

Department of Natural Resources
MARYLAND GEOLOGICAL SURVEY
Richard A. Ortt, Jr., Director

COASTAL AND ENVIRONMENTAL GEOLOGY
FILE REPORT NO. 18-02

**Offshore Sand Resources in South-Central Maryland
Shoal Fields**

Technical Report

by
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Submitted to
Bureau of Ocean and Energy Management
Marine Minerals Program

In partial fulfillment of
Contract #M14AC00007
Revised June, 2019

DNR Publication Number: 12-072419-159
Coastal and Environmental Geology File Report Number: 18-02



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Table of Contents

<u>Section</u>	<u>Page</u>
List of Figures	3
List of Tables	3
Introduction	4
Investigation	4
Objective	4
Study Area	4
Study methodology	6
Digital analysis of sub-bottom data	8
Results	9
Sediment Volumes	13
Conclusion	13
References	14
Appendix A	15
Appendix B	18

List of Figures

Figure 1: Shoal fields along Maryland’s coastline	5
Figure 2. Example of sub-bottom imagery	6
Figure 3: Study area bathymetry	7
Figure 4: Seismic image with vibrocore location	8
Figure 5: Shoal locations and thickness	10
Figure 6: Ravinement surface of the study area	11
Figure 7: Map of study shoal field with sampled mean grain size	12

List of Tables

Table 1: Locations of vibrocores collected and processed by CB&I	6
Table 2: Bulk calculated vibrocore statistics and classifications for shoal-sands	9
Table 3: Individual shoal statistics	13

Introduction

After Hurricane Sandy in 2012, there was interest in developing more resilient shorelines to reduce their damage and erosion when exposed to powerful storms. In 2015, 2016, and 2017 the Bureau of Ocean Energy Management (BOEM) funded offshore surveys to identify new sand resources along the Atlantic coast to build an inventory of offshore sand resources. The inventory will aid the development of coastal resilience to protect infrastructure and habitat. To this end, BOEM initiated the Atlantic Sand Assessment Project (ASAP) to identify new sand resource potential from geological and geophysical research. Chicago Bridge & Iron Company (CB&I) was contracted by BOEM to carry out the ASAP and collect the relevant offshore data, including side scan imagery, seismic profiles, vibracores and grab samples.

Maryland's only coastal resort, Ocean City, is of significant economic and recreational importance to the state. However, urbanization of the barrier islands has led to enhanced erosion, which when combined with the natural migration of these landforms, threatens infrastructure and economy. One of the primary methods for protecting the barrier islands and other threatened areas is beach nourishment. The U.S. Army Corps of Engineers determined that offshore sands are the best source for beach nourishment projects in Maryland, though the sands must meet specific grain size criteria and be close enough to the nourished destination to warrant extraction (U.S. Army Corps of Engineers, 1980; U.S. Army Corps of Engineers, 1994). Sand nourishment has previously targeted sand shoals within the three-mile state water jurisdiction. However, the increase of strong storms in recent years has eroded the previously nourished beaches more than expected, which has led to higher demand for offshore sands. Sands in federal waters have since been targeted as potential sources for beach nourishment.

Investigation

Objective

As part of a multi-state cooperative agreement through BOEM, the objective of this study is to define the shoal boundaries and estimate the sand volume of a shoal field off the coast of Maryland. This study is considered a successor to a series of shoal studies performed in the mid to late 1990s by Conkwright and others to more accurately define sand resource potential in other nearby shoal fields off of Maryland's coast. This project is one of many that incorporates into BOEM's national offshore sand inventory. Previous, related shoal studies off the coast of Maryland include those by Conkwright and Gast, 1994a; Conkwright and Gast, 1994b; Conkwright and Gast, 1995; Conkwright and Williams, 1996; and Conkwright et al., 2000, where designated Shoal Fields 1, 2, and 3 (Figure 1) were sampled and investigated as potential sand resources in federal waters for ongoing beach restoration projects near Ocean City, MD and on Assateague Island, MD.

Study Area

Since previous studies designated the surrounding shoals as Shoal Field 1 through 3, we continued this naming convention and designate the shoal field of this study Shoal Field 4 (Figure 1). The western-most extent of Shoal Field 4 is about 6.5 km from the Maryland

coastline and has an eastern-most extent of 16 km off the coast. The north-south extent of the field spans 25 km, or about 50 percent, of the Maryland coastline. The centroid of the closest shoals in this field are about 15 km from Ocean City, Maryland, while the more distal shoals are at a distance of about 30 km. Shoal Field 4 covers 184 square kilometers of ocean floor, with depths ranging between -24 m and -10 m below Mean Lower Low Water (MLLW) datum. The area of Shoal Field 4 fills in some of the gap between Shoal Field 2 and Shoal Field 3 for volume-calculated shoal fields off the Maryland coast.

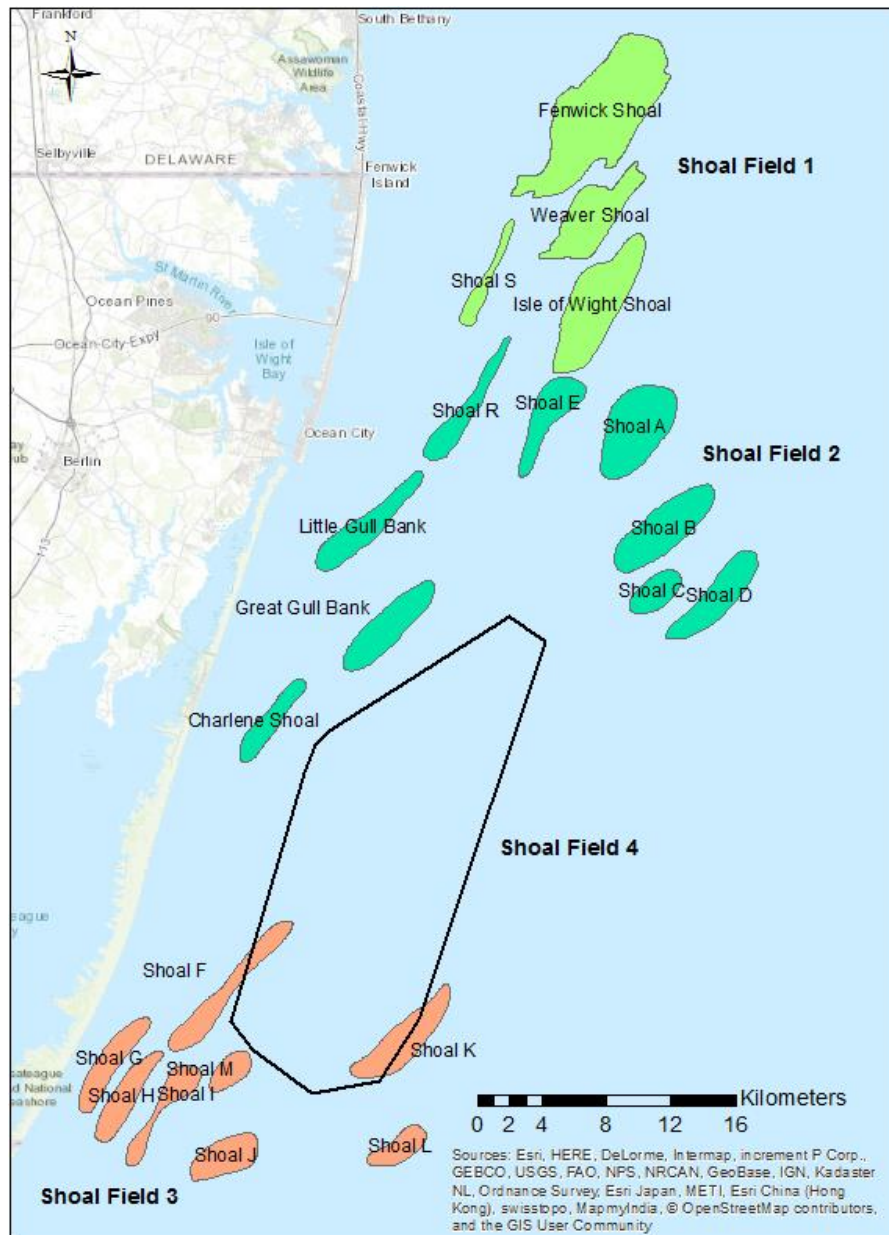


Figure 1: Shoal fields along Maryland’s coastline. Shoal Fields 1, 2, and 3 were the focus of previous studies on potential sand resources. The outline for Shoal Field 4 is the extent of the study area for this project.

Study methodology

The goal of this study is to accurately delineate the shoal boundaries in Shoal Field 4 and determine the sand volume of each shoal from vibracore and seismic data. CB&I provided sub-bottom data and vibracore logs as part of their contract with BOEM. The vibracore data report included sediment classification and significant statistical parameters, such as mean grain size and phi sorting. Sub-bottom seismic imagery reveals sediment stratification and structure that combine with vibracore data to help delineate the transition between the upper sandy-shoal layer and other underlying layers, such as mud or clay, which are undesired for beach nourishment. The sub-bottom data was collected with an EdgeTech 3200 sub-bottom profiler and a 512i towfish. Pulse frequency varied between 0.5 and 12.0 kHz to maintain image quality in the sub-surface. The data was collected between June 12, 2015 and June 13, 2015 and was provided in NAD 1983 Universal Transverse Mercator (UTM) Zone 18N projection. Additional technical details regarding collection and analysis by CB&I can be found in the first few pages of Appendix B. An example of the sub-bottom imagery can be seen in Figure 2. See Table 1 and Figure 3 for vibracore details and location.

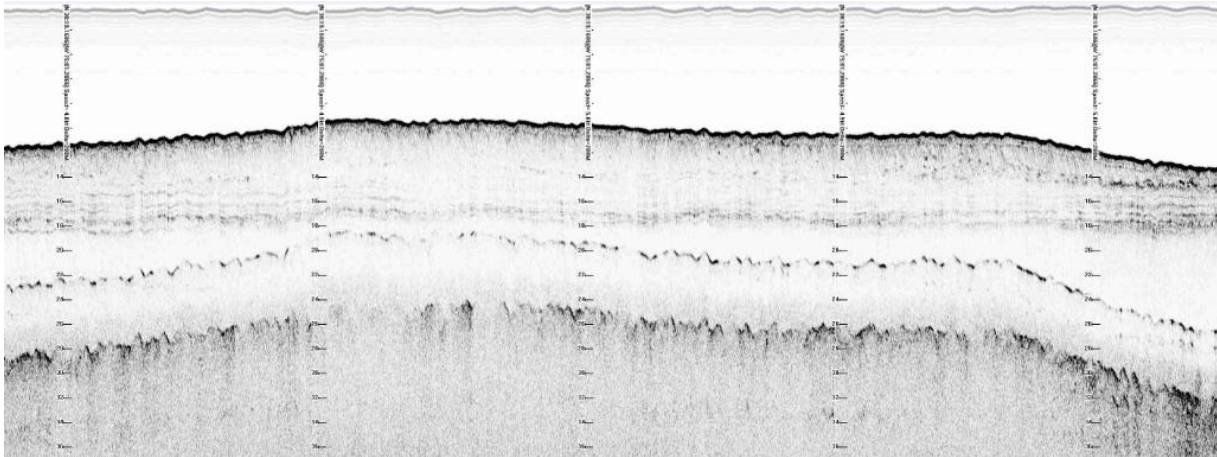


Figure 2. Example of sub-bottom imagery. The solid, darkest line is the seafloor surface. This particular image was collected along a track line perpendicular to the long-axis of the shoal. Depth measurement units are in feet.

Table 1: Locations of vibracores collected and processed by CB&I. Boring depth, length and elevation are in meters. Boring elevation measurements are referenced to datum NAVD88 (Geoid Model 12A).

Core ID	Easting	Northing	Depth of Boring	Core Length	Boring Elevation
VC01	502208.24	4232414.05	6.09	5.88	-19.05
VC03	499019.65	4228739.09	4.69	4.33	-21.12
VC03A	499018.24	4228738.15	5.12	3.02	-21.03
VC04	496902.04	4227038.42	4.57	5.33	-15.91
VC05	498215.54	4219404.14	5.76	5.88	-17.13
VC07	495479.74	4213018.20	5.12	5.78	-13.84

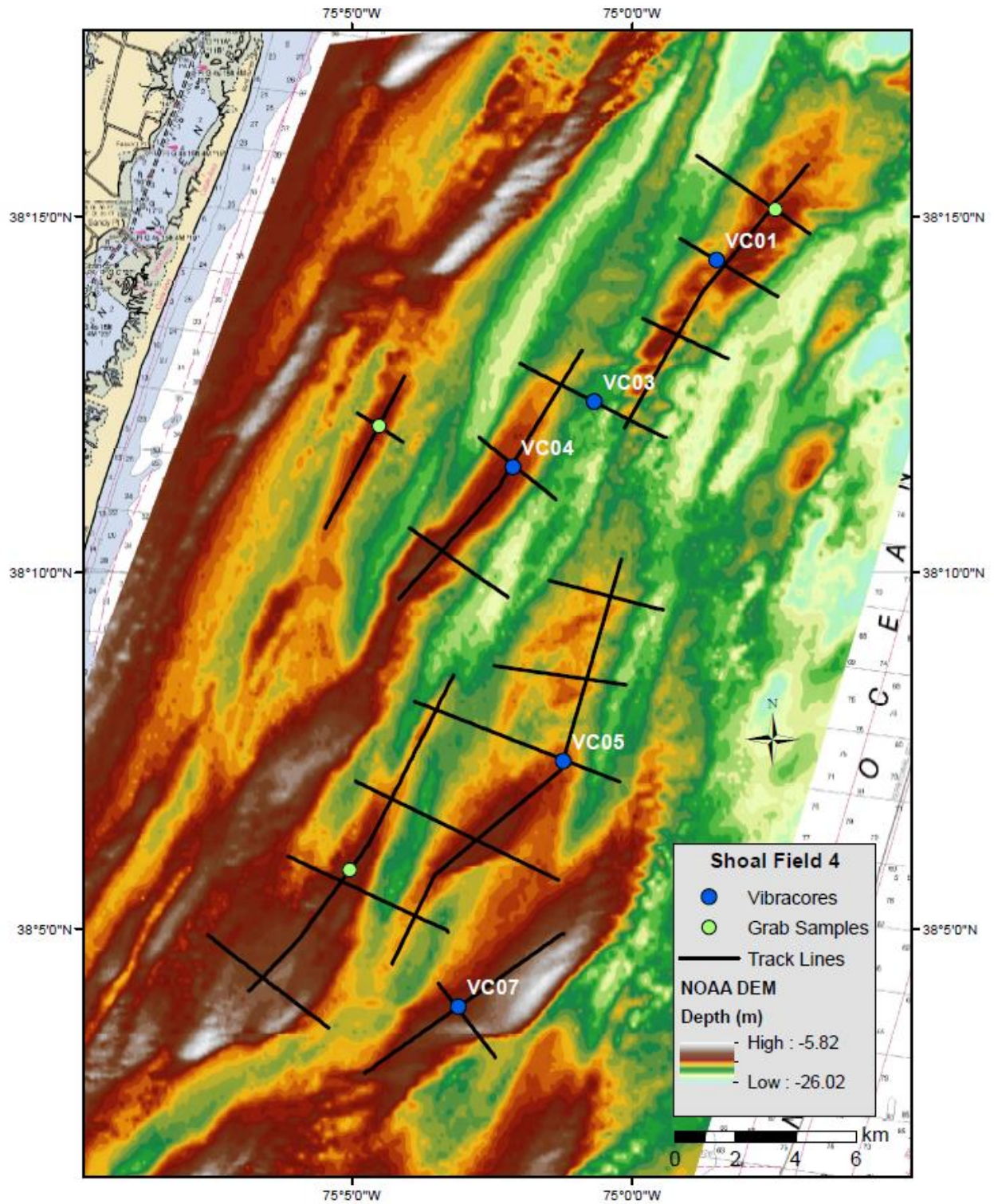


Figure 3: Interpolated bathymetry (TIN) raster of the study area, derived from merged USGS and ASAP data. Mean lower low water (MLLW) datum. Smoothed using Focal Statistics. Map includes location of track lines and samples collected by CB&I. VC03 vibracore label comprises both VC03 and VC03A core location.

Digital analysis of sub-bottom data

First, we imported the sub-bottom seismic files (.jsf file type) and vibracore data into Sonarwiz5 and digitized the lower boundary layer of shoals in the study area. Vibracore logs acted as an anchor point to assist in distinguishing significant lithologic transitions between the upper sandy shoal layer and lower non-sand layers. We consider the lower boundary layer to be the ravinement surface and the base of the Q5 transgressive shelf shoal unit described in Toscano and others (1989). Shoal edges were defined where shoal sediments pinched-out to one meter or less, continuing the methods from previously mentioned studies near this study area that considered one meter sediment thickness to be the practical limit for dredging. Using the calculate thickness tool in Sonarwiz5, we were able to produce a shoal thickness feature between the upper-boundary bathymetry layer and digitized ravinement surface (Figure 4). The shoal thickness output was exported in a comma separated value (.csv) format and imported into ArcGIS 10.1 as xyz data points. The next objective was to interpolate shoal thickness from the imported points. This involved creating a Triangulated Irregular Network (TIN) from the points, then converting the TIN to a raster dataset to produce an interpolated thickness layer for the entire study area. Individual shoal extents were delineated as a subset from this thickness layer where sediment thickness was at least one meter. Area and volume calculations for each shoal were completed using ArcGIS.

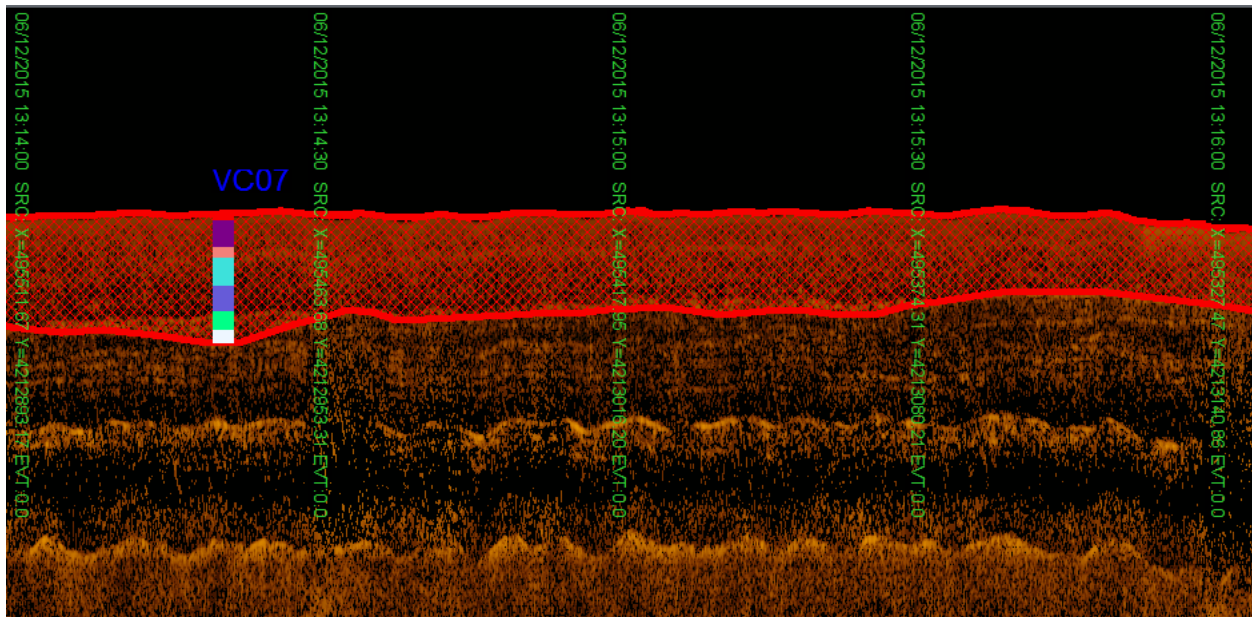


Figure 4: Seismic image with vibracore location. Crosshatched area represents the shoal thickness layer produced in Sonarwiz5, which is then exported and brought into ArcGIS for later interpretation between seismic lines. Vibracore VC07 is split visually and color coded into multiple layers to match the different lithology transitions that were classified in the vibracore logs.

Results

Shoal Field 4 contains eight individual shoals (Figure 5), each with linear, elongated bodies on a northeast axial trend typical of other shoal fields in the area. The highest bathymetric elevation is -9.4 meters in the southeast area of shoal W and the deepest shoal elevation is -23.2 meters along the southeastern edge of shoal O. The mean elevation of the shoal field is -16.2 meters. Shoal sediments are predominantly horizontal with little structure. Paleochannel features are visible in some seismic images but occur at depth and below the shoal base. A distinct reflector underlies the shoal field and is considered the ravinement surface (Figure 6) described by Toscano et al. (1989). While distinct, this ravinement surface is occasionally difficult to observe, which may be due to loss of image quality with depth or sufficient sediment mixing during formation that obscures the apparent transition. All vibracores except VC04 and VC07 penetrated the ravinement surface. In every instance where vibracores penetrated the ravinement surface a clay layer is found to underlie it, which has a minimum thickness of 0.4 meters in VC03 and maximum thickness of 3.7 meters in VC01. Bulk core statistics indicate shoal-sand size varies between medium and coarse sand that is poorly to moderately sorted (Table 2) with a couple of samples indicating moderately well to well sorted (Figure 7). Vibracore sediments above the ravinement surface are primarily medium sands with few deviations toward fine or coarse sand (Appendix A). To note, at 2.5 to 3.0 meters depth in VC05 there is a transition from medium sands to an elevated percentage (51%) of pebble sized grains where whole shell, shell fragments and trace rock are observed (VC05 Sample #3). Conversely, the largest percentage of fine sands per sample is concentrated at the bottom of VC07 at 73.5% (VC07 Sample #7). Mean grain size for the whole shoal field varies between 0.33 and 0.88 millimeters and exhibits a trend of medium sands in the northern shoals (Figure 7).

Table 2: Bulk calculated vibracore statistics and classifications for shoal-sands. Statistics are calculated using data from sand layers above the ravinement surface and includes the weighted mean grain size and sorting classification. Weighted mean grain size values are in millimeters and includes phi grain size equivalent. This study adopts the Wentworth (1922) size scale to classify grain size. Vibracore VC03A is not included in this table as it does not contain material above the ravinement surface (see vibracore VC03A log in Appendix B for additional details). Skewness and kurtosis statistics are also available in the vibracore logs enclosed in Appendix B.

Cores	Weighted Mean	Wentworth Size Class	Mean Phi Sorting	Classification
VC01	0.32 (1.64 ϕ)	medium sand	1.17 ϕ	poorly sorted
VC03	0.36 (1.47 ϕ)	medium sand	1.00 ϕ	poorly sorted
VC04	0.44 (1.18 ϕ)	medium sand	0.82 ϕ	moderately sorted
VC05	0.76 (0.40 ϕ)	coarse sand	0.99 ϕ	moderately sorted
VC07	0.55 (0.86 ϕ)	coarse sand	1.11 ϕ	poorly sorted

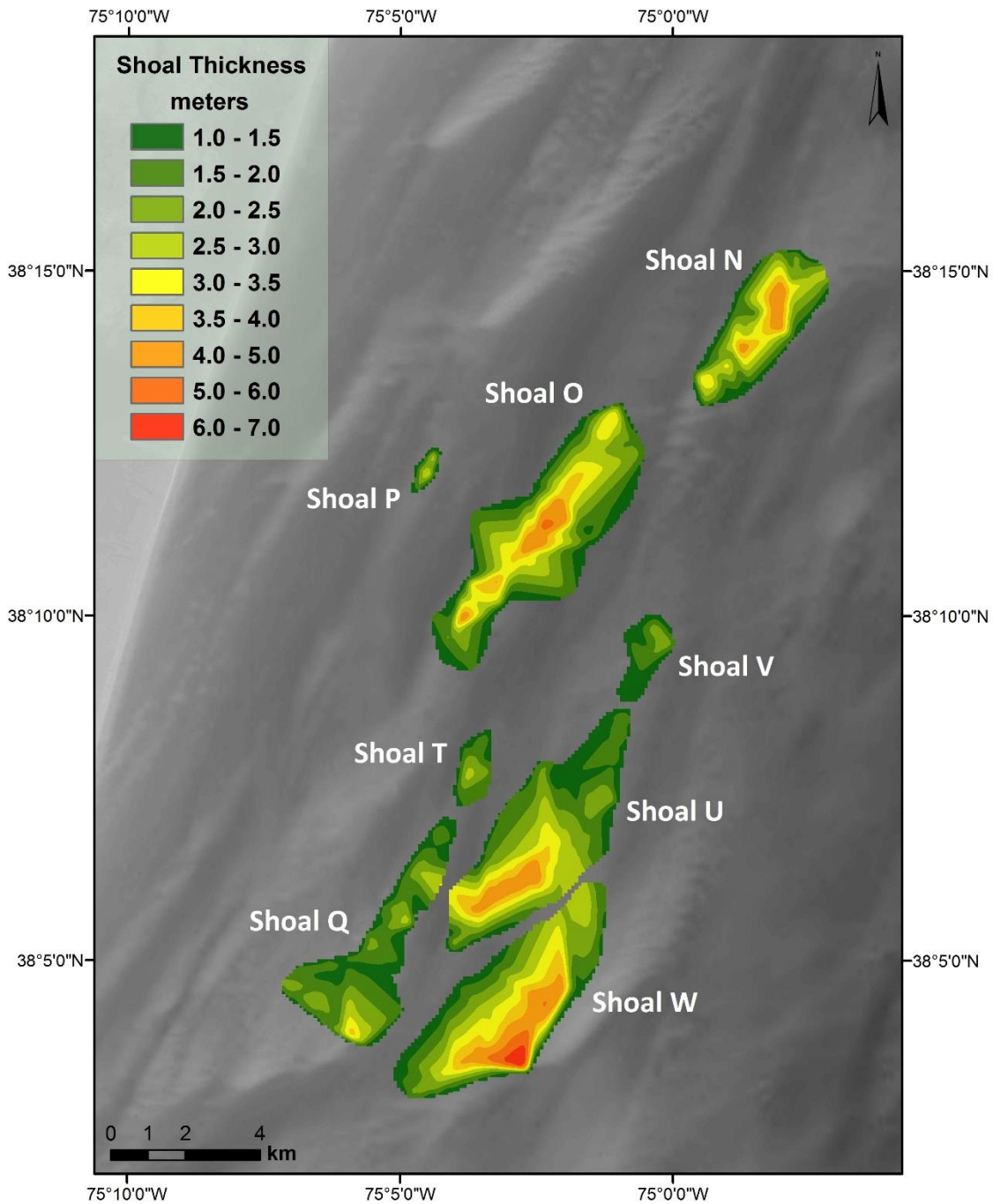


Figure 5: Shoal locations and thickness. The total sand package per shoal is classified here where sand thickness is greater than one meter. Shoals are labeled following the naming scheme of previously studied shoals in the region (the latest named shoal is 'M', thus the next 8 shoals here are given the successive letters N through W of the alphabet; letters R and S are already used for other shoals, so they were skipped). Track lines are shown for reference. Background imagery is an elevation model of the Maryland coast.

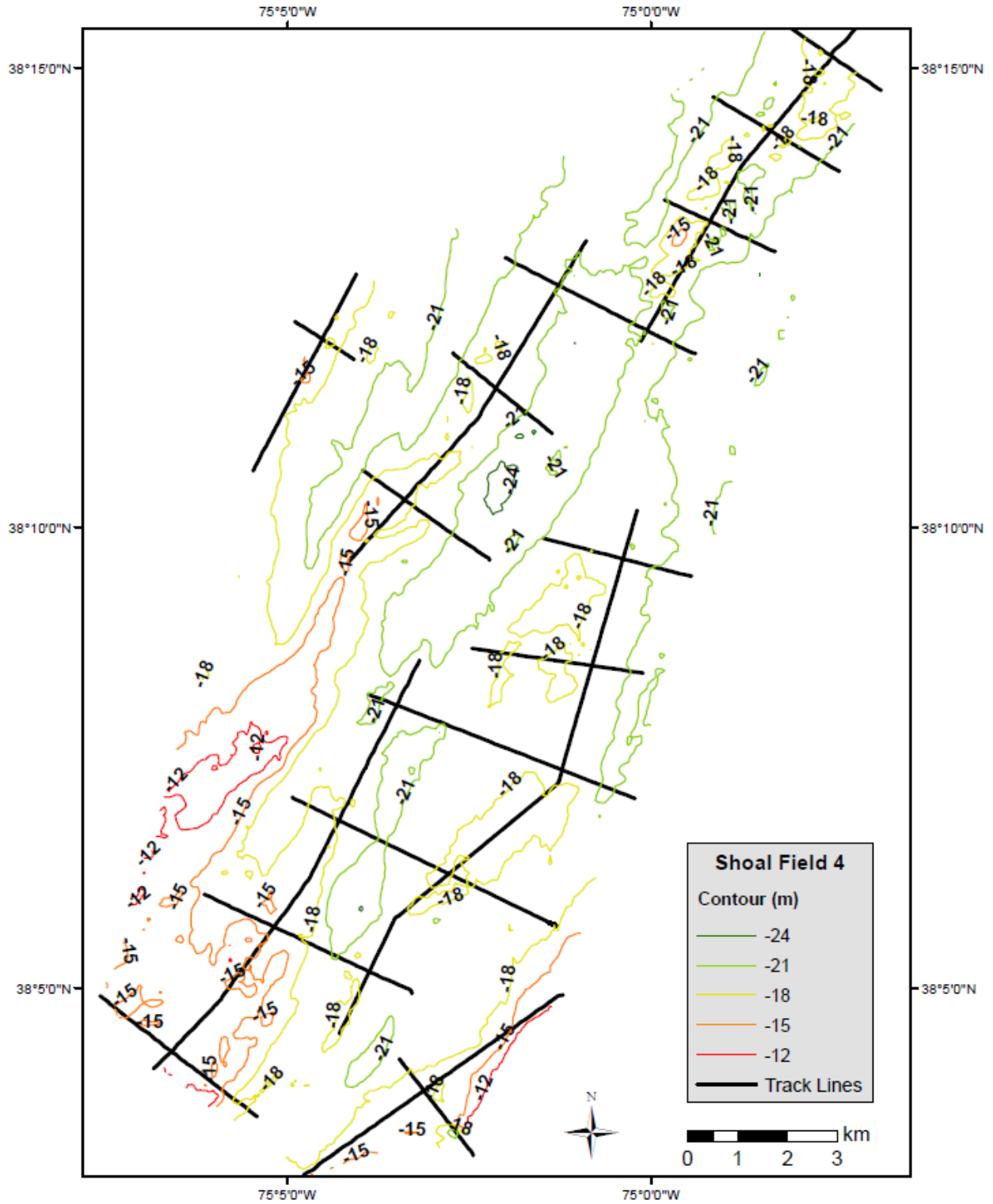


Figure 6: Ravinement surface of the study area. Subtracting out the interpolated shoal thickness layer from the bathymetric map (from Figure 3) produced this interpolated ravinement surface. Track lines shown for reference. Contour units are in meters below sea level.

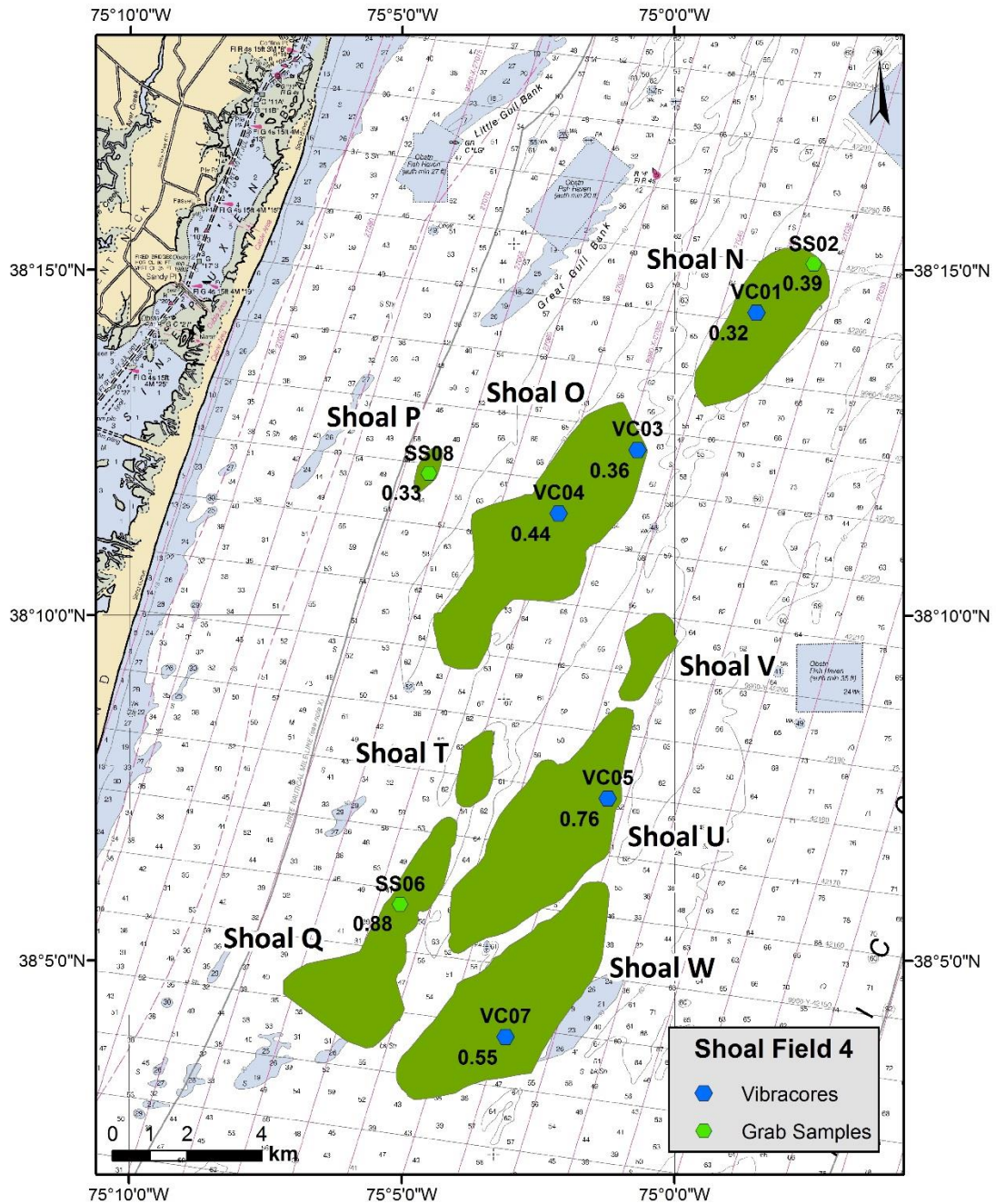


Figure 7: Map of study shoal field with sampled mean grain size. Labeled point values are in millimeters. Visualizing the mean grain size of both the vibracores and grab samples reveals a trend of medium sands in the northern shoals while coarse sands are more dominant in the southern shoals. The vibracore in the southern-most shoal (VC07) has a range of grain sizes between fine and pebble that coarsens upward in section, which may explain the lower, nearly medium, averaged sand value of 0.55 mm compared to neighboring shoals.

Sediment Volumes

Sediment volume calculations for this study are available in Table 3. Volumes include material above the shoal ravinement surface and below the bathymetric seafloor surface where sediment thickness is greater than one meter. Total shoal volume is nearly 160 million cubic meters over an area of 67 million square meters. To compare with nearby shoal fields, Fenwick Shoal (Shoal Field 1) contains over 161 million cubic meters of shoal material over an area of 27 million square meters (Conkwright et al., 2000), making Fenwick Shoal more concentrated and therefore easier to extract from an economic point of view. However, slightly north of this study area is the Great Gull Bank shoal (Shoal Field 2), which contains 43 million cubic meters of material over an 8 million square meter area (Conkwright and Gast, 1994b), a comparable numeric to shoal W in this study.

Table 3: Individual shoal statistics. Asterisk (*) indicates ‘million’.

Shoal ID	Area (*m²)	Volume (*m³)	Maximum thickness (m)	Mean thickness (m)
N	7.68	19.47	4.98	2.54
O	16.67	40.01	5.94	2.40
P	0.38	0.92	3.59	2.41
Q	9.11	16.93	4.18	1.86
T	1.42	2.66	3.04	1.88
U	14.63	34.52	4.87	2.36
V	1.98	3.07	2.43	1.56
W	15.16	42.26	7.43	2.79
Total:	67.03	159.84		

Conclusion

Eight shoal deposits were identified in Shoal Field 4 for a total estimated volume of nearly 160 million cubic meters. Shoal W has the highest volume followed closely by Shoal O, together making up over half of the total Shoal Field 4 volume. The shoals are dominated by medium sands with some layers trending to fine or coarse sand. Previous shoal studies in this area determined sand resource potential by comparing the shoal mean grain size and sorting to that of native Ocean City beach sand. This helps to gauge how well shoal sand would match the beach sand for replenishment, and accounts for the additional sand required to maintain the beach deposit once equilibrium is reached. Those values are: a mean grain size diameter of 1.84 ϕ (phi) or 0.279 mm and sorting of 1.22 ϕ (Anders and others, 1987; Anders and Hansen, 1990). Areas of high resource potential must exceed these parameters by having a mean grain size larger than 0.279 mm and sorting less than 1.22 ϕ . Comparing each vibracore bulk-calculated parameter (refer to Table 2) reveals all samples, including grab samples, exceed this threshold for high resource potential for Ocean City beaches. Thus indicating, at least for the shoals studied here, that all shoals in this study area have a high resource potential.

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Appendix A

Textural Data

The table below contains the textural data for vibracore samples used in this study. Sample numbers for the vibracore ID links to the sample number in their respective vibracore drilling log in the remarks section, available in Appendix B. Percentages refer to sediment classification under the Wentworth system. Mean grain size diameter is reported in millimeters and sorting is reported in ϕ (phi) units. Skewness and kurtosis are dimensionless. Percentages indicate weight percent of the full sample.

Sample ID	Sample Depth	% Mud	% Very Fine Sand	% Fine Sand	% Medium Sand	% Coarse Sand	% Very Coarse Sand	% Gravel	% Pebble
MD-BOEM-2015-VC01 #1	-19.84	1.37	1.87	40.77	40.09	10.71	1.25	0.60	3.34
MD-BOEM-2015-VC03 #1	-21.73	1.91	1.53	24.91	45.81	17.05	6.35	1.66	0.78
MD-BOEM-2015-VC03 #2	-22.65	1.52	1.16	31.05	46.52	15.85	2.90	0.45	0.55
MD-BOEM-2015-VC03 #3	-23.32	6.54	4.70	38.12	25.95	8.32	2.72	3.55	10.10
MD-BOEM-2015-VC04 #1	-16.52	1.00	0.48	11.49	66.62	18.89	1.17	0.14	0.21
MD-BOEM-2015-VC04 #2	-17.43	1.18	0.28	5.85	44.63	37.78	5.63	1.73	2.92
MD-BOEM-2015-VC04 #3	-18.96	0.94	0.46	12.75	58.46	22.01	3.82	1.19	0.37
MD-BOEM-2015-VC04 #4	-20.45	1.46	1.32	12.76	52.70	24.36	4.86	1.62	0.92
MD-BOEM-2015-VC05 #1	-17.83	0.87	0.28	6.17	51.66	31.50	7.15	2.25	0.12
MD-BOEM-2015-VC05 #2	-19.11	1.34	0.29	6.79	56.60	25.62	6.67	1.66	1.03
MD-BOEM-2015-VC05 #3	-19.84	2.11	0.73	5.67	7.54	12.41	10.66	9.54	51.34
MD-BOEM-2015-VC05 #4	-20.03	2.20	0.62	17.19	28.01	12.27	6.38	6.21	27.12
MD-BOEM-2015-VC07 #1	-14.05	0.60	0.15	5.34	23.56	26.38	8.91	10.04	25.02
MD-BOEM-2015-VC07 #2	-14.81	0.91	0.26	9.16	40.78	37.75	7.83	2.14	1.17
MD-BOEM-2015-VC07 #3	-15.58	0.73	0.20	4.81	24.22	29.65	9.72	6.72	23.95
MD-BOEM-2015-VC07 #4	-16.52	1.20	0.57	18.81	48.55	18.57	3.16	0.92	8.22
MD-BOEM-2015-VC07 #5	-17.50	0.94	0.44	18.76	47.07	25.71	5.34	1.01	0.73
MD-BOEM-2015-VC07 #6	-18.47	1.43	0.66	17.15	56.62	21.16	2.06	0.41	0.51
MD-BOEM-2015-VC07 #7	-19.14	2.01	4.32	73.52	19.28	0.75	0.09	0.03	0.00
MD-BOEM-2015-SS02	-14.78	1.02	0.14	15.40	59.61	20.34	3.09	0.40	0.00
MD-BOEM-2015-SS06	-16.64	0.86	0.06	4.70	18.36	38.98	22.41	8.47	6.16
MD-BOEM-2015-SS08	-14.81	1.30	0.25	14.18	78.18	5.72	0.27	0.05	0.05

Sample ID	% Total Sand	Mean Phi	Mean	Sorting	Skewness	Kurtosis	Class
MD-BOEM-2015-VC01 #1	94.69	1.63	0.32	1.17	-2.57	11.45	Medium Sand
MD-BOEM-2015-VC03 #1	95.65	1.40	0.38	0.98	-1.00	4.68	Medium Sand
MD-BOEM-2015-VC03 #2	97.48	1.59	0.33	0.85	-1.11	5.92	Medium Sand
MD-BOEM-2015-VC03 #3	79.81	1.28	0.41	1.80	-1.36	3.85	Medium Sand
MD-BOEM-2015-VC04 #1	98.65	1.39	0.38	0.60	-0.70	7.95	Medium Sand
MD-BOEM-2015-VC04 #2	94.17	0.87	0.55	0.98	-1.48	6.72	Coarse Sand
MD-BOEM-2015-VC04 #3	97.50	1.28	0.41	0.76	-1.02	5.82	Medium Sand
MD-BOEM-2015-VC04 #4	96.00	1.22	0.43	0.90	-1.09	6.32	Medium Sand
MD-BOEM-2015-VC05 #1	96.76	1.02	0.49	0.77	-0.81	4.71	Medium Sand
MD-BOEM-2015-VC05 #2	95.97	1.06	0.48	0.83	-1.34	6.54	Medium Sand
MD-BOEM-2015-VC05 #3	37.01	-1.67	3.18	2.15	0.49	2.00	Granule
MD-BOEM-2015-VC05 #4	64.47	-0.14	1.10	2.35	-0.59	1.90	Very Coarse Sand
MD-BOEM-2015-VC07 #1	64.34	-0.31	1.24	1.81	-0.40	1.82	Very Coarse Sand
MD-BOEM-2015-VC07 #2	95.78	0.96	0.51	0.90	-0.83	4.62	Coarse Sand
MD-BOEM-2015-VC07 #3	68.60	-0.21	1.16	1.79	-0.58	2.08	Very Coarse Sand
MD-BOEM-2015-VC07 #4	89.66	1.01	0.50	1.55	-2.01	6.56	Medium Sand
MD-BOEM-2015-VC07 #5	97.32	1.28	0.41	0.88	-0.94	4.87	Medium Sand
MD-BOEM-2015-VC07 #6	97.65	1.40	0.38	0.74	-1.25	8.08	Medium Sand
MD-BOEM-2015-VC07 #7	97.96	2.29	0.20	0.47	-0.52	6.59	Fine Sand
MD-BOEM-2015-SS02	98.58	1.37	0.39	0.68	-0.66	4.33	Medium Sand
MD-BOEM-2015-SS06	84.51	0.19	0.88	1.20	-0.58	3.32	Coarse Sand
MD-BOEM-2015-SS08	98.60	1.62	0.33	0.46	-0.79	9.30	Medium Sand

Appendix B

Vibracore Logs

The following is the full Vibracore Log report that was provided for this study.

Inventory of Potential Beach Nourishment and Coastal Restoration Sand Sources on the Atlantic Outer Continental Shelf

The Geophysical and Geological Data Acquisition: Inventory of Potential Beach Nourishment and Coastal Restoration Sand Sources on the Atlantic Outer Continental Shelf is an ongoing project being conducted by CB&I under contract with the Bureau of Ocean and Energy Management (BOEM). The purpose of this project is to identify, characterize and delineate potential sand resources on the Atlantic Outer Continental Shelf (OCS) for use in future coastal restoration, beach nourishment, and/or wetland restoration efforts. The eastern coast of the United States was severely damaged by strong winds, waves, and currents that were caused by Hurricane Sandy in October 2012. Since then, east coast beaches in several areas have been in need of coastal restoration. Upon the completion of this two-year project there will be an inventory of potential sand sources for future beach nourishment and coastal restoration efforts for the U.S. states adjacent to the Atlantic OCS. The project area extends from 5.6 kilometers (three nautical miles) to 14.8 kilometers (eight nautical miles) offshore on the Atlantic OCS within water depths up to approximately 30 meters from Maine to Miami, Florida. 5,600 kilometers (km) of geophysical data and 350 geological samples (250 vibracores and 100 surface grab samples) are planned. The data acquisition effort was divided between each of the 13 coastal states with an Atlantic OCS based on their length of coastline, historical need for OCS sand resources, potential future need for OCS sand resources, and historical geophysical and geological data density, among other criteria. As part of the Hurricane Sandy Disaster Relief Appropriations Act, the extent of damages caused by Hurricane Sandy was also a controlling factor, and thus required that New Jersey and New York together benefit from at least 40% of the overall project effort. Potential study areas were presented to BOEM, other federal agencies, and state and local stakeholders during State coordination meetings held between January and March 2015. Based on the criteria described above and specific input from these meetings, the study areas were refined and finalized and field investigations commenced April 19, 2015.

These data represent the sediment analysis results of the reconnaissance geologic survey samples collected using an Alpine Pneumatic vibracore for all vibracores and a Petite Ponar Grab for surface grab samples. These data were collected September 18, 2015 to September 19, 2015 and analyzed for sediment grain size and sample composition. These data are presented in the NAD 1983 Universal Transverse Mercator (UTM) Zone 18N projection.

The Bureau of Ocean Energy Management (BOEM) provides the data for use "as is." BOEM provides this information with the understanding that it is not guaranteed to be accurate, correct or complete and conclusions drawn from such information are the responsibility of the user. While every effort has been made to ensure the accuracy, correctness and timeliness of materials presented, BOEM assumes no responsibility for errors or omissions. Users are cautioned to consider carefully the provisional nature of these data and information before using them for decisions that concern personal or public safety or the conduct of business that involves substantial monetary or operational consequences. Conclusions drawn from or actions undertaken on the basis of, such data and information are the sole responsibility of the user. The data are not suitable for navigational purposes. Information found here should not be used for making financial or any other commitments. These data were developed by the U.S. Government; no other proprietary rights may be attached to them nor may they be sold to the U.S. Government as part of any procurement of products or services.

CORING

Reconnaissance geologic samples were collected within a 50 foot buffer of the planned sample location which was approved by a qualified marine archaeologist.

This dataset is from one field activity with consistent instrument calibrations.

Navigation and horizontal positioning for the Odom Hydrotrac Sounder was provided by a Trimble SPS GPS utilizing dual frequency rover antennas with DGPS Beacon corrections. GPS measurements were offset to represent the center point of the vibracore or ponar location. GPS antennas were rigidly affixed to the vessel via a pole mount on the starboard side of the vessel. Starboard pole mount offsets were measured (to within 5 cm) in relation to the reference point (top of core or ponar capstan). The positioning of the vessel and the sample location were corrected during data collection utilizing HYPACK 2015 to account for instrument offset. DGPS in combination with beacon corrections is accurate to within 1 to 5 meters. Data were collected in UTM Zone 18N, units in meters. (NAD 1983 UTM Zone 18N)

All vertical measurements are referenced to datum NAVD88 (Geoid Model 12A). Top of core elevations were derived using soundings collected during the geophysical operations and verified using an Odom single beam sounder at the time of core collection. Sounding data has been corrected for tidal fluctuations. The Odom single beam sounder was calibrated using an Odom Digibar Pro sound velocity probe with sound velocity measurements taken before sampling began. The sounder calibration was verified using bar checks at 5 foot intervals down to 30 foot depths.

The vibracores were collected using a 271B Alpine Pneumatic vibracore, configured to collect undisturbed sediment cores up to 20 ft. in length. This self-contained, freestanding pneumatic vibracore unit contains an air-driven vibratory hammer assembly, an aluminum H-beam which acts as the vertical beam upright on the seafloor, 20 ft. long steel tubes measuring 4" in diameter (with a plastic core liner), and a drilling bit with a cutting edge. An air hose array provides compressed air from the compressor on deck to drive the vibracore. The vibracore unit was A-frame deployed from AVS's vessel, the M/V Thunderforce.

The desired penetration depth was 20 feet. It is recognized, however, that maximum penetration may not be achieved at all sample locations. A minimum of 80 percent of the expected penetration was required through the unconsolidated strata. When located over a boring site, AVS made every reasonable effort to reach the required depth or to reach penetration refusal. Penetration refusal was completed when less than 1 ft of advance was accomplished after 5 minutes of vibration. When refusal was met at less than 80 percent of the desired depth of penetration, AVS removed the sampled portion and a new core pipe was set up. A jet pump hose was attached to the tip of the core pipe just below the vibrator. The rig was lowered to the bottom and jetted down to a depth 2 ft above where the first attempt met refusal. The jet was then turned off and the vibrator turned on, taking the additional part of the core and 2 ft of overlap. Retries were accomplished until penetration had reached the required depth, refusal or until three (3) retries were attempted, whichever occurred first. The jetted cores were labeled with an "A" for the first jetted section and a "B" for the second jetted section after the core name.

The vibracores were then removed from the vibracore unit. They were measured, marked and cut into 5 ft. sections. The total length of recovery was measured and compared to the measured depth of penetration to calculate percent recovery. Penetration was determined with the use of a penetrometer and chart recorder. Depth of penetration beneath the surface of the bottom was known to be within plus or minus 0.5 ft of actual penetration. Each vibracore was labeled onboard the vessel.

CB&I utilized a Ponar petite grab sampler for collection of unconsolidated surface samples. The Ponar was lowered by hand over the side to the seafloor at pre-determined and pre-approved sample locations. Once near the seafloor, the Ponar was allowed to free-fall, triggering the sampling device to penetrate

and close into the seafloor, collecting a surface sediment sample. The Ponar was then retrieved to the deck of the vessel, and the sample collected into secure sample bags for transport back to CB&I's geotechnical laboratory for visual description, photographing and sediment analysis.

SAMPLING and ANALYSIS

Upon completion of field operations, all vibracores were transported to CB&I's office in Boca Raton. The vibracores were split lengthwise and logged in detail by describing sedimentary properties by layer in terms of layer thickness, color, texture (grain size), composition and presence of clay, silt, gravel, or any other identifying features in accordance with American Society for Testing and Materials (ASTM) standard procedure D 2488-09a. The vibracores were photographed in 2.0 ft intervals using an Olympus C-765 digital camera that was mounted on a frame directly above the vibracores. The photographs were taken using full spectrum overhead lighting and an 18% gray background, which provides a known reference color and is the standard reference value against which all camera light meters are calibrated. Sediment samples were extracted from the vibracores at irregular intervals based on distinct stratigraphic layers in the sediment sequence. The vibracores were then wrapped and boxed for transfer to a BOEM-designated archive facility according to that facility's requirements (the Lamont-Doherty Core Repository). Sedimentary properties of the grab samples were also described. Each grab sample was split into two representative sub-samples, one sub-sample was used to conduct the laboratory analysis and the other sub-sample was provided to the BOEM approved archive facility.

The sediment samples were analyzed to determine color and grain size distribution. During sieve analysis, the wet, dry and washed Munsell colors were recorded. Grain size was determined through sieve analysis in accordance with ASTM Standard Materials Designation D422-63 for particle size analysis of soils. This method covers the quantitative determination of the distribution of sand particles. Sediment finer than the No. 230 sieve (4.0 phi) was analyzed following ASTM Standard Test Method, Designation D1140-00. Mechanical sieving was conducted using calibrated sieves with a gradation of half phi intervals. Additional sieves representing key ASTM sediment classification boundaries were also included to meet appropriate beach-compatible mineral characterization. Weights retained on each sieve were recorded cumulatively. Grain size results were entered into the gINT® software program, which computes the mean and median grain size, sorting, silt/clay percentages for each sample using the moment method.

The sediment samples extracted from the vibracores and the grab samples were prepared for processing in CB&I's accredited geotechnical laboratory. This laboratory is accredited by the Construction Materials Engineering Council, Inc. (CMEC) for (ASTM) D422/T88 Sieve Analysis, D1140, D4648, and CPE-HAT-09. Geological samples were analyzed to determine texture (grain size and sorting); percent carbonate, and color.

Data were collected by CB&I under BOEM contract number M14PC00006.

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APPENDIX 1
VIBRACORE LOGS



Legend for Geotechnical Data

(SP), (SM), etc.

Refers to the Army Corps of Engineers Unified Soils Classification System. Class types are defined primarily by grain size, sorting and percent of material passing the 200 sieve. Classification of materials on the core logs based on visual field examinations are identified on the core logs under the Classification of Materials Description. Classifications based on laboratory sieve analyses are identified on the core logs in the Legend and under Remarks.

Grain Size Terms

- Cobble – retained on the 3.0” sieve
- Gravel – greater than the #4 sieve and less than the 3.0” sieve
 - Coarse: greater than the 3/4” sieve and less than the 3.0” sieve
 - Fine – greater than the #4 sieve and less than the 3/4” sieve
- Sand - greater than the #200 sieve and less than the #4 sieve
 - Coarse - greater than the #10 sieve and less than the #4 sieve
 - Medium - greater than the #40 sieve and less than the #10 sieve
 - Fine - greater than the #230 sieve and less than the #40 sieve
- Fines – (silt or clay) passing the #230 sieve

Proportional definition of descriptive terms

<u>Descriptive Term</u>	<u>Range of Proportions</u>
Sandy, gravelly, etc.	35 % to 50 %
Some	20 % to 35 %
Little	10 % to 20 %
Trace	1 % to 10 %



Legend for Geotechnical Data

GW		Well graded gravels or gravel-sand mixtures, little or no fines	ML		Inorganic silts and very fine sands, rock flour, sandy silts or clayey silts with slight plasticity
GP		Poorly graded gravels or gravel-sand mixtures, w/ little or no fines	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soil, elastic silts
GM		Silty gravels, gravel-sand-silt mixtures	OL		Organic silts and organic silt-clays of low plasticity
GC		Clayey gravels, gravel-sand-clay mixtures	OH		Organic clays of medium to high plasticity, organic silts
SW		Well graded sands or gravelly sands, little or no fines	CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
SP		Poorly graded sands or gravelly sands, little or no fines	CH		Inorganic clays of high plasticity, fat clays
SM		Silty sands, sand-silt mixtures	PT		Peat and other highly organic soils
SC		Clayey sands, sand-clay mixtures	SP-SM		Poorly-graded silty sand
SW-SM		Well-graded silty sand	SM-SC		Silty clayey sand
GW-GM		Well-graded silty gravel	ML-CL		Inorganic silty lean clay
GM-GC		Clayey silty gravel			

Note: Information is after ACOE Atlantic Division Manual # 1110-1-1 titled *Engineering and Design Geotechnical Manual for Surface and Subsurface Investigations*



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Legend for Geotechnical Data

The naming convention used by CB&I incorporates key information about the item in the title. The naming format uses the following information:

- Abbreviated area name (two letters that will be used throughout the project)
- Abbreviated data type: vibracore (VC) or surface sample (SS)
- Collection year (YY)
- Identification number
- Sample identification number in the case vibracores.

Format examples:

- A) MD-BOEM-2015-VC05
B) MD-BOEM-2015-VC05 S#1

Example A is vibracore number 05, collected offshore of Maryland in the year 2015.

Example B refers to sample number 1 taken from vibracore number 05, which was collected offshore of Maryland in 2015.

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS
1. PROJECT Inventory of Potential Beach Nourishment and Coastal Restoration Sand Sources on the Atlantic OCS			9. SIZE AND TYPE OF BIT 3.0 In.	
			10. COORDINATE SYSTEM/DATUM	
			UTM 18	HORIZONTAL NAD 1983
			VERTICAL NAVD88	
2. BORING DESIGNATION MD-BOEM-2015-VC01		LOCATION COORDINATES (m) X = 502,208 Y = 4,232,414		11. MANUFACTURER'S DESIGNATION OF DRILL <input type="checkbox"/> AUTO HAMMER Alpine Pneumatic Vibracore <input type="checkbox"/> MANUAL HAMMER
3. DRILLING AGENCY American Vibracore Services, Inc.		CONTRACTOR FILE NO.		
4. NAME OF DRILLER Justin Robertson		12. TOTAL SAMPLES		
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	DISTURBED
6. THICKNESS OF OVERBURDEN 0.0 Ft.		13. TOTAL NUMBER CORE BOXES		
7. DEPTH DRILLED INTO ROCK 0.0 Ft.		14. ELEVATION GROUND WATER		
8. TOTAL DEPTH OF BORING 20.0 Ft.		15. DATE BORING	STARTED	COMPLETED
			09-18-15 12:36	09-18-15 12:44
		16. ELEVATION TOP OF BORING -62.5 Ft.		
		17. TOTAL RECOVERY FOR BORING 19.3 Ft.		
		18. SIGNATURE AND TITLE OF INSPECTOR DA		

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-62.5	0.0	○	SAND, fine grained, quartz, little shell fragments, trace silt, shell fragments up to 0.75", some fine to medium grained (2.5Y-5/4) pockets, dark gray (2.5Y-4/1), (SW).		1	Sample #1, Depth = 2.6' Mean (mm): 0.32, Phi Sorting: 1.17 Fines (230): 1.37% (SW)
-67.7	5.2	○	CLAY, very soft, little sand, sand distributed in pockets up to 1.0", dark gray (5Y-4/1), (CL).		T1	Sample #T1, Depth = 5.5' Ave. Field Vane (tsf): 0.24
-68.5	6.0	○		CLAY, soft, dark gray (5Y-4/1), (CL).		T2
-73.5	11.0	○	CLAY, very soft, dark gray (5Y-4/1), (CL).		T3	Sample #T3, Depth = 12.6' Ave. Field Vane (tsf): 0.23
-77.8	15.3	○	CLAY, soft, trace sand, sand distributed in pockets up to 0.5", dark gray (5Y-4/1), (CL).		T4	Sample #T4, Depth = 15.9' Ave. Field Vane (tsf): 0.49
-79.0	16.5	○	CLAY, very soft, some sand, sand distributed in pockets up to 1.75", dark gray (5Y-4/1), (CL).		T5	Sample #T5, Depth = 17.1' Ave. Field Vane (tsf): 0.24
-79.9	17.4	○		SAND, medium grained, quartz, little gravel, trace silt, gravel components are rock and shell up to 0.5", very dark gray (2.5Y-3/1), (SW).		2
-81.8	19.3	○	No Recovery.			
-82.5	20.0	○	End of Boring			

LOUISIANA MD-BOEM-2015-VC.GPJ_JPBRAZIL.GDT 9/12/16

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS
1. PROJECT Inventory of Potential Beach Nourishment and Coastal Restoration Sand Sources on the Atlantic OCS			9. SIZE AND TYPE OF BIT 3.0 In.	
2. BORING DESIGNATION MD-BOEM-2015-VC03			10. COORDINATE SYSTEM/DATUM UTM 18	
3. DRILLING AGENCY American Vibracore Services, Inc.			11. MANUFACTURER'S DESIGNATION OF DRILL Alpine Pneumatic Vibracore	
4. NAME OF DRILLER Justin Robertson			<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER	
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED			12. TOTAL SAMPLES DISTURBED: _____ UNDISTURBED (UD): _____	
6. THICKNESS OF OVERBURDEN 0.0 Ft.			13. TOTAL NUMBER CORE BOXES	
7. DEPTH DRILLED INTO ROCK 0.0 Ft.			14. ELEVATION GROUND WATER	
8. TOTAL DEPTH OF BORING 15.4 Ft.			15. DATE BORING STARTED: 09-18-15 09:14 COMPLETED: 09-18-15 09:23	
			16. ELEVATION TOP OF BORING -69.3 Ft.	
			17. TOTAL RECOVERY FOR BORING 14.2 Ft.	
			18. SIGNATURE AND TITLE OF INSPECTOR SMT	


ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-69.3	0.0					
-73.5	4.2		SAND, fine grained, quartz, trace shell fragments, trace shell hash, trace silt, shell fragments up to 1.0", (2.0" x 1.0") shell fragment @ 2.2', (3.0" x 2.0") and (3.0" x 1.0") shell fragments @ 3.7', (2.0" x 1.5") whole shell @ 3.9', gray (2.5Y-5/1), (SW).		1	Sample #1, Depth = 2.0' Mean (mm): 0.38, Phi Sorting: 0.98 Fines (230): 1.91% (SW)
-76.1	6.8		SAND, fine grained, quartz, trace shell fragments, trace shell hash, trace silt, shell fragments up to 0.5", (1.5" x 1.0") whole shell and shell fragment @ 6.2', (1.0" x 0.5") shell fragment @ 6.2', olive gray (5Y-5/2), (SP).		2	Sample #2, Depth = 5.0' Mean (mm): 0.33, Phi Sorting: 0.85 Fines (230): 1.52% (SP)
-76.7	7.4		Shelly SAND, fine grained, quartz, trace shell hash, trace silt, shell component is shell fragments up to (1.0" x 0.5"), (2.0" x 1.5") shell fragment @ 7.1', dark gray (5Y-4/1), (SW-SM).		3	Sample #3, Depth = 7.2' Mean (mm): 0.41, Phi Sorting: 1.80 Fines (230): 6.54% (SW-SM)
-78.0	8.7		CLAY, soft, trace sand, trace shell hash, sand and shell hash distributed at bottom of layer, dark greenish gray (10Y-4/1), (CL).		4	Sample #4, Depth = 9.6' Mean (mm): 2.85, Phi Sorting: 2.16 Fines (230): 2.44% (SW)
-80.0	10.7		Shelly SAND, fine to medium grained, quartz, trace silt, shell components are shell hash and shell fragments up to (1.75" x 1.25"), gray (5Y-5/1), (SW).		5	Sample #5, Depth = 11.8' Mean (mm): 0.21, Phi Sorting: 0.53 Fines (230): 1.43% (SP)
-81.9	12.6		SAND, fine grained, quartz, trace shell hash, trace silt, gray (5Y-5/1), (SP).		6	Sample #6, Depth = 13.1' Mean (mm): 0.78, Phi Sorting: 2.25 Fines (230): 2.15% (SW)
-83.5	14.2		SAND, fine grained, quartz, some shell fragments, trace shell hash, trace silt, shell fragments up to (1.5" x 1.0"), gray (5Y-5/1), (SW).			
-84.7	15.4		No Recovery.			
			End of Boring			

LOUISIANA MD-BOEM-2015-VC-03-GPJ-IPBRAZIL-GDT-9/12/16

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS						
1. PROJECT Inventory of Potential Beach Nourishment and Coastal Restoration Sand Sources on the Atlantic OCS			9. SIZE AND TYPE OF BIT 3.0 In.	<table border="1"> <tr> <td>10. COORDINATE SYSTEM/DATUM</td> <td>HORIZONTAL</td> <td>VERTICAL</td> </tr> <tr> <td>UTM 18</td> <td>NAD 1983</td> <td>NAVD88</td> </tr> </table>	10. COORDINATE SYSTEM/DATUM	HORIZONTAL	VERTICAL	UTM 18	NAD 1983	NAVD88
10. COORDINATE SYSTEM/DATUM	HORIZONTAL	VERTICAL								
UTM 18	NAD 1983	NAVD88								
2. BORING DESIGNATION MD-BOEM-2015-VC03A		LOCATION COORDINATES (m) X = 499,018 Y = 4,228,738	11. MANUFACTURER'S DESIGNATION OF DRILL Alpine Pneumatic Vibracore	<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER						
3. DRILLING AGENCY American Vibracore Services, Inc.		CONTRACTOR FILE NO.	12. TOTAL SAMPLES	<table border="1"> <tr> <td>DISTURBED</td> <td>UNDISTURBED (UD)</td> </tr> </table>	DISTURBED	UNDISTURBED (UD)				
DISTURBED	UNDISTURBED (UD)									
4. NAME OF DRILLER Justin Robertson			13. TOTAL NUMBER CORE BOXES							
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		DEG. FROM VERTICAL	BEARING	14. ELEVATION GROUND WATER						
6. THICKNESS OF OVERBURDEN 0.0 Ft.		15. DATE BORING		STARTED	COMPLETED					
7. DEPTH DRILLED INTO ROCK 0.0 Ft.		09-18-15 09:45		09-18-15 09:53						
8. TOTAL DEPTH OF BORING 16.8 Ft.		16. ELEVATION TOP OF BORING -69.0 Ft.		17. TOTAL RECOVERY FOR BORING 9.9 Ft.						
18. SIGNATURE AND TITLE OF INSPECTOR SMT										


ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-69.0	0.0		Jetted to 7.6'			
-76.6	7.6					
-78.2	9.2		CLAY, soft, (4.0" x 3.0") shell fragment @ 7.6', dark greenish gray (10Y-4/1), (CL).		T1	Sample #T1, Depth = 8.3' Ave. Field Vane (tsf): 0.32
-80.2	11.2		Shelly SAND, fine to medium grained, quartz, trace silt, shell components are shell hash and shell fragments up to 1.0", (2.0" x 1.0") shell fragments @ 9.6', 10.4' and 10.6', (3.0" x 1.5") shell fragment @ 10.1', 2.0" silt pocket @ 10.2', grayish brown (2.5Y-5/2), (SW).		1	Sample #1, Depth = 10.0' Mean (mm): 2.14, Phi Sorting: 2.05 Fines (230): 2.72% (SW)
-83.7	14.7		SAND, fine grained, quartz, trace shell hash, trace silt, silt distributed in silty pockets up to (0.25" x 0.5") and throughout layer, (2.0" x 0.5") silt pocket @ 14.1', gray (2.5Y-5/1), (SP).		2	Sample #2, Depth = 13.0' Mean (mm): 0.21, Phi Sorting: 0.62 Fines (230): 3.33% (SP)
-85.1	16.1		Shelly SAND, fine grained, quartz, trace shell hash, trace silt, shell component is shell fragments up to (2.0" x 1.0"), 0.5" silt pocket and 1.0" whole shell @ 15.0', 2.0" shell fragment @ 15.2', grayish brown (2.5Y-5/2), (SW).		3	Sample #3, Depth = 15.3' Mean (mm): 0.90, Phi Sorting: 2.15 Fines (230): 1.87% (SW)
-86.5	17.5		SAND, fine grained, quartz, trace silt, olive gray (5Y-4/2), (SP-SM).		4	Sample #4, Depth = 16.8' Mean (mm): 0.16, Phi Sorting: 0.33 Fines (230): 4.50% (SP-SM)
			End of Boring			









LOUISIANA MD-BOEM-2015-VC-03A-GPJ-IPBRAZIL-GDT 9/12/16

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS
1. PROJECT Inventory of Potential Beach Nourishment and Coastal Restoration Sand Sources on the Atlantic OCS <div style="float: right; text-align: center;"></div>			9. SIZE AND TYPE OF BIT 3.0 In.	
2. BORING DESIGNATION MD-BOEM-2015-VC04			10. COORDINATE SYSTEM/DATUM UTM 18	
3. DRILLING AGENCY American Vibracore Services, Inc.			11. MANUFACTURER'S DESIGNATION OF DRILL <input type="checkbox"/> AUTO HAMMER Alpine Pneumatic Vibracore <input type="checkbox"/> MANUAL HAMMER	
4. NAME OF DRILLER Justin Robertson			12. TOTAL SAMPLES DISTURBED UNDISTURBED (UD)	
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL DEG. FROM VERTICAL BEARING <input type="checkbox"/> INCLINED			13. TOTAL NUMBER CORE BOXES	
6. THICKNESS OF OVERBURDEN 0.0 Ft.			14. ELEVATION GROUND WATER	
7. DEPTH DRILLED INTO ROCK 0.0 Ft.			15. DATE BORING STARTED COMPLETED 09-18-15 08:24 09-18-15 08:33	
8. TOTAL DEPTH OF BORING 15.0 Ft.			16. ELEVATION TOP OF BORING -52.2 Ft.	
			17. TOTAL RECOVERY FOR BORING 17.5 Ft.	
			18. SIGNATURE AND TITLE OF INSPECTOR SMT	

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-52.2	0.0	•••••				
-55.7	3.5	•••••	SAND, fine to medium grained, quartz, little shell hash, trace silt, 1.0" shell hash lamina @ 2.2', 1.0" shell fragment @ 3.4', light yellowish brown (2.5Y-6/4), (SP).		1	Sample #1, Depth = 2.0' Mean (mm): 0.38, Phi Sorting: 0.60 Fines (230): 1.00% (SP)
-59.7	7.5	•••••	SAND, medium grained, quartz, little shell hash, trace silt, shell hash increases between 4.0' and 5.0', light yellowish brown (2.5Y-6/4), (SW).		2	Sample #2, Depth = 5.0' Mean (mm): 0.55, Phi Sorting: 0.98 Fines (230): 1.18% (SW)
-64.9	12.7	•••••	SAND, fine to medium grained, quartz, little shell hash, trace silt, (1.5" x 1.0") whole shell @ 11.6', light yellowish brown (2.5Y-6/4), (SP).		3	Sample #3, Depth = 10.0' Mean (mm): 0.41, Phi Sorting: 0.76 Fines (230): 0.94% (SP)
-69.7	17.5	•••••	SAND, fine to medium grained, quartz, little shell hash, trace shell fragments, trace silt, shell fragments up to 0.75", (3.0" x 2.0") shell fragment @ 13.5', (2.0" x 1.0") shell fragment @ 15.2', light yellowish brown (2.5Y-6/3), (SW).		4	Sample #4, Depth = 14.9' Mean (mm): 0.43, Phi Sorting: 0.90 Fines (230): 1.46% (SW)
			End of Boring			

LOUISIANA MD_BOEM_2015_VC.GPJ _JPBRAZIL.GDT 9/12/16

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS
1. PROJECT Inventory of Potential Beach Nourishment and Coastal Restoration Sand Sources on the Atlantic OCS			9. SIZE AND TYPE OF BIT 3.0 In.	
			10. COORDINATE SYSTEM/DATUM UTM 18	
2. BORING DESIGNATION MD-BOEM-2015-VC05			HORIZONTAL NAD 1983	
LOCATION COORDINATES (m) X = 498,216 Y = 4,219,404			VERTICAL NAVD88	
3. DRILLING AGENCY American Vibracore Services, Inc.		11. MANUFACTURER'S DESIGNATION OF DRILL <input type="checkbox"/> AUTO HAMMER Alpine Pneumatic Vibracore <input type="checkbox"/> MANUAL HAMMER		
4. NAME OF DRILLER Justin Robertson		12. TOTAL SAMPLES DISTURBED: _____ UNDISTURBED (UD): _____		
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED		13. TOTAL NUMBER CORE BOXES		
DEG. FROM VERTICAL		14. ELEVATION GROUND WATER		
BEARING		15. DATE BORING STARTED: 09-18-15 07:13 COMPLETED: 09-18-15 07:21		
6. THICKNESS OF OVERBURDEN 0.0 Ft.		16. ELEVATION TOP OF BORING -56.2 Ft.		
7. DEPTH DRILLED INTO ROCK 0.0 Ft.		17. TOTAL RECOVERY FOR BORING 19.3 Ft.		
8. TOTAL DEPTH OF BORING 18.9 Ft.		18. SIGNATURE AND TITLE OF INSPECTOR KM		

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS	
-56.2	0.0						
-60.9	4.7		SAND, medium grained, quartz, trace shell fragments, trace shell hash, trace silt, trace whole shell, shell fragments up to (1.5" x 0.5"), whole shells up to (0.75" x 0.5"), 2.0" shell fragment @ 0.4', light olive brown (2.5Y-5/3), (SP).		1	Sample #1, Depth = 2.3' Mean (mm): 0.49, Phi Sorting: 0.77 Fines (230): 0.87% (SP)	
-64.6	8.4		SAND, medium grained, quartz, trace shell fragments, trace silt, trace whole shell, shell fragments up to (1.25" x 1.0"), whole shells up to 1.0", (2.0" x 1.0") shell fragment @ 7.0', silt distributed in silty pockets up to 0.5", grayish brown (2.5Y-5/2), (SP).		2	Sample #2, Depth = 6.5' Mean (mm): 0.48, Phi Sorting: 0.83 Fines (230): 1.34% (SP)	
-65.5	9.3		SAND, medium to coarse grained, quartz, little shell fragments, trace rock, trace silt, trace whole shell, rock up to (1.0" x 0.5"), shell fragments up to (2.0" x 1.25"), whole shells up to 1.0", (2.5" x 1.5") shell fragment @ 8.5', (3.0" x 1.5") shell fragment @ 8.9', very dark gray (5Y-3/1), (GW).		3	Sample #3, Depth = 8.9' Mean (mm): 3.18, Phi Sorting: 2.15 Fines (230): 2.11% (SW)	
-65.9	9.7				4	Sample #4, Depth = 9.5' Mean (mm): 1.10, Phi Sorting: 2.35 Fines (230): 2.20% (SW)	
-66.5	10.3					5	Sample #5, Depth = 10.0' Mean (mm): 0.27, Phi Sorting: 0.85 Fines (230): 10.82% (SP-SC) Sample #T1, Depth = 12.6' Ave. Field Vane (tsf): 0.34
				SAND, fine to medium grained, quartz, trace rock, trace shell fragments, trace silt, rock up to 1.0", shell fragments up to (1.5" x 1.0"), dark gray (2.5Y-4/1), (SW).		T1	
			SAND, fine grained, quartz, little clay, trace shell fragments, trace shell hash, shell fragments up to 1.0", (2.0" x 1.0") clayey pocket @ 9.8', dark gray (5Y-4/1), (SP-SC). CLAY, soft, trace sand, trace shell hash, sand distributed in sandy pockets up to 1.0", (1.5" x 1.0") shell hash pocket @ 14.7', (2.0" x 3.0") sandy pocket with shell hash, shell fragments and whole shells up to 1.0" @ 13.0', very dark gray (N-3/0), (CL).		T2	Sample #T2, Depth = 15.2' Ave. Field Vane (tsf): 0.27	
-73.6	17.4		Clayey SAND, fine grained, quartz, trace shell fragments, trace shell hash, shell fragments up to (1.0" x 0.75"), 2.5" shell fragment @ 17.6', 3.0" clay pocket @ 18.8', 3.5" trace clay pocket @ 19.2', dark greenish gray (10Y-4/1), (SC).				
-75.5	19.3						
			End of Boring				

LOUISIANA MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

DRILLING LOG		DIVISION	INSTALLATION	SHEET 1 OF 1 SHEETS
1. PROJECT Inventory of Potential Beach Nourishment and Coastal Restoration Sand Sources on the Atlantic OCS			9. SIZE AND TYPE OF BIT 3.0 In.	
2. BORING DESIGNATION MD-BOEM-2015-VC07			10. COORDINATE SYSTEM/DATUM UTM 18	
3. DRILLING AGENCY American Vibracore Services, Inc.			11. MANUFACTURER'S DESIGNATION OF DRILL Alpine Pneumatic Vibracore	
4. NAME OF DRILLER Justin Robertson			<input type="checkbox"/> AUTO HAMMER <input type="checkbox"/> MANUAL HAMMER	
5. DIRECTION OF BORING <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED			12. TOTAL SAMPLES DISTURBED: _____ UNDISTURBED (UD): _____	
6. THICKNESS OF OVERBURDEN 0.0 Ft.			13. TOTAL NUMBER CORE BOXES	
7. DEPTH DRILLED INTO ROCK 0.0 Ft.			14. ELEVATION GROUND WATER	
8. TOTAL DEPTH OF BORING 16.8 Ft.			15. DATE BORING STARTED: 09-17-15 17:26 COMPLETED: 09-17-15 17:37	
			16. ELEVATION TOP OF BORING -45.4 Ft.	
			17. TOTAL RECOVERY FOR BORING 18.3 Ft.	
			18. SIGNATURE AND TITLE OF INSPECTOR KM	

ELEV. (ft)	DEPTH (ft)	LEGEND	CLASSIFICATION OF MATERIALS Depths and elevations based on measured values	% REC.	BOX OR SAMPLE	REMARKS
-45.4	0.0					
-46.8	1.4		SAND, medium to coarse grained, quartz, trace rock, trace shell fragments, trace silt, trace whole shell, rock up to 0.75", shell fragments up to (1.25" x 0.75"), whole shells up to 1.0", (2.0" x 0.75") shell fragment and (2.5" x 1.25") whole shell @ 0.2', light olive brown (2.5Y-5/3), (SW).		1	Sample #1, Depth = 0.7' Mean (mm): 1.24, Phi Sorting: 1.81 Fines (230): 0.60% (SW)
-50.4	5.0		SAND, fine to medium grained, quartz, little shell hash, trace shell fragments, trace silt, trace whole shell, shell fragments up to (1.0" x 0.75"), whole shell up to 1.0", (2.5" x 1.75") whole shell @ 2.3', grayish brown (2.5Y-5/2), (SW).		2	Sample #2, Depth = 3.2' Mean (mm): 0.51, Phi Sorting: 0.90 Fines (230): 0.91% (SW)
-51.9	6.5		SAND, medium to coarse grained, quartz, trace rock, trace shell fragments, trace shell hash, trace silt, rock up to 0.5", shell fragments up to (1.25" x 0.5"), grayish brown (2.5Y-5/2), (SW).		3	Sample #3, Depth = 5.7' Mean (mm): 1.16, Phi Sorting: 1.79 Fines (230): 0.73% (SW)
-55.7	10.3		SAND, fine to medium grained, quartz, trace shell hash, trace silt, (2.5" x 3.0") medium to coarse grained pocket @ 8.3', (2.0" x 0.75") shell fragment @ 7.6', dark gray (2.5Y-4/1), (SW).		4	Sample #4, Depth = 8.8' Mean (mm): 0.50, Phi Sorting: 1.55 Fines (230): 1.20% (SW)
-59.2	13.8		SAND, fine to medium grained, quartz, trace shell fragments, trace shell hash, trace silt, shell fragments up to 0.5", 1.0" shell fragment @ 11.3', 0.5" silty pocket @ 12.9', light olive brown (2.5Y-5/3), (SW).		5	Sample #5, Depth = 12.0' Mean (mm): 0.41, Phi Sorting: 0.88 Fines (230): 0.94% (SW)
-61.8	16.4		SAND, fine to medium grained, quartz, little shell hash, trace silt, trace whole shell, whole shells up to (1.0" x 0.75"), (1.25" x 1.0") shell fragment @ 14.5', (2.0" x 3.0") medium to coarse grained pocket @ 14.8', 1.5" shell fragment @ 16.0', (2.5" x 1.25") whole shell @ 16.3', dark gray (2.5Y-4/1), (SP).		6	Sample #6, Depth = 15.2' Mean (mm): 0.38, Phi Sorting: 0.74 Fines (230): 1.43% (SP)
-63.7	18.3		SAND, fine grained, quartz, trace shell hash, trace silt, dark gray (2.5Y-4/1), (SP).		7	Sample #7, Depth = 17.4' Mean (mm): 0.20, Phi Sorting: 0.47 Fines (230): 2.01% (SP)
			End of Boring			

LOUISIANA MD-BOEM-2015-VC-07-GPJ-IPBRAZIL-GDT 9/12/16

APPENDIX 2
VIBRACORE PHOTOGRAPHS



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC01

0.0' - 2.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC01

2.0' - 4.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC01

4.0' - 6.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC01

6.0' - 8.0'





INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC01

8.0'-10.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC01

10.0'-12.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC01

12.0'-14.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC01

14.0'-16.0'





INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC01

16.0'-18.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC01

18.0'-19.3'





INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC03

0.0' - 2.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC03

2.0' - 4.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC03

4.0' - 6.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC03

6.0' - 8.0'





INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC03
8.0'-10.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC03
10.0'-12.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC03
12.0'-14.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC03
14.0'-14.2'





INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC03A

7.6' - 9.6'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC03A

9.6' - 11.6'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC03A

11.6' - 13.6'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC03A

13.6' - 15.6'





INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS
MD-BOEM-2015-VC03A
15.6'-17.5'





INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC04

0.0' - 2.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC04

2.0' - 4.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC04

4.0' - 6.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC04

6.0' - 8.0'





INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC04
8.0'-10.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC04
10.0'-12.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC04
12.0'-14.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC04
14.0'-16.0'





INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS
MD-BOEM-2015-VC04
16.0'-17.5'





INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC05
0.0' - 2.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC05
2.0' - 4.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC05
4.0' - 6.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC05
6.0' - 8.0'





INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC05
8.0'-10.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC05
10.0'-12.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC05
12.0'-14.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC05
14.0'-16.0'





INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC05
16.0'-18.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC05
18.0'-19.3'





INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC07

0.0' - 2.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC07

2.0' - 4.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC07

4.0' - 6.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC07

6.0' - 8.0'





INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC07
8.0'-10.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC07
10.0'-12.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC07
12.0'-14.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC07
14.0'-16.0'





INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC07
16.0'-18.0'



INVENTORY OF
POTENTIAL SAND
RESOURCES ON THE
ATLANTIC OCS

MD-BOEM-2015-VC07
18.0'-18.3'



APPENDIX 3

INDIVIDUAL VIBRACORE GRANULARMETRIC REPORTS

Granularmetric Report
 Depths and elevations based on measured values



CB&I
 Coastal Planning & Engineering, Inc.
 2481 NW Boca Raton Blvd.
 Boca Raton, FL 33431
 ph (561) 391 8102

Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC01 #1

Analysis Date: 04-12-16

Analyzed By: AV

Easting (m):
 502,208

Northing (m):
 4,232,414

Coordinate System:
 UTM 18

Elevation (ft):
 -65.1 NAVD88

USCS: SW
 Munsell: Wet - 2.5Y-4/1
 Dry - 2.5Y-7/2
 Washed - 2.5Y-8/1
 Comments:

Dry Weight (g): 96.90	Wash Weight (g): 95.67	Pan Retained (g): 0.03	Sieve Loss (%): 0.07	Fines (%): #200 - 1.45 #230 - 1.37	Organics (%):	Carbonates (%): 4	Shell Hash (%):
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Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	1.36	1.40	1.36	1.40
5/16"	-3.00	8.00	0.90	0.93	2.26	2.33
3.5	-2.50	5.66	0.49	0.51	2.75	2.84
4	-2.25	4.76	0.41	0.42	3.16	3.26
5	-2.00	4.00	0.08	0.08	3.24	3.34
7	-1.50	2.83	0.27	0.28	3.51	3.62
10	-1.00	2.00	0.31	0.32	3.82	3.94
14	-0.50	1.41	0.36	0.37	4.18	4.31
18	0.00	1.00	0.85	0.88	5.03	5.19
25	0.50	0.71	2.43	2.51	7.46	7.70
35	1.00	0.50	7.95	8.20	15.41	15.90
45	1.50	0.35	14.76	15.23	30.17	31.13
60	2.00	0.25	24.09	24.86	54.26	55.99
80	2.50	0.18	28.71	29.63	82.97	85.62
120	3.00	0.13	10.79	11.14	93.76	96.76
170	3.50	0.09	1.47	1.52	95.23	98.28
200	3.75	0.07	0.26	0.27	95.49	98.55
230	4.00	0.06	0.08	0.08	95.57	98.63

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.92	2.47	2.32	1.88	1.30	1.00	-0.11
Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis	
Statistics	1.63	0.32	1.17	-2.57	11.45	

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report
 Depths and elevations based on measured values



CB&I
 Coastal Planning & Engineering, Inc.
 2481 NW Boca Raton Blvd.
 Boca Raton, FL 33431
 ph (561) 391 8102

Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC01 #2

Analysis Date: 04-12-16

Analyzed By: SMT

Easting (m):
 502,208

Northing (m):
 4,232,414

Coordinate System:
 UTM 18

Elevation (ft):
 -80.8 NAVD88

USCS: SW
 Munsell: Wet - 2.5Y-3/1
 Dry - 2.5Y-6/1
 Washed - 2.5Y-7/3

Comments:

Dry Weight (g): 102.13
 Wash Weight (g): 98.65
 Pan Retained (g): 0.05
 Sieve Loss (%): 0.00
 Finest (%): #200 - 3.77
 #230 - 3.46
 Organics (%):
 Carbonates (%): 0
 Shell Hash (%):

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	1.01	0.99	1.01	0.99
3.5	-2.50	5.66	1.98	1.94	2.99	2.93
4	-2.25	4.76	0.83	0.81	3.82	3.74
5	-2.00	4.00	2.71	2.65	6.53	6.39
7	-1.50	2.83	7.89	7.73	14.42	14.12
10	-1.00	2.00	7.93	7.76	22.35	21.88
14	-0.50	1.41	6.37	6.24	28.72	28.12
18	0.00	1.00	4.87	4.77	33.59	32.89
25	0.50	0.71	10.28	10.07	43.87	42.96
35	1.00	0.50	20.38	19.95	64.25	62.91
45	1.50	0.35	9.63	9.43	73.88	72.34
60	2.00	0.25	12.88	12.61	86.76	84.95
80	2.50	0.18	7.56	7.40	94.32	92.35
120	3.00	0.13	2.49	2.44	96.81	94.79
170	3.50	0.09	1.03	1.01	97.84	95.80
200	3.75	0.07	0.44	0.43	98.28	96.23
230	4.00	0.06	0.32	0.31	98.60	96.54

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	3.10	1.61	0.68	-0.75	-2.13
	0.37	0.77	1.48	-0.34	2.42

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ JPBRAZIL.GDT 9/12/16

Granularmetric Report

Depths and elevations based on measured values



CB&I
 Coastal Planning & Engineering, Inc.
 2481 NW Boca Raton Blvd.
 Boca Raton, FL 33431
 ph (561) 391 8102

Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC03 #1

Analysis Date: 04-12-16

Analyzed By: CS

Easting (m):
499,020

Northing (m):
4,228,739

Coordinate System:
UTM 18

Elevation (ft):
-71.3 NAVD88

USCS:

SW

Munsell: Wet - 2.5Y-5/1
Dry - 2.5Y-7/2
Washed - 2.5Y-7/2

Comments:

Dry Weight (g): 98.16	Wash Weight (g): 96.49	Pan Retained (g): 0.09	Sieve Loss (%): 0.11	Fines (%): #200 - 2.13 #230 - 1.91	Organics (%):	Carbonates (%): 2	Shell Hash (%):
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Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.25	0.25	0.25	0.25
4	-2.25	4.76	0.32	0.33	0.57	0.58
5	-2.00	4.00	0.20	0.20	0.77	0.78
7	-1.50	2.83	0.41	0.42	1.18	1.20
10	-1.00	2.00	1.22	1.24	2.40	2.44
14	-0.50	1.41	2.08	2.12	4.48	4.56
18	0.00	1.00	4.15	4.23	8.63	8.79
25	0.50	0.71	6.48	6.60	15.11	15.39
35	1.00	0.50	10.26	10.45	25.37	25.84
45	1.50	0.35	19.54	19.91	44.91	45.75
60	2.00	0.25	25.42	25.90	70.33	71.65
80	2.50	0.18	17.37	17.70	87.70	89.35
120	3.00	0.13	7.08	7.21	94.78	96.56
170	3.50	0.09	1.07	1.09	95.85	97.65
200	3.75	0.07	0.22	0.22	96.07	97.87
230	4.00	0.06	0.22	0.22	96.29	98.09

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.89	2.35	2.09	1.58	0.96	0.53	-0.45
Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis	
	1.4	0.38	0.98	-1	4.68	

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report
 Depths and elevations based on measured values



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Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC03 #2

Analysis Date: 04-12-16

Analyzed By: CS

Easting (m):
 499,020

Northing (m):
 4,228,739

Coordinate System:
 UTM 18

Elevation (ft):
 -74.3 NAVD88

USCS: SP
 Munsell: Wet - 5Y-5/2
 Dry - 5Y-7/2
 Washed - 5Y-7/1
 Comments:

Dry Weight (g): 96.99	Wash Weight (g): 95.67	Pan Retained (g): 0.01	Sieve Loss (%): 0.13	Fines (%): #200 - 1.71 #230 - 1.52	Organics (%):	Carbonates (%): 2	Shell Hash (%):
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Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.27	0.28	0.27	0.28
4	-2.25	4.76	0.11	0.11	0.38	0.39
5	-2.00	4.00	0.16	0.16	0.54	0.55
7	-1.50	2.83	0.12	0.12	0.66	0.67
10	-1.00	2.00	0.32	0.33	0.98	1.00
14	-0.50	1.41	0.74	0.76	1.72	1.76
18	0.00	1.00	2.08	2.14	3.80	3.90
25	0.50	0.71	5.61	5.78	9.41	9.68
35	1.00	0.50	9.77	10.07	19.18	19.75
45	1.50	0.35	17.46	18.00	36.64	37.75
60	2.00	0.25	27.66	28.52	64.30	66.27
80	2.50	0.18	21.21	21.87	85.51	88.14
120	3.00	0.13	8.90	9.18	94.41	97.32
170	3.50	0.09	0.82	0.85	95.23	98.17
200	3.75	0.07	0.12	0.12	95.35	98.29
230	4.00	0.06	0.18	0.19	95.53	98.48

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.87	2.41	2.20	1.71	1.15	0.81	0.10
Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis	
Statistics	1.59	0.33	0.85	-1.11	5.92	

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report
 Depths and elevations based on measured values



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Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC03 #3

Analysis Date: 04-12-16

Analyzed By: AV

Easting (m):
 499,020

Northing (m):
 4,228,739

Coordinate System:
 UTM 18

Elevation (ft):
 -76.5 NAVD88

USCS: SW-SM
 Munsell: Wet - 5Y-4/1
 Dry - 5Y-6/1
 Washed - 5Y-7/1
 Comments:

Dry Weight (g): 96.30
 Wash Weight (g): 90.10
 Pan Retained (g): 0.10
 Sieve Loss (%): 0.00
 Fines (%): #200 - 7.28
 #230 - 6.54
 Organics (%):
 Carbonates (%): 15
 Shell Hash (%):

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.97	1.01	0.97	1.01
5/16"	-3.00	8.00	3.25	3.37	4.22	4.38
3.5	-2.50	5.66	3.07	3.19	7.29	7.57
4	-2.25	4.76	1.28	1.33	8.57	8.90
5	-2.00	4.00	1.16	1.20	9.73	10.10
7	-1.50	2.83	1.99	2.07	11.72	12.17
10	-1.00	2.00	1.43	1.48	13.15	13.65
14	-0.50	1.41	1.19	1.24	14.34	14.89
18	0.00	1.00	1.43	1.48	15.77	16.37
25	0.50	0.71	2.85	2.96	18.62	19.33
35	1.00	0.50	5.16	5.36	23.78	24.69
45	1.50	0.35	10.19	10.58	33.97	35.27
60	2.00	0.25	14.80	15.37	48.77	50.64
80	2.50	0.18	18.65	19.37	67.42	70.01
120	3.00	0.13	18.06	18.75	85.48	88.76
170	3.50	0.09	3.14	3.26	88.62	92.02
200	3.75	0.07	0.67	0.70	89.29	92.72
230	4.00	0.06	0.71	0.74	90.00	93.46

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	1.28	0.41	1.8	-1.36	3.85

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report
 Depths and elevations based on measured values



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Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC03 #4

Analysis Date: 04-12-16

Analyzed By: AV

Easting (m):
 499,020

Northing (m):
 4,228,739

Coordinate System:
 UTM 18

Elevation (ft):
 -78.9 NAVD88

USCS: SW
 Munsell: Wet - 5Y-5/1
 Dry - 5Y-6/1
 Washed - 5Y-6/1
 Comments:

Dry Weight (g): 122.31
 Wash Weight (g): 119.55
 Pan Retained (g): 0.01
 Sieve Loss (%): 0.17
 Finest (%): #200 - 2.46
 #230 - 2.44
 Organics (%):
 Carbonates (%): 47
 Shell Hash (%):

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
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1"	-4.75	26.91	0.00	0.00	0.00	0.00
3/4"	-4.25	19.03	8.90	7.28	8.90	7.28
5/8"	-4.00	16.00	12.62	10.32	21.52	17.60
7/16"	-3.50	11.31	14.74	12.05	36.26	29.65
5/16"	-3.00	8.00	5.90	4.82	42.16	34.47
3.5	-2.50	5.66	5.53	4.52	47.69	38.99
4	-2.25	4.76	2.22	1.82	49.91	40.81
5	-2.00	4.00	2.79	2.28	52.70	43.09
7	-1.50	2.83	7.45	6.09	60.15	49.18
10	-1.00	2.00	6.74	5.51	66.89	54.69
14	-0.50	1.41	5.96	4.87	72.85	59.56
18	0.00	1.00	5.87	4.80	78.72	64.36
25	0.50	0.71	10.63	8.69	89.35	73.05
35	1.00	0.50	15.04	12.30	104.39	85.35
45	1.50	0.35	6.64	5.43	111.03	90.78
60	2.00	0.25	3.76	3.07	114.79	93.85
80	2.50	0.18	2.77	2.26	117.56	96.11
120	3.00	0.13	1.42	1.16	118.98	97.27
170	3.50	0.09	0.24	0.20	119.22	97.47
200	3.75	0.07	0.08	0.07	119.30	97.54
230	4.00	0.06	0.03	0.02	119.33	97.56

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.25	0.95	0.58	-1.43	-3.69	-4.04	-4.41

Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
Statistics	-1.51	2.85	2.16	0.12	1.65

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report
 Depths and elevations based on measured values



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Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC03 #5

Analysis Date: 04-12-16

Analyzed By: AV

Easting (m):
 499,020

Northing (m):
 4,228,739

Coordinate System:
 UTM 18

Elevation (ft):
 -81.1 NAVD88

USCS: SP
 Munsell: Wet - 5Y-5/1
 Dry - 5Y-6/1
 Washed - 5Y-6/1
 Comments:

Dry Weight (g): 97.64
 Wash Weight (g): 96.33
 Pan Retained (g): 0.02
 Sieve Loss (%): 0.06
 Finest (%): #200 - 1.52
 #230 - 1.43
 Organics (%):
 Carbonates (%): 0
 Shell Hash (%):

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.00	0.00	0.00	0.00
7	-1.50	2.83	0.08	0.08	0.08	0.08
10	-1.00	2.00	0.10	0.10	0.18	0.18
14	-0.50	1.41	0.11	0.11	0.29	0.29
18	0.00	1.00	0.21	0.22	0.50	0.51
25	0.50	0.71	0.70	0.72	1.20	1.23
35	1.00	0.50	1.61	1.65	2.81	2.88
45	1.50	0.35	3.18	3.26	5.99	6.14
60	2.00	0.25	15.90	16.28	21.89	22.42
80	2.50	0.18	48.95	50.13	70.84	72.55
120	3.00	0.13	22.46	23.00	93.30	95.55
170	3.50	0.09	2.62	2.68	95.92	98.23
200	3.75	0.07	0.24	0.25	96.16	98.48
230	4.00	0.06	0.09	0.09	96.25	98.57

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis		
	2.99	2.75	2.55	2.28	2.03	1.80	1.33
	2.23	0.21	0.53	-1.63	10.29		

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report
 Depths and elevations based on measured values



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Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC03 #6

Analysis Date: 04-12-16

Analyzed By: AV

Easting (m):
 499,020

Northing (m):
 4,228,739

Coordinate System:
 UTM 18

Elevation (ft):
 -82.4 NAVD88

USCS: SW
 Munsell: Wet - 5Y-5/1
 Dry - 5Y-7/1
 Washed - 5Y-7/1
 Comments:

Dry Weight (g): 102.60
 Wash Weight (g): 100.66
 Pan Retained (g): 0.12
 Sieve Loss (%): 0.15
 Finest (%): #200 - 2.28
 #230 - 2.15
 Organics (%):
 Carbonates (%): 28
 Shell Hash (%):

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
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1"	-4.75	26.91	0.00	0.00	0.00	0.00
3/4"	-4.25	19.03	4.26	4.15	4.26	4.15
5/8"	-4.00	16.00	0.00	0.00	4.26	4.15
7/16"	-3.50	11.31	5.92	5.77	10.18	9.92
5/16"	-3.00	8.00	3.53	3.44	13.71	13.36
3.5	-2.50	5.66	4.98	4.85	18.69	18.21
4	-2.25	4.76	0.96	0.94	19.65	19.15
5	-2.00	4.00	1.69	1.65	21.34	20.80
7	-1.50	2.83	3.72	3.63	25.06	24.43
10	-1.00	2.00	2.58	2.51	27.64	26.94
14	-0.50	1.41	1.77	1.73	29.41	28.67
18	0.00	1.00	2.02	1.97	31.43	30.64
25	0.50	0.71	4.46	4.35	35.89	34.99
35	1.00	0.50	9.55	9.31	45.44	44.30
45	1.50	0.35	12.13	11.82	57.57	56.12
60	2.00	0.25	14.45	14.08	72.02	70.20
80	2.50	0.18	17.19	16.75	89.21	86.95
120	3.00	0.13	9.63	9.39	98.84	96.34
170	3.50	0.09	1.19	1.16	100.03	97.50
200	3.75	0.07	0.23	0.22	100.26	97.72
230	4.00	0.06	0.13	0.13	100.39	97.85

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.93	2.41	2.14	1.24	-1.39	-2.73	-4.14

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	0.35	0.78	2.25	-0.84	2.34

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report

Depths and elevations based on measured values



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Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC03A #1

Analysis Date: 04-12-16

Analyzed By: CS

Easting (m):
499,018

Northing (m):
4,228,738

Coordinate System:
UTM 18

Elevation (ft):
-79.0 NAVD88

USCS:

SW

Munsell: Wet - 2.5Y-5/2
Dry - 2.5Y-7/2
Washed - 2.5Y-7/2

Comments:

Dry Weight (g):
111.59

Wash Weight (g):
108.67

Pan Retained (g):
0.03

Sieve Loss (%):
0.09

Fines (%):
#200 - 2.82
#230 - 2.72

Organics (%):

Carbonates (%):
43

Shell Hash (%):

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
1"	-4.75	26.91	0.00	0.00	0.00	0.00
3/4"	-4.25	19.03	3.62	3.24	3.62	3.24
5/8"	-4.00	16.00	5.70	5.11	9.32	8.35
7/16"	-3.50	11.31	10.38	9.30	19.70	17.65
5/16"	-3.00	8.00	9.07	8.13	28.77	25.78
3.5	-2.50	5.66	5.33	4.78	34.10	30.56
4	-2.25	4.76	2.27	2.03	36.37	32.59
5	-2.00	4.00	3.66	3.28	40.03	35.87
7	-1.50	2.83	6.19	5.55	46.22	41.42
10	-1.00	2.00	6.88	6.17	53.10	47.59
14	-0.50	1.41	7.10	6.36	60.20	53.95
18	0.00	1.00	6.38	5.72	66.58	59.67
25	0.50	0.71	12.29	11.01	78.87	70.68
35	1.00	0.50	13.32	11.94	92.19	82.62
45	1.50	0.35	6.46	5.79	98.65	88.41
60	2.00	0.25	3.52	3.15	102.17	91.56
80	2.50	0.18	3.80	3.41	105.97	94.97
120	3.00	0.13	1.92	1.72	107.89	96.69
170	3.50	0.09	0.30	0.27	108.19	96.96
200	3.75	0.07	0.24	0.22	108.43	97.18
230	4.00	0.06	0.11	0.10	108.54	97.28

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.51	1.12	0.68	-0.81	-3.05	-3.59	-4.16

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	-1.1	2.14	2.05	-0.02	1.85

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report
Depths and elevations based on measured values



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Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC03A #2

Analysis Date: 04-12-16

Analyzed By: CS

Easting (m):
499,018

Northing (m):
4,228,738

Coordinate System:
UTM 18

Elevation (ft):
-82.0 NAVD88

USCS: **SP** Munsell: **Wet - 2.5Y-5/1**
Dry - 2.5Y-6/1
Washed - 2.5Y-6/1 Comments:

Dry Weight (g): 94.48	Wash Weight (g): 91.44	Pan Retained (g): 0.05	Sieve Loss (%): 0.06	Fines (%): #200 - 3.46 #230 - 3.33	Organics (%):	Carbonates (%): 1	Shell Hash (%)
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Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.16	0.17	0.16	0.17
4	-2.25	4.76	0.19	0.20	0.35	0.37
5	-2.00	4.00	0.05	0.05	0.40	0.42
7	-1.50	2.83	0.04	0.04	0.44	0.46
10	-1.00	2.00	0.15	0.16	0.59	0.62
14	-0.50	1.41	0.11	0.12	0.70	0.74
18	0.00	1.00	0.17	0.18	0.87	0.92
25	0.50	0.71	0.54	0.57	1.41	1.49
35	1.00	0.50	1.14	1.21	2.55	2.70
45	1.50	0.35	2.92	3.09	5.47	5.79
60	2.00	0.25	13.87	14.68	19.34	20.47
80	2.50	0.18	41.86	44.31	61.20	64.78
120	3.00	0.13	27.46	29.06	88.66	93.84
170	3.50	0.09	2.29	2.42	90.95	96.26
200	3.75	0.07	0.26	0.28	91.21	96.54
230	4.00	0.06	0.12	0.13	91.33	96.67

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.24	2.83	2.68	2.33	2.05	1.85	1.37
Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis	
Statistics	2.26	0.21	0.62	-3.01	21.27	

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report
 Depths and elevations based on measured values



CB&I
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 ph (561) 391 8102

Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC03A #3

Analysis Date: 04-12-16

Analyzed By: CS

Easting (m):
 499,018

Northing (m):
 4,228,738

Coordinate System:
 UTM 18

Elevation (ft):
 -84.3 NAVD88

USCS: SW
 Munsell: Wet - 2.5Y-5/2
 Dry - 2.5Y-7/1
 Washed - 5Y-7/1

Comments:

Dry Weight (g): 105.76
 Wash Weight (g): 104.04
 Pan Retained (g): 0.06
 Sieve Loss (%): 0.16
 Fines (%): #200 - 2.04, #230 - 1.87
 Organics (%):
 Carbonates (%): 29
 Shell Hash (%):

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	6.72	6.35	6.72	6.35
7/16"	-3.50	11.31	3.33	3.15	10.05	9.50
5/16"	-3.00	8.00	4.04	3.82	14.09	13.32
3.5	-2.50	5.66	5.98	5.65	20.07	18.97
4	-2.25	4.76	1.06	1.00	21.13	19.97
5	-2.00	4.00	1.81	1.71	22.94	21.68
7	-1.50	2.83	3.64	3.44	26.58	25.12
10	-1.00	2.00	2.70	2.55	29.28	27.67
14	-0.50	1.41	2.49	2.35	31.77	30.02
18	0.00	1.00	2.90	2.74	34.67	32.76
25	0.50	0.71	7.48	7.07	42.15	39.83
35	1.00	0.50	13.99	13.23	56.14	53.06
45	1.50	0.35	14.05	13.28	70.19	66.34
60	2.00	0.25	12.53	11.85	82.72	78.19
80	2.50	0.18	12.63	11.94	95.35	90.13
120	3.00	0.13	7.21	6.82	102.56	96.95
170	3.50	0.09	0.84	0.79	103.40	97.74
200	3.75	0.07	0.23	0.22	103.63	97.96
230	4.00	0.06	0.18	0.17	103.81	98.13

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	0.15	0.90	2.15	-0.72	2.24

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report

Depths and elevations based on measured values



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Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC03A #4

Analysis Date: 04-12-16

Analyzed By: AV

Easting (m):
499,018

Northing (m):
4,228,738

Coordinate System:
UTM 18

Elevation (ft):
-85.8 NAVD88

USCS: **SP-SM** Munsell: **Wet - 5Y-4/2
Dry - 5Y-7/2
Washed - 5Y-7/2** Comments:

Dry Weight (g): 92.53	Wash Weight (g): 88.75	Pan Retained (g): 0.16	Sieve Loss (%): 0.24	Fines (%): #200 - 5.00 #230 - 4.50	Organics (%):	Carbonates (%): 0	Shell Hash (%):
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Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.00	0.00	0.00	0.00
7	-1.50	2.83	0.00	0.00	0.00	0.00
10	-1.00	2.00	0.00	0.00	0.00	0.00
14	-0.50	1.41	0.01	0.01	0.01	0.01
18	0.00	1.00	0.01	0.01	0.02	0.02
25	0.50	0.71	0.01	0.01	0.03	0.03
35	1.00	0.50	0.01	0.01	0.04	0.04
45	1.50	0.35	0.05	0.05	0.09	0.09
60	2.00	0.25	0.79	0.85	0.88	0.94
80	2.50	0.18	22.82	24.66	23.70	25.60
120	3.00	0.13	54.88	59.31	78.58	84.91
170	3.50	0.09	8.40	9.08	86.98	93.99
200	3.75	0.07	0.93	1.01	87.91	95.00
230	4.00	0.06	0.46	0.50	88.37	95.50

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.75	2.99	2.92	2.71	2.49	2.31	2.08
Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis	
	2.67	0.16	0.33	-0.03	6.23	

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report
 Depths and elevations based on measured values



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Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC04 #1

Analysis Date: 04-12-16

Analyzed By: CS

Easting (m):
 496,902

Northing (m):
 4,227,038

Coordinate System:
 UTM 18

Elevation (ft):
 -54.2 NAVD88

USCS: SP
 Munsell: Wet - 2.5Y-6/4
 Dry - 2.5Y-7/3
 Washed - 2.5Y-8/3
 Comments:

Dry Weight (g): 99.24	Wash Weight (g): 98.33	Pan Retained (g): 0.00	Sieve Loss (%): 0.07	Fines (%): #200 - 1.12 #230 - 1.00	Organics (%):	Carbonates (%): 1	Shell Hash (%):
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Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.09	0.09	0.09	0.09
4	-2.25	4.76	0.12	0.12	0.21	0.21
5	-2.00	4.00	0.00	0.00	0.21	0.21
7	-1.50	2.83	0.00	0.00	0.21	0.21
10	-1.00	2.00	0.14	0.14	0.35	0.35
14	-0.50	1.41	0.40	0.40	0.75	0.75
18	0.00	1.00	0.76	0.77	1.51	1.52
25	0.50	0.71	2.91	2.93	4.42	4.45
35	1.00	0.50	15.84	15.96	20.26	20.41
45	1.50	0.35	37.35	37.64	57.61	58.05
60	2.00	0.25	28.76	28.98	86.37	87.03
80	2.50	0.18	9.75	9.82	96.12	96.85
120	3.00	0.13	1.66	1.67	97.78	98.52
170	3.50	0.09	0.26	0.26	98.04	98.78
200	3.75	0.07	0.10	0.10	98.14	98.88
230	4.00	0.06	0.12	0.12	98.26	99.00

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.41	1.95	1.79	1.39	1.06	0.86	0.52
Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis	
Statistics	1.39	0.38	0.6	-0.7	7.95	

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report

Depths and elevations based on measured values



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Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC04 #2

Analysis Date: 04-12-16

Analyzed By: CS

Easting (m):
496,902

Northing (m):
4,227,038

Coordinate System:
UTM 18

Elevation (ft):
-57.2 NAVD88

USCS: **SW**

Munsell: Wet - 2.5Y-6/4
Dry - 2.5Y-7/3
Washed - 2.5Y-7/2

Comments:

Dry Weight (g): 98.95	Wash Weight (g): 97.97	Pan Retained (g): 0.02	Sieve Loss (%): 0.16	Fines (%): #200 - 1.22 #230 - 1.18	Organics (%):	Carbonates (%): 5	Shell Hash (%):
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Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	2.48	2.51	2.48	2.51
4	-2.25	4.76	0.28	0.28	2.76	2.79
5	-2.00	4.00	0.13	0.13	2.89	2.92
7	-1.50	2.83	0.86	0.87	3.75	3.79
10	-1.00	2.00	0.85	0.86	4.60	4.65
14	-0.50	1.41	1.74	1.76	6.34	6.41
18	0.00	1.00	3.83	3.87	10.17	10.28
25	0.50	0.71	16.27	16.44	26.44	26.72
35	1.00	0.50	21.12	21.34	47.56	48.06
45	1.50	0.35	27.86	28.16	75.42	76.22
60	2.00	0.25	16.30	16.47	91.72	92.69
80	2.50	0.18	4.86	4.91	96.58	97.60
120	3.00	0.13	0.93	0.94	97.51	98.54
170	3.50	0.09	0.16	0.16	97.67	98.70
200	3.75	0.07	0.08	0.08	97.75	98.78
230	4.00	0.06	0.04	0.04	97.79	98.82

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.24	1.74	1.48	1.03	0.45	0.17	-0.90
Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis	
	0.87	0.55	0.98	-1.48	6.72	

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report
 Depths and elevations based on measured values



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Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC04 #3

Analysis Date: 04-12-16

Analyzed By: AV

Easting (m):
 496,902

Northing (m):
 4,227,038

Coordinate System:
 UTM 18

Elevation (ft):
 -62.2 NAVD88

USCS: SP
 Munsell: Wet - 2.5Y-6/4
 Dry - 2.5Y-7/3
 Washed - 2.5Y-7/3
 Comments:

Dry Weight (g): 99.69	Wash Weight (g): 98.77	Pan Retained (g): 0.01	Sieve Loss (%): 0.00	Fines (%): #200 - 0.99 #230 - 0.94	Organics (%):	Carbonates (%): 1	Shell Hash (%):
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Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.06	0.06	0.06	0.06
4	-2.25	4.76	0.14	0.14	0.20	0.20
5	-2.00	4.00	0.17	0.17	0.37	0.37
7	-1.50	2.83	0.13	0.13	0.50	0.50
10	-1.00	2.00	1.06	1.06	1.56	1.56
14	-0.50	1.41	1.43	1.43	2.99	2.99
18	0.00	1.00	2.38	2.39	5.37	5.38
25	0.50	0.71	5.71	5.73	11.08	11.11
35	1.00	0.50	16.23	16.28	27.31	27.39
45	1.50	0.35	31.75	31.85	59.06	59.24
60	2.00	0.25	26.53	26.61	85.59	85.85
80	2.50	0.18	10.58	10.61	96.17	96.46
120	3.00	0.13	2.13	2.14	98.30	98.60
170	3.50	0.09	0.34	0.34	98.64	98.94
200	3.75	0.07	0.07	0.07	98.71	99.01
230	4.00	0.06	0.05	0.05	98.76	99.06

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.43	1.97	1.80	1.35	0.93	0.65	-0.08
Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis	
Statistics	1.28	0.41	0.76	-1.02	5.82	

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report

Depths and elevations based on measured values



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Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC04 #4

Analysis Date: 04-12-16

Analyzed By: AV

Easting (m):
496,902

Northing (m):
4,227,038

Coordinate System:
UTM 18

Elevation (ft):
-67.1 NAVD88

USCS:

SW

Munsell: Wet - 2.5Y-6/3
Dry - 2.5Y-8/2
Washed - 2.5Y-8/2

Comments:

Dry Weight (g): 98.79	Wash Weight (g): 97.50	Pan Retained (g): 0.01	Sieve Loss (%): 0.14	Fines (%): #200 - 1.65 #230 - 1.46	Organics (%):	Carbonates (%): 2	Shell Hash (%):
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Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.65	0.66	0.65	0.66
4	-2.25	4.76	0.09	0.09	0.74	0.75
5	-2.00	4.00	0.17	0.17	0.91	0.92
7	-1.50	2.83	0.94	0.95	1.85	1.87
10	-1.00	2.00	0.66	0.67	2.51	2.54
14	-0.50	1.41	1.52	1.54	4.03	4.08
18	0.00	1.00	3.28	3.32	7.31	7.40
25	0.50	0.71	6.82	6.90	14.13	14.30
35	1.00	0.50	17.25	17.46	31.38	31.76
45	1.50	0.35	28.52	28.87	59.90	60.63
60	2.00	0.25	23.54	23.83	83.44	84.46
80	2.50	0.18	10.00	10.12	93.44	94.58
120	3.00	0.13	2.61	2.64	96.05	97.22
170	3.50	0.09	0.70	0.71	96.75	97.93
200	3.75	0.07	0.41	0.42	97.16	98.35
230	4.00	0.06	0.19	0.19	97.35	98.54

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.58	1.99	1.80	1.32	0.81	0.55	-0.36
Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis	
	1.22	0.43	0.9	-1.09	6.32	

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report
 Depths and elevations based on measured values



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Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC05 #1

Analysis Date: 04-12-16

Analyzed By: CS

Easting (m):
 498,216

Northing (m):
 4,219,404

Coordinate System:
 UTM 18

Elevation (ft):
 -58.5 NAVD88

USCS: SP
 Munsell: Wet - 2.5Y-5/3
 Dry - 2.5Y-7/3
 Washed - 2.5Y-8/3
 Comments:

Dry Weight (g): 98.72
 Wash Weight (g): 98.04
 Pan Retained (g): 0.01
 Sieve Loss (%): 0.16
 Finest (%): #200 - 0.91
 #230 - 0.87
 Organics (%):
 Carbonates (%): 1
 Shell Hash (%):

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.12	0.12	0.12	0.12
7	-1.50	2.83	0.42	0.43	0.54	0.55
10	-1.00	2.00	1.80	1.82	2.34	2.37
14	-0.50	1.41	3.35	3.39	5.69	5.76
18	0.00	1.00	3.71	3.76	9.40	9.52
25	0.50	0.71	7.19	7.28	16.59	16.80
35	1.00	0.50	23.91	24.22	40.50	41.02
45	1.50	0.35	36.58	37.05	77.08	78.07
60	2.00	0.25	14.42	14.61	91.50	92.68
80	2.50	0.18	4.68	4.74	96.18	97.42
120	3.00	0.13	1.41	1.43	97.59	98.85
170	3.50	0.09	0.19	0.19	97.78	99.04
200	3.75	0.07	0.05	0.05	97.83	99.09
230	4.00	0.06	0.04	0.04	97.87	99.13

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	1.02	0.49	0.77	-0.81	4.71

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ JPBRAZIL.GDT 9/12/16

Granularmetric Report
 Depths and elevations based on measured values



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Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC05 #2

Analysis Date: 04-12-16

Analyzed By: CS

Easting (m):
 498,216

Northing (m):
 4,219,404

Coordinate System:
 UTM 18

Elevation (ft):
 -62.7 NAVD88

USCS: SP
 Munsell: Wet - 2.5Y-5/2
 Dry - 2.5Y-7/2
 Washed - 2.5Y-7/2
 Comments:

Dry Weight (g): 91.63
 Wash Weight (g): 90.47
 Pan Retained (g): 0.03
 Sieve Loss (%): 0.04
 Fines (%): #200 - 1.39, #230 - 1.34
 Organics (%):
 Carbonates (%): 3
 Shell Hash (%):

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.22	0.24	0.22	0.24
4	-2.25	4.76	0.68	0.74	0.90	0.98
5	-2.00	4.00	0.05	0.05	0.95	1.03
7	-1.50	2.83	0.46	0.50	1.41	1.53
10	-1.00	2.00	1.06	1.16	2.47	2.69
14	-0.50	1.41	2.76	3.01	5.23	5.70
18	0.00	1.00	3.35	3.66	8.58	9.36
25	0.50	0.71	5.45	5.95	14.03	15.31
35	1.00	0.50	18.02	19.67	32.05	34.98
45	1.50	0.35	35.45	38.69	67.50	73.67
60	2.00	0.25	16.41	17.91	83.91	91.58
80	2.50	0.18	5.04	5.50	88.95	97.08
120	3.00	0.13	1.18	1.29	90.13	98.37
170	3.50	0.09	0.19	0.21	90.32	98.58
200	3.75	0.07	0.03	0.03	90.35	98.61
230	4.00	0.06	0.05	0.05	90.40	98.66

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	2.31	1.54	1.19	0.75	-0.62
	1.06	0.48	0.83	-1.34	6.54

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report
 Depths and elevations based on measured values



CB&I
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 ph (561) 391 8102

Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC05 #3

Analysis Date: 04-13-16

Analyzed By: DA

Easting (m):
 498,216

Northing (m):
 4,219,404

Coordinate System:
 UTM 18

Elevation (ft):
 -65.1 NAVD88

USCS: SW
 Munsell: Wet - 5Y-3/1
 Dry - 5Y-6/1
 Washed - 5Y-7/1
 Comments:

Dry Weight (g): 113.77
 Wash Weight (g): 111.40
 Pan Retained (g): 0.03
 Sieve Loss (%): 0.00
 Finest (%): #200 - 2.24
 #230 - 2.11
 Organics (%):
 Carbonates (%): 38
 Shell Hash (%):

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	22.71	19.96	22.71	19.96
7/16"	-3.50	11.31	7.80	6.86	30.51	26.82
5/16"	-3.00	8.00	13.06	11.48	43.57	38.30
3.5	-2.50	5.66	6.11	5.37	49.68	43.67
4	-2.25	4.76	4.71	4.14	54.39	47.81
5	-2.00	4.00	4.02	3.53	58.41	51.34
7	-1.50	2.83	5.51	4.84	63.92	56.18
10	-1.00	2.00	5.35	4.70	69.27	60.88
14	-0.50	1.41	5.91	5.19	75.18	66.07
18	0.00	1.00	6.22	5.47	81.40	71.54
25	0.50	0.71	7.75	6.81	89.15	78.35
35	1.00	0.50	6.37	5.60	95.52	83.95
45	1.50	0.35	4.42	3.89	99.94	87.84
60	2.00	0.25	4.15	3.65	104.09	91.49
80	2.50	0.18	3.98	3.50	108.07	94.99
120	3.00	0.13	2.47	2.17	110.54	97.16
170	3.50	0.09	0.52	0.46	111.06	97.62
200	3.75	0.07	0.16	0.14	111.22	97.76
230	4.00	0.06	0.15	0.13	111.37	97.89

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis		
	Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
	2.50	1.01	0.25	-2.09	-3.63	-4.05	-4.19
	-1.67	3.18	2.15	0.49	2		

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report
 Depths and elevations based on measured values



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Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC05 #4

Analysis Date: 04-13-16

Analyzed By: CS

Easting (m):
 498,216

Northing (m):
 4,219,404

Coordinate System:
 UTM 18

Elevation (ft):
 -65.7 NAVD88

USCS: SW
 Munsell: Wet - 2.5Y-4/1
 Dry - 2.5Y-6/1
 Washed - 2.5Y-7/1
 Comments:

Dry Weight (g): 107.05
 Wash Weight (g): 104.82
 Pan Retained (g): 0.03
 Sieve Loss (%): 0.09
 Finest (%): #200 - 2.29
 #230 - 2.20
 Organics (%):
 Carbonates (%): 18
 Shell Hash (%):

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
1"	-4.75	26.91	0.00	0.00	0.00	0.00
3/4"	-4.25	19.03	8.78	8.20	8.78	8.20
5/8"	-4.00	16.00	0.00	0.00	8.78	8.20
7/16"	-3.50	11.31	4.00	3.74	12.78	11.94
5/16"	-3.00	8.00	7.87	7.35	20.65	19.29
3.5	-2.50	5.66	4.20	3.92	24.85	23.21
4	-2.25	4.76	1.93	1.80	26.78	25.01
5	-2.00	4.00	2.26	2.11	29.04	27.12
7	-1.50	2.83	3.40	3.18	32.44	30.30
10	-1.00	2.00	3.24	3.03	35.68	33.33
14	-0.50	1.41	3.59	3.35	39.27	36.68
18	0.00	1.00	3.24	3.03	42.51	39.71
25	0.50	0.71	5.97	5.58	48.48	45.29
35	1.00	0.50	7.16	6.69	55.64	51.98
45	1.50	0.35	8.96	8.37	64.60	60.35
60	2.00	0.25	21.02	19.64	85.62	79.99
80	2.50	0.18	15.16	14.16	100.78	94.15
120	3.00	0.13	3.24	3.03	104.02	97.18
170	3.50	0.09	0.47	0.44	104.49	97.62
200	3.75	0.07	0.10	0.09	104.59	97.71
230	4.00	0.06	0.10	0.09	104.69	97.80

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	2.64	1.87	0.85	-2.25	-4.29
	-0.14	1.10	2.35	-0.59	1.9

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report
 Depths and elevations based on measured values



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Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC05 #5

Analysis Date: 04-13-16

Analyzed By: CS

Easting (m):
 498,216

Northing (m):
 4,219,404

Coordinate System:
 UTM 18

Elevation (ft):
 -66.2 NAVD88

USCS: SP-SC
 Munsell: Wet - 5Y-4/1
 Dry - 5Y-7/1
 Washed - 5Y-7/1
 Comments:

Dry Weight (g): 88.55
 Wash Weight (g): 79.05
 Pan Retained (g): 0.01
 Sieve Loss (%): 0.09
 Finest (%): #200 - 10.96
 #230 - 10.82
 Organics (%):
 Carbonates (%): 2
 Shell Hash (%):

Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.62	0.70	0.62	0.70
3.5	-2.50	5.66	0.00	0.00	0.62	0.70
4	-2.25	4.76	0.44	0.50	1.06	1.20
5	-2.00	4.00	0.23	0.26	1.29	1.46
7	-1.50	2.83	0.06	0.07	1.35	1.53
10	-1.00	2.00	0.47	0.53	1.82	2.06
14	-0.50	1.41	0.32	0.36	2.14	2.42
18	0.00	1.00	0.28	0.32	2.42	2.74
25	0.50	0.71	0.42	0.47	2.84	3.21
35	1.00	0.50	0.81	0.91	3.65	4.12
45	1.50	0.35	9.38	10.59	13.03	14.71
60	2.00	0.25	25.67	28.99	38.70	43.70
80	2.50	0.18	29.20	32.98	67.90	76.68
120	3.00	0.13	9.56	10.80	77.46	87.48
170	3.50	0.09	1.20	1.36	78.66	88.84
200	3.75	0.07	0.18	0.20	78.84	89.04
230	4.00	0.06	0.12	0.14	78.96	89.18

Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis
	1.9	0.27	0.85	-3.12	17.57

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report

Depths and elevations based on measured values



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Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC07 #1

Analysis Date: 04-13-16

Analyzed By: CS

Easting (m):
495,480

Northing (m):
4,213,018

Coordinate System:
UTM 18

Elevation (ft):
-46.1 NAVD88

USCS: **SW**

Munsell: Wet - 2.5Y-5/3
Dry - 2.5Y-7/3
Washed - 2.5Y-7/2

Comments:

Dry Weight (g): 105.47	Wash Weight (g): 104.88	Pan Retained (g): 0.01	Sieve Loss (%): 0.06	Fines (%): #200 - 0.64 #230 - 0.60	Organics (%):	Carbonates (%): 7	Shell Hash (%):
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Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	1.89	1.79	1.89	1.79
5/16"	-3.00	8.00	9.97	9.45	11.86	11.24
3.5	-2.50	5.66	8.06	7.64	19.92	18.88
4	-2.25	4.76	4.07	3.86	23.99	22.74
5	-2.00	4.00	2.40	2.28	26.39	25.02
7	-1.50	2.83	6.25	5.93	32.64	30.95
10	-1.00	2.00	4.33	4.11	36.97	35.06
14	-0.50	1.41	4.50	4.27	41.47	39.33
18	0.00	1.00	4.89	4.64	46.36	43.97
25	0.50	0.71	10.44	9.90	56.80	53.87
35	1.00	0.50	17.38	16.48	74.18	70.35
45	1.50	0.35	15.16	14.37	89.34	84.72
60	2.00	0.25	9.69	9.19	99.03	93.91
80	2.50	0.18	4.89	4.64	103.92	98.55
120	3.00	0.13	0.74	0.70	104.66	99.25
170	3.50	0.09	0.05	0.05	104.71	99.30
200	3.75	0.07	0.06	0.06	104.77	99.36
230	4.00	0.06	0.04	0.04	104.81	99.40

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.12	1.47	1.16	0.30	-2.00	-2.69	-3.33
Moment Statistics	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis	
	-0.31	1.24	1.81	-0.4	1.82	

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report

Depths and elevations based on measured values



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Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC07 #2

Analysis Date: 04-13-16

Analyzed By: AV

Easting (m):
 495,480

Northing (m):
 4,213,018

Coordinate System:
 UTM 18

Elevation (ft):
 -48.6 NAVD88

USCS:

SW

Munsell: Wet - 2.5Y-5/2
 Dry - 2.5Y-7/3
 Washed - 2.5Y-8/2

Comments:

Dry Weight (g): 90.00	Wash Weight (g): 89.22	Pan Retained (g): 0.00	Sieve Loss (%): 0.04	Fines (%): #200 - 0.94 #230 - 0.91	Organics (%):	Carbonates (%): 3	Shell Hash (%)
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Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.10	0.11	0.10	0.11
4	-2.25	4.76	0.43	0.48	0.53	0.59
5	-2.00	4.00	0.52	0.58	1.05	1.17
7	-1.50	2.83	0.64	0.71	1.69	1.88
10	-1.00	2.00	1.29	1.43	2.98	3.31
14	-0.50	1.41	2.43	2.70	5.41	6.01
18	0.00	1.00	4.62	5.13	10.03	11.14
25	0.50	0.71	11.47	12.74	21.50	23.88
35	1.00	0.50	22.51	25.01	44.01	48.89
45	1.50	0.35	20.57	22.86	64.58	71.75
60	2.00	0.25	16.13	17.92	80.71	89.67
80	2.50	0.18	7.01	7.79	87.72	97.46
120	3.00	0.13	1.23	1.37	88.95	98.83
170	3.50	0.09	0.14	0.16	89.09	98.99
200	3.75	0.07	0.06	0.07	89.15	99.06
230	4.00	0.06	0.03	0.03	89.18	99.09

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.34	1.84	1.59	1.02	0.52	0.19	-0.69
Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis	
Statistics	0.96	0.51	0.9	-0.83	4.62	

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report
 Depths and elevations based on measured values



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Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC07 #3

Analysis Date: 04-13-16

Analyzed By: AV

Easting (m):
 495,480

Northing (m):
 4,213,018

Coordinate System:
 UTM 18

Elevation (ft):
 -51.1 NAVD88

USCS: SW
 Munsell: Wet - 2.5Y-5/2
 Dry - 2.5Y-7/3
 Washed - 2.5Y-8/3

Comments:

Dry Weight (g): 92.56	Wash Weight (g): 91.96	Pan Retained (g): 0.01	Sieve Loss (%): 0.08	Fines (%): #200 - 0.75 #230 - 0.73	Organics (%):	Carbonates (%): 3	Shell Hash (%):
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Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	4.47	4.83	4.47	4.83
5/16"	-3.00	8.00	5.73	6.19	10.20	11.02
3.5	-2.50	5.66	3.99	4.31	14.19	15.33
4	-2.25	4.76	5.27	5.69	19.46	21.02
5	-2.00	4.00	2.71	2.93	22.17	23.95
7	-1.50	2.83	3.49	3.77	25.66	27.72
10	-1.00	2.00	2.73	2.95	28.39	30.67
14	-0.50	1.41	3.81	4.12	32.20	34.79
18	0.00	1.00	5.18	5.60	37.38	40.39
25	0.50	0.71	9.92	10.72	47.30	51.11
35	1.00	0.50	17.52	18.93	64.82	70.04
45	1.50	0.35	13.12	14.17	77.94	84.21
60	2.00	0.25	9.30	10.05	87.24	94.26
80	2.50	0.18	3.68	3.98	90.92	98.24
120	3.00	0.13	0.77	0.83	91.69	99.07
170	3.50	0.09	0.12	0.13	91.81	99.20
200	3.75	0.07	0.05	0.05	91.86	99.25
230	4.00	0.06	0.02	0.02	91.88	99.27

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.09	1.49	1.18	0.45	-1.86	-2.47	-3.49
Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis	
Statistics	-0.21	1.16	1.79	-0.58	2.08	

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report
 Depths and elevations based on measured values



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Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC07 #4

Analysis Date: 04-13-16

Analyzed By: CS

Easting (m):
 495,480

Northing (m):
 4,213,018

Coordinate System:
 UTM 18

Elevation (ft):
 -54.2 NAVD88

USCS: SW
 Munsell: Wet - 2.5Y-4/1
 Dry - 2.5Y-7/2
 Washed - 2.5Y-8/4
 Comments:

Dry Weight (g): 92.04	Wash Weight (g): 91.01	Pan Retained (g): 0.02	Sieve Loss (%): 0.07	Fines (%): #200 - 1.24 #230 - 1.20	Organics (%):	Carbonates (%): 8	Shell Hash (%):
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Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	5.61	6.10	5.61	6.10
5/16"	-3.00	8.00	0.69	0.75	6.30	6.85
3.5	-2.50	5.66	0.54	0.59	6.84	7.44
4	-2.25	4.76	0.05	0.05	6.89	7.49
5	-2.00	4.00	0.67	0.73	7.56	8.22
7	-1.50	2.83	0.40	0.43	7.96	8.65
10	-1.00	2.00	0.45	0.49	8.41	9.14
14	-0.50	1.41	1.14	1.24	9.55	10.38
18	0.00	1.00	1.77	1.92	11.32	12.30
25	0.50	0.71	4.70	5.11	16.02	17.41
35	1.00	0.50	12.39	13.46	28.41	30.87
45	1.50	0.35	19.84	21.56	48.25	52.43
60	2.00	0.25	24.84	26.99	73.09	79.42
80	2.50	0.18	14.92	16.21	88.01	95.63
120	3.00	0.13	2.39	2.60	90.40	98.23
170	3.50	0.09	0.28	0.30	90.68	98.53
200	3.75	0.07	0.21	0.23	90.89	98.76
230	4.00	0.06	0.04	0.04	90.93	98.80

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.48	2.14	1.92	1.44	0.78	0.36	-3.64
Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis	
Statistics	1.01	0.50	1.55	-2.01	6.56	

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report
 Depths and elevations based on measured values



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Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC07 #5

Analysis Date: 04-13-16

Analyzed By: AV

Easting (m):
 495,480

Northing (m):
 4,213,018

Coordinate System:
 UTM 18

Elevation (ft):
 -57.4 NAVD88

USCS: SW
 Munsell: Wet - 2.5Y-5/3
 Dry - 2.5Y-8/2
 Washed - 2.5Y-8/2
 Comments:

Dry Weight (g): 90.80	Wash Weight (g): 89.95	Pan Retained (g): 0.00	Sieve Loss (%): 0.00	Fines (%): #200 - 0.96 #230 - 0.94	Organics (%):	Carbonates (%): 1	Shell Hash (%):
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Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.11	0.12	0.11	0.12
4	-2.25	4.76	0.35	0.39	0.46	0.51
5	-2.00	4.00	0.20	0.22	0.66	0.73
7	-1.50	2.83	0.23	0.25	0.89	0.98
10	-1.00	2.00	0.69	0.76	1.58	1.74
14	-0.50	1.41	1.77	1.95	3.35	3.69
18	0.00	1.00	3.08	3.39	6.43	7.08
25	0.50	0.71	7.44	8.19	13.87	15.27
35	1.00	0.50	15.91	17.52	29.78	32.79
45	1.50	0.35	19.14	21.08	48.92	53.87
60	2.00	0.25	23.60	25.99	72.52	79.86
80	2.50	0.18	13.62	15.00	86.14	94.86
120	3.00	0.13	3.41	3.76	89.55	98.62
170	3.50	0.09	0.30	0.33	89.85	98.95
200	3.75	0.07	0.08	0.09	89.93	99.04
230	4.00	0.06	0.02	0.02	89.95	99.06

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.52	2.14	1.91	1.41	0.78	0.52	-0.31
Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis	
Statistics	1.28	0.41	0.88	-0.94	4.87	

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report
 Depths and elevations based on measured values



CB&I
 Coastal Planning & Engineering, Inc.
 2481 NW Boca Raton Blvd.
 Boca Raton, FL 33431
 ph (561) 391 8102

Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC07 #6

Analysis Date: 04-13-16

Analyzed By: AV

Easting (m):
 495,480

Northing (m):
 4,213,018

Coordinate System:
 UTM 18

Elevation (ft):
 -60.6 NAVD88

USCS: SP
 Munsell: Wet - 2.5Y-4/1
 Dry - 2.5Y-7/2
 Washed - 2.5Y-8/2
 Comments:

Dry Weight (g): 88.17	Wash Weight (g): 86.94	Pan Retained (g): 0.00	Sieve Loss (%): 0.06	Fines (%): #200 - 1.50 #230 - 1.43	Organics (%):	Carbonates (%): 1	Shell Hash (%):
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Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.43	0.49	0.43	0.49
4	-2.25	4.76	0.00	0.00	0.43	0.49
5	-2.00	4.00	0.02	0.02	0.45	0.51
7	-1.50	2.83	0.17	0.19	0.62	0.70
10	-1.00	2.00	0.19	0.22	0.81	0.92
14	-0.50	1.41	0.57	0.65	1.38	1.57
18	0.00	1.00	1.24	1.41	2.62	2.98
25	0.50	0.71	4.45	5.05	7.07	8.03
35	1.00	0.50	14.20	16.11	21.27	24.14
45	1.50	0.35	23.10	26.20	44.37	50.34
60	2.00	0.25	26.82	30.42	71.19	80.76
80	2.50	0.18	13.07	14.82	84.26	95.58
120	3.00	0.13	2.05	2.33	86.31	97.91
170	3.50	0.09	0.43	0.49	86.74	98.40
200	3.75	0.07	0.09	0.10	86.83	98.50
230	4.00	0.06	0.06	0.07	86.89	98.57

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
2.48	2.11	1.91	1.49	1.02	0.75	0.20
Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis	
Statistics	1.4	0.38	0.74	-1.25	8.08	

GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

Granularmetric Report
 Depths and elevations based on measured values



CB&I
 Coastal Planning & Engineering, Inc.
 2481 NW Boca Raton Blvd.
 Boca Raton, FL 33431
 ph (561) 391 8102

Project Name: Inventory of Potential Beach Nourishment and Coastal Restoration

Sand Sources on the Atlantic OCS

Sample Name: MD-BOEM-2015-VC07 #7

Analysis Date: 04-14-16

Analyzed By: AV

Easting (m):
 495,480

Northing (m):
 4,213,018

Coordinate System:
 UTM 18

Elevation (ft):
 -62.8 NAVD88

USCS: SP
 Munsell: Wet - 2.5Y-4/1
 Dry - 2.5Y-7/1
 Washed - 2.5Y-6/1
 Comments:

Dry Weight (g): 86.62	Wash Weight (g): 84.91	Pan Retained (g): 0.02	Sieve Loss (%): 0.00	Fines (%): #200 - 2.29 #230 - 2.01	Organics (%):	Carbonates (%): 0	Shell Hash (%):
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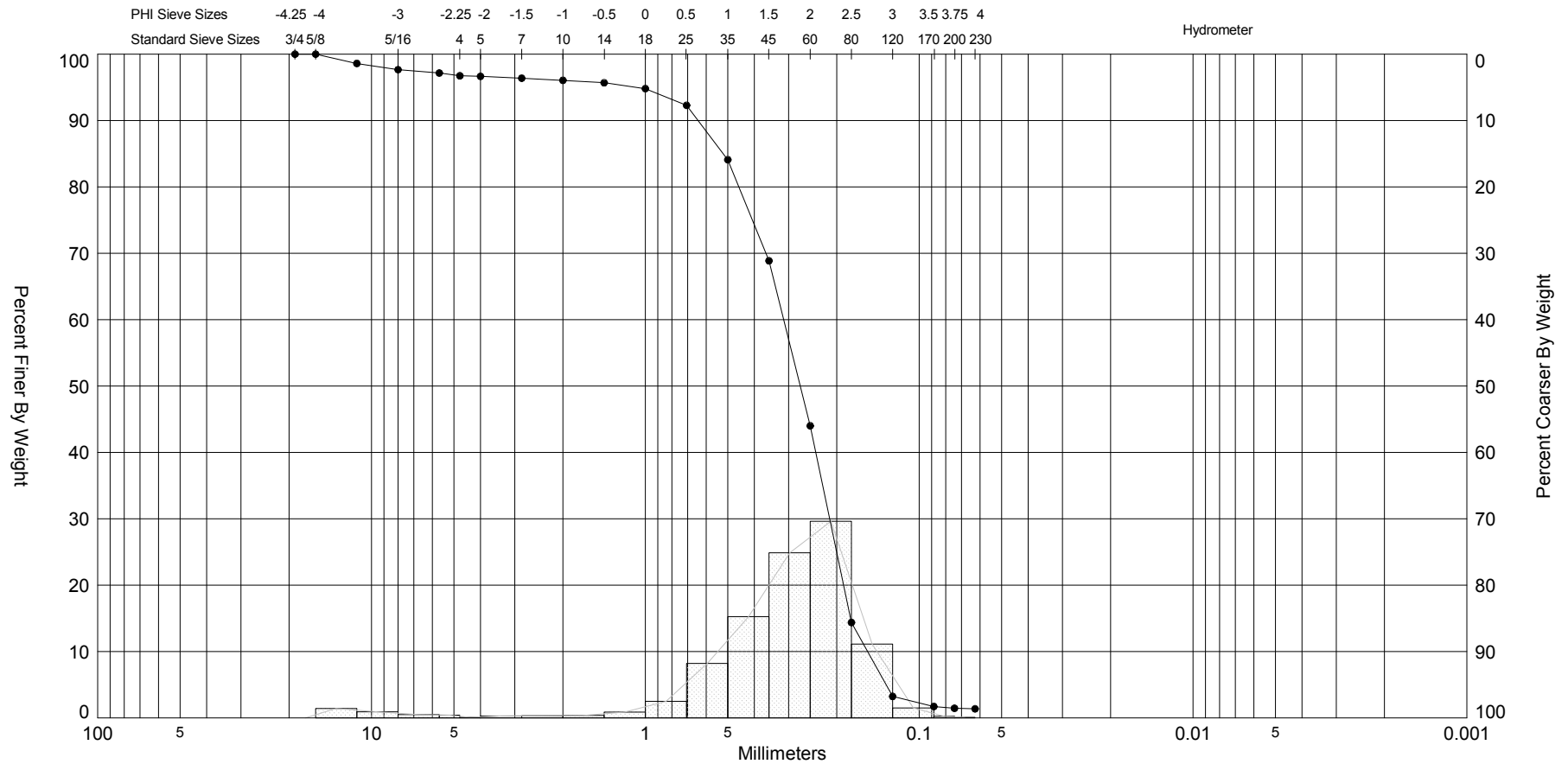
Sieve Number	Sieve Size (Phi)	Sieve Size (Millimeters)	Grams Retained	% Weight Retained	Cum. Grams Retained	C. % Weight Retained
3/4"	-4.25	19.03	0.00	0.00	0.00	0.00
5/8"	-4.00	16.00	0.00	0.00	0.00	0.00
7/16"	-3.50	11.31	0.00	0.00	0.00	0.00
5/16"	-3.00	8.00	0.00	0.00	0.00	0.00
3.5	-2.50	5.66	0.00	0.00	0.00	0.00
4	-2.25	4.76	0.00	0.00	0.00	0.00
5	-2.00	4.00	0.00	0.00	0.00	0.00
7	-1.50	2.83	0.02	0.02	0.02	0.02
10	-1.00	2.00	0.01	0.01	0.03	0.03
14	-0.50	1.41	0.01	0.01	0.04	0.04
18	0.00	1.00	0.07	0.08	0.11	0.12
25	0.50	0.71	0.11	0.13	0.22	0.25
35	1.00	0.50	0.54	0.62	0.76	0.87
45	1.50	0.35	2.65	3.06	3.41	3.93
60	2.00	0.25	14.05	16.22	17.46	20.15
80	2.50	0.18	42.56	49.13	60.02	69.28
120	3.00	0.13	21.13	24.39	81.15	93.67
170	3.50	0.09	2.96	3.42	84.11	97.09
200	3.75	0.07	0.54	0.62	84.65	97.71
230	4.00	0.06	0.24	0.28	84.89	97.99

Phi 5	Phi 16	Phi 25	Phi 50	Phi 75	Phi 84	Phi 95
3.19	2.80	2.62	2.30	2.05	1.87	1.53
Moment	Mean Phi	Mean mm	Sorting	Skewness	Kurtosis	
Statistics	2.29	0.20	0.47	-0.52	6.59	


GRANULARMETRIC REPORT MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16

APPENDIX 4
INDIVIDUAL VIBRACORE GRAIN SIZE DISTRIBUTION
CURVES/HISTOGRAMS

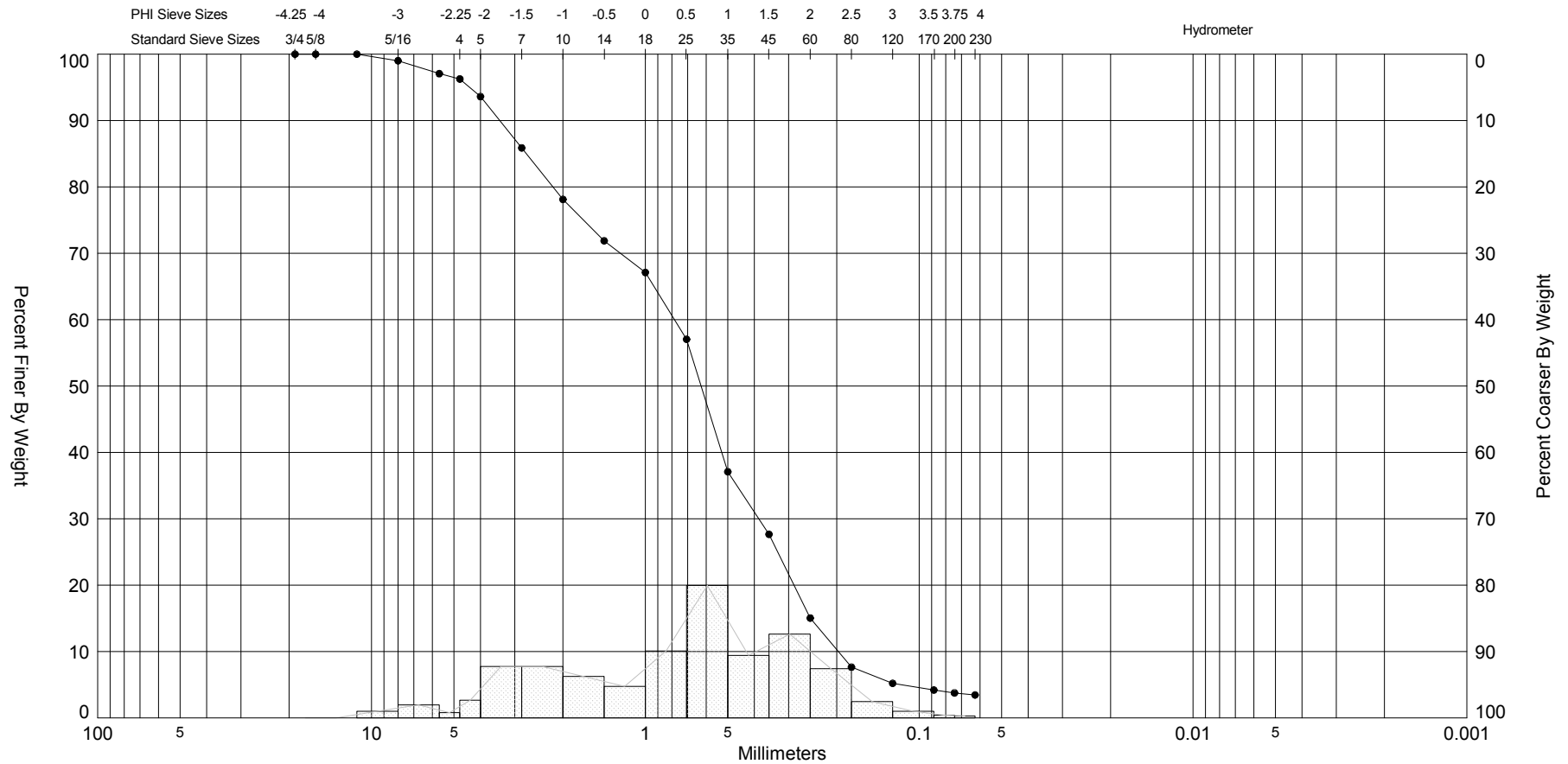
SIEVE ANALYSIS MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16




Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC01 #1	—●—	-65.1	SW	#200 - 1.45 #230 - 1.37		4	1.88	1.63	-2.57	11.45	1.17	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	04-12-16 AV
												Easting (X, m):	502,208
												Northing (Y, m):	4,232,414
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88
CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102													

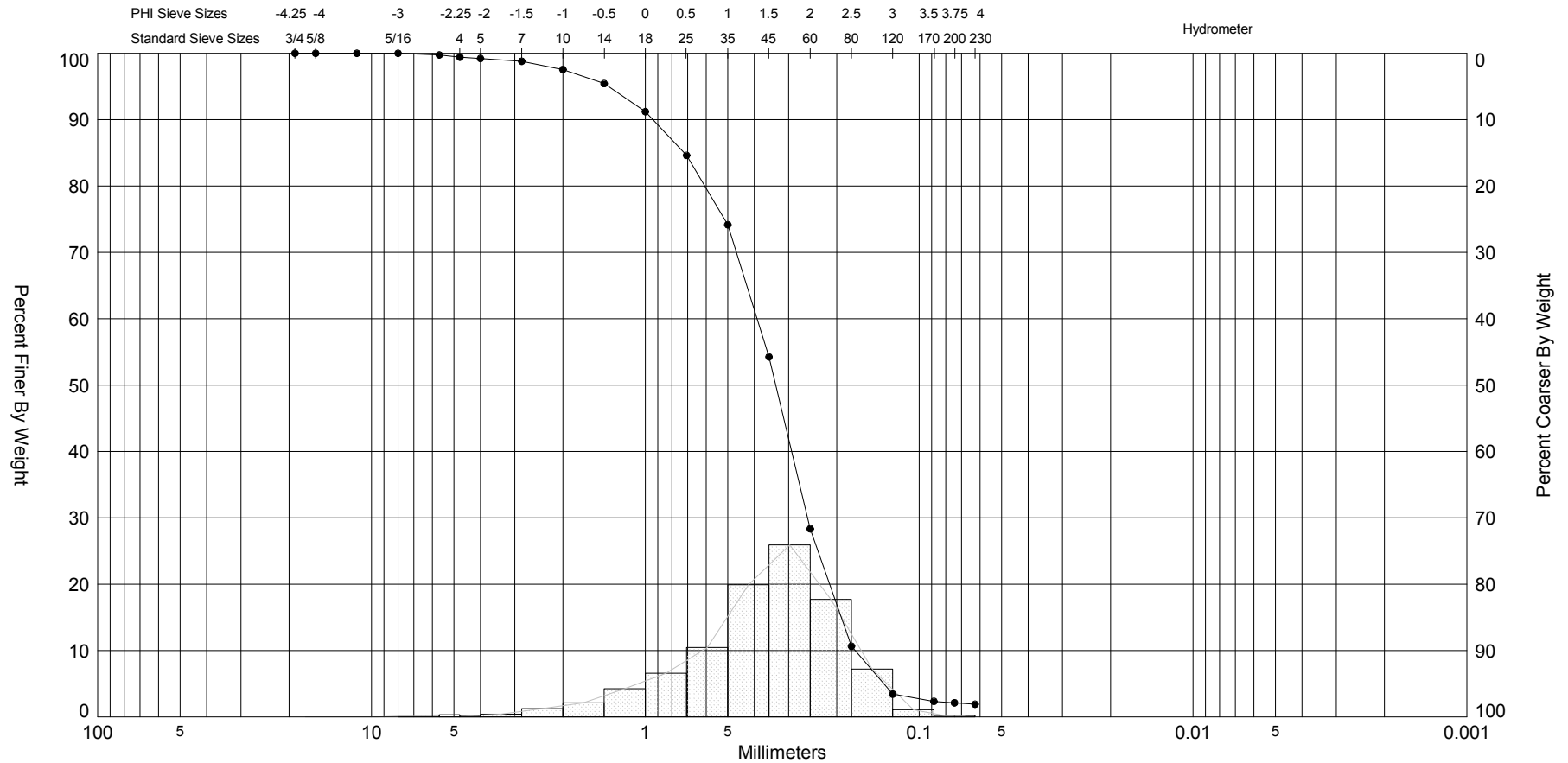
SIEVE ANALYSIS MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16



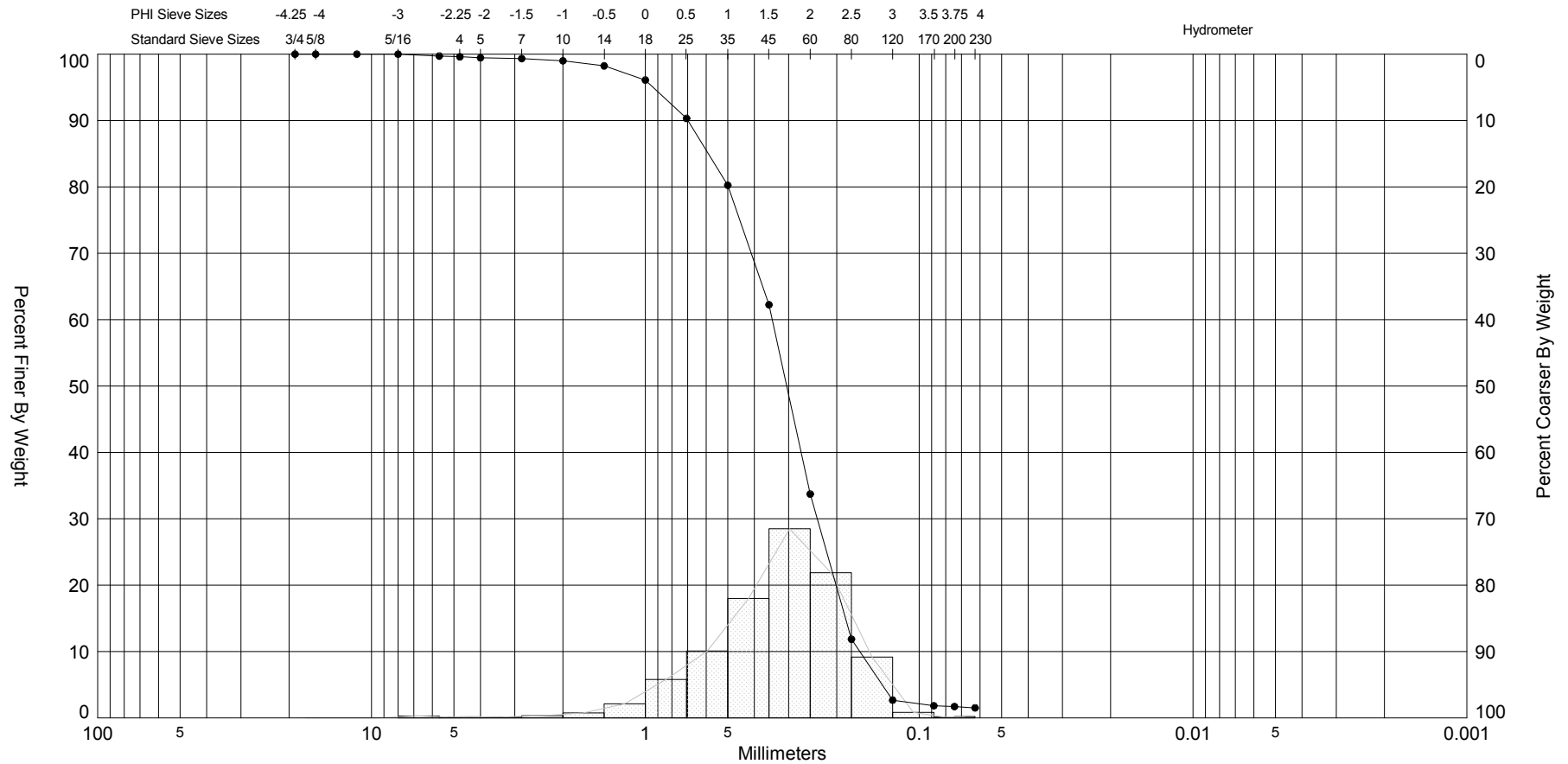
Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC01 #2	—●—	-80.8	SW	#200 - 3.77 #230 - 3.46		0	0.68	0.37	-0.34	2.42	1.48	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	04-12-16 SMT
												Easting (X, m):	502.208
												Northing (Y, m):	4,232,414
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88
												CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102	

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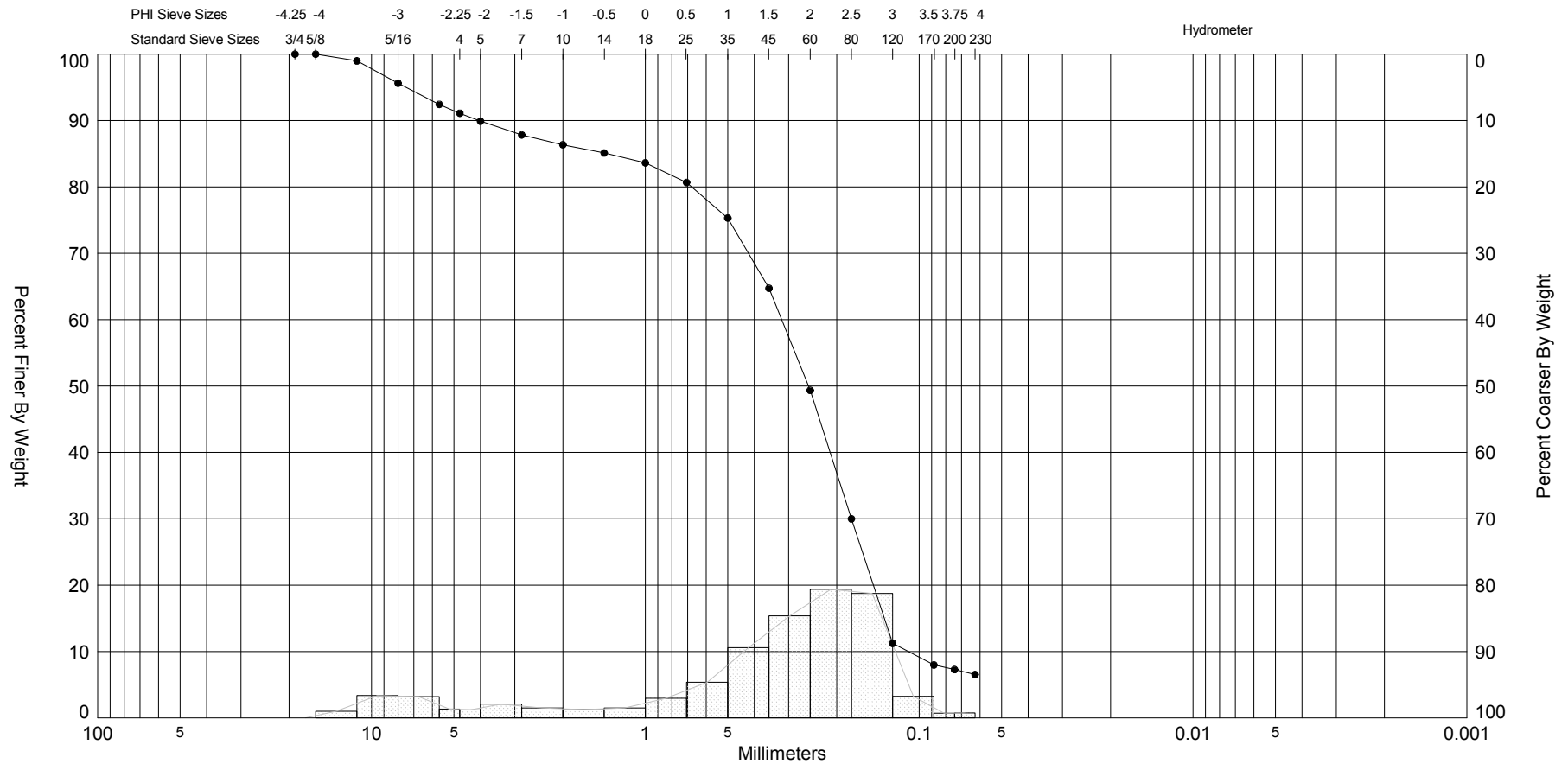
SIEVE ANALYSIS MD_BOEM_2015_VC_GPJ_JPBRAZIL.GDT 9/12/16




Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC03 #2	—●—	-74.3	SP	#200 - 1.71 #230 - 1.52		2	1.71	1.59	-1.11	5.92	0.85	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	CS
 CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102												Easting (X, m):	499,020
												Northing (Y, m):	4,228,739
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88

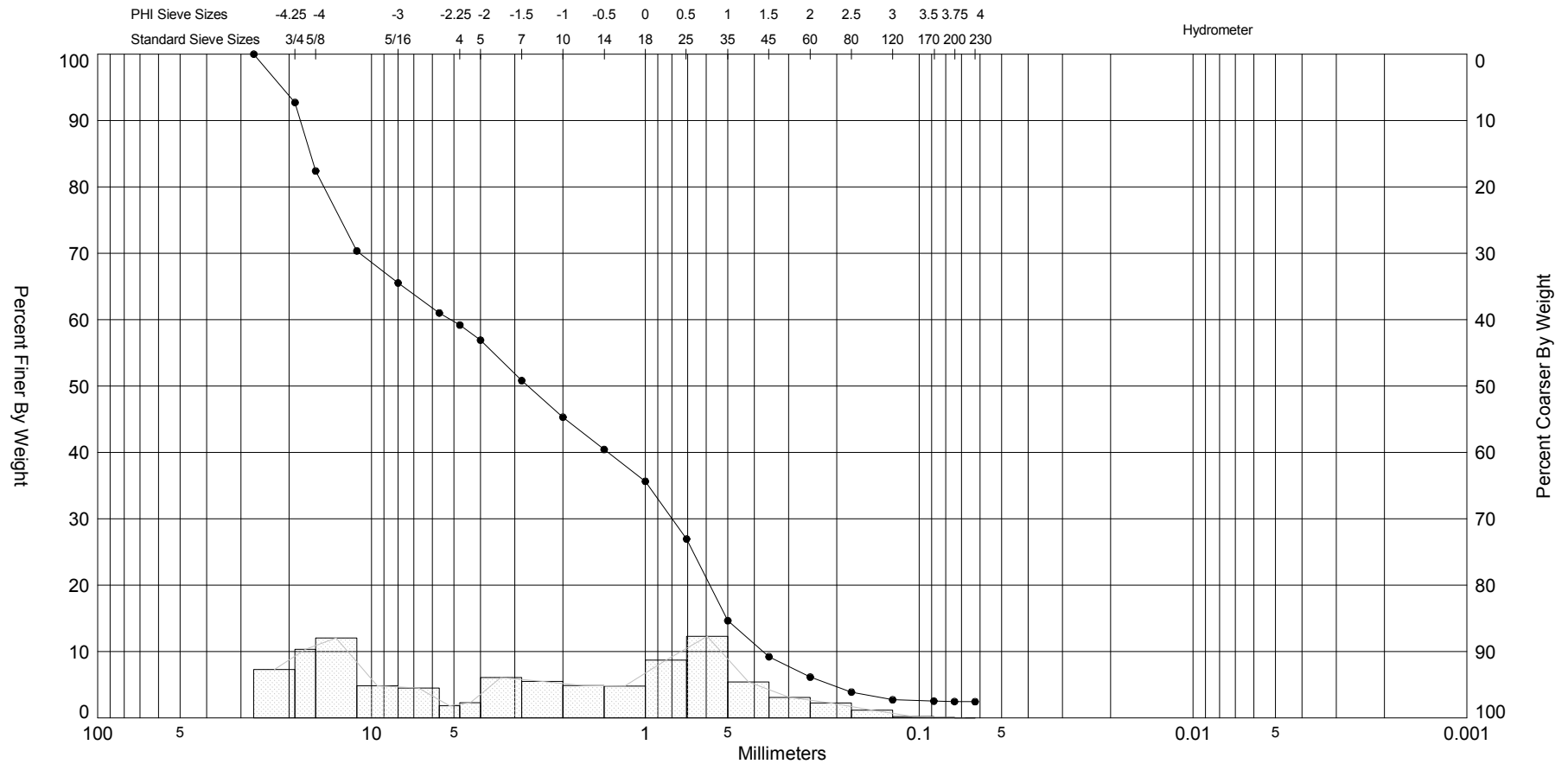
SIEVE ANALYSIS MD_BOEM_2015_VC_GPJ_JPBRAZIL.GDT 9/12/16




Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC03 #3	—●—	-76.5	SW-SM	#200 - 7.28 #230 - 6.54		15	1.98	1.28	-1.36	3.85	1.8	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	04-12-16 AV
												Easting (X, m):	499,020
												Northing (Y, m):	4,228,739
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88
CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102													

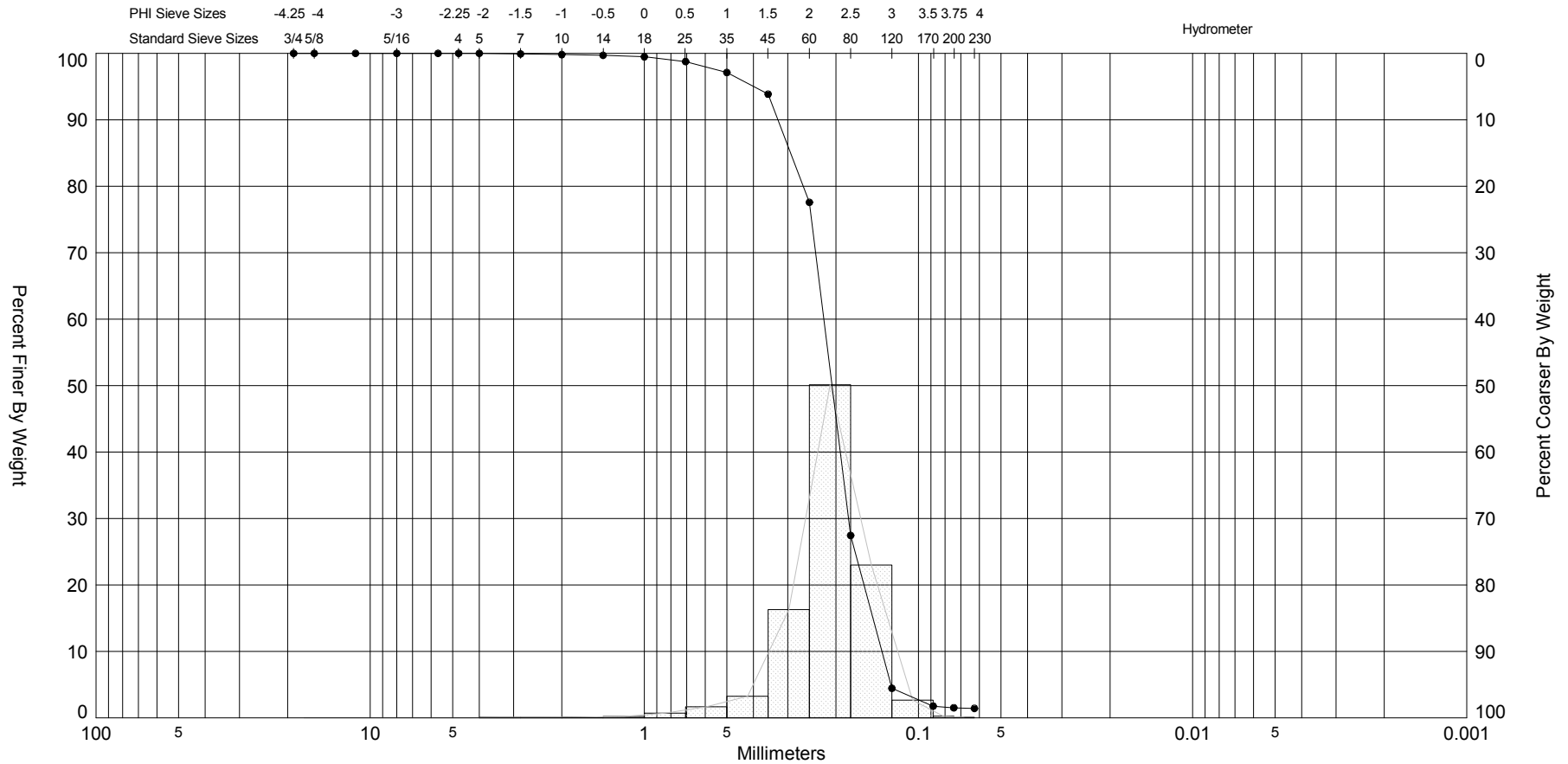
SIEVE ANALYSIS MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16




Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC03 #4	—●—	-78.9	SW	#200 - 2.46 #230 - 2.44		47		-1.51	0.12	1.65	2.16	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	04-12-16 AV
												Easting (X, m):	499,020
												Northing (Y, m):	4,228,739
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88
CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102													

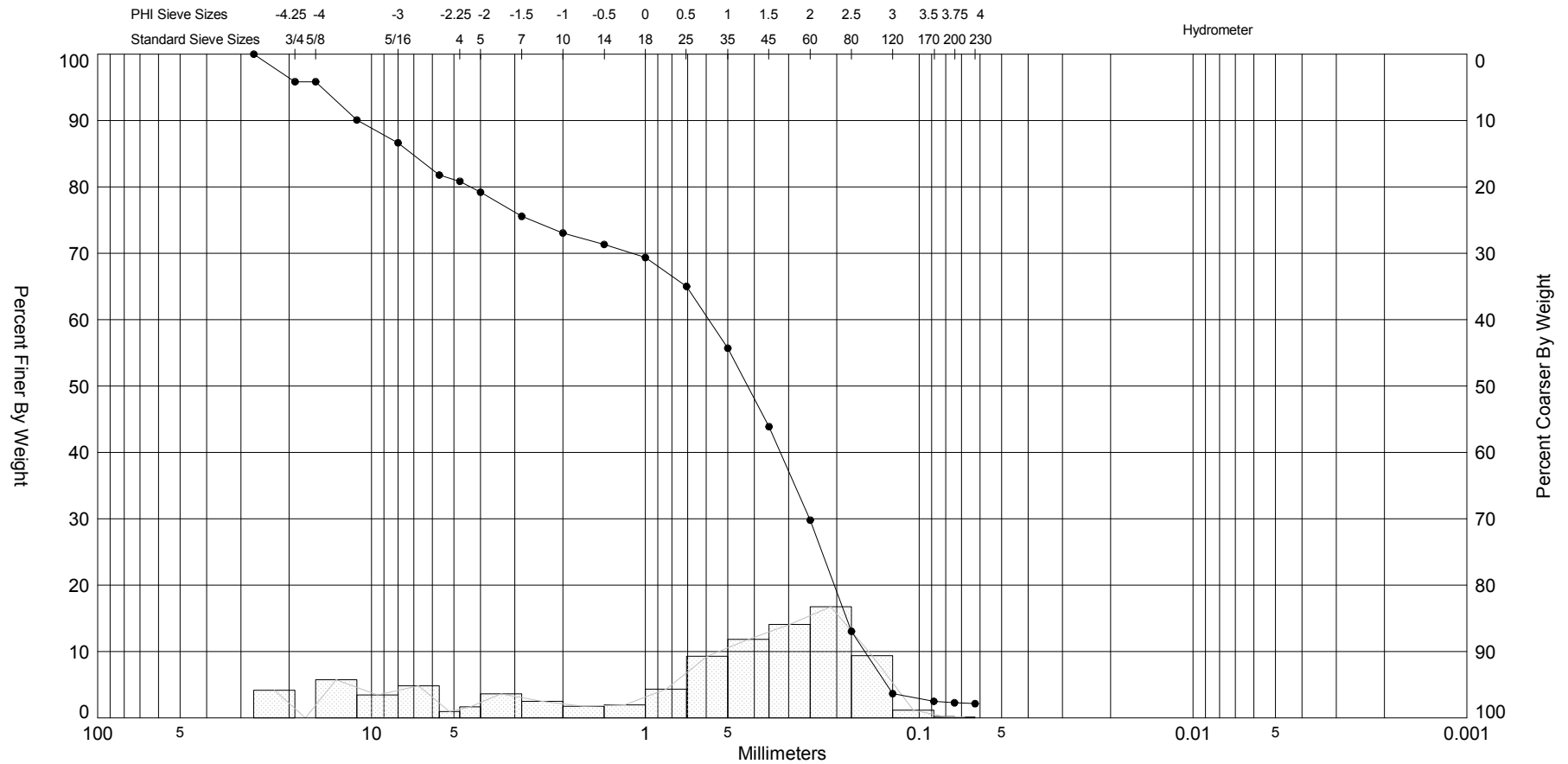
SIEVE ANALYSIS MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16




Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC03 #5	—●—	-81.1	SP	#200 - 1.52 #230 - 1.43		0	2.28	2.23	-1.63	10.29	0.53	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	04-12-16 AV
												Easting (X, m):	499,020
												Northing (Y, m):	4,228,739
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88
CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102													

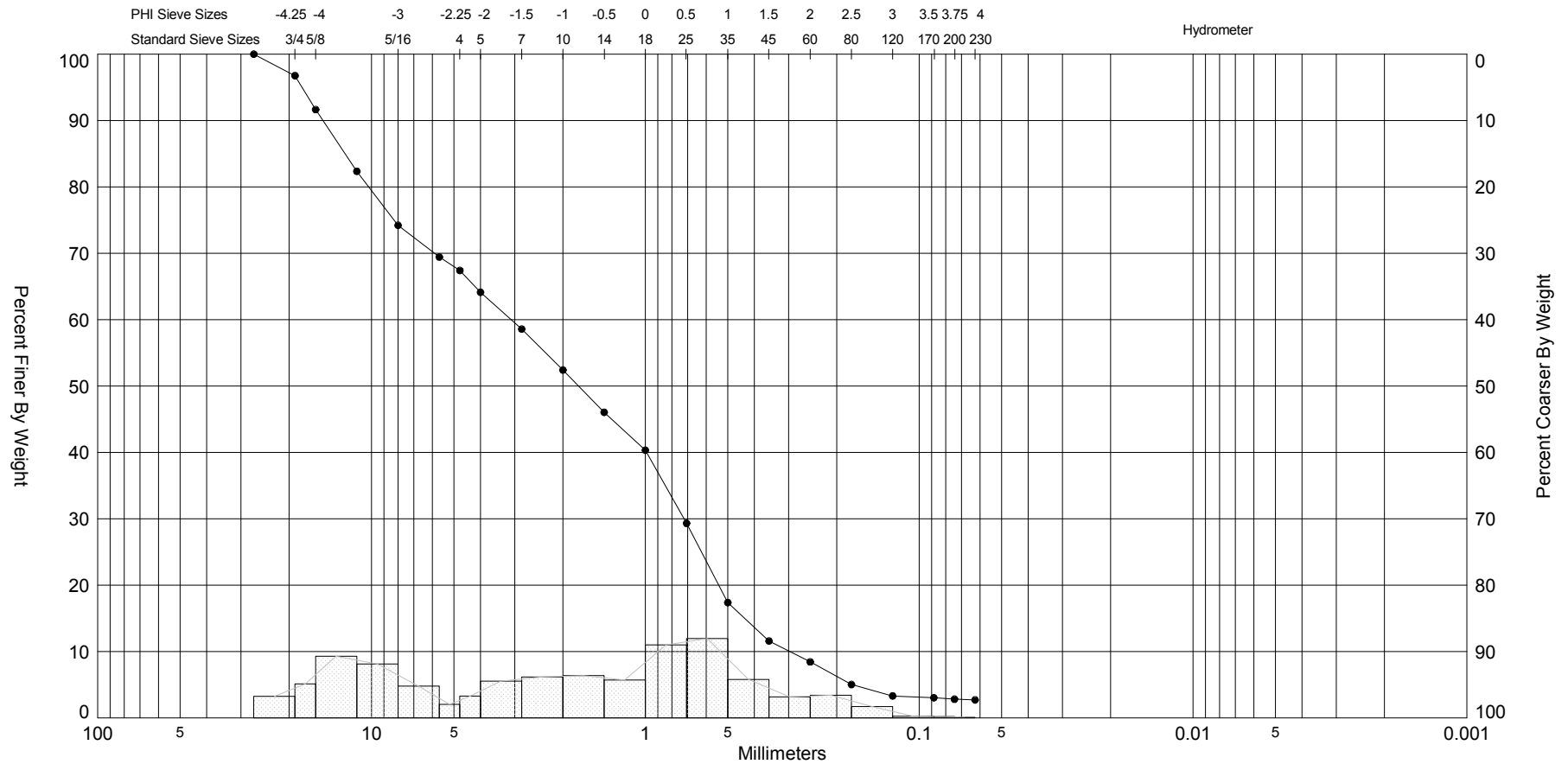
SIEVE ANALYSIS MD_BOEM_2015_VC_GPJ_JPBRAZIL.GDT 9/12/16




Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC03 #6	—●—	-82.4	SW	#200 - 2.28 #230 - 2.15		28	1.24	0.35	-0.84	2.34	2.25	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	04-12-16 AV
												Easting (X, m):	499,020
												Northing (Y, m):	4,228,739
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88
CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102													

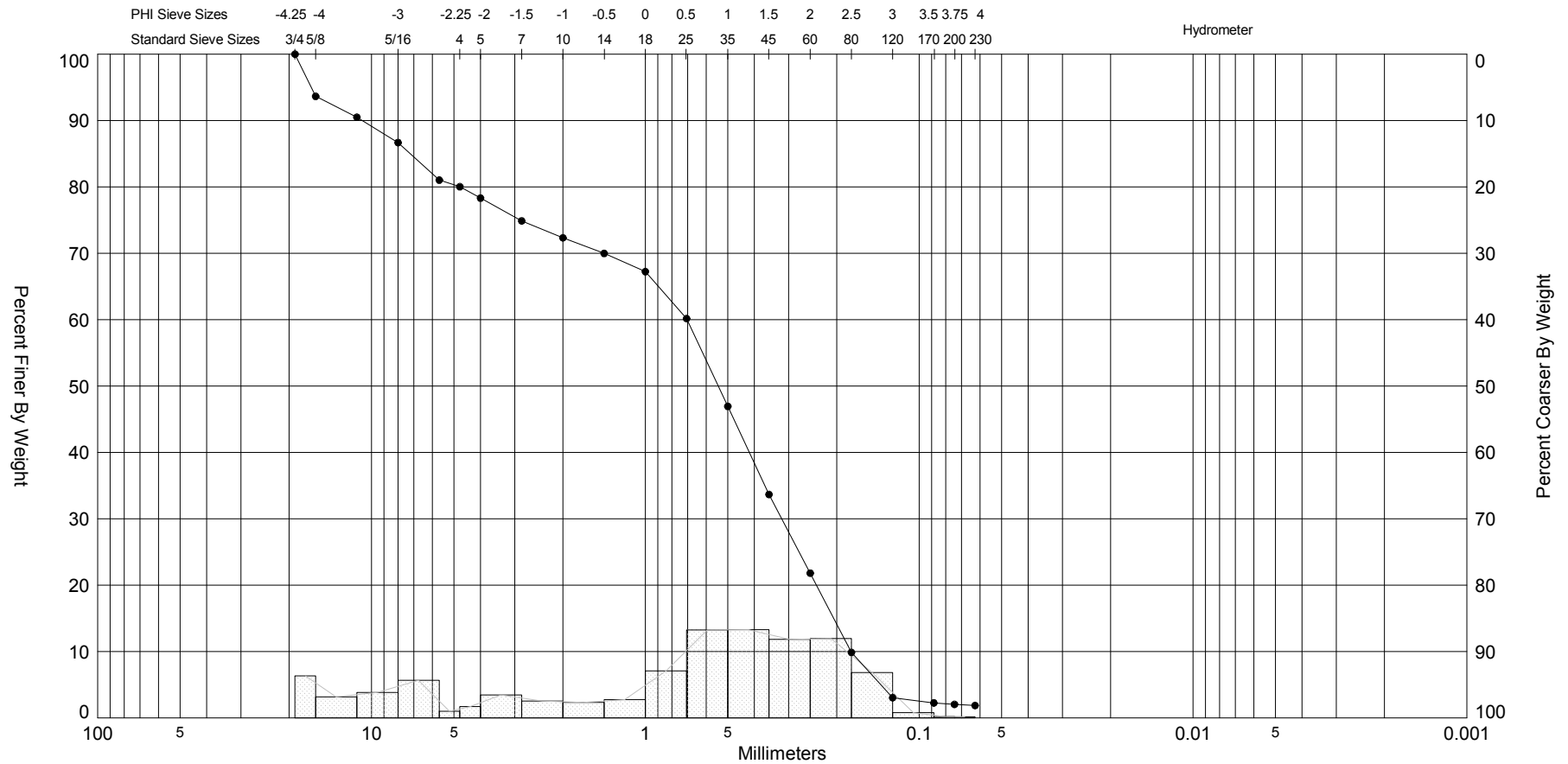
SIEVE ANALYSIS MD_BOEM_2015_VC_GPJ_JPBRAZIL.GDT 9/12/16




Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC03A #1	—●—	-79.0	SW	#200 - 2.82 #230 - 2.72		43		-1.1	-0.02	1.85	2.05	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	CS
												Easting (X, m):	499,018
												Northing (Y, m):	4,228,738
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88
												CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102	

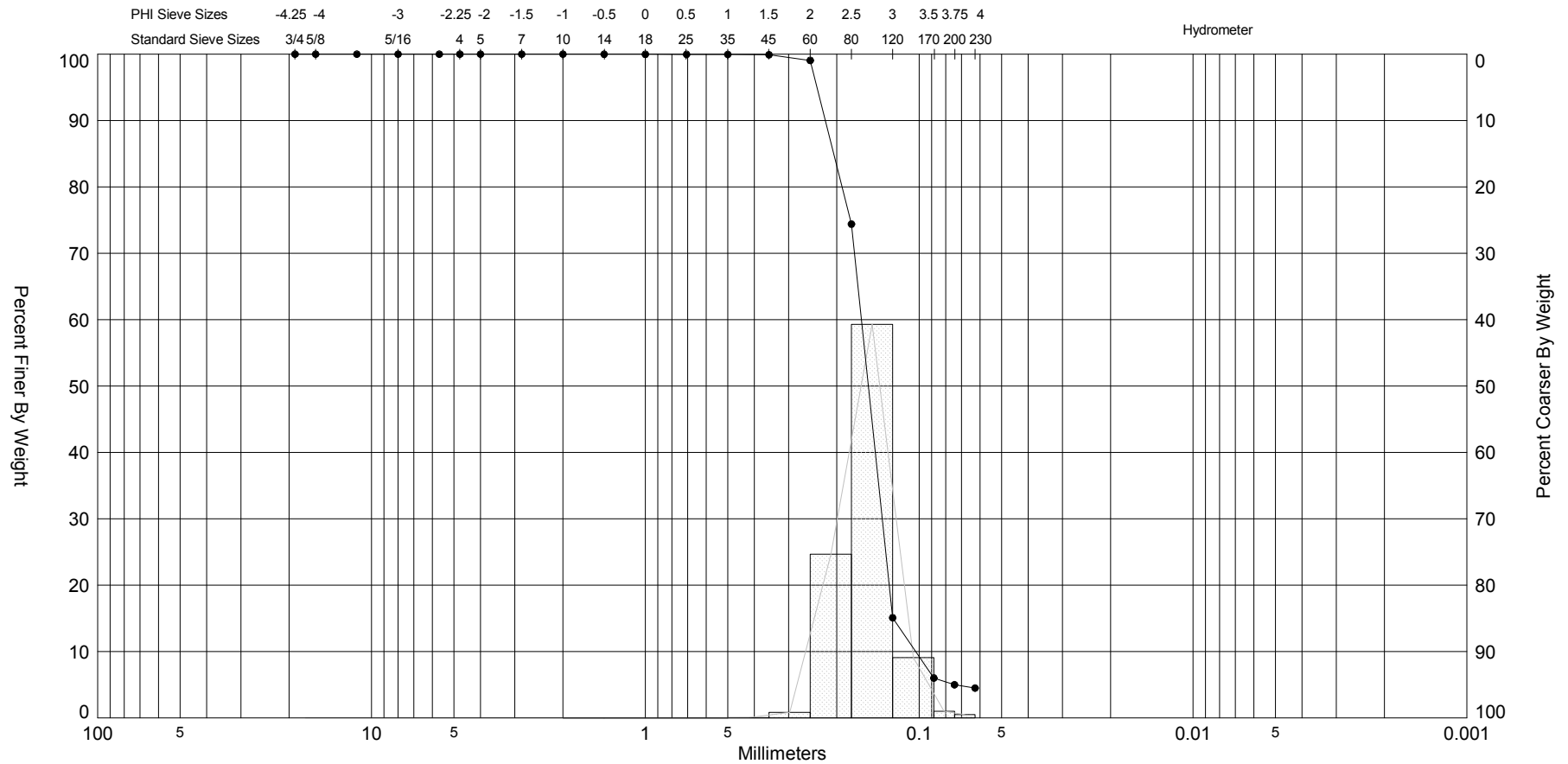
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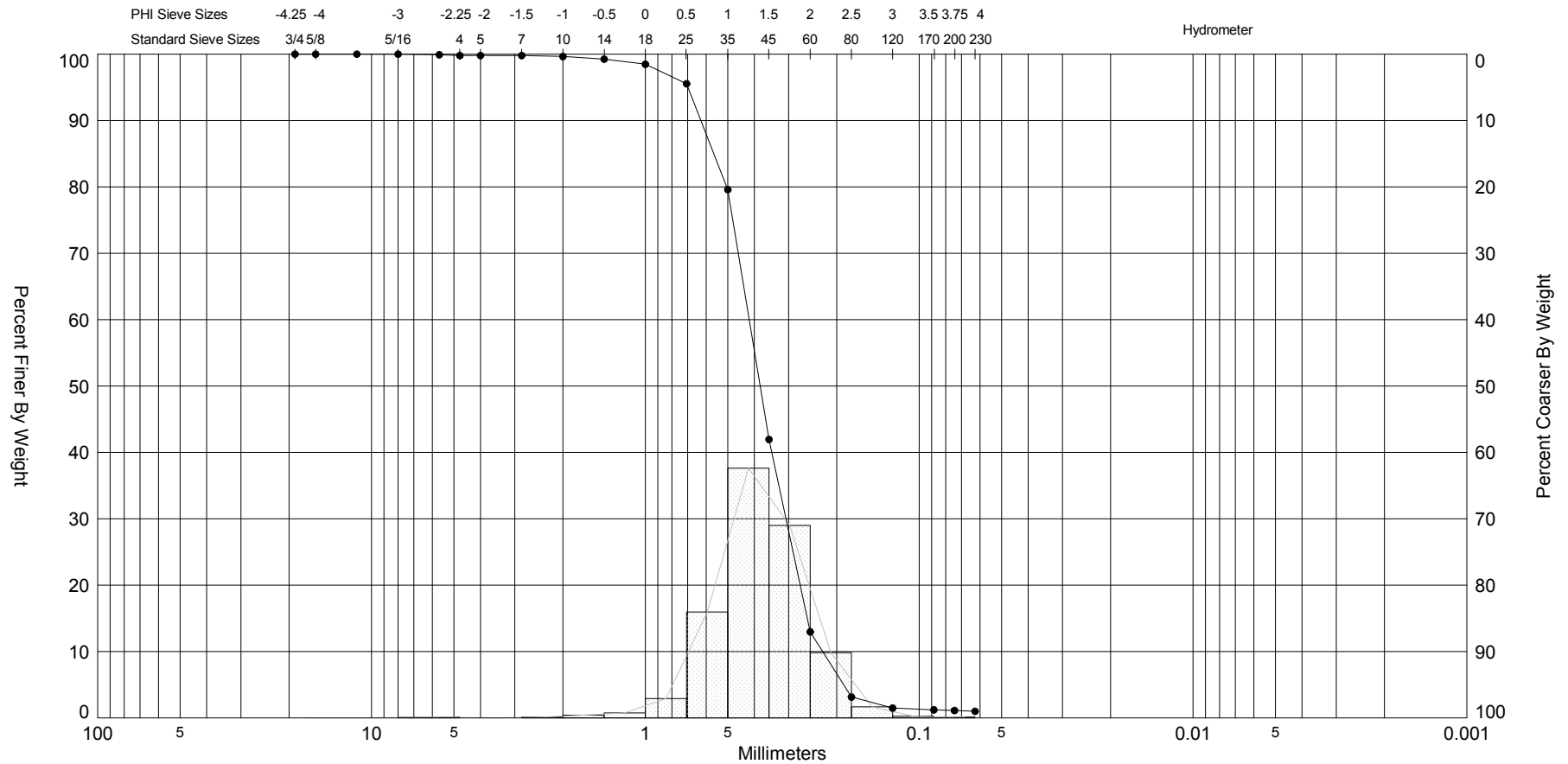
Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC03A #3	●—	-84.3	SW	#200 - 2.04 #230 - 1.87		29	0.88	0.15	-0.72	2.24	2.15	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	CS
 CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102												Easting (X, m):	499,018
												Northing (Y, m):	4,228,738
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88

SIEVE ANALYSIS MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16



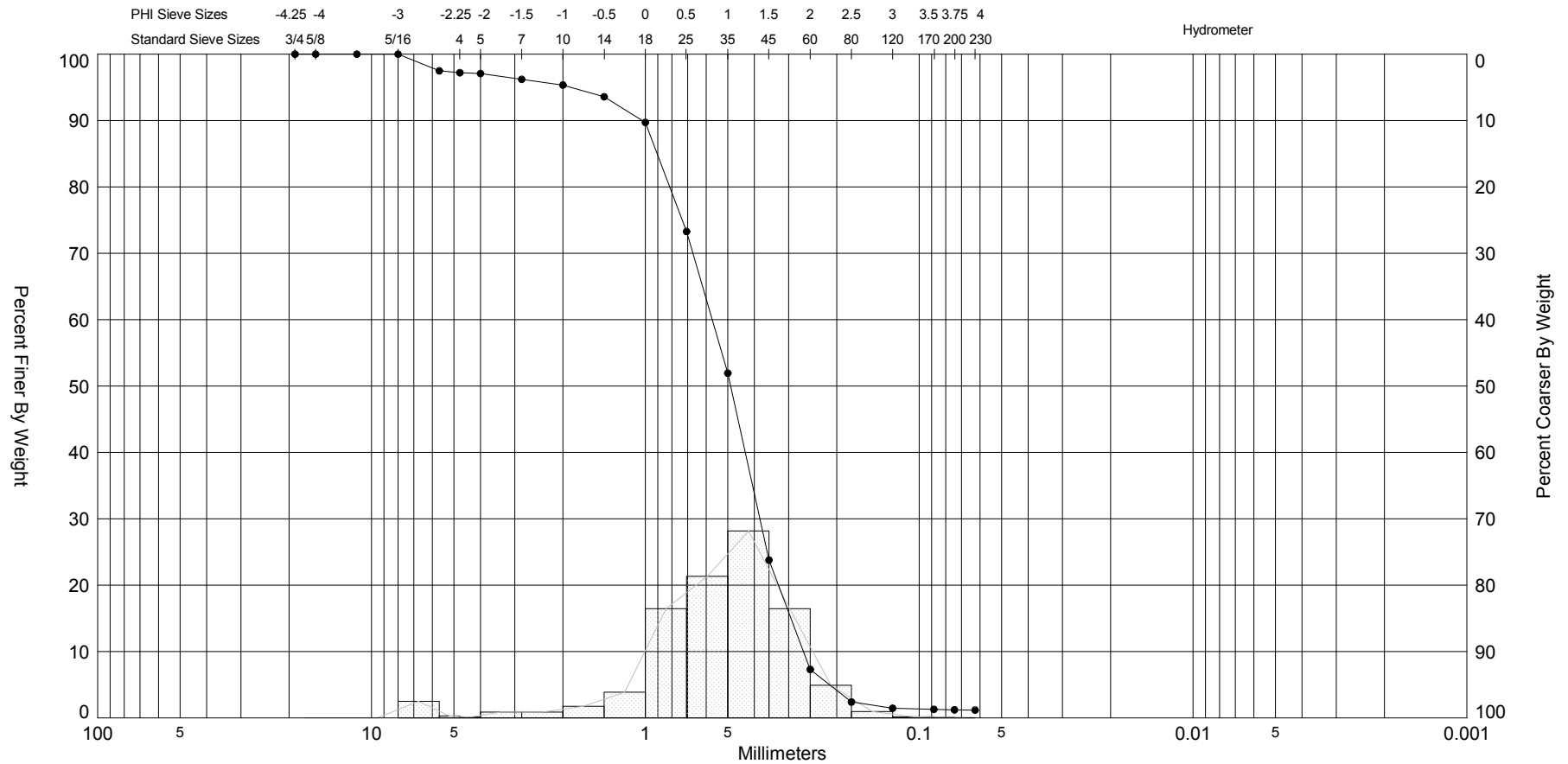
SIEVE ANALYSIS MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16




Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC04 #1	—●—	-54.2	SP	#200 - 1.12 #230 - 1.00		1	1.39	1.39	-0.7	7.95	0.6	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	CS
 CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102												Easting (X, m):	496,902
												Northing (Y, m):	4,227,038
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88

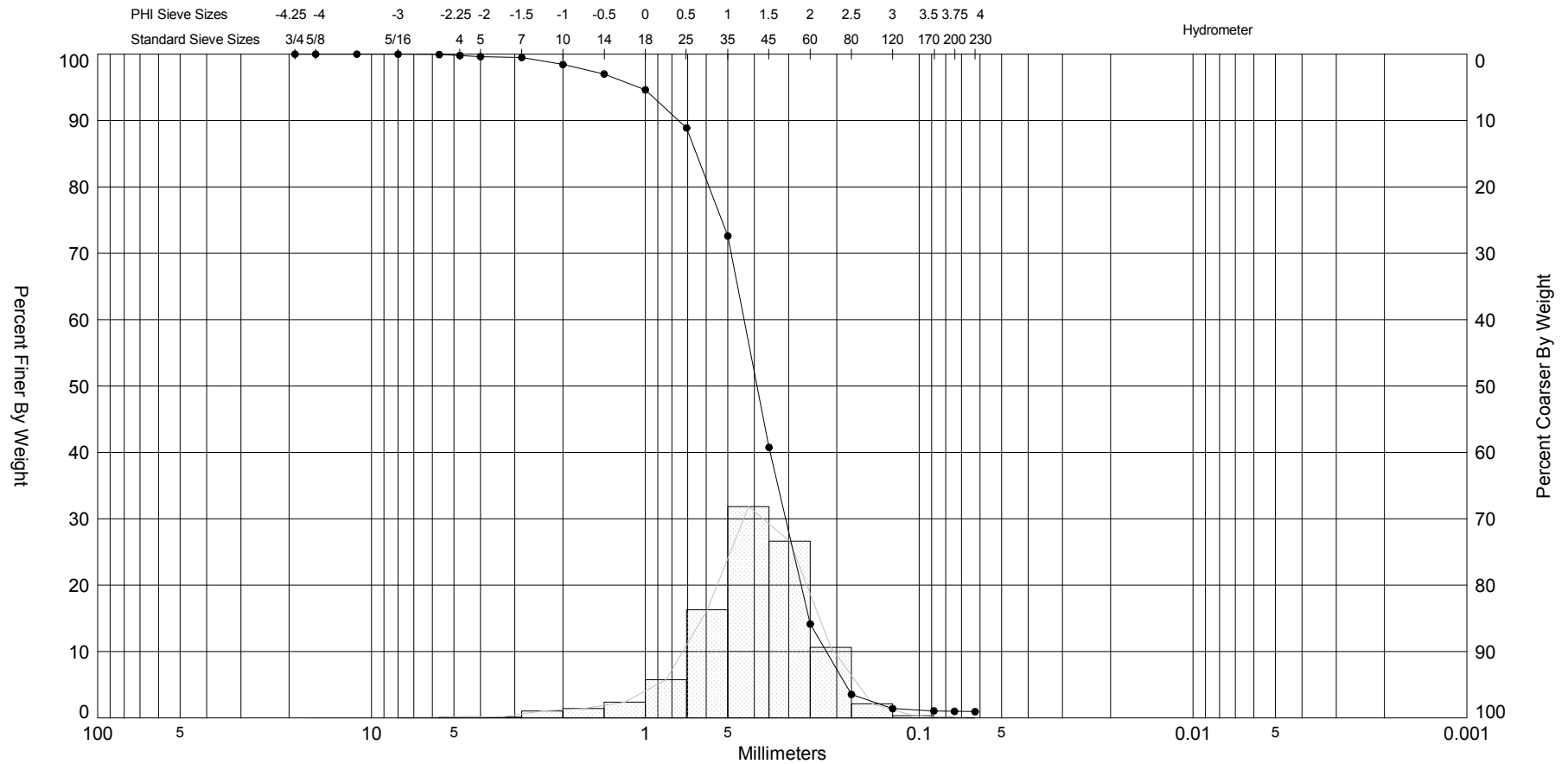
SIEVE ANALYSIS MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16




Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC04 #2	—●—	-57.2	SW	#200 - 1.22 #230 - 1.18		5	1.03	0.87	-1.48	6.72	0.98	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	CS
												Easting (X, m):	496,902
												Northing (Y, m):	4,227,038
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88
CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102													

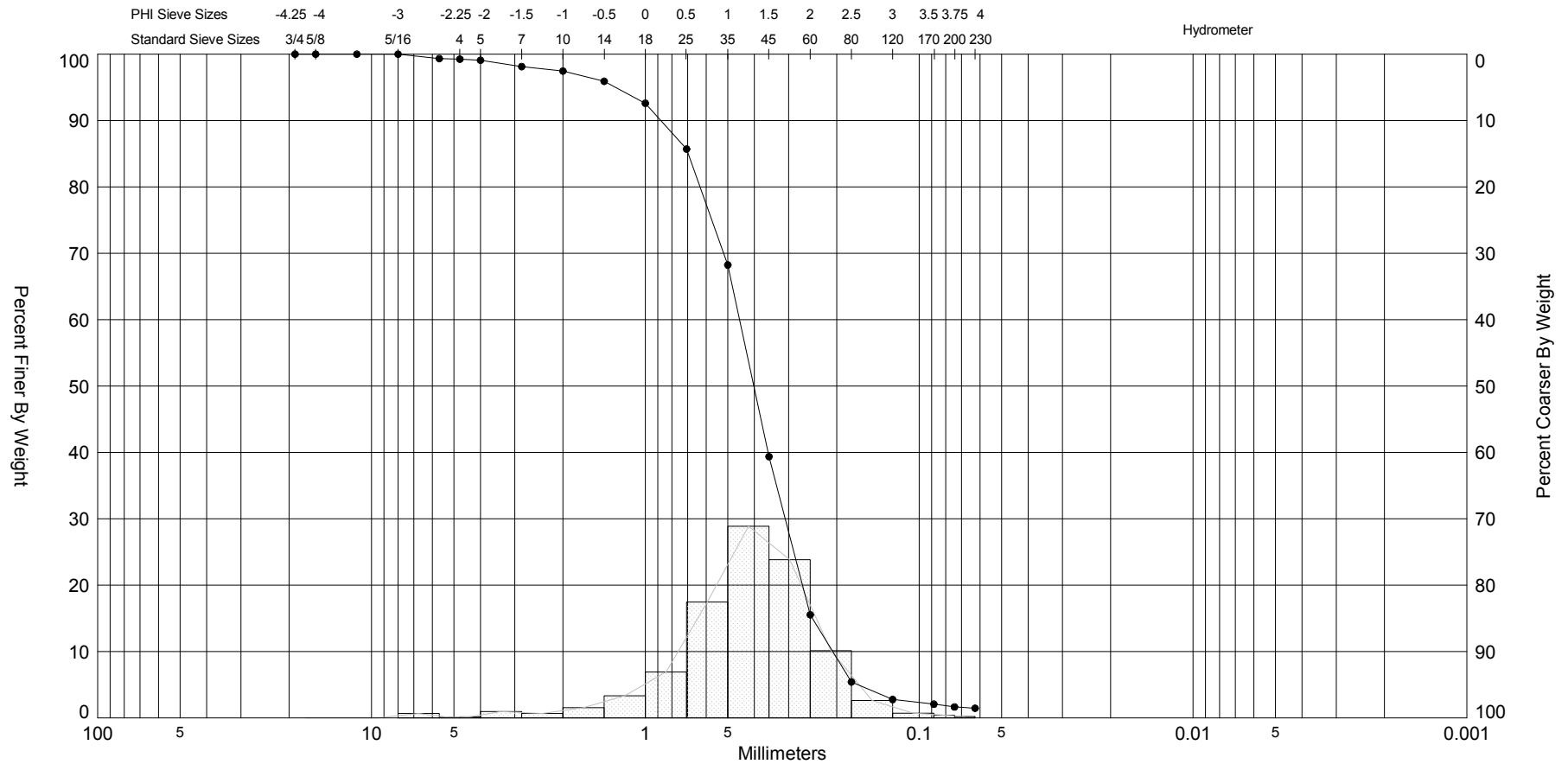
SIEVE ANALYSIS MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16




Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC04 #3	—●—	-62.2	SP	#200 - 0.99 #230 - 0.94		1	1.35	1.28	-1.02	5.82	0.76	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	04-12-16 AV
												Easting (X, m):	496,902
												Northing (Y, m):	4,227,038
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88
CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102													

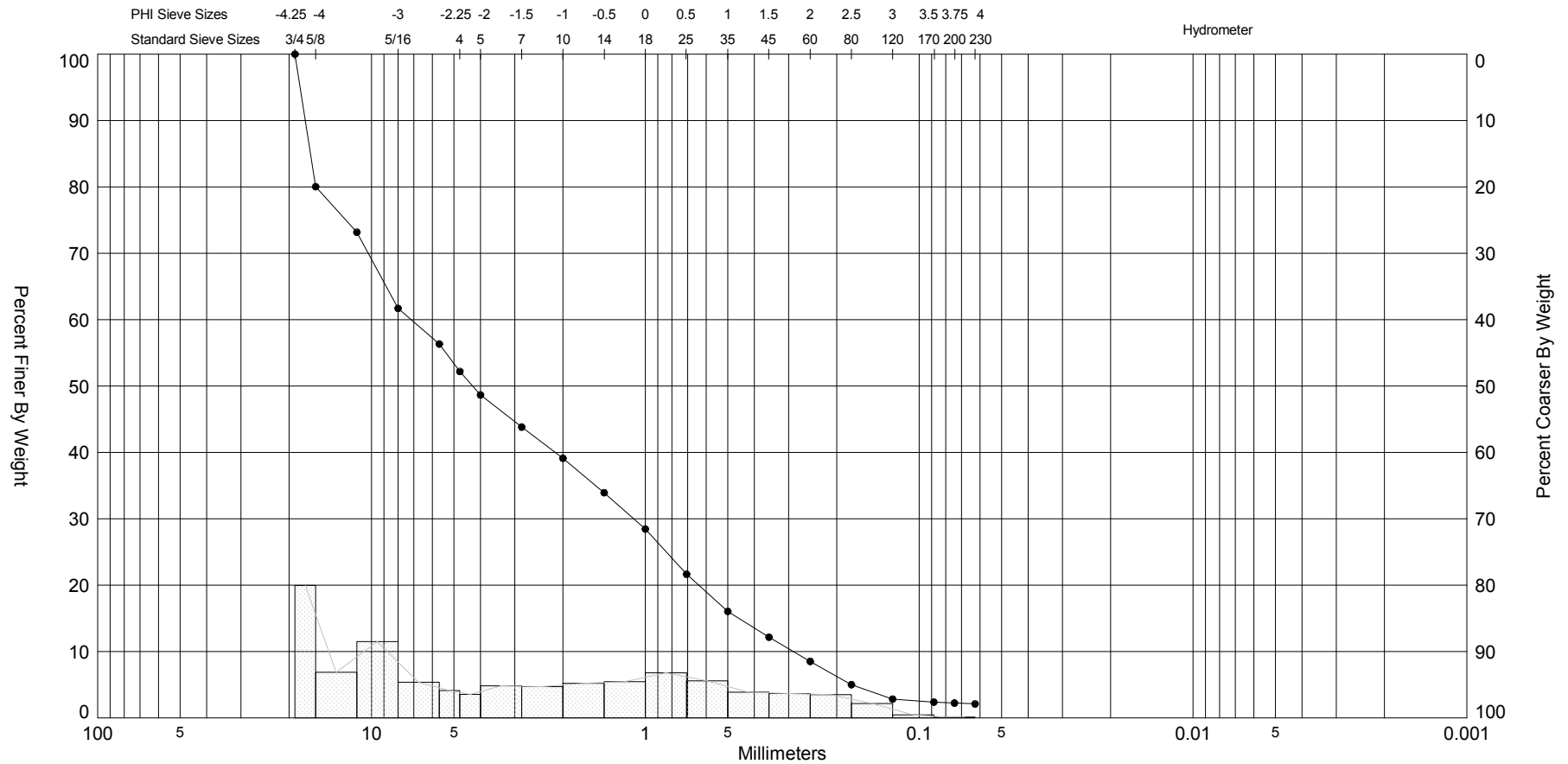
SIEVE ANALYSIS MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16




Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC04 #4	—●—	-67.1	SW	#200 - 1.65 #230 - 1.46		2	1.32	1.22	-1.09	6.32	0.9	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	04-12-16 AV
												Easting (X, m):	496,902
												Northing (Y, m):	4,227,038
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88
CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102													

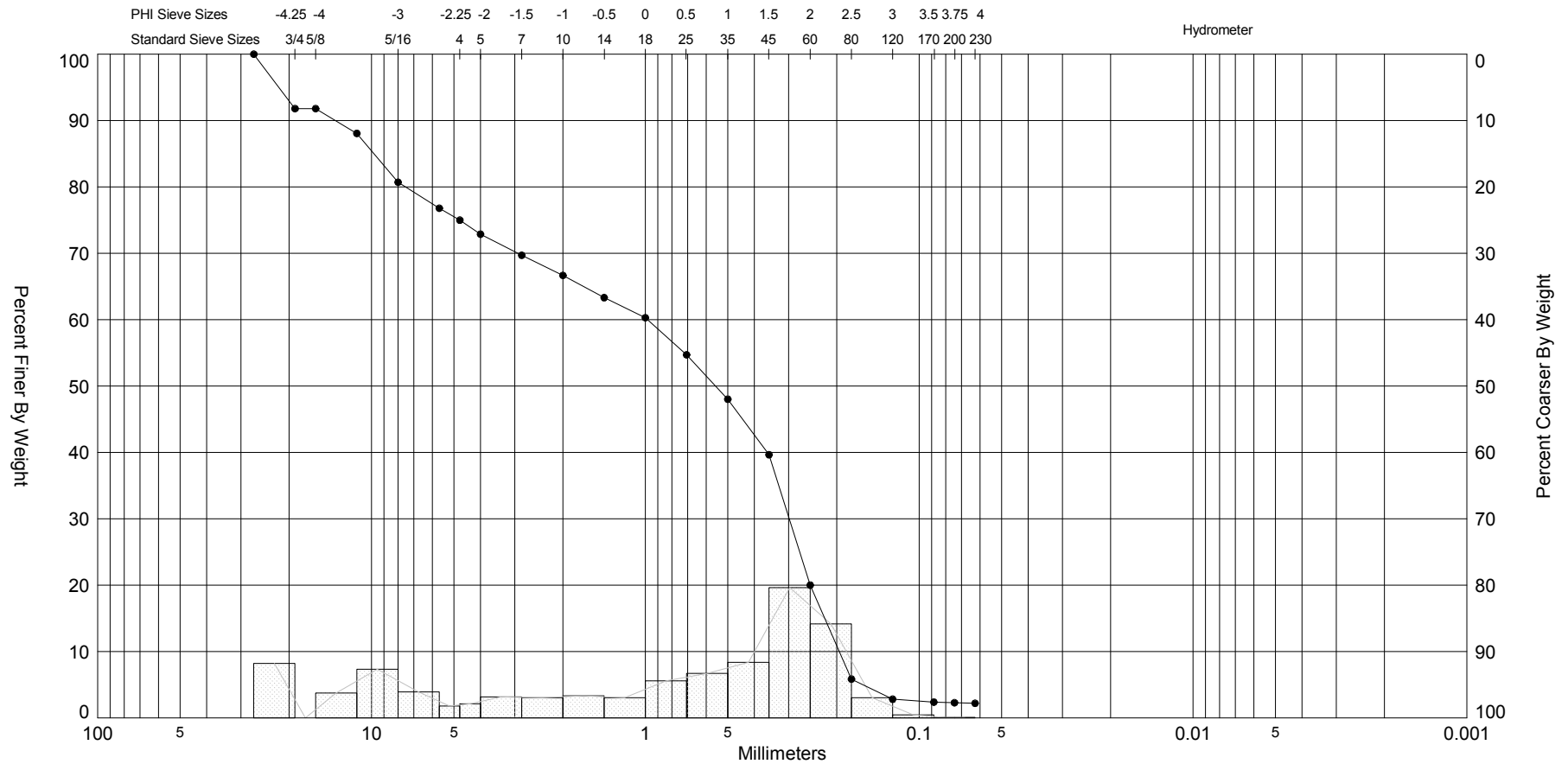
SIEVE ANALYSIS MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16




Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC05 #3	—●—	-65.1	SW	#200 - 2.24 #230 - 2.11		38		-1.67	0.49	2	2.15	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	04-13-16 DA
												Easting (X, m):	498,216
												Northing (Y, m):	4,219,404
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88
CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102													

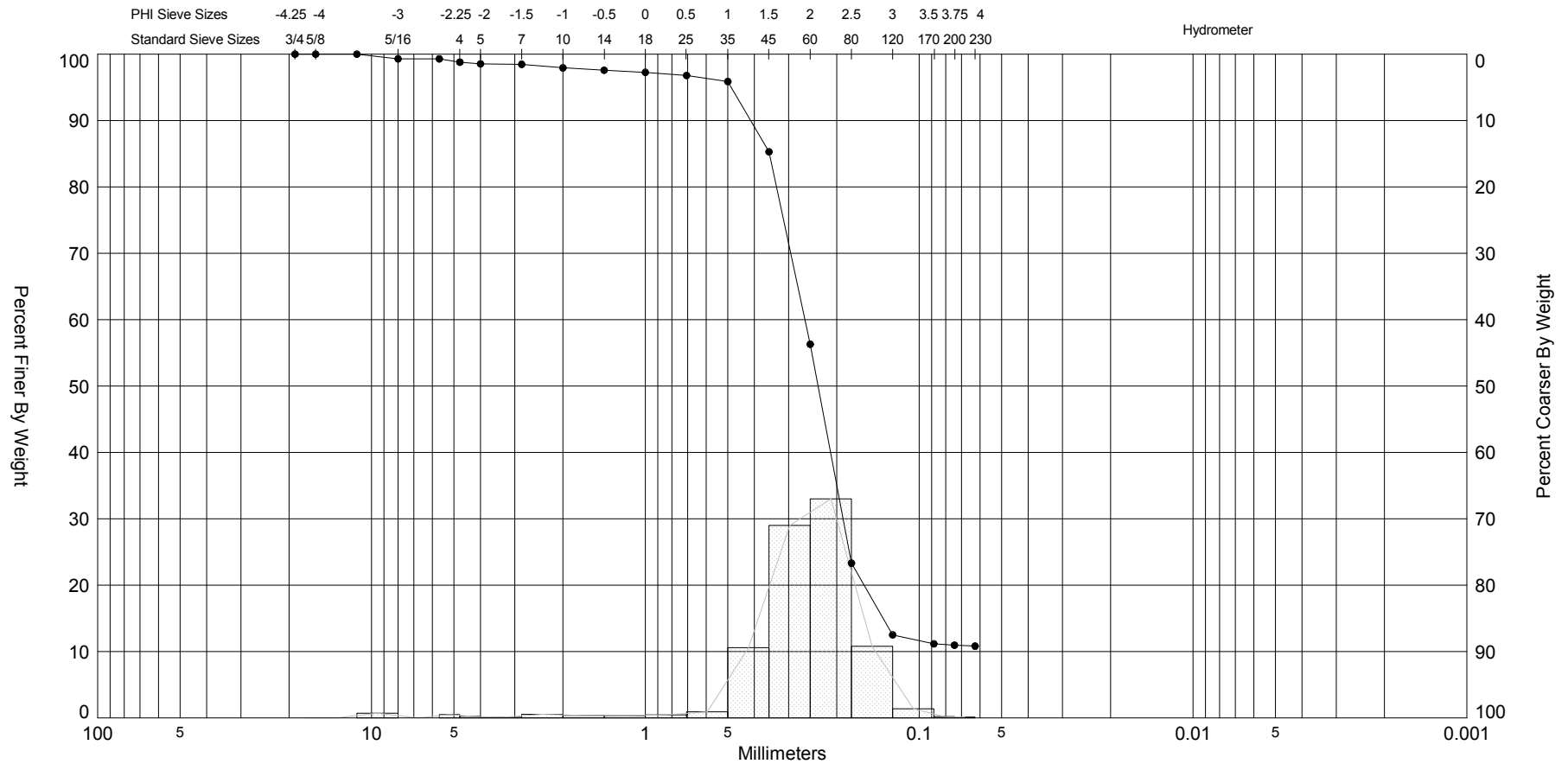
SIEVE ANALYSIS MD_BOEM_2015_VC_GPJ_JPBRAZIL.GDT 9/12/16




Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC05 #4	—●—	-65.7	SW	#200 - 2.29 #230 - 2.20		18	0.85	-0.14	-0.59	1.9	2.35	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	CS
												Easting (X, m):	498,216
												Northing (Y, m):	4,219,404
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88
<p style="text-align: center;"> CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102 </p>													

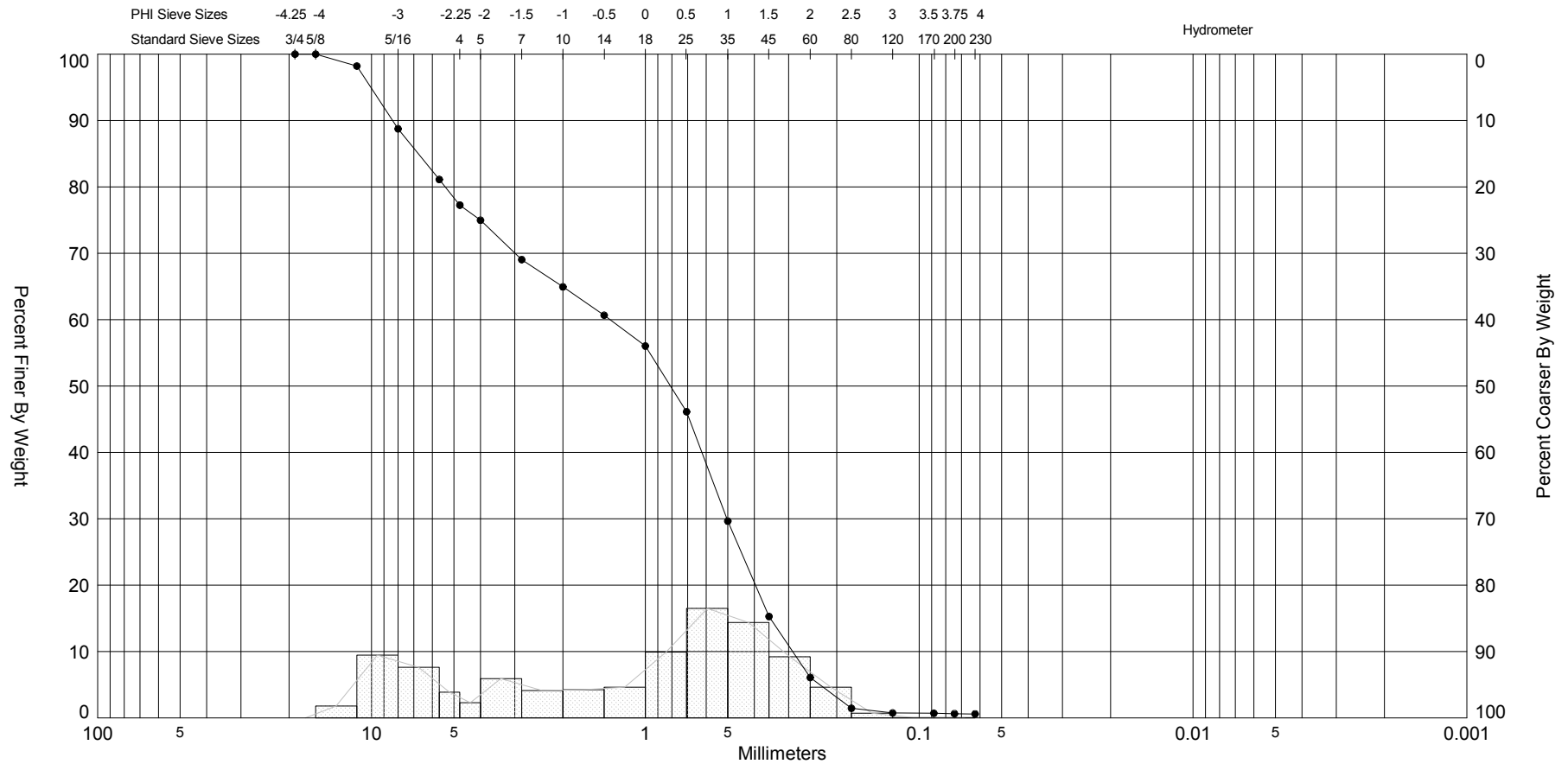
SIEVE ANALYSIS MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16




Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC05 #5	—●—	-66.2	SP-SC	#200 - 10.96 #230 - 10.82		2	2.1	1.9	-3.12	17.57	0.85	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	CS
												Easting (X, m):	498,216
												Northing (Y, m):	4,219,404
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88
CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102													

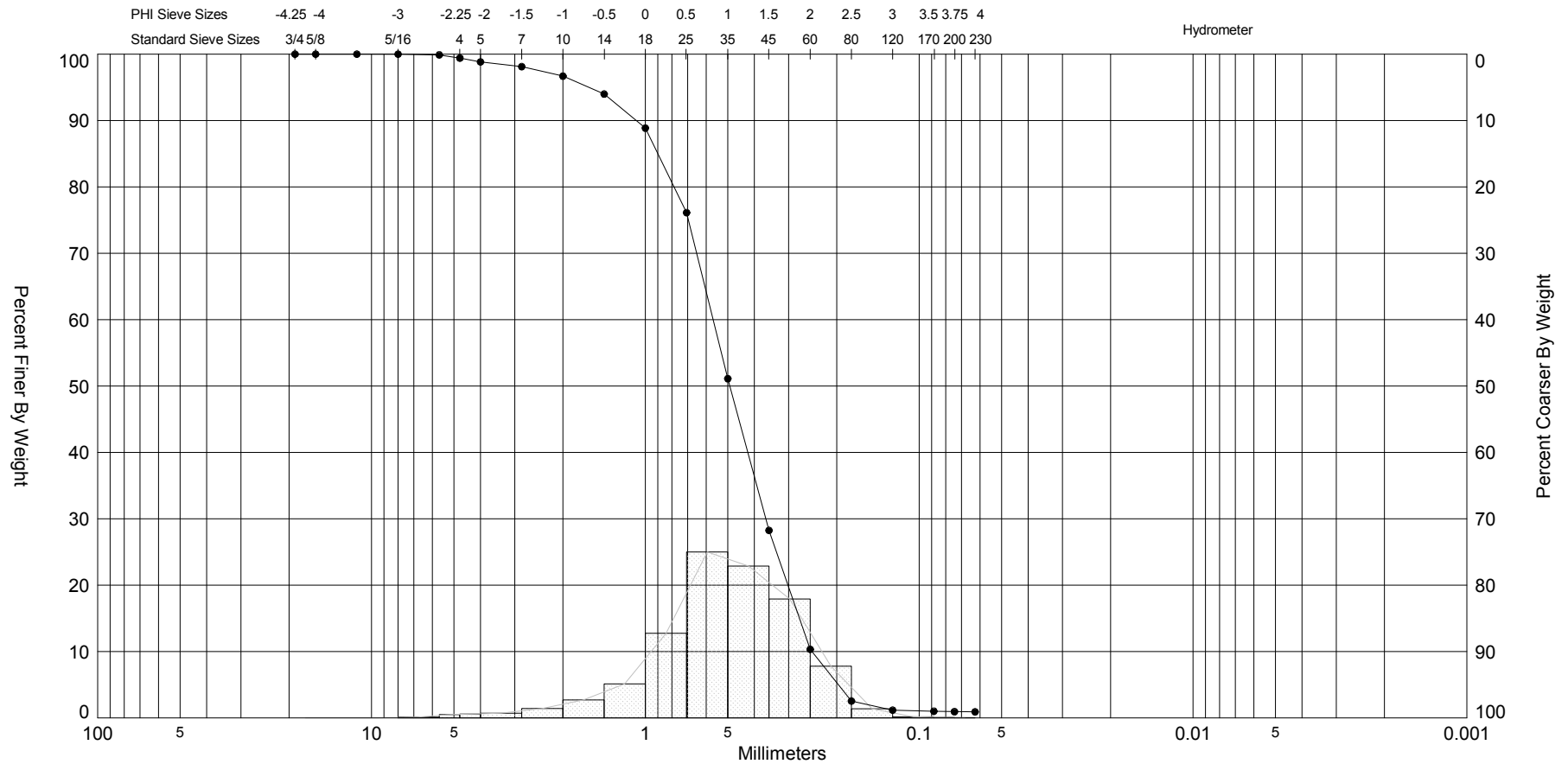
SIEVE ANALYSIS MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16




Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC07 #1	—●—	-46.1	SW	#200 - 0.64 #230 - 0.60		7	0.3	-0.31	-0.4	1.82	1.81	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	CS
												Easting (X, m):	495.480
												Northing (Y, m):	4,213,018
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88
CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102													

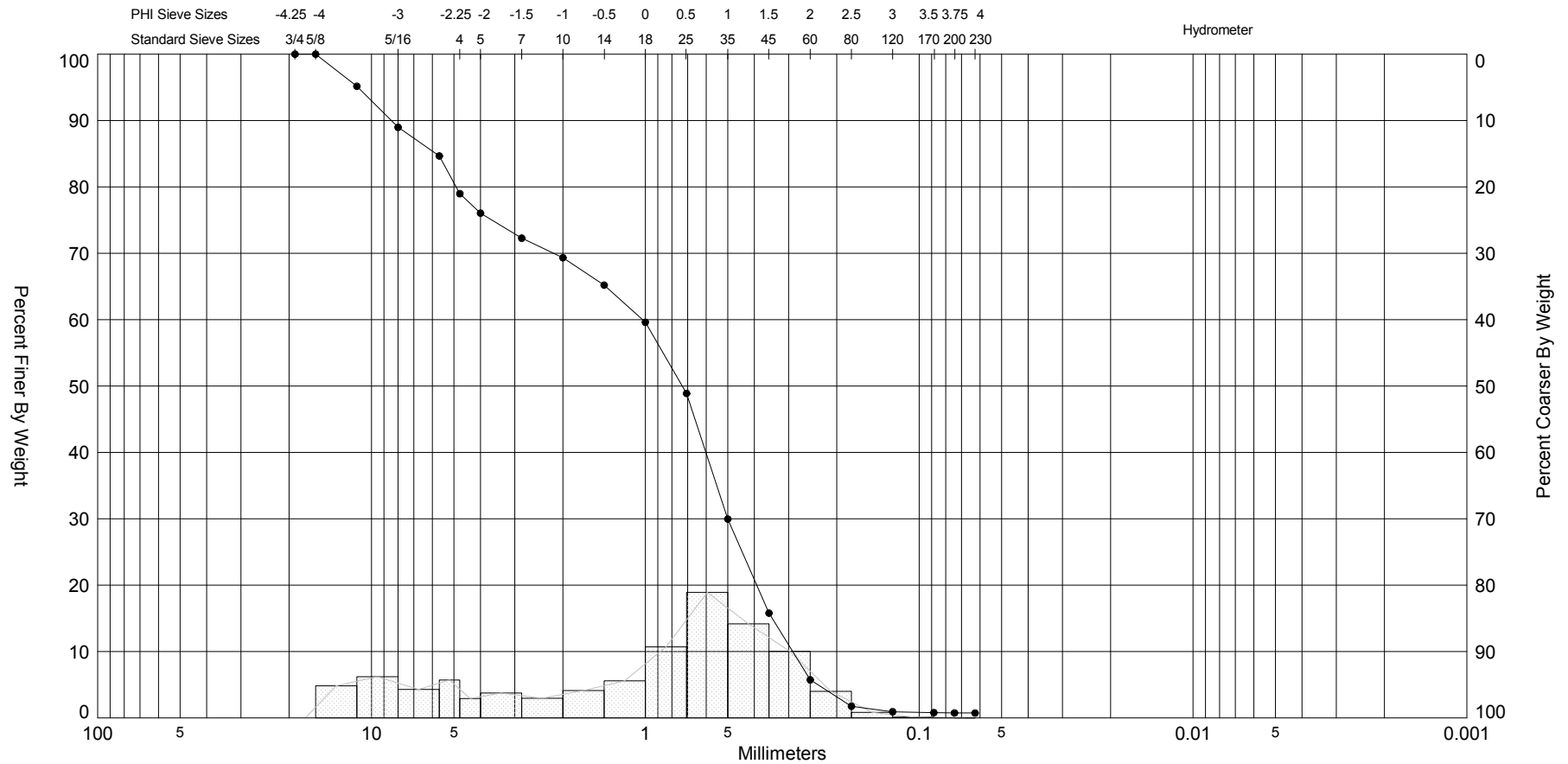
SIEVE ANALYSIS MD_BOEM_2015_VC_GPJ_JPBRAZIL.GDT 9/12/16




Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC07 #2	—●—	-48.6	SW	#200 - 0.94 #230 - 0.91		3	1.02	0.96	-0.83	4.62	0.9	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	04-13-16 AV
												Easting (X, m):	495.480
												Northing (Y, m):	4,213,018
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88
CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102													

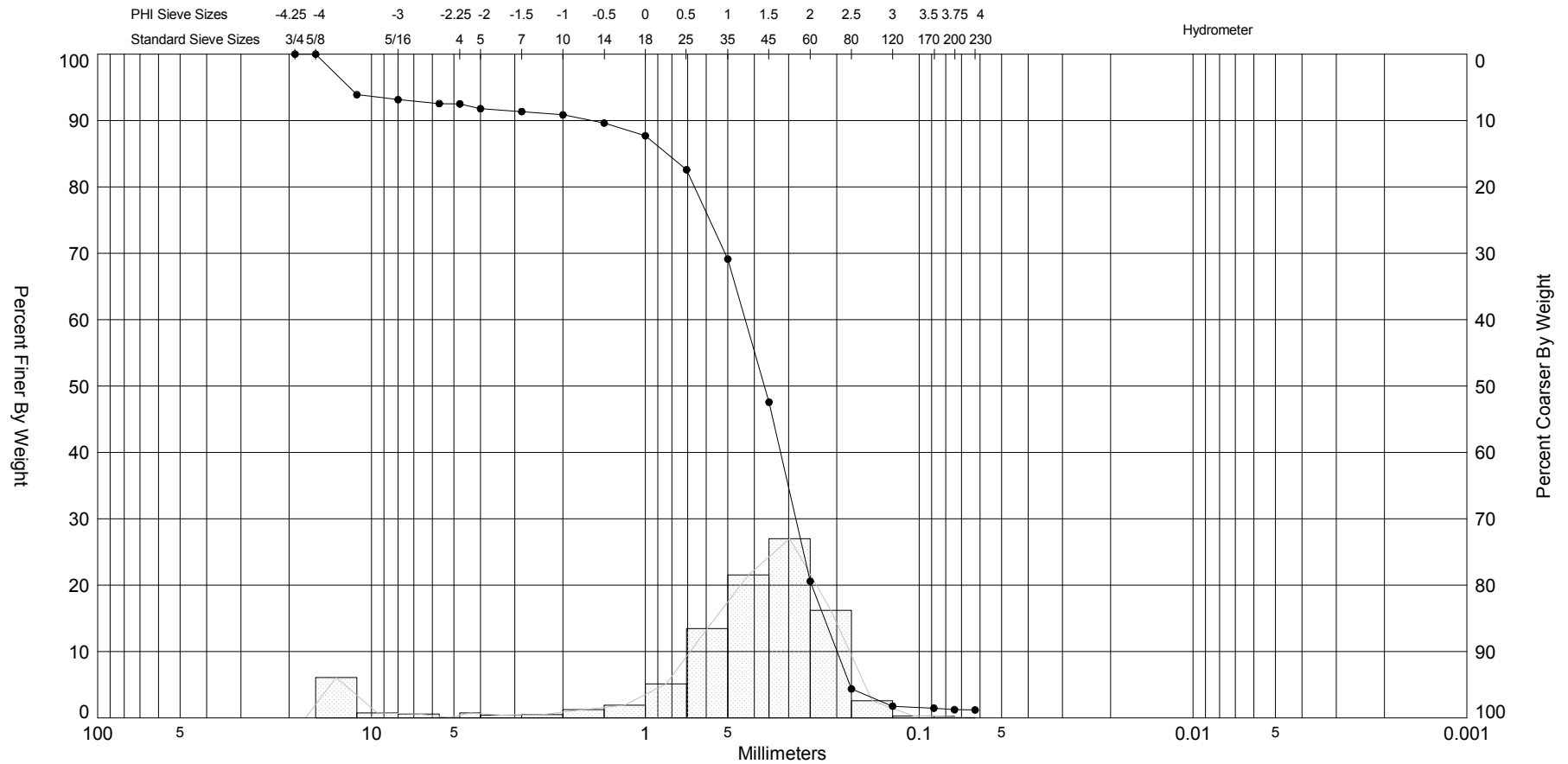
SIEVE ANALYSIS MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16




Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC07 #3	—●—	-51.1	SW	#200 - 0.75 #230 - 0.73		3	0.45	-0.21	-0.58	2.08	1.79	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	04-13-16 AV
												Easting (X, m):	495.480
												Northing (Y, m):	4,213,018
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88
												CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102	

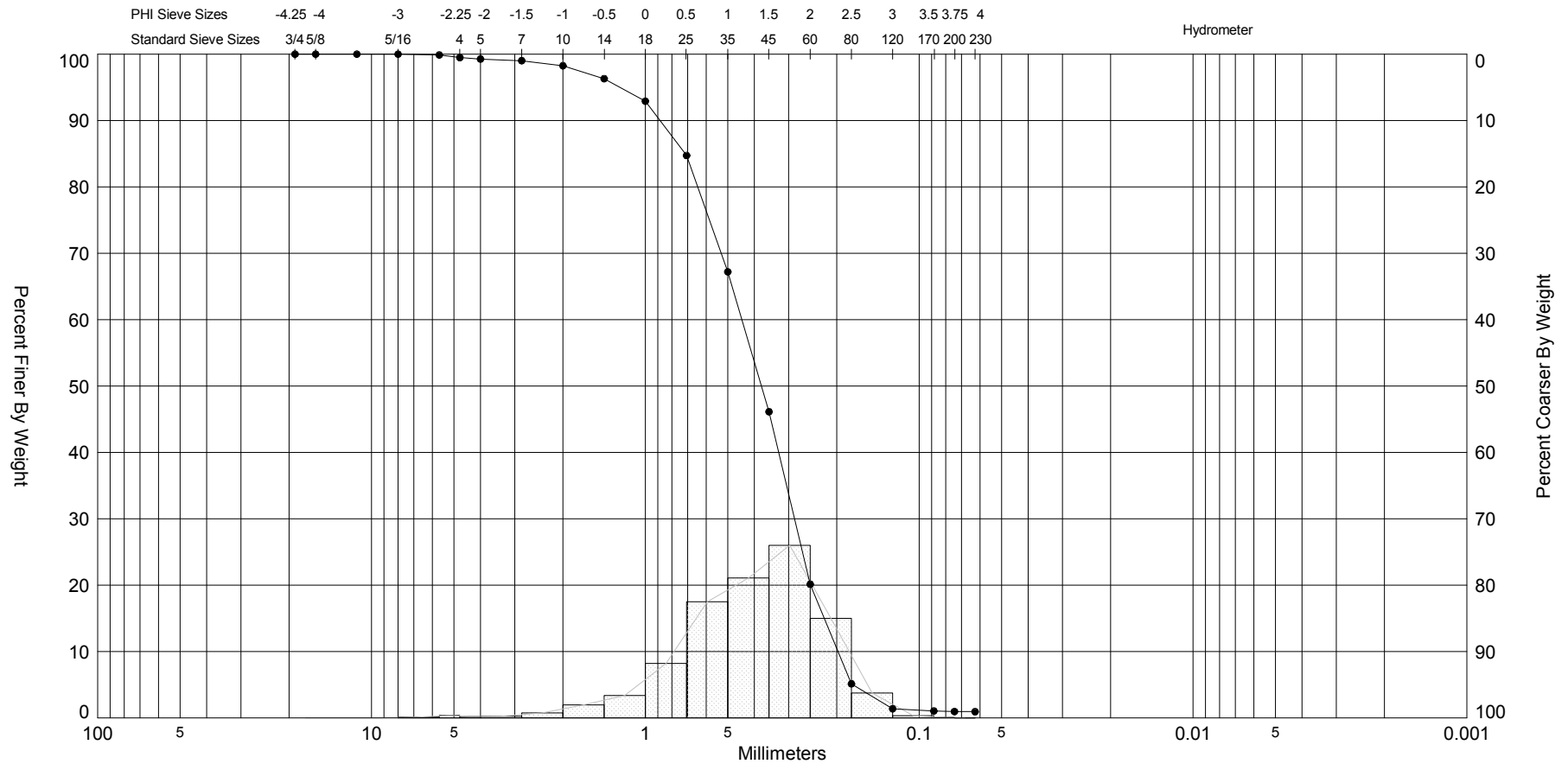
SIEVE ANALYSIS MD_BOEM_2015_VC_GPJ_JPBRAZIL.GDT 9/12/16




Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC07 #4	—●—	-54.2	SW	#200 - 1.24 #230 - 1.20		8	1.44	1.01	-2.01	6.56	1.55	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	CS
												Easting (X, m):	495.480
												Northing (Y, m):	4,213,018
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88
CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102													

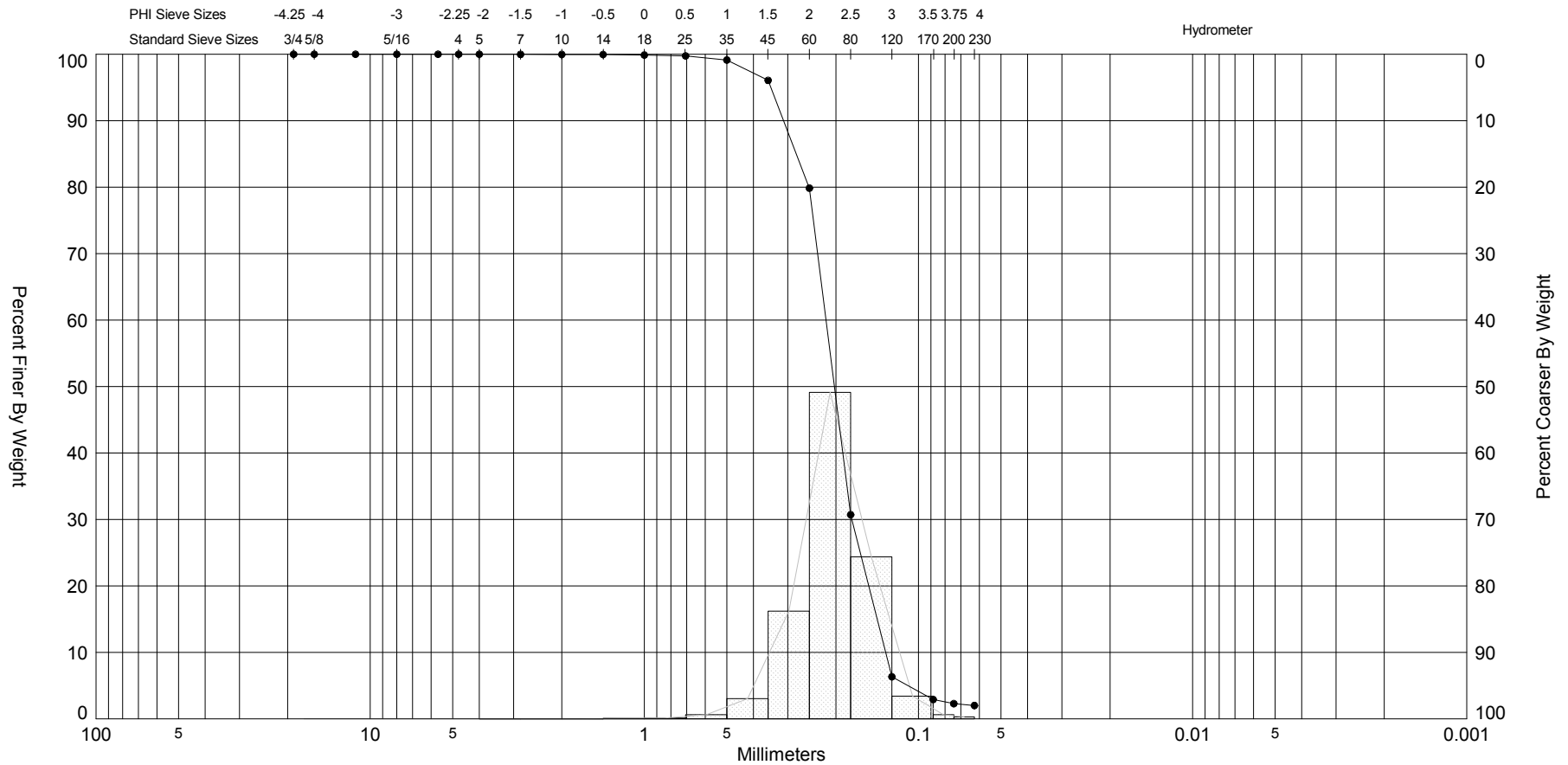
SIEVE ANALYSIS MD_BOEM_2015_VC.GPJ_JPBRAZIL.GDT 9/12/16




Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC07 #5	—●—	-57.4	SW	#200 - 0.96 #230 - 0.94		1	1.41	1.28	-0.94	4.87	0.88	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	04-13-16 AV
												Easting (X, m):	495.480
												Northing (Y, m):	4,213,018
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88
CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102													

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Gravel		Sand			Silt and Clay
Coarse	Fine	Coarse	Medium	Fine	

Sample	Symbol	Elev. (ft)	USCS	% Fines	% Organics	% Carbonates	Median	Mean	Skew	Kurt	Sort	Sample Information	
MD-BOEM-2015-VC07 #7	—●—	-62.8	SP	#200 - 2.29 #230 - 2.01		0	2.3	2.29	-0.52	6.59	0.47	Project Name:	Inventory of Potential Beach Nourishment and Coastal
Comments:												Analysis Date:	Restoration Sand Sources on the Atlantic OCS
Depths and elevations based on measured values												Analyzed By:	04-14-16 AV
 <p style="text-align: center;"> CB&I Coastal Planning & Engineering, Inc. 2481 NW Boca Raton Blvd. Boca Raton, FL 33431 ph (561) 391 8102 </p>												Easting (X, m):	495.480
												Northing (Y, m):	4,213,018
												Horizontal System:	NAD 1983
												Vertical System:	NAVD88