DCSPP borrow areas is underway. In order to place Jacksonville Harbor O&M material along the beaches of DCSPP, the permit associated with placement of navigation material needs a modification to expand the placement areas.

Project History

Initial construction of the DCSPP began in 1978 and was completed in 1980, as seen in Table 4. Subsequent large-scale renourishments of the project under the authority of the DCSPP were performed in 1985-87, 1991, 1995, 2005, and 2011. Additionally, several smaller-scale beach fills were placed within the limits of the DCSPP during maintenance dredging of the adjacent Jacksonville Harbor Federal navigation project—some prior to initial DCSPP construction. These beach fill placements were funded and constructed under the authority of the Federal navigation project. Cost sharing between navigation and shore protection projects occurred in 1985 and 2003 when the DCSPP funded the additional costs to place material farther south than the least cost disposal option at Mayport. Additionally, the 2005 renourishment event shared funding from the Flood Control and Coastal Emergency (FCCE) program and the DCSPP to restore the beach following the active hurricane seasons of 2004/2005. The 1999 navigation dredging event placed 603,000 cy of material on Huguenot Park as well as the beaches of Mayport, but this volume is not included in total volume or placement rate calculations due to an unknown breakdown of how much was placed at each location (USACE, 2002).

The cumulative volume placed on Duval County beaches equals 12,600,000 cy over the 50-year period since O&M material was initially placed on the beach (1963). Discounting the 2013 event (since the life of the material is not yet expired), this equates to 245,000 cy/yr over the 50-year period of available placement data, or slightly less than the predicted advanced nourishment needs of the project (260,000 cy/yr). Since inception of the DCSPP, the average volume placed since 1978 equals 259,000 cy/yr (discounting the 2013 fill), as seen in Table 5. For the period between the second renourishment to present (1991 to 2013), the average placement rate has fallen to half of the rate since 1978, or 132,000 cy/yr, indicating that the project has stabilized considerably.

Table 4. Duval County beach placement history for navigation and DCSP.

Year	Placement Location	Volume (cy)	Sediment Source	Business Line	Notes
1963	Jacksonville and Neptune Beaches	320,000	n/a	Navigation (NAV)	
1963	Mayport	289,050	US Navy	NAV	
1964	Mayport	120,000	Mayport Turning Basin	NAV	
1966	Mayport	226,331	Entrance Channel	NAV	Pilot Town Cut
1966	Mayport	215,000	Mayport Entrance Channel	NAV	
1972	Mayport	1,667,500	Entrance Channel	NAV	New work
1974	Hanna Park	347,283	Entrance Channel	NAV	Pilot Town Cut
1978	Hanna Park and Atlantic Beaches	1,267,800	Offshore	Shore Protection Project (SPP)	Initial Nourishment
1980	Jacksonville and Neptune Beaches	1,609,200	Offshore		
1980	Mayport and Hanna Park	822,806	Entrance Channel		
1985	Mayport, Atlantic Beach	1,284,400	Jax Harbor	NAV/SPP	First Re-nourishment
1986	Neptune Beach	308,650	Offshore	SPP	
1987	Jacksonville Beach	849,770	Offshore	SPP	
1991	Atlantic Beach	300,000	Offshore	SPP	Second Re-nourishment
1995	Atlantic, Neptune, and Jacksonville Beaches	1,187,279	Offshore	SPP	Third Re-nourishment
1999	Huguenot Park and Mayport	603,000*	Entrance Channel	NAV	Undetermined amount on Mayport
2003	Jacksonville Beach	120,000	Jax Harbor	NAV/SPP	Terminated due to poor quality material
2005	Atlantic, Neptune, and Jacksonville Beaches	615,198	Offshore	FCCE/ SPP	Fourth Re-nourishment
2011	Atlantic, Neptune, and Jacksonville Beaches	689,015	Offshore	SPP	Fifth Re-nourishment
2013	Mayport	373,000	Jax Harbor	NAV	Volume estimated from bid schedule
Total		12,612,282			

*Note: 1999 event not included in total volume due to uncertainty in volume placed on Mayport vs. Huguenot Park.

Table 5. Duval County SPP average placement volume since inception and since 1991.

Year	Volume (cy)	Cumulative Volume since 1978 (cy)	Cumulative Volume since 1991 (cy)
1978	1,267,800	1,267,800	
1980	1,609,200	2,877,000	
1980	822,806	3,699,806	
1985	1,284,400	4,984,206	
1986	308,650	5,292,856	
1987	849,770	6,142,626	
1991	300,000	6,442,626	300,000
1995	1,187,279	7,629,905	1,487,279
2003	120,000	7,749,905	1,607,279
2005	615,198	8,365,103	2,222,477
2011	689,015	9,054,118	2,911,492
2013*	373,000	9,427,118	3,284,492
Average Placement (cy/yr)		258,689	132,341

*Note: Placement from 2013 not included in averages.

MANAGEMENT ALTERNATIVES, STRATEGIES, AND RECOMMENDATIONS

RSM strategies result from combining authorities, funding, permits, and scheduled work; ideally resulting in economic savings while benefitting the region. Often, USACE operations staff achieves this “on-the-fly” through institutional knowledge. However, having strategies outlined in advance with key information regarding permits and authorities may help to take advantage of all opportunities and increase overall efficiency, while continuing to develop strategies for additional benefit to the region. Additionally, gaps in Federal authority can be identified and targeted for assistance from local sponsors and state agencies. RSM strategies also facilitate permitting and various other stakeholder coordination activities when it can be demonstrated that impacts to the entire coastal system are being considered. The holistic approach results in the accomplishment of shared project goals on an expedited timeline. Strategies specific to the Nassau and Duval counties portion of the study area are presented below.

Kings Bay Navigation Project

Maintenance dredging of the Kings Bay navigation channel (KBEC and KBIC) in support of the U.S. Navy submarine fleet is a national security priority and will likely continue in perpetuity. Current management strategies include upland disposal, beach placement, and offshore disposal in the ODMDS.

As previously mentioned, investigations are underway to qualify dredged material within the KBIC for offshore or nearshore disposal, a measure that will save upland DMMA capacity. Additionally, coordination and investigative efforts are underway to increase the upland storage capacity for KBIC by offloading material from four DMMA, which are under Navy control including Crab Island, Main Disposal Area, Disposal Area 1, and Disposal Area 2 (refer to Figure 18). The locally-funded Amelia Island Shore Stabilization Project would remove the material and use it to restore the shoreline within the project limits.

The KBEC project is actively placing material within the limits of the NCSPP during the majority of its annual contracts. The quality of this material must meet the standards outlined in the preceding sediment compatibility section (less than 10% fines), which limits the amount of dredged material that can be bypassed to the south beaches. Review of geotechnical data could expand the dredging sections that are included in the bypass effort by considering nearshore placement alternatives which require less than 20% fines. This would reduce the amount of material that is placed in the ODMDS and preserve capacity. Placement into the NDS, similar to what was done in 1988 (as

explained in the Kings Bay Dredge Material Management section), could be considered in the future with the NCSPP or local shore protection projects moving the material from the NDS to the beach at a later time.

The 1987-1988 modifications to the KBEC included sediment settling basins (channel wideners) north and south of the navigation channel. This project feature currently contains beach quality material that could be used for nourishing portions of the NCSPP. Rosati et al. (2013) determined that the north settling basin accumulates 47,000 cy/yr on average based on survey data analyzed between 2006 and 2012. The sandy material that accumulates in the settling basin is typically placed on the NCSPP or the beaches along Ft. Clinch, however, maintenance of the feature is not included in the 2014 KBEC contract. Future optimization studies of the KBEC project could include review of the settling basin feature including maintenance history, benefits, recharge rates, and geotechnical data. The settling basin could potentially be expanded and serve dual maintenance roles for navigation and shore protection projects.

Recommendations:

- Continue efforts to determine the compatibility of the material located in the upland DMMA's used for KBIC dredging to supply sediment to the local Amelia Island SPP project, thus increasing future capacity for the U.S. Navy.
- Continue efforts to permit and place KBIC material in the nearshore or ODMDS to save DMMA capacity.
- Continue placement of maintenance material on SPP beaches and the Ft. Clinch shoreline.
- Investigate nearshore placement options to increase the amount of KBEC material that is bypassed to the beaches to the south and reduce pressure on the ODMDS.
- Include review of settling basins in future KBEC studies to determine if the settling basin can be expanded or better utilized. Pursue advanced maintenance of settling basins using SPP leveraged funds.
- Coordinate with local sponsor, FDEP, Georgia DNR, and other stakeholders to further management strategies and promote new ideas.

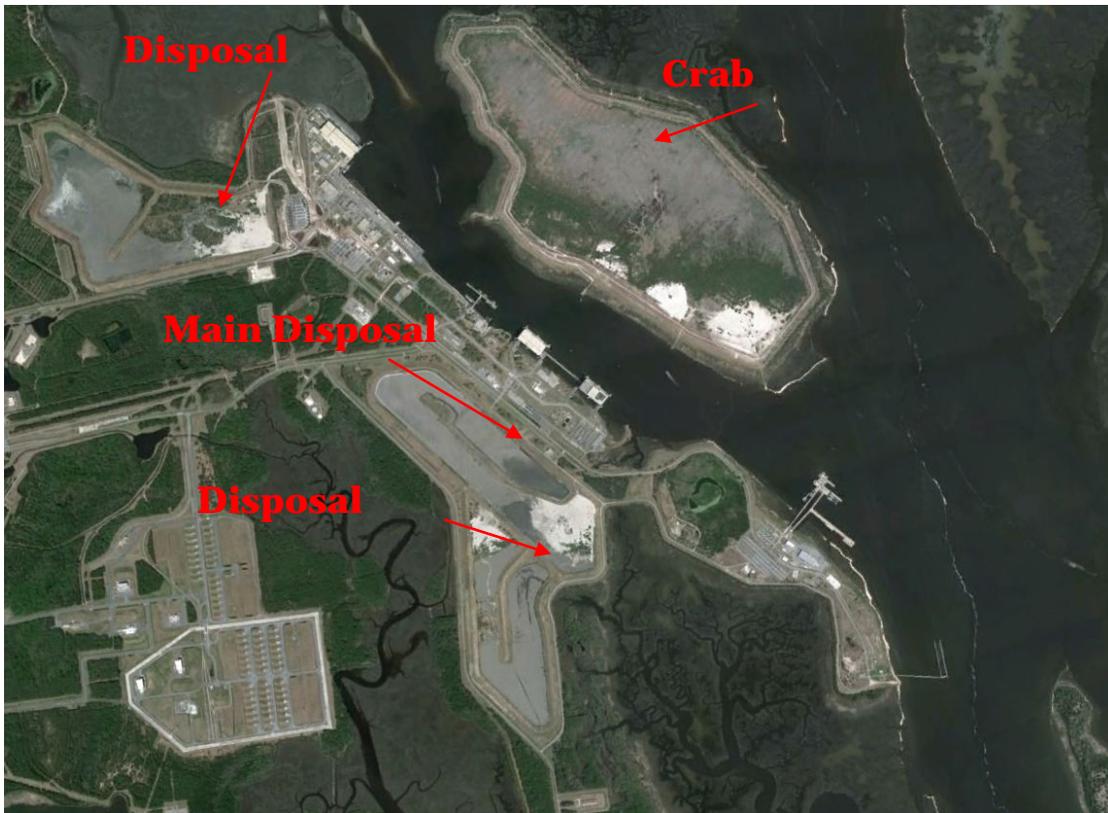


Figure 18. Kings Bay Inner Channel Dredge Material Management Areas.

Atlantic Intracoastal Waterway and Intracoastal Waterway

The proximity of the AIWW cuts near the southern end of Amelia Island, as well as the composition of sediments, have made beneficial use of AIWW dredged material a successful practice. The placement of this material on southern Amelia Island coupled with the terminal structure and offshore breakwater, both built in 2005 by local interests, have substantially stabilized the area compared to prior years. Beneficial use of the dredged material in the Sawpit Cuts reserves capacity of the upland storage facilities. Further study of these efforts may be warranted as the evolution of the material placed on southern Amelia Island is unknown and some material could migrate into Nassau Sound and deposit back into the AIWW channel.

Previous contracts for dredging the AIWW in the vicinity of Sawpit Creek have included cuts near the FGR. The Florida Park Service, National Park Service, City of Jacksonville, and (non-governmental organizations (NGO) have displayed interest in management efforts to ensure flow through the FGR is maintained and that inlet closure is prevented. The USACE efforts to remove material from the system (discussed in the following section) are currently focused on the ebb tidal shoal since it is the least cost option for the DCSP. Coordination with FGR stakeholders could provide a leveraging

opportunity to dredge the FGR concurrently with future AIWW maintenance dredging contracts. In order to implement this idea, the stakeholders would need to secure disposal options, and the contracting mechanism for such a project would require analysis to determine if the work could be performed under an all-encompassing USACE contract or separate contracts. Material could be placed with AIWW material on south Amelia Island, however, long haul distances could be expensive and confirmation of compatibility would be required through geotechnical investigations. The beaches south of the SJR Inlet could also serve as a possible placement area.

Recommendations:

- Continue to dredge AIWW material and maintain southern Amelia Island.
- Create a monitoring and/or data collection program with the intent of future hydrodynamic modeling of the projects to ensure that back-passed material is not re-deposited in the AIWW navigation channel.
- Coordinate future dredging contracts with the environmental agencies and NGOs interested in restoring the efficiency of the FGR Inlet and determine if future contracts can be leveraged to support dredge work within the FGR funded by said organizations. If coordination is promising, provide assistance with geotechnical investigation and other potential permit requirements to accomplish the sediment removal.

Ft. George River Inlet

The impacts to the sediment transport regime caused by the SJR Inlet and the modifications of the inlet system in support of the Jacksonville Harbor Federal Navigation Project have resulted in the documented northward migration of Wards Bank. The northward migration of Wards Bank (refer to Figure 19) forces the FGR Inlet to the in the same direction resulting in erosion to the southern end of Little Talbot Island (Gosselin, Kabling, and Cranston, 2002). The combined effects of cumulative erosional losses due to storms and the blocking of the predominant north to south sediment flow path in the area has also left the beaches south of the inlet starved for sand and has necessitated implementation of the Duval County SPP (USACE, 1964). Management strategies to restore a portion of captured sediments from within or north of the SJR inlet system to the beaches south of the inlet are discussed below.

Management alternatives and strategies for the Ft. George River Inlet complex were thoroughly reviewed in USACE (2000). The most realistic strategies include shoreline armoring, shoreline nourishment, and dredging activities or a combination thereof. The current strategy for managing the FGR Inlet as stated by FDEP (2008) includes a detailed study and analysis of sand transfer or bypassing activities and the resulting effects on inlet stability.



Figure 19. Features around the Ft. George River Inlet.

In order to determine the effectiveness of the dredging alternative strategies, SAJ has initiated a study effort as a part of the Northeast Florida RSM program by refocusing the CMS model that was developed in support of the Jacksonville Harbor GRR deepening study to the FGR inlet area. The model currently analyzes different dredging alternatives and the impacts of each alternative on the hydrodynamics of the river-inlet system. Additional management strategies outlined in USACE (2000) could be added to the modeling effort in the future if needed.

In support of the FGR Inlet modeling effort, the DC SPP sponsored a survey of the FGR ebb shoal, Wards Bank, and the SJR north jetty inner shoal in June 2013. These newer surveys do not cover the entire FGR region, and existing survey data sets from the early 2000s are becoming outdated for current use due to the dynamic nature of the area and

growth of the flood shoals. The Wards Bay area has very limited survey coverage, which is insufficient to resolve the complex morphology of the bay.

The goal of the CMS model of FGR inlet is to formulate a dredging plan that will provide a more efficient path for the FGR to exit into the ocean south of its present configuration to reduce erosional pressure on Little Talbot Island. As stated in USACE (2000), the efficiency of the inlet is reduced as it is displaced northward by the migrating Wards Bank. If the prevailing trend continues, the inlet will likely either close or create an alternate outlet that proves more efficient which could occur in a location that would threaten public infrastructure within Huguenot Park or elsewhere. Therefore, stabilizing the inlet, alleviating environmental concern that the inlet may close, identifying a sediment source for the DCSPP, and reducing shoaling pressure on the Jacksonville Harbor Federal navigation project are desired outcomes of the FGR CMS model study.

If the modeling study proves successful, the material could be used to renourish the DCSPP. However, a preliminary scoping estimate in a 2004 memorandum stated that the cost of using the FGR Inlet ebb shoal would be approximately two times greater than that of using the offshore sediment source currently used for the SPP. In 2004, the construction equipment which was assumed necessary for accessing the FGR Inlet ebb shoal sediment source was a cutter-suction dredge that would load ocean certified scows. The material would then be placed directly on the beach from the scows using an ocean certified hydraulic unloader. The construction method used for the offshore sediment source was assumed to be a medium class hopper with pump out capabilities. Using the Ft. George Inlet ebb shoal as a sediment source for the DCSPP currently has strong support from multiple stakeholders, and as such, it may be possible for those interested parties to combine resources to cover any potential additional costs.

City of Jacksonville-owned Huguenot Park is situated along the southern end of Wards Bay and includes Wards Bank. Relocation of the inlet to the south would inevitably require erosion to the northern tip of Wards Bank. Some of these areas are habitat for nesting birds as well as popular areas for recreation. This could constrain RSM efforts to stabilize the FGR inlet. An additional constraint placed on dredging operations in the area results from portions of the area designated as Coastal Resource Barrier Act (CBRA) protection areas, as seen in Figure 20. The CBRA was passed in 1982 and areas that fall within the established zones are ineligible for new Federal expenditures and financial assistance as an effort to curb Federal incentive to develop important coastal areas (USFW, 2014).



Figure 20. Coastal Barrier Resource Act Zone at Ft. George Inlet.

Recommendations:

- Continue modeling study efforts and present results of dredging alternative analyses to stakeholders. Upon favorable review of the modeling study, develop detailed cost estimates for the DCSPP to access the FGR Inlet ebb shoal as a borrow area. Perform geotechnical exploration and data collection to ensure compatibility between the DCSPP and the potential borrow area. Establish a survey data collection program for the area to refine modeling efforts, as well as

to set a baseline for monitoring sand mining activities and the resulting effect on the river-inlet system.

- Resume coordination efforts with FDEP, the City of Jacksonville, Florida Park Service, National Park Service, and other stakeholders. Query interested parties for sponsorship of an environmental enhancement CAP study (as mentioned in the Stakeholder Discussions section) to reduce sedimentation in the river and restore flow efficiency. Leverage RSM study efforts to reduce CAP study costs and therefore preserve limited project construction funding. Solicit assistance from stakeholders, including universities, to sponsor additional data collection and studies.

Naval Station Mayport

Due to the overlap between the Mayport and Jacksonville Harbor maintenance efforts, management alternatives and strategies largely overlap as well. Also refer to the Jacksonville Harbor section for discussion of management alternatives and strategies pertaining to channel maintenance.

During the 2013 beach placement of channel maintenance material, SAJ partnered with the University of North Florida (UNF) to monitor the evolution of the placement material. Using 2013 RSM funds, SAJ completed two topographic surveys of the placement area that covered from behind the dune to the minus 30-foot contour. UNF collected additional surveys to wading depths, as well as wave and current data using an acoustic Doppler current profiler (ADCP) located in 30-foot water depths off the project area. The RSM SAJ/UNF data are being integrated into the ongoing Nassau/Duval RSM project.

As mentioned previously, Gosselin, Kabling, and Cranston (2002) identified the sediment transport nodal point to vary between 1,500 to 3,000 feet south of the south jetty. One goal of the Fiscal Year 2014 Northeast Florida RSM project is to verify the location of the nodal point or modify the location suggested by Gosselin, Kabling, and Cranston (2002) by using the coupled wave and current hydrodynamic models CMS-Wave and CMS-Flow. Future placement of material south of the inlet should be placed to the south of the nodal point to prevent northward migration of the material up to and through the porous south jetty. If beaches north of the nodal point reach an eroded state, nourishment efforts should focus on limited placement volumes or placement configurations that supply minimal input to the sediment transport regime (such as a dune feature or narrow, raised berm). The current areas covered under NEPA shown in Figure 15 may need modification depending on where the nodal point lies. Sand tightening of the south jetty could be pursued to reduce erosion of the beach north of the nodal point. The U.S. Navy may have a dual interest in the effort since it could reduce

erosion to the beach at NS Mayport, as well as reduce material transported into the Mayport entrance channel.

Recommendations:

- Continue monitoring (i.e. data collection) and analysis of the 2013 beach placement project and determine sediment transport pathways and response to environmental forcing to date. Reengage UNF to assist with this effort.
- Modify beach nourishment placement locations if the Fiscal Year 2014 RSM modeling effort indicates the sediment transport node is farther south than previously estimated.
- Expand Mayport maintenance dredging permit to include nearshore placement of material.
- Expand hydrographic survey data collection to extend beyond the extents of the channel to include areas adjacent to the jetties (particularly the south jetty as it relates to Mayport).
- Investigate benefits of sand-tightening the south jetty and if favorable present to the Navy for funding assistance. Assist the Navy to secure excess granite stone as a result of the future Jacksonville Harbor Milepoint project.

Jacksonville Harbor O&M Beach and Nearshore Placement

The clearest path to accomplish the FDEP and RSM goal of keeping sediments within the littoral zone involves beneficial use of O&M dredged materials from the lower SJR cuts (Bar Cut 3 through Cut 13). Federal authority already exists to remove sediments trapped by the Jacksonville Harbor navigation channel for placement south to restore down-drift beaches. As estimated by USACE (2012), nearshore placement of this material could cost 29% less than placing directly on the beach and 8% less than placing in the ODMDS. Nearshore placement could also significantly increase the volume of sand delivered to the downdrift littoral system due to less restrictive requirements for fines content.

The Navy and Civil Works Federal navigation projects located in the SJR generate a considerable volume of beach or nearshore quality material. The proposed deepening of the Jacksonville Harbor Navigation project will involve a significant volume of virgin cut material that is likely not beach compatible, but mixed with beach sands. Currently, there are no plans to recover any beach quality material from the scheduled deepening project due to the inefficiency of available methods to separate beach/nearshore quality sand from other non-beach quality materials. However, maintenance of shoaling areas, turning basins, and other necessary activities associated with the harbor channel will continue if the deepening occurs, generating sediments requiring disposal. The 2013

DMMP ensures enough upland storage capacity for 20 years, however, strategies to preserve capacity should be pursued and updated regularly. Once upland storage facilities reach capacity, material will have to be hauled to the ODMDS at a higher cost unless capital improvements are made to existing facilities or development of new facilities.

Placing material in the nearshore or on the beach presents an effective way to preserve DMMA and ODMDS capacity. The annual O&M dredged volume estimate ranges from 185,000 cy/yr (USACE, 2013) to 210,000 cy/yr (USACE, 2007) between Cuts 3 and 13 alone. Current estimates for the increase in shoaling based on the increase in channel dimensions alone equal 12,000 cy/yr for Cuts 3 to 13, bringing the total potential beach quality estimate to 197,000 cy/yr. This volume satisfies the average renourishment rate of the DCSPP beaches since 1991 (132,000 cy/yr) as calculated in the project history section of this report. The 2013 DMMP also identifies that material from Cuts 14 to 42 could be placed in the nearshore zone.

Historically, O&M material was placed along the beaches just south of the inlet. With the exception of the 2013 placement event at Mayport, however, O&M material has not been accepted by the DCSPP local sponsor since 2003. If future O&M placement events ensure flexible placement locations so that the most depleted areas of the DCSPP were prioritized, then DCSPP renourishment intervals could potentially be increased. Coordinating this idea with the local sponsor will be necessary to gain its support. The local sponsor of the DCSPP, the City of Jacksonville, who also owns and operates Hanna Park, is no longer interested in supplementing offshore borrow area material with navigation maintenance material to restore the DCSPP beaches. This is due to the perception that the quality will be undesirable as experienced in the 2003 event which included oyster shells and clays in the material placed on the beach. Additional geotechnical data collection may be warranted to provide increased assurance to the local sponsor that the maintenance material is desirable.

Beach quality material is found within the Jacksonville Harbor Federal navigation channel, and establishing a nearshore placement program for the Jacksonville Harbor maintenance material would provide additional opportunities to increase the amount of material available for placement along the DCSPP shoreline. Aesthetic concerns related to the quality of the material should be alleviated since the material that migrates from the nearshore to the beach will be naturally sorted and washed. If designed properly, nearshore placement of O&M material as a management measure would help maintain the DCSPP's storm damage reduction benefits and reduce the need for offshore sand. Consideration of the depth of placement is of great importance during design and construction if the desired result is shoreward propagation of the material and attendant shore protection benefits.

To accomplish nearshore placement of maintenance material off of DCSPP beaches, the current permit will need modification to allow placement within the nearshore zone. To best address the renourishment needs of the DCSPP using navigation O&M material, the permit should provide flexibility to place material in the nearshore (or directly on the beach) along the entire DCSPP so depleted areas of the project can be prioritized for placement.

Typically nearshore placement methods involve a split hull barge or hopper dredge that empties into shallow water with the understanding that if placed in optimum water depths, the coarse, desirable material will naturally migrate towards the shore while finer particles will be dispersed. Optimum nearshore placement water depths vary with ocean energy levels, as well as sediment characteristics, and typically present operational challenges due to proximity to the active surf zone.

An additional method for placement in shallower waters is the discharge of the dredged material as water-sediment slurry by a pump mounted on the end of the barge or dredge, known as “rainbow discharge.” Due to elevated turbidity levels and the potential for negative environmental impacts, this method is only applicable in areas absent of benthic resources of concern (e.g., hardbottom or submerged aquatic vegetation). Rainbow discharge could provide more control in the three dimensional shape of the placement which could offer recreation enhancements for surfing or swimming depending on design characteristics, however, there is added expense versus traditional bottom dumping of material due to reductions in productivity. As included in the 2013 DMMP, a nearshore area is also designated for placement by shore-based dredge pipe that extends into the surf zone (refer to Figure 15).

Recommendations:

- Coordinate maintenance material placement ideas with the local sponsor to gain support.
- Collect additional geotechnical data in order to provide additional assurances to the local sponsor that USACE can execute a beneficial use mission with high quality material.
- Continue placing beach/nearshore quality material removed from the Jacksonville Harbor Federal navigation channel on the beaches south of the inlet or within the nearshore zone.
- Expand the current permit to provide for nearshore placement zones as outlined in environmental compliance (NEPA) documentation and in the 2013 DMMP. Consider expanding placement areas in the permit, as well as in NEPA documentation to allow for placement within areas of the DCSPP that are most eroded.

- Revise the northern limit of the placement area if the 2014 RSM modeling study determines the sediment transport nodal point to be south of current northern placement limit.
- Optimize nearshore placement depth versus equipment type, placement method, and productivity.
- Solicit feedback from FDEP on the inclusion of rainbow discharge as a placement method.
- Expand hydrographic survey data collection to extend beyond the extents of the channel to include areas adjacent to the jetties as well as the beaches north and south of the inlet.

Hanna Park and the Duval SPP

As mentioned previously, the local sponsor of the DCSPP is averse to the idea of using Jacksonville Harbor O&M material for placement on DCSPP beaches due to concerns regarding material quality. One way this concern could be alleviated is through nearshore placement of O&M material as discussed in the previous section. Nearshore placement results in natural sorting of the dredged materials and only those carried by natural transport processes would migrate onto the dry beach.

In addition to shore protection benefits, placement of navigation maintenance material could provide enhanced recreational benefits. If the placement area is designed to alter the wave environment with the goal of increasing its potential for optimal surfing, recreational benefits could be captured as well as any associated economic benefits. Consideration in design would require minimal interference with existing hydrodynamics similar to the design of submerged breakwaters which, if not placed properly, can reduce sediment transport in the lee of the structure; beaches down-drift then erode due to reduced sediment supply. If properly designed, however, interruptions to sediment transport are minimal and given that the feature would consist of O&M material, its shape will quickly be altered due to wave and tidal action.

Goshow, Albada, and Gosselin (2001) investigated strategic maintenance material placement as well as a traditional surfing reef design for the nearshore waters off of Hanna Park. Detailed wave modeling studies indicated that the surfability of the local wave field would be enhanced, however, the costs and environmental permitting were determined to be difficult obstacles. Defrayment of the costs by leveraging existing Jacksonville Harbor maintenance dredge work was mentioned in the Goshow, Albada, and Gosselin (2001) report, but not considered in cost evaluations.

Placement of navigation maintenance material from the SJR entrance channel in 1972 (refer to Figure 21) was not planned to provide recreational surfing enhancements, but

anecdotal evidence suggests that it did (Mitch Kaufman, personal communication, 2014). The magnitude of the 1972 event is likely not to be repeated in the future, but the concept of beach placement extending offshore could be considered, or a similar shape created as a submerged berm feature. Such a placement method is already included in environmental compliance (NEPA) documentation, but the FDEP permit would require modification to include the method.

Recommendations:

- Solicit the local sponsor's opinion on recreational enhancement design features related to navigation material placed in the nearshore.

Refer to the previous section for additional recommendations.

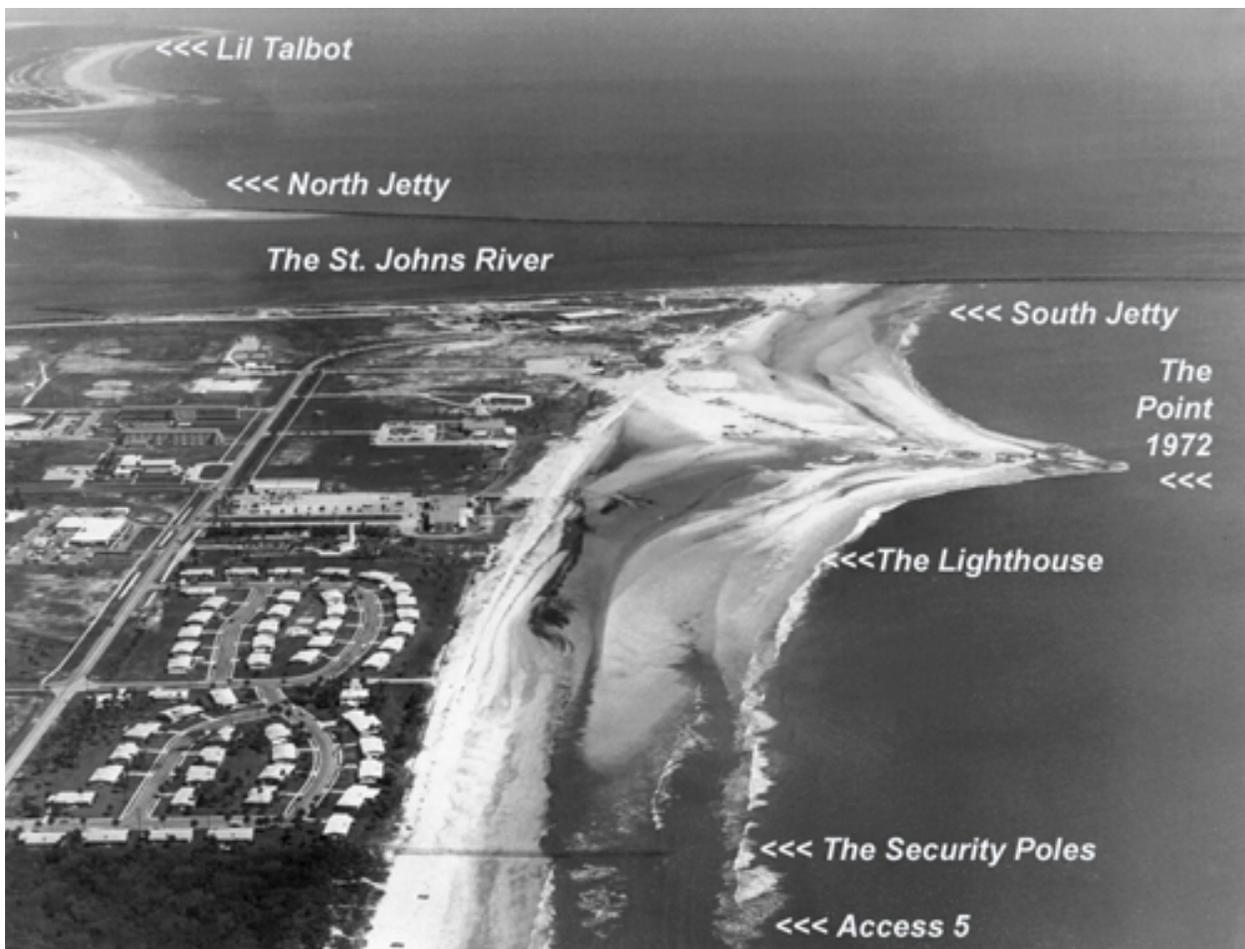


Figure 21. Mayport beach placement of entrance channel material, 1972.

St. Johns River North Jetty Shoal and Ebb Shoal

Inside the north jetty of the SJR entrance channel a large shoal extends from Wards Bank to the east and south toward the Federal navigation channel (refer to Figure 19 and Figure 20). In Gosselin, Kabling, and Cranston (2002), this feature was studied as a possible source of material for bypassing to the beaches south of the inlet. The north jetty inner shoal feature is presumably a result of material that is transported through or over the jetty.

The north jetty shoal may also be a result of decreased tidal flows due to the expansion in the channel area associated with the entrance to the NS Mayport ship basin, which is directly south of the shoal. The decreased flow allows sediments to settle out of the water column (Gosselin, Kabling, and Cranston, 2002). The hydrodynamic model CMS-Flow was used in the Gosselin, Kabling, and Cranston (2002) study and showed that current velocities in and around the channel were lower for areas in the vicinity of the Mayport entrance and existing north jetty shoal. The modeling showed that the shoal was acting to deflect currents away from the leeward shoreline of the shoal during both the flood and ebb tidal cycles.

The sediments that comprise the north jetty shoal appear to have the qualities needed for direct beach placement if bypassing were initiated, but consideration needs to be given to the effects of mining the material. The roadway in Huguenot Park that provides access to the beach at Wards Bank is periodically damaged during storm events and removal of the shoal may exacerbate the problem. Thus, armoring or other structural alternatives, could be required to stabilize the roadway in Huguenot Park. Since this shoal area lies in a CRBA zone (refer to Figure 20), using the area as a source of sediment for SPP efforts could prove difficult using USACE funding.

The SJR ebb shoal (outlined in Figure 15) could serve as a sediment source for the beaches south of the SJR inlet. Core borings from the SJR ebb shoal indicate that although the sediments are finer than what is typically used in the DCSPP, the material clearly meets the percent fines requirements for placement in the nearshore (i.e., less than 20%). Dredging the ebb shoal material could reduce the sediment load at the entrance of the Jacksonville Harbor Federal navigation project allowing for increased time between maintenance dredging cycles while also serving SPP needs. However, since offshore borrow areas contain compatible material for direct beach placement and shoaling rates associated with the ebb shoal feature are relatively low, local support for beneficial use of ebb shoal material is not likely to occur.

Adequate surveys are not available to estimate the growth rate of the entire ebb shoal, thus an expected recharge rate cannot be established at this time. Based on the latest sediment budget, 112,000 cy/yr is transported to the ebb shoal from the area north of the inlet and 57,000 cy/yr from the beaches to the south. Using the volume of material

estimated to arrive at the SJR Inlet ebb shoal from north and south of the inlet, the ebb shoal could provide as much as 169,000 cy/yr of material for placement in the nearshore areas of the DCSPP. Although placing this volume of material in the nearshore would theoretically account for a majority of what is needed for the DCSPP efforts, the local sponsor would likely still prefer the coarser material obtained from the offshore borrow area for placement on the dry beach.

Even though beneficial use of the St. Johns River ebb shoal is not likely, repeated surveys of the feature would provide information to update the sediment budget. The SJR ebb shoal has very limited survey coverage since the objective of most surveys is to identify shoals within the channel that create navigation hazards. Complete surveys of the ebb shoal would provide understanding of ebb shoal morphology and allow for updates to the sediment budget since the current budget was only able to assume an impoundment rate. Likewise geotechnical investigations are limited to areas within and immediately adjacent to the navigation channel. Additional sediment characteristics data area needed to properly define the areas where sediment compatibility standards are met for nearshore placement.

Recommendations:

- Following completion of the Fiscal Year 2014 RSM modeling effort, use model output to estimate channel infilling rates near the SJR inner shoal and ebb shoal. Reconfigure the model to include potential dredge cuts and analyze results for reduction in shoaling rates.
- Enhance the current survey data collection program to include regular frequency surveys of the north and south lobes of the SJR ebb shoal. Update the sediment budget for northeast Florida once sufficient data exist.

Jacksonville Harbor DMMA Offloading

Using upland DMMA sand sources to maintain SPPs was one strategy identified by FDEP (2008). This strategy may prove difficult to implement for Jacksonville Harbor DMMA's due to the mixed quality of material in the DMMA's, as well as the costs associated with mobilizing and placing the material.

The 2013 update to the Jacksonville Harbor DMMP incorporates offloading Cell A of the Buck Island DMMA for construction material. Although this management strategy does not keep sediments within the littoral system, the majority of sediments in this cell are not from the beach/nearshore zone. The current management strategy of offloading Cell A for construction material represents a no-cost option for the Federal navigation project while expanding the capacity of the site, in keeping with beneficial use principles. Other Jacksonville Harbor DMMA's, such as Bartram Island, consist of material dredged from farther up-river and are typically classified as suitable for

offshore disposal, but in some cases, are restricted to DMMA disposal. The least cost option for disposal of up-river dredged materials is placement in upland DMMA. The Florida Inland Navigation District (FIND) DMMA (DU-6) at Mile Point contains 700,000 cy of capacity remaining for placement. Offloading the material in DU-6 for construction purposes or reintroducing the material into the littoral system may be considered if the DMMA capacity is not sufficient to address the disposal needs of the adjacent projects.

Recommendations:

- Continue offloading Buck Island DMMA for construction material at no cost to the project.
- When capacity issues are presented for DMMA DU-6, initiate geotechnical investigations and project cost breakdowns for offloading into the nearshore fronting the DCSPP.

Jacksonville Harbor Marsh Improvements with Dredged Material

An application of beneficial use of dredged materials is under investigation for application at Jacksonville Harbor and the surrounding marsh habitats. Current estimates of sea-level rise (including the potential for accelerated sea-level rise) present both a problem and opportunity for the environmental resources of the area. It is recognized that projected sea levels could substantially impact the marsh areas surrounding Jacksonville Harbor (Anderson, Katin, and Wise, 2005) so initial coordination is underway for the consideration of using dredged material to raise the elevations of the marsh. The method of thin layer placement of sediments has been used on Gulf of Mexico shorelines, as well as in estuarine environments in the Chesapeake Bay and locations in Delaware in order to create marsh habitat (Tim Welp personal communication). The recent effort to restore marsh habitat on Pepper Creek in Dagsboro, DE proved to be a great success for accomplishing project goals and was a great example of agency coordination (DNREC, 2014). Researchers at the USACE Engineering Research and Development Center (ERDC) are studying this technology to increase implementation around the nation.

Recommendations:

- Initiate further discussions with ERDC researchers and environmental agencies with the goal of instituting a thin layer placement of dredged material test case in the vicinity of Jacksonville Harbor. Upon successful implementation, select locations where this technology can be implemented on a regular basis. Also, include the technology in the next Jacksonville Harbor DMMP, establish environmental compliance (NEPA), and obtain proper permitting so that future maintenance dredging events can include the disposal method.

CONCLUSIONS

The most successful implementation of RSM principles in northeast Florida involves beneficial use of navigation maintenance material to serve as shore protection and to mitigate for the navigation projects' disruption to the natural sediment transport patterns and morphology. This practice involves the coordination of Navigation and Shore Protection construction actions and the use of multiple authorities and permits for projects to accomplish the overall RSM objective of maintaining the maximum amount of littoral material in the coastal system. The NCSPP regularly benefits from beneficial use of navigation maintenance material which has extended the renourishment interval of the project. The successful coordination of the navigation project and shore protection project in Nassau County should serve as an example, providing motivation for other counties to increase beneficial use of dredged material.

The beneficial use of dredged material from the Mayport Navy project and the Jacksonville Harbor Federal Navigation project has been successful to date, but could be expanded through the use of nearshore placement. This will require the coordination and permitting of a nearshore placement site south of the St. Johns River entrance. This strategy has the potential to increase the amount of material bypassed to down-drift beaches due to less restrictive sediment qualifications. Additionally, nearshore placement is 29% less expensive than traditional beach placement and 8% less expensive than disposal in the ODMDS as analyzed for the Jacksonville Harbor project (USACE, 2012). Optimizing nearshore placement depth is an operational issue that warrants further study to balance effectiveness versus cost. Also, optimizing placement areas along the shoreline of the shore protection project that are in greatest need of material could allow for extension of renourishment intervals, reducing lifetime project costs.

Additional opportunities outlined in this report that would enhance the RSM program in northeast Florida are currently under investigation or need further investigation. Potential beach quality and cost effective sediment sources identified for use in shore protection projects while also serving to benefit nearby navigation channels were considered for the Kings Bay Entrance Channel (settling basin use and expansion), the Ft. George River Inlet ebb shoal, the St. Johns River inner shoal, and the St. Johns River Inlet ebb shoal. The opportunities identified in this report each have challenges and limitations to overcome including stakeholder coordination, Federal authorization, and environmental concerns. Thus, efforts to better understand the physical processes and site conditions are needed to accept or reject opportunities as viable RSM options.

A more robust data collection program is needed to develop a greater understanding of the physical processes that influence sediment transport in the vicinity of northeast

Florida Federal projects. Regular surveys of navigation channels and shore protection projects are performed, however, surveys are often project specific and do not extend beyond what is necessary to monitor project performance. This practice introduces gaps in coverage that make complete understanding of the regional morphology change difficult. Data collection with improved spatial and temporal scale is the most important item needed to study and better understand the physical processes of the coastal system and to better ensure RSM concepts and strategies outlined in this document are viable and carried forward into practice.

Geotechnical investigations are required to ensure sediment compatibility between areas of identified sources and areas of need, including delineation of borrow areas. Periodic hydrographic surveys that extend beyond the navigation channel and cover the ebb shoal lobes, the areas between the jetties, and the beaches north and south of inlets should be conducted on an annual basis, or at a minimum, between maintenance dredging events. These periodic surveys provide the information needed to update the sediment budget and enhance the understanding of the functioning coastal morphology. The two inlets in this region that are not maintained (Nassau Sound and Ft. George River) should also be surveyed regularly to gain understanding of sediment transport processes so adjacent projects are managed as effectively as possible. Collection of currents, water levels, and wave data are also important for input into hydrodynamic models to allow for simulation of any proposed changes to the system. As a relatively low-cost investment (compared to project costs), geotechnical data, survey data, and hydrodynamic data collection can provide great dividends over project lifecycles when additional efficiencies and enhanced management strategies are realized.

The multitude of stakeholders that have an interest in the coastal system within the northeast Florida area requires that management strategies and alternatives are actively coordinated. Clear and frequent means of communication between Federal, state, city, academia, and NGOs will provide solutions tailored to address all parties' concerns and enhance the management of the coastal resources in the region. Not only will project support be garnered, and additional efficiencies achieved, but project implementation may also be realized where gaps in Federal authority preclude Federal action. Identifying the needs of all the stakeholders would also outline leveraging opportunities to help fund data collection, studies, and construction activities in order to accomplish shared goals. USACE can play a unique role to facilitate strategies that, for example, benefit U.S. Navy interests as well as non-federal interests (by coordinating offloading sediments from DMMA's at Kings Bay to the local shore protection project on Amelia Island). Previous coordination meetings, including the 2013 meeting held regarding management alternatives for the Ft. George River inlet system, have outlined paths forward and identified the roles that Federal, state, and local stakeholders can take to accomplish shared goals. USACE should continue to build collaborative relationships by setting up regular status meetings with interested parties.

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