INTRODUCTION

The New Jersey Geological and Water Survey (NJGWS) maps the State's offshore geology and identifies offshore sand deposits by acquiring, analyzing and interpreting marine geologic and geophysical data. With support from its parent agency, the New Jersey Department of Environmental Protection (NJDEP) and from the U.S. Department of Interior, Bureau of Ocean Energy Management (BOEM), NJGWS is preparing assessments of offshore sand resources for beach nourishment in a series of maps by county at a scale of 1:80,000. These maps are developed to support the cooperative sand resource assessment by NJDEP and the United States Army Corps of Engineers (USACE).

This map identifies and quantifies nearshore sand shoals offshore Monmouth County, New Jersey, located in both State and Federal waters (within and beyond the 3-mile State/Federal jurisdictional boundary, respectively). The USACE had previously identified five borrow sites in this map area, including the large site offshore Sea Bright and a group of small sites offshore Belmar (USACE, 1989,1993), most of which are located within State waters. Sand volumes for these areas were calculated by previous USACE studies and are listed in the Map Explanation. The State of New Jersey has accessed sand from the large site offshore Sea Bright and several of the smaller sites offshore Belmar. The goal of this survey was to find additional sand resources in the area offshore central and southern Monmouth County, including sites in Federal waters, where sites had not previously been identified.

This map identifies 14 additional shoal features. Sand volumes at these sites, calculated based on a 5-foot minimum thickness, range from 295,000 to 31,337,000 cubic yards (cu. yds.). Sand volumes at these sites, calculated based on a more constrained 10-foot minimum thickness, range from 53,000 to 27,028,000 cu. yds.

The 1:80,000 map scale corresponds to the scale common to nautical charts. Likewise, the level of detail presented in these maps and the goal of depicting a regional view are best achieved at this scale. In addition, Plates 1 and 2 include larger-scale views of each of the 14 shoal features, along with grain-size data on vibracores acquired at each shoal to ground-truth the seismic data and for sediment characterization.

METHODS

NJGWS collected the seismic sub-bottom data used in this analysis in 2000 and 2001, using an Octopus 360 Sub-Bottom Processor. This grid of sub-bottom profiles extends from Sea Bright to just south of Manasquan Inlet. The seismic signal was recorded in real time as an analog paper copy and also recorded on tape. Post-survey, a number of tapes were found to be defective or incomplete. For completeness and consistency, NJGWS recently converted the analog data into digital seg-y files using ImagetoSegy™ software. This allowed for the data to be processed and analyzed in SonarWiz5™ seismic processing software.

A total of 61 Vibracores were collected in the map area in three acquisition phases in 2000, 2001, and 2002. Analysis of these cores was completed in the sediment labs at NJGWS. For each core, lithologic and photographic logs were prepared and samples for grain-size analysis were collected and processed. A 5-cm-long quarter-round of the core was extracted at 30-cm intervals down-core and analyzed for grain-size. Sediment samples were analyzed following procedures outlined by Folk (1980). Grain size distribution focused on sand-sized and coarser material, with weight percents of full phi sizes ranging from -2 to >4 (from gravel to silt/clay; see Table 1), cumulative curves, and the textural statistics derived from these data (median, mean, sorting, skewness, and kurtosis). Of these statistics, median grain size is listed in the core tables; the other calculated statistics are on file at NJGWS. Several cores in these tables list multiple runs. These are cores drilled at sites where the pneumatic drill did not penetrate the full 20-foot depth of the core. After extracting the retrieved core segment from the coring apparatus, the platform would be re-positioned as close as possible to the original seafloor drilling location. The coring device would be jetted down to the depth where resistance was hit originally, and then would collect the remaining amount of core. As a result of this process, there can be slight discrepancies in the median grain size of sediment at the same depth in different runs. Radiocarbon samples were collected and analyzed, where available. The vibracores reported in this map are archived at the NJGWS Core Storage Facility.

CORRELATION OF SEISMIC DATA AND SEDIMENT ANALYSIS

NJGWS correlated changes in sediment character with acoustic impedance changes and major reflectors observed on the sub-bottom profiles. For each of the sand shoals identified on this map, cores were used to locate which reflector represented the base of sand. That reflector was traced for the entirety of the shoal, or for as long as the data clarity would allow (Figure 1).

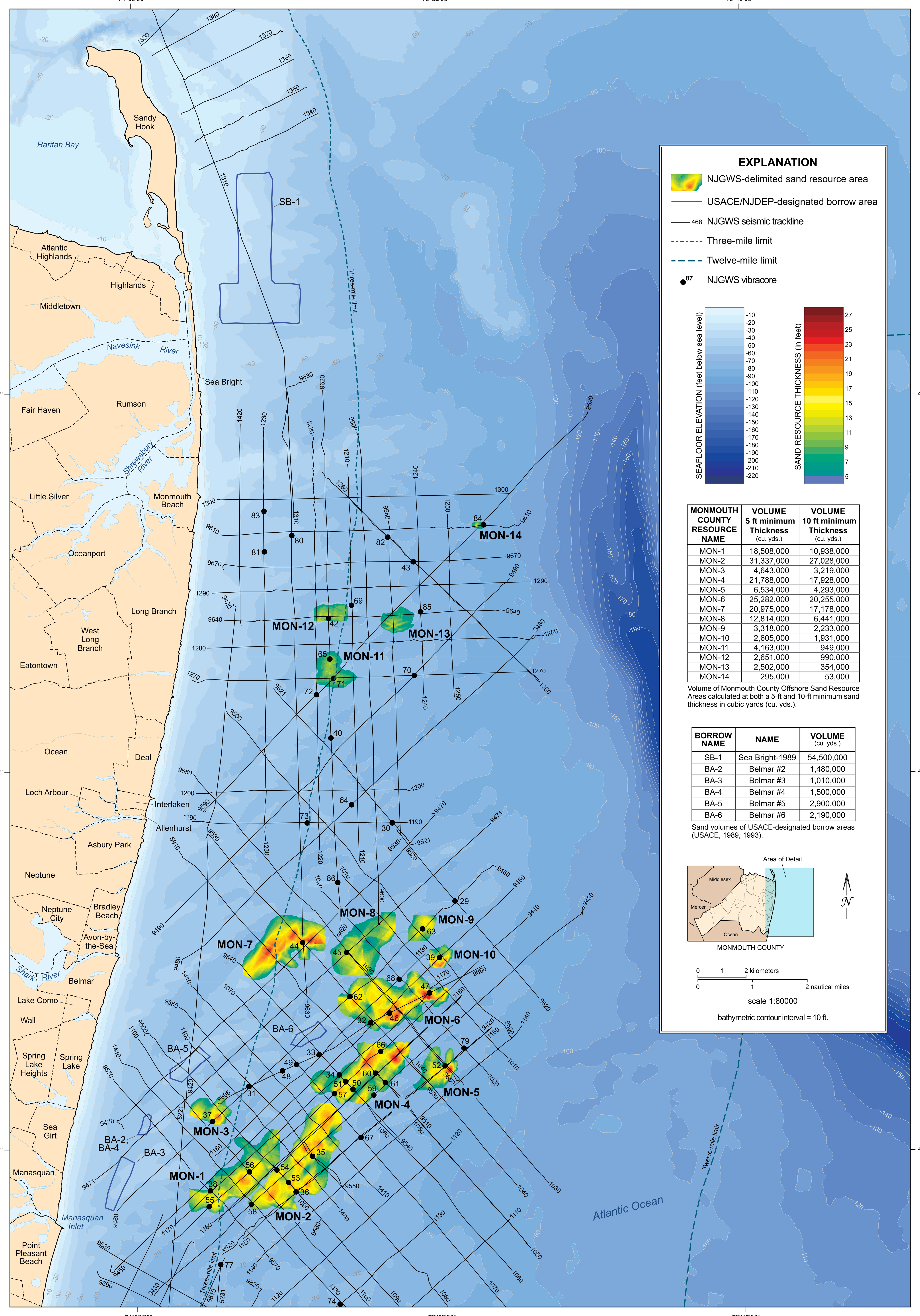
INCORPORATING PREVIOUS ANALYSIS INTO CURRENT, STANDARDIZED SHOAL ASSESSMENT PROTOCOL

Previously, we performed initial analysis of the shoal areas offshore Monmouth County by transferring the data from analog seismic records into digital files using the Didger™ and Surfer™ imaging and contouring software. This initial analysis targeted shoal areas where the sand thickness was in excess of 10 feet. In this analysis, two sand volumes are computed for each shoal: 1) areas with a 5-foot minimum thickness of sand; and 2) areas with a 10-foot minimum thickness of sand. On the 14 large-scale sand thickness plots, the 5-foot minimum thickness is the practical boundary of the contour plots, and the 10-foot minimum thickness contours are indicated with a solid black line. On each geo-referenced and depth-referenced sub-bottom profile, NJGWS delineated the base of sand, correlated to the vibracore lithology, to generate sand thickness data for all profiles that cross the feature. These data were then contoured in Surfer™ to further delimit the shoal and to calculate sand volumes.

NJGWS determined that it is most practical to trace the reflector interpreted as the base of the sand deposit across its full extent (Figure 1). This method provides additional data in the contouring analysis, resulting in a more complete and realistic representation of the shoal. In calculating sand volume, the minimum thickness was selected and all areas of less than this thickness are excluded. The resulting sand volumes for the area of 5-foot minimum thickness and the area of 10-foot minimum thickness are listed in the map explanation and on each sand thickness contour plot.

Sand thickness contour plots of each shoal feature are shown on Plates 1 and 2, with accompanying median grain-size values (in mm and phi) for sediment samples collected at 30-cm (approximately 1 ft) intervals from a 6-meter (20-foot) long vibracore. This high-frequency sampling increases the accuracy for determining the base-of-sand on the sub-bottom profiles.

[1] New Jersey Geological and Water Survey
[2] Previously of New Jersey Geological and Water Survey
[3] Retired, New Jersey Geological and Water Survey
[4] Office of Energy and Sustainablity, New Jersey Department of Environmental Protection



MONMOUTH COUNTY RESOURCE NAME	VOLUME 5 ft minimum Thickness (cu. yds.)	VOLUME 10 ft minimum Thickness (cu. yds.)
MON-1	18,508,000	10,938,000
MON-2	31,337,000	27,028,000
MON-3	4,643,000	3,219,000
MON-4	21,788,000	17,928,000
MON-5	6,534,000	4,293,000
MON-6	25,282,000	20,255,000
MON-7	20,975,000	17,178,000
MON-8	12,814,000	6,441,000
MON-9	3,318,000	2,233,000
MON-10	2,605,000	1,931,000
MON-11	4,163,000	949,000
MON-12	2,651,000	990,000
MON-13	2,502,000	354,000
MON-14	295,000	53,000

Volume of Monmouth County Offshore Sand Resource Areas calculated at both a 5-ft and 10-ft minimum sand thickness in cubic yards (cu. yds.).

BORROW NAME	NAME	VOLUME (cu. yds.)
SB-1	Sea Bright-1989	54,500,000
BA-2	Belmar #2	1,480,000
BA-3	Belmar #3	1,010,000
BA-4	Belmar #4	1,500,000
BA-5	Belmar #5	2,900,000
BA-6	Belmar #6	2,190,000

Sand volumes of USACE-designated borrow areas (USACE, 1989, 1993).

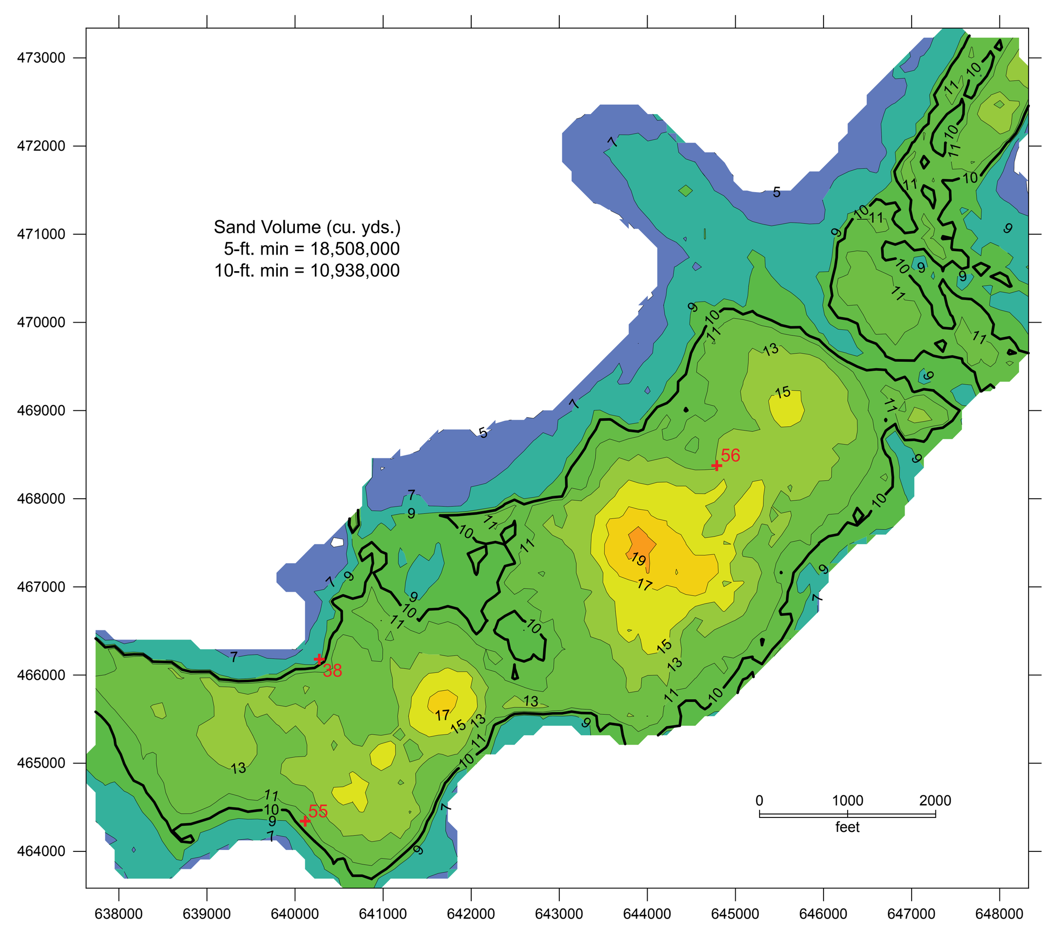
SIGNIFICANT SAND RESOURCE AREAS IN STATE AND FEDERAL WATERS OFFSHORE MONMOUTH COUNTY, NEW JERSEY

by

Michael V. Castelli[1], Daniel Latini[2], Jane Uptegrove[1], Jeffrey S. Waldner[3], David W. Hall[3], Andrea L. Friedman[4]

2015

Sand Resource Thickness of MON-1



Core 55		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.46	0.36
0.3	1.67	0.31
0.6	1.78	0.29
0.9	1.72	0.30
1.2	1.97	0.26
1.5	1.73	0.30
1.8	1.64	0.32
2.1	1.77	0.29
2.4	1.75	0.30
2.7	1.87	0.27
3.0	1.91	0.27
3.3	1.88	0.27
3.6	4.23	0.05
3.9	2.36	0.19
4.2	4.17	0.06
4.5	3.25	0.11
4.8	3.27	0.10
5.1	3.22	0.11
5.4	3.19	0.11
5.7	3.41	0.09
6.0	3.56	0.08

NJGWS reports grain-size median values by depth in core runs, as recorded in the driller's log. In some cases, core depths on different runs may not exactly coincide. Due to this possibility, there may be discrepancies in grain size median values at specific depths on different drilling runs.

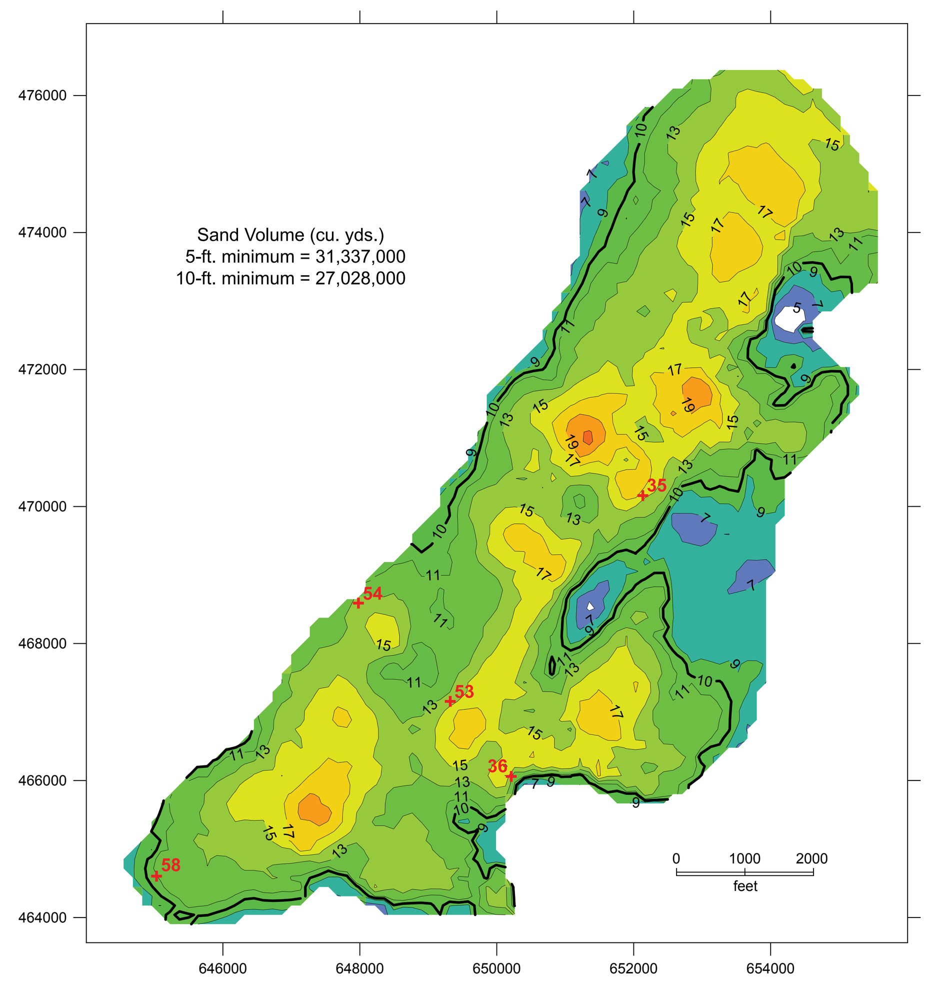
Core 38, Run 1		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.33	0.40
0.3	1.39	0.38
0.6	1.37	0.39
0.9	1.61	0.33
1.2	1.46	0.36
1.5	1.55	0.34
1.8	1.06	0.48
2.1	1.39	0.38
2.4	1.57	0.34
2.7	1.48	0.36
3.0	1.07	0.47
3.3	1.35	0.39
3.6	1.40	0.38
3.9	1.23	0.43
4.2	2.06	0.24
4.5	2.20	0.22
4.8	2.32	0.20
5.1	2.43	0.19
5.4	-2.62	6.14

Core 36, Run 2		
Depth	Median	
bsf (m)	(phi)	(mm)
3.6	1.85	0.28
3.9	2.01	0.25
4.2	2.00	0.25
4.5	1.86	0.27
4.8	4.19	0.05
5.1	2.92	0.13
5.4	4.18	0.06
5.7	4.23	0.05
6.0	4.23	0.05
6.3	4.23	0.05
6.6	4.14	0.06

Core 56, Run 1		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.46	0.36
0.3	1.67	0.31
0.6	1.78	0.29
0.9	1.72	0.30
1.2	1.97	0.26
1.5	1.73	0.30
1.8	1.64	0.32
2.1	1.77	0.29
2.4	1.75	0.30
2.7	1.87	0.27
3.0	1.91	0.27
3.3	1.88	0.27
3.6	1.60	0.33
3.9	1.71	0.31
4.2	2.49	0.18

Core 56, Run 2		
Depth	Median	
bsf (m)	(phi)	(mm)
3.6	4.23	0.05
3.9	2.36	0.19
4.2	4.17	0.06
4.5	3.25	0.11
4.8	3.27	0.10
5.1	3.22	0.11
5.4	3.19	0.11
5.7	3.41	0.09
6.0	3.56	0.08

Sand Resource Thickness of MON-2



Core 35		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.68	0.31
0.3	1.32	0.40
0.6	1.38	0.38
0.9	1.69	0.31
1.2	1.81	0.29
1.5	1.62	0.33
1.8	1.38	0.39
2.1	1.82	0.28
2.4	1.81	0.28
2.7	1.84	0.28
3.0	1.73	0.30
3.3	1.57	0.34
3.6	1.46	0.36
3.9	1.67	0.32
4.2	1.45	0.36
4.5	1.78	0.29
4.8	1.40	0.38

Core 53		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.28	0.41
0.3	1.15	0.45
0.6	1.09	0.47
0.9	1.18	0.44
1.2	1.01	0.50
1.5	1.42	0.37
1.8	1.01	0.50
2.1	1.34	0.40
2.4	1.18	0.44
2.7	1.58	0.33
3.0	1.35	0.39
3.3	1.45	0.37
3.6	1.35	0.39
3.9	1.64	0.32
4.2	2.37	0.19
4.5	1.79	0.29
4.8	1.92	0.26
5.1	1.66	0.32
5.4	2.16	0.22

Core 36, Run 1		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.58	0.33
0.3	1.28	0.41
0.6	1.50	0.35
0.9	1.70	0.31
1.2	1.62	0.32
1.5	1.43	0.37
1.8	1.58	0.34
2.1	1.56	0.34
2.4	1.70	0.31
2.7	1.47	0.36
3.0	4.08	0.06
3.3	1.48	0.36
3.6	1.50	0.35
3.9	1.63	0.32
4.2	1.81	0.29

Core 54		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	0.84	0.56
0.3	0.95	0.52
0.6	0.87	0.55
0.9	0.85	0.55
1.2	1.01	0.50
1.5	0.98	0.51
1.8	1.13	0.46
2.1	1.02	0.49
2.4	1.09	0.47
2.7	1.00	0.50
3.0	1.06	0.48
3.3	1.38	0.38
3.6	0.93	0.53
3.9	0.96	0.51
4.2	1.18	0.44
4.5	1.02	0.49
4.8	-2.88	7.37
5.1	-3.04	8.21
5.4	1.71	0.31
5.7	1.77	0.29

Core 36, Run 2		
Depth	Median	
bsf (m)	(phi)	(mm)
3.6	1.85	0.28
3.9	2.01	0.25
4.2	2.00	0.25
4.5	1.86	0.27
4.8	4.19	0.05
5.1	2.92	0.13
5.4	4.18	0.06
5.7	4.23	0.05
6.0	4.23	0.05
6.3	4.23	0.05
6.6	4.14	0.06

Core 58		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	0.98	0.51
0.3	1.13	0.46
0.6	1.19	0.44
0.9	1.04	0.49
1.2	1.09	0.47
1.5	1.22	0.43
1.8	1.27	0.41
2.1	1.09	0.47
2.4	1.15	0.45
2.7	1.50	0.35
3.0	1.69	0.31
3.3	1.62	0.33
3.6	2.10	0.23
3.9	-2.85	7.21
4.2	-2.64	6.23
4.5	-2.73	6.63
4.8	-1.55	2.92
5.1	-1.13	2.19
5.4	2.89	0.14
5.7	3.37	0.10
6.0	3.07	0.12

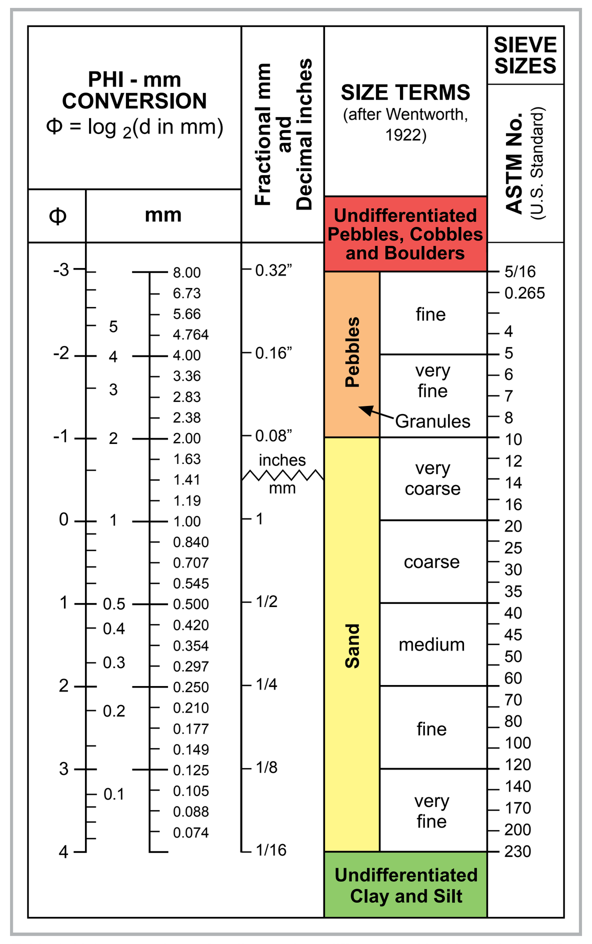


Table 1. Unit conversions of sediment sizes differentiated in this study (modified from Wentworth, 1922).

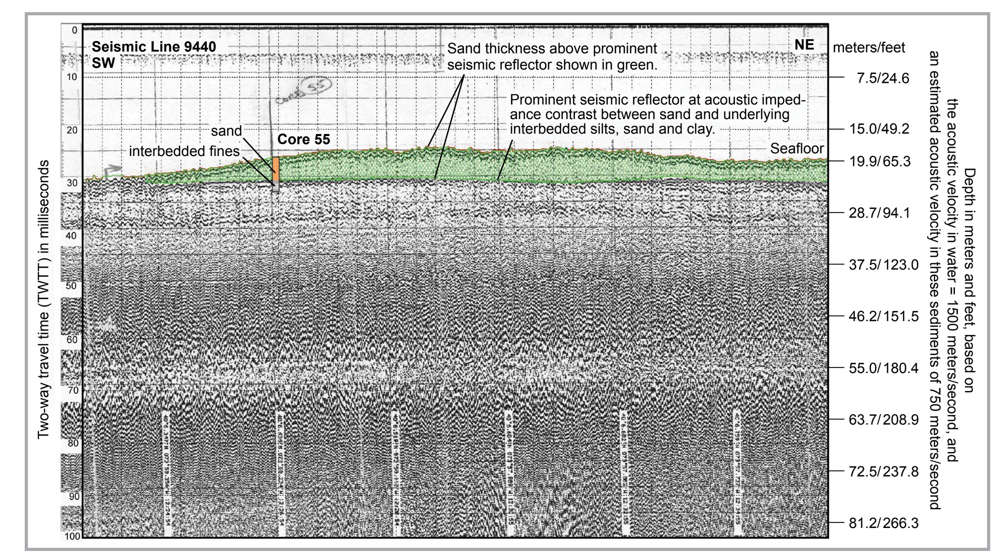
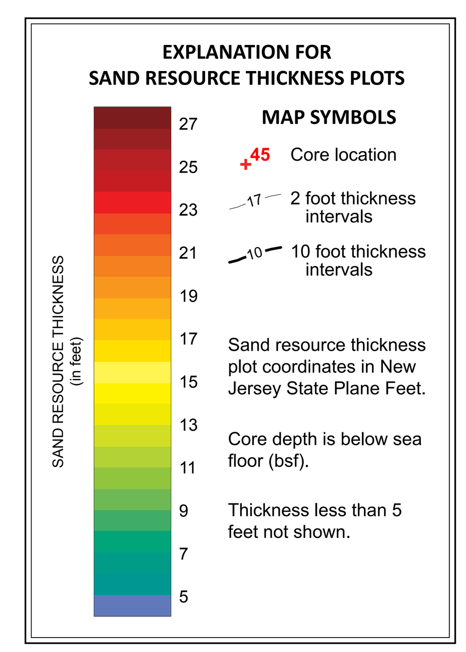


Figure 1. Speed over ground at 3.5 knots; time/location stamps at 2-minute intervals = approximately 700 ft.



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Zehdreh Allen-Lafayette, Cartographer/GIS Specialist created the base map and incorporated the sand volume data into a NJGWS standard-format GIS map at 1:80,000 scale.

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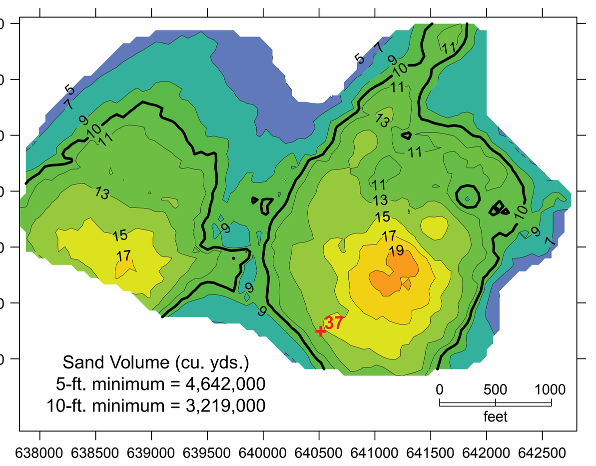
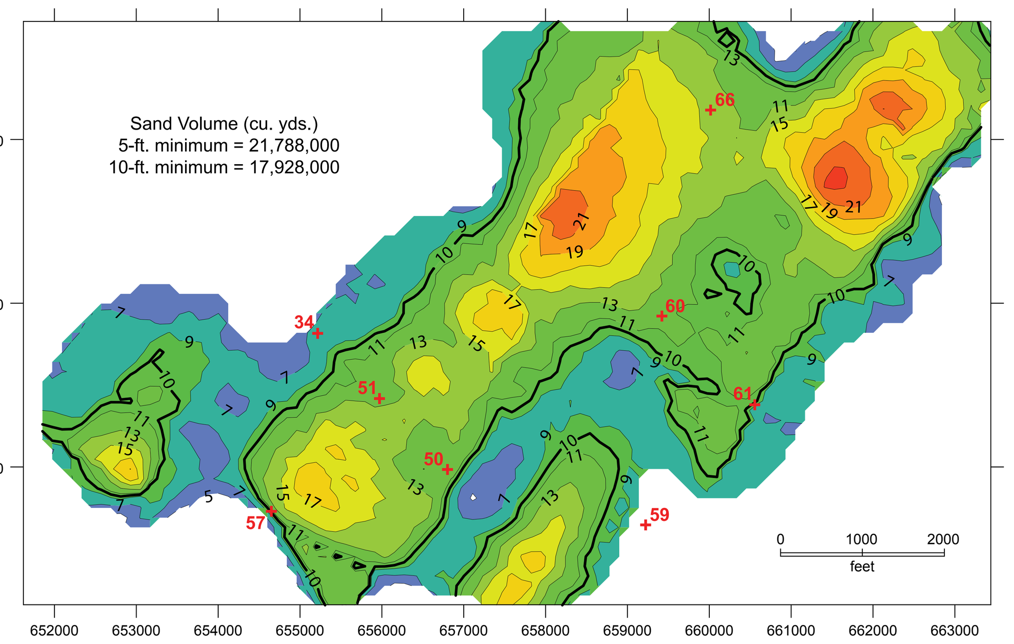
Sand Resource Thickness of MON-3



Core 37		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	2.37	0.19
0.3	2.30	0.20
0.6	2.35	0.20
0.9	2.33	0.20
1.2	2.36	0.19
1.5	2.25	0.21
1.8	2.42	0.19
2.1	2.43	0.19
2.4	2.42	0.19
2.7	2.44	0.18
3.0	2.37	0.19
3.3	2.18	0.22
3.6	2.28	0.21
3.9	3.70	0.08
4.2	2.16	0.22
4.5	2.71	0.15
4.8	2.79	0.14
5.1	3.69	0.08
5.4	4.12	0.06
5.7	3.89	0.07

Sand Resource Thickness of MON-4



Core 34		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.09	0.47
0.3	1.38	0.38
0.6	1.38	0.38
0.9	1.18	0.44
1.2	1.71	0.31
1.5	1.53	0.35
1.8	4.13	0.06
2.1	4.21	0.05
2.4	4.18	0.06
2.7	3.63	0.08
3.0	4.20	0.05
3.3	0.97	0.51
3.6	1.26	0.42
3.9	0.54	0.69
4.2	0.95	0.52
4.5	1.34	0.40
4.8	1.46	0.36
5.1	1.16	0.45
5.4	1.61	0.33

Core 50		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.39	0.38
0.3	1.44	0.37
0.6	1.41	0.38
0.9	1.71	0.31
1.2	1.40	0.38
1.5	1.40	0.38
1.8	1.51	0.35
2.1	1.30	0.41
2.4	1.12	0.46
2.7	1.71	0.31
3.0	1.58	0.33
3.3	1.69	0.31
3.6	2.09	0.23
3.9	2.14	0.23
4.2	2.87	0.14
4.5	2.81	0.14
4.8	1.36	0.39
5.1	1.79	0.29
5.4	1.67	0.31
5.7	-3.05	8.25

Core 51		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.42	0.37
0.3	1.38	0.38
0.6	1.40	0.38
0.9	1.51	0.35
1.2	1.62	0.33
1.5	1.57	0.34
1.8	1.01	0.50
2.1	1.17	0.44
2.4	1.29	0.41
2.7	1.31	0.40
3.0	1.63	0.32
3.3	1.02	0.49
3.6	0.87	0.55
3.9	1.28	0.41
4.2	0.80	0.57
4.5	1.14	0.38
4.8	1.34	0.40
5.1	1.39	0.38

Core 57		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.00	0.50
0.3	1.08	0.47
0.6	1.17	0.44
0.9	0.90	0.54
1.2	1.32	0.40
1.5	1.24	0.42
1.8	1.09	0.47
2.1	0.89	0.54
2.4	0.87	0.55
2.7	0.87	0.55
3.0	1.24	0.42
3.3	1.44	0.37
3.6	1.46	0.36

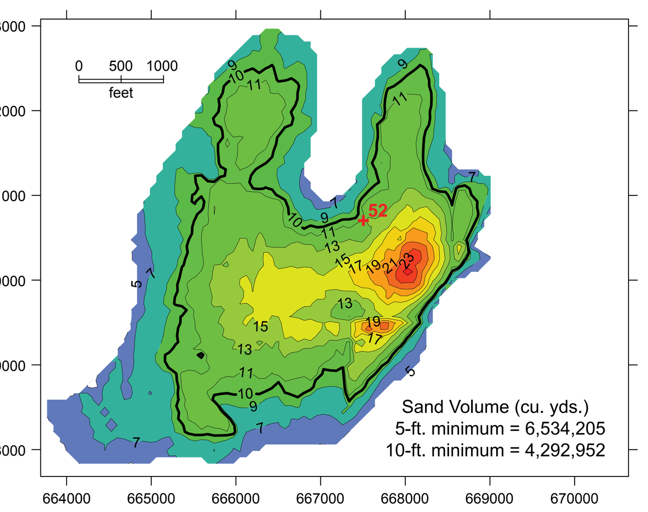
Core 59		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	2.13	0.23
0.3	1.40	0.38
0.6	1.14	0.45
0.9	2.09	0.24
1.2	2.12	0.23
1.5	1.76	0.30
1.8	1.98	0.25
2.1	2.17	0.22
2.4	2.20	0.22
2.7	0.76	0.59
3.0	2.06	0.24
3.3	2.11	0.23
3.6	2.16	0.22
3.9	2.20	0.22
4.2	2.12	0.23
4.5	2.23	0.21
4.8	1.51	0.35
5.1	1.55	0.34
5.4	2.11	0.23
5.7	2.28	0.21
6.0	2.11	0.23

Core 60		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.93	0.26
0.3	1.84	0.28
0.6	1.89	0.27
0.9	2.05	0.24
1.2	1.89	0.27
1.5	1.94	0.26
1.8	1.87	0.27
2.1	1.71	0.31
2.4	1.84	0.28
2.7	1.88	0.27
3.0	1.88	0.27
3.3	1.80	0.29
3.6	1.86	0.28
3.9	1.73	0.30
4.2	1.97	0.26
4.5	2.06	0.24
4.8	2.11	0.23
5.1	2.19	0.22
5.4	2.07	0.24
5.7	-0.44	1.36
6.0	1.81	0.29

Core 61		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.46	0.36
0.3	2.24	0.21
0.6	2.19	0.22
0.9	2.23	0.21
1.2	2.02	0.25
1.5	2.38	0.19
1.8	2.49	0.18
2.1	2.47	0.18
2.4	2.33	0.20
2.7	2.48	0.18
3.0	2.63	0.16
3.3	2.62	0.16
3.6	2.58	0.17
3.9	2.50	0.18
4.2	1.67	0.31
4.5	-3.00	8.00
4.8	0.57	0.67
5.1	2.26	0.21
5.4	2.29	0.20
5.7	2.19	0.22

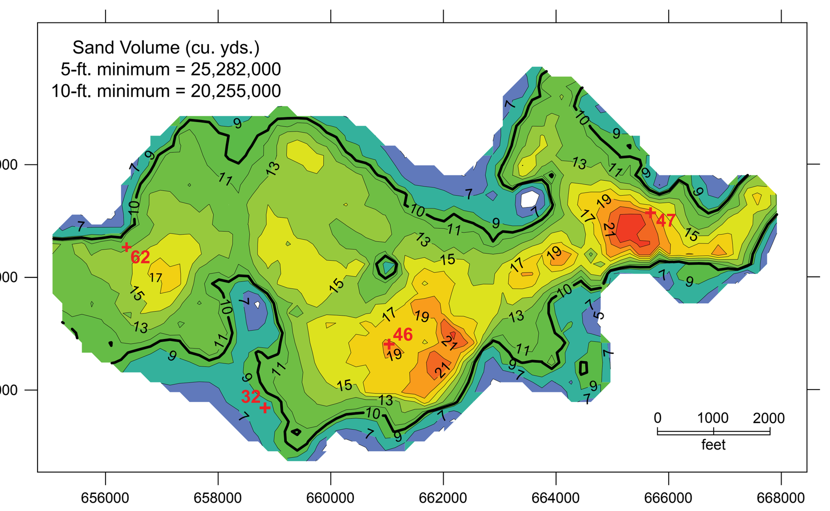
Core 66		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.69	0.31
0.3	1.74	0.30
0.6	1.70	0.31
0.9	1.69	0.31
1.2	1.73	0.30
1.5	1.56	0.34
1.8	1.71	0.31
2.1	1.83	0.28
2.4	1.93	0.26
2.7	1.95	0.26
3.0	1.77	0.29
3.3	1.98	0.25
3.6	1.47	0.36
3.9	1.26	0.42
4.2	1.66	0.32
4.5	1.97	0.25
4.8	1.88	0.27
5.1	4.19	0.05
5.4	4.23	0.05
5.7	4.23	0.05
6.0	4.23	0.05

Sand Resource Thickness of MON-5



Core 52		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.86	0.28
0.3	1.80	0.29
0.6	0.86	0.55
0.9	2.08	0.24
1.2	1.99	0.25
1.5	2.19	0.22
1.8	2.20	0.22
2.1	2.06	0.24
2.4	2.09	0.24
2.7	0.91	0.53
3.0	2.65	0.16
3.3	0.80	0.57
3.6	1.29	0.41
3.9	1.37	0.39
4.2	1.52	0.35
4.5	1.43	0.37
4.8	1.07	0.47
5.1	0.94	0.52
5.4	1.14	0.46
5.7	-1.41	2.65

Sand Resource Thickness of MON-6



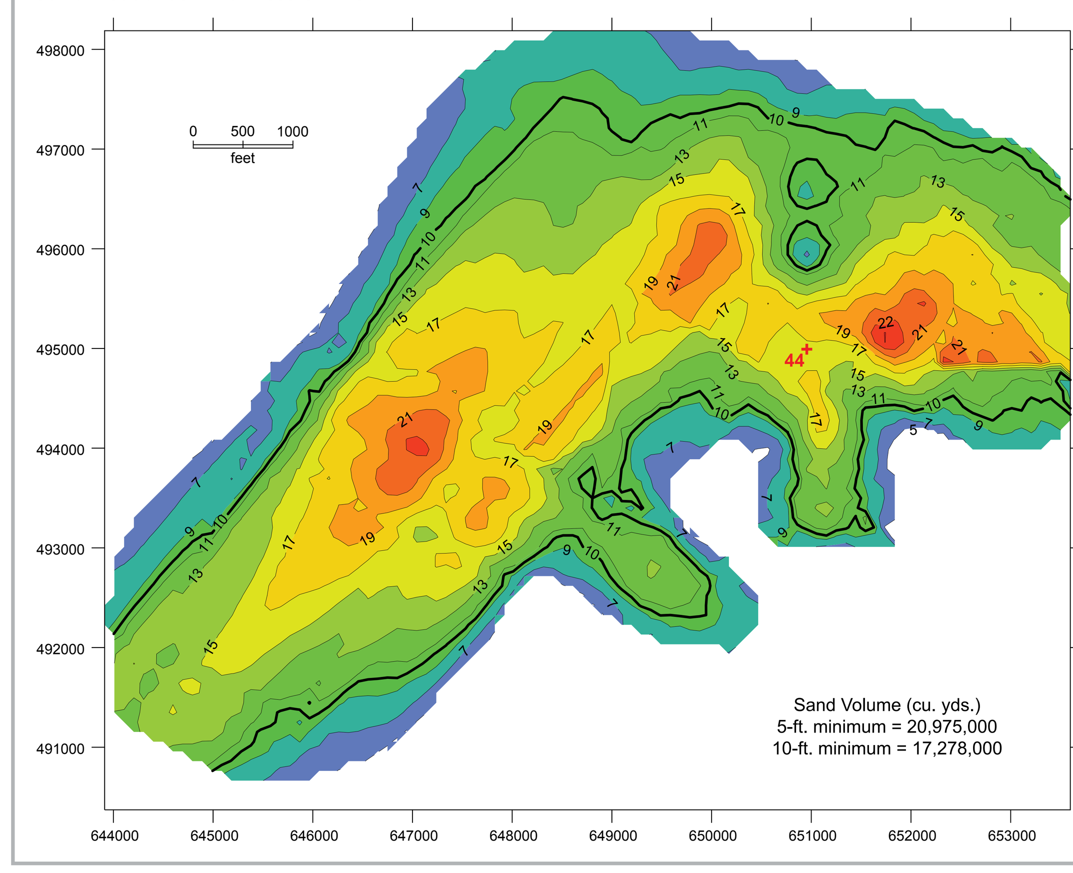
Core 32		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	0.87	0.55
0.3	1.02	0.49
0.6	1.35	0.39
0.9	1.19	0.44
1.2	1.41	0.38
1.5	1.88	0.27
1.8	0.90	0.53
2.1	2.52	0.17
2.4	1.99	0.25
2.7	1.93	0.26
3.0	1.68	0.31
3.3	1.48	0.36
3.6	1.60	0.33
3.9	1.71	0.31
4.2	0.17	0.89
4.5	3.03	0.12
4.8	1.40	0.38
5.1	0.61	0.65

Core 46		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.23	0.43
0.3	1.07	0.47
0.6	1.50	0.35
0.9	1.74	0.30
1.2	1.63	0.32
1.5	1.29	0.41
1.8	1.15	0.45
2.1	0.94	0.52
2.4	0.80	0.58
2.7	1.29	0.41
3.0	0.40	0.76
3.3	0.72	0.61
3.6	0.47	0.72
3.9	1.27	0.42
4.2	0.99	0.50
4.5	1.14	0.45
4.8	1.32	0.40
5.1	1.41	0.38

Core 47		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.82	0.28
0.3	1.90	0.27
0.6	1.97	0.26
0.9	0.50	0.71
1.2	0.34	0.79
1.5	2.00	0.25
1.8	1.94	0.26
2.1	2.12	0.23
2.4	2.05	0.24
2.7	2.15	0.23
3.0	2.05	0.24
3.3	2.07	0.24
3.6	2.04	0.24
3.9	2.14	0.23
4.2	2.14	0.23
4.5	1.98	0.25
4.8	1.94	0.26
5.1	2.25	0.21
5.4	2.04	0.24
5.7	2.02	0.25
6.0	2.04	0.24

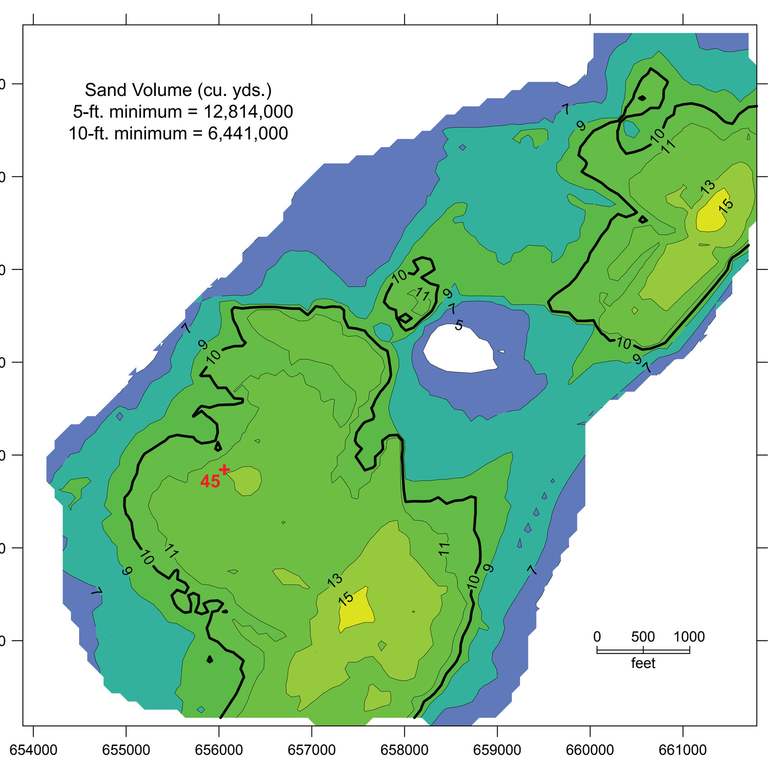
Core 62		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.38	0.38
0.3	1.38	0.39
0.6	1.30	0.41
0.9	0.80	0.57
1.2	1.46	0.36
1.5	1.29	0.41
1.8	1.23	0.43
2.1	1.49	0.35
2.4	1.69	0.31
2.7	1.98	0.25
3.0	1.57	0.34
3.3	1.81	0.28
3.6	2.19	0.22
3.9	1.69	0.31
4.2	2.52	0.17
4.5	2.59	0.17
4.8	2.55	0.17
5.1	-2.46	5.49
5.4	1.16	0.45
5.7	0.89	0.54
6.0	2.94	0.13

Sand Resource Thickness of MON-7



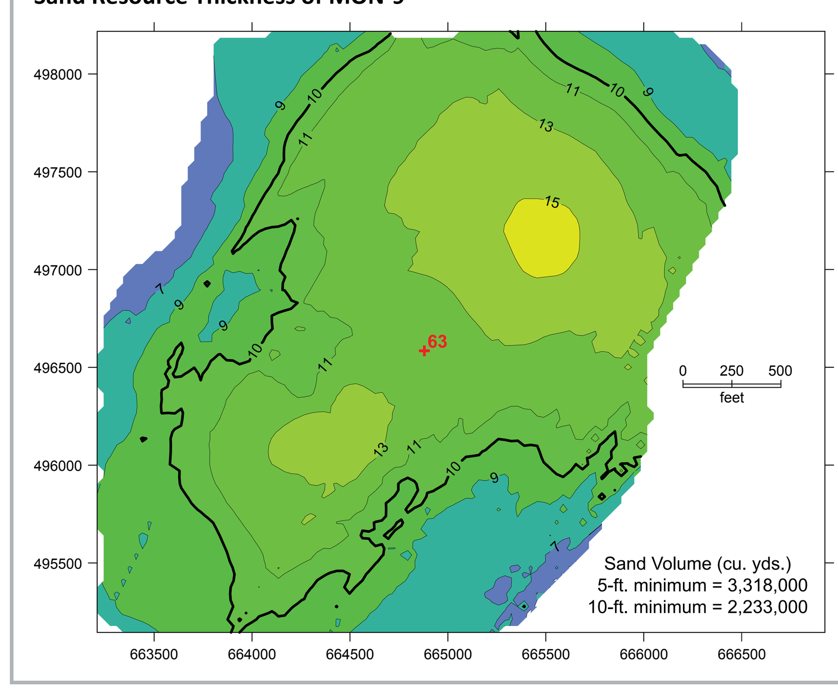
Core 44		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.87	0.27
0.3	1.66	0.32
0.6	2.17	0.22
0.9	2.29	0.20
1.2	2.17	0.22
1.5	2.27	0.21
1.8	2.25	0.21
2.1	2.25	0.21
2.4	2.21	0.22
2.7	2.25	0.21
3.0	2.29	0.20
3.3	2.23	0.21
3.6	2.25	0.21
3.9	2.21	0.22
4.2	2.28	0.21
4.5	2.31	0.20
4.8	2.27	0.21
5.1	2.34	0.20
5.4	2.33	0.20

Sand Resource Thickness of MON-8



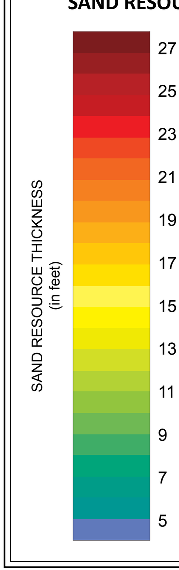
Core 45		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.50	0.35
0.3	1.42	0.37
0.6	1.69	0.31
0.9	1.62	0.33
1.2	1.68	0.31
1.5	1.76	0.30
1.8	2.13	0.23
2.1	2.07	0.24
2.4	2.59	0.17
2.7	2.69	0.15
3.0	2.73	0.15
3.3	2.70	0.15
3.6	1.73	0.30
3.9	-2.65	6.26
4.2	1.64	0.32
4.5	1.74	0.30
4.8	1.67	0.31
5.1	1.88	0.27

Sand Resource Thickness of MON-9



Core 63		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.31	0.40
0.3	1.27	0.42
0.6	1.37	0.39
0.9	1.40	0.38
1.2	1.53	0.35
1.5	1.43	0.37
1.8	1.32	0.40
2.1	1.76	0.30
2.4	2.17	0.22
2.7	1.63	0.32
3.0	2.20	0.22
3.3	2.05	0.24
3.6	0.34	0.79
3.9	1.34	0.40
4.2	2.12	0.23
4.5	2.35	0.20
4.8	-0.63	1.54

EXPLANATION FOR SAND RESOURCE THICKNESS PLOTS



MAP SYMBOLS

45 Core location

17 2 foot thickness intervals

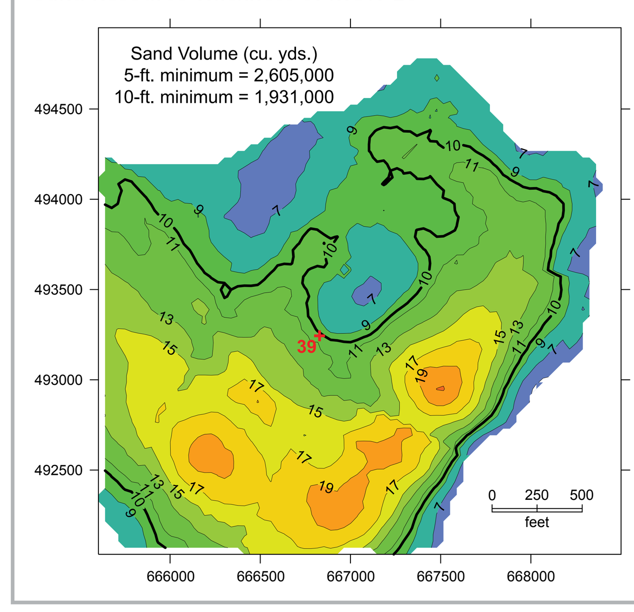
10 10 foot thickness intervals

Sand resource thickness plot coordinates in New Jersey State Plane Feet.

Core depth is below sea floor (bsf).

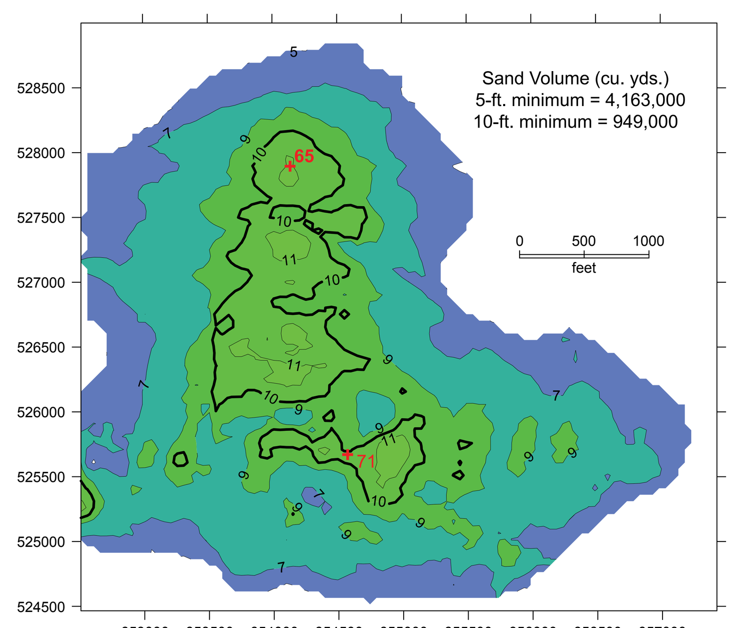
Thickness less than 5 feet not shown.

Sand Resource Thickness of MON-10



Core 39		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.61	0.33
0.3	1.84	0.28
0.6	1.97	0.26
0.9	2.08	0.24
1.2	1.95	0.26
1.5	1.58	0.33
1.8	1.88	0.27
2.1	1.68	0.31
2.4	1.67	0.31
2.7	1.99	0.25
3.0	4.13	0.06
3.3	1.82	0.28
3.6	2.03	0.24
3.9	-2.56	5.89
4.2	-0.43	1.35
4.5	1.67	0.32
4.8	1.84	0.28
5.1	1.77	0.29
5.4	1.50	0.35

Sand Resource Thickness of MON-11

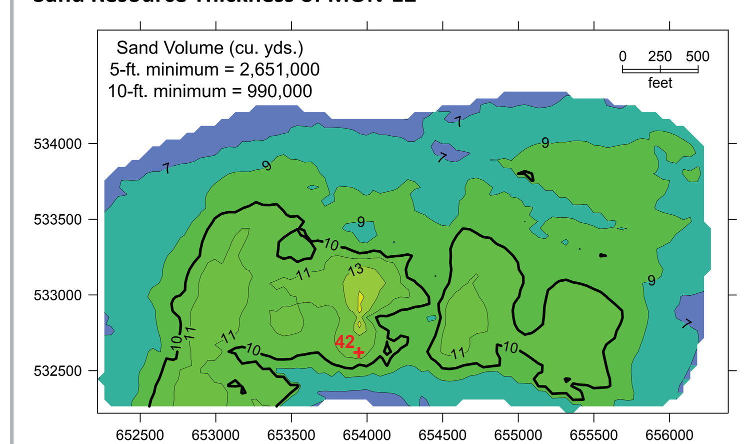


Core 65, Run 1		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.15	0.45
0.3	1.33	0.40
0.6	0.87	0.55
0.9	1.29	0.41
1.2	1.31	0.40
1.5	1.19	0.44
1.8	1.17	0.44
2.1	1.41	0.38
2.4	1.10	0.47
2.7	0.99	0.50
3.0	1.34	0.40
3.3	0.97	0.51
3.6	1.38	0.38
3.9	1.01	0.50
4.2	1.19	0.44

Core 65, Run 2		
Depth	Median	
bsf (m)	(phi)	(mm)
3.3	0.56	0.68
3.6	0.81	0.57
3.9	-0.21	1.16
4.2	0.74	0.60
4.5	0.65	0.64
4.8	0.84	0.56
5.1	1.12	0.46

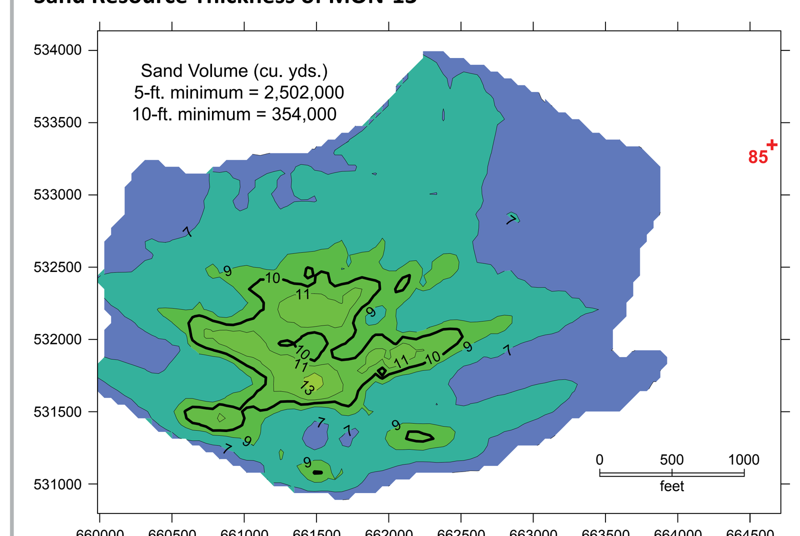
Core 71		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.18	0.44
0.3	0.83	0.56
0.6	1.27	0.42
0.9	0.66	0.63
1.2	1.49	0.36
1.5	1.03	0.49
1.8	1.49	0.36
2.1	1.24	0.42
2.4	1.35	0.39
2.7	1.70	0.31
3.0	1.74	0.30
3.3	1.70	0.31
3.6	1.69	0.31
3.9	2.48	0.18
4.2	2.79	0.14
4.5	3.08	0.12
4.8	2.28	0.21
5.1	1.81	0.28
5.4	1.84	0.28
5.7	1.91	0.27

Sand Resource Thickness of MON-12



Core 42		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.41	0.38
0.3	1.34	0.40
0.6	1.04	0.49
0.9	1.31	0.40
1.2	1.49	0.36
1.5	1.41	0.38
1.8	1.38	0.38
2.1	1.51	0.35
2.4	1.42	0.37
2.7	1.34	0.40
3.0	1.68	0.31
3.3	1.48	0.36
3.6	1.53	0.35
3.9	1.28	0.41
4.2	1.50	0.35
4.5	1.48	0.36
4.8	1.74	0.30
5.1	1.70	0.31
5.4	1.63	0.32
5.7	1.56	0.34
6.0	1.34	0.39

Sand Resource Thickness of MON-13

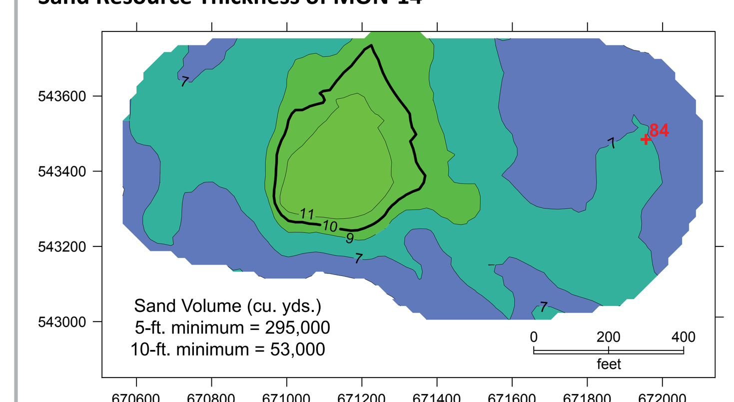


Core 85, Run 1		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.58	0.33
0.3	1.63	0.32
0.6	-3.04	8.22
0.9	0.95	0.52
1.2	4.02	0.06
1.5	1.54	0.34
1.8	0.93	0.53
2.1	1.12	0.46
2.4	0.89	0.54
2.7	1.60	0.33
3.0	1.51	0.35
3.3	1.41	0.38
3.6	0.60	0.66

Core 85, Run 2		
Depth	Median	
bsf (m)	(phi)	(mm)
4.2	0.71	0.61
4.5	1.10	0.47
4.8	1.29	0.41
5.1	1.23	0.43
5.4	0.91	0.53
5.7	1.26	0.42
6.0	0.13	0.91

Although core 85 is not inside the five-foot sand-thickness minimum at which all shoal features were clipped, it does show useful information about MON-13. The change from medium grained sand to pebbles seen in Core 85 clearly matched up with reflectors on seismic lines passing through this shoal feature. It is an exploration level resource that was found using confirmatory geologic data from the eastern flank of the shoal. NJGWS would highly recommend additional coring of this resource if it is considered for the design level phase.

Sand Resource Thickness of MON-14



Core 84		
Depth	Median	
bsf (m)	(phi)	(mm)
0.0	1.58	0.33
0.3	1.54	0.34
0.6	1.88	0.27
0.9	1.97	0.26
1.2	2.04	0.24
1.5	2.27	0.21
1.8	2.27	0.21
2.1	2.37	0.19
2.4	2.62	0.16
2.7	2.99	0.13
3.0	4.00	0.06
3.3	3.58	0.08
3.6	3.57	0.08
3.9	4.03	0.06
4.2	4.12	0.06