ST. LUCIE COUNTY, FLORIDA

COASTAL STORM RISK MANAGEMENT PROJECT

DRAFT INTEGRATED FEASIBILITY STUDY AND ENVIRONMENTAL ASSESSMENT

APPENDIX D
Geotechnical

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US Army Corps of Engineers
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1 BACKGROUND

This report includes a description of the regional and local geology of St. Lucie County, a sediment characterization of the native beach, and a preliminary sand source design. Vibracore boring logs and laboratory results are available upon request.

Sand source coordinates and quantities listed are based on "St. Lucie Sand Search – Geotechnical Investigations Reconnaissance Level Investigation" prepared by Coastal Technology Corporation (Coastal Tech), May 4, 2010 and "St. Lucie County Sand Search Plans & Specs-Level Investigation" prepared by Coastal Technology Corporation, February 29, 2012.

1.1 REGIONAL GEOLOGY

The Florida Peninsula occupies a portion of a much larger geologic unit called the Florida Plateau. Deep water in the Gulf of Mexico is separated from deep water of the Atlantic Ocean by this partially submerged platform, nearly 500 miles long, that varies from 250 to 450 miles wide. In the last 200 million years, the plateau has been alternately dry land or covered by shallow seas. During that time up to 20,000 feet of carbonate and marine sediments were deposited. There has been a tilting of the Florida Plateau about its longitudinal axis. The west coast is partially submerged, as indicated by the wide estuaries and offshore channels, while the east coast is correspondingly elevated, showing the characteristics of an emergent coastline (Randazzo and Jones, 1997).

During the last million years, a series of four glacial periods, or ice ages, brought about significant changes in sea level, as shown in **Figure 1.** As a result of these sea level fluctuations, the Florida peninsula was again covered and uncovered by shallow seas. Following the first glacial period, sea level rose 270 feet above its present level. Dry land on the Florida peninsula was then restricted to a few small islands along the central Florida ridge and in northeast Florida.

About 100,000 years ago, the last glacial period began. Sea level fell to 300 feet below its present level and the Florida Plateau emerged as dry land. Approximately 15,000 years ago, sea level began its most recent rise towards present sea level (Shackleton, 1987). Sea level rose at an average rate of 30 feet per 1,000 years. About 7,000 years ago, the rate of sea level rise slowed when the sea level was about 30 feet below its present level (Smith et al., 2011). It was during this most recent slowing of sea level rise that the modern barrier islands of southeast peninsular Florida formed.

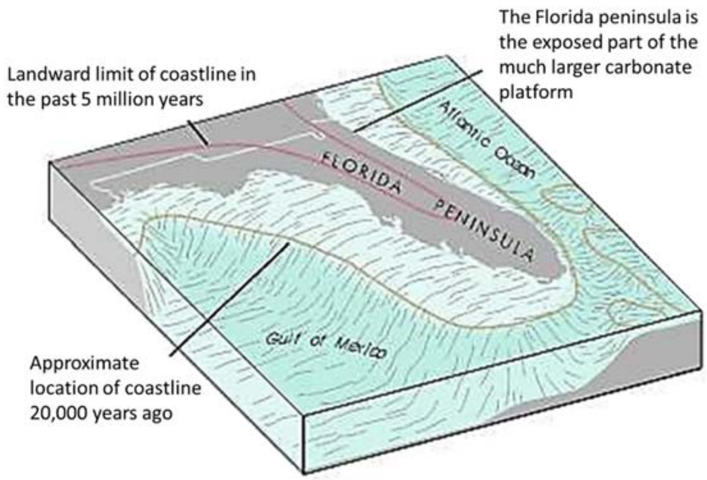

Figure 1. The Florida Peninsula, including the present coastline, previous sea level stands, and the extent of the carbonate platform.

Offshore of the beaches and modern barrier islands is the continental shelf. It is a broad, shallow, low relief shelf that extends from 80 miles offshore near Jacksonville, to only a few miles offshore near Miami. The shelf contains relic Pleistocene and Holocene terraces and submerged beach sand ridges. The wave climate and sediment transportation system creates a linear sandy coastline. The linear coastline is modified locally by inlets. An exception to the linear coastline is the cape structure located at Cape Canaveral which formed in response to a different wave and sand sediment transport system in the southern portion of the state.

The east coast of Florida, from the state line at the Georgia border to Miami Beach (350 miles), consists of a series of sandy barrier islands broken occasionally by inlets, as shown in **Figure 2**. The barrier islands are characterized by dunes and shore parallel beach ridges. Many of the islands display relic beach ridges formed during higher stands of sea level. The barrier islands often have a distinctive drumstick-shape with an accreting bulbous end and a slender eroding end. These barrier islands were formed from waves and longshore currents reworking marine and fluvial sediments. Lagoons and marshes are typically located between the barrier islands and the mainland.

The quartz component of the modern barrier island sand was deposited from sand migrating southward along the Atlantic coast, from the reworking of the Pamlico Sand that was previously deposited over the entire region. The remaining component of coastal sediments are typically carbonates, locally produced by calcite-producing plants and animals. Additional carbonate materials are from reworked materials from outcropping Pleistocene formations offshore (Duane and Meisburger, 1969).

Figure 2. Map of Florida, including points of interest on the Atlantic Coastal Plain.

1.2 LOCAL GEOLOGY

The project is located on the barrier island beach, South Hutchinson Island, in southern St. Lucie County, in the Atlantic Coastal Plain physiographic unit. The formations exposed at the surface are undifferentiated sediments of Pleistocene and Recent age overlying the Anastasia Formation (Scott, et al., 2001). These deposits consist of fine to medium quartz sand and lenses of shell and clay of varying thickness. Thick shell beds and erosion of the outcropping Anastasia formation near the coast have been firmly cemented to form coquina. This formation is underlain by Upper Miocene or Pliocene deposits of interbedded lenses of marine, fine to medium sand, shell and green, calcareous, silty clay. This is underlain by the Hawthorne Formation of early and middle Miocene age, the surface of which is approximately 250 feet below sea level. The Hawthorne Formation consists of gray to green, plastic, phosphatic, sandy clay and marl, interbedded with lenses of phosphatic sand, pebbles and sandy limestone. The Hawthorne Formation is underlain by limestone formations of Eocene age (Reese, 2004).

South Hutchinson Island (**Figure 3)** is part of a chain of sandy barrier islands separated by narrow inlets from Cape Canaveral to Palm Beach. These barrier islands rarely exceed one mile in width or 20 feet in elevation. Separating South Hutchinson Island form the mainland is the Indian River, a shallow lagoon, approximately 2 miles in width. During high seas and storms, the island may be overwashed by the sea, which spreads the sands into the lagoon, forming a fan or delta shape. Also during storms, new inlets may break through the island while others may fill in and become closed. The Ft. Pierce Inlet is located approximately 12 miles to the north of the project and the St. Lucie inlet is located approximately 3.5 miles south.

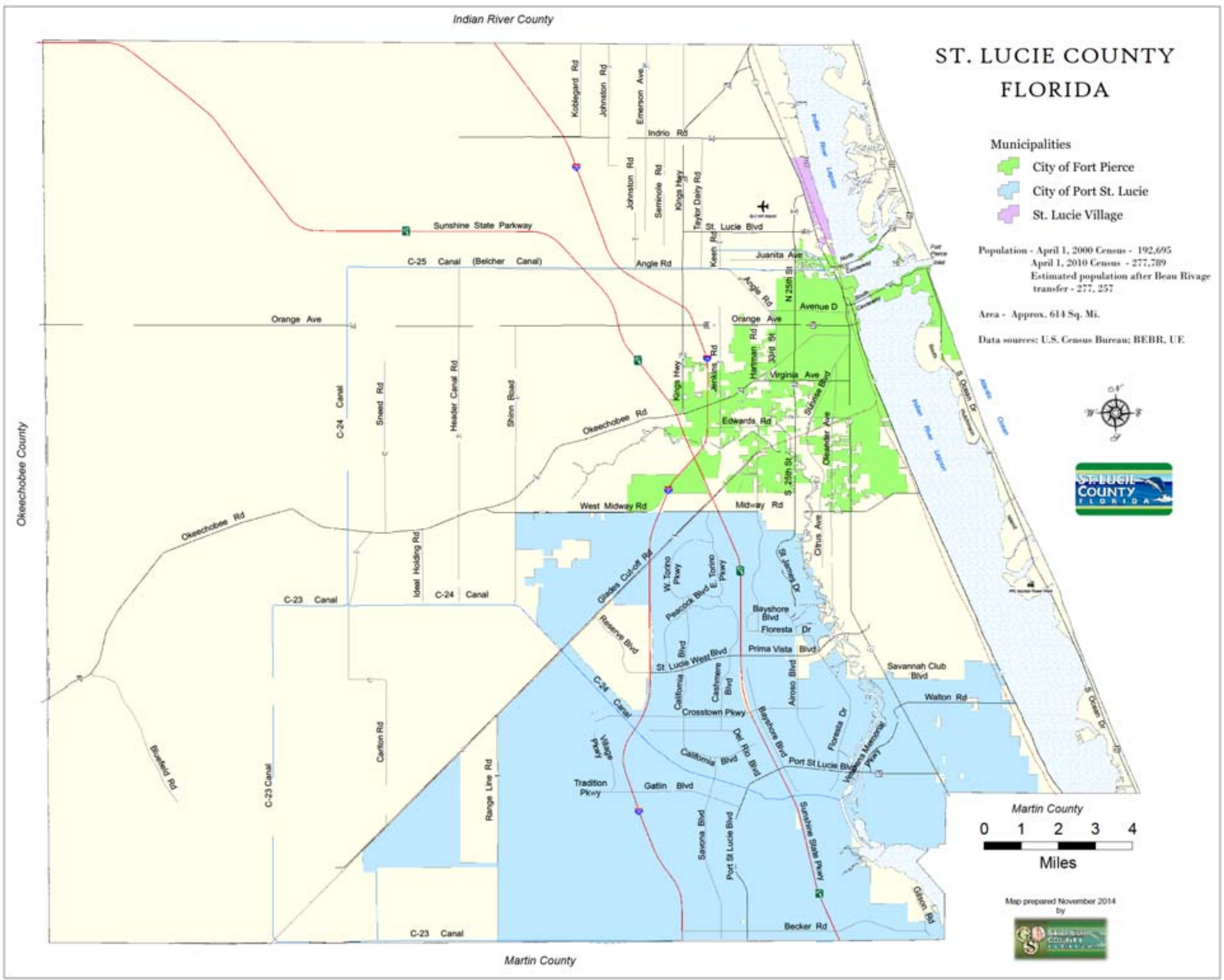

Figure 3. Map of St. Lucie County, Florida.

2 NATIVE BEACH

2.1 GENERAL

The native beach on South Hutchinson Island was sampled by Coastal Tech in February 2007 to characterize the recent native beach sediments and assess compatibility with the potential sand source material. The fill template extends from Florida Department of Environmental Protection (FDEP) survey monument R-98 south to the county line, as depicted on **Plate B - 1.**

Between March 2013 and May 2013, approximately 635,000 cubic yards of sand were placed within the proposed fill template (R-98 to the Martin County line) by St. Lucie County. The sand source for the 2013 project was a portion of the St. Lucie Shoal, located approximately three miles offshore.

2.2 NATIVE BEACH SAMPLING AND ANALYSIS

Sixty native beach sediment samples were obtained from R-77, R-80, R-85, R-90, R-95, R-98, R-100, R-105, R-110, and R-115. Samples were collected from the toe of dune, mid-berm, mean high water, mean low water and near the -3 foot contour **Figure 4**. Samples were obtained from approximately 5” below the surface (Coastal Tech, 2010).

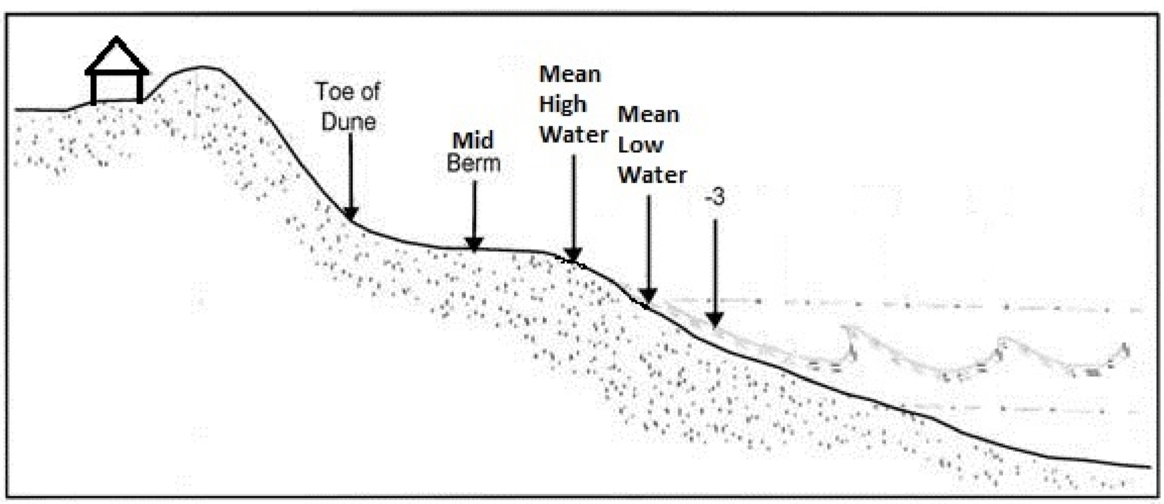

Figure 4. Beach Transect with Beach Sampling Locations

Gradation analysis was performed using 20 sieves ranging from ¾-inch to No. 230 at ½ phi intervals, including the No. 4 and No. 200 sieves. Compositional analyses through Loss on Ignition, as well as Munsell color analysis were performed. These data show that, in 2007, the native South Hutchinson Island beach consisted of light gray to very pale brown, moderately to poorly sorted, medium grained sand with 50% carbonate. The grain size analysis results are summarized in **Table 1** in the **Sub-Appendix.** The gradation curves are available upon request.

Table 1. South Hutchinson Island, Grain Size Statistics Summary

	Mean (mm)	Mean (phi)	Percent Fine Gravel* (%)	Percent Silt** (%)	Sorting / St. Dev (phi)	Percent Carbonate (%)	Munsell Color
South Hutchinson Island Beach Composite	**0.50**	**1.08**	**1.52**	**0.23**	**0.94**	**52.37**	**10YR 7/2**

*Retained in the #4 Sieve, **Passing the #200 Sieve

3 SAND SOURCES

This report is based on the data collected by Coastal Tech during a geotechnical investigation of the St. Lucie Shoal in 2011 and described in the following sub-sections. Ninety-two (92) vibracores were obtained from the portion of the St. Lucie Shoal in Federal waters **Plate B - 2** and **Plate B - 3**. These vibracoring locations were chosen based on a review of the bathymetric data, a cultural resources survey, and previously obtained vibracores. The portion of the St. Lucie Shoal in Federal water lies on the Inner Shelf Plain of the Florida Continental Shelf, three to seven miles offshore from the proposed fill template and has not previously been dredged.

A total of 438 sediment samples were selected for analysis using standard laboratory methods to characterize texture, composition, and color. Geologic cross-sections have been developed to delineate the proposed sand source boundaries and preliminary dredging limits. The lithology shown on the cross-sections is based on the vibracore logs; however, if a soil classification in a vibracore log is different with that from the lab data, the classification from the lab tests are used for the cross-sections. The vibracore logs, gradation curves, and statistical analysis of data from those samples are available upon request.

3.1 SAND SOURCE INVESTIGATIONS

3.1.1 Historic Investigations

In 2006, Coastal Planning & Engineering (CPE) conducted offshore geotechnical investigations to identify sand sources in association with the South County Beach Project. CPE identified five potential sand sources in state waters, including four nearshore linear shoals and the landward portion of St. Lucie Shoal.

St. Lucie County authorized Coastal Tech to conduct geotechnical investigations to identify additional beach-compatible sand sources for the long-term nourishment of St. Lucie County beaches. In 2007 and 2008, Coastal Tech examined the portion of the St. Lucie Shoal in Federal water and Pierce Shoal in State water.

On December 4, 2008 a total of five (5) vibracores were obtained from the long axis of Pierce Shoal, in State water, and eleven (11) vibracores were obtained from the St. Lucie Shoal in Federal water. Sixty-two (62) line miles of bathymetric surveys were also collected. In addition, data were reviewed from a series of eighteen (18) existing vibracores previously obtained in association with the FGS/MMS cooperative study entitled "A Geological Investigation of Sand Resources Along Florida's Central-East Coast".

A total of 84 sediment samples were selected for analysis using standard laboratory methods to characterize: (1) texture, (2) composition, and (3) color. Sediment texture was quantified using nested sieves and described in accordance with the Unified Soils Classification (USC) system. Composition was determined through Loss on Ignition, and color analysis was performed using the Munsell color chart. The results of this investigation indicated that the Pierce Shoal had a limited volume of beach quality sand due to the high percentage of gravel and darker colored sand. Coastal Tech estimated that the Federal portion of St. Lucie Shoal may contain up to 21.13 million cubic yards of beach quality sand (Coastal Tech, 2010).

3.1.2 Recent Investigations

In 2011, Coastal Tech conducted a plans and specifications-level study of the St. Lucie Shoal in Federal water. This study included approximately 152 line miles of bathymetric and seismic surveys, 81 20-foot vibracores and 11 10-foot vibracores as well as a cultural resources survey (Coastal Tech, 2012). Vibracore locations are shown on **Plate B - 2** and **Plate B - 3.**

A broadly spaced bathymetric survey was performed in August 2007. The survey was performed along transects spaced 1000 feet apart, perpendicular to the long axis of the shoals. About 53 line miles of bathymetric data were acquired during this survey on both St. Lucie Shoal in Federal water and Pierce Shoal in state water. In May 2011, this survey was supplemented with a more tightly spaced bathymetric survey concentrated on St. Lucie Shoal. The line spacing for this survey was 250 feet for a total of approximately 152 line miles of data.

A seismic survey was conducted in May 2011 for the purpose of establishing the extent of the upper layer of sand throughout the area. Sub-bottom profile data were collected and analyzed for acoustic reflectors and anomalies that can indicate the presence and quantities of beach re-nourishment resources. The surveys were conducted along approximately 152 track-line miles collected on 250-foot centers.

A cultural resources survey was performed in June 2008 for the purpose of identifying the presence or absence of submerged cultural resources within the proposed sand sources.

A total of 438 sediment samples were selected for analysis using standard laboratory methods to characterize texture, composition, and color. Sediment texture was quantified using nested sieves and described in accordance with the USC System. Gradation analysis was performed using 20 sieves ranging from ¾-inch to No. 230 at ½ phi intervals, including the No. 4 and No. 200 sieves. Composition was determined through Loss on Ignition, and color analysis was performed using the Munsell color chart.

Sand source delineation and compatibility of the sediment for use as beach fill was assessed: (1) through analysis of vibracore sedimentology (i.e., texture, composition, color) and stratigraphy, (2) by computing volume weighted composite vibracore and borrow area granularmetrics and organic / carbonate contents, (3) by computing composite native beach granularmetrics and carbonate content and (4) calculating Overfill Factor (Ra) as outlined in the Coastal Engineering Manual (USACE, 2003). The vibracore logs and gradation curves are available upon request.

3.2 PROPOSED OFFSHORE SAND SOURCE

The proposed offshore sand source is the portion of the St. Lucie Shoal located in Federal water, approximately three to seven miles offshore of the proposed fill template (**Plate B - 1).** The proposed preliminary sand source locations and associated vibracores are depicted on **Plate B - 2** and **Plate B - 3.** Coastal Tech (2012) subdivided the St. Lucie Shoal into three primary sand sources, identified as A, B and C. After reviewing the data, the three sand sources were reconfigured into two; North St. Lucie Shoal and South St. Lucie Shoal. In general, the beach-quality material encountered within the St. Lucie Shoal consists of olive brown to olive gray, fine to medium-grained skeletal sand with few to some fine-grained quartz and few to some gravel-size shell.

3.2.1 North St. Lucie Shoal

The North St. Lucie Shoal sand source is centered approximately 5.5 miles offshore of R-98, at the northern end of the proposed placement area. The sand source covers an area of approximately two (2) square miles (**Plate B - 2**). The grain size statistics show the mean grain sizes of individual samples range from 0.26 mm to 0.82 mm with an overall average of 0.44 mm (1.21 phi). The silt content (passing #230 sieve) in individual samples ranges from 0.01 % to 3.98 %, having an average of 0.68%. The fine gravel content varies from 0 % to 10.23 %, having an average of 1.05 %. The standard deviation values range from 0.6 phi to 1.67 phi, with an average of 0.93 phi, representing moderately well sorted to poorly sorted sediments. The moist Munsell color of the materials is predominately a value of 6 or lighter; occasionally there are some samples with a Munsell value of 5. A summary of the composite sediment statistics of the North St. Lucie Shoal is shown in **Table 2.** The North St. Lucie Shoal contains approximately 8.3 million cubic yards of beach-quality material.

Table 2. North St. Lucie Shoal Sediment Summary

	Mean (mm)	Mean (phi)	Percent Fine Gravel* (%)	Percent Silt** (%)	Sorting / St. Dev (phi)	Munsell Color
North St. Lucie Shoal	**0.44**	**1.21**	**1.05**	**0.68**	**0.93**	**2.5Y 6/2**

*Retained in the #4 Sieve **Passing the #230 Sieve

Geologic cross-sections were developed for the North St. Lucie Shoal using the 2011 geotechnical data. The geologic cross-section of the North St. Lucie Shoal, from north (A) to south (A'), is shown on **Figure 5.** Two east-west geologic cross-sections of the North St. Lucie Shoal (B to B' and C to C') are shown on **Figure 6** and **Figure 7**, respectively. The thickness of beach-quality sand averages approximately 9 feet with a minimum of 1.9 feet and a maximum thickness of 16.6 feet. The vibracore logs, gradation curves, and statistical analysis of data from those samples are available upon request.

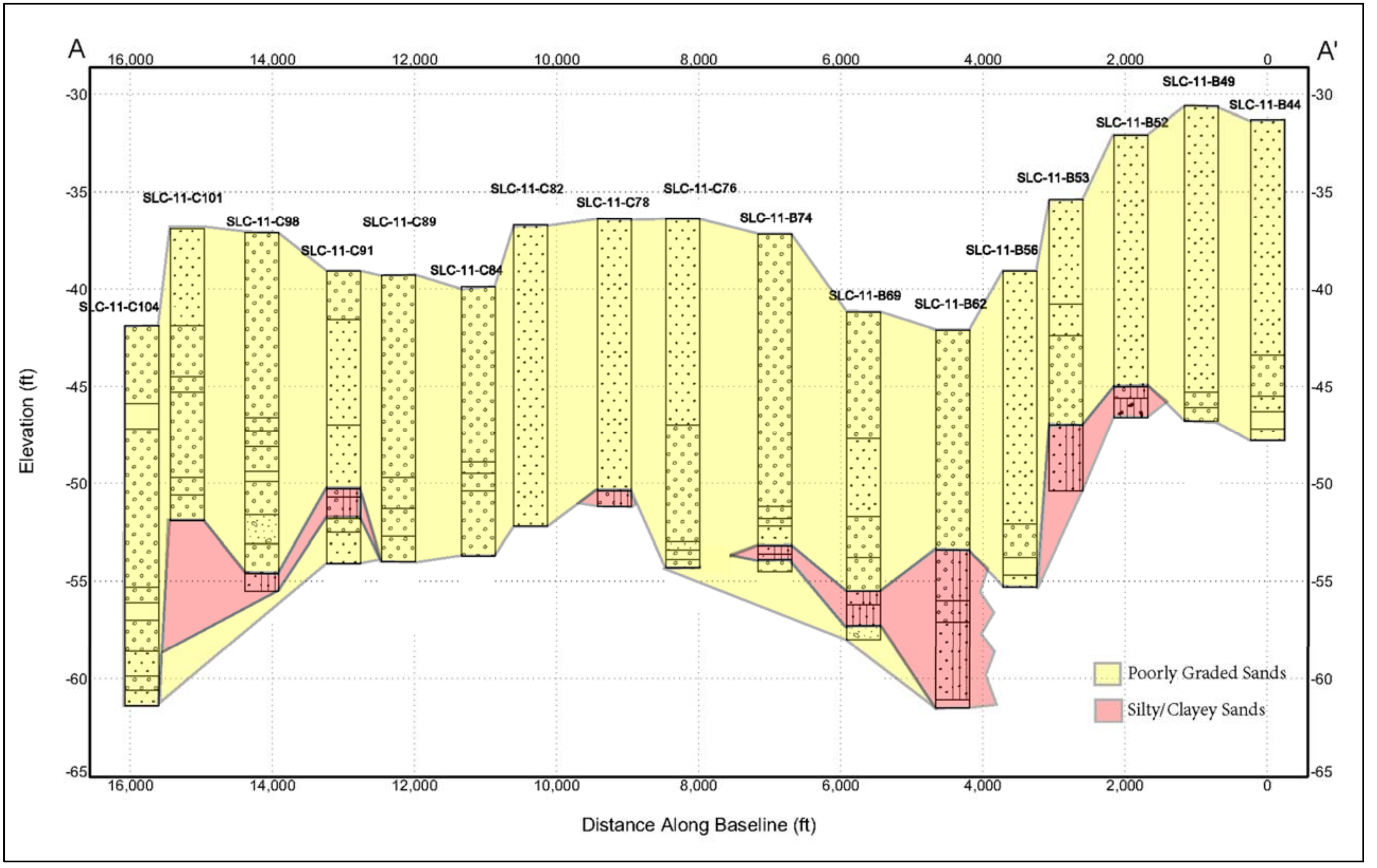

Figure 5. Geological cross section along the axis A - A' - North St. Lucie Shoal

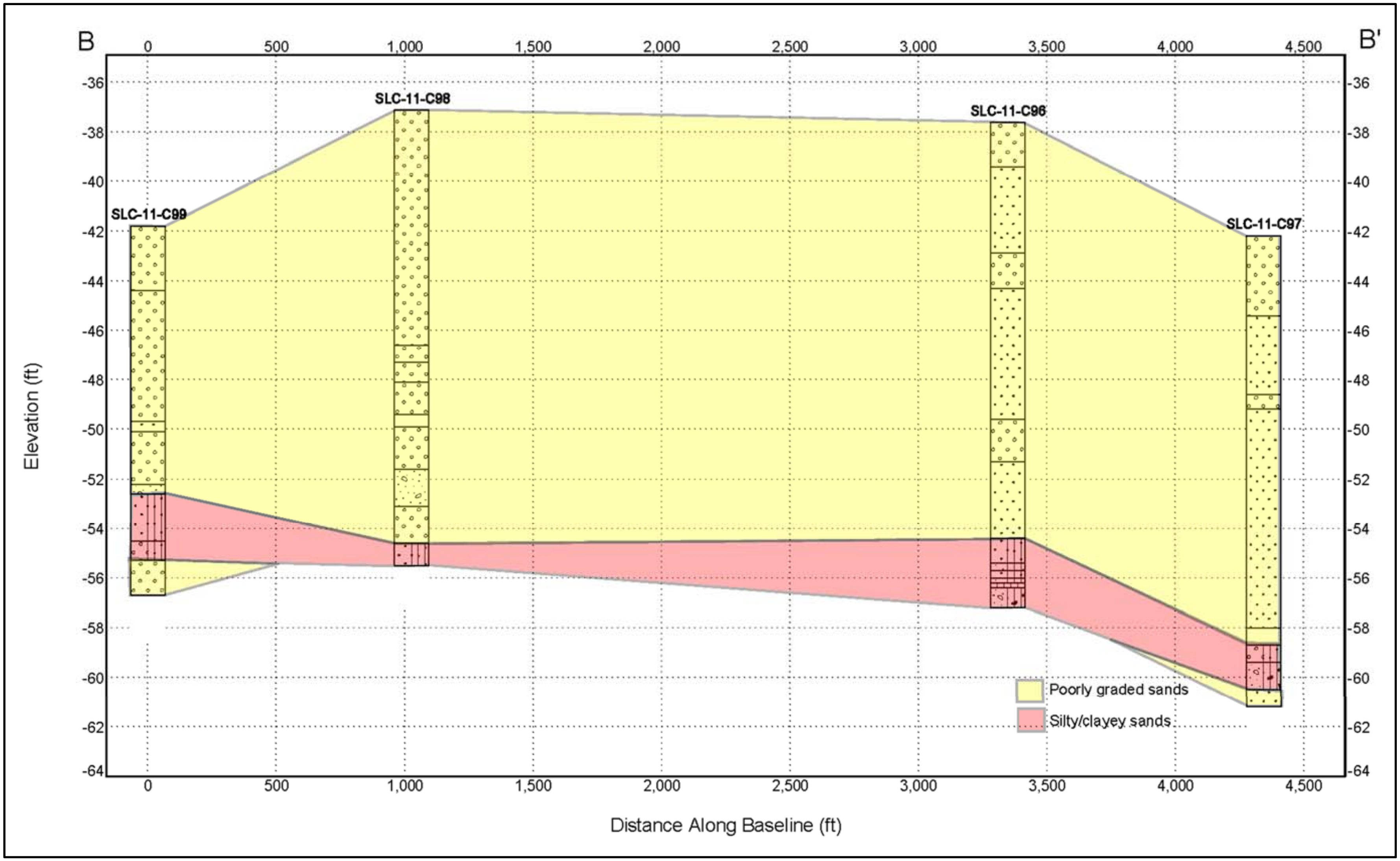

Figure 6. Geological cross section along the axis B - B' - North St. Lucie Shoal

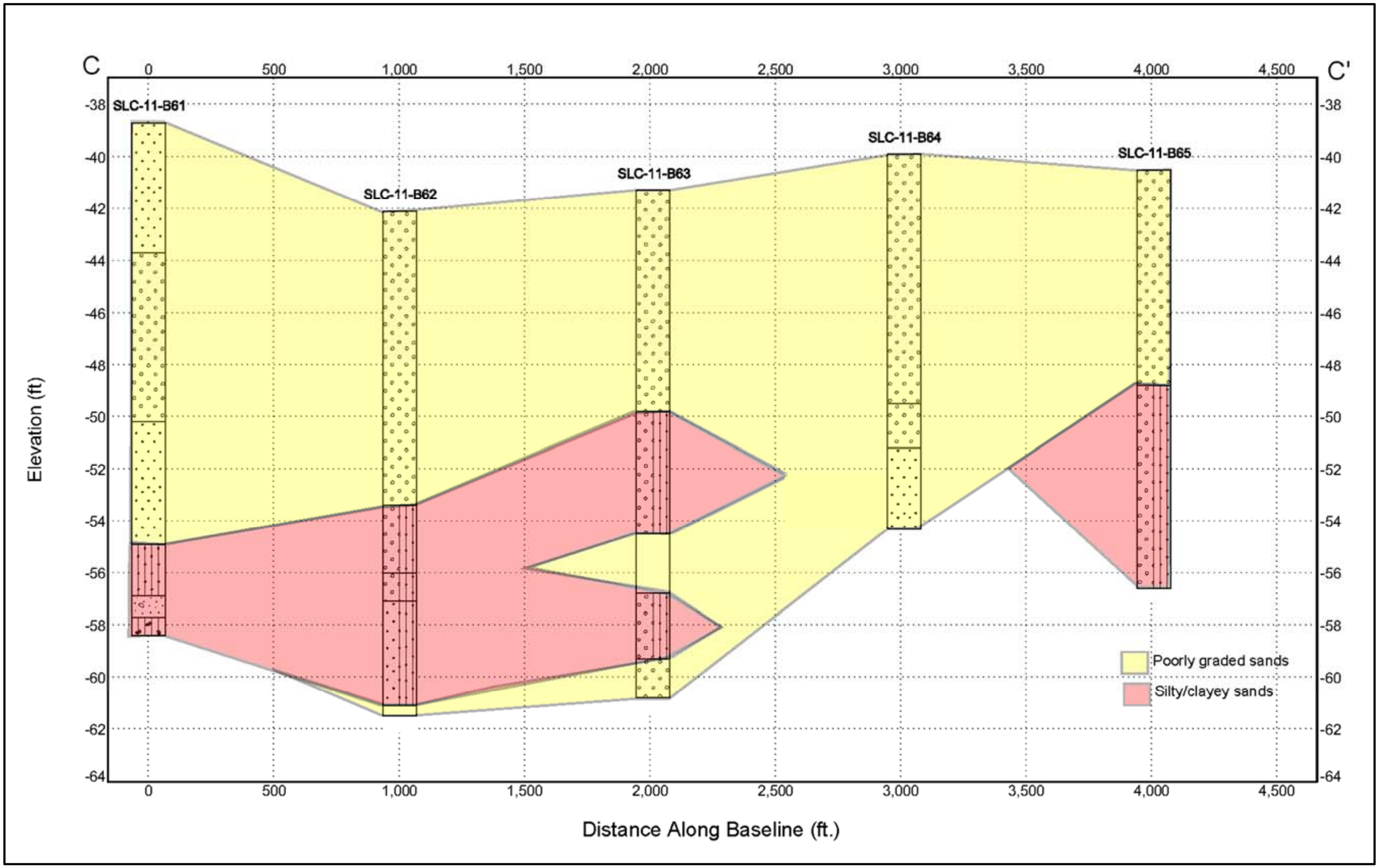

Figure 7. Geological cross section along the axis C - C' - North St. Lucie Shoal

3.2.2 South St. Lucie Shoal

The South St. Lucie Shoal sand source is centered approximately 4.0 miles offshore of R-106, roughly in the middle of the proposed placement area. The sand source covers an area of approximately 1.2 square miles (**Plate B - 3**). The grain size statistics show the mean grain sizes of individual samples range from 0.27 mm to 0.95 mm with an overall average of 0.47 mm (1.15 phi). The silt content (passing the #230 sieve) in individual samples ranges from 0.0% to 3.95%, having an average of 0.93%. The fine gravel content varies from 0.0% to 8.86%, having an average of 0.95%. The standard deviation values range from 0.55 phi to 1.63 phi, with an average of 0.91 phi, representing moderately well sorted to poorly sorted sediments. The moist Munsell color of the materials is predominantly a value of 6 or lighter; occasionally there are some samples with a Munsell value of 5. A summary of the composite sediment statistics of the North St. Lucie Shoal is shown in **Table 3**. The South St. Lucie Shoal contains approximately 2.3 million cubic yards of beach-quality material.

Table 3. South St. Lucie Shoal Sediment Summary

	Mean (mm)	Mean (phi)	Percent Fine Gravel* (%)	Percent Silt** (%)	Sorting / St. Dev (phi)	Munsell Color
South St. Lucie Shoal	**0.47**	**1.15**	**0.95**	**0.93**	**0.91**	**2.5Y 6/2**

*Retained in the #4 Sieve **Passing the #230 Sieve

Geologic cross-sections were developed for the South St. Lucie Shoal using the 2011 geotechnical data. The geologic cross-section of the South St. Lucie Shoal, from north (A) to south (A'), is shown on **Figure 5.** One east-west geologic cross-section of the South St. Lucie Shoal (B to B') is shown on **Figure 9**. The thickness of beach-quality sand averages approximately 12.5 feet with a minimum of 6.3 feet and a maximum thickness of 18.0 feet. The vibracore logs, gradation curves, and statistical analysis of data from those samples are available upon request.

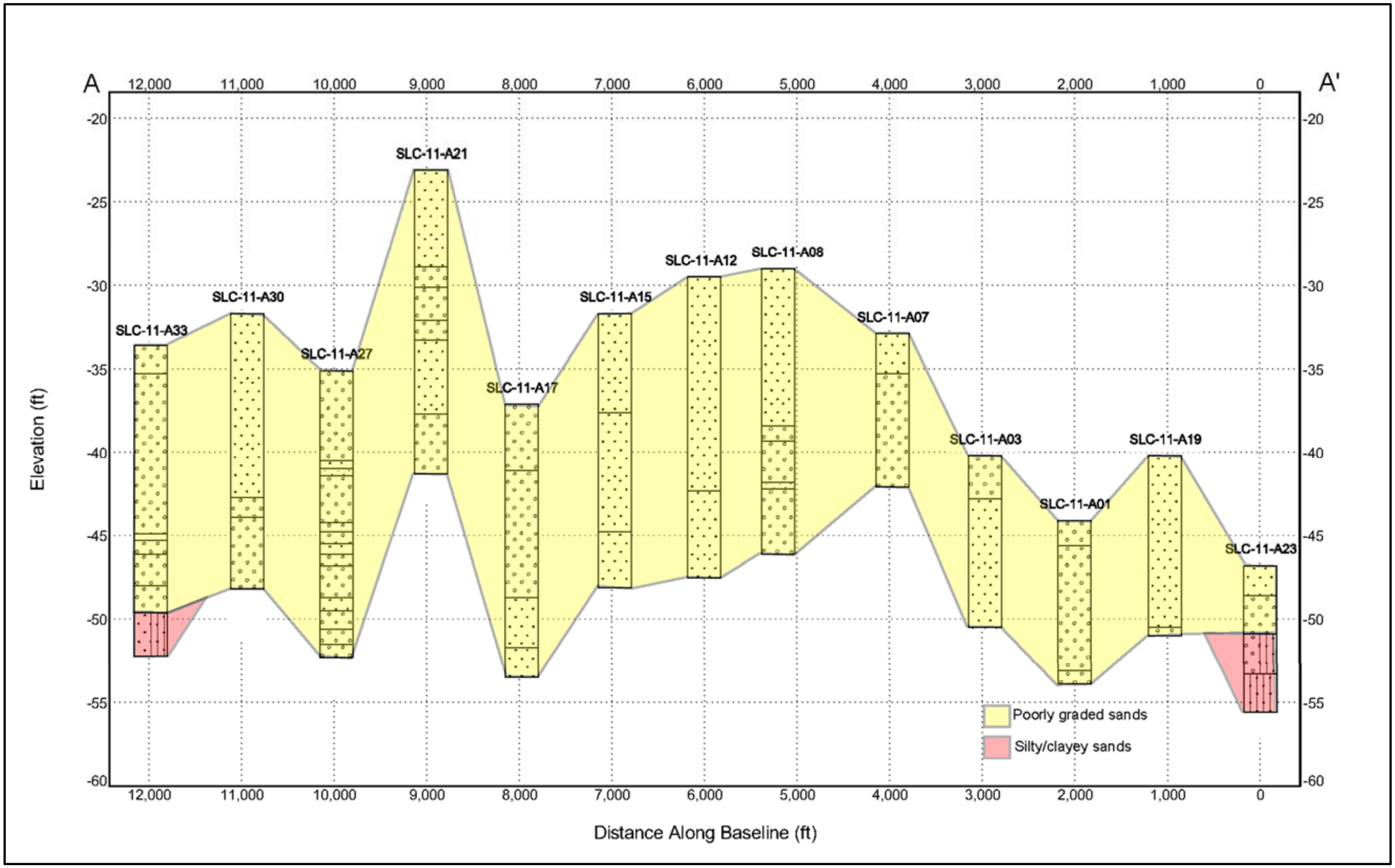

Figure 8. Geological cross section along the axis A - A' - South St. Lucie Shoal

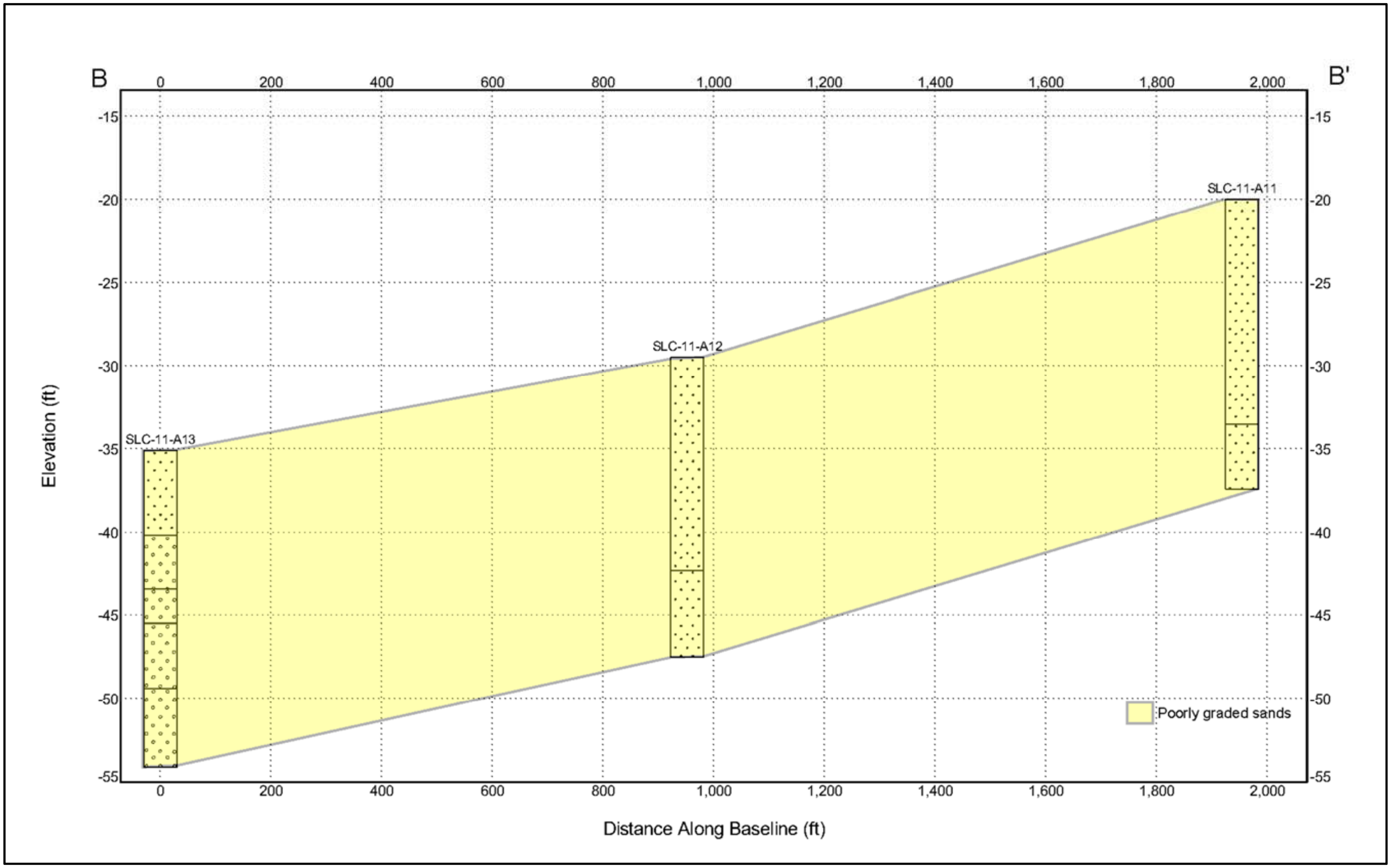

Figure 9. Geological cross section along the axis B - B' - South St. Lucie Shoal

4 COMPATIBILITY OF THE SAND SOURCES WITH THE BEACHES

Florida Administrative Code (F.A.C.) 62B-41.007(2)(j) requires that beach fill meets the following requirements:

- Predominately carbonate or quartz with a particle size distribution ranging between 0.062 mm (4 phi) and 4.76mm (-2.25 phi);
- Contain less than 5% silt passing the #230 sieve;
- Contain less than 5% gravel sized shell retained on the #4 sieve;
- Not contain coarse gravel, cobbles, or material retained on the ¾" sieve in a percentage greater than the native beach
- Be free of construction debris, toxic material, or other foreign matter;
- Be similar in color and grain size distribution; and
- Not result in cementation of the beach.

The proposed sand sources meet the requirements of the sand rule criteria, as outline above, and in 62B-41.007(2)(j), F.A.C. Grain size distribution and Overfill Factor are also used to determine compatibility between the proposed sand sources and the beaches of South Hutchinson Island.

4.1 GRAIN SIZE DISTRIBUTION

Grain size analyses were performed on beach samples from South Hutchinson Island and on discrete samples of the proposed offshore sand sources. An arithmetic composite sample was calculated from the granularmetric results. The composite sample results for the beach and offshore sand sources are summarized in **Table 4** and discussed below.

The native South Hutchinson Island beach consisted of light gray to very pale brown, moderately to poorly sorted, medium grained sand. The material from the proposed offshore sand sources consists of olive brown to olive gray, fine to medium-grained skeletal sand with few to some fine-grained quartz and few to some gravel-size shell.

The testing results show that the material from the St. Lucie Shoal sand sources are very similar and compatible with the existing beach and also meet the requirements of Florida state regulation, 62B-41.007(2)(j), F.A.C. The color of this material is slightly darker than the native beach but will typically lighten when exposed to the sun. The most dissimilar characteristic is the mineral composition due to the higher shell content of the shoal material.

Table 4. Sediment Analysis Summary of Proposed Sand Sources.

Sand Source Composite	Mean (mm)	Mean (phi)	Percent Fine Gravel* (%)	Percent Silt** (%)	Sorting / St. Dev (phi)	Munsell Color
North St. Lucie Shoal	0.44	1.21	1.05	0.68	0.93	2.5Y 6/2
South St. Lucie Shoal	0.47	1.15	0.95	0.93	0.91	2.5Y 6/2
Beach	0.50	1.08	1.52	0.23	0.94	10YR 7/2

*Retained in the #4 Sieve **Passing the #230 Sieve

4.2 OVERFILL AND RENOURISHMENT FACTOR

The Overfill and Renourishment Factors were calculated to estimate the predicted performance of the sand sources with respect to the native beach materials, both during initial beach stabilization and over the long term. Thus, they help in choosing the best available material. The factors also are used to calculate fill construction volume and renourishment volumes.

Overfill and Renourishment Factors are calculated using the sediment mean grain size and standard deviation of the native beach and the sand source in phi units.

4.2.1 Overfill Factor

The Overfill Factor (R_A) is primarily a volume factor which may be used to calculate an intentional overfill to compensate for volume loss during the initial construction. The R_A is used to determine which of the proposed sand sources will provide the lowest placement volume, and thus is most compatible with the existing beach.

The R_A for South Hutchinson Island was calculated using the USACE Coastal Engineering Manual (CEM) software program for each of the sand sources, and the results are in

Table 5. As a rule of thumb, for native beach material with a composite median grain diameter exceeding 0.2 mm, sand source material with a composite median diameter within plus or minus 0.02 mm of the native median grain diameter is considered compatible (US Army Corps of Engineers, 2003). The proposed sand sources from the St. Lucie Shoal are slightly finer than the native beach. However, both proposed sand sources are suitable for placement on the beaches of South Hutchinson Island.

Table 5. Summary of Overfill Factors for South Hutchinson Island

	Native Beach	North St. Lucie Shoal	South St. Lucie Shoal
Mean (mm)	0.50	0.44	0.47
Mean (phi)	1.08	1.21	1.15
Sorting / St. Dev (phi)	0.94	0.93	0.91
Overfill Factor, R_A (Native)	n/a	1.18	1.10

4.2.2 Renourishment Factor

The Renourishment Factor (R_J) estimates long term relative erosion rates of sand source materials with respect to native materials. This is done by assuming all grains have a finite residence time in the local littoral system before being transported offshore or alongshore. Larger grains remain longer. The R_J is primarily a measure of relative long-term stability.

The R_J for South Hutchinson Island was calculated using the USACE CEM software program for each of the sand sources, and the results are shown in **Table 6** . R_J values greater than one predict the sand source will erode at a higher rate than the native beach. Conversely, values of less than one predict the sand source is more stable than the native beach. Both proposed sand sources are suitable for placement on the beaches of South Hutchinson Island.

Table 6. Summary of Renourishment Factors for South Hutchinson Island

	Native Beach	North St. Lucie Shoal	South St. Lucie Shoal
Mean (mm)	0.50	0.44	0.47
Mean (phi)	1.08	1.21	1.15
Sorting / St. Dev (phi)	0.94	0.93	0.91
Renourishment Factor, R_J (Native)	n/a	1.16	1.11

4.3 COMPATIBILITY SUMMARY

The portion of the St. Lucie Shoal in Federal water contains significant volumes of beach quality sand that can be excellent sources for beach nourishment, although the materials in both sand sources are slightly finer than that at the project beach. In general, the materials in the North St. Lucie Shoal sand source are coarser than that in the South St. Lucie Shoal sand source.

Grain size distribution, Overfill Factor and Renourishment Factor computations were used to determine if the proposed offshore sand sources are compatible with the South Hutchinson Island beaches. The compatibility analysis results for South Hutchinson Island are summarized in

Table 5 and **Table 6**. The grain size analyses revealed that the sediments of the St Lucie Shoal are composed of olive brown to olive gray, fine to medium-grained skeletal sand with few to some fine-grained quartz and few to some gravel-size shell. The native beach is composed of light gray to very pale brown, moderately to poorly sorted, medium grained sand with 50% carbonate.

The Overfill and Renourishment Factors for South Hutchinson Island were calculated for each of the sand sources using the USACE CEM software program. The proposed sand sources within the St. Lucie shoal showed acceptable Overfill Factors and Renourishment Factors and are therefore suitable for placement on South Hutchinson Island's beaches.

5 REFERENCES

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PLATES

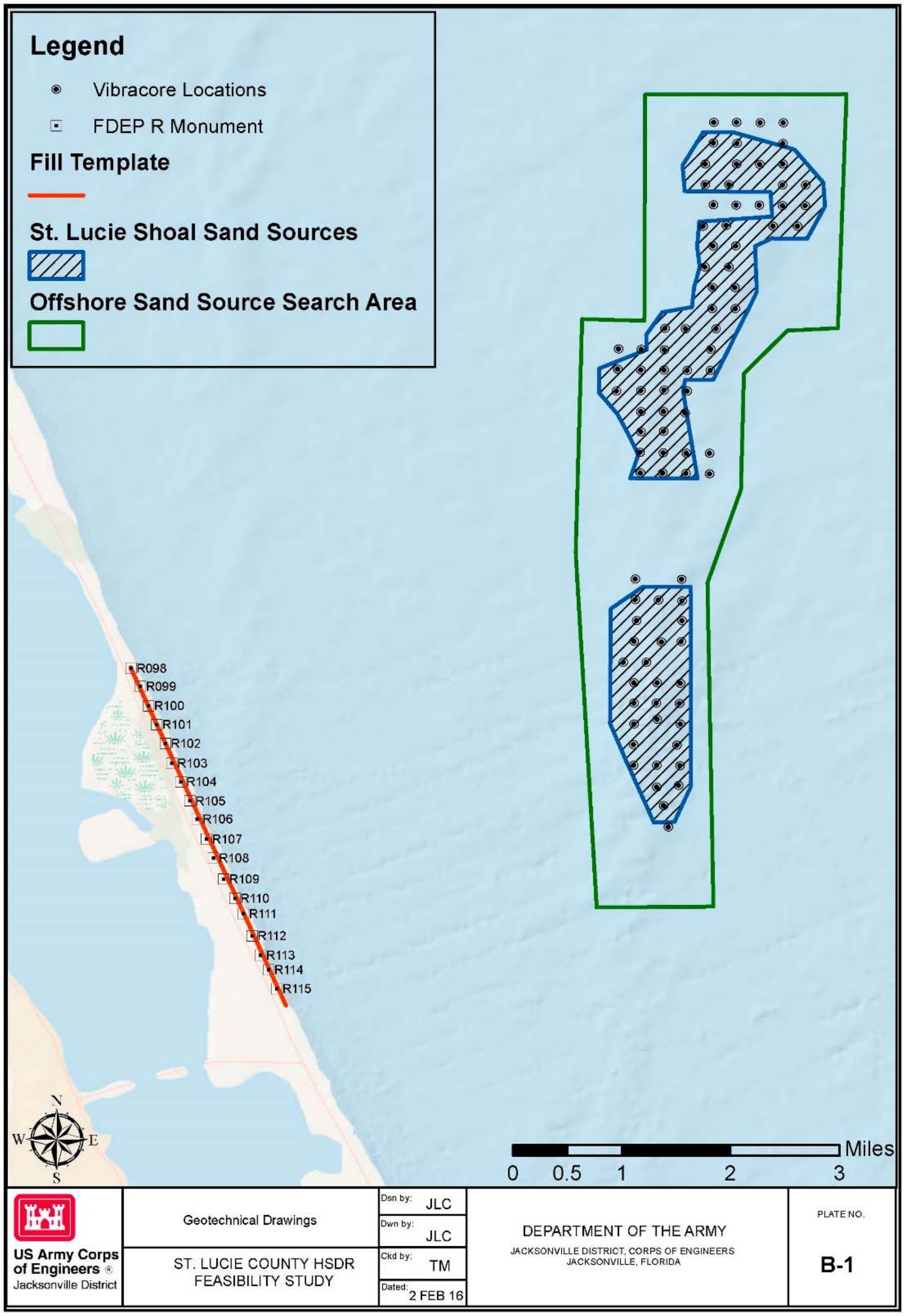

Plate B - 1. Overview of South Hutchinson Island, St. Lucie County, Florida and Proposed Sand Source Locations.

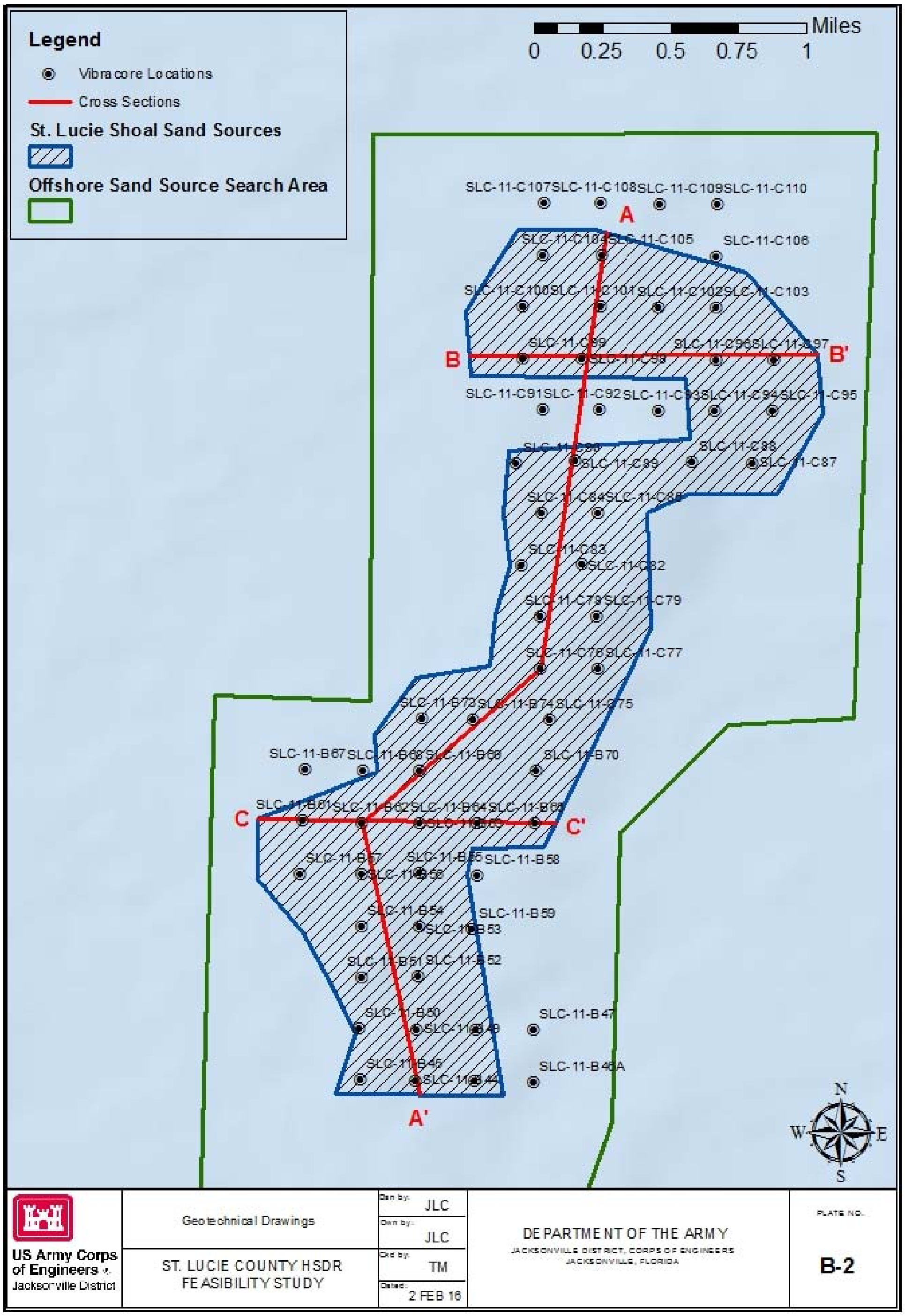

Plate B - 2. Proposed North St. Lucie Shoal Sand Source, Geological Cross Sections, and Vibracore Boring Locations.

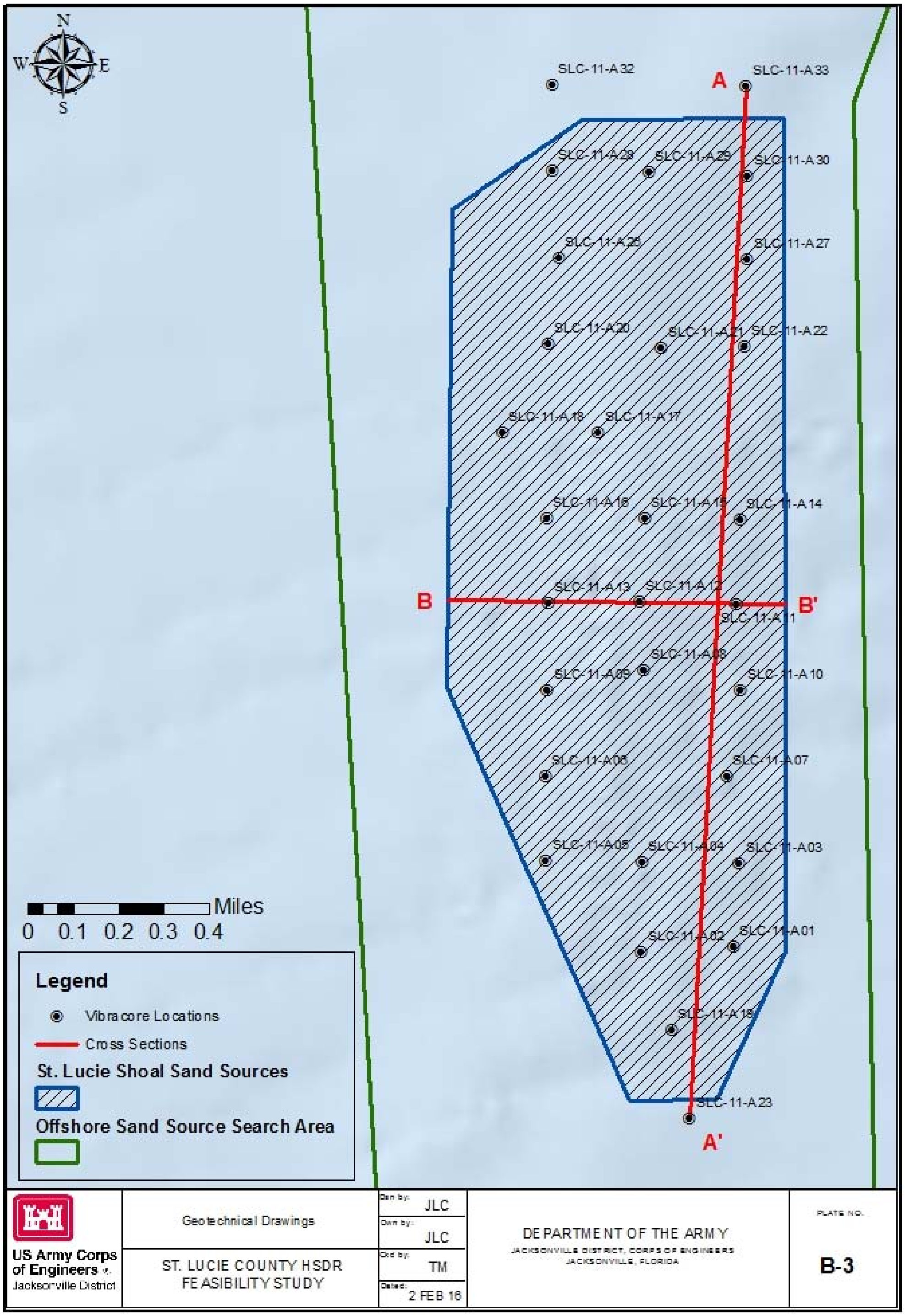

Plate B - 3. Proposed South St. Lucie Shoal Sand Source, Geological Cross Sections, and Vibracore Boring Locations.

SUB-APPENDIX

GRAIN SIZE ANALYSIS RESULTS FOR SOUTH HUTCHINSON ISLAND

Table D - 1. South Hutchinson Island, Grain Size Statistics

FDEP R-Monument	Sample Location	Mean (mm)	Mean (phi)	Percent Fine Gravel* (%)	Percent Silt** (%)	Sorting / St. Dev (phi)	Percent Carbonate (%)	Munsell Color
R-98	Toe of Dune	0.46	1.12	0.00	0.28	0.76	51.80	10YR 7/2
	Mid-Berm	0.56	0.84	0.00	0.27	0.67	59.60	10YR 7/2
	MHW	0.47	1.09	0.24	0.29	0.87	41.60	10YR 7/2
	MLW	0.41	1.29	0.00	0.15	0.96	49.40	10YR 7/2
	-5	0.28	1.84	0.46	0.46	1.20	49.00	10YR 7/2
R-100	Toe of Dune	0.44	1.18	0.33	0.27	0.96	44.10	10YR 7/2
	Mid-Berm	0.39	1.36	0.03	0.23	0.72	44.40	10YR 7/2
	MHW	0.41	1.29	0.38	0.57	0.76	46.20	10YR 7/2
	MLW	0.38	1.40	0.14	0.02	0.67	44.30	10YR 7/2
	-5	0.74	0.43	14.03	0.29	2.05	66.00	10YR 7/2
R-105	Toe of Dune	0.49	1.03	3.07	0.08	0.99	48.80	10YR 7/2
	Mid-Berm	0.63	0.67	1.21	0.06	1.13	64.00	10YR 7/2
	MHW	0.63	0.67	0.00	0.00	0.98	65.60	10YR 7/3
	MLW	0.39	1.36	0.00	0.11	0.69	46.90	10YR 7/2
	-5	1.16	-0.21	4.58	0.23	1.18	85.00	10YR 7/2
R-110	Toe of Dune	0.55	0.86	0.00	0.25	0.82	55.10	10YR 7/2
	Mid-Berm	0.35	1.51	0.00	0.00	0.60	37.10	10YR 7/2
	MHW	0.40	1.32	0.00	0.14	0.77	47.70	10YR 7/3
	MLW	0.44	1.18	0.04	0.04	0.80	47.60	10YR 7/2
	-5	0.21	2.25	0.78	0.15	0.88	39.00	10YR 7/2
R-115	Toe of Dune	0.42	1.25	0.46	0.35	0.78	44.80	10YR 7/2
	Mid-Berm	0.55	0.86	0.40	0.44	0.83	60.00	10YR 7/3
	MHW	0.38	1.40	0.00	0.01	0.83	49.80	10YR 7/2
	MLW	0.47	1.09	0.48	0.03	0.84	49.50	10YR 7/2
	-5	1.00	0.00	11.33	0.93	1.69	72.00	10YR 7/2
South Hutchinson Island Composite		**0.50**	**1.08**	**1.52**	**0.23**	**0.94**	**52.37**	**10YR 7/2**

*Retained in the #4 Sieve, **Passing the #230 Sieve

GRAIN SIZE ANALYSIS RESULTS FOR NORTH ST. LUCIE SHOAL SAND SOURCES

Table D - 2. Sediment Analysis Results from Vibracores in North St. Lucie Shoal

Boring Number	Sample Depth (ft)	Mean (mm)	Mean (phi)	Percent Fine Gravel* (%)	Percent Silt** (%)	Sorting / St. Dev (phi)	Munsell Color (moist)
SLC-11-B43	0.5	0.38	1.38	0.63	0.15	1	2.5Y 6/2
SLC-11-B44	0.5	0.44	1.2	0	0.04	0.65	2.5Y 6/3
	5	0.44	1.2	0	0.06	0.69	2.5Y 6/2
	10	0.42	1.26	0	0.39	0.77	2.5Y 6/2
	13	0.36	1.46	0.08	3.8	0.92	5Y 6/2
SLC-11-B45	1	0.44	1.19	1.13	0.09	0.87	2.5Y 6/2
	5	0.67	0.57	1.35	0.11	0.97	2.5Y 6/2
	9	0.38	1.39	0.31	0.41	0.9	2.5Y 6/2
SLC-11-B48	0.5	0.35	1.53	0.02	0.2	0.83	2.5Y 6/2
	4	0.35	1.51	0.25	0.21	0.84	2.5Y 6/2
SLC-11-B49	0.5	0.39	1.36	0.11	0.13	0.81	2.5Y 6/3
	4.5	0.43	1.21	0	0.21	0.76	2.5Y 6/2
	7.5	0.40	1.33	0	0.6	0.71	2.5Y 6/2
	12.5	0.48	1.06	0.34	0.47	0.8	2.5Y 6/2
SLC-11-B51	0.5	0.38	1.4	0.77	0.17	0.92	2.5Y 6/2
	5	0.44	1.17	0	0.44	0.71	2.5Y 6/2
	8.5	0.31	1.67	0	0.54	0.72	2.5Y 6/2
	11.5	0.35	1.53	0.27	3.52	0.88	5Y 6/2
SLC-11-B52	0.5	0.46	1.11	0.17	0.07	0.85	2.5Y 6/2
	4	0.36	1.47	0.35	0.19	0.73	2.5Y 6/2
	7.5	0.47	1.1	0.44	0.27	0.92	2.5Y 6/2
	11	0.39	1.37	0.05	1.29	0.85	5Y 6/2
SLC-11-B53	0.5	0.45	1.16	0.59	0.1	0.88	5Y 6/3
	4	0.32	1.65	0	0.19	0.75	5Y 5/2
	6	0.26	1.94	0	0.28	0.63	5Y 5/2
	9.5	0.48	1.07	3.04	0.59	1.26	5Y 6/2
SLC-11-B54	0.5	0.67	0.58	4.17	0.16	1.24	5Y 6/3
	3	0.53	0.92	2.05	0.27	1.12	5Y 6/2
	5.5	0.31	1.71	0.22	0.4	0.89	2.5Y 6/2
	9	0.34	1.55	0.03	0.44	0.73	2.5Y 6/2
	10.2	0.46	1.11	1.35	0.62	1.14	2.5Y 6/2
	14	0.36	1.47	0.05	0.99	0.85	2.5Y 6/2
SLC-11-B55	0.5	0.54	0.9	3.12	0.08	1.24	2.5Y 6/2

Boring Number	Sample Depth (ft)	Mean (mm)	Mean (phi)	Percent Fine Gravel* (%)	Percent Silt** (%)	Sorting / St. Dev (phi)	Munsell Color (moist)
SLC-11-B55	4	0.64	0.65	0.81	0.32	0.92	2.5Y 6/2
	8	0.27	1.88	0.26	0.56	0.75	2.5Y 5/2
	11.5	0.50	0.99	4.64	1.66	1.59	5Y 6/2
	13.5	0.27	1.91	0.14	1.94	0.88	2.5Y 5/2
SLC-11-B56	0.5	0.50	1.01	1.65	0.78	0.97	2.5Y 6/2
	4	0.40	1.33	0.18	0.63	0.76	2.5Y 6/2
	7.5	0.41	1.29	0.04	0.57	0.74	2.5Y 6/2
	11.5	0.43	1.21	0.08	0.6	0.79	2.5Y 5/2
SLC-11-B57	0.5	0.45	1.16	0.36	0.07	0.81	2.5Y 6/2
	5.5	0.33	1.58	0	0.23	0.6	2.5Y 6/2
	9	0.43	1.22	0.67	0.82	0.92	5Y 6/2
SLC-11-B59	0.5	0.51	0.96	2.21	0.09	1.12	2.5Y 6/2
	4	0.48	1.06	1.07	0.14	1.03	2.5Y 6/2
	7.5	0.34	1.54	0	0.38	0.88	2.5Y 6/2
	10.5	0.63	0.66	10.23	3.69	1.67	2.5Y 5/1
	12	0.40	1.31	0.02	0.14	0.79	2.5Y 5/1
SLC-11-B61	0.5	0.38	1.38	0.25	0.23	0.78	2.5Y 6/2
	4	0.40	1.34	0	0.2	0.6	2.5Y 6/2
SLC-11-B62	0.5	0.40	1.32	0.92	0.1	0.87	2.5Y 6/2
	4	0.34	1.54	0.72	0.68	0.88	5Y 7/1
	7	0.37	1.42	0.97	1.43	1.21	5Y 6/2
SLC-11-B65	1.5	0.53	0.91	0.14	0.43	0.98	2.5Y 6/2
	5.5	0.46	1.12	0.37	1.15	0.95	2.5Y 6/1
SLC-11-B69	0.5	0.40	1.33	1.14	0.17	1.02	2.5Y 6/2
	4.5	0.44	1.18	0.54	0.44	1.05	5Y 7/1
SLC-11-B70	2.3	0.50	1.01	2.02	0.3	1.16	2.5Y 6/2
	6.3	0.48	1.05	0.75	0.47	1.04	2.5Y 6/1
	8.3	0.31	1.68	0.21	0.84	0.78	5Y 7/1
SLC-11-B73	1	0.56	0.83	3.84	0.32	1.37	2.5Y 6/2
	4.5	0.42	1.24	0.07	0.59	1.02	2.5Y 6/2
	7	0.36	1.47	0.64	0.86	0.97	2.5Y 6/2
SLC-11-B74	0.5	0.61	0.71	2.8	0.11	1.12	2.5Y 6/3
	4.5	0.40	1.31	0.08	0.38	0.76	2.5Y 6/2
	7.5	0.54	0.88	3.6	0.61	1.24	2.5Y 6/2
	12	0.39	1.36	0	0.9	0.98	2.5Y 6/2
	14	0.32	1.64	0.1	2.33	0.93	5Y 6/2

Boring Number	Sample Depth (ft)	Mean (mm)	Mean (phi)	Percent Fine Gravel* (%)	Percent Silt** (%)	Sorting / St. Dev (phi)	Munsell Color (moist)
SLC-11-C100	0.5	0.65	0.63	5.84	0.17	1.51	2.5Y 6/2
	3	0.38	1.4	1.86	0.35	1.08	2.5Y 6/2
SLC-11-C101	0.5	0.63	0.67	0.11	0.45	0.91	2.5Y 6/3
	4	0.45	1.14	0.06	0.38	0.79	2.5Y 6/2
	6.5	0.32	1.65	0.07	0.82	0.86	2.5Y 6/2
SLC-11-C102	0.5	0.46	1.13	0	0.02	0.7	2.5Y 6/2
	4.5	0.48	1.07	0.22	0.08	0.85	2.5Y 6/2
	7	0.37	1.45	0	0.12	0.67	2.5Y 6/2
	11	0.33	1.58	0.03	0.22	0.63	2.5Y 6/2
	15.5	0.32	1.66	0	0.74	0.64	2.5Y 6/2
SLC-11-C103	0.5	0.51	0.96	1.05	0.23	1.09	2.5Y 6/2
SLC-11-C104	1	0.57	0.82	1.57	0.08	1.06	2.5Y 6/2
SLC-11-C110	0.5	0.37	1.43	0.23	0.26	0.85	2.5Y 6/2
	4.5	0.38	1.41	1	0.16	1.04	5Y 6/1
SLC-11-C75	0.5	0.51	0.97	0.61	0.37	0.9	2.5Y 6/2
	4	0.56	0.83	0.6	0.94	1.05	2.5Y 6/2
	7	0.47	1.09	0.16	0.8	0.89	2.5Y 6/3
SLC-11-C76	0.5	0.62	0.7	0.64	0.19	0.96	2.5Y 6/3
	4	0.39	1.36	0.2	0.51	0.77	2.5Y 6/2
	7	0.37	1.42	0.36	0.44	0.74	2.5Y 6/2
	10	0.42	1.24	0.06	0.59	0.87	2.5Y 6/2
	14	0.33	1.59	0.33	1.87	1.07	5Y 6/2
	16	0.31	1.7	0.04	2.99	0.89	5Y 6/2
SLC-11-C77	0.5	0.58	0.78	0.17	0.06	0.81	2.5Y 6/3
	4.5	0.42	1.25	0.05	0.44	0.72	2.5Y 6/2
	7	0.53	0.92	0.37	0.46	0.88	2.5Y 6/2
	10	0.46	1.12	0.23	0.71	0.93	5Y 6/2
	14	0.39	1.35	0	1.58	0.8	2.5Y 6/2
	16	0.39	1.37	0.06	3.4	0.91	5Y 7/2
SLC-11-C78	0.5	0.59	0.77	7.37	0.18	1.06	2.5Y 6/2
	4.5	0.41	1.28	0.09	0.26	0.84	2.5Y 6/2
	7	0.45	1.14	0.01	0.37	0.83	2.5Y 6/2
	10	0.33	1.58	0.31	0.93	0.83	5Y 6/1
	13	0.28	1.82	0	1.53	0.77	5Y 6/2
SLC-11-C79	0.5	0.55	0.86	1.13	0.07	0.94	2.5Y 6/3
	4	0.54	0.89	8.02	0.31	0.99	5Y 6/2

Boring Number	Sample Depth (ft)	Mean (mm)	Mean (phi)	Percent Fine Gravel* (%)	Percent Silt** (%)	Sorting / St. Dev (phi)	Munsell Color (moist)
SLC-11-C79	7	0.40	1.32	0.07	0.6	0.77	2.5Y 6/2
	10	0.46	1.13	0.07	0.24	0.93	2.5Y 6/2
	14.5	0.35	1.5	0.14	1.34	0.79	5Y 6/2
SLC-11-C82	0.5	0.63	0.67	0	0.01	0.82	2.5Y 6/3
	4	0.37	1.45	0	0.46	0.69	2.5Y 6/2
	7	0.40	1.31	0.57	0.66	0.91	2.5Y 6/2
	10	0.38	1.39	0.09	1.54	0.85	2.5Y 6/2
	14.5	0.36	1.49	0.38	3.98	0.97	5Y 7/2
SLC-11-C84	0.5	0.60	0.73	0.56	0.1	0.89	2.5Y 6/3
	4.5	0.54	0.89	0.22	0.42	0.97	2.5Y 6/2
	7	0.43	1.22	1.26	1.19	1.09	2.5Y 6/2
	10	0.67	0.57	6.37	1.06	1.6	2.5Y 6/2
	12	0.29	1.77	0.55	2.58	1.06	2.5Y 6/1
SLC-11-C85	0.5	0.55	0.85	0	0.06	0.66	2.5Y 6/3
	4	0.52	0.93	0.71	0.23	0.95	2.5Y 6/2
	7	0.39	1.35	0.28	0.32	0.67	2.5Y 6/2
	10	0.53	0.92	0.33	1.31	0.79	2.5Y 6/2
	14	0.40	1.31	0.08	2.39	0.94	2.5Y 6/2
SLC-11-C87	0.5	0.41	1.28	0.9	0.04	0.91	2.5Y 6/3
	4.5	0.31	1.7	0	0.21	0.66	2.5Y 6/2
SLC-11-C88	0.5	0.41	1.27	1.02	0.08	0.96	2.5Y 6/2
	4	0.70	0.52	0.05	0.26	0.87	2.5Y 6/3
	6.5	0.36	1.49	0	0.44	0.69	5Y 6/1
SLC-11-C89	0.5	0.77	0.38	7.18	0.19	1.34	2.5Y 6/3
	4	0.43	1.21	0	0.63	0.72	2.5Y 6/2
	7	0.48	1.05	0.27	1.34	1.05	2.5Y 6/2
	11.3	0.30	1.75	0.07	2.53	0.98	5Y 6/1
	12.5	0.64	0.64	2.9	1.46	1.39	2.5Y 7/1
	14	0.26	1.94	0.16	3.17	1	2.5Y 5/2
SLC-11-C94	0.5	0.57	0.81	3.09	0.04	1.18	2.5Y 6/2
	5	0.40	1.32	0.45	0.59	0.89	5Y 6/2
SLC-11-C95	0.5	0.34	1.54	0.61	0.16	0.88	5Y 6/2
	4.5	0.34	1.57	0	0.22	0.73	2.5Y 6/2
SLC-11-C96	0.5	0.42	1.26	1	0.13	1.02	2.5Y 6/2
	4.5	0.33	1.59	0	0.19	0.67	2.5Y 6/2
	6	0.47	1.09	0.12	0.18	0.96	2.5Y 6/2

Boring Number	Sample Depth (ft)	Mean (mm)	Mean (phi)	Percent Fine Gravel* (%)	Percent Silt** (%)	Sorting / St. Dev (phi)	Munsell Color (moist)
SLC-11-C97	1	0.75	0.42	6.79	0.1	1.43	2.5Y 6/3
	4.5	0.30	1.72	0	0.19	0.65	2.5Y 6/2
	6.4	0.49	1.02	5.98	0.22	1.33	2.5Y 6/2
	12.5	0.27	1.9	0	0.66	0.74	2.5Y 6/2
SLC-11-C98	0.5	0.82	0.28	7.47	0.03	1.38	2.5Y 6/2
	5.5	0.47	1.08	0	0.18	0.79	2.5Y 6/2
	9.5	0.64	0.64	0.84	0.36	1.07	2.5Y 6/2
	10.5	0.73	0.45	6.4	3.34	1.44	2.5Y 6/2
SLC-11-C99	1	0.69	0.54	6.2	0.11	1.38	2.5Y 6/2
	4	0.36	1.49	1.86	1.76	1.17	2.5Y 6/2
	6.5	0.42	1.26	0.06	0.46	0.81	2.5Y 6/2
	9	0.34	1.57	0.03	0.7	1	5Y 6/1
North St. Lucie Shoal Composite		0.44	1.21	1.05	0.68	0.93	2.5Y 6/2

GRAIN SIZE ANALYSIS RESULTS FOR SOUTH ST. LUCIE SHOAL SAND SOURCES

Table D - 3. Sediment Analysis Results from Vibracores in South St. Lucie Shoal

Sample Number	Sample Depth (ft)	Mean (mm)	Mean (phi)	Percent Fine Gravel* (%)	Percent Silt** (%)	Sorting / St. Dev (phi)	Munsell Color (moist)
SLC-11-A01	0.5	0.44	1.18	1.35	0.21	1.03	2.5Y 6/2
	4	0.47	1.1	0.15	0.68	0.86	5Y 5/2
	7	0.41	1.27	0.3	0.96	0.86	5Y 5/2
SLC-11-A02	0.5	0.50	0.99	0.06	0.17	0.78	2.5Y 6/2
	3.5	0.46	1.12	0.1	0.11	0.7	2.5Y 6/3
	6	0.39	1.35	0.45	0.35	0.86	5Y 5/2
	9.5	0.40	1.34	0.63	1.58	1	5Y 6/2
SLC-11-A03	0.5	0.48	1.07	0.29	0	0.86	2.5Y 6/2
	4.5	0.36	1.47	0.13	0.56	0.79	5Y 5/2
	8	0.46	1.11	1.71	0.59	0.97	5Y 5/2
SLC-11-A04	0.5	0.59	0.77	0.34	0.23	0.84	2.5Y 6/2
	4.5	0.43	1.23	0.29	0.47	0.7	5Y 7/1
	7	0.36	1.47	0	0.78	0.66	2.5Y 6/2
	11	0.41	1.3	0.07	1.59	0.99	5Y 7/1
	14.5	0.48	1.07	0.23	1.03	0.93	5Y 7/1
	17	0.45	1.16	0.49	1.04	0.99	5Y 7/1
SLC-11-A05	0.5	0.47	1.08	0.77	0.09	0.87	2.5Y 6/2
	3.5	0.68	0.56	5.56	0.21	1.35	2.5Y 7/1
	6	0.40	1.32	0.14	0.45	0.75	5Y 5/2
	7.5	0.70	0.51	6.02	2.43	1.44	2.5Y 7/1
SLC-11-A06	0.5	0.46	1.13	1.16	0.25	0.95	2.5Y 6/2
	4.5	0.35	1.53	0.1	0.3	0.74	5Y 5/2
	8	0.45	1.14	1.85	1.34	1.19	5Y 5/1
	9.5	0.52	0.95	2.83	3.7	1.29	5Y 6/1
	11	0.42	1.26	0.09	1.22	0.84	5Y 6/1
SLC-11-A07	0.5	0.40	1.32	0.23	0.09	0.71	2.5Y 6/2
	4.5	0.32	1.63	0.2	0.96	0.95	5Y 5/2
	7	0.39	1.36	0.78	0.66	0.94	5Y 5/2
SLC-11-A08	0.5	0.49	1.03	0.15	0.04	0.77	2.5Y 6/2
	5	0.48	1.07	0.04	0.08	0.71	2.5Y 6/2
	8.5	0.46	1.13	1.49	0.21	0.96	2.5Y 7/1
	9.5	0.80	0.32	8.86	1.63	1.63	2.5Y 7/1
	14.5	0.41	1.29	0.68	0.8	0.89	2.5Y 6/2

Sample Number	Sample Depth (ft)	Mean (mm)	Mean (phi)	Percent Fine Gravel* (%)	Percent Silt** (%)	Sorting / St. Dev (phi)	Munsell Color (moist)
SLC-11-A09	0.5	0.5	0.61	0.72	5.86	0.15	1.2
	5	5	0.44	1.18	0.49	0.2	0.85
	8.5	8.5	0.69	0.53	5.99	2.04	1.4
	11.5	11.5	0.45	1.16	0.11	0.74	0.91
SLC-11-A10	0.5	0.5	0.49	1.04	0.34	0.14	0.79
	4.5	4.5	0.45	1.14	0.03	0.33	0.77
	7.5	7.5	0.47	1.09	0.09	0.44	0.76
	11	11	0.33	1.6	0	0.99	0.71
SLC-11-A11	0.5	0.5	0.64	0.64	1.09	0.06	0.94
	4.5	4.5	0.59	0.75	0.52	0.06	0.9
	8	8	0.38	1.41	0.15	0.76	0.64
	12	12	0.34	1.57	0.29	3.54	0.75
	15.5	15.5	0.30	1.76	0	2.89	0.72
SLC-11-A12	0.5	0.5	0.45	1.15	2.35	0.08	1.18
	7	7	0.63	0.66	0.16	0.17	0.74
	11	11	0.44	1.18	0.19	0.79	0.83
	15	15	0.27	1.88	0.06	3.08	0.83
SLC-11-A13	0.5	0.5	0.58	0.79	1.14	0.1	0.89
	4	4	0.53	0.92	0.47	0.1	0.8
	6	6	0.78	0.36	4.26	0.2	1.26
SLC-11-A14	0.5	0.5	0.63	0.66	0.12	0.13	0.7
	4.5	4.5	0.55	0.85	0.13	0.09	0.73
	8	8	0.63	0.66	0	0.09	0.72
	12.5	12.5	0.55	0.85	0.63	0.39	0.89
	14.1	14.1	0.30	1.73	0	2.62	0.63
	17	17	0.52	0.94	0.27	0.42	0.88
SLC-11-A15	0.5	0.5	0.54	0.88	0.29	0.09	0.78
	4	4	0.61	0.72	0.11	0.1	0.8
	10	10	0.40	1.32	0	3.26	0.79
	15	15	0.32	1.66	0	3.95	0.59
SLC-11-A16	0.5	0.5	0.52	0.93	0.29	0.17	0.78
	6.5	6.5	0.42	1.26	0.07	0.11	0.72
	10	10	0.37	1.42	0	0.26	0.86
	14.5	14.5	0.57	0.8	2.69	2.61	1.36
SLC-11-A17	0.5	0.5	0.49	1.04	0.62	0.09	0.95
	4.5	4.5	0.56	0.83	0.33	0.12	0.96

Sample Number	Sample Depth (ft)	Mean (mm)	Mean (phi)	Percent Fine Gravel* (%)	Percent Silt** (%)	Sorting / St. Dev (phi)	Munsell Color (moist)
SLC-11-A17	8	0.38	1.38	0.17	0.34	0.82	5Y 5/2
	12.5	0.42	1.26	0.03	0.82	0.8	2.5Y 5/1
SLC-11-A18	0.5	0.68	0.56	1.12	0.23	1.07	2.5Y 7/1
	4	0.37	1.42	0	0.41	0.76	2.5Y 5/1
	6.5	0.36	1.49	0	0.44	0.81	5Y 5/2
SLC-11-A19	0.5	0.37	1.43	0	0.07	0.61	2.5Y 6/2
	4	0.37	1.43	0	0.96	0.8	5Y 5/2
	7.5	0.42	1.25	0	0.5	0.83	5Y 5/2
SLC-11-A20	0.5	0.56	0.84	2.21	0.31	1.1	2.5Y 6/3
	4	0.50	1	0.87	0.48	0.92	5Y 5/2
	5.5	0.58	0.79	1.57	1	1.19	5Y 5/2
	8	0.33	1.59	0.28	1.02	0.91	2.5Y 5/1
	12	0.30	1.75	0	0.45	0.67	5Y 5/2
	15.5	0.33	1.62	0	2.15	0.79	2.5Y 5/1
SLC-11-A21	0.5	0.49	1.04	0	0.13	0.55	2.5Y 6/3
	4	0.57	0.8	0.04	0.47	0.75	2.5Y 6/3
	7.5	0.47	1.1	0.61	0.37	1.02	5Y 5/2
	9.5	0.95	0.07	7.37	0.5	1.31	2.5Y 7/1
	13.5	0.36	1.48	0	1.82	0.69	5Y 5/2
	16.5	0.34	1.54	0	0.91	0.91	2.5Y 5/1
SLC-11-A22	0.5	0.45	1.15	0	0.11	0.73	2.5Y 6/2
	4.5	0.39	1.36	0.27	0.77	0.86	5Y 5/2
	8	0.37	1.42	0.28	1.11	0.99	5Y 5/2
	13	0.33	1.59	0	0.65	0.75	5Y 5/2
	16.5	0.32	1.63	0	2.19	1.01	2.5Y 5/1
SLC-11-A26	0.5	0.63	0.67	0.78	0.18	0.83	2.5Y 6/3
	4.5	0.48	1.07	2.19	3.14	1.11	5Y 5/2
	7	0.59	0.77	3.36	3.23	1.19	5Y 5/2
	8.2	0.65	0.62	2.63	0.84	1.29	2.5Y 7/1
	13	0.28	1.84	0	0.97	0.8	2.5Y 5/1
SLC-11-A27	0.5	0.45	1.16	0.21	0.32	0.78	2.5Y 6/2
	4.5	0.48	1.05	0.53	1.11	1.06	5Y 5/2
	5.4	0.30	1.72	0	0.78	0.76	2.5Y 5/1
	8	0.31	1.67	0.33	1.02	1	2.5Y 5/1
	9.4	0.55	0.85	5.72	1.48	1.53	5Y 5/2
	11.7	0.32	1.63	0.15	1.13	0.95	5Y 5/1

Sample Number	Sample Depth (ft)	Mean (mm)	Mean (phi)	Percent Fine Gravel* (%)	Percent Silt** (%)	Sorting / St. Dev (phi)	Munsell Color (moist)
SLC-11-A29	1	0.46	1.12	1.75	0.17	1.06	2.5Y 6/2
	4.5	0.54	0.89	0.42	0.15	0.79	2.5Y 6/3
	7.5	0.38	1.38	0.28	2.82	0.84	2.5Y 6/2
	9.3	0.43	1.22	0.24	3.26	0.99	2.5Y 6/2
	14	0.45	1.16	2.09	2.7	1.15	2.5Y 6/2
SLC-11-A30	1	0.42	1.24	0.19	0.01	0.71	2.5Y 6/2
	4.5	0.42	1.24	0	0.17	0.77	2.5Y 6/3
	7.5	0.37	1.44	0.12	0.38	0.76	2.5Y 6/2
	11.5	0.55	0.85	4.13	3.39	1.43	2.5Y 6/2
	15.5	0.40	1.31	0.09	1.22	0.97	2.5Y 6/2
SLC-11-A33	0.5	0.49	1.02	0.33	0.36	0.87	2.5Y 6/2
	3	0.36	1.49	0.54	1.09	0.85	2.5Y 6/2
	7.5	0.47	1.1	2.87	3.27	1.29	2.5Y 6/2
	13	0.47	1.1	2.02	3.24	1.17	2.5Y 6/2
South St. Lucie Shoal Composite			**0.47**	**1.15**	**0.95**	**0.93**	**0.91**

*Retained in the #4 Sieve, **Passing the #230 Sieve