CS17-285

NASSAU COUNTY - SAISSA
Task Order Memorandum
Contract CM1852

To:	Olsen Associates, Inc. 2618 Herschel St. Jacksonville, FL 32204	**Date:** **Contract:** **Request Made By:** **Request Received By:** **Task Order No:**	10 April 2018 Coastal Engineering SAISSA Albert E. Browder, Ph.D., P.E. CM 1852-TO 31

Task Order: Nassau Sound: Analyses of Potential Impacts of Borrow Area Excavation - Part 2 of 2
South Amelia Island Shore Stabilization Project
Amelia Island, Nassau County, FL

Consultant shall perform those subtasks described in Exhibit A, to conduct analytical and numerical analyses to evaluate the potential impacts of the proposed borrow area excavation on the ebb shoal at Nassau Sound, FL upon the sediment transport pathways on the ebb shoal and in the vicinity of the borrow area. Costs associated with this work are eligible for State cost-sharing. Subtasks include (continuing from Task Order #30):

Subtask IV:	Numerical Modeling Analysis of Alternatives	$ 57,000.00 (Lump Sum)
Subtask V:	Final Engineering Report	$ 35,900.00 (Lump Sum)
Subtask VI-1:	RAI Responses regarding modeling	$ 15,000.00 (T&M, Initial NTE)
Subtask VI-2:	Modeling Contingency (one production run)	$ 15,000.00 (Lump Sum)
	Total Fee:	**$ 122,900.00 (Part 2)**

Requested Completion Date: 6 months from Notice to Proceed (Subtasks IV-VI)

Olsen Associates, Inc.

Albert E. Browder, Ph.D., P.E.

Date: 10 April 2018

SAISSA

Mr. Andrew L. Wallace, SAISSA President

Date: May 9, 2018

Nassau County Board of County Commissioners

Pat Edwards
Its: Chairman

Date: September 10, 2018

Attest to Chair
Signature

John A. Crawford
It's: Ex-Officio Clerk

Date: September 10, 2018

Approved As To Form and Legal Sufficiency:

Michael S. Mullin

Date: September 10, 2018

MES
09.11.18

SCOPE-OF-WORK

FOR

South Amelia Island Shore Stabilization Project

Amelia Island, Nassau County, FL

Nassau Sound: Analyses of Potential Impacts of Borrow Area Excavation
(Part 2 of 2)
10 April 2018

Introduction (Parts 1 and 2)

It is proposed to conduct analytical and numerical modeling analyses of the potential impacts of borrow area excavation proposed along the northeast edge of Nassau Sound at Amelia Island, Florida (**Figure 1**). The analytical analyses will seek to describe the volumetric and morphological changes measured at Nassau Sound over the last several decades to 1) evaluate changes occurring within the shoal system, 2) assess the potential changes associated with prior dredging efforts, and 3) provide an analytical description of the apparent sediment transport pathways in the area. Numerical modeling efforts will seek to describe the local wave fields, current patterns, and sediment transport pathways over the Nassau Sound ebb shoal and the adjacent nearshore areas of Amelia Island (north) and Little and Big Talbot Islands (south), with and without the proposed excavation from a sand borrow area (**Figure 2**). The two efforts will be developed in tandem to provide an evaluation of the potential impacts of the proposed excavation. The proposed work is intended to support the permitting of future beach nourishment projects for the South Amelia Island Shore Stabilization Project and to address questions posed by the Florida Department of Environmental Protection (FDEP) regarding the evaluation of potential impacts of borrow area excavation to Nassau Sound and the adjacent islands. This initial Scope of Work was developed with input from the FDEP 'Guidelines for Documenting Numerical Model Studies in Submittals to the FDEP,' (FDEP, 2009).

The analyses shall be conducted in two parts. Part 1 of the effort (Task Order #30) shall include a) the collection of field data; b) an analytical evaluation of historical shoal and shoreline changes and their implied sediment transport pathways; and c) the first phase of numerical modeling. The first phase of modeling shall include 1) the creation of the numerical model grid (domain) and the population of that domain with topographic/hydrographic data; 2) the calibration and verification of the model to demonstrate its skill in reproducing the hydrodynamics of the inlet; and 3) the simulation of existing bathymetric, wave, and current conditions over a representative tidal cycle for a range of incident wave conditions. The simulation shall then be scaled up to describe average annual transport pathways as well as individual storm conditions.

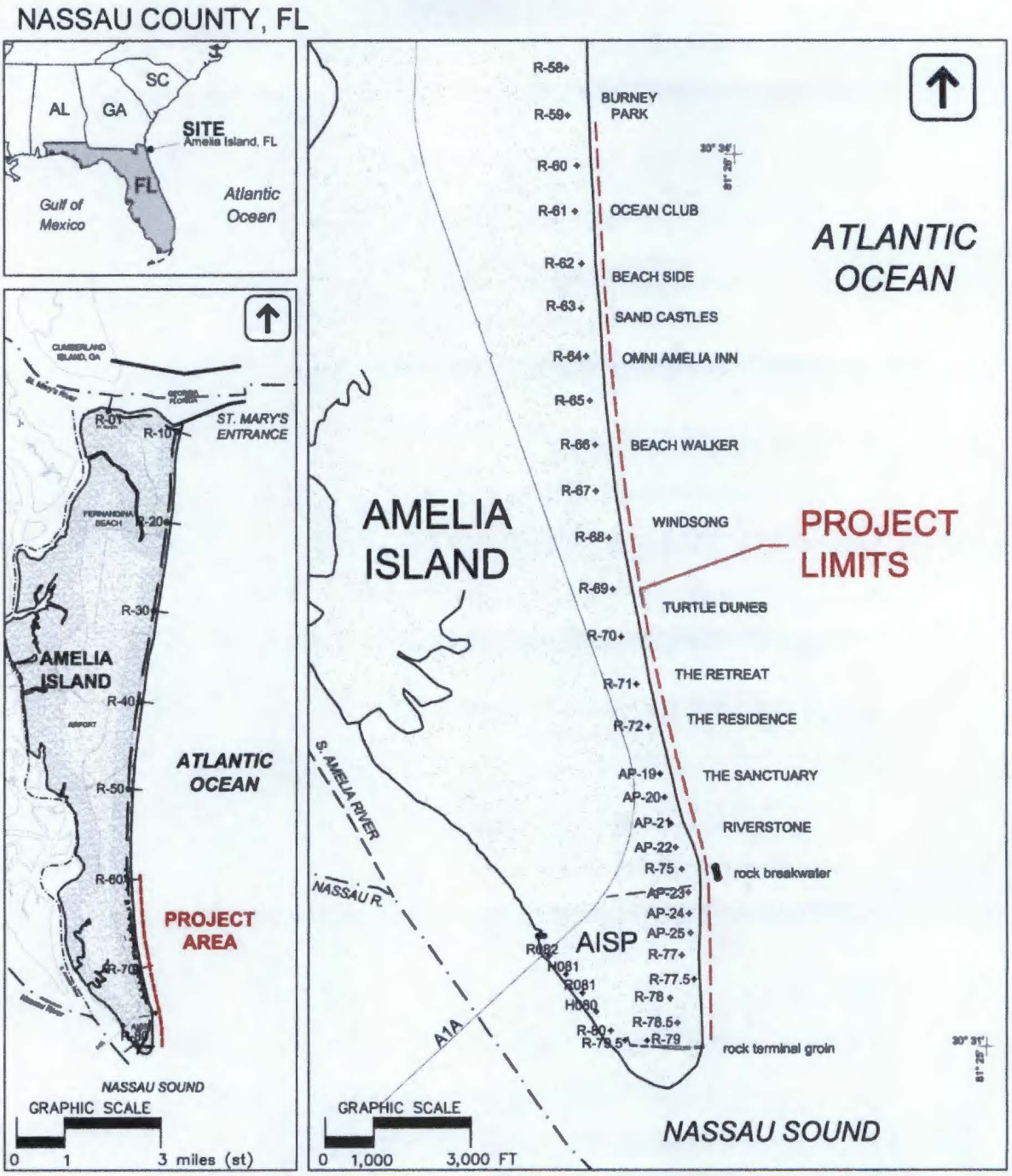

Figure 1 Location Map – South Amelia Shore Stabilization Project, Nassau County, FL.

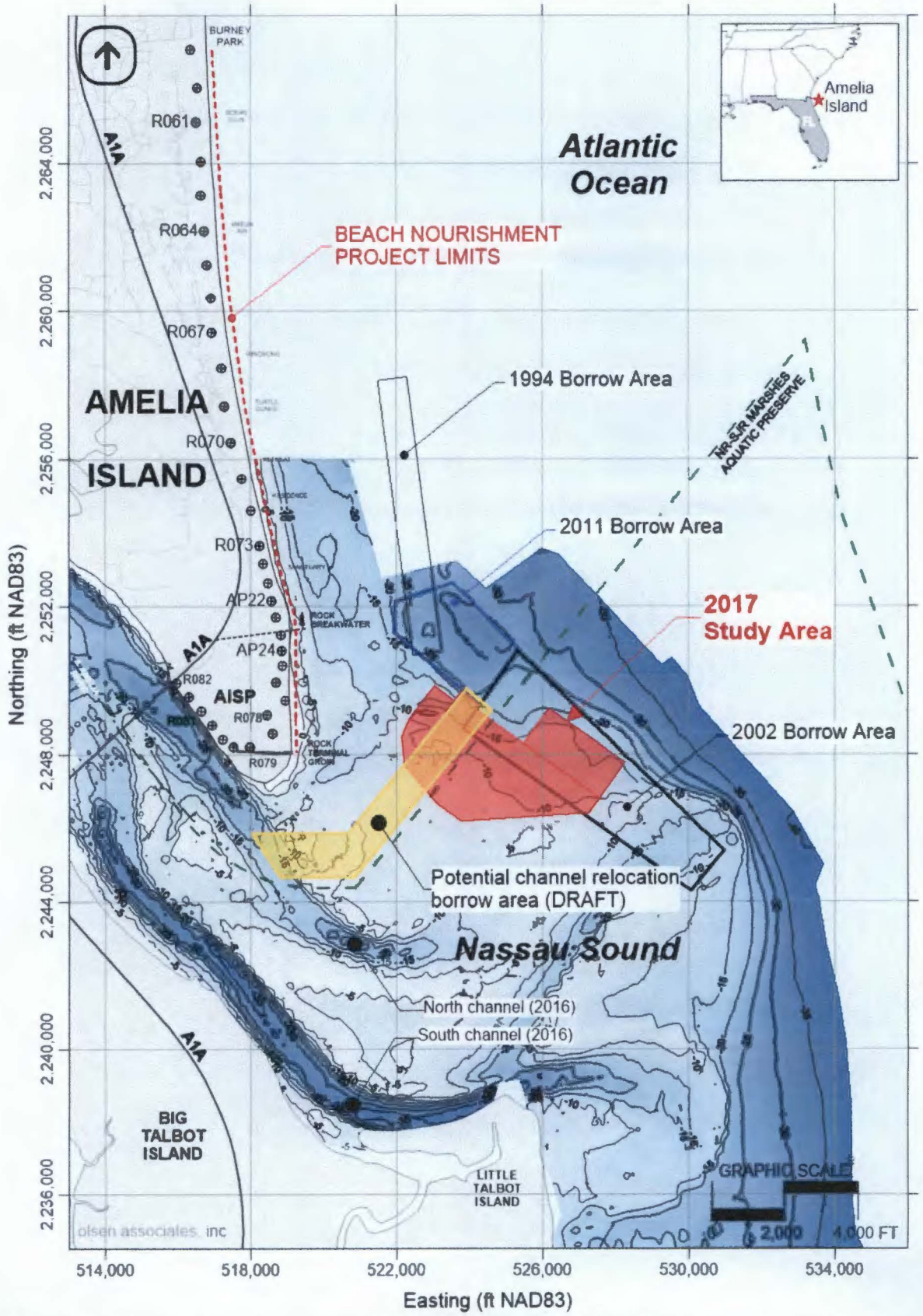

Figure 2 Borrow area development at Nassau Sound (2016/2017 survey conditions).

Part 2 of 2 of the study shall include the simulation of borrow area configurations to include an initial 3.2 million cubic yard excavation, a subsequent excavation based upon an analytical projection of conditions 8-10 years in the future (including some projected infilling of the initial simulated excavation based upon historical surveys of prior projects), and the simulation of a potentially recyclable linear borrow area intended to relocate one of the two dominant channels through Nassau Sound and relieve erosional pressure on the emergent "Bird Island Shoals" lying between the two channels. Part 2 of 2 shall also include the preparation of a final engineering report, and the processing of post-submittal Requests for Additional Information (RAIs) from regulatory agencies specifically regarding the numerical modeling effort. The RAI subtask does include a contingency for executing an additional alternative model run.

Engineered Beach Project Description

The South Amelia Island Shore Stabilization Association (SAISSA), Nassau County, FL, and the Florida Park Service presently maintain 3.6 miles of engineered beaches along the Atlantic Ocean shoreline at the southern end of Amelia Island in Nassau County, FL (**Figure 1**). The project Owners seek to acquire a set of 15-yr, multiple-nourishment permits to maintain the project via periodic dredging and beach nourishment. The proposed first renourishment of the engineered beach under the new permits would occur in the summer of 2020 (at the earliest) and would replace not only the expected average annual erosion losses from the project fill but also sand losses directly associated with Hurricane Matthew, which impacted the project in October 2016, and Hurricane Irma (September 2017).

General Approach and Objective of Modeling Effort

OAI (2017) describes the recent geotechnical sand search data collection performed along the northeast edge of the Nassau Sound ebb shoal at the south end of Amelia Island (**Figure 2**). This geotechnical investigation identified over 5.2 million cubic yards of beach-compatible sediment that could be excavated for beach nourishment along the South Amelia Island beaches. For each nourishment effort -- typically performed every 8-10 years -- approximately two million cubic yards of sand are placed along the project shoreline. This approach has been utilized in the three previous nourishment projects at this location (1994, 2002, 2011, see **Figure 2**).

To address questions posed by the Florida Department of Environmental Protection (FDEP) regarding the potential impacts of future excavation of sand from the Nassau Sound ebb shoal, it is proposed to conduct Sound-specific analyses to investigate historical shoreline and volume changes in the area, including time periods associated with previous

dredging/nourishment projects and with the construction of the current A1A bridge over the Sound (1999-2000). It is further proposed to apply the Delft3D suite of numerical modeling tools created and supported by Deltares, NL, and Delft University of Technology. Delft3D is an internationally recognized 2-D/3-D numerical modeling system designed to investigate riverine, tidal- and wave-driven hydrodynamics, sediment transport, and morphological change in coastal and estuarine environments. The Delft3D suite shall be applied to develop a series of coupled numerical grids to describe the hydrodynamics (Delft3D-FLOW), wave fields (Delft3D-WAVE) and sediment transport potential (Delft3d-MOR, run in fixed bed mode) across the nearshore and into the inlet. By developing and calibrating the model grid for local conditions, the potential effects of excavating a sand borrow area can be evaluated by comparison of the with- and without-borrow area conditions.

[Subtasks I-III are found in Task Order #30 (part 1 of 2)]

Subtask IV Numerical Model Analyses

Part 1 of 2 of the study (Task Order #30) provides for the creation of the model grid/domain (**Figure 3**), the calibration/verification of the model, and the first production run, intended to simulate existing conditions. With those results completed, the numerical model will then be applied to:

- Simulate the excavation of a ~3.2 million cubic yard borrow area excavation on the northeast edge of the Nassau Sound ebb shoal (see **Figure 2**). The simulated excavation volume is intended to assess not only the initial project to be constructed (approximately 2.1 million cubic yards), but also a contingency volume for that construction. The contingency volume may also represent a future emergency dredging source for storm repairs. Consultant shall develop the bathymetry of the modeled excavation with primary consideration for sediment quality (per OAI 2017), overall depth of excavation, and vertical and horizontal geometry and positioning of the modeled borrow area [production run #2].

- Simulate the excavation of a second 2.1+ million cubic yard borrow area excavation on the northeast edge of the Nassau Sound ebb shoal, designed to represent the second renourishment under this permit application (e.g. a project in the late 2020's or early 2030's, 8-10 years after the initial excavation described above). Consultant shall develop the bathymetry of the modeled borrow area with primary consideration for sediment quality (per OAI 2017), the potential for the first site to potentially infill in the intervening years (based upon historical surveys of prior projects), the overall depth of excavation, and the vertical and horizontal geometry and positioning of the modeled borrow area [production run #3].

- Simulate the excavation of a linear borrow area[1] through the northern portion of the Sound, with sand placement along the Amelia Island project shoreline. This borrow area (roughly plotted in **Figure 2**) would be designed to redirect a significant portion of the ebb flows through the Sound and relocate the northernmost of the two primary channels through Nassau Sound farther to the north. Historically, the northern channel has been observed to migrate southward over a broad portion of the Sound (moreso than the southern channel), thereby narrowing the shallow area between the two primary channels and adversely impacting (eroding) the ephemeral emergent Bird Island shoals that form between the channels. The hypothesis of the relocation is that by moving the northern channel northward, a more hydraulically efficient pathway would be created for the northern channel, and the sand shoal that currently lies northward of the north channel would then be free to migrate southward and contribute sand to the Bird Island shoals area.

  As shown in preliminary form in **Figure 2**, the linear borrow area contains roughly 2.1 million cubic yards above -16 ft NAVD88, and roughly 3.1 million cubic yards above -20 ft NAVD88. The modeling shall investigate the different effects of these two depth-cut scenarios. The relocated channel will not be stabilized in any way, and thus would be expected to again migrate southward, filling in the cut excavation area with sand generally moving southward from Amelia Island. In this regard it is expected that the channel borrow area may be considered to be recyclable, since the infilling sand is expected to originate, at least in part, from the beach fill sand that will subsequently stream off the Amelia Island shoreline. This pattern of sediment transport will be investigated by the modeling, and potential rates of infilling shall likewise be assessed via the modeling and analyses of historical shoal/channel changes (Subtask II, TO #30). At least two different simulated channel borrow area cuts shall be presented. It is anticipated that a new channel cut must be of sufficient width and depth to be able to sufficiently capture the flow from the existing northern channel. The productions runs shall consider this requirement [production runs #4a and #4bm, possible additional runs].

- For each production run, the results of the existing condition simulations (run #1) shall be compared to the various borrow area simulations (runs #2-#4) to compute, or assess, differences in waves and wave energy, currents, and sediment transport potential. In particular, assess potential changes in wave energy and sediment transport potential that occur near the adjacent shorelines of Amelia Island and Big and Little Talbot Islands.

Deliverables – Subtask IV Consultant shall prepare a numerical modeling report that provides the details of the modeling effort (incorporating the results of Subtask III from Task Order #30 as

[1] Additional geotechnical and cultural resources data shall be required along the channel borrow area footprint to assess sediment quality and rule out the presence of any culturally significant items in a potential excavation area.

well as the Subtask IV findings), including graphics depicting the overall modeling domain, the incorporation of the field data and input schematization, and the individual flow and potential transport patterns. Consultant shall provide two (2) hardcopies of the numerical modeling report summary memorandum document and an electronic version of the memorandum in *.PDF format. Following the Guidelines for Documenting Numerical Model Studies in Submittals to the FDEP Beaches Inlets and Ports Program (BIPP, formerly (BBCS)), input and output files from the modeling effort shall be provided in their native electronic formats.

Figure 3 General area of analysis for Delft3D model domain of Nassau Sound. Final dimensions and geometry of model domain to be determined (Google Earth).

Subtask V Final Engineering Report

The Consultant shall prepare a final engineering report to synthesize the results of the field data collection efforts, the development and findings of the analytical analyses, and the creation, calibration, and operation of the numerical model simulations. The report shall include the synthesis and discussion of results and findings of all these elements that address the potential impacts of the proposed excavation.

Deliverables – Subtask V Consultant shall provide two (2) hardcopies of the engineering report and an electronic version of the memorandum in *.PDF format.

Subtask VI RAI Assistance / Modeling Contingency

Herein, the Consultant has identified analytical and numerical modeling efforts believed to be necessary to address the potential impacts of the proposed borrow area excavation on the sediment transport pathways at Nassau Sound. To address questions that may arise during the permitting process relating to the tasks described herein, Consultant shall respond to Requests for Additional Information (RAIs) from the regulatory agencies in a prompt and professional manner to accomplish receipt of the permits as quickly as possible. This Subtask shall be billed on an hourly basis, with an established initial Not-to-Exceed amount. Some questions from agency personnel may require additional modeling production runs. Specific modeling production runs shall be performed and reported upon at a fixed lump sum rate.

Deliverables – Subtask V - Deliverables shall include digital and hardcopies of RAI Response materials consistent with the relevant Subtask I-IV deliverables cited in both Task Orders, relevant correspondence to and from the agencies, attendance at meetings (as required), and preparation and delivery of presentations (as required). Where applicable, electronic *.PDF versions of documents shall be provided.

References

Elias, E., and Hansen, J. (2013), "*Understanding processes controlling sediment transports at the mouth of a highly energetic inlet system (San Francisco Bay, CA),*" Marine Geology V. 345, pp. 207,220. Elsevier B.V., Amsterdam, the Netherlands.

Olsen Associates, Inc. (OAI, 2017), "*Nassau Sound, FL, Geotechnical Investigation for Borrow Area Development,*" Report submitting to South Amelia Island Shore Stabilization Association, Inc., Nassau County, FL, and Beaches, Inlets, and Ports Program, Florida Department of Environmental Protection, Olsen Associates, Inc., Jacksonville, FL.

SCOPE-OF-WORK: COASTAL ENGINEERING SERVICES

FOR

South Amelia Island Shore Stabilization Project
Amelia Island, Nassau County, FL

Nassau Sound: Analyses of Potential Impacts of Borrow Area Excavation
Part 2 of 2

10 April 2018

COST SUMMARY

Nassau Sound: Analyses of Potential Impacts of Borrow Area Excavation Part 2 of 2		
Subtask IV	Numerical Model Development and Analyses	**$57,000.00 (L.S.)**
Subtask V	Final Engineering Report	**$35,900.00 (L.S.)**
Subtask VI	RAI Responses regarding Modeling Modeling Contingency (one production run)	**$15,0000.00 (T&M, Initial NTE)** **$15,000.00 (Lump Sum, each run)**
	TOTAL FEE:	**$122,900.00**