TAYLOR ENGINEERING, INC.

SAD SAND DMMA Offloading and Sediment Exchange Study

August 28, 2020

Final Report

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SAD SAND DMMA Offloading and Sediment Exchange Study

Final Report

Prepared for

USACE Jacksonville

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by

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1.0 INTRODUCTION AND PURPOSE

The U.S. Army Corps of Engineers (USACE) dredges several hundred million cubic yards of sediment each year from U.S. ports, harbors, and waterways, and half of all dredged sediment is placed in upland or offshore facilities (USACE, 2020a). In many cases, the dredged material (sediment) retained in upland sites—traditionally called "disposal areas" (DAs), "confined disposal facilities" (CDFs), or dredged material management areas (DMMAs)—could be used to support beneficial re-use opportunities. Dredged sediment can and should be viewed as a valuable resource, not as a waste product which requires "disposal."

Regional Sediment Management (RSM) is a systems approach using best management practices for more efficient and effective use of sediments in coastal, estuarine, and inland environments. Offloading of sediment in DMMAs presents RSM opportunities to support coastal resilience, such as beach, nearshore, or littoral zone placement; and backbay, marsh, or wetland habitat creation. Other beneficial uses for the dredge material exist on the upland including use of sediment for building levees; or augmenting agriculture, infrastructure, and residential or commercial development.

The goal of this study is to promote RSM best practices, such as the beneficial re-use of dredged material placed in USACE-managed DMMAs throughout South Atlantic Division (SAD) and to identify potential uses to support offloading. The study includes a comprehensive database of the Division's confined and potentially offloadable DMMAs. The database is envisioned as an offloading and sediment exchange web application, designed in a way that potential end users can obtain comprehensive information about the available sediments in SAD DMMAs. This project is a subset of the USACE South Atlantic Coastal Study (SACS). This study seeks to identify and recognize successful dredged material management offloading and beneficial re-use practices within SAD, as well as to develop a framework for matching USACE DMMAs as sediment sources to sediment needs and beneficial re-use projects.

Figure 1.1 provides an overview of SAD boundaries and its Districts—Wilmington, Charleston, Savannah, Jacksonville, and Mobile. Section 4 of this report, the report appendices, and the study's companion database are organized by these Districts. This study does not include Puerto Rico or the U.S. Virgin Islands.

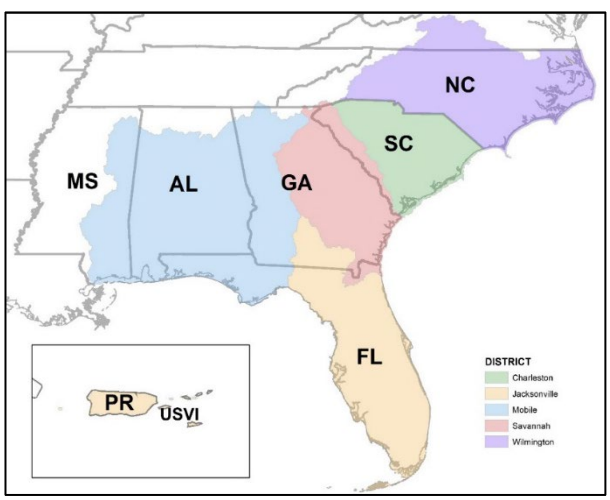

Figure 1.1 Map of the South Atlantic Division

2.0 METHODOLOGY OF GEODATABASE CREATION

The initial steps of this project included designing the geospatial database schema and collecting data on USACE-utilized upland DMMAs. Once USACE approved the database schema (see Appendix A for additional details on database structure), the team evaluated several data sources and contacted USACE-partnered private DMMA owners for detailed information associated with each DMMA. Section 2.1 details the primary data sources. A preliminary review of the DMMA records, at the start of the project in January 2020, estimated 652 DMMAs in SAD, as shown in Table 2.1. This count included civilian ports, U.S. Navy facilities, and some planned, unconstructed upland DMMAs. After a preliminary analysis of the data sources, Taylor Engineering provided an initial dataset to USACE for their review and update with the most current information.

Table 2.1 Initial Estimate of SAD DMMAs at Project Kickoff Meeting

USACE District	Estimated Number of USACE Utilized Placement Areas[1]	Estimated Number of Ports[2]	Estimated Number of U.S. Navy Facilities[2]	Estimated Initial DMMA Count
Wilmington	314	2	1 (Camp Lejeune)	318
Charleston	97	3	2 (Beaufort, Charleston)	102
Savannah	68	5	0	73
Jacksonville	97	9	2 (Mayport, Kings Bay)	108
Mobile	29	19	3 (Panama City, Pensacola, Pascagoula)	51
TOTAL	**605**	**39**	**8**	**652**

[1]*Not all of these USACE Placement Areas are constructed DMMAs.*
[2] *This is an initial estimate of ports and facilities, not the number of DMMAs at each facility.*

The initial USACE inputs contributed available DMMA characteristics for the USACE-utilized, -owned, or -managed DMMAs in the preliminary geodatabase. Taylor Engineering refined the data further by removing duplicate entries and unconstructed DMMA records. The next phase of the project entailed identifying and characterizing the list of DMMAs with information provided by USACE and the primary data sources. Characterizing each DMMA as confined or unconfined proved the most essential criteria for identifying those sites with potential for offloading. This analysis of confined vs unconfined used available aerial imagery of each DMMA in the geodatabase. Aerial imagery analysis included observations of the site's general conditions, such as the number of weirs, adjacency to marsh land, or if the placement appeared to be sidecast or a placement island. While conducting these site observations, numerous sites previously noted as "active" emerged with new attributes of "residential or commercial use" or "undeveloped." USACE reviewed the refined geodatabase, and the team reduced the list of 652 DMMAs down to 130 confined, upland DMMAs with the potential for offloading. Table 2.2 lists the updated number of DMMAs and their distribution among the five Districts within SAD.

Table 2.2 Revised Number of Potentially Offloadable DMMAs in SAD

USACE District	Initial DMMA Count (1 14 20)	Revised DMMA Count (2 21 20)	Final DMMA Count (7 1 20)
Wilmington	318	265	20
Charleston	102	104	98
Savannah	73	48	12
Jacksonville	108	79	37
Mobile	51	120	7
Total	**652**	**616**	**174**

2.1 Data Sources

The SAD DMMA Offloading and Sediment Exchange Study derives detailed information from past projects and geodatabases. Taylor Engineering compared available data from each of the primary sources listed in Table 2.3. In the case of conflicting information, the most recent data replaced the outdated information. For example, data provided in the 2019 plan replaced older data sourced from the 2011 report or 2010 USACE Placement Areas Geodatabase. An example data field requiring an update is “Remaining Volume,” indicating a DMMA’s available capacity, as this changes with each offloading and placement event. Up-to-date information provided by the Technical Points of Contact within each USACE District superseded data from older project reports and geodatabases.

Table 2.3 SAD DMMA Primary Database Sources

Source	File Type	Author
USACE Placement Areas Geodatabase (2010)	ESRI File Geodatabase	USACE
Atlantic Intracoastal Waterway Initial Plan Development Dredged Material Management Plan (2011)	Report, Spreadsheet, ESRI Shapefiles	Taylor Engineering
Florida Inland Navigation District Programmatic Spoil Site Rejuvenation Plan (2019)	Report, Spreadsheet, ESRI File Geodatabase	Taylor Engineering

2.1.1 *USACE Placement Areas Geodatabase (2010)*

The USACE Placement Areas Geodatabase contains a variety of placement areas throughout SAD. The coastal placement areas in this data source are categorized as upland, beach, estuarine, littoral, open water, and ocean. This SAD DMMA Offloading and Sediment Exchange Study is limited to the upland placement area type, as the other types are not easily offloadable. The Placement Areas Geodatabase was created as part of the USACE Navigation and Coastal Data Bank project in 2010 from 21 coastal USACE Districts. Additional placement areas included in this geodatabase are sourced from two USACE national programs—the National Dredging Quality Management, and CE-Dredge Programs. Specific DMMA attributes from this geodatabase which are carried over in the SAD DMMA Offloading and Sediment Exchange Study geodatabase include Initial Volume, Active or Inactive status, and Dike Height. Appendix A provides definitions of database attributes.

2.1.2 *Atlantic Intracoastal Waterway (AIWW) Initial Plan Development Dredged Material Management Plan (DMMP) (2011)*

In 2009, USACE SAD initiated a strategic and consistent long-range dredged material disposal capacity plan for all maintenance material dredged for the 740-mile portion of the AIWW between Norfolk, Virginia and the St. Johns River in Duval County, Florida. This resulted in the AIWW Initial Plan DMMP, completed in 2011 (Adams et al, 2011). The data from this AIWW study provided detailed information of each of the DMMAs along the AIWW in North Carolina, South Carolina, Georgia, and North Florida. Specific DMMA attributes from this study which are carried over in the SAD DMMA Offloading and Sediment Exchange Study geodatabase include Area, Dike Elevation, and Capacity.

2.1.3 *Florida Inland Navigation District Programmatic Spoil Site Rejuvenation Plan (2019)*

The Florida Inland Navigation District (FIND) is a twelve-county state special taxing district for the continued management and maintenance for the Atlantic and Intracoastal Waterways (ICWW) and a portion of the Okeechobee Waterway (OWW). The ICW and OWW extend along the east coast of Florida between Nassau and Miami-Dade counties. As the "local sponsor" of the ICWW, the District is also required to provide the USACE with sites suitable for placing materials dredged from the authorized navigation channels. The District maintains long-term (50-year) DMMPs for each of the 12 counties and the OWW. In total, the District owns and operates 57 DMMAs located throughout the twelve east coast counties. Of the 57 DMMAs, 50 are permanent upland facilities that are eligible for offloading, and the remaining 7 are beach placement or temporary offloading facilities. Of the 50 permanent upland facilities, 21 are currently constructed and operational, 4 are in the permitting and final design phase, 6 are in the current 5-year plan for permitting and design, and the remaining 19 are scheduled for future design and construction (Taylor Engineering, 2019). The 2019 study, entitled the *Florida Inland Navigation District Programmatic Spoil Site Rejuvenation Plan*, provided detailed data for use in the SAD DMMA Offloading and Sediment Exchange Study. Specific DMMA attributes used from this study include Existing Capacity, Sediment Quality, and Offloading Uses.

2.1.4 *Direct Input from USACE SAD Districts*

The USACE SAD Districts—Wilmington, Charleston, Savannah, Jacksonville, and Mobile—provided direct input for the DMMA Offloading and Sediment Exchange Study. The District Technical Point of Contact (TPOC) representatives on the project team are within the USACE Operations & Maintenance Navigation Program. Each District's TPOC reviewed the draft and final versions of the geodatabase and project report and provided available updated information for each placement area.

2.2 Study Limitations

The purpose of this study and geodatabase is to share best practices of DMMA management and planning across USACE SAD Districts and to encourage future offloading of sediment at these sites. Due to these goals, this study evaluated sites which had the potential for offloading as defined by USACE and Taylor

Engineering. The DMMAs presented in the final version of the geodatabase are defined as upland, confined, accessible by road or barge, with limited site restrictions, and evaluated by USACE as having potential for offloading. The DMMA attributes in this geodatabase represent information provided to Taylor Engineering by USACE or the DMMA sponsor/owner. For numerous DMMAs, available information was limited or not current. As a result, the details of some potential beneficial re-use or offloading opportunities may be limited and those that contain more detailed information provide more accurate recommendations.

3.0 DREDGED MATERIAL MANAGEMENT FACILITIES AND RE-USE AND OFFLOADING PRACTICES

DMMAs use a constructed earthen dike to enclose an area and receive and hold dredged material. Exterior to the diked enclosure, construction of these sites often includes ancillary infrastructure that supports the function—access roadways, stormwater facilities, and equipment staging areas—for example. In a typical dredging project's use of a DMMA, a hydraulic dredge pumps dredged material as a sediment-water slurry into the diked enclosure. The enclosure serves as a settling basin within which the dredged sediment settles out of the transporting water. To control the large volume of incoming water, constructed DMMAs incorporate outflow control structures, typically a network of weirs connected to an outflow pipeline which returns the clarified water (after the dredged material has settled out) to the waterway. Figure 3.1 provides a typical DMMA cross section.

Other dredged material management strategies exist which do not rely on DMMAs. These include:

- Unconfined Disposal — Unconfined disposal refers to direct placement of dredged material, either in open water or marsh environments, with no confining or outflow control structures. This strategy may result in creation of upland stockpile of dredge material. However, these sites typically include no supporting infrastructure (roads, etc.). Therefore, they offer unique challenges for application as beneficial re-use sediment sources.
- Ocean Disposal — Ocean disposal of dredged material requires transport of dredged material from a dredging site to an authorized offshore dredged material disposal site (ODMDS). Wilmington and Charleston districts each use a portion of an ODMDS as a re-handling area to store non-contaminated sediment for future use.
- Direct Beneficial Use — This RSM strategy takes dredged material and puts it to direct beneficial use without the intermediate step of storage within a DMMA. Because the material is put to direct beneficial use, there is no need to identify "re-use" applications.

Although beneficial re-use can occur in each of the dredged material management strategies listed above, these are not the topic of this report. This study focuses on offloading sediment from existing, constructed, and in-service confined DMMAs for beneficial re-use.

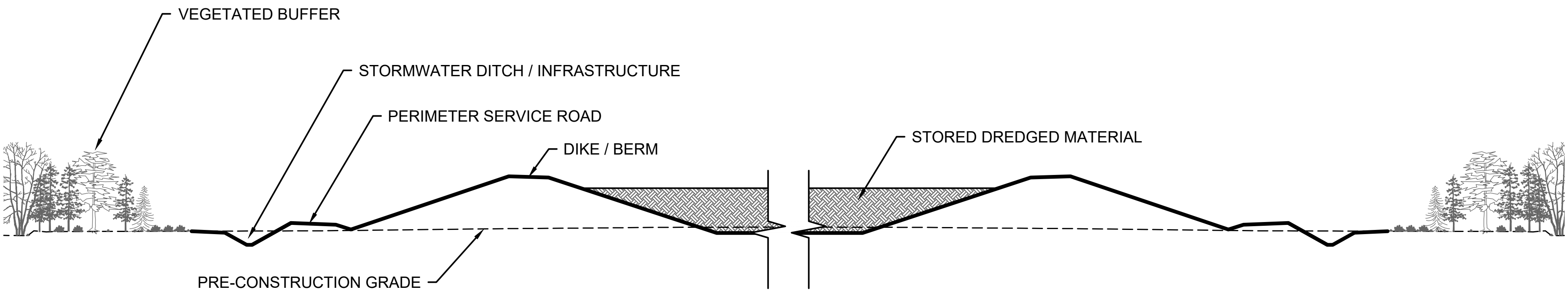

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FIGURE 3.1
CROSS-SECTION THROUGH A TYPICAL DREDGED MATERIAL MANAGEMENT AREA

PROJECT	
DRAWN BY	AF
SHEET	1 OF 1
DATE	JULY 2020

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PRELIMINARY DRAWINGS: THESE DRAWINGS ARE NOT IN FINAL FORM, BUT ARE BEING TRANSMITTED FOR AGENCY REVIEW.

3.1 Offloading and Beneficial Re-Use Concepts

DMMA offloading consists of removal, transport, and disposal (permanent) or re-use of materials previously (during a past dredging event) placed within a DMMA. Offloading serves to restore the DMMA's storage capacity for future dredging events. Beneficial re-use of dredged material uses the material previously placed in a DMMA as a resource to provide environmental, economic, or social benefits (USACE, 1987). Offloading and beneficial re-use of dredged material is an important goal for a sustainable future in long-term dredged material management. Historically, dredged material placement and indefinite storage within confined disposal facilities contributed to the perception of dredged material as a waste product instead of a resource. New dredged material management practices within SAD will create potential for offloading and beneficial re-use of sediment materials. These practices will regenerate available capacity within existing DMMAs to allow for a sustainable future in dredging that allows for navigation maintenance while minimizing environmental impacts and, in some cases, providing for environmental improvements.

The most cost-effective re-use opportunities are generally on-site. Dredge material often serves as a source of material to improve site infrastructure. For example, many DMMA sites apply dredged material to augment or raise the site's earthen dikes. This strategy increases site storage by restoring storage volume (through the removal of stored sediments) and by increasing capacity through an increase in containment dike elevation. In another example of onsite re-use, dredged material with gravel content might serve to maintain access roads.

Various categories define dredged material management practices that provide for direct beneficial use (Childs, 2015). These direct use opportunities provide the full range of categories that may be refined to characterize offsite beneficial re-use options. Beneficial re-use categories qualify as "re-use" if the dredged material, first placed into a DMMA, is then offloaded for a beneficial use application. Below lists the DMMA offloading beneficial use categories (ASCE, 2019) refined for beneficial re-use:

- *Placement for Upland Land Development:* This beneficial re-use applies dredged material for upland elevation gain or land development including commercial or residential development, agriculture application, and parks and recreation construction. Photograph 3.1 is an aerial image of DMMA DU-2 (Jacksonville, Florida) offloading in 2018 for use in commercial construction. In this case, typical upland earthwork equipment excavated dredge material from the DMMA and placed the material in trucks for transport to a nearby construction site.

Photograph 3.1 DMMA DU-2 Offloading for Commercial Construction (2018)

- *Beach or Nearshore Placement for Shoreline Protection or Beach Nourishment*: This re-use application places dredged material on or along the shoreline (coastal, estuary, and inland) to restore or maintain beaches. This option includes sediment placed directly for beach nourishment, as well as nearshore placement with the intent for the dredged material to remain within the depth of closure or littoral zone. Beach placement may occur either through truck haul and earthwork placement or via hydraulic dredge where material at the DMMA is re-slurried and pumped to the beach site. Photograph 3.2 provides an image of beach placement at Summer Haven, Florida where dredged material from DMMA SJ-1 (St. Johns County, Florida) hauled to the site helped restore a beach severely damaged by coastal storms.

Photograph 3.2 Summer Haven, Florida Beach Placement from DMMA SJ-1 (2011)

- *Upland Habitat Development*: Dredged material may be beneficially re-used for environmental restoration or habitat development. In this application, dredged material may be placed upland for forest or bird habitat creation, for example.

- *Wetland Habitat Development*: This re-use application places dredged material below ordinary high water for wetland or marsh nourishment/creation or to build other habitat such as bottomland hardwood, swamp, wooded wetland, scrub-shrub, and forested wetland. Depending on the project, material transport and placement may occur via traditional earthwork equipment, or by pipeline in slurry form placed by hydraulic dredge. This latter method is called thin layer placement (TLP), where pumped material is sprayed or piped in to build up the marsh in shallow lifts in order to slowly raise the ground elevation of an existing habitat. Photograph 3.3 illustrates the TLP method, with slurried material applied via the spraying technique.

Photograph 3.3 Wetland Habitat Development at Blackwater National Wildlife Refuge, Maryland (Harp, 2017)

- *Unconfined Aquatic Placement*: With this re-use strategy, offloaded dredged material may be placed into a river, lake, bay, estuary, or ocean in an unconfined manner. Here the goal is to beneficially restore or maintain sediment in the littoral system to improve the aquatic ecosystem.

- *Confined Aquatic Placement (CAP)*: This beneficial re-use application places dredged material in-water but in a confined and controlled manner within a defined footprint. These placements can occur within historic dredged holes, natural deep areas, or within constructed confinement areas. Commonly, such projects have the goal of supporting sub-aquatic vegetation, essential fish habitat, or other beneficial purpose. Figure 3.2 provides a graphic representation of a confined aquatic placement application.

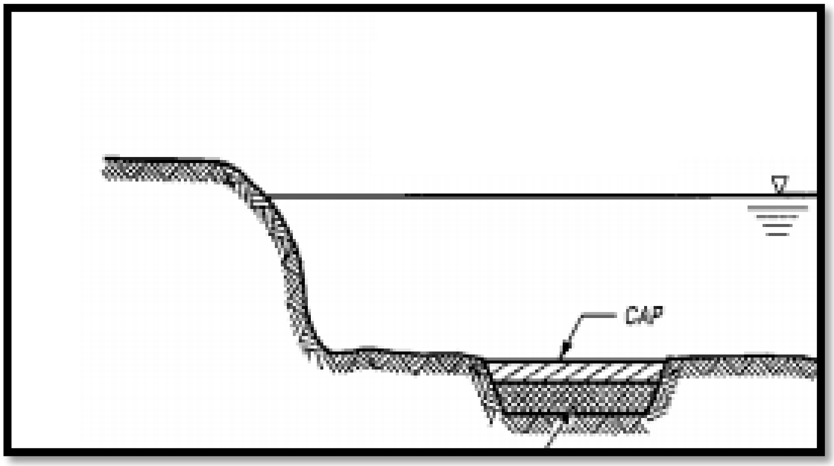

Figure 3.2 Schematic of Confined Aquatic Placement
(Adapted from: USACE, 1998 - *Confined Disposal Facilities on the Great Lakes*)

- *Island Placement*: Dredged material may be beneficially re-used to create islands or to nourish islands impacted by erosion. Such island creation can satisfy a range of beneficial re-use needs. For example, in 2013, dredged material offloaded from DMMA M-5 (Martin County, Florida) served to construct the foundation of breakwater islands to protect the Ft. Pierce Marina from storm waves and boat wakes (Photograph 3.4).

Photograph 3.4 Island Placement at Ft. Pierce Marina, Florida Islands and Breakwater

3.2 Beneficial Re-Use Flowchart

The goal of DMMA offloading and beneficial re-use is to apply stored dredged sediment as a resource. Matching appropriate beneficial re-use strategies with DMMA offloading projects requires consideration of numerous factors. The next section of the report provides guidance to begin evaluation and planning for DMMA offloading and beneficial re-use opportunities.

Successful DMMA offloading for beneficial re-use requires balancing multiple project features. This study introduces a beneficial re-use flow chart (Figure 3.3) to provide initial guidance for assessing potential projects for offloading and beneficial re-use of dredged material.

The flowchart begins with a basic question as to whether a planned beneficial re-use project is economically feasible. A variety of factors contribute to a cost-feasible project. These factors begin with DMMA proximity to the potential re-use site and related transportation costs—whether by truck, pipeline, or barge—to move dredged material from the DMMA to the beneficial re-use sites. Section 3.4 provides guidance for these direct costs. There are, however, project-specific cost questions which planners must consider. For example, is it necessary to upgrade road access to allow for heavy earthwork equipment mobilization to the site for loading and truck haul transportation? For a project that relies on pipeline transport, what is the cost to construct an intramodal offloading area to reslurry and pump dredged materials? These and other similar additional infrastructure costs are highly dependent on local site conditions, and these costs should be carefully considered early in the planning process. There are other, indirect costs that should also enter into determination of economic feasibility. The intended project must abide by local and federal environmental regulations that address water quality, wetland impacts, habitat protection, and threatened and endangered species considerations. Planners should include an evaluation of environmental impact cost during the initial assessment process.

Notably, while the question of cost is topmost in the flow chart, arriving at a final answer regarding cost feasibility requires an iterative approach where planners work through the flowchart to make key decisions regarding the project. These decisions will inform cost models, and the cost models may suggest alterations to the plan.

The flowchart then queries whether any opportunities may exist to apply dredged material for on-site beneficial re-use. Engineering Manual 1110-2-5026 recommends that enhancement measures on existing DMMA should be identified before offloading dredged material. These enhancements include dike raising, perimeter road improvements, and land development features that maintain the DMMA. If planners and designers identify no on-site enhancements, or if excess material remains, the material may then serve beneficial re-use projects.

Many DMMAs store pristine natural sediments, but some DMMA sites include contaminated materials. Planners should begin with a review of the site's history in receiving dredged material to determine likelihood of contamination. With an understanding of the site-specific history, a thorough sampling and testing plan allows the design team to identify and mitigate any contamination risk. As noted in the flowchart, with appropriate testing and precautions, beneficial re-use opportunities may still exist under the procedures described in CWA Section 404 guidelines for compliance (EPA/USACE, 2007).

A thorough characterization of dredged material composition and constituent is a necessary early step in planning for offloading and beneficial re-use. If soil characteristics are unknown, the design team should commission a geotechnical investigation to determine soil characteristics. Table 3.1 lists the dredged material types with each corresponding common beneficial re-use:

Table 3.1 Beneficial Re-Use Based on Dredged Material Classification

Dredged Material Type	Beneficial Re Use Categories
Gravel	Upland Land Development, Confined Aquatic Placement, Unconfined Aquatic Placement
Sand	Beach Placement, Upland Land Development, Upland Habitat Development, Wetland Habitat Development, Confined Aquatic Placement, Unconfined Aquatic Placement, Island Placement
Clay	Upland Land Development, Upland Habitat Development, Wetland Habitat Development, Confined Aquatic Placement, Unconfined Aquatic Placement
Silt	Upland Land Development, Upland Habitat Development, Wetland Habitat Development, Confined Aquatic Placement, Unconfined Aquatic Placement
Muck	Upland Land Development, Wetland Habitat Development

As illustrated in the flowchart in Figure 3.3, beneficial re-use opportunities are often associated with specific sediment types.

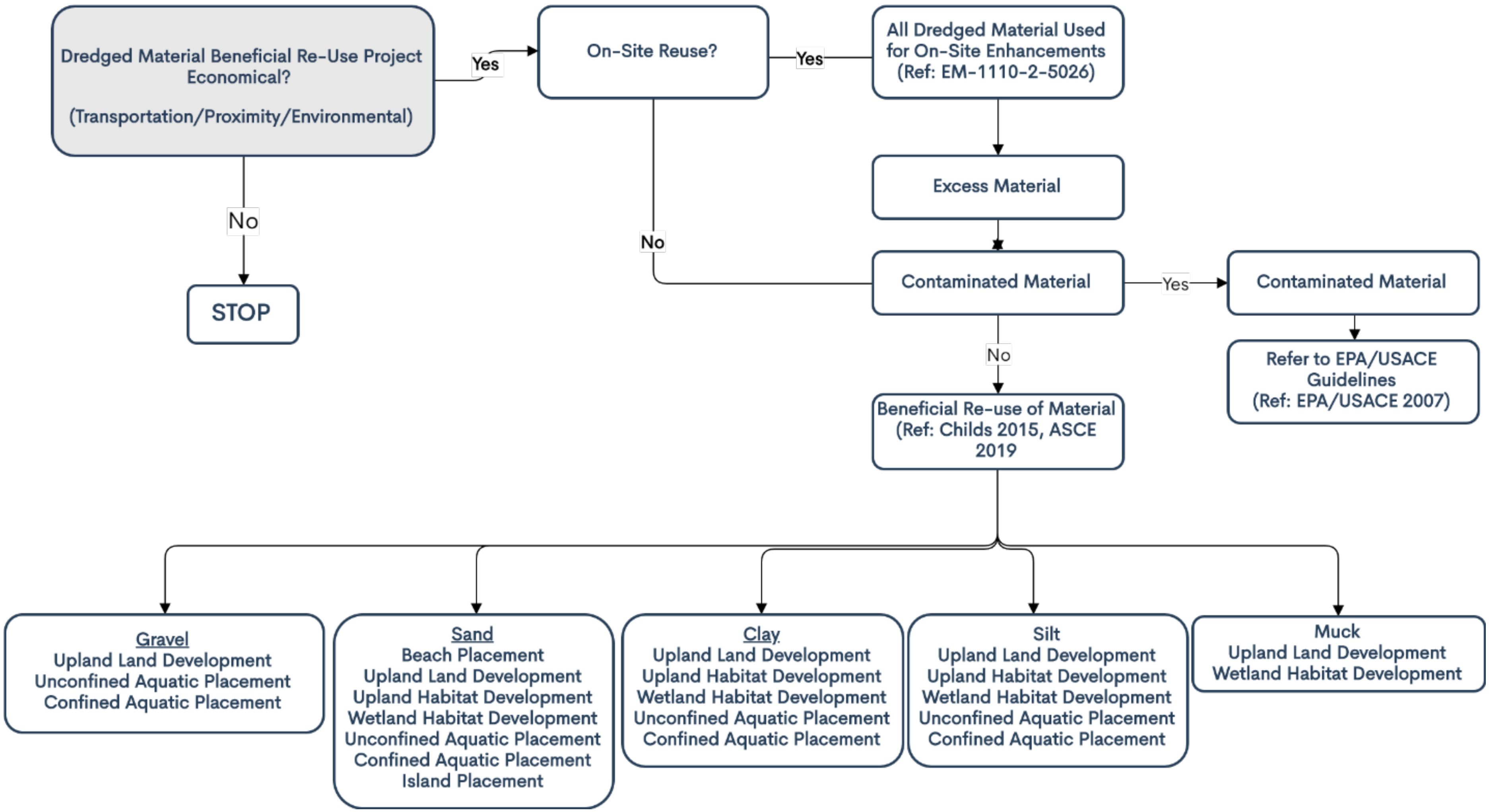

Figure 3.3 Beneficial Re-Use Flowchart

3.3 Offloading and Beneficial Re-Use Costs

This section describes basic costs for various potential offloading and beneficial re-use projects. The costs presented are meant to provide generalized unit costs to serve for planning purposes and do not represent complete cost estimates. As noted above, site specific conditions may require specific infrastructure improvements, environmental considerations, or unique mobilization/demobilization requirements that may not be captured by costs noted herein.

Table 3.2 provides a summary for offloading costs organized by beneficial re-use category. This table provides costs ranges for major project components including mobilization, excavation, transport, and placement. Because specific costs depend on site-specific conditions and project requirements, the table presents typical 2020 cost ranges. These costs are based on recently completed offloading projects performed in the Jacksonville district over the last two years. Where current cost data was not available, it was estimated by applying escalation to costs from a 1987 USACE study entitled *Beneficial Uses of Dredged Material*.

Beneficial re-use project costs are particularly sensitive to transport method and distance to the beneficial re-use placement site. Long transport distances increase costs. In addition, the size of the project also influences costs. Larger projects (by volume of sediment) benefit from economies of scale and offer some cost savings.

Table 3.3 serves to account for transport method, distance, and project size factors as an initial tool to better refine the noted cost ranges. This table provides estimated costs in dollars per cubic yard (CY) of dredged material transported. The reader should note, however, that transport costs are highly variable and dependent on local conditions. For example, barge transport across open water in a rural setting is typically much less costly than through a high-traffic urban navigation corridor. Research indicates that offloading of USACE DMMAs range on the order of $20/CY in the Mobile District and $50/CY along the Intracoastal Waterway in the Philadelphia District (USACE, 2020a). Transport by rail is not included in this summary due to limited proximity of rail for those DMMAs in this study.

When evaluating the economic feasibility of an offloading and beneficial re-use projects, planners must consider more than the cost side of the ledger. Presumably, a beneficial re-use project offers a benefit with some economic value. As a simple example, if a DMMA may be offloaded to provide fill for a nearby public roadway project, that offloading may offer a significant cost saving to the roadway project. Often, recognition of these benefits and saving can offset the costs tabulated herein. In fact, some of the offloading and beneficial re-use examples included in this chapter and throughout this report occurred without any direct construction cost to the DMMA owner. The sediment was of such value to the receiving party, that the receiving party offered to remove the sediment at no cost to the DMMA owner. Of course, even in the most opportune cases, the DMMA owner will incur some management and oversight costs to ensure offloading occurs in a safe and orderly manner and without damage to site infrastructure. In these case, successful offloading and beneficial re-use relies on a partnership between DMMA owner and receiving party. These partnerships offer benefit to both parties. The DMMA owner benefits from a low-cost offloading of the DMMA that restores site capacity, and the receiving party benefits from a lower cost (as compared to other sources) and ready supply of sediment.

Table 3.2 Offloading Costs by Beneficial Re-Use Category

Beneficial Re Use Opportunity	Excavation Costs ($/CY)	Transport Costs ($/CY)	Placement Costs ($/CY)	Mobilization/Demobilization/ Other Associated Costs
Upland Land Development (Truck)	$3-$5	$8-$32	$2-$5	$100,000 -$200,000
Beach Placement (Truck)	$3-$5	$8-$32	$2-$5	$100,000 -$200,000
Beach Placement (Pipeline)	$10-$30	$5-$33	$2-$5	$400,000 - $1,200,000
Upland Habitat Development (Truck)	$3-$5	$8-$32	$2-$5	$100,000 -$200,000
Wetland Habitat Development (Pipeline or Barge)	$10-$30	$5-$33	$30-$50	$300,000 - $1,700,000
Unconfined Aquatic Placement (Pipeline or Barge)	$10-$30	$5-$33	$2-$5	$300,000 - $1,200,000
Confined Aquatic Placement (Pipeline or Barge)	$10-$30	$5-$33	$10-$30	$300,000 - $1,200,000
Island Placement (Pipeline or Barge)	$10-$30	$5-$33	$25-$30	$300,000 - $1,200,000

Notes:
Offloading quantities range from 50,000 CY - 1,000,000 CY of dredged material.
Transport distance range from 5-30 miles.
Cost information adapted from USACE 1987, with an escalation factor to 2020 dollars.
Values are consistent with 2020 industry standards (referenced from RS Means Heavy Construction Costs and Taylor Engineering projects).

Table 3.3 Offloading Costs by Quantity and Distance

Transport Cost, $/CY				
Quantity (CY)	Distance (mi)	Truck	Barge[1]	Pipeline[2]
50,000	5	$13	$5	$21
	10	$18	$5	$25
	20	$30	$8	-
	30	$32	$9	-
100,000	5	$12	$5	$14
	10	$16	$5	$17
	20	$25	$8	-
	30	$27	$9	-
500,000	5	$9	$7	$5
	10	$12	$7	$7
	20	$18	$9	-
	30	$20	$10	-
1,000,000	5	$8	$8	$5
	10	$10	$8	$7
	20	$11	$9	-
	30	$14	$9	-

Notes:
This table supplements Table 3.2 to provide more resolution for the method and distance of material transport.
Cost information adapted from USACE, 1987a, with an escalation factor to 2020 dollars.
Values are generally consistent with 2020 industry standards (referenced from RS Means Heavy Construction Manual and Taylor Engineering projects).
This table does not include mobilization and demobilization costs, excavation costs, placement costs, or other associated costs.
[1]Barge transport cost is dependent on numerous location-specific variables (i.e. regional barge availability, waterway traffic, transit water depths, overhead clearance along the route, etc).
[2]Pipeline transport over 10 miles is not economical.

4.0 SEDIMENT EXCHANGE PRACTICES AND OPPORTUNITIES

4.1 Wilmington District (SAW)

4.1.1 *Dredged Material Management Areas*

The Wilmington District includes 20 active DMMAs chosen by the USACE technical team with the potential for offloading and beneficial re-use opportunities. The majority of these DMMAs are along the AIWW. Photograph 4.1 depicts an example of an AIWW DMMA (DA 203) with beach quality sand in Pender County, North Carolina.

Photograph 4.1 DA 203 (Google, 2020)

Figure 4.1 shows a map overview of the DMMAs in the Wilmington District. Appendix C provides a one-page overview with aerial image, locator map, and tabular summary of each site.

4.1.2 *Current Management, Offloading, and Beneficial Re-use Strategies and Applications*

The USACE Wilmington District manages various DMMAs from Manteo Bay in Dare County to the Port of Wilmington and including the extent of the AIWW within North Carolina. The USACE technical team supplied information indicating infrequent DMMA offloading for beneficial re-use has occurred within the district. Many of the district's DMMAs have offloaded material for on-site enhancements such as dike raising and other site improvements. The sections below provide a brief narrative description of previous DMMA offloading and beneficial re-use activities that have occurred in the District.

Table 4.1 lists the sediment exchange study DMMAs in the Wilmington District, identifies each site's current volume and capacity characteristics, and summarizes previous instances of offloading and beneficial re-use. Where data is unknown, such as the current or remaining volume of a DMMA, the field is blank. If the DMMA has not been offloaded for beneficial re-use in the recent past, blank fields indicate no record of offloading exists. Notably, the sparseness of the data in Table 4.1 indicates areas where additional data collection and analyses can provide significant benefits to the District's potential RSM project roster.

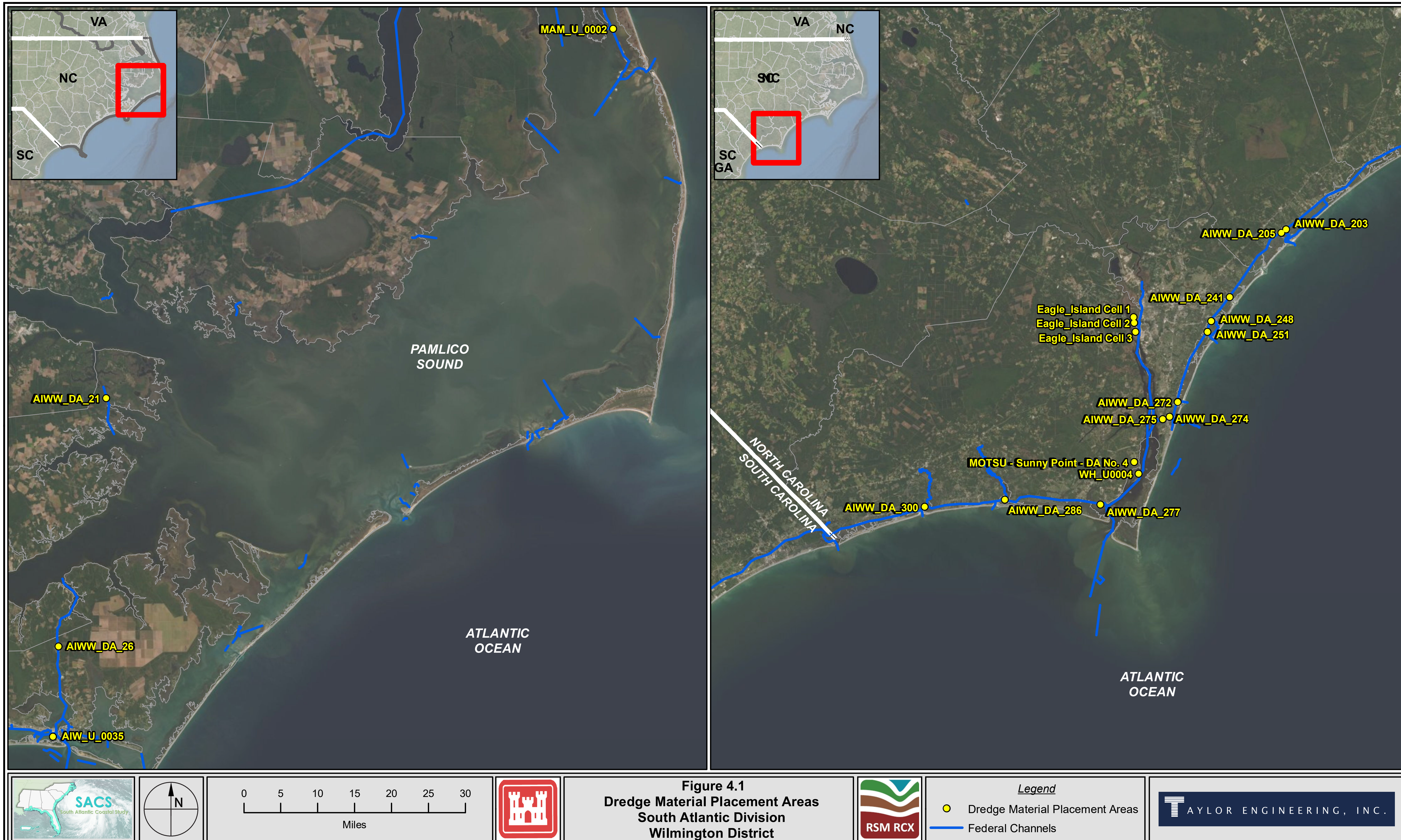

Figure 4.1
Dredge Material Placement Areas
South Atlantic Division
Wilmington District

Table 4.1 SAW DMMA Volumes, Past Offloading and Beneficial Re-use as of April 2020

DMMA Name	Also Known As	Navigation Project or Reach	County	Design Capacity (CY)	Current Volume (CY)	Remaining Volume (CY)	Previous Beneficial Use of Material	Previous Offloading Location	Offloading Volumes	Offloading Frequency
MAN_U_0002	Island H	Manteo "Shallowbag" Bay	Hyde							
AIWW_DA_21	DA 21	Norfolk Beaufort Hobucken	Pamlico	120,000			Upland Land Development	NCDOT Bridge		
AIWW_DA_26	DA 26	Norfolk Beaufort Core Creek	Carteret	192,000						
AIW_U_0035	Brandt Island	Morehead City Harbor	Carteret							
AIWW_DA_203	DA 203	Beaufort to Cape Fear River Section 3	Pender	3,000			Beach Placement	Topsail Beach, NC		Most recent (2011-2012)
AIWW_DA_205	DA 205	Beaufort to Cape Fear River Section 3	Pender	428,718						
AIWW_DA_241	DA 241	Beaufort to Cape Fear River Section 3	New Hanover	701,098			Beach Placement	Figure 8 Island		Most recent (1999-2000)
AIWW_DA_248	DA 248	Beaufort to Cape Fear River Section 4	New Hanover	206,300						

DMMA Name	Also Known As	Navigation Project or Reach	County	Design Capacity (CY)	Current Volume (CY)	Remaining Volume (CY)	Previous Beneficial Use of Material	Previous Offloading Location	Offloading Volumes	Offloading Frequency
AIWW_DA_251	DA 251	Beaufort to Cape Fear River Section 4	New Hanover	80,000						
AIWW_DA_272	DA 272	Beaufort to Cape Fear River Section 4	New Hanover	36,000						
AIWW_DA_274	DA 274	Beaufort to Cape Fear River Section 5	New Hanover							
AIWW_DA_275	DA 275	Beaufort to Cape Fear River Section 5	New Hanover							
Eagle_Island	Eagle Island Cell 1	Wilmington Harbor	Brunswick							
Eagle_Island	Eagle Island Cell 2	Wilmington Harbor	Brunswick							
Eagle_Island	Eagle Island Cell 3	Wilmington Harbor	Brunswick							
MOTSU - Sunny Point - DA No. 4	MOTSU - Sunny Point - DA No. 4	MOTSU	Brunswick							
WH_U0004	WH 4	Beaufort to Cape Fear River Section 5	Brunswick							

DMMA Name	Also Known As	Navigation Project or Reach	County	Design Capacity (CY)	Current Volume (CY)	Remaining Volume (CY)	Previous Beneficial Use of Material	Previous Offloading Location	Offloading Volumes	Offloading Frequency
AIWW_DA_277	DA 277	Cape Fear River to Little River	Brunswick	100,000						
AIWW_DA_286	DA 286	Cape Fear River to Little River	Brunswick	40,000						
AIWW_DA_300	DA 300	Cape Fear River to Little River	Brunswick	74,000						

4.1.2.1 Upland Land Development — Past Projects

DA 21 (Norfolk Beaufort Hobucken): North Carolina Department of Transportation (NCDOT) offloaded this DMMA during a bridge construction project. The dates and volumes of this offload were not available.

4.1.2.2 Beach or Nearshore Placement — Past Projects

DA 203 (Beaufort to Cape Fear River Section 3): The most recent offloading of DA 203 occurred in 2011-2012 by a local entity. DA 203 is situated adjacent to the AIWW and contains primarily beach compatible dredged material.

DA 241 (Beaufort to Cape Fear River Section 3): In 1999-2000, DA 241 was offloaded and placed on Figure Eight Island by a local entity. DA 203 is located next to the AIWW and contains primarily beach compatible dredged material.

4.1.3 *Potential Management, Offloading, and Beneficial Re-Use Opportunities*

Review of the DMMA site database offers a range of potential management, offloading, and beneficial re-use opportunities. This section provides an initial evaluation for potential future offloading and beneficial re-use opportunities. Appendix B provides detailed specific project examples. USACE may plan future offloading events and re-use strategies with the beneficial re-use flowchart presented previously (Figure 3.3) as a guideline. Approximate offloading costs per cubic yard of material, including excavation and transport, are provided in Chapter 3.3.

The following sections list future DMMA offloading opportunities in the Wilmington District, categorized by beneficial re-use strategies.

4.1.3.1 District-wide Summary of Potential Management, Offloading, and Beneficial Re-Use Opportunities

The Wilmington District's potential offloading and beneficial re-use strategies include upland land development and beach or nearshore placement. These strategies involve excavating the material from the DMMA and transporting the sediment to a beneficial re-use project. Evaluation of several criteria is necessary to decide which re-use strategies are most appropriate for a given DMMA site and re-use project location. Chapter 3's beneficial re-use flowchart (Figure 3.3) outlines these criteria.

Planners should consider minimizing transportation distance between the DMMA and the selected project site to improve economic feasibility. The sediment characteristics of the material in each DMMA are a critical component when deciding which offloading and beneficial re-use strategies are most applicable to the site. If sediment characteristics are unknown at the DMMA, geotechnical investigations can classify the chemical and physical properties of the material inside the DMMA. The geotechnical investigation will determine sediment characteristics (grain size, Munsell color, silt content, shell content, etc.) and material chemistry (levels of contamination). If the chemical tests identify contaminants, refer to the EPA and USACE reference documents noted in the beneficial re-use flowchart (Figure 3.3).

Table 4.2 identifies potential beneficial re-use opportunities in the Wilmington District. Where data is unknown, such as the potential offloading volume or sediment characteristics of a DMMA, the field is blank. If sediment characteristics are unavailable, the potential beneficial uses, locations and strategies will also be blank, indicating not enough information exists. The relative sparseness of the data in Table

4.2 indicates areas where additional data collection can provide significant benefits to the District's future DMMA offloading opportunities.

4.1.3.2 Upland Land Development

Upland land development provides dredged material as a source for several opportunities. Potential beneficial re-use opportunities include commercial and residential construction, farming, parks and recreation. Additional upland opportunities exist for future levee development to protect against storm surge and sea level rise. Upland land development retrieves sand from DMMA by excavating the material and trucking the material to the desired beneficial re-use project location. Table 4.2 indicates the DMMA sites that are feasible for upland land development.

DMMA sites preliminarily identified as suitable for potential upland land development (and their respective navigation project) are:

- DA 21 (Norfolk Beaufort Hobucken)
- DA 274 (Beaufort to Cape Fear River Section 4)
- DA 275 (Beaufort to Cape Fear River Section 5)
- Eagle Island Cell 1 (Wilmington Harbor)
- Eagle Island Cell 2 (Wilmington Harbor)
- Eagle Island Cell 3 (Wilmington Harbor)

4.1.3.3 Beach or Nearshore Placement for Shoreline Protection or Beach Nourishment

Beach or nearshore placement of re-used dredged sediment restores and augments beaches and dunes. Typical beach placement from DMMA offloading relies on excavation of sand from the site and truck haul transport to the desired beach placement area. When the DMMA is accessible by water, an alternative transport method includes loading sand onto barges for transport or re-slurrying sediment with water for pumping and pipeline transfer of dredged material to the selected beach or nearshore. The quality of the sediment, considerations of environmental impacts, and the cost/economics of transportation are three factors that frequently govern feasibility of such a project.

Table 4.2 and the following bulletized list summarize those sites with potential for future beach placement offloading. These sites are identified as currently having beach compatible dredged material and are located within 20 miles of a prospective beach placement location.

DMMA sites preliminarily identified as suitable for potential beach placement (and their respective navigation project) are:

- DA 203 (Beaufort to Cape Fear River Section 3)
- DA 205 (Beaufort to Cape Fear River Section 3)
- DA 241 (Beaufort to Cape Fear River Section 3)
- DA 272 (Beaufort to Cape Fear River Section 4)
- DA 274 (Beaufort to Cape Fear River Section 4)
- DA 275 (Beaufort to Cape Fear River Section 5)
- WH 4 (Beaufort to Cape Fear River Section 5)
- DA 286 (Cape Fear River to Little River)

Table 4.2 Potential Beneficial Re-use Opportunities in SAW

DMMA Name	Also Known As	Navigation Project or Reach	County	Potential Beneficial Uses of Material	Potential Offloading Volume (CY)	Potential Offloading Location	Potential Offloading Strategy	Sediment Characteristics
MAN_U_0002	Island H	Manteo "Shallowbag" Bay	Hyde					
AIWW_DA_21	DA 21	Norfolk Beaufort Hobucken	Pamlico	Upland Land Development		Pamlico County, NC	Excavator, Dump Truck, Barge, Hydraulic Dredge, Bulldozer	
AIWW_DA_26	DA 26	Norfolk Beaufort Core Creek	Carteret					
AIW_U_0035	Brandt Island	Morehead City Harbor	Carteret					
AIWW_DA_203	DA 203	Beaufort to Cape Fear River Section 3	Pender	Beach Placement		Topsail Beach, NC	Excavator, Barge, Hydraulic Dredge, Bulldozer	Sand
AIWW_DA_205	DA 205	Beaufort to Cape Fear River Section 3	Pender	Beach Placement		Topsail Beach, NC	Excavator, Barge, Hydraulic Dredge, Bulldozer	Sand
AIWW_DA_241	DA 241	Beaufort to Cape Fear River Section 3	New Hanover	Beach Placement		Wrightsville Beach, NC	Excavator, Barge, Hydraulic Dredge, Bulldozer	Sand

DMMA Name	Also Known As	Navigation Project or Reach	County	Potential Beneficial Uses of Material	Potential Offloading Volume (CY)	Potential Offloading Location	Potential Offloading Strategy	Sediment Characteristics
AIWW_DA_248	DA 248	Beaufort to Cape Fear River Section 4	New Hanover					
AIWW_DA_251	DA 251	Beaufort to Cape Fear River Section 4	New Hanover					
AIWW_DA_272	DA 272	Beaufort to Cape Fear River Section 4	New Hanover	Beach Placement		Carolina Beach, NC	Excavator, Barge, Hydraulic Dredge, Bulldozer	Sand
AIWW_DA_274	DA 274	Beaufort to Cape Fear River Section 5	New Hanover	Beach Placement, Upland Land Development		Carolina Beach, NC	Excavator, Dump Truck, Bulldozer	Sand
AIWW_DA_275	DA 275	Beaufort to Cape Fear River Section 5	New Hanover	Beach Placement, Upland Land Development		Downtown Wilmington/Carolina Beach, NC	Excavator, Barge, Hydraulic Dredge, Bulldozer	Sand
Eagle_Island	Eagle Island Cell 1	Wilmington Harbor	Brunswick	Upland Land Development		Commercial/Residential Development - Brunswick County, NC	Excavator, Dump Truck, Bulldozer	
Eagle_Island	Eagle Island Cell 2	Wilmington Harbor	Brunswick	Upland Land Development		Commercial/Residential Development - Brunswick County, NC	Excavator, Dump Truck, Bulldozer	
Eagle_Island	Eagle Island Cell 3	Wilmington Harbor	Brunswick	Upland Land Development		Commercial/Residential Development - Brunswick County, NC	Excavator, Dump Truck, Bulldozer	

DMMA Name	Also Known As	Navigation Project or Reach	County	Potential Beneficial Uses of Material	Potential Offloading Volume (CY)	Potential Offloading Location	Potential Offloading Strategy	Sediment Characteristics
MOTSU - Sunny Point - DA No. 4	MOTSU - Sunny Point - DA No. 4	MOTSU	Brunswick					
WH_U0004	WH 4	Beaufort to Cape Fear River Section 5	Brunswick	Beach Placement		Caswell Beach, NC	Excavator, Barge, Hydraulic Dredge, Bulldozer	Sand
AIWW_DA_277	DA 277	Cape Fear River to Little River	Brunswick					
AIWW_DA_286	DA 286	Cape Fear River to Little River	Brunswick	Beach Placement		Oak Island Beach, NC/Holden Beach, NC	Excavator, Barge, Hydraulic Dredge, Bulldozer	Sand
AIWW_DA_300	DA 300	Cape Fear River to Little River	Brunswick					

4.2 Charleston District (SAC)

4.2.1 *Dredged Material Management Areas*

The Charleston District includes 98 operating DMMAs that have been offloaded or have potential for offloading. Photograph 4.2 depicts an aerial image of 1056S W-C in Charleston County, South Carolina. Figure 4.2 provides a map overview of the DMMAs in the Charleston District. Appendix D provides a one-page overview with aerial image and tabular summary of each site.

Photograph 4.2 1056S W-C (Google, 2020)

4.2.2 *Current Management, Offloading, and Beneficial Re-use Strategies and Applications*

The USACE Charleston District manages various DMMAs related to navigation projects such as the Atlantic Intracoastal Waterway, Charleston Harbor, Georgetown Harbor, and Folly River. In the past, the USACE has used material from many of these sites for on-site enhancement opportunities that include dike raising and other site feature improvements.

4.2.2.1 District-Wide Summary of Current Management, Offloading, and Beneficial Re-Use Strategies

The Charleston District currently does not offload dredged material, except for on-site enhancements such as dike raising and other site improvements. Third parties that use the USACE DMMAs have previously offloaded dredged material from the USACE sites. The “Tri-Party Agreement” between the USACE, State of South Carolina, and Horry County allow third parties to use DMMAs, but the material placed must be hauled out to restore capacity.

Table 4.3 itemizes Charleston District’s DMMA, including each site’s current volume and capacity characteristics, and past offloading and beneficial re-use information. Where data is unknown, such as the current or remaining volume of a DMMA, the field is blank. If the DMMA has not been offloaded for beneficial re-use in the recent past, blank fields indicate no record of offloading exists. Notably, the sparseness of the data in Table 4.3 indicates areas where additional data collection and analyses can provide significant benefits to the District’s potential RSM project roster.

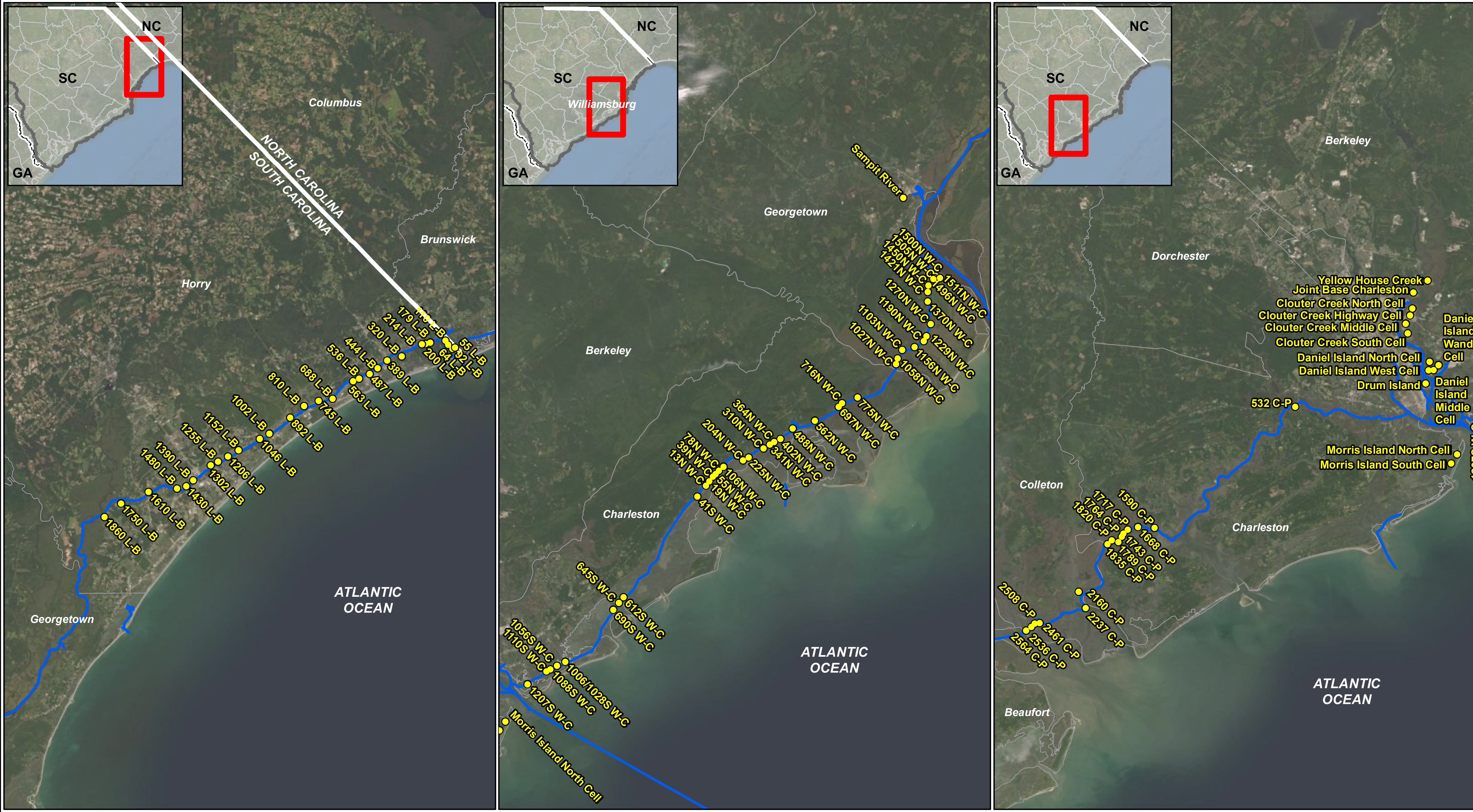

Figure 4.2
Dredge Material Placement Areas
South Atlantic Division
Charleston District

SACS South Atlantic Coastal Study

N

0 5 10 15 20 25
Miles

RSM RCX

Legend
Dredge Material Placement Areas
Federal Channels

TAYLOR ENGINEERING, INC.

Table 4.3 SAC DMMA Volumes, Past Offloading and Beneficial Re-use as of April 2020

DMMA Name	Also Known As	Navigation Project or Reach	County	Design Capacity (CY)	Current Volume (CY)	Remaining Volume (CY)	Previous Beneficial Use of Material	Previous Offloading Location	Offloading Volumes	Offloading Frequency
55 L-B		Little River to Bucksport	Horry			7,803				
64 L-B		Little River to Bucksport	Horry			11,482				
92 L-B		Little River to Bucksport	Horry			26,018				
110 L-B		Little River to Bucksport	Horry			4,999				
179 L-B		Little River to Bucksport	Horry							
200 L-B		Little River to Bucksport	Horry							
214 L-B		Little River to Bucksport	Horry							
320 L-B	Tidewater Basin	Little River to Bucksport	Horry			236,000	Beach Placement	Cherry Grove Beach, SC and Windy Hill Beach, SC	64,000 CY, 69,000 CY	Most recent (2017, 2019)
389 L-B	Swingbridge	Little River to Bucksport	Horry			42,000	Upland Land Development	Reclamation pits	31,000 CY, 16,500 CY	Most recent (2016, 2018)
444 L-B	Vereen Road	Little River to Bucksport	Horry			16,204				
487 L-B		Little River to Bucksport	Horry			13,671				
536 L-B		Little River to Bucksport	Horry			82,375				

DMMA Name	Also Known As	Navigation Project or Reach	County	Design Capacity (CY)	Current Volume (CY)	Remaining Volume (CY)	Previous Beneficial Use of Material	Previous Offloading Location	Offloading Volumes	Offloading Frequency
563 L-B	Tom E Chestnut	Little River to Bucksport	Horry			12,269				
688 L-B	Airport	Little River to Bucksport	Horry			93,242				
745 L-B	Driving Range	Little River to Bucksport	Horry			81,675				
810 L-B		Little River to Bucksport	Horry			47,623				
892 L-B		Little River to Bucksport	Horry			160,292				
1002 L-B		Little River to Bucksport	Horry			230,644				
1046 L-B		Little River to Bucksport	Horry			435,434				
1152 L-B		Little River to Bucksport	Horry			267,000				
1206 L-B		Little River to Bucksport	Horry			146,449				
1255 L-B		Little River to Bucksport	Horry			47,839				
1302 L-B		Little River to Bucksport	Horry							
1390 L-B		Little River to Bucksport	Horry			52,783				
1430 L-B		Little River to Bucksport	Horry			106,562				
1480 L-B		Little River to Bucksport	Horry			131,308				
1610 L-B		Little River to Bucksport	Horry							
1750 L-B	Osprey Marina	Little River to Bucksport	Horry							

DMMA Name	Also Known As	Navigation Project or Reach	County	Design Capacity (CY)	Current Volume (CY)	Remaining Volume (CY)	Previous Beneficial Use of Material	Previous Offloading Location	Offloading Volumes	Offloading Frequency
1860 L-B	Enterprise Road	Little River to Bucksport	Horry			22,000				
Sampit River		Georgetown Harbor	Georgetown			460,000				
1511N W-C		Winyah Bay to Charleston	Georgetown			45,344				
1505N W-C		Winyah Bay to Charleston	Georgetown							
1500N W-C		Winyah Bay to Charleston	Georgetown							
1496N W-C		Winyah Bay to Charleston	Georgetown							
1450N W-C		Winyah Bay to Charleston	Georgetown			140,403				
1421N W-C		Winyah Bay to Charleston	Georgetown							
1370N W-C		Winyah Bay to Charleston	Georgetown							
1270N W-C	1281N/1292N/1299N W-C	Winyah Bay to Charleston	Georgetown							
1229N W-C	Minim Creek	Winyah Bay to Charleston	Georgetown			8,275				
1190N W-C	Little Crow Island, Banana Dike	Winyah Bay to Charleston	Georgetown			241,182				
1156N W-C	Kinloch Island	Winyah Bay to Charleston	Georgetown			45,762				
1103N W-C		Winyah Bay to Charleston	Georgetown			66,081				
1058N W-C		Winyah Bay to Charleston	Georgetown			86,395				
1027N W-C		Winyah Bay to Charleston	Georgetown			38,163				

DMMA Name	Also Known As	Navigation Project or Reach	County	Design Capacity (CY)	Current Volume (CY)	Remaining Volume (CY)	Previous Beneficial Use of Material	Previous Offloading Location	Offloading Volumes	Offloading Frequency
775N W-C		Winyah Bay to Charleston	Charleston			143,301				
716N W-C		Winyah Bay to Charleston	Charleston							
697N W-C		Winyah Bay to Charleston	Charleston			116,830				
562N W-C		Winyah Bay to Charleston	Charleston							
488N W-C		Winyah Bay to Charleston	Charleston							
402N W-C		Winyah Bay to Charleston	Charleston							
364N W-C		Winyah Bay to Charleston	Charleston							
341N W-C		Winyah Bay to Charleston	Charleston							
310N W-C		Winyah Bay to Charleston	Charleston							
225N W-C		Winyah Bay to Charleston	Charleston							
204N W-C		Winyah Bay to Charleston	Charleston							
106N W-C		Winyah Bay to Charleston	Charleston			21,965				
78N W-C		Winyah Bay to Charleston	Charleston			67,000				
55N W-C		Winyah Bay to Charleston	Charleston							
39N W-C		Winyah Bay to Charleston	Charleston							
19N W-C		Winyah Bay to Charleston	Charleston			3,915				

DMMA Name	Also Known As	Navigation Project or Reach	County	Design Capacity (CY)	Current Volume (CY)	Remaining Volume (CY)	Previous Beneficial Use of Material	Previous Offloading Location	Offloading Volumes	Offloading Frequency
13N W-C	13S W-C	Winyah Bay to Charleston	Charleston			34,949				
41S W-C		Winyah Bay to Charleston	Charleston			146,530				
612S W-C		Winyah Bay to Charleston	Charleston							
645S W-C		Winyah Bay to Charleston	Charleston							
690S W-C		Winyah Bay to Charleston	Charleston							
1006/1028S W-C	IOP Connector	Winyah Bay to Charleston	Charleston			122,751				
1056S W-C		Winyah Bay to Charleston	Charleston			20,211				
1088S W-C	Breach Inlet	Winyah Bay to Charleston	Charleston			90,209				
1110S W-C	Breach Inlet	Winyah Bay to Charleston	Charleston			18,623				
1207S W-C	Sullivans Island	Winyah Bay to Charleston	Charleston			58,993				
Yellow House Creek		Joint Base Charleston	Berkeley			5,200,000				
Joint Base Charleston		Joint Base Charleston	Berkeley							
Clouter Creek North Cell		Charleston Harbor	Berkeley							
Clouter Creek Highway Cell		Charleston Harbor	Berkeley			2,800,000				

DMMA Name	Also Known As	Navigation Project or Reach	County	Design Capacity (CY)	Current Volume (CY)	Remaining Volume (CY)	Previous Beneficial Use of Material	Previous Offloading Location	Offloading Volumes	Offloading Frequency
Clouter Creek Middle Cell		Charleston Harbor	Berkeley			2,500,000				
Clouter Creek South Cell		Charleston Harbor	Berkeley							
Daniel Island North Cell		Charleston Harbor	Berkeley				Upland Land Development	Port of Charleston		
Daniel Island West Cell		Charleston Harbor	Berkeley							
Daniel Island Middle Cell		Charleston Harbor	Berkeley				Upland Land Development	Port of Charleston		
Daniel Island Wando Cell		Charleston Harbor	Berkeley			2,339,333				
Drum Island		Charleston Harbor	Charleston							
Morris Island North Cell		Charleston Harbor	Charleston			708,000				
Morris Island South Cell		Charleston Harbor	Charleston							
532 C-P	Grimball Gates	Charleston to Port Royal	Charleston							
1590 C-P	Sugar Bowl;1595 C-P	Charleston to Port Royal	Charleston			4,579				
1668 C-P		Charleston to Port Royal	Charleston							

DMMA Name	Also Known As	Navigation Project or Reach	County	Design Capacity (CY)	Current Volume (CY)	Remaining Volume (CY)	Previous Beneficial Use of Material	Previous Offloading Location	Offloading Volumes	Offloading Frequency
1717 C-P		Charleston to Port Royal	Charleston			69,376				
1743 C-P		Charleston to Port Royal	Charleston			12,653				
1764 C-P		Charleston to Port Royal	Charleston							
1789 C-P		Charleston to Port Royal	Charleston							
1820 C-P		Charleston to Port Royal	Charleston							
1835 C-P		Charleston to Port Royal	Charleston							
2160 C-P	Dodge Dike	Charleston to Port Royal	Colleton			68,050				
2237 C-P	Fenwick	Charleston to Port Royal	Colleton							
2461 C-P		Charleston to Port Royal	Colleton							
2508 C-P	2464 C-P	Charleston to Port Royal	Colleton							
2536 C-P		Charleston to Port Royal	Colleton							
2564 C-P		Charleston to Port Royal	Colleton							

4.2.3 *Potential Management, Offloading, and Beneficial Re-Use Opportunities*

Review of the DMMA site database offers a range of potential management, offloading, and beneficial re-use opportunities. This section provides an initial evaluation for potential future offloading and beneficial re-use opportunities. Appendix B provides detailed specific project examples. USACE may plan future offloading events and re-use strategies with the beneficial re-use flowchart presented previously (Figure 3.3) as a guideline. Approximate offloading costs per cubic yard of material, including excavation and transport, are provided in Chapter 3.3.

The following sections list future DMMA offloading opportunities in the Charleston District, categorized by beneficial re-use strategies.

4.2.3.1 District-wide Summary of Potential Management, Offloading, and Beneficial Re-Use Opportunities

The Charleston District's potential offloading and beneficial re-use strategies include upland land development and beach or nearshore placement. These strategies involve excavating material from the DMMA and transporting the sediment to a beneficial re-use project. Evaluation of several criteria is necessary to decide which re-use strategies are most appropriate for a given DMMA site and re-use project location. Chapter 3's beneficial re-use flowchart (Figure 3.3) outlines these criteria.

Planners should consider minimizing transportation distance between the DMMA and the selected project site to improve economic feasibility. The sediment characteristics of the material in each DMMA are a critical component when deciding which offloading and beneficial re-use strategies are most applicable to the site. If sediment characteristics are unknown at the DMMA, geotechnical investigations can classify the chemical and physical properties of the material inside the DMMA. The geotechnical investigation will determine sediment characteristics (grain size, Munsell color, silt content, shell content, etc.) and material chemistry (levels of contamination). If the chemical tests identify contaminants, refer to the EPA and USACE reference documents noted in the beneficial re-use flowchart (Figure 3.3).

Table 4.4 identifies potential beneficial re-use opportunities in the Charleston District. Where data is unknown, such as the potential offloading volume or sediment characteristics of a DMMA, the field is blank. If sediment characteristics are unavailable, the potential beneficial uses, locations and strategies will also be blank, indicating not enough information exists. The relative sparseness of the data in Table 4.4 indicates areas where additional data collection can provide significant benefits to the District's future DMMA offloading opportunities.

4.2.3.2 Upland Land Development

Upland land development provides dredged material as a source for several opportunities. Potential beneficial re-use opportunities include commercial and residential construction, farming, parks, and recreation. Additional upland opportunities could exist for future levee development to protect against storm surge and sea level rise. Upland land development retrieves sediment from a DMMA by excavating the material and trucking the material to the desired beneficial re-use project location. Table 4.4 indicates the DMMA sites that are feasible for upland land development based on assumed sediment characteristics. More sites may be identified in the future as more sediment data is collected.

DMMA sites preliminarily identified as suitable for potential upland land development (and their respective navigation project) are:

- 320 L-B (Little River to Bucksport)
- 389 L-B (Little River to Bucksport)
- 562N W-C (Winyah Bay to Charleston)
- 1006/1028S W-C (Winyah Bay to Charleston)
- 1056S W-C (Winyah Bay to Charleston)
- 1088S W-C (Winyah Bay to Charleston)
- 1110S W-C (Winyah Bay to Charleston)
- 532 C-P (Charleston to Port Royal)
- 1789 C-P (Charleston to Port Royal)
- 1835 C-P (Charleston to Port Royal)
- 2160 C-P (Charleston to Port Royal)
- 2237 C-P (Charleston to Port Royal)

4.2.3.3 Beach or Nearshore Placement for Shoreline Protection or Beach Nourishment

Beach or nearshore placement of re-used dredged sediment restores and augments beaches and dunes. Typical beach placement from DMMA offloading relies on excavation of sand from the site and truck haul transport to the desired beach placement area. When the DMMA is accessible by water, an alternative transport method includes loading sand onto barges for transport or re-slurrying sediment with water for pumping and pipeline transfer of dredged material to the selected beach or nearshore. The quality of the sediment, considerations of environmental impacts, and the cost/economics of transportation are three factors that frequently govern feasibility of such a project.

Table 4.4 and the following bulletized list summarize those sites with potential for future beach placement offloading. District staff identified these sites as 1) currently having beach compatible dredged material and 2) located within 20 miles of a prospective beach placement location.

DMMA sites preliminarily identified as suitable for potential beach placement (and their respective navigation project) are:

- 320 L-B (Little River to Bucksport)
- 1152 L-B (Little River to Bucksport)
- 1006/1028S W-C (Winyah Bay to Charleston)
- 1056S W-C (Winyah Bay to Charleston)
- 1088S W-C (Winyah Bay to Charleston)
- 1110S W-C (Winyah Bay to Charleston)

Table 4.4 Potential Beneficial Re-use Opportunities in SAC

DMMA Name	Also Known As	Navigation Project or Reach	County	Potential Beneficial Uses of Material	Potential Offloading Volume (CY)	Potential Offloading Location	Potential Offloading Strategy	Sediment Characteristics
55 L-B		Little River to Bucksport	Horry					
64 L-B		Little River to Bucksport	Horry					
92 L-B		Little River to Bucksport	Horry					
110 L-B		Little River to Bucksport	Horry					
179 L-B		Little River to Bucksport	Horry					
200 L-B		Little River to Bucksport	Horry					
214 L-B		Little River to Bucksport	Horry					
320 L-B	Tidewater Basin	Little River to Bucksport	Horry	Beach Placement, Upland Land Development		Horry County, SC	Excavator, Dump Truck, Barge, Hydraulic Dredge, Bulldozer	Sand, silty sand
389 L-B	Swingbridge	Little River to Bucksport	Horry	Upland Land Development		Horry County, SC	Excavator, Dump Truck, Barge, Hydraulic Dredge, Bulldozer	
444 L-B	Vereen Road	Little River to Bucksport	Horry					
487 L-B		Little River to Bucksport	Horry					
536 L-B		Little River to Bucksport	Horry					
563 L-B	Tom E Chestnut	Little River to Bucksport	Horry					

DMMA Name	Also Known As	Navigation Project or Reach	County	Potential Beneficial Uses of Material	Potential Offloading Volume (CY)	Potential Offloading Location	Potential Offloading Strategy	Sediment Characteristics
688 L-B	Airport	Little River to Bucksport	Horry					
745 L-B	Driving Range	Little River to Bucksport	Horry					
810 L-B		Little River to Bucksport	Horry					
892 L-B		Little River to Bucksport	Horry					
1002 L-B		Little River to Bucksport	Horry					
1046 L-B		Little River to Bucksport	Horry					
1152 L-B		Little River to Bucksport	Horry	Beach Placement				Sand
1206 L-B		Little River to Bucksport	Horry					
1255 L-B		Little River to Bucksport	Horry					
1302 L-B		Little River to Bucksport	Horry					
1390 L-B		Little River to Bucksport	Horry					
1430 L-B		Little River to Bucksport	Horry					
1480 L-B		Little River to Bucksport	Horry					
1610 L-B		Little River to Bucksport	Horry					
1750 L-B	Osprey Marina	Little River to Bucksport	Horry					
1860 L-B	Enterprise Road	Little River to Bucksport	Horry					

DMMA Name	Also Known As	Navigation Project or Reach	County	Potential Beneficial Uses of Material	Potential Offloading Volume (CY)	Potential Offloading Location	Potential Offloading Strategy	Sediment Characteristics
Sampit River		Georgetown Harbor	Georgetown					
1511N W-C		Winyah Bay to Charleston	Georgetown					
1505N W-C		Winyah Bay to Charleston	Georgetown					
1500N W-C		Winyah Bay to Charleston	Georgetown					
1496N W-C		Winyah Bay to Charleston	Georgetown					
1450N W-C		Winyah Bay to Charleston	Georgetown					
1421N W-C		Winyah Bay to Charleston	Georgetown					
1370N W-C		Winyah Bay to Charleston	Georgetown					
1270N W-C	1281N/1292N/1299N W-C	Winyah Bay to Charleston	Georgetown					
1229N W-C	Minim Creek	Winyah Bay to Charleston	Georgetown					
1190N W-C	Little Crow Island, Banana Dike	Winyah Bay to Charleston	Georgetown					
1156N W-C	Kinloch Island	Winyah Bay to Charleston	Georgetown					
1103N W-C		Winyah Bay to Charleston	Georgetown					
1058N W-C		Winyah Bay to Charleston	Georgetown					
1027N W-C		Winyah Bay to Charleston	Georgetown					
775N W-C		Winyah Bay to Charleston	Charleston					

DMMA Name	Also Known As	Navigation Project or Reach	County	Potential Beneficial Uses of Material	Potential Offloading Volume (CY)	Potential Offloading Location	Potential Offloading Strategy	Sediment Characteristics
716N W-C		Winyah Bay to Charleston	Charleston					
697N W-C		Winyah Bay to Charleston	Charleston					
562N W-C		Winyah Bay to Charleston	Charleston	Upland Land Development		Charleston County, SC	Excavator, Dump Truck, Barge, Hydraulic Dredge, Bulldozer	
488N W-C		Winyah Bay to Charleston	Charleston					
402N W-C		Winyah Bay to Charleston	Charleston					
364N W-C		Winyah Bay to Charleston	Charleston					
341N W-C		Winyah Bay to Charleston	Charleston					
310N W-C		Winyah Bay to Charleston	Charleston					
225N W-C		Winyah Bay to Charleston	Charleston					
204N W-C		Winyah Bay to Charleston	Charleston					
106N W-C		Winyah Bay to Charleston	Charleston					
78N W-C		Winyah Bay to Charleston	Charleston					
55N W-C		Winyah Bay to Charleston	Charleston					
39N W-C		Winyah Bay to Charleston	Charleston					
19N W-C		Winyah Bay to Charleston	Charleston					

DMMA Name	Also Known As	Navigation Project or Reach	County	Potential Beneficial Uses of Material	Potential Offloading Volume (CY)	Potential Offloading Location	Potential Offloading Strategy	Sediment Characteristics
13N W-C	13S W-C	Winyah Bay to Charleston	Charleston					
41S W-C		Winyah Bay to Charleston	Charleston					
612S W-C		Winyah Bay to Charleston	Charleston					
645S W-C		Winyah Bay to Charleston	Charleston					
690S W-C		Winyah Bay to Charleston	Charleston					
1006/1028S W-C	IOP Connector	Winyah Bay to Charleston	Charleston	Beach Placement, Upland Land Development		Charleston, SC/Sullivans Island Beaches, SC/Isle of Palms Beaches, SC	Excavator, Barge, Hydraulic Dredge, Bulldozer	Sand
1056S W-C		Winyah Bay to Charleston	Charleston	Beach Placement, Upland Land Development		Charleston, SC/Sullivans Island Beaches, SC/Isle of Palms Beaches, SC	Excavator, Barge, Hydraulic Dredge, Bulldozer	Sand
1088S W-C	Breach Inlet	Winyah Bay to Charleston	Charleston	Beach Placement, Upland Land Development		Charleston, SC/Sullivans Island Beaches, SC/Isle of Palms Beaches, SC	Excavator, Barge, Hydraulic Dredge, Bulldozer	Sand

DMMA Name	Also Known As	Navigation Project or Reach	County	Potential Beneficial Uses of Material	Potential Offloading Volume (CY)	Potential Offloading Location	Potential Offloading Strategy	Sediment Characteristics
1110S W-C	Breach Inlet	Winyah Bay to Charleston	Charleston	Beach Placement, Upland Land Development		Charleston, SC/Sullivans Island Beaches, SC/Isle of Palms Beaches, SC	Excavator, Barge, Hydraulic Dredge, Bulldozer	Sand
1207S W-C	Sullivans Island	Winyah Bay to Charleston	Charleston					
Yellow House Creek		Joint Base Charleston	Berkeley					
Joint Base Charleston		Joint Base Charleston	Berkeley					
Clouter Creek North Cell		Charleston Harbor	Berkeley					
Clouter Creek Highway Cell		Charleston Harbor	Berkeley					
Clouter Creek Middle Cell		Charleston Harbor	Berkeley					
Clouter Creek South Cell		Charleston Harbor	Berkeley					
Daniel Island North Cell		Charleston Harbor	Berkeley			Upland Land Development	Excavator, Dump Truck, Barge, Hydraulic Dredge, Bulldozer	
Daniel Island West Cell		Charleston Harbor	Berkeley					
Daniel Island Middle Cell		Charleston Harbor	Berkeley			Upland Land Development	Excavator, Dump Truck, Barge,	

DMMA Name	Also Known As	Navigation Project or Reach	County	Potential Beneficial Uses of Material	Potential Offloading Volume (CY)	Potential Offloading Location	Potential Offloading Strategy	Sediment Characteristics
							Hydraulic Dredge, Bulldozer	
Daniel Island Wando Cell		Charleston Harbor	Berkeley					
Drum Island		Charleston Harbor	Charleston					
Morris Island North Cell		Charleston Harbor	Charleston					
Morris Island South Cell		Charleston Harbor	Charleston					
532 C-P	Grimball Gates	Charleston to Port Royal	Charleston	Upland Land Development		Charleston County, SC	Excavator, Dump Truck, Barge, Hydraulic Dredge, Bulldozer	
1590 C-P	Sugar Bowl;1595 C-P	Charleston to Port Royal	Charleston					
1668 C-P		Charleston to Port Royal	Charleston					
1717 C-P		Charleston to Port Royal	Charleston					
1743 C-P		Charleston to Port Royal	Charleston					
1764 C-P		Charleston to Port Royal	Charleston					
1789 C-P		Charleston to Port Royal	Charleston	Upland Land Development		Charleston County, SC	Excavator, Dump Truck, Barge, Hydraulic Dredge, Bulldozer	
1820 C-P		Charleston to Port Royal	Charleston					
1835 C-P		Charleston to Port Royal	Charleston	Upland Land Development		Charleston County, SC	Excavator, Dump Truck, Barge,	

DMMA Name	Also Known As	Navigation Project or Reach	County	Potential Beneficial Uses of Material	Potential Offloading Volume (CY)	Potential Offloading Location	Potential Offloading Strategy	Sediment Characteristics
							Hydraulic Dredge, Bulldozer	
2160 C-P	Dodge Dike	Charleston to Port Royal	Colleton	Upland Land Development		Charleston County, SC	Excavator, Dump Truck, Barge, Hydraulic Dredge, Bulldozer	
2237 C-P	Fenwick	Charleston to Port Royal	Colleton	Upland Land Development		Charleston County, SC	Excavator, Dump Truck, Barge, Hydraulic Dredge, Bulldozer	
2461 C-P		Charleston to Port Royal	Colleton					
2508 C-P	2464 C-P	Charleston to Port Royal	Colleton					
2536 C-P		Charleston to Port Royal	Colleton					
2564 C-P		Charleston to Port Royal	Colleton					

4.3 Savannah District (SAS)

4.3.1 *Dredged Material Management Areas*

The Savannah District includes 12 operating dredged material management areas that have potential for offloading and beneficial re-use opportunities. Photograph 4.3 depicts an aerial image of Bird Island in Glynn County, Georgia. Figure 4.3 shows a map overview of the DMMAs in the Savannah District. A one-page overview with aerial image, locator map, and tabular summary of each site is provided in Appendix E.

Photograph 4.3 Bird Island (Google, 2020)

4.3.2 *Current Management, Offloading, and Beneficial Re-use Strategies and Applications*

The USACE Savannah District manages various DMMAs located along the Savannah River, the Altamaha River, and Saint Simons Sound. In the past, the USACE has re-used sediment from many of these sites for on-site enhancement opportunities that include dike raising and other site feature improvements.

4.3.2.1 District-Wide Summary of Current Management, Offloading, and Beneficial Re-Use Strategies

Based off the information provided by the USACE technical team, the Savannah District currently does not offload or implement beneficial re-use strategies to the dredged material management areas in this region. Table 4.5 itemizes the sediment exchange study DMMAs in the Savannah District by DMMA ID, identifies each site's current volume and capacity characteristics, and summarizes current offloading and beneficial re-use information. Where data is unknown, such as the current or remaining volume of a DMMA, the field is blank. If the DMMA has not been offloaded for beneficial re-use in the recent past, blank fields indicate no record of offloading exists. Notably, the sparseness of the data in Table 4.5 indicates areas where additional data collection and analyses can provide significant benefits to the District's potential RSM project roster.

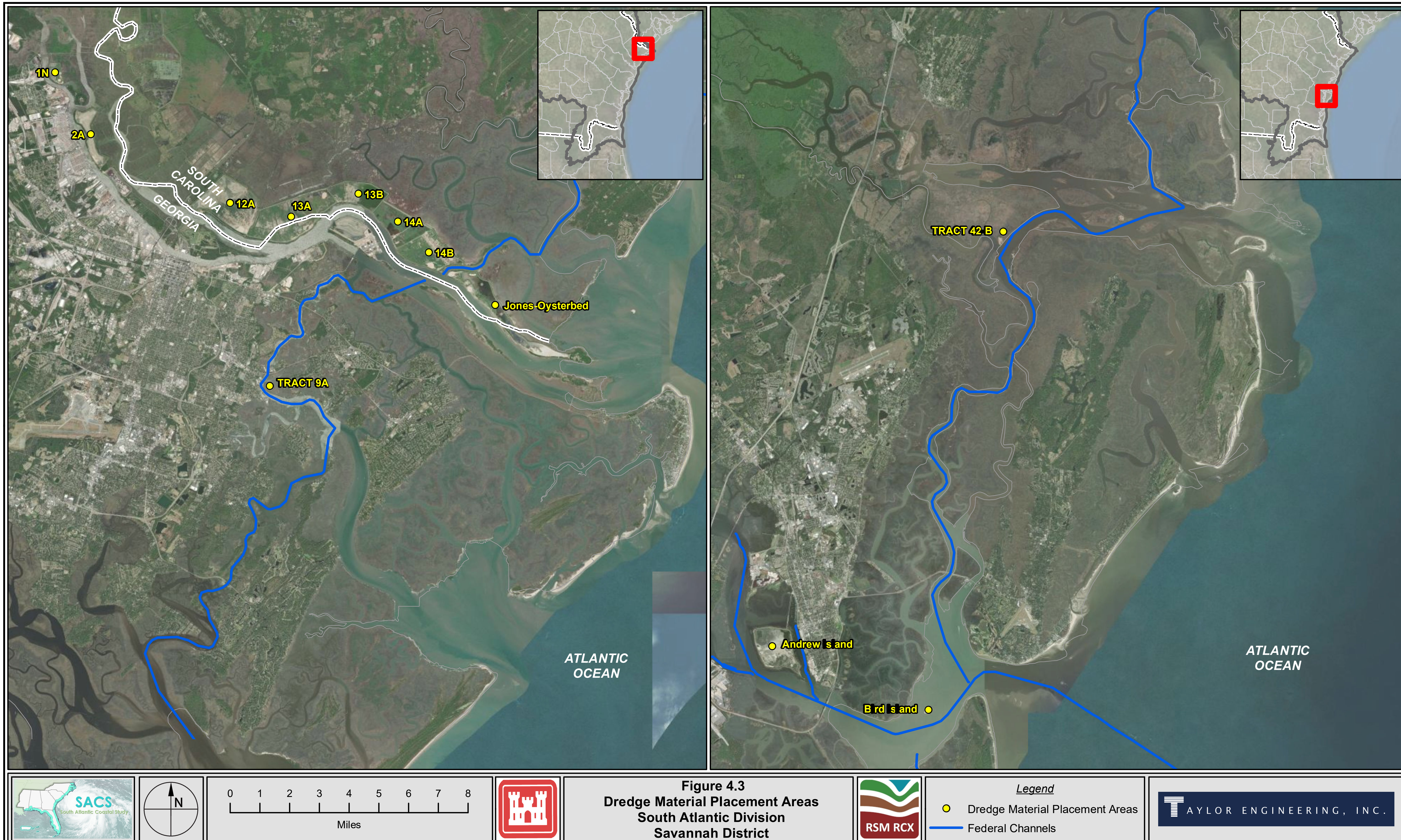

Figure 4.3
Dredge Material Placement Areas
South Atlantic Division
Savannah District

Table 4.5 SAS DMMA Volumes, Past Offloading and Beneficial Re-use as of April 2020

DMMA Name	Also Known As	Navigation Project or Reach	County	Design Capacity (CY)	Current Volume (CY)	Remaining Volume (CY)	Previous Beneficial Use of Material	Previous Offloading Location	Offloading Volumes	Offloading Frequency
1N			Chatham		280,000					
2A			Chatham		130,000					
12A			Jasper		4,600,000					
13A			Jasper		24,700,000					
13B			Jasper		8,700,000					
14A			Jasper		13,600,000					
14B		SAV-5	Jasper	9,466,589	5,600,000	3,866,589				
Jones-Oysterbed			Jasper		5,600,000					
TRACT 9A		SAV-8	Chatham	433,553	130,000	303,553				
TRACT 42-B		SAV-29	Mcintosh							
Andrew Island			Glynn		17,800,000					
Bird Island		Brunswick River	Glynn							

4.3.3 *Potential Management, Offloading, and Beneficial Re-Use Opportunities*

Review of the DMMA site database offers a range of potential management, offloading, and beneficial re-use opportunities. This section provides an initial evaluation for potential future offloading and beneficial re-use opportunities. Appendix B provides detailed specific project examples. USACE may plan future offloading events and re-use strategies with the beneficial re-use flowchart presented previously (Figure 3.3) as a guideline. Approximate offloading costs per cubic yard of material, including excavation and transport, are provided in Chapter 3.3.

The following sections list future DMMA offloading opportunities in the Savannah District, categorized by beneficial re-use strategies.

4.3.3.1 District-wide Summary of Potential Management, Offloading, and Beneficial Re-Use Opportunities

The Savannah District's potential offloading and beneficial re-use strategies include beach or nearshore placement. This strategy involves excavating the material from the DMMA and transporting the sediment to a beneficial re-use project. Evaluation of several criteria is necessary to decide which re-use strategies are most appropriate for a given DMMA site and re-use project location. These criteria are outlined in Chapter 3's beneficial re-use flowchart (Figure 3.3).

Planners should consider minimizing transportation distance between the DMMA and the selected project site to improve economic feasibility. The sediment characteristics of the material in each DMMA are a critical component when deciding which offloading and beneficial re-use strategies are most applicable to the site. If sediment characteristics are unknown at the DMMA, geotechnical investigations can classify the chemical and physical properties of the material inside the DMMA. The geotechnical investigation will determine sediment characteristics (grain size, Munsell color, silt content, shell content, etc.) and material chemistry (levels of contamination). If the chemical tests identify contaminants, refer to the EPA and USACE reference documents noted in the beneficial re-use flowchart (Figure 3.3).

Table 4.6 identifies potential beneficial re-use opportunities in the Savannah District. Where data is unknown, such as the potential offloading volume or sediment characteristics of a DMMA, the field is blank. If sediment characteristics are unavailable, the potential beneficial uses, locations and strategies will also be blank, indicating not enough information exists. The relative sparseness of the data in Table 4.6 indicates areas where additional data collection can provide significant benefits to the District's future DMMA offloading opportunities.

4.3.3.2 Beach or Nearshore Placement for Shoreline Protection or Beach Nourishment

Beach or nearshore placement of re-used dredged sediment restores and augments beaches and dunes. Typical beach placement from DMMA offloading relies on excavation of sand from the site and truck haul transport to the desired beach placement area. When the DMMA is accessible by water, an alternative transport method includes loading sand onto barges for transport or re-slurrying sediment with water for pumping and pipeline transfer of dredged material to the selected beach or nearshore. The quality of the sediment, considerations of environmental impacts, and the cost/economics of transportation are three factors that frequently govern feasibility of such a project.

Table 4.6 and the following list summarize those sites with potential for future beach placement offloading. District staff identified this site as 1) currently having beach compatible dredged material and

2) located within 20 miles of a prospective beach placement location. A DMMA site preliminarily identified as suitable for potential beach placement is:

- Jones Oysterbed

Table 4.6 Potential Beneficial Re-use Opportunities in SAS

DMMA Name	Also Known As	Navigation Project or Reach	County	Potential Beneficial Uses of Material	Potential Offloading Volume (CY)	Potential Offloading Location	Potential Offloading Strategy	Sediment Characteristics
1N			Chatham		280,000			
2A			Chatham		130,000			
12A			Jasper		4,600,000			
13A			Jasper		24,700,000			
13B			Jasper		8,700,000			
14A			Jasper		13,600,000			
14B		SAV-5	Jasper		5,600,000			
Jones-Oysterbed			Jasper	Beach Placement	5,600,000	Tybee Island, GA	Excavator, Barge, Hydraulic Dredge, Bulldozer	Sand
TRACT 9A		SAV-8	Chatham		130,000			
TRACT 42-B		SAV-29	Mcintosh					
Andrew Island			Glynn		17,800,000			
Bird Island		Brunswick River	Glynn					

4.4 Jacksonville District (SAJ)

4.4.1 *Dredged Material Management Areas*

The Jacksonville District includes 37 operating DMMAs that have been offloaded or have potential for offloading. In this District, the USACE cooperatively maintains 15 DMMAs. The Florida Inland Navigation District (FIND)—Florida's local sponsor for the AIWW and a portion of the Okeechobee Waterway (OWW)—owns and maintains 22 DMMAs that are included in this sediment exchange study. Together, USACE and FIND use these sites for dredging and maintenance of the waterways. Photograph 4.4 depicts a low-level aerial view of one of FIND's sites—DMMA FL-3—in Flagler County, Florida.

Photograph 4.4 FIND DMMA FL-3 in Flagler County, Florida (2019)

Figure 4.4 shows a summary of the Jacksonville District DMMA locations identified with potential for offloading. A one-page overview with aerial image, locator map, and tabular summary of each site is provided in Appendix F.

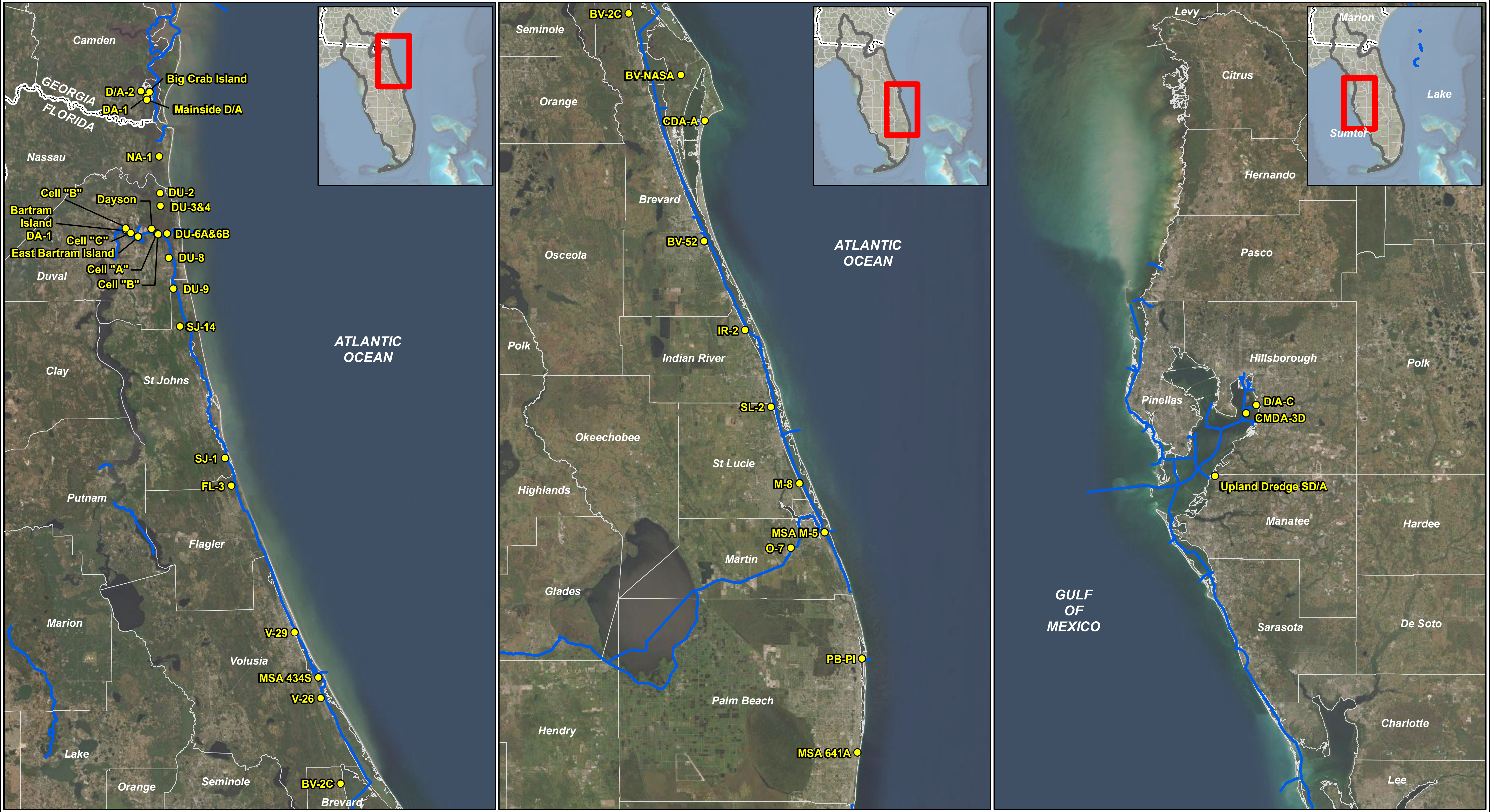

Figure 4.4
Dredge Material Placement Areas
South Atlantic Division
Jacksonville District

Legend

- Dredge Material Placement Areas
- Federal Channels

4.4.2 *Current Management, Offloading, and Beneficial Re-use Strategies and Applications*

The USACE Jacksonville District manages various DMMAs ranging from Naval Submarine Base Kings Bay, Jacksonville Harbor, Tampa and Manatee Harbors, and several sites along the intracoastal waterway of Florida that have been offloaded or have potential for offloading and beneficial re-use opportunities. In the past, the USACE has re-used sediment from many of these sites for on-site enhancement opportunities that include dike raising and other site feature improvements.

The Florida Inland Navigation District is a twelve-county special state taxing district for the continued management and maintenance of the AIWW and a portion of the OWW. FIND's dredged material management program's goal is to manage approximately 45 million cubic yards of dredged material from the 400-mile length of the Florida AIWW and OWW and over a 50-year planning horizon. Approximately 20 million of those cubic yards are planned for placement in upland DMMAs, and the other approximately 25 million cubic yards is planned for beach placement. However, frequent maintenance dredging causes individual DMMAs to reach their capacity sooner than the 50-year planning horizon. Therefore, FIND frequently pursues offloading of dredged material from DMMAs to extend the life of facilities while often supporting beneficial re-use of the sediment.

For FIND, offloading of a DMMA requires development of a removal and restoration plan that is customized to each individual DMMA. FIND representatives monitor the offloading process to ensure compliance with the removal and restoration plan and to prevent damage to the DMMA dike, roads, and weirs. At the conclusion of the offloading process, FIND requires a site inspection to evaluate site conditions and identify and implement any corrective measures necessary to return the site to DMMA service. FIND uses dredged material in accordance with the following priorities (FIND, 2019):

1. Placement of all beach quality material on public beaches
2. Upgrading and improving existing dikes, cells, and other features within the DMMA
3. Expansion of DMMA
4. Use off-site for public purposes
5. Use on-site or off-site for environmental restoration or enhancement
6. Use off-site for private purposes

4.4.2.1 District-Wide Summary of Current Management, Offloading, and Beneficial Re-Use Strategies

Current offloading and beneficial re-use strategies within the Jacksonville District primarily include upland land development, beach or nearshore placement, and island placement. These strategies consist of carefully excavating material from the dredged material management areas and transporting the dredged material to the appropriate beneficial re-use project location. Table 4.7 lists the DMMAs in the Jacksonville District selected for the sediment exchange study, identifies each site's current volume and capacity characteristics, and summarizes past offloading and beneficial re-use information. Where data is unknown, such as the current or remaining volume of a DMMA, the field is blank. If the DMMA has not been offloaded for beneficial re-use in the recent past, blank fields indicate no record of offloading exists.

The sections below provide a brief narrative description of historical DMMA offloading and beneficial re-use activities that have occurred in the District. The FIND DMMA naming convention incorporates the county name; for example, NA-1 is located in Nassau County while FL-3 is located in Flagler County. The terminology in parentheses after each DMMAs name refers to the navigation project, reach, or harbor associated with the DMMA.

Table 4.7 SAJ DMMA Volumes, Past Offloading and Beneficial Re-use as of April 2020

DMMA Name	Also Known As	Navigation Project or Reach	County	Design Capacity (CY)	Current Volume (CY)	Remaining Volume (CY)	Previous Beneficial Use of Material	Previous Offloading Location	Offloading Volumes	Offloading Frequency
Big Crab Island	DA-C	Kings Bay Sub Base	Camden	34,000,000						
D/A-2	DA-2	Kings Bay Sub Base	Camden	11,900,000						
DA-1	DA-1	Kings Bay Sub Base	Camden	8,000,000						
Mainside D/A	DA-M	Kings Bay Sub Base	Camden	10,500,000						
Bartram Island Cell B	Cell "B"	Jacksonville Harbor	Duval							
Bartram Island DA-1	Bartram Island Cell B-2	Jacksonville Harbor	Duval	2,229,862	1,729,862	500,000				
Bartram Island Cell C	Cell "C"	Jacksonville Harbor	Duval			400,000	Upland Land Development	Cell A & Cell B-2, Jacksonville, FL		Once (2015)
East Bartram Island	Bartram Island Cell G	Jacksonville Harbor	Duval							
Dayson	Dayson Island	USMC Blount Island	Duval							
Buck Island Cell A	Cell "A"	Jacksonville Harbor	Duval	2,750,000	1,750,000	1,000,000	Upland Land Development	Jacksonville, FL Road Construction	1,000,000 CY	Ongoing, intermittently
Buck Island Cell B	Cell "B"	Jacksonville Harbor	Duval							

DMMA Name	Also Known As	Navigation Project or Reach	County	Design Capacity (CY)	Current Volume (CY)	Remaining Volume (CY)	Previous Beneficial Use of Material	Previous Offloading Location	Offloading Volumes	Offloading Frequency
NA-1	Crane Island (S/A 43 – 44)	NA-I	Nassau	186,754	55,895	130,859	Upland Land Development	Crane Island Development, FL	39,141 CY, 38,000 CY	Most recent (2018, 2019)
DU-2	Sawpit; NE Black Hammock Island	DU-III	Duval	394,972	374,972	20,000	Upland Land Development	Jacksonville/JEA Power Park, FL	250,000 CY, 18,570 CY	Most recent (2015, 2019)
DU-3&4	West Central Black Hammock Island	DU-III	Duval	1,342,310			Upland Land Development	Jacksonville/JEA Power Park, FL	Ongoing (300,000 CY)	Ongoing (2019-2020)
DU-6A&6B	Fanning Island (DU-6A)	DU-IV	Duval	730,219		730,219				
DU-8	Moody Marine	DU-VI	Duval	208,236	25,000	183,236				
DU-9	Dee Dot Ranch; Pablo Creek	DU-VII	St Johns	2,050,825	1,885,825	165,000				
SJ-14	Nocatee	SJ-I & II	St Johns	1,953,289	1,153,289	800,000	Upland Land Development	Pulte Homes, St. Johns County, FL	200,000 CY	Once (2015)
SJ-1	Matanzas Site	SJ-V	St Johns	646,500	396,500	250,000	Beach Placement	Summer Haven, St. Johns & Flagler Counties, FL	57,000 CY, 33,000vCY	Most recent (1998, 2011, 2017, 2018)
FL-3	Flagler South	FL-I	Flagler	777,740	300,000	477,740	Upland Land Development	Old A1A Road, Summer Haven, FL	700 CY	Once (2020)
V-29	Bethune Point WWTP	V-II & III	Volusia	105,000	45,000	60,000				

DMMA Name	Also Known As	Navigation Project or Reach	County	Design Capacity (CY)	Current Volume (CY)	Remaining Volume (CY)	Previous Beneficial Use of Material	Previous Offloading Location	Offloading Volumes	Offloading Frequency
MSA 434S		V-IV	Volusia	515,900	500,900	15,000	Beach Placement	New Smyrna Beach, FL	830,000 CY	Once (2006)
V-26	Edgewater Business Park	V-V	Volusia	418,000	268,000	150,000				
BV-2C	Scottsmore	BV-I	Brevard	3,241,188	3,041,188	200,000				
BV-NASA	Kennedy Space Center (KSC)	BV-II	Brevard	644,000		644,000				
CDA-A	CDA-A	Canaveral Harbor	Brevard							
BV-52	Palm Bay Site	BV-V	Brevard	208,700		208,700	Upland Land Development	Brevard County Sod Farms, FL	236,000 CY	Once (2016)
IR-2	Duck Point	IR-I	Indian River	460,284	230,284	230,000				
SL-2	St Lucie Site	SL-I	St Lucie	84,803		84,803				
M-8	Indian River Drive Site	SL-II	St Lucie	79,552		79,552				
MSA M-5	St Lucie Inlet Site	ICWW-I, OWW-II	Martin	325,500	265,500	60,000	Beach Placement, Island Placement	Ft. Pierce (South), Ft. Pierce Marina	500,000 CY, 102,000 CY	Most recent (1996, 2013)
O-7	St Lucie Locks	OWW-IV	Martin	564,142		564,142				
PB-PI	Peanut Island	PB-III	Palm Beach	365,000	190,000	175,000	Beach Placement	Peanut Island, Palm Beach County, FL	24,530 CY	2018

DMMA Name	Also Known As	Navigation Project or Reach	County	Design Capacity (CY)	Current Volume (CY)	Remaining Volume (CY)	Previous Beneficial Use of Material	Previous Offloading Location	Offloading Volumes	Offloading Frequency
MSA 641A	Delray - Gulfstream Site	PB-IV	Palm Beach	66,788		66,788				
D/A-C	DMMA C	Tampa Harbor Alafia River	Hillsborough	392,000	392,000					
CMDA-3D	DMMA 3D	Tampa Harbor	Hillsborough	12,000,000	4,500,000	7,500,000				
Upland Dredge SD/A	Manatee Harbor Upland DMMA	Manatee Harbor	Manatee	6,200,000	5,200,000	1,000,000	Upland Land Development	Manatee County, FL Road Construction	300,000 CY	Ongoing, intermittently

4.4.2.2 Upland Land Development — Past Projects

NA-1 (NA-I): This FIND site provided sand for upland land development in Crane Island, Florida in 2018. Materials excavated from the DMMA and transported one mile via off-road dump truck provided fill for the Crane Island residential development. In total, this offloading event removed 39,141 cubic yards of dredged material. Photograph 4.5 shows offloading at NA-1.

Photograph 4.5 DMMA NA-1 Offloading for Residential Construction (2018)

DU-2 (DU-III): This FIND site provided sand for construction fill at JEA's St. Johns River Power Park in 2019. 18,570 cubic yards of recycled dredged material was hauled 10 miles and used for construction fill. In 2015, 250,000 cubic yards of dredged material was offloaded at DU-2 and used for road construction.

DU-3 & 4 (DU-III): Beginning in 2019 and ongoing, this FIND site serves as a sand source for upland land development in Jacksonville, Florida. A contractor excavated material from the DMMA using long-reach excavators and hauled the material 8 miles by dump truck to JEA's St. Johns River Power Park. Once completed, this offloading event will remove a total of 300,000 cubic yards of recycled dredged material for use as construction fill at the power plant.

SJ-14 (SJ-I & II): In 2015, Pulte Homes offloaded this FIND site as a sand source for upland land development in St. Johns County, Florida. The developer excavated and hauled approximately 200,000 cubic yards of material from the DMMA for use in local residential construction projects.

FL-3 (FL-I): In 2020, the Florida Department of Transportation (FDOT) offloaded DMMA FL-3 as a sand source for upland land development. FDOT transported approximately 700 cubic yards of material from the DMMA for road construction in Summer Haven, Florida.

BV-52 (BV-V): In 2016, this site provided sediment for upland land development in Brevard County, Florida. Use of this FIND site for a local environmental restoration muck dredging project was contingent on fully offloading the 236,000 cubic yards of dredged material, and the contractor identified sod farming as a beneficial re-use opportunity. Contractors excavated materials from the DMMA using long-reach excavators and trucked the organic-rich material to local sod farms as shown in Photograph 4.6.

Photograph 4.6 FIND DMMA BV-52 in Brevard County, Florida (2016)

Upland Dredge SD/A (Manatee Harbor): In an ongoing project, USACE, Manatee County, and the Manatee County Port Authority are cooperating to offload material to serve as a fill source for upland land development in Manatee County, Florida. Once completed, a total of one million cubic yards of dredged material will be used as construction fill to create a public park (Washington Park).

4.4.2.3 Beach or Nearshore Placement—Past Projects

SJ-1 (SJ-V): In 2017, The Florida Department of Environmental Protection (FDEP) used dredged material from SJ-1 for emergency fortification of the beach-dune system protecting Old A1A Road in St. Johns and Flagler Counties with a total volume of 57,000 cubic yards. In 2011, this FIND site provided sand source for beach placement at Summer Haven, Florida. The dredged material was excavated and transported 15-miles from the DMMA, providing 33,000 cubic yards of sand to mitigate coastal erosion.

MSA 434S (V-IV): In 2006, Volusia County committed to restore the dune system before the start of the 2006 hurricane season to provide emergency storm protection to shorefront development. 830,000 cubic yards was offloaded by hydraulic pumps from MSA 434S and placed on the beaches at New Smyrna Beach, Florida.

MSA M-5 (ICWW-I, OWW-II): In 1996, beach compatible dredged material was offloaded and placed on the beaches south of St. Lucie Inlet. Beach placement resulted in removing 500,000 cubic yards from MSA M-5.

4.4.2.4 Island Placement—Past Projects

MSA M-5 (ICWW-I, OWW-II): In 2013, contractors for the Fort Pierce marina offloaded approximately 102,000 cubic yards of material from this site. The dredged material from MSA M-5 served as the foundation for 12 island breakwaters and one peninsular structure constructed to protect the marina. The contractor transported the dredged material by barge and placed it in the designated areas for island and breakwater construction. Photograph 4.7 depicts an image of island creation at Ft. Pierce marina.

Photograph 4.7 DMMA MSA M-5 Offloading for Ft. Pierce Marina Breakwater Islands (2013)

4.4.3 *Potential Management, Offloading, and Beneficial Re-Use Opportunities*

The DMMA sediment exchange geodatabase offers a range of potential management, offloading, and beneficial re-use opportunities. As noted above, the Jacksonville District has multiple proven offloading projects which will continue. This section of the report provides USACE with an initial evaluation for potential future offloading and beneficial re-use opportunities. Detailed specific project examples are provided in Appendix B. USACE may plan future offloading events and re-use strategies with the beneficial re-use flowchart presented in Chapter 3.2 (Figure 3.3) as a guideline. Approximate offloading costs per cubic yard of material, including excavation and transport, are provided in Chapter 3.3.

Future DMMA offloading opportunities in the Jacksonville District, categorized by beneficial re-use strategies, are listed in the following sections.

4.4.3.1 District-wide Summary of Potential Management, Offloading, and Beneficial Re-Use Opportunities

The Jacksonville District's potential offloading and beneficial re-use strategies include upland land development, beach or nearshore placement, wetland habitat development, and unconfined aquatic placement. These strategies involve excavating the material from the DMMA and transporting the sediment to a beneficial re-use project. Evaluation of several criteria is necessary to decide which re-use strategies are most appropriate for a given DMMA site and re-use project location. These criteria are outlined in Chapter 3's beneficial re-use flowchart (Figure 3.3).

Minimizing transportation distance between the DMMA and the selected project site should be considered for economic feasibility. The sediment characteristics of the potential material in each DMMA are a critical component to deciding which offloading and beneficial re-use strategies are most applicable to the site. If sediment characteristics are unknown at the DMMA, geotechnical investigations are recommended to classify the chemical and physical properties of the material inside the DMMA. The geotechnical investigation will determine sediment characteristics (grain size, Munsell color, silt content, shell content, etc.) and material chemistry (levels of contamination). If the chemical tests identify contaminants, refer to the EPA and USACE reference documents noted in the beneficial re-use flowchart (Figure 3.3).

Table 4.8 provides a summarized list of potential beneficial re-use opportunities in the Jacksonville District, complementing those listed below. Where data is unknown, such as the potential offloading volume or sediment characteristics of a DMMA, the field is blank. If sediment characteristics are unavailable, the potential beneficial uses, locations and strategies will also be blank, indicating not enough information exists.

4.4.3.2 Upland Land Development

Upland land development provides recycled dredged material as a source for several opportunities. Potential beneficial re-use opportunities include commercial and residential construction, farming, parks and recreation. Additional upland opportunities exist for future levee development to protect against storm surge and sea level rise. Upland land development retrieves sand from a DMMA by excavating the material and trucking the material to the desired beneficial re-use project location.

A majority of the Jacksonville District sites have potential for upland land development. The list is too extensive to bulletize here, as it includes 27 of the 34 sites. Table 4.8 indicates the DMMA sites that are feasible for upland land development.

4.4.3.3 Beach or Nearshore Placement for Shoreline Protection or Beach Nourishment

Beach or nearshore placement of re-used dredged sediment restores and augments beaches and dunes. Typical beach placement from DMMA offloading relies on excavation of sand from the site and truck haul transport to the desired beach placement area. When the DMMA is accessible by water, an alternative transport method includes loading sand onto barges for transport or re-slurrying sediment with water for pumping and pipeline transfer of dredged material to the selected beach or nearshore. The quality of the sediment, considerations of environmental impacts, and the cost/economics of transportation are three factors that frequently govern feasibility of such a project.

Table 4.8 and the following bulletized list summarize those sites with potential for future beach placement offloading. These sites are identified as currently having beach compatible dredged material and are located within 20 miles of a prospective beach placement location.

DMMA sites suitable for potential beach placement (and their respective navigation project) are:

- Bartram Island Cell “C” (Jacksonville Harbor)
- Buck Island Cell “A” (Jacksonville Harbor)
- NA-1 (NA-I)
- DU-2 (DU-III)
- DU-6A&B (DU-IV)
- SJ-1 (SJ-V)
- FL-3 (FL-I)
- MSA 434S (V-IV)
- V-26 (V-V)
- SL-2 (SL-I)
- MSA M-5 (ICWW-I, OWW-II)
- PB-PI (PV-III)

4.4.3.4 Wetland Habitat Development

Wetland habitat development creates marshes and lowlands. Wetland habitat development uses DMMA sand sources with fine sediments for thin-layer placement. Thin-layer placement uses a hydraulic dredge and pipeline to spray liquified dredged material and builds up the elevation of wetlands. This beneficial re-use technique restores or creates wetlands and is experimentally used as an adaptation strategy to create resiliency to sea level rise. Table 4.8 and the bulletized list summarize those sites that may offer potential for wetland habitat development:

- Big Crab Island (Naval Submarine Base Kings Bay)
- D/A-2 (Naval Submarine Base Kings Bay)
- DA-1 (Naval Submarine Base Kings Bay)
- Mainside D/A (Naval Submarine Base Kings Bay)
- IR-2 (IR-I)

4.4.3.5 Unconfined Aquatic Placement

Unconfined aquatic placement places dredged material in the littoral zone, nearshore, or waterway. Unconfined aquatic placement occurs using flow lane placement, side-casting or agitation dredging equipment. The site below (also listed in Table 4.8) may offer potential for unconfined aquatic placement:

- PB-PI (PV-III)
- MSA 434S (V-IV): is situated on an island along the intracoastal waterway in Volusia County. MSA 434S is currently filled with 500,900 cubic yards of sediment. Plans to place the sand 1,000 feet offshore New Smyrna Beach (500-ft North of R-158 to 500-ft south of R-174) are in process. The permit is under review as of June 2020. The hauling distance from the DMMA to the beach is approximately three miles.

Table 4.8 Potential Beneficial Re-use Opportunities in SAJ

DMMA Name	Also Known As	Navigation Project or Reach	County	Potential Beneficial Uses of Material	Potential Offloading Volume (CY)	Potential Offloading Location	Potential Offloading Strategy	Sediment Characteristics
Big Crab Island	DA-C	Kings Bay Sub Base	Camden	Wetland Habitat Development		Cumberland Island National Seashore, GA	Excavator, Barge, Hydraulic Dredge, Bulldozer	50% sand / 50% fines
D/A-2	DA-2	Kings Bay Sub Base	Camden	Wetland Habitat Development		Cumberland Island National Seashore, GA	Excavator, Dump Truck, Barge, Hydraulic Dredge, Bulldozer	60% sand / 40% fines
DA-1	DA-1	Kings Bay Sub Base	Camden	Wetland Habitat Development		Cumberland Island National Seashore, GA	Excavator, Dump Truck, Barge, Hydraulic Dredge, Bulldozer	60% sand / 40% fines
Mainside D/A	DA-M	Kings Bay Sub Base	Camden	Wetland Habitat Development		St. Marys, GA	Excavator, Dump Truck, Barge, Hydraulic Dredge, Bulldozer	20% sand / 80% fines
Bartram Island Cell B	Cell "B"	Jacksonville Harbor	Duval	Upland Land Development		Commercial/Residential Development - Jacksonville, FL	Excavator, Barge, Hydraulic Dredge, Bulldozer	10% sand / 90% fines
Bartram Island DA-1	Bartram Island Cell B-2	Jacksonville Harbor	Duval	Upland Land Development	1,729,862	Commercial/Residential Development - Jacksonville, FL	Excavator, Barge, Hydraulic Dredge, Bulldozer	10% sand / 90% fines
Bartram Island Cell C	Cell "C"	Jacksonville Harbor	Duval	Beach Placement, Upland Land Development		Atlantic/Neptune Beach, Commercial/Residential Development - Jacksonville, FL	Excavator, Barge, Hydraulic Dredge, Bulldozer	80% sand / 20% fines
East Bartram Island	Bartram Island Cell G	Jacksonville Harbor	Duval	Upland Land Development		Commercial/Residential Development - Jacksonville, FL	Excavator, Barge, Hydraulic Dredge, Bulldozer	10% sand / 90% fines

DMMA Name	Also Known As	Navigation Project or Reach	County	Potential Beneficial Uses of Material	Potential Offloading Volume (CY)	Potential Offloading Location	Potential Offloading Strategy	Sediment Characteristics
Dayson	Dayson Island	USMC Blount Island	Duval					
Buck Island Cell A	Cell "A"	Jacksonville Harbor	Duval	Beach & Island Placement, Upland Land Development	1,750,000	Jacksonville, FL Road Construction/Beach Placement	Excavator, Dump Truck, Barge, Hydraulic Dredge, Bulldozer	Sand
Buck Island Cell B	Cell "B"	Jacksonville Harbor	Duval	Upland Land Development		Commercial/Residential Development - Jacksonville, FL	Excavator, Dump Truck, Barge, Hydraulic Dredge, Bulldozer	10% sand / 90% fines
NA-1	Crane Island (S/A 43 – 44)	NA-I	Nassau	Beach Placement, Upland Land Development	55,895	Residential Development - Fernandina Beach, FL	Excavator, Dump Truck, Bulldozer	Gray fine sand w/ varying amounts of silt and shell
DU-2	Sawpit; NE Black Hammock Island	DU-III	Duval	Beach Placement, Upland Land Development	374,972	Commercial/Residential Development - Jacksonville, FL	Excavator, Dump Truck, Barge, Hydraulic Dredge, Bulldozer	Fine sand w/ varying amounts of silt and shell
DU-3&4	West Central Black Hammock Island	DU-III	Duval	Upland Land Development		Commercial/Residential Development - Jacksonville, FL	Excavator, Dump Truck, Bulldozer	Fine sand w/ varying amounts of silt and shell
DU-6A&6B	Fanning Island (DU-6A)	DU-IV	Duval	Beach Placement, Upland Land Development		Commercial/Residential Development - Jacksonville, FL	Excavator, Dump Truck, Bulldozer	Fine sand w/ varying amounts of silt, shell, and clay
DU-8	Moody Marine	DU-VI	Duval	Upland Land Development	25,000	Commercial/Residential Development - Jacksonville, FL	Excavator, Dump Truck, Bulldozer	Fine sand w/ varying amounts of silt, shell, and clay

DMMA Name	Also Known As	Navigation Project or Reach	County	Potential Beneficial Uses of Material	Potential Offloading Volume (CY)	Potential Offloading Location	Potential Offloading Strategy	Sediment Characteristics
DU-9	Dee Dot Ranch; Pablo Creek	DU-VII	St Johns	Upland Land Development	1,885,825	Commercial/Residential Development - Jacksonville, FL	Excavator, Dump Truck, Bulldozer	Fine sand w/ varying amounts of silt, shell, and clay
SJ-14	Nocatee	SJ-I & II	St Johns	Upland Land Development, Island Placement	1,153,289	Commercial/Residential Development - St. Johns County, FL	Excavator, Dump Truck, Bulldozer	Tan to gray fine sand w/ trace silt and shell
SJ-1	Matanzas Site	SJ-V	St Johns	Beach & Island Placement, Upland Land Development	396,500	St. Johns County/Summer Haven Beach, FL	Excavator, Dump Truck, Barge, Hydraulic Dredge, Bulldozer	Tan to gray fine to medium sand w/ trace silt and shell
FL-3	Flagler South	FL-I	Flagler	Beach Placement, Upland Land Development	300,000	Flagler County/Summer Haven Beach, FL	Excavator, Dump Truck, Barge, Hydraulic Dredge, Bulldozer	Light gray to brown fine sand w/ varying minor fractions of silt and shell
V-29	Bethune Point WWTP	V-II & III	Volusia	Upland Land Development	45,000	Volusia County, FL	Excavator, Dump Truck, Bulldozer	Light gray to dark gray, with varying amounts of shell, shell hash, and clay
MSA 434S		V-IV	Volusia	Beach Placement, Unconfined Aquatic Placement	500,900	Volusia County/ New Smyrna Beach, FL	Excavator, Barge, Hydraulic Dredge, Bulldozer	White to gray fine-grained sand, trace amounts of shell hash
V-26	Edgewater Business Park	V-V	Volusia	Beach Placement, Upland Land Development	268,000	Volusia County/ New Smyrna Beach, FL	Excavator, Dump Truck, Bulldozer	White to very dark gray with varying amounts of shell, shell hash, and only trace fines
BV-2C	Scottsmore	BV-I	Brevard	Upland Land Development	3,041,188	Brevard County, FL	Excavator, Dump Truck, Bulldozer	Fine sand with silt and trace organics

DMMA Name	Also Known As	Navigation Project or Reach	County	Potential Beneficial Uses of Material	Potential Offloading Volume (CY)	Potential Offloading Location	Potential Offloading Strategy	Sediment Characteristics
BV-NASA	Kennedy Space Center (KSC)	BV-II	Brevard	Upland Land Development		Brevard County, FL	Excavator, Dump Truck, Bulldozer	Fine sand with silt and trace organics
CDA-A	CDA-A	Canaveral Harbor	Brevard					
BV-52	Palm Bay Site	BV-V	Brevard	Upland Land Development		Brevard County, FL	Excavator, Dump Truck, Bulldozer	Fine sand with silt and trace organics
IR-2	Duck Point	IR-I	Indian River	Wetland Habitat Development	230,284	Indian River County, FL	Excavator, Barge, Hydraulic Dredge, Bulldozer	Silt w/ organic matter, muck
SL-2	St Lucie Site	SL-I	St Lucie	Beach & Island Placement, Upland Land Development		St. Lucie County, FL	Excavator, Dump Truck, Barge, Hydraulic Dredge, Bulldozer	Fine to medium sand w/ varying amounts of silt and shell
M-8	Indian River Drive Site	SL-II	St Lucie	Upland Land Development		Martin County, FL	Excavator, Dump Truck, Bulldozer	Silt w/ areas of high clay content
MSA M-5	St Lucie Inlet Site	ICWW-I, OWW-II	Martin	Beach & Island Placement, Upland Land Development	265,500	Ft. Pierce/Martin County, FL	Excavator, Barge, Hydraulic Dredge, Bulldozer	Clean fine sand w/ minor silt components
O-7	St Lucie Locks	OWW-IV	Martin	Upland Land Development		Martin County, FL	Excavator, Dump Truck, Barge, Hydraulic Dredge, Bulldozer	Fine sand w/ trace silt
PB-PI	Peanut Island	PB-III	Palm Beach	Beach Placement, Unconfined Aquatic Placement	190,000	Palm Beach, FL	Excavator, Barge, Hydraulic Dredge, Bulldozer	Fine sand w/ silt
MSA 641A	Delray - Gulfstream Site	PB-IV	Palm Beach	Upland Land Development		Palm Beach County, FL	Excavator, Dump Truck, Barge, Hydraulic Dredge, Bulldozer	Fine sand w/ silt

DMMA Name	Also Known As	Navigation Project or Reach	County	Potential Beneficial Uses of Material	Potential Offloading Volume (CY)	Potential Offloading Location	Potential Offloading Strategy	Sediment Characteristics
D/A-C	DMMA C	Tampa Harbor Alafia River	Hillsborough		392,000			
CMDA-3D	DMMA 3D	Tampa Harbor	Hillsborough	Upland Land Development	4,500,000	Commercial/Residential Development - Tampa, FL	Excavator, Barge, Hydraulic Dredge, Bulldozer	20% sand / 80% fines
Upland Dredge SD/A	Manatee Harbor Upland DMMA	Manatee Harbor	Manatee	Upland Land Development	5,200,000	Washington Park, Manatee County, FL	Excavator, Dump Truck, Bulldozer	20% sand / 80% fines

4.5 Mobile District (SAM)

4.5.1 *Dredged Material Management Areas*

The Mobile District includes seven operating dredged material management areas that have been offloaded or have potential for offloading and beneficial re-use opportunities. Photograph 4.8 depicts an aerial image of Gaillard Island in Mobile County, Alabama. Figure 4.5 provides a map overview of the DMMAs in the Mobile District. Appendix G provides a one-page overview with aerial image and tabular summary of each site.

Photograph 4.8 Gaillard Island (Google, 2020)

4.5.2 *Current Management, Offloading, and Beneficial Re-use Strategies and Applications*

The USACE Mobile District manages various dredged material management areas extending from Pensacola Harbor to the Mobile River. In the past, the USACE has used many of these sites for on-site enhancement opportunities that include dike raising and other site feature improvements.

4.5.2.1 District-Wide Summary of Current Management, Offloading, and Beneficial Re-Use Strategies

The Mobile District's current offloading and beneficial re-use strategies include upland land development and beach or nearshore placement. Table 4.9 itemizes the sediment exchange study DMMAs in the Mobile District by DMMA ID, identifies each sites current volume and capacity characteristics, and summarizes current offloading and beneficial re-use information. Where data is unknown, such as the current or remaining volume of a DMMA, the field is blank. If the DMMA has not been offloaded for beneficial re-use in the recent past, blank fields indicate no record of offloading exists.

The sections below provide a brief narrative description of previous DMMA offloading and beneficial re-use activities that have occurred in the District.

0 2 4 6 8 10
Miles

Figure 4.5
Dredge Material Placement Areas
South Atlantic Division
Mobile District

RSM RCX

Legend
- Dredge Material Placement Areas
- Federal Channels

TAYLOR ENGINEERING, INC.

Table 4.9 SAM DMMA Volumes, Past Offloading and Beneficial Re-use as of April 2020

DMMA Name	Also Known As	Navigation Project or Reach	County	Design Capacity (CY)	Current Volume (CY)	Remaining Volume (CY)	Previous Beneficial Use of Material	Previous Offloading Location	Offloading Volumes	Offloading Frequency
45	Ft. McRee	Pensacola Pass	Escambia	1,500,000	1,300,000	200,000	Beach Placement	Gulf Islands National Seashore, FL		
Gaillard Island	Pelican Island	0+00-385+54	Mobile	124,772,622	14,556,805	110,215,817				
North Pinto	NP	50+00-300+00	Mobile	11,293,100	1,129,310	10,163,790				
South Blakeley	SB	0+00-160+00	Mobile	40,171,100	7,632,522	32,538,578				
Mud Lake 6	ML6	0+00-90+00	Mobile	14,197,000	1,419,704	12,777,296	Upland Land Development	Port of Mobile	175,000 CY between Mud Lake 6 & 7	Most recent (2019-2020)
Mud Lake 7	ML7	0+00-90+00	Mobile	24,038,100	2,403,817	21,634,283	Upland Land Development	Port of Mobile	175,000 CY between Mud Lake 6 & 7	Most recent (2019-2020)
North Blakeley	NB	0+00-120+00	Mobile	14,519,700	1,742,364	12,777,336				

4.5.2.2 Upland Land Development — Past Projects

Mud Lakes 6 and 7 (Mobile Harbor): In 2019-2020, the Port of Mobile offloaded a total of 175,000 cubic yards of sandy material from these two DMMAs for fill for a port expansion project. The material was stockpiled through normal site maintenance activities, and the Port's contractor hauled the material at no additional cost to USACE SAM.

4.5.2.3 Beach or Nearshore Placement— Past Projects

DMMA 45 (Pensacola Pass): USACE Mobile District used this site for beach placement in the past. DMMA 45 is located inside Pensacola Pass and contains primarily beach compatible dredged material.

4.5.3 *Potential Management, Offloading, and Beneficial Re-Use Opportunities*

Review of the DMMA site database offers a range of potential management, offloading, and beneficial re-use opportunities. This section of the report provides USACE with an initial evaluation for potential future offloading and beneficial re-use opportunities. Detailed specific project examples are found in Appendix G. USACE may plan future offloading events and re-use strategies with the beneficial re-use flowchart presented in Chapter 3.2 (Figure 3.3) as a guideline. Approximate offloading costs per cubic yard of material, including excavation and transport, are provided in Chapter 3.3.

Future DMMA offloading opportunities in the Mobile District, categorized by beneficial re-use strategies, are listed in the following sections.

4.5.3.1 District-wide Summary of Potential Management, Offloading, and Beneficial Re-Use Opportunities

The Mobile District's potential offloading and beneficial re-use strategies include upland land development and beach or nearshore placement. These strategies involve excavating the material from DMMA and transporting the sediment to a beneficial re-use project. Evaluation of several criteria is necessary to decide which re-use strategies are most appropriate for a given DMMA site and re-use project location. Chapter 3's beneficial re-use flowchart (Figure 3.3) outlines these criteria.

Planners should consider minimizing transportation distance between the DMMA and the selected project site to improve economic feasibility. The sediment characteristics of the material in each DMMA are a critical component when deciding which offloading and beneficial re-use strategies are most applicable to the site. If sediment characteristics are unknown at the DMMA, geotechnical investigations can classify the chemical and physical properties of the material inside the DMMA. The geotechnical investigation will determine sediment characteristics (grain size, Munsell color, silt content, shell content, etc.) and material chemistry (levels of contamination). If the chemical tests identify contaminants, refer to the EPA and USACE reference documents noted in the beneficial re-use flowchart (Figure 3.3).

Table 4.10 identifies potential beneficial re-use opportunities in the Mobile District. Where data is unknown, such as the potential offloading volume or sediment characteristics of a DMMA, the field is blank. If sediment characteristics are unavailable, the potential beneficial uses, locations and strategies will also be blank, indicating not enough information exists. The relative sparseness of the data in Table 4.10 indicates areas where additional data collection can provide significant benefits to the District's future DMMA offloading opportunities.

4.5.3.2 Upland Land Development

Upland land development provides recycled dredged material as a source for several opportunities. Potential beneficial re-use opportunities include commercial and residential construction, farming, parks and recreation. Additional upland opportunities exist for future levee development to protect against storm surge and sea level rise. Upland land development retrieves sand from a DMMA by excavating the material and trucking the material to the desired beneficial re-use project location. Table 4.10 indicates the DMMA sites that are feasible for upland land development.

DMMA sites suitable for potential upland land development (and their respective navigation project) are:

- North Pinto (Mobile Harbor)
- South Blakeley (Mobile Harbor)
- Mud Lake 6 (Mobile Harbor)
- Mud Lake 7 (Mobile Harbor)
- North Blakeley (Mobile Harbor)

4.5.3.3 Beach or Nearshore Placement for Shoreline Protection or Beach Nourishment

Beach or nearshore placement of re-used dredged sediment restores and augments beaches and dunes. Typical beach placement from DMMA offloading relies on excavation of sand from the site and truck haul transport to the desired beach placement area. When the DMMA is accessible by water, an alternative transport method includes loading sand onto barges for transport or re-slurrying sediment with water for pumping and pipeline transfer of dredged material to the selected beach or nearshore. The quality of the sediment, considerations of environmental impacts, and the cost/economics of transportation are three factors that frequently govern feasibility of such a project.

Table 4.10 and the following bulletized list summarize those sites with potential for future beach placement offloading. District staff identified these sites as 1) currently having beach compatible dredged material and 2) located within 20 miles of a prospective beach placement location.

DMMA sites suitable for potential beach placement (and their respective navigation project) are:

- DMMA 45 – Ft. McRee (Pensacola Pass)

Table 4.10 Potential Beneficial Re-use Opportunities in SAM

DMMA Name	Also Known As	Navigation Project or Reach	County	Potential Beneficial Uses of Material	Potential Offloading Volume (CY)	Potential Offloading Location	Potential Offloading Strategy	Sediment Characteristics
45	Ft. McRee	Pensacola Pass	Escambia	Beach Placement	1,300,000	Gulf Islands National Seashore, FL	Excavator, Barge, Hydraulic Dredge, Bulldozer	Sand
Gaillard Island	Pelican Island	0+00-385+54	Mobile		14,556,805			
North Pinto	NP	50+00-300+00	Mobile	Upland Land Development	1,129,310	Commercial/Residential Development - Mobile, AL	Excavator, Dump Truck, Bulldozer	Sandy silts
South Blakeley	SB	0+00-160+00	Mobile	Upland Land Development	7,632,522	Commercial/Residential Development - Mobile, AL	Excavator, Dump Truck, Bulldozer	Sandy silts
Mud Lake 6	ML6	0+00-90+00	Mobile	Upland Land Development	1,419,704	Commercial/Residential Development - Mobile, AL	Excavator, Dump Truck, Bulldozer	Sandy silts
Mud Lake 7	ML7	0+00-90+00	Mobile	Upland Land Development	2,403,817	Commercial/Residential Development - Mobile, AL	Excavator, Dump Truck, Bulldozer	Sandy silts
North Blakeley	NB	0+00-120+00	Mobile	Upland Land Development	1,742,364	Commercial/Residential Development - Mobile, AL	Excavator, Dump Truck, Bulldozer	Sandy silts

5.0 SUMMARY AND CONCLUSIONS

This report serves to continue an ongoing paradigm shift recognizing that dredged material stored in USACE DMMAs—material often traditionally viewed as a waste product—can become an asset for application in RSM best practices. First, the study's catalogues and document available information about SAD's confined and potentially offloadable DMMAs on a District-by-District basis. Then, the work documents past DMMA offloading and beneficial re-use practices. Finally, the study seeks to lay the foundation to identify potential beneficial re-use projects, pair these projects with appropriate DMMA sediment sources, and plan for offloading and beneficial re-use application of stored dredged material. Key findings are captured in a database to serve as an offloading and sediment exchange web application, designed in a way that potential end users can obtain information about the available sediments in SAD DMMAs.

The results of this study pivot on the review and incorporation of multiple data sources. Study authors and District TPOC focused the database on those DMMA that offer feasible opportunities for offloading. In many cases, specific desired data is not available. However, even in these cases, the resulting database will serve as a tool to identify data gaps and to guide collection of necessary information to convert appropriate DMMAs into valuable sediment sources.

Offloading and beneficial re-use of DMMA sediments vary from District to District and from site to site. Some DMMAs have a long history on ongoing offloading and beneficial re-use. Others have never been offloaded. To begin to more fully and systematically realized the potential for DMMA offloading and sediment re-use, the study leverages existing USACE beneficial use definitions to identify the spectrum of potential applications.

Planning for a DMMA offloading and beneficial re-use project requires consideration of several overarching as well as project specific factors. Chapter 3 of this study introduces these considerations and offers a flowchart to guide initial planning aimed at linking a DMMA sediment source to a beneficial re-use project. Considering the importance of economic feasibility, the chapter also provides an overview of cost factors and ranges for typical offloading and beneficial reuse applications. The physical actions of sediment excavation, transport, and placement certainly entail unavoidable construction costs. However, this report urges planners to not only to consider these costs but also to incorporate the project-specific value of the sediment re-use. In some cases, the value of the sediment re-use offsets the offloading costs. DMMA owners can fashion partnerships with receiving projects that offer win-win opportunities where both parties secure significant benefits—for the DMMA owner, restored site storage capacity; and for the receiving party, a ready sediment source—with significant cost saving.

For this study to realize its full potential, the database should be maintained and updated as an ongoing reference and tool. Updates should document changes in DMMA details and record offloading and beneficial re-use applications. As noted in this study, a thorough understanding of stored sediment characteristics is the key criteria for planning beneficial re-use projects is. However, this information is unavailable for many sites. A two-pronged approach may begin to fill this data gap. First, for sites with high offloading potential, geotechnical investigations of historically placed dredged materials could be commissioned to characterize the available sediments. Second, with each new dredging event, the sediment characteristics of the dredged material—information commonly available at the time of dredging—should be logged into the database to inform future potential offloading and beneficial re-use opportunities. Building on the results of this study and maintaining the database will provide a foundation for a robust program of DMMA offloading and beneficial re-use.

6.0 REFERENCES

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