To: Mr. David Touring, PE
DTouring@thetouringco.com
Isle of Palms Special District
14286 Beach Blvd, Suite No. 19-272
Jacksonville, FL 32250

From: Joe Wagner, PE, D.NE
joseph.wagner@woodplc.com
Wood Environment & Infrastructure Solutions, Inc.
6256 Greenland Road
Jacksonville, FL 32258

Date: December 06, 2018 (Updated December 10, 2018)

Ref: Northern, Central, and Southern Isle of Palms "Central Channel" Dredging: Preliminary Order of Magnitude Engineering and Construction Cost Estimate, Task 4
Wood Project No. 6735179416

1.0 BACKGROUND

Under Project No. 6734179416, the Isle of Palms Special District (DISTRICT) has requested that Wood Environment & Infrastructure Solutions, Inc. (CONSULTANT) deliver dredging engineering and sediment removal services for the DISTRICT. *Task No. 1* of that December 05, 2017 scope of services tasked the CONSULTANT with providing a letter memorandum summarizing the CONSULTANT's dredging templates ("center channel" and "bank to bank"). The completed short letter memorandum described the plan area, typical cross-sections, and the total required dredging volume based on the updated hydrographic survey collected by our SUBCONSULTANT Arc Surveying and Mapping as part of *Task No. 2*.

As noted, *Task No. 2* of the December 05, 2017 scope of services tasked the CONSULTANT with providing signed and sealed exhibits depicting the results of the hydrographic survey in plan view with elevations and contours of the approximately 30,000 linear feet of canals and channels located within Northern, Central, and Southern Isle of Palms Community. *Task No. 2* is complete. The SUBCONSULTANT completed the hydrographic survey in March of 2018.

Meanwhile, *Task No. 3* of the December 05, 2017 scope of services tasked the CONSULTANT with providing sediment quality assessment, which will likely be required to support some disposal options for any maintenance dredging event. To date, this item remains on hold.

Task No. 4 of the December 05, 2017 scope of services tasked the CONSULTANT with providing a letter memorandum summarizing the CONSULTANT's order of magnitude construction cost estimate. Acceptance of the particular effort, this document, would signal the completion of *Task No. 4* of the December 05, 2017 scope of services.

Subsequently, the DISTRICT requested two additional proposals. Both proposals remain unauthorized.

(1) The first unauthorized scope of services, dated August 08, 2018 covered professional data collection and regulatory coordination services related to the restoration of (a) Marsh View Drive & Plumosa Drive; (b) San Pablo Road South & Cordgrass Inlet Drive; (c) Royal Palm Drive; and (d) Island Eunice Road & Palm Island Drive canals. Please see the August 08, 2018 scope of services for more detail.

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a. Marsh View Drive & Plumosa Drive: this portion of the provided scope of services considers shoaling at the southeast end of the canal located between Marsh View Drive and Plumosa Drive, also referred to as the Central canal, at the confluence of Pablo Creek with the dredged channel, about 280 feet from the entrance to the Intracoastal Waterway. Historically an artificial berm, along with the southern edge of the canal, blocked water flow and suspended sediments from flushing from the south through the marsh to the project area. Recently residents have reported shallow conditions for boating along the east end of the channel, particularly at the area where the creek meets the channel. As tides ebb, the CONSULTANT suspects that storm and tidal flow carry sediments and deposit them where water flow rates decrease. Based on preliminary conversations with the Florida Department of Environmental Protection (FDEP) and the U.S. Army Corps of Engineers (USACE) regulatory staff correcting this issue will require permitting engineering solutions to repair/replace the berm formerly located near the canal mouth.
b. San Pablo Road South & Cordgrass Inlet Drive: this portion of the provided scope of services considers shoaling at the south end of San Pablo Road South and Cordgrass Inlet Drive where the Open Creek meets with the DISTRICT canals. Historically San Pablo Road South crossed over this area of creek and marsh. That portion of the road has since been removed and replaced with a road redirected to the west, which is referred to as San Pablo Parkway. Currently, Open Creek flows around the edge of the San Pablo Road and into the DISTRICT canals. This canal leads residential boaters to intermediary Southern Channel and eventually to the Intracoastal Waterway. Based on conversations with FDEP and USACE staff correcting this situation requires demonstrating which specific forces contributed directly to the sedimentation issue, which will likely prove difficult to determine conclusively. Instead, the CONSULTANT will focus on permitting an engineering solution, which includes developing a sediment trap near the confluence of Open Creek and the DISTRICT's canals.
c. Royal Palm Drive: this portion of the provided scope of services considers shoaling at the south end of the end of Royal Palm Drive within the DISTRICT canal to the north of Lagoon Drive. Currently, untreated stormwater flows directly off of Royal Palm Drive down a short embankment and straight into the Royal Palm Drive Canal. Based on a preliminary site-visit and conversations with FDEP and USACE regulatory staff, the CONSULTANT believes that the DISTRICT can ameliorate this situation in one of two ways.
    i. The first will require demonstrating that stormwater flows have contributed directly to the sedimentation issue and then pressing the City of Jacksonville Public Works Department to implement proper curb, gutter, and stormwater collection improvements to at least the end of Royal Palm Drive. This first approach will likely prove difficult to demonstrate conclusively and even more challenging to receive approvals and funding from the City of Jacksonville City of Jacksonville Public Works Department.
    ii. Instead, the CONSULTANT will focus on the second approach, permitting an engineering solution, developing a sediment trap near the confluence of Open Creek and the DISTRICT's canals.
d. Eunice Road & Palm Island Drive: this portion of the provided scope of services considers shoaling at the southeast corner of the canal located between Eunice Road and Palm Island Drive, referred to here as Island Drive Canal. During a preliminary site-visit, the CONSULTANT could not determine a specific reason for the accelerated shoaling at this location. One possible reason for the shoaling in this region may be that the dredger did not entirely remove the dredge material from this location during the previous dredging

efforts. Based on conversations with FDEP and USACE regulatory staff, the CONSULTANT will focus on permitting an engineering solution, which includes developing a sediment trap at the southeast corner of the canal.

(2) The second unauthorized scope of services, dated November 10, 2018, covered the delivery of professional dredging engineering services. These services include developing a project-specific set of plans and specifications for advertisement to dredging CONTRACTORs; providing bidding assistance and administration services, and finally providing construction-related and project closeout services. Please see the November 10, 2018 scope of services for more detail.

a. The unauthorized November 10, 2018 scope of services is based on the use of the future Harbour Waterway Special District dredged material management area (DMMA) as the primary location for bidding purposes. However, bidders will be able to propose alternative permissible offloading and disposal sites as well and bid on alternative dredging templates.

b. The Harbour Waterway DMMA is not permitted to receive dredged material from the Isle of Palms project. However, the CONSULTANT understands that Harbour Waterway Special District plans to actively procure permits for the use of their DMMA site by the Isle of Palms.

c. The CONSULTANT based the unauthorized November 10, 2018 scope of services on the assumption that the final design of the proposed dredging template will use the DISTRICT's 2018 "center channel" template with an allowable overdepth of -6 feet Mean Low Water (MLW), which would produce approximately 150,000 cubic yards of dredged material.

d. Please **Figure 1** and **Figure 2** for a description of the two proposed dredging templates (1) "center channel" and (2) "bank to bank" and the two different proposed dredging depths (1) a required project depth of -5 feet MLW and (2) an allowed overdepth of -6 feet MLW.

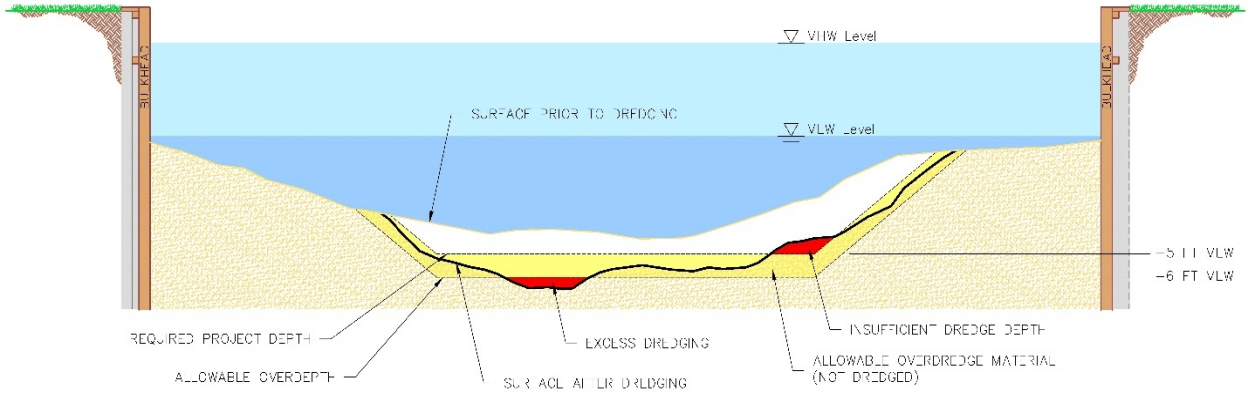

Figure 1: Central Channel Dredging Template

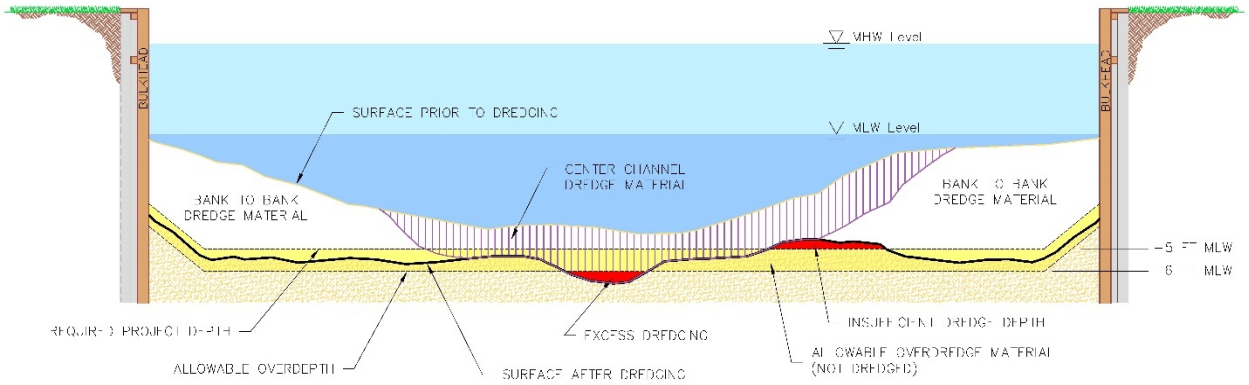

Figure 2: Bank to Bank Dredging Template

1.1 Northern, Central, and Southern Isle of Palms "Central Channel" Dredging

As noted above, this document covers producing a preliminary Order of Magnitude Engineering and Construction Cost Estimate herein referred to as "estimate" (**Appendix A**). Final construction drawings are included within the aforementioned unauthorized November 10, 2018 scope of services. However, the *Task No. 1* of that December 05, 2017 project scope of services did provide preliminary design figures included for reference as part of the April 09, 2018 document titled the Preliminary 2014 and 2018 Hydrographic Survey Analysis (**Appendix B**). Preliminary design figures show the DISTRICT design dredge template in plan view, with representative cross-sections along the dredge template.

On May 23, 2014, based on an application provided by the CONSULTANT's project manager Joe Wagner, the FDEP granted the exemption request, File No. 16-221376-002-EE. The FDEP permit language states that "This verification will expire after one year, and will not be valid at any other time if site conditions materially change, the project design is modified, or the statutes or rules governing the exempt activity are amended."

The CONSULTANT has coordinated with Aaron Sarchet of the FDEP, who indicated that because the project design has not materially changed and only maintenance dredging is proposed, no additional coordination is required with FDEP, except for the use of most proposed dredged material disposal facilities.

On January 19, 2016, based on an application provided by the CONSULTANT's project manager Joe Wagner, the USACE granted an extension of the DISTRICT's existing maintenance dredging permit. The permit, File No. SAJ-2003-10787 (SP-BAL), is valid through January 19, 2026. No further permitting related correspondence with the USACE is necessary with the possible exception of the use of some proposed disposal facilities.

For both permits, dredging is permitted using either mechanical or hydraulic dredging methodology and disposal in an authorized upland confined disposal facility. However, given the use of the future unpermitted Harbour Waterway DMMA site as the primary location for bidding purposes, only mechanical dredging has been estimated here.

The dredge will need to operate close to existing bulkheads, pilings, and other in water infrastructures. Therefore a homeowner wavier to dredge near any in water structures is necessary. The homeowner wavier document will be reviewed and amended, as appropriate, by the DISTRICT's legal advisors. Also, homeowner dispute procedures for any disputes regarding the CONTRACTOR's possible failure to dredge acceptably or damage to in water structures and bulkheads is also necessary.

Upon the DISTRICT entering into a construction contract with the selected firm, the CONSULTANT will provide a review of technical submittals (shop drawings, cut sheets, etc.) required of the CONTRACTOR by the contract documents. These include numerous items that will be necessary for the proposed offloading, handling, and disposal location for the dredged material.

The SUBCONSULTANT (Arc Surveying and Mapping) will provide a precondition mobile laser scan, in three separate mobilizations, of all bulkhead, shoreline, and dock features. The georeferenced terrestrial laser scan survey of the docks, piling, seawalls, bulkheads, and shoreline as a record of the existing waterfront feature positions and conditions within the limits of the hydrographic survey. The DISTRICT will use this survey as a current condition survey and may be used as a baseline in the event of movement thought to be caused by the dredging process. Furthermore, the CONSULTANT has budgeted for up to five (5) post-condition surveys, may issues arise during construction. Each post-condition survey is budgeted to require eight (8) hours of a CONSULTANT staff engineer's time and twenty-four (24) hours of the CONSULTANT project manager's time to perform and document.

Also during the construction phase, the CONSULTANT will provide periodic construction inspections services to monitor construction and the project schedule, to prevent schedule delays and cost over-runs. Said inspections would generate corresponding bi-weekly reports detailing project progress, billing quantities, project issues, and project completion forecasts. For budgeting purposes, the CONSULTANT has assumed a 52-week project schedule (from mobilization to demobilization) with two construction inspections (one scheduled and one occurring randomly) each week. Each inspection is budgeted to require four (4) hours of a CONSULTANT staff field technician II time and one-and-a-half (1.5) hours of the CONSULTANT project manager time to perform and document.

The CONSULTANT will also review CONTRACTOR's "as-built" drawings for conformance with project requirements. The CONSULTANT will be responsible for project coordination and communications; preparation of bi-weekly reports; participation in conference calls, meetings, and submittal of meeting summaries; review of pay requests; and final acceptance of the project.

1.2 Contractor' Potential Project Sequence of Operations

The following is a potential project sequence of operations although the selected CONTRACTOR will ultimately be responsible for specific means and methods.

The selected CONTRACTOR will likely launch the mechanical dredge barge and scows from a nearby boat ramp. Alternatively, the CONTRACTOR may bring the mechanical dredge barge and scows to the site via the Intracoastal Waterway. The mechanical dredge barge anchors or spuds will be lowered into place to secure the barge's position during dredging. A scow barge, with 50-yard Roll-off containers, will be brought alongside or behind the mechanical dredge barge (depending on the channel's width restrictions) and secured to the hull of the dredge. Mechanical dredging will begin starting from the eastern end of main (North, Central, and Southern entrance channels), working westward towards the homes serviced by the channels. The mechanical dredge barge excavator will scoop up the dredged material from the bottom of the channel to the targeted depth. The dredge operator will execute dredging as specified in contract drawings. The dredge operator will remove the dredged material from the substrate in the bucket compartment. Once the dredge operator has lifted the excavator bucket out of the water surface and position it over the scow barge, the dredge operator will mechanically release the dredged material into the scow barge.

The selected CONTRACTOR will remove the dredged material from projects channels and canals down to the construction dredge depths and limit all work to within the approved dredge template. When a scow barge becomes full of dredged material, the selected CONTRACTOR will tow the scow barge to the Harbour Waterway DMMA and the 50-yard roll-off containers will be pumped out into the DMMA. During offloading, dewatering, and transport to a final disposal location, the CONSULTANT anticipates that the selected CONTRACTOR will use best management practices to prevent spills or turbidity exceedances.

Equipment List (may vary depending on selected CONTRACTOR and equipment availability)

- Mechanical Dredge Barge – Typically an excavator mounted onto a barge with an open bucket.
- Scow Barges - A barge used to temporarily store and transport dredged material from the project area to the next processing location.
- 50-Yard Roll-Off Containers – Large watertight containers used to transport dredged material from the Isle of Palm channels and canals to the Harbour Waterway DMMA.
- Tugboat (Tug) – A powerful boat used for towing large vessels. In this case, the tug will be used to mobilize, demobilize, and position the mechanical dredge barge. Additionally, a tug will likely tow scow barges to a designated processing area for unloading.

- Pump-out Barge – Standard pumping equipment used to re-fluidize the dredge material and send it into the Harbour Waterway DMMA.

As noted previously, the DISTRICT has requested the CONSULTANT use a preliminary calculation of approximately 150,000 cubic yards of sediment to be excavated from the dredge template. The tow distance from the intersection of the Northern Channel and the Intracoastal Waterway and the most likely access point for the Harbour Waterway site is approximately 12.2 miles, one-way. The CONSULTANT assumed that 50-CY capacity roll-off dumpsters would be used to contain the dredged material during transit due to the weight of the containers and the significant effect that has on the draft of the scow barges. Nonetheless, the selected CONTRACTOR will ultimately be responsible for specific means and methods.

The chosen CONTRACTOR will conduct turbidity monitoring before construction, and at 4-hour intervals during construction using a 150-foot mixing zone to control the effects of construction activities on ambient water quality. The selected CONTRACTOR will also adhere to any, yet to be determined, permitting requirements for the Harbour Waterway DMMA.

2.0 PURPOSE STATEMENT

The purpose of the proposed project is to maintain safe boating access for residents of the DISTRICT. The DISTRICT currently serves as a public navigation channel, providing boating access to State and Federal waters. The DISTRICT is the only accessway for residential boaters within the Northern, Central, and Southern Isle of Palms communities. The DISTRICT will advertise the described project. The selected CONTRACTOR will provide the specific means and methods to remove the DISTRICT sediments to authorized design dredge elevations, and transport sediments to the Habour Waterway DMMA. The proposed final disposal location, the Harbour Waterway DMMA, is depicted in **Figure 3** below.

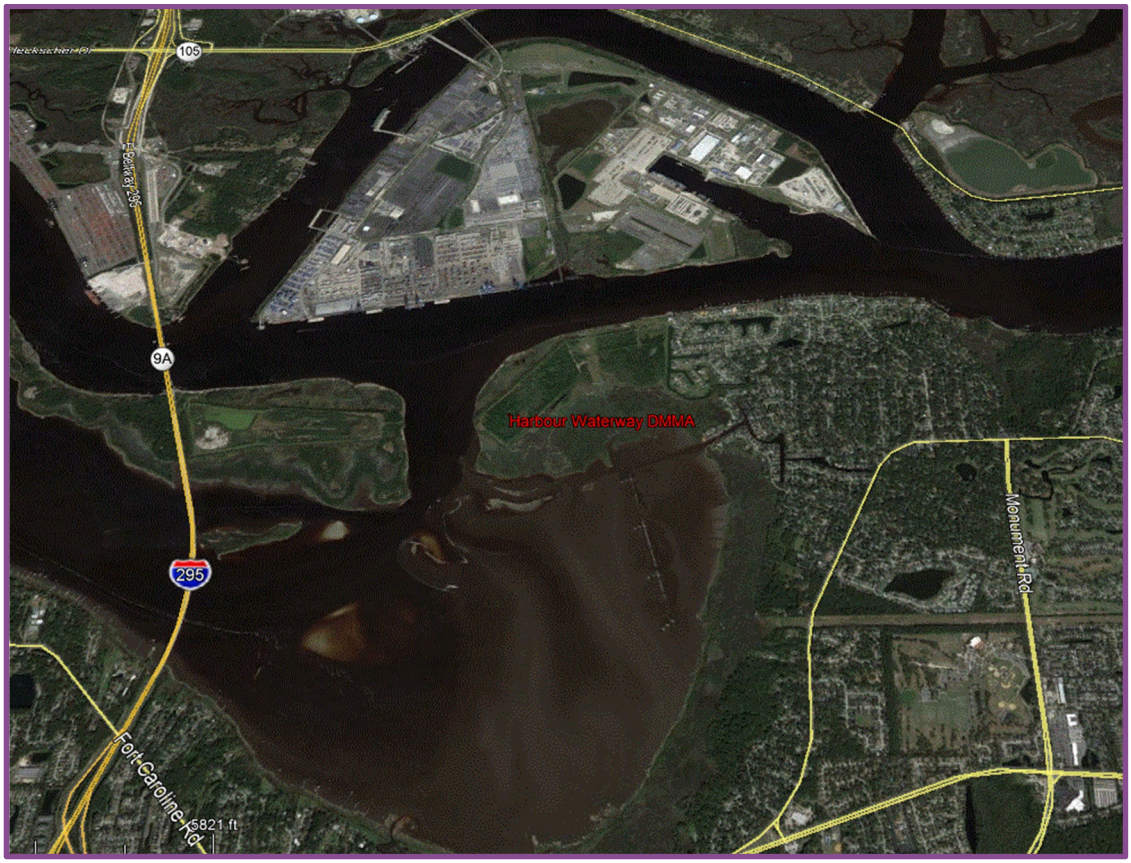

Figure 3: Harbour Waterway DMMA

3.0 PRELIMINARY ORDER OF MAGNITUDE ENGINEERING AND CONSTRUCTION COST ESTIMATE

As noted, the DISTRICT has requested the CONSULTANT provide a preliminary estimate based on the initial design presented within this document. For specialized construction items such as dredging and dredged material management, the CONSULTANT's cost estimating team utilizes means and methods along with production rates observed on similar projects to assist in deriving unit costs and project schedule.

The preliminary estimate provided here includes all the foreseeable project costs: (1) final dredging engineering items; (2) general construction items; and (3) final construction and closeout services. Final dredging engineering services include creating construction plans and specifications, bidding assistance and administration, and construction administration/project closeout costs. General construction items include mobilization/demobilization and pre- and post-construction surveying (hydrographic and condition). Final construction and close out services include staging the Harbour Waterway DMMA; possible sediment chemistry sampling and testing (if required); floating turbidity barriers and monitoring; severing dredged material from the dredge template; barge dewatering; dredged material transportation and disposal; pump-out into Harbour Waterway DMMA, rehabilitation of staging areas. 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.

4.0 MAIN ASSUMPTIONS

The estimate (**Appendix A**) for the preliminary plans and specifications presented within was prepared based on the following assumptions and stipulations.

1) The preliminary Order of Magnitude Engineering & Construction Cost Estimate ("estimate") is consistent with those decisions made by the DISTRICT and those recommendations made by to the CONSULTANT as outlined in this memorandum. In addition, the final design of the proposed dredging template assumes the use of the DISTRICT's 2018 "center channel" template down to the allowable overdepth of -6 feet MLW (~150,000 cubic yards).
2) The CONSULTANT will work with the DISTRICT to develop a project-specific set of plans and specifications for advertisement to dredging contractors. The DISTRICT will be responsible for any fees related to advertising of the prospective bid or meeting notices.
3) At the request of the DISTRICT, bidders will be asked to provide pricing for two additional templates; (1) a "center channel" template down to the project depth of -5 feet MLW (~88,300 cubic yards) & (2) a "bank to bank" template down to the project depth of -5 feet MLW (~189,300 cubic yards).
4) The CONSULTANT's "Construction Administration / Project Closeout" effort assumes a contiguous 12-month construction period, which may prove to be unattainable due to unforeseen or unanticipated site conditions.
5) The selected CONTRACTOR'S mobilization and demobilization fee include all equipment and personnel to operate the DMMA, as well, as all dredging related activities.
6) A hydrographic construction survey will establish (pre- & post-construction) horizontal & vertical limits & establish/verify existing elevations for payment applications. A similar survey (pre-and post-

construction) condition survey will establish that the selected CONTRACTOR has utilized the dredged material management area (DMMA) as required.

7) The final design assumes that the selected CONTRACTOR will use the Harbour Waterway DMMA site as the primary location for bidding purposes. However, bidders will be able to propose alternative permissible offloading & disposal locations as well. To date, the Harbour Waterway site is not permitted to receive dredged material from the Isle of Palms project & this critical issue will be noted in the dredging specifications. However, CONSULTANT understands that Harbour Waterway is planning to actively procure permits for the use of their DMMA site by the Isle of Palms.
8) The CONSULTANT understands that a sediment quality assessment will likely be required to support disposal options for most maintenance dredging events. The CONSULTANT's staff have previously coordinated with JPA regarding rates, rules, & regulations associated with the use of JPA sediment disposal facilities. JPA will likely authorize sediment disposal at its facilities with prior approval from its Engineering & Construction Department. This approval will be based on an agreement to pay a disposal fee & on available DMMA capacity & environmental considerations. The environmental compliance manager of JPA has previously reviewed an Isle of Palms disposal request & requested environmental analysis for twenty-two (22) piston tube samples from within the Isle of Palms canals. Please note sediment testing requirements are not just the purview of the regulatory agencies. In fact, the receiving organization (JPA, FIND, Harbour Waterway, etc.) is likely to have much stricter sediment testing requirements. Again, for budgeting purposes, we have assumed that only 22 samples of the analytes tested will be tested at this time. However, should this assumption prove inaccurate or should the final receiving organization require a different level of testing, the CONSULTANT proposes to perform any additional field work under a separate scope of services.
9) Turbidity curtains installed offshore will prevent suspended sediments from affecting the ambient water quality outside of the canal & channel limits. This estimate assumes that the CONTRACTOR will not be required to monitor environmental resources during construction activities.
10) Based on direction from the DISTRICT, for this estimate, a dredge volume of roughly 150,000 cubic yards of mostly fine-grained sediments was assumed.
11) The tow distance from the intersection of the Northern Channel & the Intracoastal Waterway & the most likely access point for the Harbour Waterway site is approximately 12.2 miles, one-way.
12) The selected CONTRACTOR's means and methods must indicate how the CONTRACTOR will offload (pump-out) dredged material onto the designated Harbour Waterway DMMA. The Harbour Waterway DMMA is not permitted to receive dredged material from the Isle of Palms project. However, the CONSULTANT understands that Harbour Waterway Special DISTRICT plans to actively procure permits for the use of their DMMA site by the Isle of Palms.
13) The selected CONTRACTOR will also adhere to any, yet to be determined, FDEP or USACE permitting requirements and contractual constraints for the Harbour Waterway DMMA. At this time this cost remains unknown and is assumed to be insignificant.
14) The selected CONTRACTOR will be responsible for restoring all staging and offloading areas to the pre-construction condition.
15) The preliminary estimate presented herein include a 20 percent construction contingency and 3 percent contingency for construction supervision and permit closeout costs.

5.0 CLOSING REMARKS

The analyses suggest a preliminary estimate (**Appendix A**) of between approximately $5,400,000 and $6,400,000 for the proposed dredging project as outlined in this document. Given that the proposed dredging activities will remove approximately 150,000 cubic yards of new capacity, which is a cost of around $36.00 and $42.70 per cubic yard of fine-grained sediment removed.

For budgeting purposes, Table 1 lists the cost breakdown for several additional quantity scenarios, including for the two other templates:

(1) A "center channel" template down to the project depth of -5 feet MLW (~88,300 cubic yards)
(2) A "bank to bank" template down to the project depth of -5 feet MLW (~189,300 cubic yards).

Given that the proposed "center channel" dredging template down to the project depth of -5 feet MLW will remove approximately 88,300 cubic yards of new capacity, the analyses suggest a preliminary estimate of between approximately $3,300,000 and $4,000,000 for the proposed dredging project as outlined in this document, which is a cost of around $36.00 and $42.70 per cubic yard of fine-grained sediment removed.

Given that the proposed "bank to bank" dredging template down to the project depth of -5 feet MLW will remove approximately 189,300 cubic yards of new capacity, the analyses suggest a preliminary estimate of between approximately $6,700,000 and $8,000,000 for the proposed dredging project as outlined in this document, which is a cost of around $35.40 and $42.30 per cubic yard of fine-grained sediment removed.

Table 1: Cost per Cubic Yard (With and Without Contingency)

Quantity (cy)	Cost	Cost (with Contingency)	Cost/cy	Cost/cy (with Contingency)
199,000	$7,000,000	$8,400,000	$35.20	$42.30
189,300	$6,700,000	$8,000,000	$35.40	$42.30
169,000	$6,000,000	$7,200,000	$35.60	$42.70
150,000	$5,400,000	$6,400,000	$36.00	$42.70
139,000	$5,000,000	$5,960,000	$36.00	$42.90
109,000	$4,000,000	$4,770,000	$36.70	$43.80
88,300	$3,300,000	$4,000,000	$37.40	$45.40
79,000	$3,000,000	$3,570,000	$38.00	$45.20
49,000	$2,000,000	$2,370,000	$40.90	$48.40
19,000	$1,000,000	$1,170,000	$52.70	$61.60

6.0 LIMITATIONS AND RISKS

In general, there are three fundamental cost factors for any large dredging project: (1) anticipated contractor costs; (2) contractors perceived risk; and (3) market conditions.

The first factor, anticipated contractor costs, is driven by mobilization costs, daily costs, and daily estimated production. Mobilization, generally a fixed cost, is driven down by undertaking projects with higher quantities. Daily costs are mainly driven by fuel, labor, and anticipated overhead costs. The cost of fuel is a significant component of any dredging project and fuels costs can easily represent as much as thirty (30) percent of the total dredging cost. The cost of fuel is also highly volatile in short- and long-term periods. Currently, fuel prices are on a recent downward trend.

The second factor, contractors perceived risk, is often driven by variation in production (estimated vs. actual). Perceived risk is regularly reduced through good data collection (e.g., soils data, hydrographic survey accuracy, etc.). It is also preferable to avoid the perceived possibility of the need to re-work a portion of the dredging project and unanticipated non-recoverable costs such as project delays, equipment damage, third party claims, permit compliance risks and environmental incidents.

The third factor, market conditions is the hardest for a given owner to have any direct impact on except the level of competition.

The CONSULTANT is relying on hydrographic survey data performed in March of 2018. Meanwhile, it will likely take at least an additional six (6) more months before an agreement with the Harbour Water Special District is in place and probably even longer before the necessary permits for the DMMA are prepared. Due to delays in issuance of final permits; hydrographic survey data will not reflect the exact conditions at the time of construction. Sedimentation may advance, or be exacerbated by storm events. However, analysis of shoaling patterns and the CONSULTANT's familiarity with the site put this risk at likely less than a 05 - 10% inaccuracy.

The CONSULTANT understands that the DISTRICT has not collected any recent geotechnical data from the site. Thus this data cannot be provided to prospective bidders. There is a chance that the lack of this data may affect the potential bidders pricing and the cost of dredged material disposal will increase. Again, the CONSULTANT's familiarity with the site put this risk at likely less than a 05 - 10% inaccuracy.

ATTACHMENTS

Appendix A: Preliminary Order of Magnitude Engineering and Construction Cost Estimate

Appendix B: Preliminary 2014 and 2018 Hydrographic Survey Analysis

Appendix A: Preliminary Order of Magnitude Engineering and Construction Cost Estimate

Appendix A: Preliminary Order of Magnitude Engineering and Construction Cost Estimate

Client: Isle of Palms Special DISTRICT | **Prepared by: RJW**

Project: Northern, Central, & Southern Isle of Palms "Central Channel" Dredging | **Date: December 06, 2018**

Project No.: 6735179416 | **Revision 2.0**

Preliminary Order of Magnitude Engineering & Construction Cost Estimate[1] | **Reviewed by: LML**

Item	Description	Plan Qty.	Unit	Unit Price	Total
1.00	**ENGINEERING ITEMS:**				
1.01	Construction Plans & Specifications[2]	1	LS	$17,774	$17,774
1.02	Bidding Assistance[3]	1	LS	$9,885	$9,885
1.03	Construction Administration / Project Closeout[4]	1	LS	$169,667	$169,667
				Subtotal (Engineering Items):	**$197,326**
2.00	**GENERAL ITEMS:**				
2.01	Mobilization/Demobilization[5]	1	LS	$85,000	$85,000
2.02	Construction Surveys (pre- & post-dredging & pre- & post-placement DMMA)[6]	4	LS	$18,000	$72,000
				Subtotal (General Items):	**$157,000**
3.00	**DREDGING, TRANSPORTATION, & DISPOSAL:**				
3.01	Harbour Waterway DMMA Preparation[7]	1	LS	$28,000	$28,000
3.02	Sediment Chemistry Testing[8]	1	LS	$37,000	$37,000
3.03	Floating Turbidity Barrier & Monitoring[9]	1	LS	$25,000	$25,000
3.04	Material Removal (Dredging)[10]	150,000	CY	$17.50	$2,625,000
3.05	Barge Dewatering	150,000	CY	$0.50	$75,000
3.06	Transportation/Disposal[11]	150,000	CY	$9.50	$1,425,000
3.07	Pump-out into Harbour Waterway DMMA[12]	150,000	CY	$1.25	$187,500
3.08	Harbour Waterway DMMA Tipping Fee[13]	150,000	CY	$3.96	$594,000
3.09	Rehabilitation of Staging Areas[14]	1	LS	$13,000	$13,000
				Subtotal (Dredging Items):	**$5,010,000**
				Project Total (with contingency[15]):	**$6,400,000**

Approximate Dredge Volume (cubic yards):	**150,000**
Average Engineering & Construction Cost/cubic yards:	**$42.70**

Notes:

1 This preliminary Order of Magnitude Engineering & Construction Cost Estimate ("estimate") assumes the use of the DISTRICT's 2018 "center channel" template down to the allowable overdepth of -6 feet MLW (~150,000 cubic yards) as the final dredge template.

Notes (continued):

2 The CONSULTANT will work with the DISTRICT to develop a full project-specific set of plans and specifications for advertisement to regional dredging CONTRACTOR's. The DISTRICT will be responsible for any fees related to advertising of the prospective bid or meeting notices.

3 At the request of the DISTRICT, bidders will be asked to provide pricing for two additional templates; (1) a “center channel” template down to the project depth of -5 feet MLW (~88,300 cubic yards) & (2) a “bank to bank” template down to the project depth of -5 feet MLW (~189,300 cubic yards).

4 The CONSULTANT’s “Construction Administration / Project Closeout" effort assumes a contiguous 12-month construction period, which may prove to be unattainable due to unforeseen or unanticipated site conditions.

5 5) The selected CONTRACTOR'S mobilization and demobilization fee include all equipment and personnel to operate the DMMA, as well, as all dredging related activities.

6 A hydrographic construction survey will establish (pre- & post-construction) horizontal & vertical limits & establish/verify existing elevations for payment applications. A similar survey (pre-and post-construction) condition survey will establish that the dredged material management area (DMMA) have been utilized as required.

7 The final design assumes that the selected CONTRACTOR will use the Harbour Waterway DMMA site as the primary location for bidding purposes. However, bidders will be able to propose alternative permissible offloading & disposal locations as well. To date, the Harbour Waterway site is not permitted to receive dredged material from the Isle of Palms project & this critical issue will be noted in the dredging specifications. However, CONSULTANT understands that Harbour Waterway is planning to actively procure permits for the use of their DMMA site by the Isle of Palms.

8 The CONSULTANT understands that a sediment quality assessment will likely be required to support disposal options for most maintenance dredging events. The CONSULTANT has assumed that only 22 samples of the analytes tested will be tested at this time. However, should this assumption prove inaccurate or should the final receiving organization require a different level of testing, the CONSULTANT proposes to perform any additional field work under a separate scope of

9 Turbidity curtains installed offshore will prevent suspended sediments from affecting the ambient water quality outside of the canal & channel limits. This estimate assumes that the CONTRACTOR will not be required to monitor environmental

10 Based on direction from the DISTRICT, for the purposes of this estimate, a dredge volume of roughly 150,000 cubic yards of mostly fine-grained sediments was assumed.

11 The tow distance from the intersection of the Northern Channel & the Intracoastal Waterway & the most likely access point for the Harbour Waterway site is approximately 12.2 miles, one-way.

12 The selected CONTRACTOR's means & methods must indicate how the CONTRACTOR will offload (pump-out) dredged material onto the designated Harbour Waterway DMMA. The Harbour Waterway DMMA is not permitted to receive dredged material from the Isle of Palms project. However, the CONSULTANT understands that Harbour Waterway Special DISTRICT plans to actively procure permits for the use of their DMMA site by the Isle of Palms.

13 The selected CONTRACTOR will also adhere to any, yet to be determined, FDEP or USACE permitting requirements and contractual constraints for the Harbour Waterway DMMA. At this time this cost remains unknown and is assumed to be insignificant.

14 The selected CONTRACTOR will be responsible for restoring all staging and offloading areas to the pre-construction condition. The proposed contract documents will establish the holding of retainage to ensure that this occurs, as required.

15 The preliminary estimate presented herein include a 20 percent construction contingency and 3 percent contingency for construction supervision and permit closeout costs.

Appendix B: Preliminary 2014 and 2018 Hydrographic Survey Analysis

To: Mr. Kenneth Wright
ken@jacobsonwright.com
Isle of Palms Special District Chair
14286 Beach Blvd #19-272
Jacksonville, FL 32250

From: Joe Wagner, PE, D.NE
joseph.wagner@amecfw.com
Amec Foster Wheeler Environment and Infrastructure, Inc.
6256 Greenland Road
Jacksonville, FL 32258

Date: April 09, 2018

Ref: **Amec Foster Wheeler Project No. 6375179416**

1.0 BACKGROUND

The Isle of Palms Special District (District) has requested that Amec Foster Wheeler Environment and Infrastructure, Inc. (Amec Foster Wheeler) deliver professional dredging engineering services related to the District's plan to dredge the Isle of Palms Special District waterways. The District's waterways, located adjacent to the properties within the District's boundaries, enable continuous access to the Intracoastal Waterway in Jacksonville Florida. The District is composed of approximately 30,000 linear feet (5.7 miles) of canals located within the Northern, Central, and Southern Isle of Palms Community (**Figure 1** & **2**). The District currently has both valid Florida Department of Environmental Protection (FDEP) and U.S. Army Corps of Engineers (USACE) permits, which authorize the maintenance dredging of the waterways. Importantly however to date, the final sediment dewatering and disposal locations for any upcoming dredging projects, have yet to be determined.

2.0 GENERAL OBJECTIVES

The general objectives of this project are to provide professional engineering, permitting, planning, design, geotechnical, biological, environmental, and other necessary field survey services to evaluate how best to remove accumulated sediments and to improve visual aesthetics and to facilitate safe casual boating within the District's Waterways.

The specific objectives documented in this memorandum is a comparison of two separate surveying events. Arc Surveying & Mapping, Inc. (Arc Surveying) completed the first surveying effort in February 2014, while they finished the second effort in late March 2018. For both surveying events, the District was divided into two regions the northern and central (north/central) canal system (**Figure 1**) and the southern (south) canal system (**Figure 2**).

Amec Foster Wheeler then analyzed both regions (north/central and south) for both surveying events (2014 and 2018) against two dredging templates (1) "center channel" and (2) "bank to bank." Finally, these analyzes were performed for two different dredging depths (1) a required project depth of -5 feet

mean low water (MLW) and (2) an allowed overdepth of -6 feet MLW. These terms and this analysis is discussed in greater detail below, please also see (**Figure 3** & **4**).

The first dredging template, "center channel," represents the pattern of dredging that has occurred in the past within the Isle of Palms community (2005 dredging event). In this case, the dredging contractor was primarily contracted to simply remove sediments down the center of the channel, thus "center channel." The results are that the dredger leaves a significant amount of un-dredged sediments above the required project dredging depth and against docks, piles, and bulkheads.

The second dredging template, "bank to bank," represents the District's preferred pattern of dredging. That is, removing all the sediments lying above required project dredging depth within the entire limits of the canal, thus "bank to bank." If appropriately completed this template leaves much less un-dredged sediments above the required project dredging depth and against docks, piles, and bulkheads.

Required project depth is defined as the favored operating depth of the waterbody, in this case -5 feet MLW is the required project depth. The term overdepth dredging is defined as dredging down to a depth below the required project depth (favored operating depth) in which the dredger is paid for the material removed.

Additionally, when the dredger fails to reach the required project depth, this is referred to as insufficient dredge depth, and the selected dredger will be directed by the engineer to return to those areas and remove the missed material. If however, the dredger dredges below the allowable overdredge depth, this is referred to excessive dredging. The dredger is ***not*** paid for the sediments removed below the allowable depth. Again as noted above, please see **Figure 3 & 4** for a visual representation of these terms.

Altogether, for the comparison of two separate surveying events documented in this memorandum, Amec Foster Wheeler created a three-dimensional AutoCAD-based digital terrain model of the project area and proposed dredging locations. We then used the bathymetric survey data provided by Arc Surveying in the models to develop a dredging template with describe plan area, cross-sections, and the total required dredging volume.

All told Amec Foster Wheeler calculated a separate volume for each of the following scenarios based on the year, region, template, and depth:

(1) 2014 Arc Survey, north/central "center channel" -5 feet MLW
(2) 2014 Arc Survey, north/central "center channel" -6 feet MLW
(3) 2014 Arc Survey, north/central "bank to bank" -5 feet MLW
(4) 2014 Arc Survey, north/central "bank to bank" -6 feet MLW
(5) 2014 Arc Survey, south "center channel" -5 feet MLW
(6) 2014 Arc Survey, south "center channel" -6 feet MLW
(7) 2014 Arc Survey, south "bank to bank" -5 feet MLW
(8) 2014 Arc Survey, south "bank to bank" -6 feet MLW
(9) 2018 Arc Survey, north/central "center channel" -5 feet MLW
(10) 2018 Arc Survey, north/central "center channel" -6 feet MLW
(11) 2018 Arc Survey, north/central "bank to bank" -5 feet MLW
(12) 2018 Arc Survey, north/central "bank to bank" -6 feet MLW
(13) 2018 Arc Survey, south "center channel" -5 feet MLW
(14) 2018 Arc Survey, south "center channel" -6 feet MLW
(15) 2018 Arc Survey, south "bank to bank" -5 feet MLW
(16) 2018 Arc Survey, south "bank to bank" -6 feet MLW

3.0 ARC SURVEY 2014 SURVEY DATA VOLUMES

As noted, the 2014 survey was then analyzed for both regions (north/central and south) and against two dredging templates (1) "center channel" and (2) "bank to bank." Finally, Amec Foster Wheeler performed our analyses for two different dredging depths (1) a required project depth of -5 MLW and (2) an allowed overdepth of -6 feet MLW (**Table 1**).

The result of the analysis for the 2014 survey indicates that if the District's "center channel" template would require the removal of approximately 93,000 cubic yards of material (~83.7 feet^2/linear feet of the canal) down to the project depth of -5 ft. MLW and roughly 147,700 cubic yards of material (~132.9 feet^2/linear feet of the canal) down to the allowable overdepth of -6 ft. MLW.

Meanwhile, the District's 2014 "bank to bank" template would require the removal of approximately 200,000 cubic yards of material (~180.0 feet^2/linear feet of the canal) down to the project depth of -5 ft. MLW and roughly 282,600 cubic yards of material (~254.3 feet^2/linear feet of the canal) down to the allowable overdepth of -6 ft. MLW.

4.0 ARC SURVEY 2018 SURVEY DATA VOLUMES

Similar to the 2014 survey, the 2018 survey was then analyzed for both regions (north/central and south) and against two dredging templates (1) "center channel" and (2) "bank to bank." Finally, Amec Foster Wheeler performed our analyses for two different dredging depths (1) a required project depth of -5 MLW and (2) an allowed overdepth of -6 feet MLW (**Table 2**).

The result of the analysis for the 2018 survey indicates that if the District's "center channel" template would require the removal of approximately 88,300 cubic yards of material (~79.5 feet^2/linear feet of the canal) down to the project depth of -5 ft. MLW and roughly 141,700 cubic yards of material (~127.5 feet^2/linear feet of the canal) down to the allowable overdepth of -6 ft. MLW. The change in this templates required dredging volume from the District's 2014 to 2018 survey is a decrease of nearly 4.5%.

Meanwhile, the District's 2018 "bank to bank" template would require the removal of approximately 189,300 cubic yards of material (~170.4 feet^2/linear feet of the canal) down to the project depth of -5 ft. MLW and roughly 269,900 cubic yards of material (~242.9 feet^2/linear feet of the canal) down to the allowable overdepth of -6 ft. MLW. The change in this templates required dredging volume from the District's 2014 to 2018 survey is a decrease of nearly 4.9%.

5.0 CLOSING REMARKS

The analyses suggest a roughly 4 – 5 % decrease in the overall shoaling within the Isle of Palms Special District waterways between the 2014 survey and the 2018 survey. This decrease in the overall shoaling can also be viewed as a loss of approximately 1,300 to 3,000 cubic yards per year ("center channel" and "bank to bank" template respectively). Which is an unanticipated result given the 2005 to 2014 trend of a gain of approximately 10,300 to 16,400 cubic yards per year ("center channel" only).

There is no readily apparent explanation for this incongruity. Following the discovery of this incongruity, Amec Foster Wheeler and Arc Surveying performed several outside the scope of services checks of the 2018 data collection, calibration, and computation process. No errors were identified in any of those processes, leading to the conclusion that if any errors did exist, they might have occurred during the 2014 survey.

Given these findings, Amec Foster Wheeler recommends considering a cycle from 2005 to 2018 instead. Over that time, a gain of approximately 6,800 to 10,900 cubic yards per year ("center channel" only) is evident.

Finally, as the District moves forward with plans to contract with an agency or company to lease a sediment dewatering and disposal location for any upcoming dredging projects, the District must evaluate and select a final dredging template. Amec Foster Wheeler suggest choosing a "bank to bank" template with a depth of -5.5 ft. MLW (-5 ft. project depth and up to 6 inches of allowable overdepth) which would require the removal of approximately 242,000 cubic yards of material (~217.8 $feet^2$/linear feet of the canal).

Figure 1: Northern and Central Channels

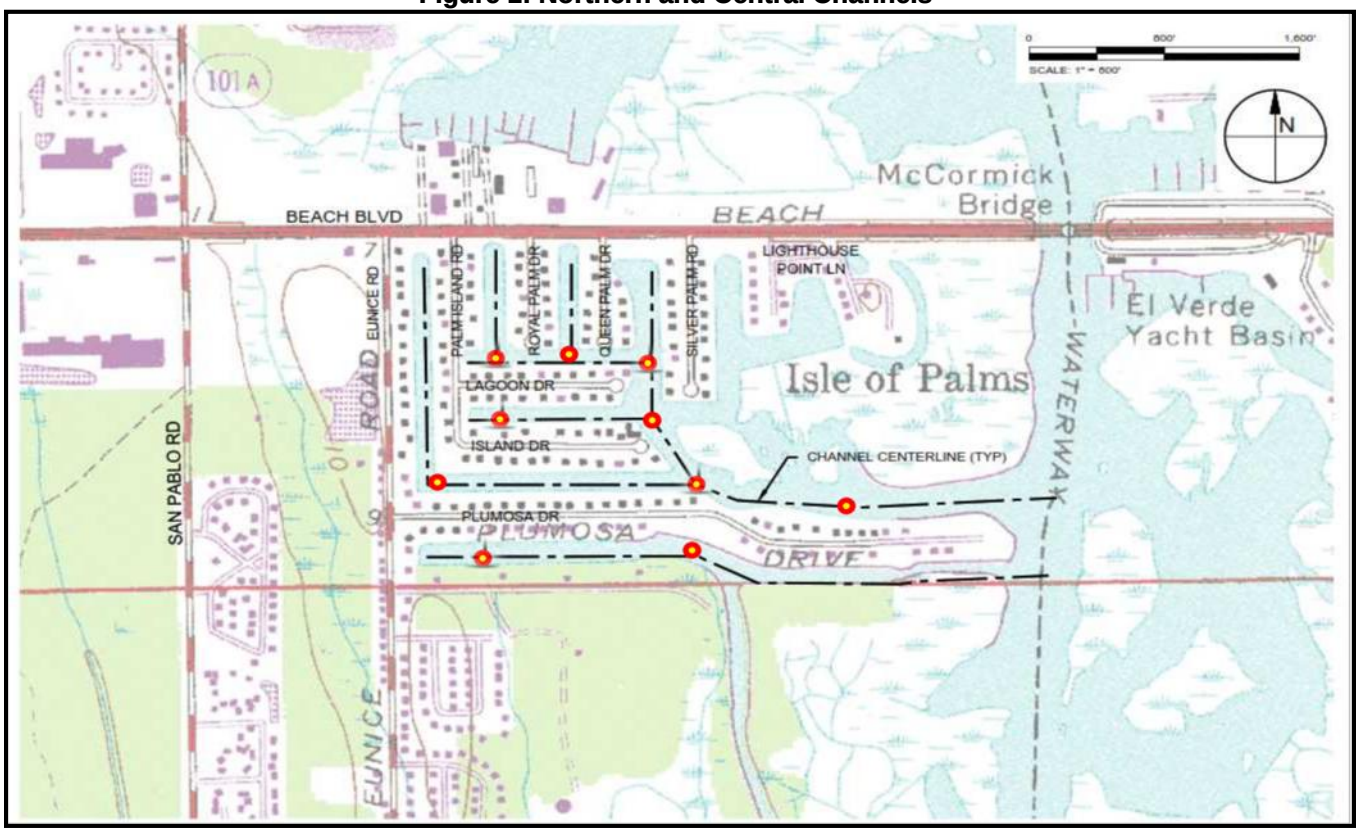

Figure 2: Southern Channels

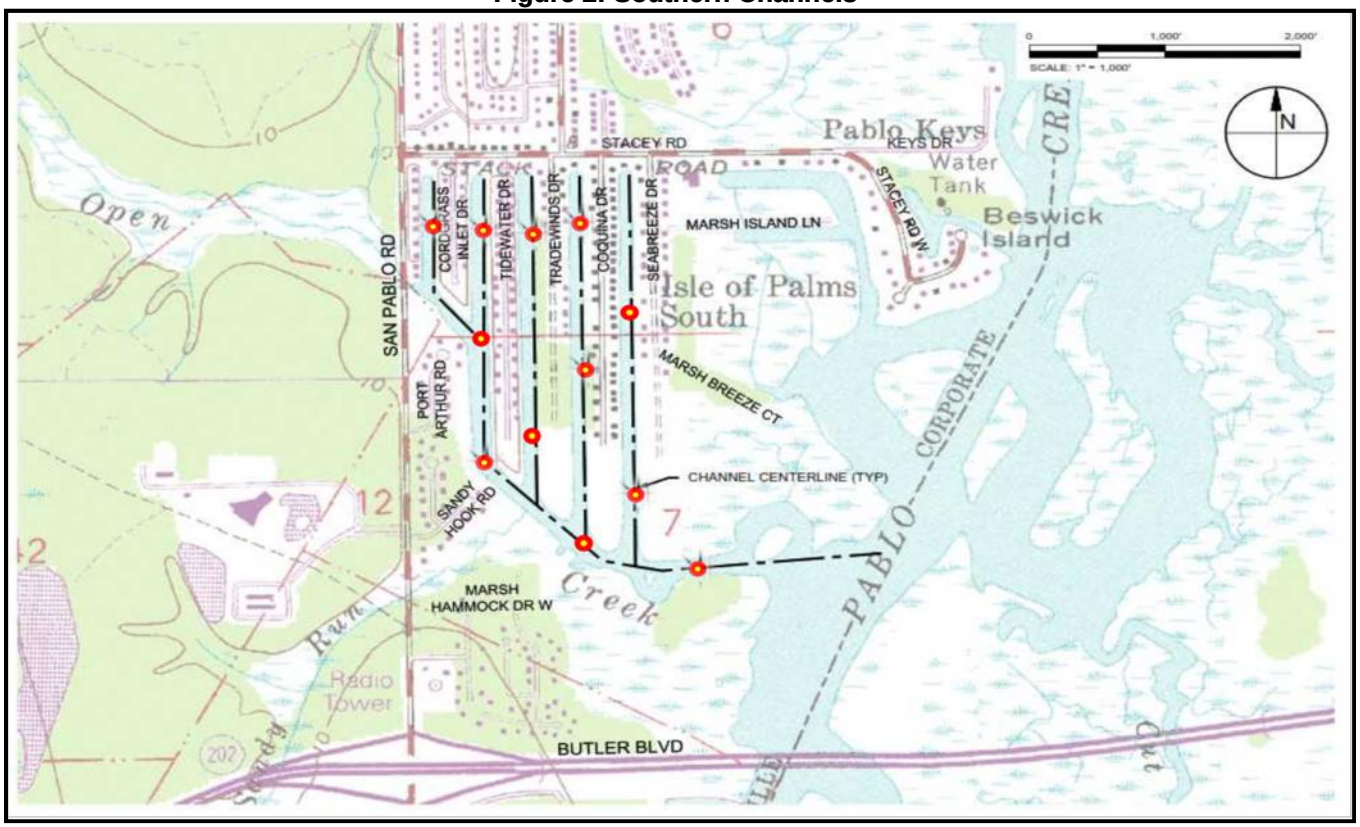

Figure 3: Central Channel Dredging Template

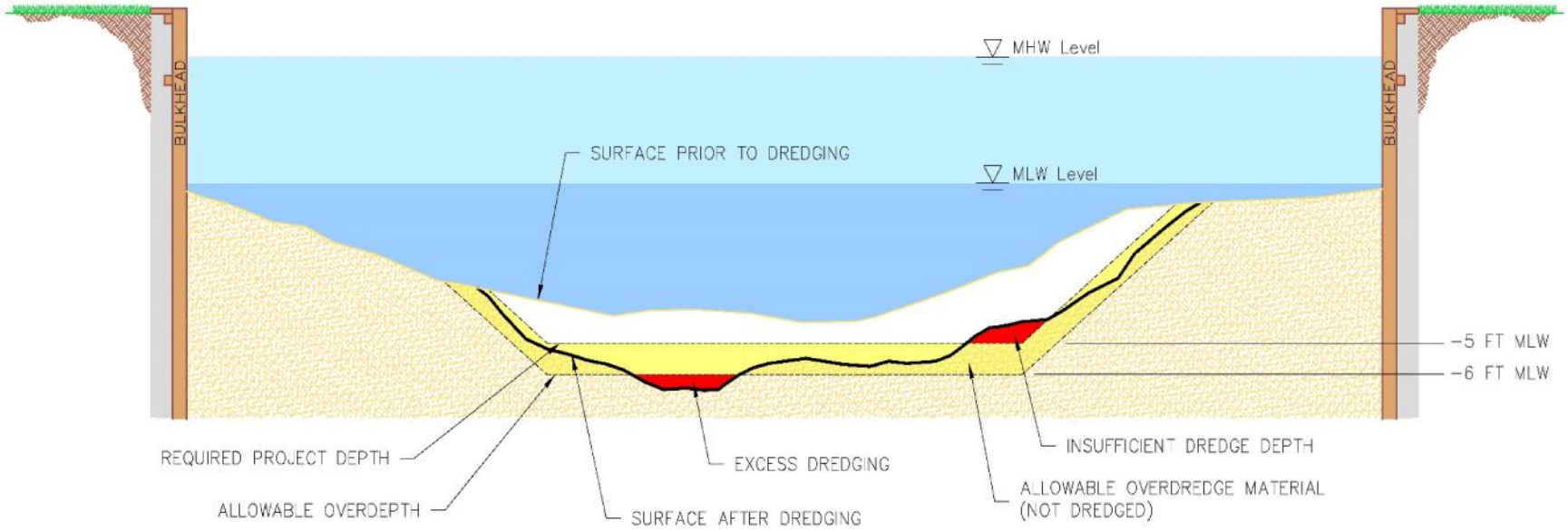

Figure 4: Bank to Bank Dredging Template

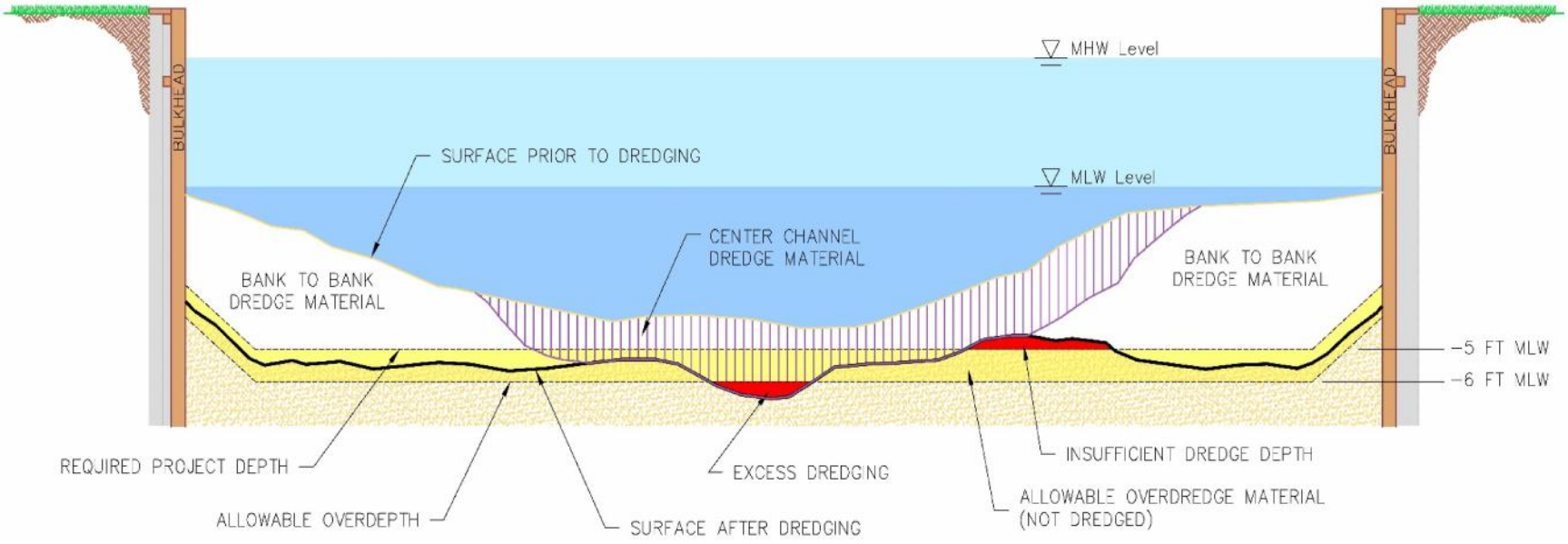

Table 1: 2014 Dredging Template Volumes

Location	Center Channel		Bank to Bank	
	Project Depth (-5 ft. MLW)	Overdepth (-6 ft. MLW)	Project Depth (-5 ft. MLW)	Overdepth (-6 ft. MLW)
North/Central Channels	42,200	68,000	93,300	132,900
South Channels	50,800	79,700	106,700	149,700
Total:	93,000	147,700	200,000	282,600

Table 2: 2018 Dredging Template Volumes

Location	Center Channel		Bank to Bank	
	Project Depth (-5 ft. MLW)	Overdepth (-6 ft. MLW)	Project Depth (-5 ft. MLW)	Overdepth (-6 ft. MLW)
North/Central Channels	39,700	64,800	90,100	128,800
South Channels	48,600	76,900	99,200	141,100
Total:	88,300	141,700	189,300	269,900

DRAFT

REV.	DATE	DESCRIPTION	BY:	APVD	REV.	DATE	DESCRIPTION	BY:	APVD	REV.	DATE	DESCRIPTION	BY:	APVD

DESIGN BY:	JP	11APR18
DRAWN BY:	JP	11APR18
CHECKED BY:	JW	11APR18
APPROVED BY:	JW	11APR18

Isle of Palms Special District
14286 Beach Boulevard, #19-272
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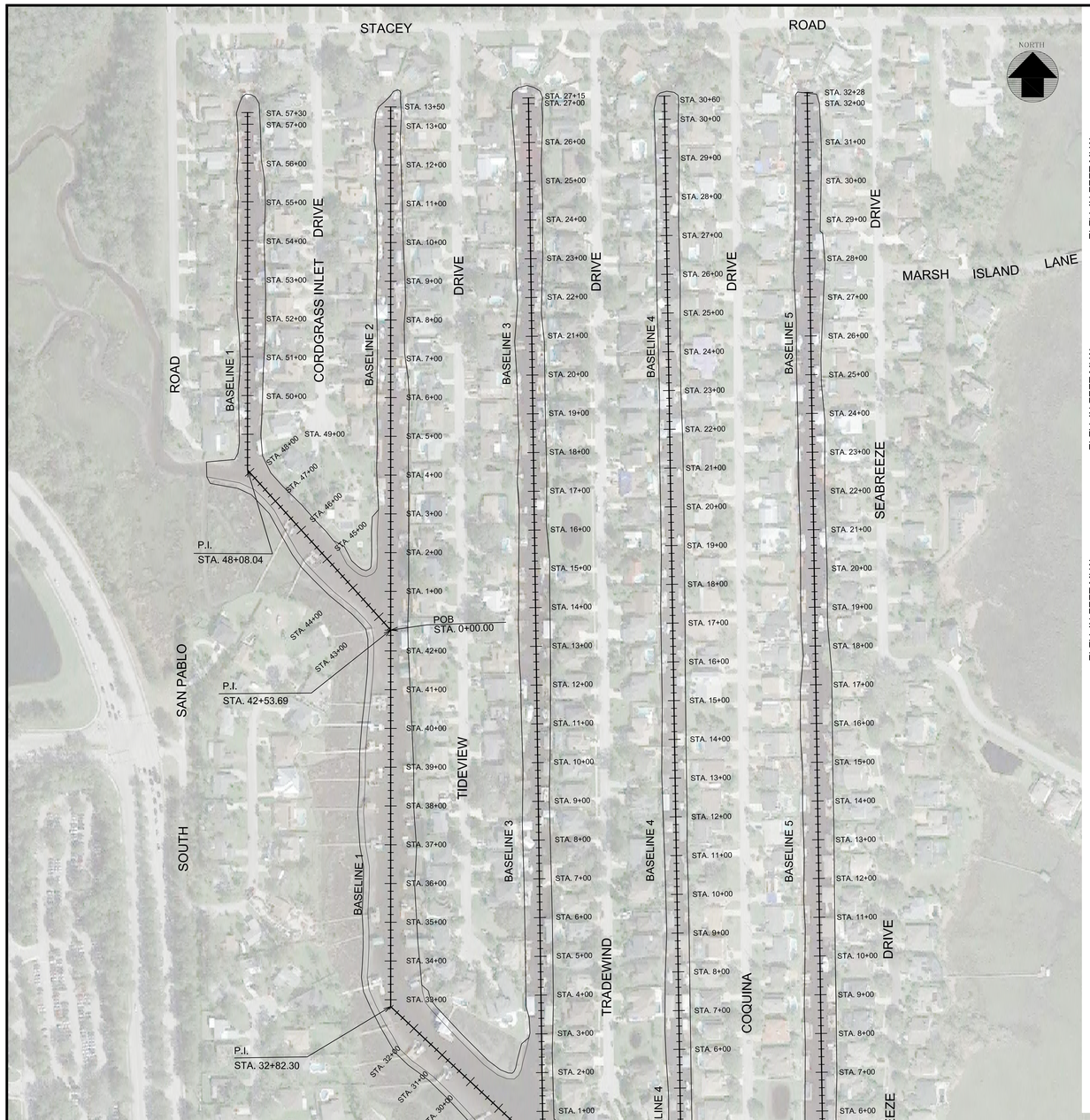
amec foster wheeler
6256 GREENLAND ROAD - JACKSONVILLE, FL 32258

FL. COA NO.: 8379 | AMEC PROJECT NO. 6735179416

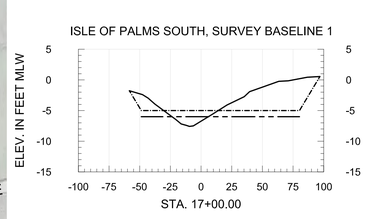
DRAWING TITLE

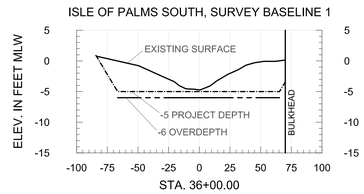
PROJECT MAP/CROSS SECTIONS
ISLE OF PALMS - NORTH/CENTRAL
Isle of Palms Dredging Project
Jacksonville, Florida

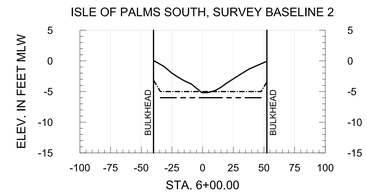
DWG. NO. FIGURE 1 | REV.

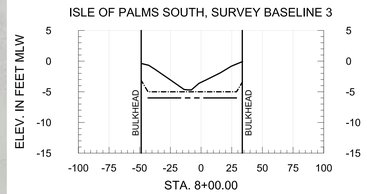


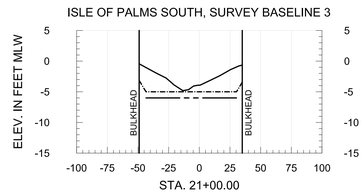
REPRESENTATIVE CROSS SECTIONS

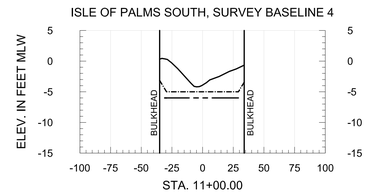


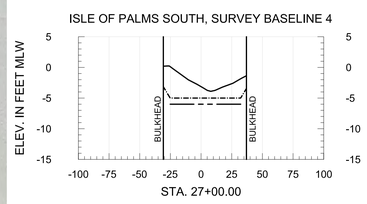


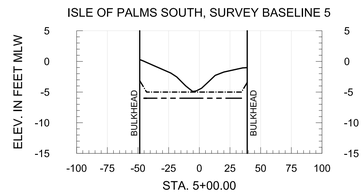


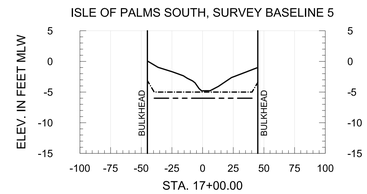












DRAFT

REV.	DATE	DESCRIPTION	BY	APVD

DESIGN BY:	JP	11APR18
DRAWN BY:	JP	11APR18
CHECKED BY:	JW	11APR18
APPROVED BY:	JW	11APR18

Isle of Palms Special District
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Jacksonville, FL 32250

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6256 GREENLAND ROAD - JACKSONVILLE, FL 32258

FL. COA NO.: 8379 | AMEC PROJECT NO. 6735179416

DRAWING TITLE:
PROJECT MAP/CROSS SECTIONS
ISLE OF PALMS - SOUTH
Isle of Palms Dredging Project
Jacksonville, Florida

DWG. NO.: FIGURE 2

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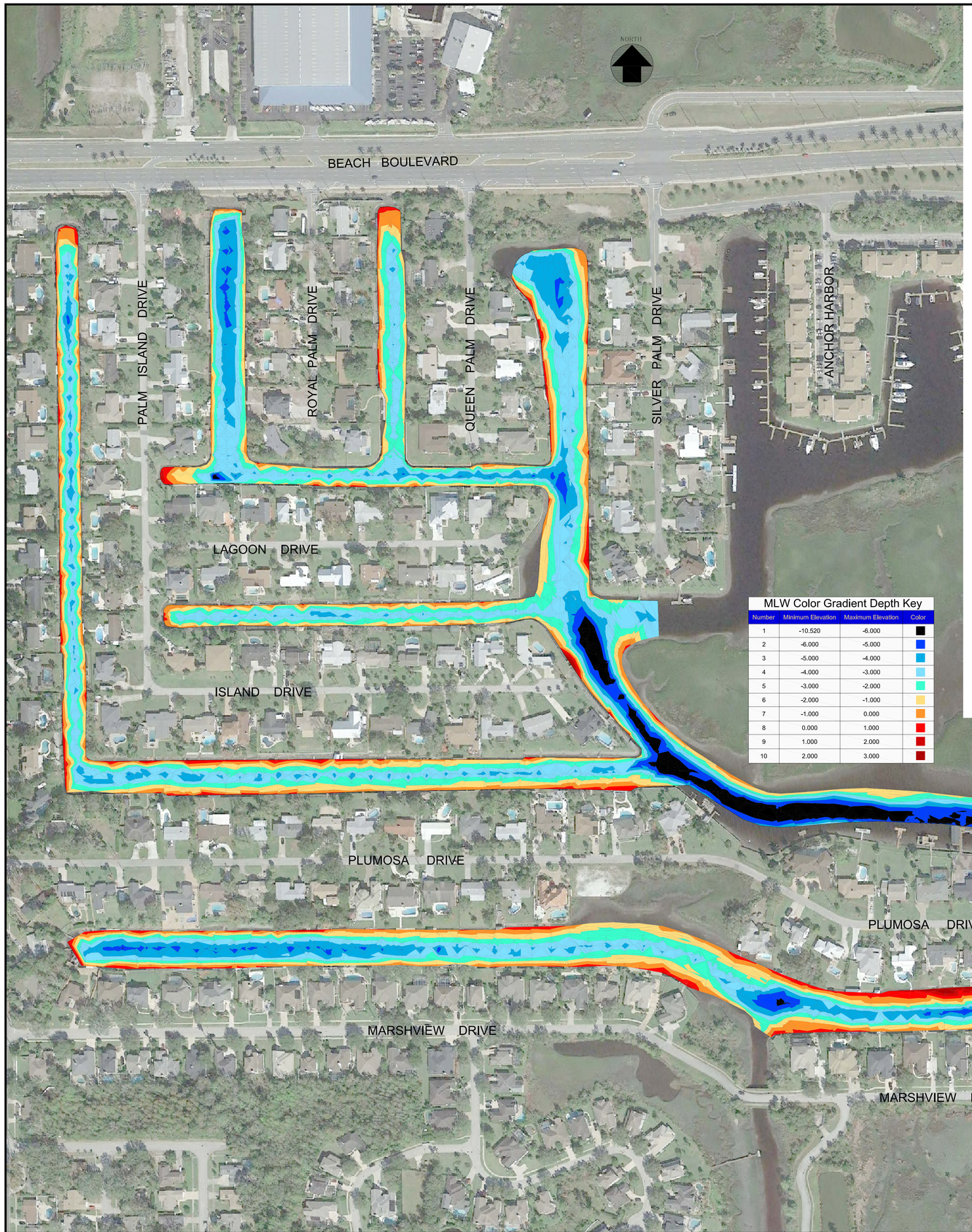

MLW Color Gradient Depth Key

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2	-6.000	-5.000	
3	-5.000	-4.000	
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5	-3.000	-2.000	
6	-2.000	-1.000	
7	-1.000	0.000	
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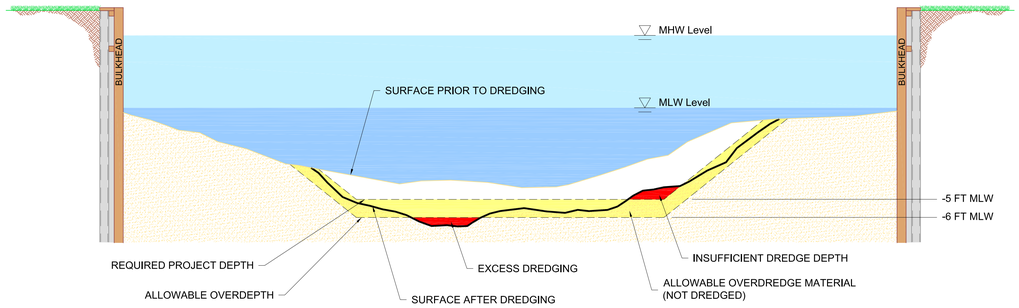
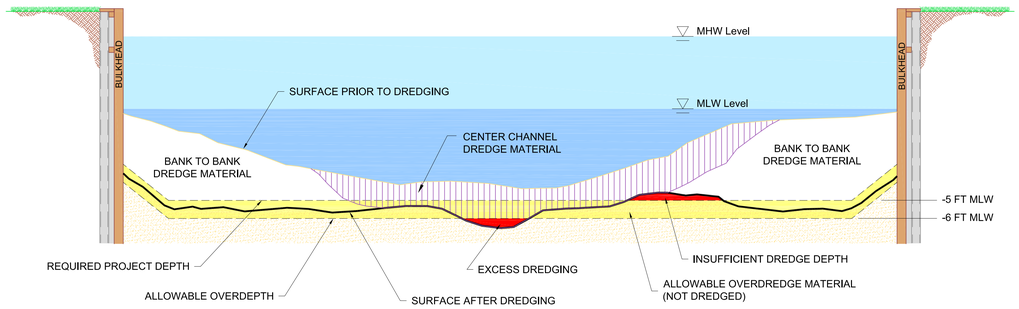
CENTRAL CHANNEL DREDGING TEMPLATE



BANK TO BANK DREDGING TEMPLATE



GRAPHIC SCALE
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(IN FEET)
1 inch = 120 ft.

DRAFT

REV.	DATE	DESCRIPTION	BY:	APVD.

DESIGN BY:	JP	11APR18
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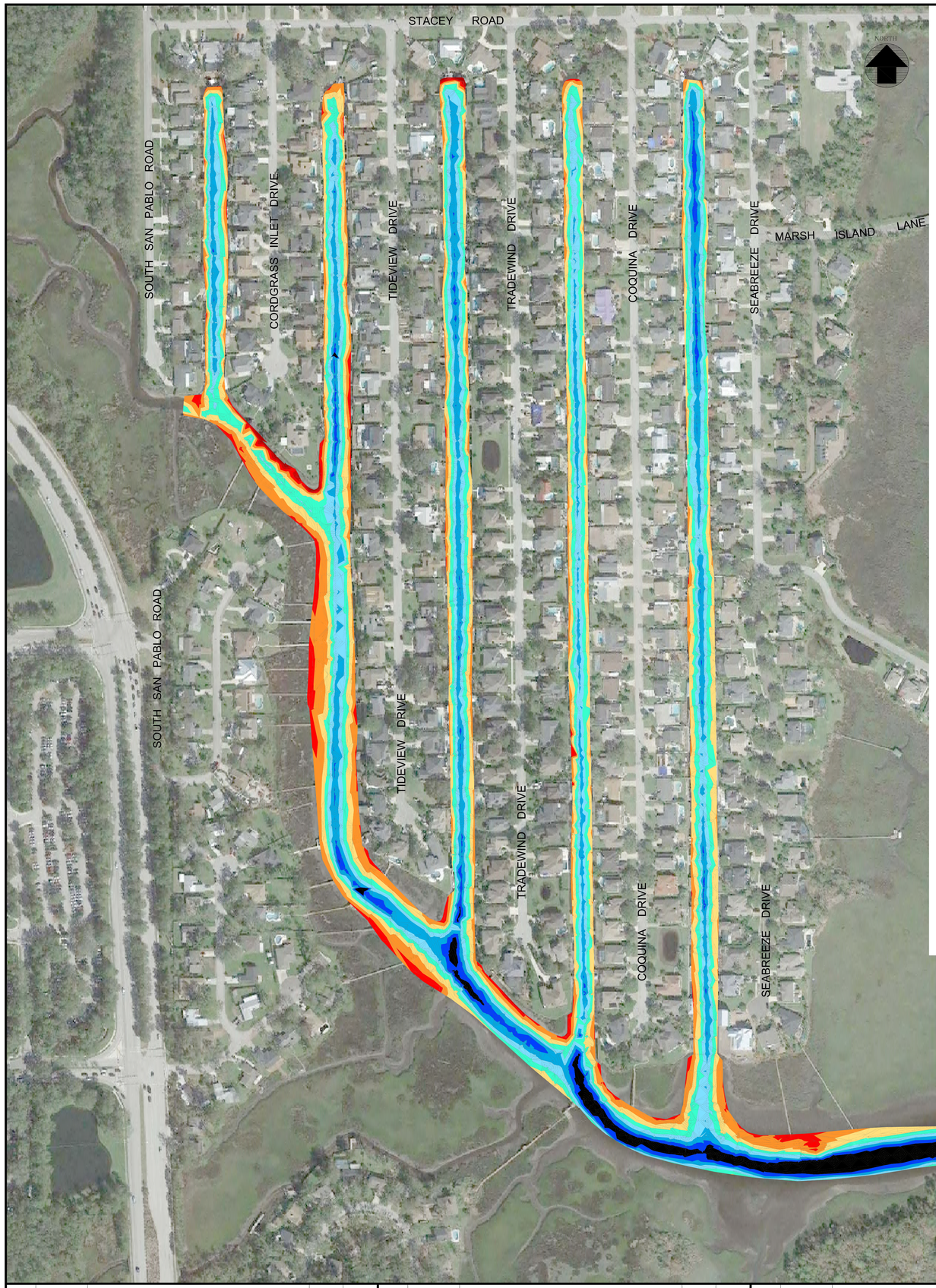
6256 GREENLAND ROAD - JACKSONVILLE, FL 32258
FL. COA NO.: 8379 | AMEC PROJECT NO. 6735179416

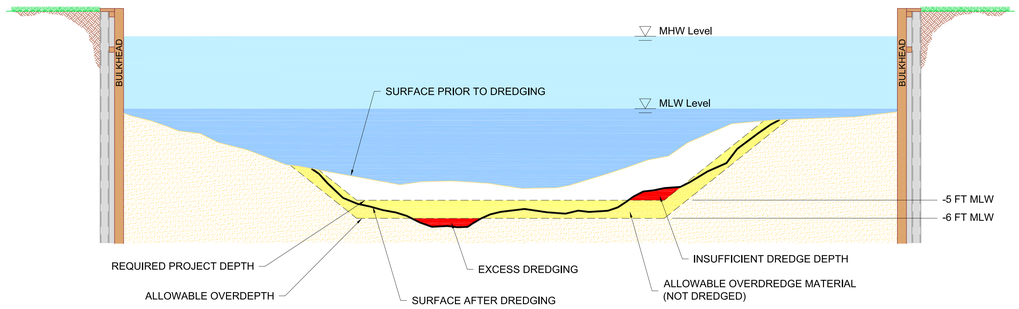
DRAWING TITLE
COLOR GRADIENT PROJECT MAP/TYP. SECTIONS
ISLE OF PALMS - NORTH/CENTRAL
Isle of Palms Dredging Project
Jacksonville, Florida

DWG. NO.: FIGURE 3

REV.



CENTRAL CHANNEL DREDGING TEMPLATE



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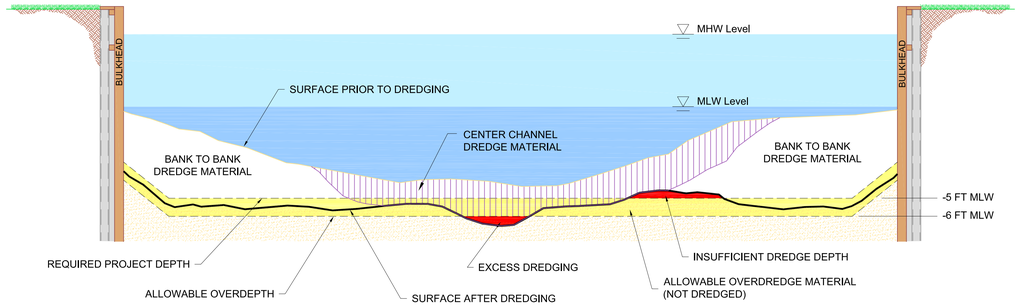

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(IN FEET)
1 inch = 140 ft.

MLW Color Gradient Depth Key

Number	Minimum Elevation	Maximum Elevation	Color
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2	-6.000	-5.000	
3	-5.000	-4.000	
4	-4.000	-3.000	
5	-3.000	-2.000	
6	-2.000	-1.000	
7	-1.000	0.000	
8	0.000	1.000	
9	1.000	2.000	
10	2.000	3.000	

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ISLE OF PALMS - SOUTH
Isle of Palms Dredging Project
Jacksonville, Florida

DWG. NO.: FIGURE 4

REV.: