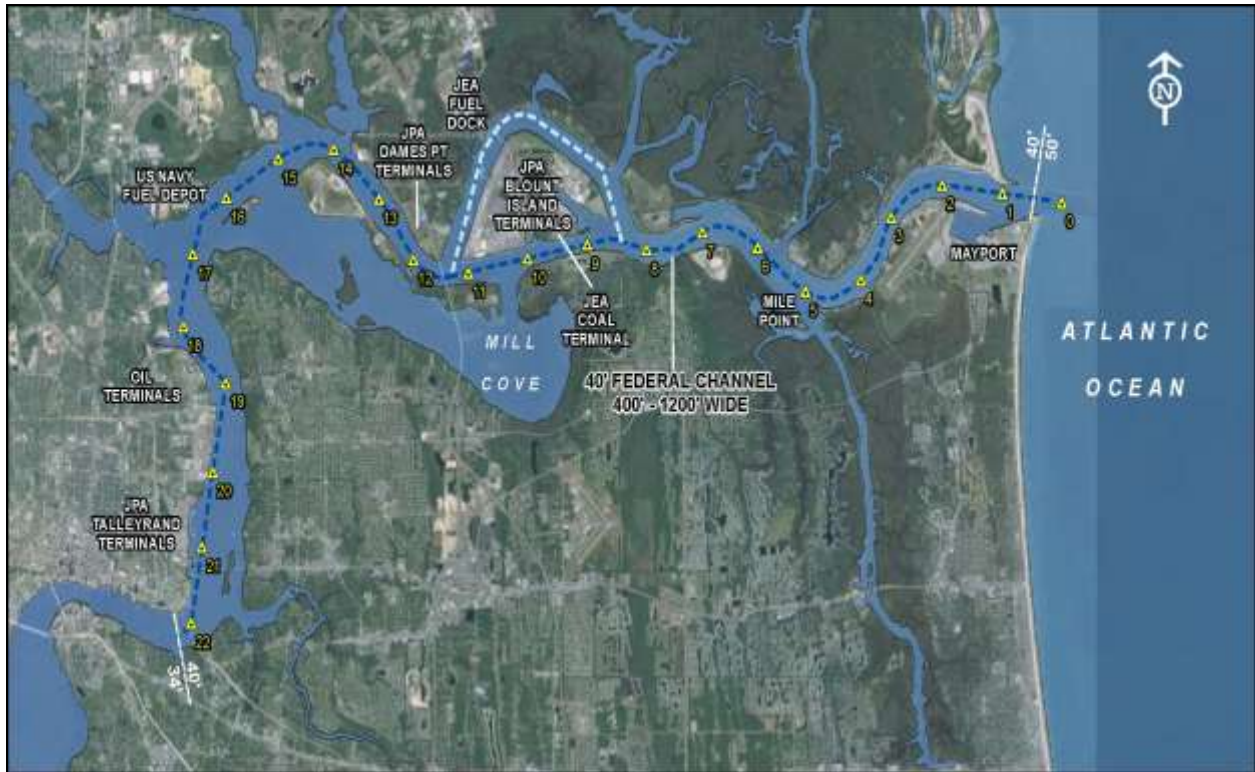


## New Sediment Storage Areas for the Jacksonville Port Authority, Duval County, Florida

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**ABSTRACT:** The Jacksonville Port Authority (JAXPORT), located in Duval County, Florida, manages the primary deep-draft port for waterborne commerce in northeast Florida and southeast Georgia. The Jacksonville Harbor Federal Project follows the St. Johns River for approximately 43.1 km (26.8 mi) from the Atlantic Ocean to downtown Jacksonville. The federal government, through the U.S. Army Corps of Engineers (USACE), is responsible for maintaining the Jacksonville Harbor Federal Project. JAXPORT, the local sponsor, works with the USACE to carry out its maintenance responsibilities.

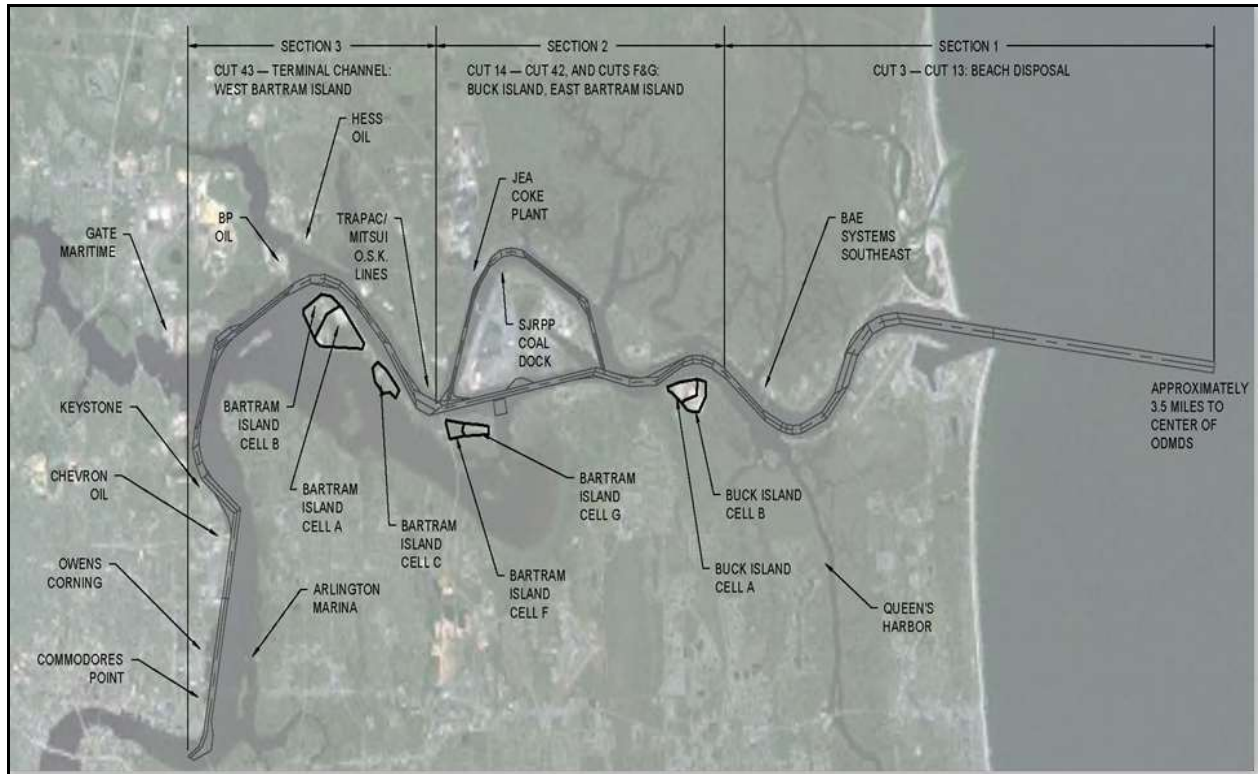


**Figure 1.** JAXPORT Federal Navigation Channel and Facilities

Initial planning efforts began in mid-2011 when the USACE and JAXPORT faced a critical shortage of available dredged material management handling and disposal facilities. At the time, the capacity of existing facilities was nearly exhausted, and the prospect of identifying available land to construct new facilities looked dim. Furthermore, increased environmental awareness and accompanying regulation would make securing dredge material permits for either open water placement or storage in new contained disposal facilities increasingly difficult and expensive, especially in Florida's high-growth and rapidly urbanizing northeastern corridor.

Major potential environmental concerns within the Jacksonville Harbor area included assessing impacts to wetlands, open water, water quality, and endangered species. Also, all efforts would have to minimize any impacts to the Timucuan National Ecological and Historic

Preserve and the Nassau River-St. Johns River Marshes Aquatic Preserve. Finally, all expansion alternatives and new dredged material management area (DMMA) development must undergo formal review and consultation with the responsible regulatory agencies to establish final permitting requirements.



**Figure 2.** JAXPORT Harbor Map and Current Dredged Material Handling Facilities

JAXPORT has developed a 20-year Dredged Material Management Plan (DMMP) for the that describes the remaining DMMA capacities currently available to JAXPORT, discusses current constraints on those and future DMMA construction, and evaluates all identified alternatives to provide the required dredged material handling capacities. The active plan defines the least-cost environmentally acceptable alternatives along with the corresponding evaluated associated costs.

Recently, Wood Environment and Infrastructure Solutions (Wood) developed a preliminary Order of Magnitude Engineering and Construction Cost Estimate and developed initial design figures for the relocation of non-building grade dredged material (fine sediments composed mainly of silts, clays, and organics) from within Buck Island DMMA Cell B and sandy sediments in Cell A to other areas on Buck Island. These new sediment storage areas include those areas adjacent to the existing Buck Island DMMA cell walls, which is both outside of the existing DMMA cell walls and yet within areas without direct environmental impacts.

The objective of the project is to economically recapture site sediment storage capacity, mainly from within Buck Island DMMA Cell B, but also to create storage for any non-building grade sediment found within Buck Island DMMA Cell A, as well. Wood estimated the final project cost at just over \$8,500,000 in final data collection, engineering, and construction costs and the handling of slightly more than one million cubic yards of sediments. JAXPORT will bid out the project as a design-build, with the selected contractor tasked with providing the specific means and methods to remove the dewatered sediments from within Buck Island DMMA Cell B

and transport that material to the designated upland location area shown on the final construction drawings for final storage.

### APPROACH/ACTIVITIES

The following types of activities will be included under this project:

- 1) Implementation of a program to lower the stored water depths within Buck Island DMMA Cell B by creating a sump near the sites weirs and cutting trenches within Cell B.
- 2) Construction of a new sediment storage area using either
  - a. Sandy sediments from Buck Island DMMA Cell A previously deposited during dredging events
  - b. Excavating the necessary sediments from below the proposed footprint of the new sediment storage area itself
- 3) Relocating of dried sediments in Buck Island DMMA Cell B
- 4) Conducting a threatened and endangered species survey of the project site. JAXPORT anticipates at least one listed animal species being found on site since gopher tortoise (*Gopherus polyphemus*) burrows have previously been identified
- 5) Employing erosion and sediment control best management practices before any clearing and grubbing and all other construction activities and after the site is full

### INTRODUCTION

This effort also covers developing initial design figures all for the relocation of non-building grade dredged material (fine sediments composed mainly of silts, clays, and organics) from within Buck Island DMMA Cell B to areas on Buck Island. These new sediment storage areas include those areas adjacent to the existing Buck Island DMMA cell walls, which is both outside of the existing DMMA cell walls and yet within areas without direct environmental impacts.

Based on discussions between JAXPORT and the U.S. Army Corps of Engineers (USACE), the proposed activities will not require new permits, amendment of existing permits, nor any additional correspondence with regulatory agencies since all work will occur within the footprint of the existing permits. Also, the proposed efforts will not alter the design or function of the existing system. Furthermore, all material will be placed in a manner to avoid all direct environmental impacts on any known environmental resources. The initial design figures for the relocation of non-building grade dredged material assume a minimum five (5) foot setback for all identified and mapped environmental resources.

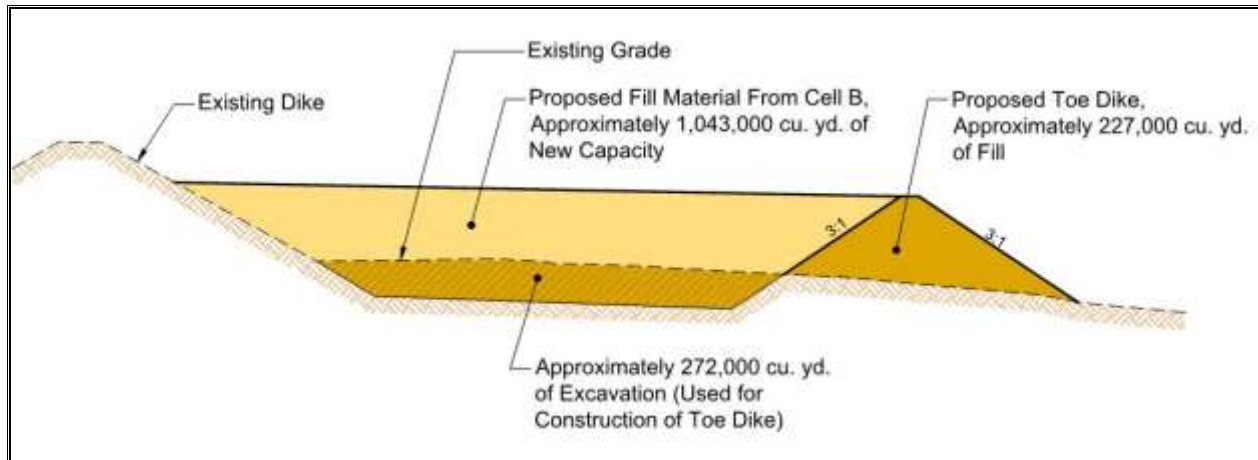
For the initial phase of construction for the new sediment storage area, the selected contractor can acquire the material used to create the new toe dike structure from sandy sediments previously deposited during dredging events into Buck Island DMMA Cell A.

Alternatively, a more cost-efficient approach is to excavate the necessary sediments from below the proposed footprint of the new sediment storage area itself. The preliminary calculations, made without access to complete topographic and geotechnical data, indicate that the selected contractor can remove roughly 272,000 cubic yards of sediment from below the proposed footprint of the new sediment storage area (**Figure 3**).

Approximately 204,000 cubic yards of sandy material is assumed to be available from below the proposed footprint of the new sediment storage area itself ( $272,000 - 204,000 = 68,000$  cubic yards) for the initial phase of construction, assuming a conservative waste rate of 25% (68,000 cubic yards).

The preliminary calculations indicated that the new toe dike structure would require approximately 227,000 cubic yards of sandy material to construct. Therefore the remaining roughly 23,000 cubic yards of material will likely come from Buck Island DMMA Cell A ( $227,000 - 204,000 = 23,000$  cubic yards). For design purposes, it was assumed that the selected contractor would work the remaining 68,000 cubic yards of waste sediment back into the

exterior of the constructed dike in the manner of adding a soil amendment during the final regrading, stabilizing, and vegetating the new sediment storage area.



**Figure 3.** New Sediment Storage Area – Sediment Budget

In all, the selected contractor will excavate roughly 272,000 cubic yards of material from below the proposed footprint of the new sediment storage area for the initial phase of construction. The selected contractor will then use 204,000 cubic yards of this material along with 23,000 cubic yards from within Buck Island DMMA Cell A to construct the new toe dike structure.

Please note that this estimate does not cover the cost to create sumps, trench, dewater, or otherwise manipulate the sediments found within Buck Island DMMA Cell B, just the cost for the relocation of those dried sediments. The effort to dewater Buck Island DMMA Cell B sediments has been excluded from this estimate. JAXPORT intends to implement a program to lower the stored water depths within Buck Island DMMA Cell B, create a sump near the sites weirs, and create a system of trenches within Buck Island DMMA Cell B. All of which will significantly decrease the cost of handling the sediments found within Buck Island DMMA Cell B.

For the final phase of construction, the new toe dike structure will create an estimated capacity of 1,020,000 cubic yards of non-building grade dredged material capacity for those sediments previously deposited in Buck Island DMMA Cell B.

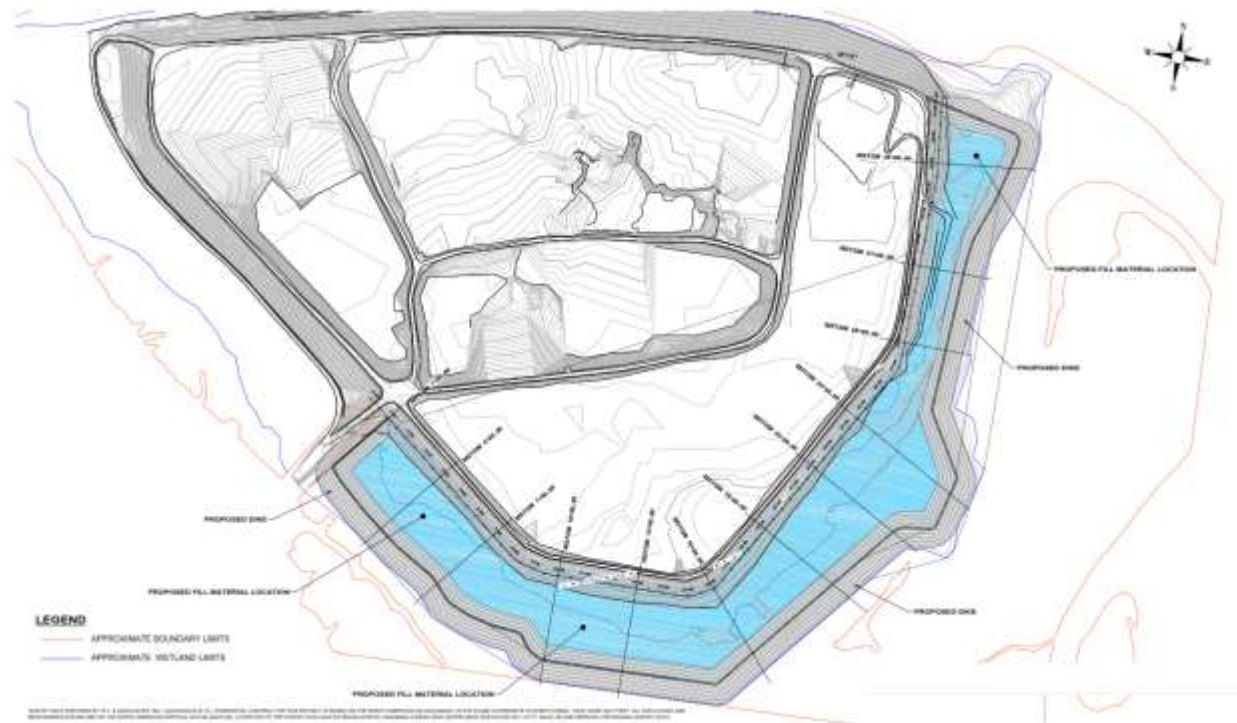
In total, roughly 23,000 cubic yards of sandy sediments will be removed from within Buck Island DMMA Cell A, while approximately 1,020,000 cubic yards of non-building grade dredged material will be removed from within Buck Island DMMA Cell B providing JAXPORT with 1,043,000 cubic yards of new capacity. In this way, JAXPORT will be able to initiate an ongoing process to continually reclaim site sediment storage capacity lost due to water retention within Buck Island DMMA Cell B. Future efforts may include removing the dried non-building grade dredged material off of Buck Island entirely.

## **PURPOSE STATEMENT**

As noted previously, the purpose of the proposed project is to primarily recapture site sediment storage capacity, mainly from within Buck Island DMMA Cell B, but also to create storage for any non-building grade sediment found within Buck Island DMMA Cell A, as well. JAXPORT will bid the project and the selected contractor will be tasked with providing the specific means and methods to remove the dewatered sediments from within Buck Island DMMA Cell B and transport that material to the designated upland location area shown on the final construction drawings for final storage.

Before bid document submission additional data collection will be conducted, engineering analysis will be performed, and updated draft construction drawings and specifications will be

developed based on the new data collection findings. The additional data collection findings may significantly alter the proposed design and ultimate site capacity.



**Figure 4.** Proposed Toe Dike and Fill Locations

Also, before bidding document submission, a threatened and endangered (T&E) species survey of the project site will be conducted. Records will be made of any wildlife observed, listed plant species found, any evidence of wildlife utilization, and appropriate habitat for listed species. Wood anticipates the field survey resulted in at least one T&E listed animal species being found on site since gopher tortoise (*Gopherus polyphemus*) burrows have previously been identified, and the uplands on site are at least moderately desirable habitat. A Florida Fish and Wildlife Conservation Commission (FWC) permit will likely need to be issued for the capture and relocation of gopher tortoises. Wood assumes that at most, 25 gopher tortoise will need to be relocated.

The selected contractor will employ erosion and sediment control best management practices before any clearing and grubbing activities. The selected contractor will remove obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off JAXPORT's property. Burning of tree, shrub, and other vegetation waste will be allowed if permitted by regulatory agencies. The selected contractor will control such burning to produce the least smoke or air pollutants and minimum annoyance to surrounding properties. The burning of other waste and debris is prohibited. Separate recyclable materials produced during site clearing from other non-recyclable materials will be stored or stockpiled without intermixing with other materials and transport them to recycling facilities. During the selected contractor's clearing and grubbing efforts, all gopher tortoise burrows will be excavated for the relocation of the tortoises to a permitted recipient site.

During construction of the new toe dikes and filling of the new sediment storage area, erosion monitoring will be performed by the chosen contractor by installing temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil bearing water runoff or airborne dust to adjacent properties according to standard erosion and sedimentation control practices.

The selected contractor will handle (including any additional dewatering, if necessary) and adequately store dried dredged materials before offloading of excavated materials by the contract documents. Stockpile management of material may include, if necessary, covering the stored material with an impermeable material (e.g., polyethylene), and segregation of material for new toe dike construction.

The final filled storage facilities will be vegetated, and the selected contractor will be required to provide a six-month warranty for both the vegetation cover and the stability of the stored material.

## **ORDER OF MAGNITUDE ENGINEERING AND CONSTRUCTION COST ESTIMATE**

For specialized construction items such as dredging and dredged material management, the cost estimating team usually utilizes means and methods along with production rates observed on similar projects to assist in deriving unit costs and production rates. To further assist with this estimation our cost estimating team contacted two reputable dredging and sediment removal firms who operate throughout the Southeastern U.S. to aid in verifying general rates and support costs to mobilize/demobilize personnel and equipment to the project site.

The provided preliminary estimate includes all the foreseeable project costs: mobilization/demobilization; pre- and post-construction surveying; maintenance of traffic; clearing and grubbing vegetated area; new toe dike construction; disposal of dried dredged material; erosion controls and soil tracking prevention devices; roadway base material; vegetating storage areas; and associated attendant items. As noted earlier, an updated estimate with line by line itemized breakout of costs was prepared only for the selected plan presented above.

The estimate presented herein includes a 20 percent contingency (typically a 20 to 30 percent contingency is applied to infrastructure projects at the conceptual stage with the contingency being reduced as the initial design is advanced and unknown/uncertainties reduced) and 3 percent contingency for construction supervision and project closeout costs.

For this preliminary estimate, certain assumptions regarding the likely means and methods have been assumed. Those assumptions are listed in the next section of this document.

## **MAIN ASSUMPTIONS**

The estimate for the preliminary plans and specifications presented within was prepared based on the following assumptions and stipulations.

- (1) The preliminary estimate is consistent with the recommendations made to JAXPORT by the Wood as outlined in this paper.
- (2) Before bid document submission additional data collection, engineering analysis, and update the draft construction drawings and specifications based on the data collection findings will be conducted. This may significantly alter the proposed design and ultimate site capacity.
- (3) The final engineering and construction management efforts assume a contagious 36-month construction period, which may prove to be unattainable due to unforeseen or unanticipated site conditions.
- (4) An independent surveyor will establish (pre- and post-construction) horizontal and vertical limits and establish/verify existing elevations for payment applications.
- (5) The selected contractor will mechanically clear, grub, and remove vegetation and any debris from the proposed storage location. The contractor will dispose of the material in an approved location. In no case should material be placed in such a way as to impede entrance to Buck Island from the bridge connecting Fort Caroline Road and Buck Island.

- (6) During the selected contractor's clearing and grubbing efforts, all gopher tortoise burrows will be excavated for the relocation of the tortoises to a permitted recipient site.
- (7) The selected contractor will excavate roughly 272,000 cubic yards of material from below the proposed footprint of the new sediment storage area for the initial phase of construction. Given a conservative waste rate of 25% (68,000 cubic yards), approximately 204,000 cubic yards of sandy material is assumed to be available from below the proposed footprint of the new sediment storage area itself.
- (8) This preliminary estimate assumed that the selected contractor would erect the new toe dike in stages (multiple lifts of 2 to 3 feet at a time) while filling in the enclosed new sediment storage area with dried dredged material from Buck Island DMMA Cell B.
- (9) Preliminary calculations indicate that the new toe dike structure will require approximately 227,000 cubic yards of sandy material to construct.
- (10) The selected contractor will likely excavate roughly 23,000 cubic yards of material from Buck Island DMMA Cell A for the construction of the new toe dike structures.
- (11) The selected contractor's means and methods must indicate how the selected contractor will dispose of and stabilize the dried dredged material within the new toe dike. The plan assumed for this preliminary estimate assumes the selected contractor can successfully stabilize the dried dredged material without the use of spur dikes, geotextiles, sheet pile walls, etc.
- (12) It was assumed that the selected contractor would work the remaining 68,000 cubic yards of waste sediment back into the exterior of the constructed dike in the manner of adding a soil amendment during the final regrading, stabilizing, and vegetating the new sediment storage area.
- (13) The preliminary estimate presented herein include a 20 percent construction contingency and 3 percent contingency for construction supervision and permit closeout costs.

## **LIMITATIONS AND RISKS**

Inadequate topographic data is available, which prevents accurately determining the exact new toe dike material requirements as well as the final storage capacity. However, analysis of site photos, JAXPORT and Wood's familiarity with the site, and several calculations put this risk at likely less than a 10% inaccuracy.

Also, insufficient geotechnical data is available to assess the proposed new toe dike height, crest-width, and side slopes. For example, the presence of non-building grade sediments below the proposed location for the new toe dike may limit the new toe dike height to less than 25 feet above the existing surface, which would limit the site's final storage capacity. Conversely, better soils than anticipated within Buck Island DMMA Cell B allow for steeper side slopes than anticipated, which would increase the dike's capacity. With the addition of sufficient geotechnical data, as outlined above of the attached preliminary estimate a more accurate cost element can be developed.

## **CONCLUSIONS**

The analyses suggest a preliminary estimate of between approximately \$6,940,000 and \$8,530,000 for the proposed dredging project as outlined in this document. Given that the proposed construction activities will yield approximately 1,043,000 cubic yards of new capacity, which is a cost of around \$8.20 per cubic yard of new storage capacity.

## **REFERENCES**

- Wagner, R.J. (February 2011). Jacksonville Harbor Preliminary Dredged Material Management Plan, Dredged Material Management Area Needs, and Dredging Alternatives for the Near-Term (FY 2011 – FY 2014) and Long-Term (FY 2011 -FY 2030), Duval County, FL
- U. S. Army Corps of Engineers, Jacksonville District South Atlantic Division (June 2005). Final Interim Jacksonville Harbor Dredged Material Management Plan (DMMP) with Environmental Report for Jacksonville Harbor Duval County, Florida - 008410, Jacksonville, FL.

## **CITATION**

- Wagner, R.J., Bennett, J.T., Proctor, F.D., and DeLeon, L.G. "New Sediment Storage Areas for the Jacksonville Port Authority, Duval County, Florida" Proceedings of the Battelle Sediments Technical Conference, New Orleans, LA, February 13, 2019.